University of Alberta

Prevalence and Predictors of Infant Feeding Practices in Alberta, Western Canada

by

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Dedications

To the most amazing parents in the world, **Mehri Khaki** and **Jafar Jessri**, who loved me and taught me the value of humanity, honesty and hard work. I will always be indebted to them as they worked hard and sacrificed so that I would have the opportunities that they never had. They are and will always be the best part of my life; I can't wish for better parents.

To my older sister **Maryam**, whose unquestionable love for me has brought us laughter and tears, fiery fights and heart melting make-ups.

To my younger sister **Mahshid**, a female Peter Pan, who never grows up in our eyes. She knows how to bring a smile to my face and make me happy.

Abstract

Despite the evidence supporting 6-month exclusive breastfeeding, few Canadian mothers follow the recommendations. The first study in this thesis evaluated predictors of 6-month exclusive breastfeeding among participants of Alberta Pregnancy Outcomes and Nutrition (APrON) study. The 6-month exclusive breastfeeding rate was 15.3%, and higher maternal education and multiparity increased the probability by 3.76 and 2.21 times, respectively ($P<0.03$). Women in the highest quartile of Iowa Infant Feeding Attitude Scale score were 4.29 times more likely to breastfeed exclusively (p-trend<0.001). The second study was an ethnographic assessment of infant feeding experiences among Middle Eastern mothers in Canada. Five layers of influence emerged from focus groups among which religious beliefs were the strongest factors dismissing all negative influences on breastfeeding. However, cultural practices promoted pre-lacteal feeding and jeopardized breastfeeding exclusivity. Our findings suggest the necessity of developing culturally-sensitive programs targeting maternal attitudes and beliefs to promote infant feeding practices in Alberta.

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Table of Contents

Title	Page
Chapter I. Introduction	**1**
1. Background	1
2. Research gaps and rationale	3
a. Measurement and reporting of infant feeding practices	3
b. Predictors of infant feeding practices	6
3. Objectives	12
4. Summary	14
5. References	15
Chapter II. Literature Review	**23**
1. Benefits of breast milk and breastfeeding	23
a. Composition of breast milk	23
b. Health benefits	27
i. Health benefits for infants	28
ii. Health benefits for mothers	32
iii. Breastfeeding contraindications	34
iv. Limitations of the evidence	36
c. Economic benefits	41
d. Environmental benefits	43
2. Infant feeding: support and recommendations	45
a. International, federal and provincial support for breastfeeding	45
i. The Baby-Friendly® Initiatives (BFI)	46

ii. Breastfeeding policies 48
b. Infant feeding guidelines in Canada 49
c. International infant feeding definitions: complexities and controversies 50
3. Breastfeeding rates and trends 56
a. Breastfeeding history in North America 56
b. Breastfeeding rates in Canada 59
i. Trends across time 59
ii. Regional differences 62
c. Limitations of infant feeding studies 64
4. Determinants of infant feeding behaviours 67
a. Application of theories to breastfeeding 67
i. The ecological perspective: A multilevel approach 67
ii. Behavioural theories to explain different levels of influence 69
b. Predictors of infant feeding behaviours 75
i. Behavioural factors 75
ii. Socio-demographic characteristics 83
iii. Biomedical factors 92
c. Summary 95
5. References 97
Chapter III. Research Methodology **136**
1. Study 1: Alberta Pregnancy Outcomes and Nutrition (APrON) study
a. Setting and design 136
b. Population and sampling 136

c. Measurements 142

2. Study 2: Ethnographic study

a. Ethnography 145

b. Human ecological theory 149

3. References 151

Chapter IV. Manuscript 1 **154**

Predictors of 6-month Exclusive Breast Feeding: Observations from the Alberta Pregnancy Outcomes and Nutrition (APrON) study

1. Introduction 154

2. Materials and methods 156

3. Results 165

4. Discussion 173

5. Conclusion 183

6. References 205

Chapter V. Manuscript 2 **219**

Invisible Middle Eastern Mothers in Canada: An Ethnographic Study

1. Introduction 219

2. Materials and methods 221

3. Results 228

4. Discussion 273

5. Conclusion 281

6. References 289

Chapter VI. Conclusions and Future Directions **301**

1. Summary of findings 301

2. Implications, recommendations and future directions 305

3. References 308

Chapter VII. Appendices **309**

Appendix A. Ten Steps to Successful Breastfeeding 310

Appendix B. Summary of the International Code of Marketing of Breast Milk Substitutes 311

Appendix C. Ethics Approval (Study 1) 312

Appendix D. Study Information (Study 1) 313

Appendix E. Consent Form (Study 1) 318

Appendix F. Iowa Infant Feeding Attitude Scale (IIFAS) 319

Appendix G. Ethics Approval (Study 2) 320

Appendix H. Study Information (Study 2) 321

Appendix I. Consent Form (Study 2) 322

Appendix J. Interview Guide for Focus Groups 324

List of Tables

Title	Page
Table II.1. Key global infant feeding definitions	52
Table II.2. World Health Organization criteria for defining infant feeding practices	53
Table II.3. Comparison of breastfeeding initiation and exclusivity rates across different regions in Canada	64
Table III.1. Comparison of socio-demographic and lifestyle variables according to research participation: Alberta Pregnancy Outcomes and Nutrition (APrON) study	137
Table IV.1. Comparison of cases excluded from the regression models due to missing values for any of the potential predictors of exclusive breastfeeding and those included in the final regression models: Alberta Pregnancy Outcomes and Nutrition (APrON) study	185
Table IV.2. Baseline characteristics of a subsample of participants from the first cohort of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to breastfeeding exclusivity for 6 months	186
Table IV.3. Comparison of significant items in the Iowa Infant Feeding Attitude Scale (IIFAS) between mothers who exclusively breastfed to 6 months and those who did not: Alberta Pregnancy Outcomes and Nutrition (APrON) study	189
Table IV.4. Follow-up postnatal characteristics of a subsample of participants from the first cohort of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to breastfeeding exclusivity for 6 months	190
Table IV.5. Baseline characteristics of a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to	192

three feeding categories during the first 6 months postpartum

Table IV.6. Follow-up postnatal characteristics of a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to three feeding categories during the first 6 months postpartum 195

Table IV.7. Direct (forced-entry) logistic regression analysis of best-fitting model for predictors of 6-month exclusive breastfeeding among a subsample of participants from the first cohort of Alberta Pregnancy Outcomes and Nutrition (APrON) study 197

Table V.1. Key characteristics of the Middle Eastern mothers in an ethnographic study in Edmonton, AB, Canada 282

Table V.2. Infant feeding practices of Middle Eastern mothers in an ethnographic study in Edmonton, AB, Canada 284

Table V.3. Complementary foods introduced to the Middle Eastern infants in an ethnographic study in Edmonton, AB, Canada 286

List of Figures

Title	Page
Figure II.1. McLeroy's social ecological model	69
Figure II.2. Schematic of Bandura's social cognitive theory	72
Figure II.3. Conceptual framework for understanding determinants of infant feeding decisions adapted from Bandura's social cognitive theory	74
Figure IV.1. Recruitment details: reasons for non-participation and non-eligibility among a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study	199
Figure IV.2. Infant feeding patterns and transitions between 3 months (n=402) and 6 months (n=300) postpartum in a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study	200
Figure IV.3. Detailed breakdown of infant feeding categories during 3 and 6 months postpartum in a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study	202
Figure IV.4. Adjusted odds ratios (OR) with 95% confidence intervals (CI) for probability of exclusive breastfeeding for 6 months across the quartiles of Iowa Infant Feeding Attitude Scale (IIFAS) score among a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study	203
Figure IV.5. The means plot of Iowa Infant Feeding Attitude Scale (IIFAS) score across the three feeding categories during the first 6 months postpartum: Alberta Pregnancy Outcomes and Nutrition (APrON) study	204
Figure V.1. Age of introduction of liquids and solid foods to the Middle Eastern	287

infants in an ethnographic study in Edmonton, AB, Canada

Figure V.2. Different levels of influence explaining the breastfeeding behaviours of Middle Eastern mothers in Canada according to the human ecological framework 288

List of Symbols and Abbreviations

Acronym	Full form
WHO	World Health Organization
CCHS	Canadian Community Health Survey
MES	Maternity Experiences Survey
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
APrON	Alberta Pregnancy Outcomes and Nutrition
IIFAS	Iowa Infant Feeding Attitude Scale
FDA	Food and Drug Administration
DHA	Docosahexaenoic acid
AA	Arachidonic acid
AHRQ	Agency for Healthcare Research and Quality
BMI	Body Mass Index
SIDS	Sudden Infant Death Syndrome
UNICEF	United Nations Children's Fund
HIV	Human Immunodeficiency Virus
AFASS	Acceptable, Feasible, Affordable, Sustainable and Safe
RCT	Randomized Controlled Trial
WIC	Women, Infants and Children
INFACT	Infant Feeding Action Coalition
WABA	World Alliance for Breastfeeding Action
BFI	The Baby-Friendly® Initiatives

BFHI	Baby-Friendly Hospital Initiatives
BCC	Breastfeeding Committee for Canada
AIDS	Acquired Immune Deficiency Syndrome
IGAB	Interagency Group for Action on Breastfeeding
NPHS	National Population Health Survey
NLSCY	National Longitudinal Survey of Children and Youth
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
GRABS	Gender-Role Attitudes toward Breastfeeding Scale
IIFAS	Iowa Infant Feeding Attitude Scale
BAPT	Breastfeeding Attrition Prediction Tool
WCHRI	Women & Children's Health Research Institute
LBW	Low birth weight
FFQ	Food frequency questionnaire
IQR	Interquartile range
SD	Standard Deviation
ORS	Oral Rehydration Solution
SPSS	Statistical Software for the Social Sciences
VIF	Variance inflation factors
AHFMR	Alberta Heritage Foundation for Medical Research
CAD	Canadian dollars
FG	Focus Group

Chapter I. Introduction

I.1. Background

Adequate nutrition during infancy is fundamental to development of a child's full potential; therefore, the period from birth to two years of age is a critical window for the promotion of growth, health, and behavioural development (1). Compelling evidence from epidemiological studies suggests that breastfeeding confers several short- and long-term health benefits for both mothers and infants and is an unequalled form of infant nutrition by providing all the nutritional, immunological and psychological requirements of healthy term infants to thrive (2).

In Canada, unlike the breastfeeding initiation rate that has steadily increased during the past few decades, exclusive breastfeeding for the first 6 months has shown little or no increase (3-6). Early weaning and non-exclusive breastfeeding are common public health concerns facing infants across Canada (5-7). In Alberta, although 93.8% of mothers intend to breastfeed during pregnancy and 94.6% initiate breastfeeding, after only 6 months, the rates of "any breastfeeding" and "exclusive breastfeeding" fall to 51.7% and 15.3%, respectively (5). This is in sharp contrast with the latest guidelines of the World Health Organization (WHO) (8,9), Canadian Paediatric Society, Dietitians of Canada and Health Canada (10,11), which recommend that all healthy infants be exclusively breastfed for the duration of 6 months. Of concern are also disparities observed in breastfeeding rates by socioeconomic status, race/ethnicity and geographic region (5,6), so that older, married, Caucasian mothers of higher

socioeconomic status are generally more likely to breastfeed compared to their socially-disadvantaged peers (12).

According to the United States Department of Health and Human Services, the method of infant feeding is controlled and determined by maternal personal decisions which have ramifications on children's health and growth (13). On the other hand, according to the social ecological model of breastfeeding, dynamic interactions between macro-level influences (e.g., media, marketing of breast milk substitutes, and economic, political and legislative policies) and micro-level factors (e.g., personal beliefs, social network and the community) influence maternal infant feeding decisions (14). As a result, provision of support, guidance and information to mothers by their social networks, community, employers and the health care team could potentially influence their infant feeding choice and decisions (13,14).

To provide a better picture of current infant feeding practices, barriers and disparities among groups in Alberta province, Canada, the present thesis project was conducted in form of two separate studies, each addressing distinct research questions. The first study is a longitudinal birth cohort conducted within the framework of Alberta Pregnancy Outcomes and Nutrition (APrON) study, while the second, is a two-part ethnographic research study addressing the beliefs, experiences and cultural values concerning infant feeding among Middle Eastern immigrant and refugee mothers in Alberta. The following sections include the research gaps and objectives for each of the two studies completed as part of this thesis project.

I.2. Research gaps and rationale

The present thesis project was conducted to address some of the limitations and research gaps that exist in previous studies. In the following section, the limitations of earlier studies are discussed to provide the theoretical basis and rationale for conducting the present thesis research.

a. Measurement and reporting of infant feeding practices

Findings from a recent literature review illustrated that a major difficulty in comparing the breastfeeding rates between different studies is the ambiguity and heterogeneity of infant feeding definitions used in previous research, as well as lack of standardization in the operationalization of infant feeding terms (12,15). Despite their efforts, few countries have standardized a whole-country system for categorizing breastfeeding practices and many inaccuracies and inconsistencies remain in reporting of breastfeeding rates.

In Canada, researchers and practitioners have loosely interpreted the guidelines resulting in diverse meaning of infant feeding practices and infant feeding categories. The application of these terms coupled with differences in dietary data collection methods has exacerbated the problem. For instance, some researchers have applied infant feeding definitions to "current status data" (e.g., based on 24-hour dietary recalls), while others have used "retrospective recalls" (e.g., based on food frequency questionnaires collecting longitudinal data since birth). The problem with the use of different measurement techniques could arise not only at the data collection stage, but also at the analysis level (15,16). As a result, breastfeeding terms commonly used in the literature might be misleading

as the analyses of current status data should result in breastfeeding "at" a specific age, while breastfeeding "for, until, under, up to" should refer to collection of longer-term recalls (15,16).

There are advantages and disadvantages associated with the use of "current status" data and "long-term recall" techniques. The "current status" method, often collected through the 24-hour recall, has the benefit of requiring a small number of questions to report against many indicators important to practice and policy; in addition, the analyses and interpretation of data are straightforward and the recall bias is significantly reduced (16).The current status data can be used to gain reliable estimates of patterns and trends of breastfeeding over a period of time (16).

However, there are several issues with "current status" method, and the major criticism is that this technique misclassifies and overestimates the number of mothers as exclusively breastfeeding (17). Since the 24-hour recall captures intake for the previous day and not usual feeding over time, it lacks precision in classifying those women who are adhering to or breaching the WHO definition of exclusive breastfeeding. For instance, some mothers might only be providing liquids and foods on an irregular, not daily, basis (16). Many research studies have revealed that a large proportion of infants who are classified as exclusively breastfed according to the 24-hour recall method, were not exclusively breastfed during the previous 7 days and/or since birth (18,19). The WHO recommends ascertaining if the previous 24 hours has been representative of usual practice, and this problem may be overcome with use of 24-hour recall at several time points

rather than using it in cross-sectional studies (9,16). Another potential problem is that any infant feeding indicator reported using this method can only report rates "at" each month of age and should not be interpreted as infant feeding "to" or "under" a certain age.

The second method for collecting infant feeding data is through "longer-term" recalls. The most significant limitation of this technique is the maternal recall bias, which might be overcome by using a prospective cohort design to reduce the period of recall (17), rather than using retrospective cross-sectional design as used in national Canadian surveys (4,5). The Canadian Community Health Survey (CCHS 2009/2010) is based on maternal recall which goes back five years and the Maternity Experiences Survey (MES) is based on the 6-month recall of infant feeding (4,5). However, it has been suggested that long-term recalls of breastfeeding (>6 months) are inaccurate and could significantly overestimate the duration of exclusive breastfeeding (18,19). Bland et al. have reported 6-month post-delivery recall of breastfeeding to be poor, with a sensitivity of 79% to detect exclusively breastfed infants and a specificity of 40% to correctly identify non-exclusively breastfed infants. Specifically, a 20% difference between 48-hour assessment and 6-month recalls has been reported on exclusive breastfeeding rates for 6 weeks (19).

Other issues relate to determining cut-off points and use of prepositions for defining and estimating prevalence of exclusive breastfeeding. Prevalence of breastfeeding is sourced from survey questions in which mothers are asked about the age at which breastfeeding stopped and infants are assumed to have been

breastfed for the period until the age of cessation; however, it is not clear if infants are also considered to be breastfed at the month of cessation. Uncertainty regarding boundary points for infant feeding practices has implications for analyses and interpretation of data and has led to mixed reporting of breastfeeding practices (16). In particular, "at" and "to" are used interchangeably when describing exclusive breastfeeding rates while the indicator "exclusive breastfeeding at 6 months" is used to describe data which might not accurately portray "exclusive breastfeeding to six months" (16). Such methodological issues are relevant to the MES, a large-scale national Canadian study, since it reported exclusive breastfeeding "at" 6 months and at the same time used long-term retrospective recalls of infant feeding since birth (5,20).

Overall, the above-mentioned inconsistencies and ambiguities in research methodology may explain in part the discrepancies in infant feeding rates reported in different studies. There is a need for standardization of the infant feeding concept, the instruments used to collect the data and the way feeding data are analyzed and reported.

b. Predictors of infant feeding practices

For the province of Alberta, the only available information on determinants of breastfeeding is based on the data collected by National Population Health Survey in 1996-1997 and analyzed by Yang et al. in 2004 (21). There are several limitations to the Alberta-based data. Given that Health Canada endorsed the recommendation of 6-month exclusive breastfeeding in 2004 (10), findings of studies on duration of exclusive breastfeeding conducted before this

period should be interpreted with caution. Before 2004, Canadian mothers were instructed to exclusively breastfeed their infants for 4-6 months and as such, the prevalence of 6-month exclusive breastfeeding extracted from studies conducted during this period underestimate the number of mothers who were actually "following the guidelines" at the time, and they might not represent the current feeding status in Alberta. Generally, comparison of exclusive breastfeeding rates between studies conducted before and after the recommendation of 6-month exclusive breastfeeding should be avoided.

Another limitation of the aforementioned study (21) is that data are based on a 5-year recall of breastfeeding, and therefore, the protracted recall period is prone to severe recall bias (18,19). Moreover, the cross-sectional design of this study limits our ability to infer any causal or temporal relationships between feeding practices and potential influencing factors (3-6,21). Another limitation of Yang et al.'s study is that it only examined a limited number of socioeconomic and lifestyle predictors of breastfeeding, including: age, race, marital status, education level, income, sense of well-being, exercise, smoking and alcohol intake during pregnancy (21), and it neglected to consider other maternal behavioural and socio-cultural factors.

Emerging evidence supports the prominent role of maternal knowledge, attitudes and beliefs in their infant feeding choice and decisions over and above the effect of non-modifiable factors such as socio-demographic and biomedical variables. However, as of yet, the focus of most Canadian studies has been the

influence of non-modifiable (extrinsic) factors on infant feeding decisions (3,12,21-23).

The importance of behavioural variables in determining maternal infant feeding decisions is that these factors are malleable to change in response to support and behavioural interventions (24,25). It has been suggested that breastfeeding interventions are likely to be strengthened through incorporation of behavioural theories which are based on psychosocial characteristics of women and their social living (26). Among several different behavioural theories, Theory of Planned Behaviour (TPB) (27,28) and Theory of Reasoned Action (TRA) (29) have been most commonly applied to breastfeeding behaviour (25-26) mainly because they provide an approach with which human social behaviour is explained, predicted and influenced in any given behavioural domain (26). Specifically, TRA suggests that the intention to perform the behaviour is the single most important determinant of the behaviour (30), and is itself influenced by attitudes toward the act (31). TPB and its antecedent, TRA, both explain that breastfeeding intention is posed as the antecedent to breastfeeding initiation and duration and hence provides a potential target for support and interventions (26).

However, despite the prominence of behavioural factors, as of yet the impact of maternal knowledge and attitudes concerning infant feeding on actual feeding outcomes has been left unspecified in the Canadian context. This warrants a careful evaluation of maternal knowledge and attitudes as potential predictors for understanding infant feeding disparities among different groups in Canada. Moreover, there is an increasing acceptance that maternal knowledge and attitude

provide better targets for public health interventions compared to non-modifiable socio-demographic factors (32).

A closer look at contextual factors influencing breastfeeding and methodologies used in estimating breastfeeding, such as limitations of previous research, temporal changes in determinants of breastfeeding (33) and provincial disparities in breastfeeding rates in Canada (3,22) is warranted . Specifically, in order to design structured, effective and targeted promotional programs for improving the current situation of exclusive breastfeeding in Alberta, acquisition of province-specific knowledge about the role of socio-demographic, biophysical, psychosocial and behavioural determinants of breastfeeding exclusivity is crucial.

The first study included in this two-part thesis project was conducted within the framework of the largest Canadian prenatal nutrition cohort, Alberta Pregnancy Outcomes and Nutrition (APrON) study (see www.apronstudy.ca for further details), to be the first longitudinal study to assess the infant feeding practices of Albertan mothers based on the WHO guidelines (34). This study was the first in Canada to validate a measure of maternal infant feeding knowledge and attitude and evaluate its sensitivity to differences between exclusive and non-exclusive breastfeeding mothers.

However, despite the novelties inherent in this prospective cohort study, findings from this research are not quite generalizable to the general population of infants in Alberta, since only few infants in this cohort had multi-ethnic parents and none were from the Middle Eastern countries. This is of prime importance to the Canadian multicultural mosaic given that 16.2% of its total population is

comprised of immigrants (35). According to Statistic Canada, the population of ethnic minority groups in Alberta has increased from 3,010.7 in 2001 to 3,209.4 and 3,373.4 in 2006 and 2011, respectively (35). The Middle Eastern population in particular is of interest, since it is the fastest growing population to influx Canada (35) and it is estimated that by 2017, the population of West Asians and Arab groups will increase by 150% and 118% to reach 276,000 and 423,000, respectively.

Due to the homogeneity and lack of diversity in the APrON sample, a second study in this thesis project focused on groups from different ethnicities to capture cultural differences and contextual factors and to provide a better understanding of infant feeding practices among these emerging groups in Canada. This ethnographic study was comprised of two phases of data collection: survey and focus group discussions. The purpose of this study was to identify, from the Middle Eastern refugee/immigrant mothers' perspective, the experiences, perceptions, beliefs and social/cultural values that formed their infant feeding decisions after migration to Canada.

As lifestyle behaviours change in response to acculturation to the norms of Western societies, breastfeeding is also influenced since this behaviour is often constructed within the social living environment of a woman (36-38). Racial disparities have been observed in the prevalence of breastfeeding among mothers of different ethnicities, so that immigrants with longer-stays have lower breastfeeding rates due to the effect of acculturation (39-42). It is suggested that mothers might change their health behaviours in an attempt to better reflect norms

of the new country (43-46). Despite the trends reported in acculturation studies, Middle Eastern mothers are exceptions to this rule. Although few studies have included this group, they have shown the highest rates of breastfeeding initiation and duration even after immigration to the United States and Australia (47-49). The higher rates of breastfeeding among immigrant Middle Eastern mothers highlight the role of a mediating factor influencing their breastfeeding behaviours which appears to be independent of the acculturation process and assimilation to the local norm of the host country. However, no previous studies have evaluated the cultural beliefs and values of new-settler mothers from the Middle East (Arabs and Iranians) with regards to infant feeding from an emic perspective.

By conducting this two-part thesis project, we hoped to bring to light a holistic understanding of the processes that take place for mothers residing in Alberta that ultimately lead them to their infant feeding decisions.

I.3. Objectives

Studies included in this thesis are aimed at addressing some of the aforementioned research gaps. Research for this thesis was divided into two distinct studies. In the first study, a longitudinal cohort design approach was taken to evaluate, among participants of the APrON study, the transitions in infant feeding practices between 3 and 6 months post-delivery. In addition, for the first time in Canada, we evaluated the validity and reliability of a measure of maternal infant feeding knowledge and attitude, Iowa Infant Feeding Attitude Scale (IIFAS) (50), and examined its ability to predict 6-month exclusive breastfeeding among Albertan mothers. In addition, the predictive potential of a wide range of parental and infants' socioeconomic, demographic and biomedical characteristics was evaluated in relation to 6-month exclusive breastfeeding. The maternal self-reported reasons for breastfeeding cessation were also sought to further help explain current feeding practices.

In the second study, an ethnographic approach was taken with Middle Eastern mothers to determine their experiences, cultural beliefs and values toward infant feeding through focus group discussions. To complement focus group information and to obtain an overall contextual picture of socio-demographic characteristics and infant feeding practices among this high-risk immigrant/refugee sample, survey data were also collected using the pre-tested questionnaires of the APrON study.

The overall purpose of this thesis was that the information provided by the two-phase ethnographic research, complement results from the quantitative

APrON study, given the deficiency in sample heterogeneity in the APrON project. It is hoped that these complementary approaches create a profile of Albertan infants' feeding patterns that has not been previously described. The findings from this research may be potentially used to design and implement practical evidence-based strategies to improve the infant feeding practices of Albertan mothers, which may lead to overall health and wellbeing of infants in this community.

I.4. Summary

The paucity of data on determinants of 6-month exclusive breastfeeding prevalence in Alberta and the unidentified role of behavioural factors in infant feeding decisions in Canada indicate a need for research in this area. In addition, lack of data on the Middle Eastern mothers' infant feeding experiences, cultural practices, norms and values after migration to a Western country overall, and to Canada, in particular, calls for an action in this research area. The following chapters will review the literature, describe the methodology and present two journal papers that have resulted from this thesis project. Finally, conclusions and recommendations will be provided followed by suggestions for future research and implications for health care professionals.

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Chapter II. Literature Review

This chapter reviews the evidence on benefits of breast milk and breastfeeding, infant feeding support and recommendations, breastfeeding rates and trends, and determinants of infant feeding behaviours.

II.1. Benefits of breast milk and breastfeeding

a. Composition of breast milk

Breast milk is a live unstructured tissue with beneficial immunological and anti-inflammatory properties, and is uniquely suited to the infants' nutritional needs (1). Since breast milk offers nutrients that affect infants' biochemical and immunological systems and destroy the pathogens, it is sometimes referred to as white blood (2). It has been suggested that breast milk uniquely contains nutrients that may stimulate cognitive development in newborn infants, although for premature infants a substantial amount of breast milk is required before a lasting positive effect is observed (3).

According to the American Academy of Pediatrics, all other methods of infant feeding should be compared against the human milk feeding which is the gold standard; since breast milk seems to contain the exact combination of nutrients needed for human infant development, growth and health (4,5). In addition, based on the Food and Drug Administration (FDA), breast milk is nutritionally the best food for infants since it meets all their nutrient requirements and contains just the right amount of water, amino acids and fatty acids for human digestion (6).

It is suggested that feeding colostrum to infants within hours of birth contributes to their health and development. Colostrum contains high amounts of protein and enzymes, anti-infective agents, growth factors and hormones and could potentially decrease the risk of infant morbidity and mortality (7-9). Specifically, the growth factors in colostrum facilitate absorption of nutrients and construction of physical gastrointestinal barriers against pathogens, which may in turn promote the maturation of gastrointestinal tract epithelial cells (2). These positive health benefits could result from the passive immunity conferred through colostrum feeding as well as the lack of infants' exposure to alternative feeding methods (7).

Over a 10-day period, colostrum turns into mature breast milk and would continue to offer passive immunity in addition to transferring several nutrients to infants (7). Components such as maternal immune cells, immune-stimulating cells, long-chain polyunsaturated fatty acids and docosahexaenoic acid (DHA) are not available in formulas and give the breast milk its valuable content (3,10). In particular, breast milk may provide distinct immunological benefits through transferring several antibodies to infants, given the fact that infants' immune systems are not mature for about 2 years after birth (10-13).

Proteins contained in breast milk are suggested to be the "building blocks" for human growth and development, and they are in easily digestible form (14). Proteins most commonly present in human milk are whey protein and casein, with the former being more easily digested to provide immune and growth factors (7).

It is notable that 80% of cells in the breast milk are macrophages, which have the potential to kill bacteria, viruses and fungi. In addition, since mothers produce disease-specific antibodies in response to the diseases present in their environments, breastfeeding infants could benefit from custom-designed milk which protects them against a host of illnesses they are exposed to, and reduces their hospital admission rates (12).

The high fat content of breast milk helps infants gain weight quickly and its high cholesterol levels may protect against hypercholesterolemia in adulthood (7,14). Approximately, 50% of the calories derived from breast milk are provided by fat, a high proportion of which is from DHA and arachidonic acid (AA). DHA and AA are both highly associated with vision acuity and cognitive development (15-17). Despite the criticisms and debates, some companies are adding AA and DHA to their infant formulas and market them as "healthy products for cognitive development" in an effort to emulate breast milk, although the effectiveness and safety of this procedure is yet under question (18).

The types of carbohydrates that breast milk contains may also induce protection of digestive tract from unhealthy levels of bacteria and facilitate digestion (19). Lactose is the most common form of carbohydrate in the human breast milk which is easily digestible by infant's intestinal enzymes (7).

It has been shown that iron from human milk is more retained by infants compared to the iron from formulas or cow's milk, and the main reason is the presence of lactoferrin and a higher proportion of whey protein (lactalbumin) in the human milk (12). Lactoferrin in the breast milk could also protect the body

against a host of infections through withholding iron from microorganisms that need it for proliferation (12).

Human milk supplies adequate amounts of most micronutrients for full-term healthy infants (12). The amount of water-soluble vitamins in breast milk depends on maternal nutritional status and therefore undernourished mothers are likely to provide inadequate amounts of these vitamins to their infants. Fat-soluble vitamins (A, D, E, K) on the other hand, are drawn from mothers' storage and hence are less affected by maternal dietary intakes (2).

However, human milk contains insufficient amounts of vitamin K and D, and therefore newborn infants, especially if premature or exclusively breastfed, are susceptible to developing hypoprothrombinemia during the first days of life (12). Due to inability of neonates to synthesize adequate amounts of vitamin K, all infants receive a bolus dose at birth to prevent hemorrhagic diseases (2). In addition, exclusively breastfed infants are prone to vitamin D deficiency and rickets due to the low quantities of vitamin D in human milk (20-22). This is more problematic among infants with darker skins, at minimal exposure to sunlight or with mothers that exclude fish, meat and dairy products from their diets (2). Health Canada recommends that all breastfed infants receive a daily vitamin D supplement equal to 400 IU for one year (23). This recommendation however, imparts added costs to breastfeeding and might lead mothers to believe their breast milk has nutritional inadequacies (24). This might even have negative impacts on maternal feeding decisions, especially considering the fact that many mothers receive this message that "formulas are good enough" (25).

Another limitation of the breast milk is that its chromium content is only 3-8 nmol/L, which is lower than the recommended intake for infants (12). Chromium primarily potentiates insulin action and influences carbohydrate, lipid and protein metabolism (12). However, the recommended intake set for this trace element seems to be higher than infants' actual requirements since no evidence supports the higher bioavailability of chromium from breast milk than that from the infant formula (12).

In addition to the nutritional content of breast milk, the psychological and physical environment in which the breast milk is fed could positively impact infants' cognitive functioning. As an example, Feldman and Eidelman (2003) have suggested that premature infants receiving at least 75% of their nutritional requirements from breast milk receive more affectionate touch from their mothers compared to infants who receive less than this amount of breast milk (3).

b. Health benefits

Breastfeeding could potentially impart physical benefits for children who are either fed breast milk directly at the breast or from the bottle, while providing psychological benefits only to the former group. Breastfeeding is considered a public health strategy with which infant and child health survival is improved, maternal morbidity and health care costs are decreased, and natural resources are conserved (26).

Previous research has well established the health benefits of breastfeeding but studies may have overstated some of the benefits; however, less is known about the risks and benefits of breastfeeding coupled with other forms of feeding.

Therefore, caution should be practiced in interpretation of findings from previous research.

In the following section, breastfeeding health benefits and contraindications are discussed, and the current evidence regarding the benefits of breast milk is debated through highlighting the limitations of previous studies.

i. Health benefits for infants:

Physical health: The short- and long-term health benefits rendered through breastfeeding are well-recognized and may apply to both children (27-41) and mothers (42,43) in developed and developing nations. A summary of systematic reviews and meta-analyses on breastfeeding and maternal and infant health published by the Agency for Healthcare Research and Quality (AHRQ) reaffirmed some the potential health risks associated with formula feeding and early weaning from the breast milk (30).

Studies in some populations have reported that the short-term risks associated with formula feeding may include an increased risk of common infant infections, such as diarrhea (44,45) and otitis media (ear infection) (36). Infants who are exclusively formula-fed were shown to be at higher risk of developing otitis media compared to those who are exclusively breastfed for 6 months (36), which highlights a potential immune-enhancing effect for breast milk (4). The risks of some serious infections such as severe lower respiratory tract infections (36,45,46) and leukemia (36,47) also seem to be higher among formula-fed infants. Compared to the exclusively breastfed infants, those who were formula-

fed were more than 250 times more likely to be hospitalized for lower respiratory tract infections during the first year of life (46).

In addition, a review of 115 primary studies, systematic reviews and meta-analyses completed in 2007 on the breastfeeding health outcomes for mothers and infants in the developed countries (36) concluded that breastfeeding is negatively correlated with both incidence and severity of many early-life infectious diseases, such as urinary tract infections (45), rotavirus and enterobacterial infections, bacteremia, pneumonia (31,48,49), and bacterial meningitis (27,28). In addition to being protected against infections (50,51), breastfed infants may enjoy immunologic fortification (51-55), better neonate oxygenation, and temperature regulation (28). There are also extensive benefits accrued in improvement of vision acuity and reduction in risk of gastroenteritis and sudden infant death syndrome (SIDS) (36).

Furthermore, in the long-term breastfeeding may help prevent childhood and adolescence obesity and type 2 diabetes (56-59). Findings from studies conducted on large low-income samples in the United States have shown that the longer a woman breastfeeds her child, the less likely the child will be obese (body mass index (BMI)> 95th percentile) at 4 years of age (57,58). Prevalence of asthma is also likely to be decreased among breastfeeding infants, with children receiving breast milk for at least 4 months having lower rates compared to those who do not (36, 60).

Premature infants specifically may benefit from breastfeeding since premature breast milk contains different amounts of nutrients than the mature

milk and is more suited to the needs of premature babies (61). In addition, the act of suckling at the breast and digesting the breast milk may cause less stress for premature infants as compared to bottle feeding (61). Generally, premature formula-fed infants are likely to be at greater risk for necrotizing enterocolitis compared to breastfed babies (36).

According to the Canadian Pediatric Society and the American Academy of Pediatrics, the reduction in the incidence and severity of infectious diseases is associated with continued exclusive breastfeeding (45,62). Generally, infants who were never breastfed were 56% more prone to the SIDS (36), while infant mortality rate was 21% lower among infants over 1 month who were fed the breast milk (45,63).

The risk of major chronic diseases may increase with formula feeding, while the most significant ones being gastrointestinal disorders (64), type 2 diabetes (65), and childhood obesity (66). The incidence of atopic eczema, wheezing, food allergies and intolerances, as well as other allergic and autoimmune disorders may also decrease among infants breastfed for at least 3 months (2,4,5,50,54,64,67-74). In addition, the prevalence of childhood cancers and liver disorders are shown to be lower in infants who are breastfed (75). According to the United Nations Children's Fund (UNICEF), breastfeeding is also important for proper development and growth of infants' mouth and jaw (11,76).

The benefits of breastfeeding are suggested to extend into adulthood to reduce the incidence of obesity (4,5), non-insulin and insulin dependent diabetes

mellitus (4,5,28), hypercholesterolemia, hypertension (28,35,67), cardiovascular diseases (4,5,35,67), autoimmune diseases, celiac disease, Crohn's disease, lymphoma, leukemia (45), Hodgkin's disease, ulcerative colitis, gastric reflux and aspiration (28).

Mental health: Breastfed infants appear to have enhanced cognitive development, and longer duration of breastfeeding has been associated with significantly higher scores on intelligence tests (77). The fact that IQ scores are increased by 3-8 points among breastfed toddlers and school-aged children further suggests a positive influence of breastfeeding on cognitive function (15). It has been suggested that even after adjusting for psychosocial factors such as mother-infant attachment and bonding, cognitive development is still positively improved by breastfeeding (78,79).

Generally, breastfeeding provides positive cognitive benefits to term infants, while premature infants may also enjoy from improved neurobehavioural and cognitive outcomes so that the longer they are breastfed the better their mental and psychomotor skills would be at 6 months corrected age (3). Being more alert, having more interactions with others during and after feeding and improved psychological outcomes are among other benefits associated with breastfeeding (79). Interestingly, breastfed infants show better relationships with their mothers at 12 month postpartum and they seem to feel more warmth, security and comfort compared to the formula-fed infants (6,80, 81).

ii. Health benefits for mothers:

Breastfeeding may also confer health benefits for lactating mothers. It has been suggested that breastfeeding facilitates the return of mother's body to its pre-pregnant state in a shorter period of time through faster contraction of the uterus and decreased postpartum bleeding (4,5,42,82,83). Breastfeeding mothers have also shown faster return to their pre-pregnancy weights since breast milk production may require 200-500 calories a day (4,5,42,83), which is equivalent to the energy required to swim 30 laps or ride a bicycle for over an hour (31). However, women with higher pre-pregnancy BMIs (BMI >35 kg/m^2) tend to lose less weight during postpartum period compared to women with normal pre-pregnancy BMIs (84-86) despite their breastfeeding efforts. This might be due to lower breastfeeding rates among obese mothers, which is rooted from either a physiological delayed onset of milk production, or a perceived sense of breast milk insufficiency (86,87). In addition, overweight women have unrealistically high expectations of breastfeeding effects in decreasing the body weight, which might also explain their higher rates of early weaning due to failure to meet their own expectations (85).

Exclusive breastfeeding for an extended period of time may induce lactational amenorrhea in some women but not all, and help conserve iron stores through delays in menstruation. It could also decrease the likelihood of pregnancy and increase infant spacing through suppressing ovulation (4,88-91), even after menses return (45,92), although it is not recommended as a method of contraception (42).

Breastfeeding mothers have higher levels of the oxytocin hormone which enhances mother-infant attachment and promotes faster recovery from childbirth. Several studies have confirmed that mothers with lifetime breastfeeding histories have lower risk of developing osteoporosis (2,5,45,50,83,89,92,93), hip fractures (83), rheumatoid arthritis, type 2 diabetes (26,28,36,94), hypertension (5,95), ovarian, uterine and breast cancers (2,5,36,43,45,50,89,93,96-99) as well having lower rates of postpartum depressive symptoms, anger, anxiety and sleeping disorders (4,100,101). Generally, the health benefits of breastfeeding for mothers have been attributed to some extend to the prolonged suppression of ovulatory cycles (102).

Furthermore, maternal bonding and closeness to the infant is promoted through skin-to-skin contact of mother and her child during breastfeeding. In fact, the desire to experience a sense of bonding and closeness with the newborn is an important reason cited by some mothers for breastfeeding (103-105). Exclusive breastfeeding mothers in particular, have reported that they believe in superiority of breastfeeding to formula feeding since it creates a close bond between mother and the child (104).

Prolactin and oxytocin hormones that are released during breastfeeding to primarily induce milk production and letdown could also produce calm, relaxed and loving feelings toward the infant which may improve maternal psychological health (106,107). Although the evidence is still inconclusive on this issue, the risk of postpartum depression which affects 13% of mothers, may be lower among lactating women (38,108) especially those who breastfeed for longer periods

(109-112). Postpartum depression on the other hand, poses health risks to both mothers and infants, especially when mothers cannot fully care for their infants (109). This makes it difficult to understand whether the depression affects breastfeeding behaviours or vice versa (113).

The mother-infant relationship has been defined as an interdependence, which means that each needs the other and each has something to offer to the other (59). As noted by Uvnas-Moberg (1996), breastfeeding promotes development of attachment behaviour between mother and infant and establishes a strong emotional bond (114). Breastfeeding mothers also experience more empowerment (2,50,54,73) and better mood (3) as well as adjustment (106) to their role as a parent (50).

iii. Breastfeeding contraindications:

Despite the benefits of breastfeeding, several conditions contraindicate breastfeeding that are worth noting. According to the latest WHO/UNICEF guidelines on the acceptable medical reasons for use of breast milk substitutes there are certain categories of mother/infant conditions in which breastfeeding is exempted. Among infant conditions, having classic galactosemia, maple syrup urine disease and phenylketonuria entail receiving specialized formulas and not the breast milk. Moreover, infants born weighing <1500 grams, at less than 32 weeks gestational age and with hypoglycemia might need formulas in addition to the breast milk for a limited period of time (115).

On the other hand, maternal Human Immunodeficiency Virus (HIV) could justify permanent avoidance of breastfeeding if alternative feeding is acceptable,

feasible, affordable, sustainable and safe (AFASS) (116). Other maternal conditions that justify temporary avoidance of breastfeeding include: severe illnesses (e.g., sepsis), herpes simplex virus type 1, and intake of some medications. The list of drugs contraindicated for nursing mothers is as follows (115):

1. Anti-epileptic drugs, sedating psychotherapeutic drugs, opioids and their combinations that cause side-effects
2. Radioactive iodine-131 (breastfeeding could resume 2 months after receiving this drug)
3. Excessive topical iodine or iodophors use
4. Cytotoxic chemotherapy (breastfeeding could resume after the therapy)

Conditions in which the WHO recommends breastfeeding but warns against the adverse health effects include: breast abscess, Hepatitis B, Hepatitis C, mastitis, tuberculosis and substance use (e.g., nicotine, alcohol, ecstasy, amphetamines, cocaine, opioids, benzodiazepines, cannabis and related stimulants). Specifically, alcohol inhibits milk production and since it is concentrated in breast milk, breastfeeding should not be practiced within two hours immediately after alcohol intake (45,115). It is noteworthy that the common practice of pumping the breasts and disposing the milk immediately after alcohol consumption does not facilitate removal of alcohol from the breast milk, as the newly produced milk will contain alcohol as long as mother's blood has measurable alcohol levels (117,118). Despite considerable individual differences,

peak alcohol level in mother's blood and milk occurs approximately 0.5-1 hour after drinking and is decreased thereafter (117,118).

iv. Limitations of the evidence:

Despite the clarity of current breastfeeding recommendations and the rarity of breastfeeding contraindications, some debates exist in the medical literature regarding the benefits of breastfeeding. As of writing this chapter, there was not an agreement as a whole that breastfeeding is indeed beneficial for both mothers and infants and several reasons are behind this discord.

From an epidemiological research perspective, randomized controlled trials (RCT) could offer the most conclusive evidence regarding the causal relationships between breastfeeding and any functional outcomes (119). In this research design, different feeding methods should be randomly assigned to infants who are themselves randomly chosen from a population of interest (119). However, since assigning some infants to formula feeding is unethical, no RCT has been conducted thus far to examine the benefits of infant feeding practices over one another (23). In addition to ethical objections, this type of research is not feasible for the topic of "infant feeding" since most mothers are not willing to accept random assignment of feeding methods for their infants (119). As a consequence, most evidence concerning the health benefits of breastfeeding is derived from observational studies (case-control and cohort), which are flawed by the maternal choice of infant feeding method (119). In addition, the internal validity and generalizability of findings from observational studies are limited by factors such as misclassification of exposures, confounding effects from self-

selection bias, reverse causality, and the residual confounding. For instance, although some maternal and infant outcomes are specific and well-defined (e.g., breast cancer, childhood acute lymphocytic leukemia), others are not well-specified (e.g., gastrointestinal infection, asthma) and the validity of measured effects for these outcomes is debated. In case-control studies, infant feeding practices of "cases" (infants with an illness) are compared with those of the "controls" (infants without the problem) using retrospective designs (119). In cohort studies on the other hand, outcomes are compared among infants who are fed differently, instead of comparing the infant feeding methods for infants with different outcomes (119).

It has been suggested that as long as feeding methods are not randomly assigned, there is an increased likelihood that data are muddled by possible confounding variables such as characteristics of mothers (e.g., age, education, income) or infants (e.g., sex, pre-existing illness). For instance, if highly-educated mothers breastfeed more, a positive association between breastfeeding and intellectual development of infants might be a proxy indicator of maternal education. Therefore, breastfeeding might have little impact in and of itself and the observed associations between breastfeeding and positive health outcomes might be spurious due to the mentioned methodological issues. As an example, some studies recognize breastfeeding as an indication of parents' general commitment to their children's well-being but one cannot rule out the possibility that the "parental commitment" itself is what is differentiating the outcomes between breastfeeding and formula feeding infants (92).

Furthermore, lower risk of maternal obesity with breastfeeding could occur simply because mothers who choose breastfeeding for health reasons are more health attentive which includes having balanced diets and doing regular exercises (59,120). In a study by Schauberger et al. (120), physical activity or breastfeeding did not have significant effects on weight change at 6 months postpartum, although both behaviours were associated with weight status at follow-up of 8.5 years (120). It has been suggested that the behaviour of breastfeeding mothers might be responsible for their lower risk of overweight and obesity (121-123), and although breastfeeding might have positive effects on weight loss post-delivery, the overall effect is small and easily confounded by other variables including energy intake and physical activity (36,124).

On the other hand, reverse causality in observational studies can create biased results in the opposite direction. For instance, infants who are falling off their growth charts are more likely to be weaned or supplemented in an effort to reverse the trend; however, this supplementation may be wrongly criticized as the cause of poor growth if supplementation does not lead to catch-up growth among these infants (125). As a result, the findings from previous studies suggesting conferral of numerous health benefits through breastfeeding, compared to other methods of infant feeding, should be interpreted with caution considering the societal context and socioeconomic status to avoid confounding effects.

The second methodological concern in breastfeeding literature is that much of the information available worldwide regarding breastfeeding benefits are based on the large-scale national studies. Although these studies might be of

benefit in some respects, there are several limitations associated with the data collected in this way. The first is that the sample would usually be household-based in which all women are interviewed and thus postpartum or breastfeeding women comprise only a small proportion of the total sample. This small sample would be insufficient to provide enough details about maternal infant feeding practices and the tests of statistical significance would therefore be restricted (92). In addition, breastfeeding is usually only a sub-topic within a more general survey in national large-scale studies which severely limits the quantity and quality of information collected about infant feeding. Another concern associated with cross-sectional large-scale surveys is their reliance on retrospective data collection which does not truly capture the dynamic process of breastfeeding decision-making and its health benefits. Previous studies have consistently shown that retrospective evaluation techniques systematically overestimate the duration of breastfeeding compared to the use of event calendars (126). Specifically, using retrospective recalls to investigate the association of breastfeeding with disease incidence may be problematic since such analyses require accurate data at individual levels while maternal recall errors are likely to bias any associations toward the null (126).

The third limitation of evidence concerning the health benefits of breastfeeding stems from the definition of "infant feeding" used in different studies, which raises unease during interpretation and comparison of findings. Despite the efforts made to standardize the breastfeeding indicators and categories, some ambiguities and complexities still remain. Terms such as

"exclusive breastfeeding, bottle feeding, full breastfeeding, mixed feeding, and supplementary feeding" that are commonly used in breastfeeding literature, are rarely defined throughout the literature consistently. This would make comparisons between studies challenging and might lead to artificially-inflated rates and inaccurate prevalence of breastfeeding (69). It might also negatively influence the correlations between breastfeeding and health outcomes.

Another limitation is related to examination of dose-response relationships between breastfeeding and positive health outcomes so to ascertain whether "any" breastfeeding would make a difference or the benefits are only seen after a specific period of continued breastfeeding. As an example, a study has shown that higher intelligence scores in adulthood are associated with duration of breastfeeding, although no additional benefits are observed for breastfeeding longer than 9 months (77). Similarly another study has shown that the beneficial effects of breastfeeding on overweight and obesity are only seen among infants who are breastfed for more than three months (58). Relatedly, some researchers have claimed that duration and exclusivity of breastfeeding, and not merely the initiation, matter in this regard (30).

Another dilemma roots from the length and content of published materials in medical journals. Often, the findings from different studies on benefits of breastfeeding are contradictory, with some ranking the benefits as weak, tied and immeasurable while others finding the benefits to be relevant and significant (59). Word limitations set by journals and also publication bias could lead to omitting

nuances of interpretation of results as well as reporting merely the positive outcomes.

Taken collectively, these issues indicate that breastfeeding is a complicated area to study and yet much is unknown about the protective effects of breastfeeding. Despite the limitations in evidence supporting the health benefits of breastfeeding, it is still recommended as the best method for infant feeding, mainly because of its social and economic benefits, which are described below.

c. Economic benefits

In addition to the health benefits associated with breast milk feeding, several economic advantages are also supplied through breastfeeding which have implications for families, employers, insurers and society as a whole. In general these benefits are dose-dependent with better outcomes resulting from longer periods of breastfeeding (127). A study conducted in 1999 revealed that the formula costs saved by breastfeeding in the first year alone are over $1,200-1,500 for families (128). Findings from this research also suggested that health care costs during the first year of life for an infant who is never breastfed are $331-475 more than the costs for an infant who is exclusively breastfed for at least 3 months (128). However, this study has only taken into account the direct health care costs for three illnesses (lower respiratory tract infections, otitis media and gastrointestinal track disorders) and if current health care costs, lost wages, other diseases and formula costs associated with non-breastfeeding were also considered, this figure would have been significantly higher.

In 2001, Weimer estimated that if levels of breastfeeding in the United States are increased from 64% in early postpartum and 29% at 6 months to 75% and 50% respectively, the savings from indirect costs of formula, direct costs of medical care, and lost wages of a parent to take care of a sick child would be $300 million (129). However, this estimated figure only represents costs for two of the infants' illnesses (i.e., otitis media and gastroenteritis) and by adding other health problems related to not breastfeeding such as obesity, type 2 diabetes and maternal health issues (e.g., breast and ovarian cancers) the savings would be significantly higher. It has been estimated that breastfeeding in the United States could result in more than 3 billion dollars per year savings from the health care costs, and 1.5 billion dollars per year savings from the formula costs that U.S. Department of Agriculture provides to the Women, Infants and Children (WIC) program (130).

Moreover, improved infant health as a result of breastfeeding means fewer health insurance claims (131), higher productivity, less employee absenteeism for taking care of sick children (132), lower family income loss and employee turnover rates (133). Health care cost is also reduced through the overall decreased rate of various illnesses conferred as a result of breastfeeding. A recent study in the United States evaluated the costs associated with several diseases (SIDS, hospitalization for lower respiratory tract infections in infancy, childhood leukemia, childhood obesity, childhood asthma, type 1 diabetes and atopic dermatitis) and concluded that if 90% of families followed the guidelines to breastfeed exclusively for 6 months, the United States would have saved $13

billion annually from indirect and direct medical costs and reduced risk of premature death. If 80% of families in the United States complied with 6-month exclusive breastfeeding guideline then the savings would have been $10.5 billion (134).

According to Infant Feeding Action Coalition (INFACT) Canada, the projected costs of breastfeeding for one year, including nursing bras and the additional 200-500 calories/day addition to maternal diet, are approximately $300 while formula feeding, including the costs of liners, bottles and nipples, would require $1188 and $3000 annually for powered milk and ready-to-feed formulas, respectively (135).

d. Environmental benefits

Human milk is a natural, sustainable and renewable food, acting as the sole source of infants' nutrition for the first 6 months of life (5). As opposed to breast milk, human milk substitutes (i.e., infant formula) need packaging which will ultimately be deposited in landfills (38). It is estimated that every one million formula-fed infants, use 150 million containers of formula, many of which end up in the landfills (136). In addition, the transportation needed for infant formulas to reach grocery stores from the factories will contribute to pollution (38). Since lactation does not require container, paper, fuel to prepare and transportation to deliver, it certainly is the most environmentally-friendly mode of infant feeding which reduces carbon footprint by saving global resources and energy (38). According to the American Academy of Pediatrics, the overall environmental

benefits of breastfeeding are attributed to the reduced quantities of formula cans and bottles being disposed (45).

II.2. Infant feeding: support and recommendations

The numerous immediate and long-term benefits of breastfeeding for infants and mothers warrant greater attention to this behaviour, and as such, breast milk has been named as "liquid gold". Internationally, breastfeeding has been consistently recommended by the WHO/UNICEF (137), World Alliance for Breastfeeding Action (WABA) (138), the International Pediatric Association (139), and the International Lactation Consultant Association (140). Within Canada, the Canadian Paediatric Society, Health Canada and Dietitians of Canada support breastfeeding through their joint statement in the latest infant feeding guidelines published in 2005 (23). Since 1978, breastfeeding has been a primary goal for the WHO and Health Canada and both recommend "exclusive breastfeeding for 6 months and continued breastfeeding for 2 years and beyond" (23,137,141).

According to the INFACT Canada, breastfeeding is a basic human right for both mothers and infants (142). This right is reflected internationally in documents such as the "International Covenant on Economic, Social and Cultural Rights", "United Nations Convention on the Right of the Child", the "Convention on the Elimination of All Forms of Discrimination Against Women", and the "International Labour Organization Convention on Maternity Protection" (143).

a. International, federal and provincial support for breastfeeding

In the following section, the main commitments in Canada to supporting breastfeeding (The Baby-Friendly® Initiatives (BFI), and breastfeeding policies)

and their complexities are reviewed followed by a summary of the latest infant feeding recommendations proposed by Health Canada (23).

i. The Baby-Friendly® Initiatives:

The WHO and the UNICEF developed the global program of "Baby-Friendly® Hospital Initiatives" (BFHI) in 1991 (144). In simple terms, this program recognizes and encourages maternity facilities and hospitals which offer the best possible care for infants and mothers. Institutions are recognized for promoting and facilitating breastfeeding initiation and continuation by being awarded the Baby-Friendly® designation.

In Canada, the Breastfeeding Committee for Canada (BCC) was established as a national authority according to the BFHI guidelines. Later in 1996, BFHI was officially recognized by BCC as the primary strategy for the protection, promotion and support of breastfeeding (145). The BFHI was then modified to BFI in Canada in order to emphasize that a continuum of care will be provided to mother-infant dyads in Canada both inside and outside the hospital setting. Since the framework for BFI is based on the WHO/UNICEF joint statement (146) which includes the "Ten Steps to Successful Breastfeeding" (Appendix A) and "The International Code of Marketing of Breast Milk Substitutes" (Appendix B), in order for a maternity facility or a hospital to receive the Baby-Friendly® designation, they must comply with both of these guidelines (147). The "Ten Steps" (Appendix A) were originally developed in an attempt to promote, protect and support breastfeeding in institutions, and "The Code"

(Appendix B) is aimed at protecting breastfeeding through ensuring ethical marketing of the breast milk substitutes (148).

Worldwide, over 15,000 hospitals have received Baby-Friendly® designation (149), and surprisingly, only four of these hospitals are located in Canada and 27 are in the USA (149, 150). The first Canadian hospital to receive the Baby-Friendly® designation in 1998 was the Brome-Missiquoi-Perkins Hospital in Quebec; and currently 3 hospitals in Quebec and one in Ontario have the BFI designation. Overall, the process of receiving BFI designation is labor-intensive, involves several steps and requires commitment from policy makers and support from people at all different levels (150).

In addition, adherence to "The Code" requires that hospitals pay fair market price for costs of all formulas and infant feeding supplies that they use and do not accept free or discounted supplies (147). This policy requires that mothers pay the market price if they want to formula feed their infants, but if formula is medically-indicated, it would be provided free of charge to the patient but would cost hospital the market price (147). This seems problematic since in presence of limited health care dollars, one could imagine how difficult it is convincing hospital authorities to adhere to "The Code" (151). However, some suggest that previous attempts have been successful in this regard (150).

Most Canadian hospitals have contracts with formula companies for other medical supplies and formula is often accepted as a gift (151). Although during hospitalization the saving from formula costs is passed to mothers, after discharge

most mothers are unable to cover the high costs of formula, which at some cases equal to one-third of a family's income (151).

What further complicates the issue of "free formula" is that hospitals need access to formulas for medically-indicated conditions or for mothers who are unwilling or unable to breastfeed. Currently no other alternatives for formula exists and although in the 1970-1980s, some hospitals (e.g., in Saskatchewan) operated milk banks, unfortunately they were dismantled due to the fear brought about by Acquired Immune Deficiency Syndrome (AIDS) (151). Currently, there are only two milk banks in Canada, one of which was established in British Columbia over 30 years ago, and the other was opened in January 2012 in Calgary, Alberta (http://www.calgarymothersmilkbank.ca/).

The foregoing discussion illustrates the challenges and complexities surrounding the BFI in Canada and confirms that provision of a Baby-Friendly environment requires time, efforts and commitment from different levels of government and society. It seems reasonable that proponents of BFI claim that the fight toward establishing BFI is more difficult that one might think and is largely dependent on the corporate hold on infant feeding (148).

ii. Breastfeeding policies:

In contrast to the general beliefs that policies supporting a woman's legal right to breastfeed in public are widespread, no Canadian court decision exists on this issue. Following a court case in 1997, British Columbia was the first Canadian province where its Human Rights Commission created a breastfeeding

policy. The other provinces with breastfeeding policy are Ontario, Quebec, Nova Scotia, Manitoba and Alberta (25).

In most cases policies were created in response to cases where breastfeeding mothers in public were approached. For instance, the Art Gallery of Alberta lifted its breastfeeding ban in December 2010 after an Edmonton mother complained that she was asked to leave the exhibit area of the gallery because no food or drink were allowed around the artworks (152). Similarly, at the municipal level, breastfeeding policies are scant and appear to have been developed as a result of a complaint against a breastfeeding mother.

To summarize, it seems that formal and informal policies have the capacity to influence breastfeeding decisions. One predictable implication of breastfeeding policies is that when breastfeeding is viewed as a "problem", mothers might simply choose not to breastfeed (151).

b. Infant feeding guidelines in Canada

The first infant feeding guidelines in Canada were developed in 1979 by the Canadian Paediatric Society Nutrition Committee (153), and were updated in 1986 (154). These guidelines were used until 2004 when the Canadian Paediatric Society, Dietitians of Canada and Health Canada updated the recommendations (23).

In 2001, the WHO recommendations for duration of exclusive breastfeeding were changed from four months to six months of age (155). Health Canada reviewed and judged the evidence presented by the WHO in the Canadian context before aligning with this guideline in 2004 (156), and they recommended

that all health care professionals in Canada promote and implement exclusive breastfeeding for 6 months at the national, provincial and community level (156).

However, Health Canada also recommends that all breastfed full-term infants in Canada receive a daily dose of vitamin D equal to 400 IU for the first year and 200 IU for the second year. It is recommended that this protocol is continued until infants' diets include at least 400 IU per day of vitamin D (157).

Health Canada suggests complementary feeding with a focus on iron-rich foods from six months of age, and continued breastfeeding for up to 2 years and beyond. In addition, Health Canada recognizes the importance of providing social support to improve infant feeding practices at national and provincial level, and therefore, supports the "Canada Prenatal Nutrition Program" which funds coalitions and community agencies for increasing health and social support (e.g., breastfeeding promotion for pregnant women). Finally, Health Canada supports the activities of Breastfeeding Committee of Canada to implement WHO/UNICEF Baby Friendly Initiatives across the country.

c. International infant feeding definitions: complexities and controversies

Critical examination of literature reveals that breastfeeding research has been inflated with inconsistent definitions and lack of clarity and distinction between the different feeding categories (158). It has been suggested that if authors had used more coherent infant feeding definitions, the protective effects of breast milk would have appeared to be even more dramatic (159-161).

For instance, some researchers have used "current status data" (i.e., 24-hour recall, 3-day records, 7-day recalls), and hence, their findings merely

illustrate the feeding patterns in cross-sectional format and should be interpreted as breastfeeding "at" a specific age and "at" a specific point in time. However, by using "longitudinal data", some researchers have attempted to report the long-term patterns of breastfeeding "since" birth and "until/to" a specific time. These inconsistencies raise the question as to whether the quality of data generated in this manner is acceptable, and whether comparisons among studies are possible. Since the contents and health outcomes of breast milk, formulas and other types of milk differ significantly, care must be taken when categorizing infants according to different feeding groups (158). If an infant's diet is comprised only of breast milk (100%), this feeding pattern brings about different health outcomes than if it contained 50% breast milk. As a result, type and amount of milk consumed must be clearly described in order to facilitate comparisons between studies. To ensure reliability of infants' placement in different feeding categories, feeding practices must be clearly defined.

The method of infant feeding is yet another issue to consider with regards to infant feeding definitions. It has been suggested that compared to receiving breast milk from the bottle, breastfeeding directly from the breast has several distinct benefits, including oral and visual development (162,163), psychological development, and antibody protection against pathogens in the environment (164).

In response to the aforementioned complexities and inconsistencies in breastfeeding definitions, the Interagency Group for Action on Breastfeeding (IGAB) (161) was formed in 1990 and breastfeeding was defined for the first time

(Table II.1.). This infant feeding framework was published in an influencing article by Labbok and Krasovec (161) in which three breastfeeding categories were proposed: full (exclusive and almost exclusive), partial (high, medium and low) and token (minimal). However, as indicated by Thulier (158), albeit the terms "exclusive", "full" and "partial" breastfeeding had been previously used inconsistently in the literature, further sub-categorization of full and partial breastfeeding, as suggested by Labbok and Krasovec (161), did not find the required popularity.

Table II.1. Key global infant feeding definitions

Organization	Statement title	Reference
Interagency Group for Action on Breastfeeding, 1990	Toward consistency in breastfeeding definitions	161
World Health Organization Working Group on Infant Feeding, 1991	Indicators for assessing breastfeeding practices	165
World Health Organization Global Consensus Meeting, 2008	Indicators for assessing infant and young child feeding practices	166
Thulier D, 2010	A call for clarity in infant breast and bottle feeding definitions for research	158

In 1991, the WHO presented "indicators for assessing breastfeeding practices" (165), which was minimally modified and updated in 2008 (Table II.2.) (166). The WHO breastfeeding indicators have been developed to provide simple and easy-to-measure breastfeeding categories to determine the mode of infant feeding (165). The five main feeding categories suggested by the WHO include:

exclusive breastfeeding, predominant breastfeeding, complementary feeding, breastfeeding and bottle feeding (165).

Table II.2. World Health Organization criteria for defining infant feeding practices

Feeding practices	Requires that the infant receives	Allows the infant to receive	Does not allow the infant to receive
Exclusive breastfeeding	Breast milk (including milk expressed or from a wet nurse)	ORS, drops, syrups (vitamins, minerals, medications)	Anything else
Predominant breastfeeding	Breast milk (including milk expressed or from a wet nurse) as the predominant source of nourishment	Certain liquids (water and water-based drinks, fruit juice), ritual fluids, ORS, drops or syrups (vitamins, minerals, medicines)	Anything else (in particular, non-human milk, food-based fluids)
Complementary feeding	Breast milk (including milk expressed or from a wet nurse) and solid or semi-solid foods	Anything else: any food or liquid including non-human milk and formula	NA
Breastfeeding	Breast milk (including milk expressed or from a wet nurse)	Anything else: any food or liquid including non-human milk and formula	NA
Bottle feeding	Any liquid (including breast milk) or semi-solid foods from a bottle with nipple/teat	Anything else: any food or liquid including non-human milk and formula	NA

Source: *World Health Organization. Indicators for assessing infant and young child feeding practices: Conclusions of a consensus meeting held 6-8 November 2007 in Washington DC, USA. Geneva, Switzerland [Internet].2008 [cited 2012 Feb 13]. Available from: http://www.emro.who.int/cah/pdf/IYCF-Indicators-2007.pdf*

However, there is a major limitation inherent in the WHO recommendations which relates specifically to the general category defined as "breastfeeding". The "breastfeeding" category does not account for the amount of breast milk consumed, and therefore, if an infant receives only a small amount of breast milk, he/she would still be categorized in this group. Another concern is that although the WHO has recommended using these feeding categories in large-scale studies, many investigators have used these definitions inconsistently in their studies (158).

Generally, differences between the feeding categories proposed by international organizations give rise to another problem. For instance, the WHO 1991 guidelines (165) were claimed to be essentially the same as those suggested by Labbok and Krasovec in 1990 (161), with only a minor change in the terminology used for "almost exclusive", which was changed to "predominant breastfeeding", and also acceptance of certain fluids (e.g., water, water-based drinks and fruit juice) in this category. However, these two guidelines have other apparent differences, such as the use of "partial (high, medium and low) breastfeeding" in Labbok and Krasovek guidelines (161) which was not included in the WHO 1991 recommendations (158,165). Overall, the inconsistencies of definitions proposed by international organizations seem to have caused more problems in defining breastfeeding practices rather than solving them (158).

Taken collectively, in absence of a consistent breastfeeding definition, comparing the true incidence and duration of breastfeeding and evaluating the impact of infant feeding practices on health outcomes seems difficult, if not

impossible (158). Despite the efforts made, no national system exists for categorizing infant feeding practices, and many complexities and inaccuracies yet remain in the way breastfeeding practices are reported.

II.3. Breastfeeding rates and trends

a. Breastfeeding history in North America

During the past centuries, many factors such as science, formula industry, medicine, politics, culture and religious beliefs have influenced infant feeding practices (167). In the early 1900s, the Chicago Visiting Nurses Association started encouraging mothers to breastfeed by defining it as a "mother's duty". In 1907, the Chicago Department of Health actively promoted breastfeeding through posters with statements such as " Don't kill your baby" and "Mother's milk for babes. Cow's milk for calves. God's plan". These activities formed in response to high infant mortality rates in the United States due to intake of contaminated cow's milk (168).

During this period however, mothers were exposed to mixed messages since they were also told that nipples and their breast milk could be contaminated with germs and their milk might be of low quality (168). Breastfeeding mothers were advised to regularly analyze their own breast milk to ensure that their nursing infants are not being starved in spite of abundant secretion of breast milk, since physicians believed that breast milk could sometimes be of poor quality (168). Lactating mothers were instructed to express their milk and let it stand in a test tube overnight; if the milk was "normal milk", it formed a 3-4% layer of cream on top while if it was "bad milk" it only produced a layer of less than 1% cream (168). In addition, breastfeeding mothers were recommended to clean their nipples with a boric solution and not to be nervous because it could harm the milk (168). Most strikingly, mothers were warned against feeding their babies more

than every four hours, because they thought it could kill the baby (168). At the same time, companies were developing and promoting "human milk substitutes" to be later known as "formula". After regulations were developed and pasteurization was performed to make cow's milk safer, companies started marketing the formula and early weaning practices became more common (168).

Generally, in early 20th century, the women's movement and their participation in activities outside home led to the widespread bottle feeding practices in North America (169). In this period it was believed that formula feeding women were free to leave home, and breasts represented a sexual symbol instead of a source of nutrition for infants (167). Later during the World War II, many women were made to work far from home, and consequently feeding commercial formulas became the socially-acceptable method of infant feeding. In the 1950s, physicians explicitly promoted commercial formulas thinking it was healthier than the breast milk (167). In addition, since at this point in time infant feeding had come under the domain of medicine, the rigid complex guidelines for management of breastfeeding, commodification of infant feeding and medicalization of breastfeeding resulted in women who were more likely to formula feed than breastfeed (170). By 1963, breastfeeding rates in Canada had plummeted to 38%, and in 1970s the breastfeeding rates in North America were at the lowest of all times with 28% of women initiating breastfeeding and only 8% breastfeeding for 3 months postpartum (167,171).

However, it was in the same decade that research on composition and benefits of breast milk began, and in 1981 for the first time it was reported that

breast milk offers nutritional, cognitive, psychological and immunological benefits compared to the commercial formulas (172). These research findings in combination with the international initiatives from the WHO led to an increased popularity of breastfeeding practice in the 1980s so that in 1981, 61% of infants in the United States were breastfed at birth. However, since breastfeeding was not yet accepted widely in the community, it was more a private affair (167). The WHO and the UNICEF then set new standards and guidelines for breastfeeding practice and the BFHI was officially introduced in 1991 (167). BFHI was originally developed for supporting new mothers worldwide to breastfeed their newborn infants anywhere they pleased. In Canada specifically, the goal of BFI is to maintain the initiation rate of breastfeeding at 75% or higher and continuation rate to 6 and 12 months postpartum at 50% and 25%, respectively (173).

Recently, breastfeeding has increasingly become a "measure of the mother" (174) and a "moral imperative" (175). Breastfeeding is perceived as something more than just sustenance and is permeated with social, cultural and emotional meanings for mothers (176). Currently, the governmental health policies, pregnant women's magazines, health care professionals, and brochures targeted at women all promote breastfeeding. One of the other influences in North America has been the tendency of women toward using the natural products and hence when mothers are told that breast milk is "nature's perfect food" and that "they will always have sufficient milk" and their milk is "always at the best quality", the pressure to breastfeed becomes extreme (175). Women's exposure to cultural and social expectations to breastfeed coupled with an overarching cultural

standard of being a "good or successful" mother seems to influence their infant feeding decisions (175).

However, infant formula companies are still continuing to aggressively market their products through provision of free samples to hospital maternity wards (177). Distribution of formula samples is generally an efficient marketing strategy by which manufacturers attract new mothers to try their company's products and probably become a permanent customer (178). Formula providers also send free samples and coupons to pregnant women and new mothers, since they are aware that women who receive these free samples are more likely to wean their infants from breast milk and need infant formula, compared to women who do not receive these offers.

Despite the strong push that has formed recently toward breastfeeding, there is room for improvement in breastfeeding continuum among Canadian mothers. The rates and trends of breastfeeding in Canada are presented in the following section.

b. Breastfeeding rates in Canada

i. Trends across time:

The prevalence of breastfeeding in Canada has nearly doubled during the past decades. In 1963, the breastfeeding rate was 38% in general Canadian population compared to 75% in 1982. Generally, this improvement occurred in two distinct waves, the first one being between 1973 and 1978 and the second one occurring between 1981 and 1982 (171).

In 1988, the breastfeeding initiation rate in Canada was 76% (179), and no national breastfeeding rates were available until 1994 following the development of National Population Health Survey (NPHS) and National Longitudinal Survey of Children and Youth (NLSCY), which were both administered by Statistics Canada (180,181). The aim of NPHS was to collect health information from Canadians using cross-sectional and longitudinal research designs, while NLSCY was designed to measure child well-being and development (180,181). The breastfeeding initiation rate in Canada, as reported by NPHS and NLSCY, was 75% in 1994-1995, and the rates were reported every two years by these two national surveys until 1998-1999 (182).

During 2001-2007 the prevalence of breastfeeding was reported every two years through the Canadian Community Health Survey (CCHS), and since 2007 the rates are reported annually. Generally, breastfeeding initiation rates increased significantly during 2001-2005, so that the rate in 2005 was 87.0%, which is higher than those reported in 2003 (85.9%) and 2001 (81.6%) (183). Between 2005 and 2007-2008, no significant difference was observed between breastfeeding initiation rates (87.0% vs. 87.9%), and the most recent rate of breastfeeding initiation reported in 2010 is also similar to that reported in 2008 (87.2%) (184).

Caution should be practiced when interpreting the "exclusive breastfeeding" rates in Canada since it is likely that differences reported in the rates may be artefactual. Health Canada's recommendation of "6-month exclusive breastfeeding" was established in 2004 and before this period mothers were

advised to breastfeed exclusively for four months, which has implications on the way data have been categorized and interpreted. To have a better understanding of infant feeding practices before 2004, it is imperative to consider the prevalence of exclusive breastfeeding for both 4 and 6 months postpartum.

In 2003 and 2005, the proportions of mothers who reported exclusive breastfeeding for four months and more, were 37.3% and 43.1%, respectively; this rate remained relatively stable at 42.8% in 2007-2008. The 6-month exclusive breastfeeding rate, on the other hand, increased from 17.3% in 2003 to 23.1% in 2007-2008. In 2010, the rate of 6-month exclusive breastfeeding in Canada was reported at 27.7% (184). Despite public health messages promoting the superiority of breast milk and "breast is best" message, the prevalence of exclusive breastfeeding to 6 months and continued breastfeeding to 12 months fail to meet the WHO recommendations.

Although the breastfeeding duration among Canadian mothers has increased during the past few years, this rise has not been as significant as that occurred for initiation rates. The prevalence of "any breastfeeding" at four and six months postpartum were 14% and 7% in 1963, respectively, while the corresponding rates in 1982 surged to 44% and 31%, respectively (171). In 1988, the prevalence of "any breastfeeding" was further increased to 56% at three months and 33% at six months postpartum (179). In addition, compared to 58.7% of mothers who breastfed their infants for 3 months in 1994, as many as 65.7% of Canadian mothers offered breast milk to their infants for 3 months during 2000-2001 (182). According to the American Academy of Pediatrics, termination of

breastfeeding usually occurs between 2 weeks to 2 months postpartum, which is the period before breastfeeding practices are fully developed and therefore, presenting a key window of opportunity for education and support (64).

Discrepancies in breastfeeding rates in Canada: Breastfeeding rates in Canada reported by the CCHS are likely to be overestimated (173) due to the high probability of recall bias inherent in the 5-year recall method compared to shorter recall periods. The Maternity Experience Survey (MES), a national Canadian study conducted in 2007 based on mothers' 6-month recall of breastfeeding, reported the prevalence of 6-month exclusive breastfeeding in Canada and Alberta at 14.4% and 15.3%, respectively. These rates are hugely different from those reported by the CCHS (27.7% for Canada and 29.6% for Alberta) and it is likely due to a high probability of recall bias in this national survey.

ii. Regional differences:

In addition to the changes across time, regional differences in breastfeeding rates have also been apparent across Canada since 1980s and this regional gradient seems to continue. Breastfeeding initiation rates have shown a steady progression from eastern to Western Canada with the lowest rates being reported in Atlantic Canada (50%) and the highest in British Columbia (86%) (171).

In 2000-2001, British Columbia was still leading with breastfeeding initiation rate of 93.5%, and the Atlantic provinces were still showing the lowest rates in the country at 68.2%. Breastfeeding duration also showed the same regional pattern with British Columbia having the highest 3-month breastfeeding

rate at 72%, and Atlantic provinces having the lowest prevalence at 55.3%. Through 1994-1999, the Prairie provinces have repeatedly come second after British Columbia for both initiation and duration of breastfeeding (3-month) (182).

However, it must be noted that Canadian reports from 1994 to 1999 excluded the three territories (Nunavut, Yukon, North West Territories) from the statistics, while when they were included in subsequent years the rate of breastfeeding in the Yukon even surpassed that of the British Columbia with a 3-month breastfeeding rate of 77.5%.

As presented in Table II.3., currently the highest rate of 6-month exclusive breastfeeding is reported in the Yukon (44.6%) followed by the British Columbia (35.6%). In Alberta, the breastfeeding rate at birth has been reported to be 89.5%, which decreases to 73.2% at three months and 58.9% at 6 months, respectively. In addition, the prevalence of exclusive breastfeeding for 3 and 6 months postpartum among Albertan women are 53.1% and 29.6%, respectively.

Table II.3. Comparison of breastfeeding initiation and exclusivity rates across different regions in Canada

Region	Breastfeeding initiation	Exclusive breastfeeding for 6 months
Canada	87.2	27.7
Newfoundland and Labrador	63.4	18.2
Prince Edward Island	75.7	18.4
Nova Scotia	77.7	22.9
New Brunswick	80.0	20.7
Quebec	83.8	21.6
Ontario	89.6	28.9
Manitoba	90.9	28.5
Saskatchewan	89.8	33.8
Alberta	89.5	29.6
British Columbia	89.0	35.6
Yukon	93.8	44.6
Northwest Territories	92.3	33.1
Nunavut	59.2	NR

Source: *Statistics Canada. Health indicator profile, annual estimates, by age group and sex, Canada, provinces, territories, health regions (2011 boundaries) and peer groups, occasional, CANSIM (database) [Internet] .[cited 2012 Feb 16]. Available from: http://www5.statcan.gc.ca/cansim/a01?lang=eng*

Overall, the maintenance of breastfeeding is low among Canadian mothers, which is in contrast to the guidelines proposed by the Canadian Paediatric Society, Dietitians of Canada and Health Canada.

c. Limitations of infant feeding studies

Generally, the large variations in breastfeeding rates reported for the same region or country might be simply the result of methodological limitations such as: recall bias, sample selection bias, design limitations, failure to report infants' birth weights and gestational ages, and different measurements and infant feeding definitions used (185) (refer to section II.2.c for more information).

National surveys are generally descriptive studies in which data are collected retrospectively through questionnaires, and therefore recall bias is inevitable (185). For instance, the CCHS collects information on infant feeding practices of Canadian women who have had a baby during the past five years, whereas the MES survey is based on 6 months recall of infant feeding (173,186). These studies rely on the memory of participants to provide information, yet it has been suggested that subjects are more likely to recall positive than negative memories (185). Although the breastfeeding experience might be exhaustive, mothers are still more likely to recall positive breastfeeding experiences than the negative ones, and therefore, there is an increased likelihood that incidence and duration of breastfeeding be inflated and potentially overestimated in these studies (185).

Generally, it has been suggested that long-term recalls of breastfeeding (>6 months) are inaccurate, and overestimate the duration of exclusive breastfeeding significantly (187). For instance, Bland et al. (187) conducted weekly interviews with 130 mothers for 16 weeks postpartum and at each interview collected breastfeeding history using 48-hour and 7-day recalls. A sub-sample of these women was revisited at 6 and 9 months postpartum and "breastfeeding recalls since birth" were collected. Findings from this study revealed a large discrepancy between the breastfeeding rates reported through "48-hour recalls" and those reported retrospectively "since birth" (specificity: 65–89%; positive predictive value: 31–48%) (187). It has been suggested that

breastfeeding data be collected in prospective longitudinal studies rather than in cross-sectional surveys.

Sample selection biases may also explain the wide variations in reported breastfeeding rates. Researchers usually do not report the reasons for non-participation in surveys, but it is likely that mothers who choose not to breastfeed, also choose not to participate in infant feeding studies and as such, the incidence and duration of breastfeeding might be skewed given the selection bias of the sample (185). Other subject selection biases relate to the differences in characteristics of respondents and non-respondents. Generally, those who participate in research in developed countries are more likely to be white, older and from a higher socioeconomic status, all of which are also significantly associated with incidence and duration of breastfeeding (185).

Neglecting to report infants' gestational ages and birth weights is yet another problem for interpreting the findings from different studies, since these variables could significantly influence the breastfeeding initiation and duration rates (185).

Overall, the mentioned methodological issues highlight the complexities inherent in infant feeding research, and emphasize the importance of using comprehensive and consistent methodological approaches in order to study breastfeeding behaviour more concisely.

II.4. Determinants of infant feeding behaviours

Psychologists and behaviourists have theorized several factors which could shape human behaviour (188,189). Some of these theories have been applied to explain health behaviours and only a few have been used to explain breastfeeding as a behaviour (188). A better understanding of the determinants of establishing and maintaining successful breastfeeding practices increases the likelihood of improving this behaviour. The following section provides a review of the evidence regarding the influence of several determinants of infant feeding at different levels through an ecological lens. In addition, general behavioural theories that might be useful for explaining determinants of infant feeding behaviours are introduced.

a. Application of theories to breastfeeding

i. The ecological perspective: A multilevel approach:

Recently, the focus of health promotion interventions has shifted from simply educating "individuals" about healthy behaviours; it now involves efforts to change organizational behaviour, physical and social environments of communities and to develop policies that support health (189). One of the most commonly used multilevel interactive approaches that has been developed based on a spectrum of strategies to operate on multiple factors is the "ecological perspective". This framework describes the interaction among and interdependence of factors within and across all levels of a health problem (189) and defines behaviour as a dynamic interaction between the environment and individuals (190). Ecological perspective has two key elements which help design

proper interventions for promoting health. The first concept points to the fact that human behaviour is affected by and affects *multiple levels of influence,* and the second concept highlights that behaviour is shaped by and shapes the social environment *(reciprocal causation).*

The first key concept of ecological perspective, "multiple levels of influence", was explained by McLeroy and colleagues in 1988 (190). In McLeroy's social ecological paradigm, five levels of influence are identified for health-related behaviours (190). These factors, which could also be applied to infant feeding as a health-related behaviour, include (190):

I) Intra-personal factors (e.g., socio-demographic, biomedical, behavioural)

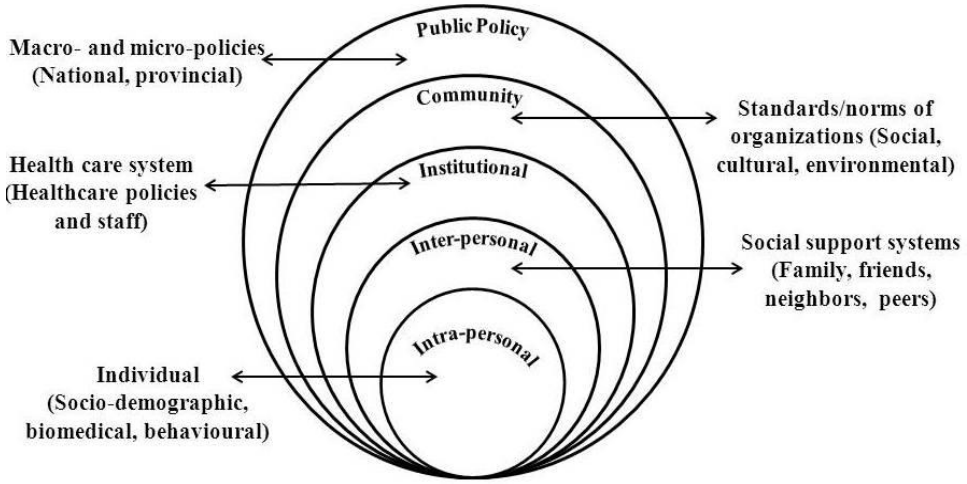
II) Inter-personal factors (e.g., formal and informal social networks, social support systems including family members, neighbors, friends, colleagues, acquaintances)

III) Institutional factors (e.g., health care policies and staff)

IV) Community factors (e.g., social, cultural, environmental)

V) Public policy (e.g., policies at national and provincial level)

Figure II.1. McLeroy's social ecological model



Source: *McLeroy K, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. Health Educ Quart.1988;15(4):351-377.*

The second key concept of ecological model is "reciprocal causation" between the environment and individuals, suggesting that people both influence and are influenced by their surrounding environments .The locus of change based on this concept is shifted from individual to the system in which the individual resides (190).

Overall, categorizing the determinants of infant feeding according to this framework highlights the advantage of multilevel interventions that target both behavioural and environmental factors to bring about positive infant feeding outcomes.

ii. Behavioural theories to explain different levels of influence:

Several behavioural change theories have been developed to describe determinants of health behaviours at intrapersonal, interpersonal and community levels of ecological model. Since addressing the community-level factors involves

consideration of institutional and public policy factors as well, these three levels of influences have been categorized as one group (189).

For the purpose of this thesis project, only the behavioural theories that have been previously applied to breastfeeding behaviour are discussed. The following section describes behavioural theories and their applications at intrapersonal and interpersonal levels of ecological perspective.

Intrapersonal level: This level of influence is the most basic in health promotion programs and is usually targeted by health practitioners through one-on-one counseling and education (189). Since individual behaviours are basic units of group behaviours, the behaviour-change theories at this level often comprise of broader models of group, community and national behaviour (189). In addition, theories at intrapersonal level focus on intrinsic factors such as knowledge, attitude, beliefs and experience. Behavioural theories at intrapersonal level that could be potentially applied to infant feeding as a health behaviour include Theory of Planned Behaviour (TPB) and Theory of Reasoned Action (TRA). TPB (191,192) and its predecessor, TRA (193), have been used to predict breastfeeding behaviours based on the maternal breastfeeding intentions (194). Generally, TPB examines the relationships between individuals' beliefs, intentions, attitudes and behaviours and their perceived control over that behaviour (191,192).

Both TPB and TRA suggest that the most important determinant of behaviour is behavioural intention (191-193), which is itself controlled by individuals' attitude toward performing the behaviour as well as their beliefs

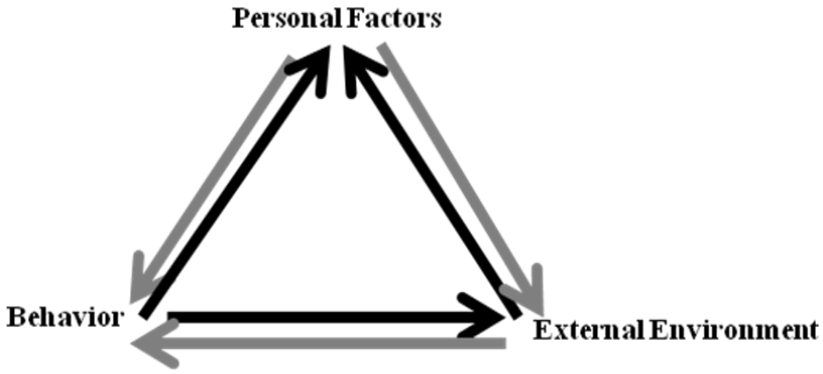
about approval of the behaviour by significant others (subjective norm) (191,192). According to these behavioural theories, all other factors (e.g., socio-demographic variables, culture, and environment) act through the model's constructs and are unable to independently explain the behaviour.

Interpersonal level: At the interpersonal level, behaviour change theories assume that individuals are within the social environment and are influenced by it (189). Feelings, behaviours, thoughts and support of people around individuals (e.g., family members, friends, and healthcare staff) are thought to influence their feelings and health behaviours, and in turn individuals' behaviours have reciprocal effects on those people. Social cognitive theory is one of the most robust and widely-used health behaviour theories at interpersonal level of influence (195,196). It explores reciprocal interactions among people and their environments as well as psychosocial determinants of health.

Bandura's social cognitive theory suggests an on-going dynamic interaction between human behaviour, personal factors and external environment (195,196), and provides a framework for understanding, predicting and changing individuals' behaviours (Figure II.2.) (195,196). According to the social cognitive theory, the interaction of human and behaviour is influenced by individuals' thoughts and actions. On the other hand, the interaction between person and environment is influenced by human beliefs and cognitive competencies, which are developed and modified through social structures within the environment. The third type of interaction is suggested to be between the environment and behaviour, which involves determination of aspects of environment by

individuals' behaviour and in turn modification of the behaviour by that environment (Figure II.2.). Overall, the social cognitive theory fits well with the multiple predictors of infant feeding and it has shown to be useful for understanding group and individual behaviours and the ways by which behaviour can be modified and changed.

Figure II.2. Schematic of Bandura's social cognitive theory



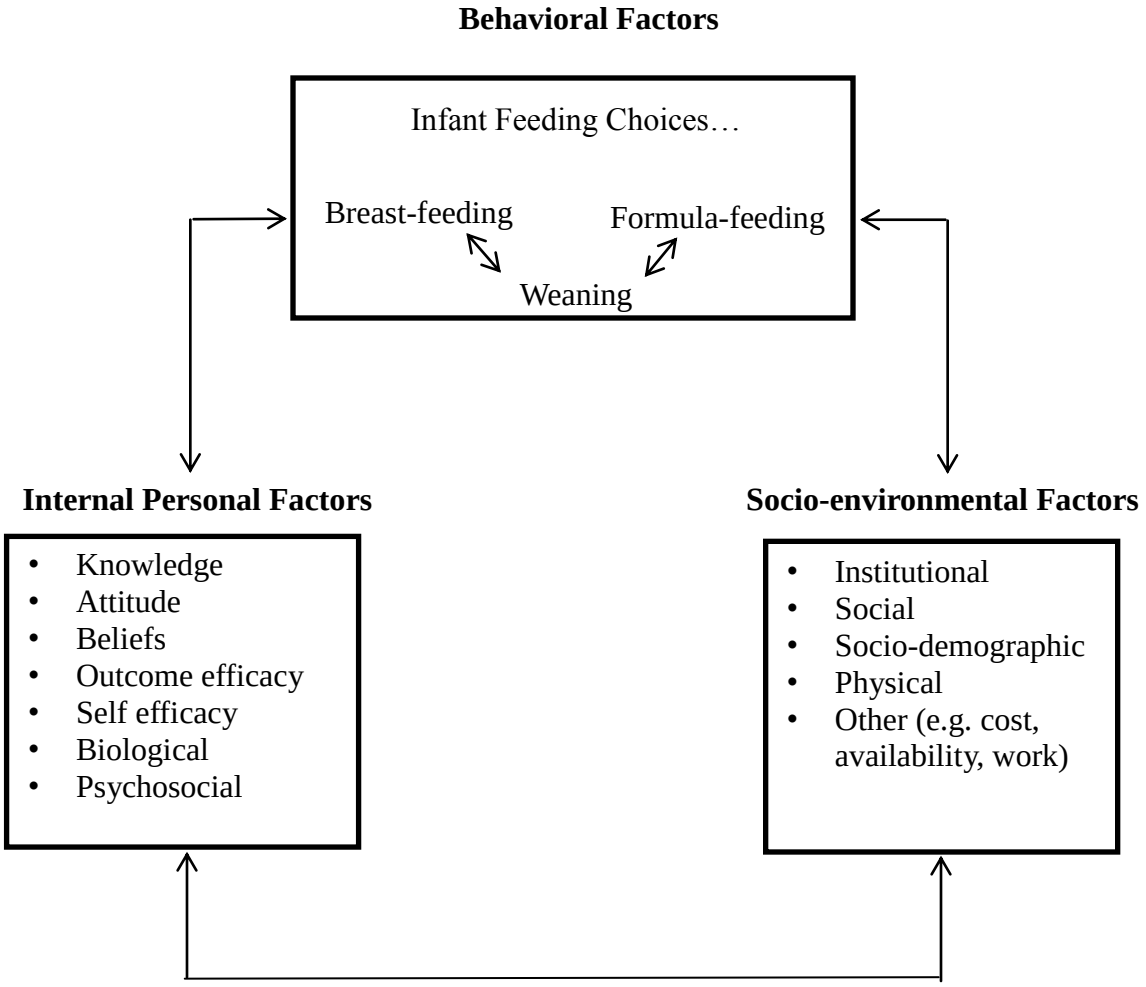
Source: *Bandura A. Social foundations of thought and action: a social cognitive theory. Englewood Cliffs. NJ: Prentice Hall;1986.*

Infant feeding behaviours are influenced by a multitude of factors which based on the Bandura's social cognitive theory, can be divided into two broad categories of "socio-environmental" and "internal personal" factors (195,196). Williams et al. have developed a conceptual framework for describing determinants of infant feeding decisions based on the Bandura's social cognitive theory (Figure II.3.) (197). This framework elucidates how infant feeding choice and decisions are reciprocally determined by factors at socio-environmental and internal personal levels. The socio-environmental factors that might influence

infant feeding decisions include: institutional (e.g., health care practices and policies), social (e.g., family support and dynamics), socio-demographic (e.g., income, ethnicity and education), physical (e.g., nipple pain and fatigue) and other factors (e.g., availability and cost) (197).

On the other hand, internal personal parameters that could influence infant feeding decisions might be affective/cognitive (e.g., knowledge, attitudes and beliefs), self-efficacy (e.g., previous experience and confidence), outcome expectations (e.g., best for the baby), biological (e.g., age) or psychosocial (e.g., comfortable breastfeeding in public) (197,198). The social cognitive theory is recognized as one of the most successful theories for explaining health-related behaviours (195), and is an appropriate model for examining the determinants of infant feeding decisions. The mother-infant relationship post-delivery changes from a merely physiological dependence to an emotional and psychological relationship. As a result, maternal decision to breastfeed is a significant part of this dependency and is ranked as one of the mothers' most important decisions.

Figure II.3. Conceptual framework for understanding determinants of infant feeding decisions adapted from Bandura's social cognitive theory



Reprinted with permission from: *Williams P, Innis S, Vogel A, Stephen LJ. Factors influencing infant feeding practices of mothers in Vancouver. Can J Public Health. 1999;90(2):114-119.*

b. Predictors of infant feeding behaviours

For the purpose of this thesis project an extensive review of intra-personal factors influencing infant feeding behaviours will be provided in the following section.

According to the social ecological model, potential targets of interventional programs at intra-personal level of influence are psychosocial factors such as knowledge, attitudes and beliefs (190), rather than non-modifiable socioeconomic and demographic parameters. However, knowing that breastfeeding is less achievable for a specific group of women helps clinicians focus their support and education for those groups.

The following section will initially present the evidence concerning the impact of parental behavioural factors (i.e., knowledge, attitude and beliefs) on infant feeding practices and will then demonstrate the influence of socio-demographic, economic and biomedical variables.

i. Behavioural factors:

Several studies have indicated that negative attitudes of mothers, fathers and health care staff as well as the stigma from society with respect to breastfeeding are important barriers to successful breastfeeding (199). In contrast, receiving support from husband/partner, family and friends may positively influence maternal breastfeeding choice and duration (200-202). It has been suggested that several maternal characteristics as well as the influence of people in mothers' network could potentially influence maternal attitudes, and consequently, their infant feeding decisions (203-207). Specifically, women's

partner and mother have major independent influences on their decision of the choice and duration of breastfeeding (208).

A growing body of evidence suggests that psychosocial factors such as beliefs and attitudes may have significant roles in infant feeding choice and decisions (207,209-215). Women with more positive attitudes toward breastfeeding have an internal belief about breastfeeding benefits which makes them feel a strong connection to it, and are therefore, more likely to adhere to infant feeding recommendations (216). However, in contrast to two-thirds of formula feeding mothers, lactating women often make their decision to breastfeed prior to conception, which makes prenatal assessment of breastfeeding orientation and attitudes necessary (217). This also suggests that the "decision" to breastfeed or formula feed would eventually result in the actual intended behaviour among mothers (218).

In general, breastfeeding mothers are more knowledgeable about health benefits associated with breastfeeding and also the cost-effectiveness of this practice (218), while mothers who formula feed perceive formula as an easy and convenient alternative (217). Women who believe breastfeeding is healthy, convenient and conducive to freedom are more likely to breastfeed compared to those who do not. Similarly, women who associate breastfeeding with physical discomfort or lifestyle restrictions have lower breastfeeding rates (69).

Moreover, women's perception of their partners' attitude is also an important factor influencing infant feeding behaviours. For instance, women who perceive their partners' attitudes toward breastfeeding as being negative are more

likely to plan bottle feeding, compared to those who do not (219). In addition, despite a large proportion of women being knowledgeable about breastfeeding health benefits, still some mothers choose bottle feeding in order to involve fathers in the feeding process (220).

According to Dungy and colleagues, maternal breastfeeding attitudes are more important predictors of breastfeeding choice than mothers' socioeconomic status (208,221,222). In addition, parental attitudes seem to provide much greater potential targets for interventions compared to unmodifiable socio-demographic factors (207). This is in line with the Theory of Reasoned Action (TRA) which suggests that the primary determinant of a behaviour is individual's intention to perform it (223). The intention to perform a behaviour is in turn directly influenced by attitudes toward performing the behaviour as well as individuals' perceptions of the social (or normative) pressure imposed on them to perform the act (224).

Scales for evaluation of attitudes toward infant feeding: To evaluate attitudes toward infant feeding, three main self-report tools have been developed, namely, Gender-Role Attitudes toward Breastfeeding Scale (GRABS), Iowa Infant Feeding Attitude Scale (IIFAS) and Breastfeeding Attrition Prediction Tool (BAPT).

One of the first breastfeeding attitude scales has been Gender-Role Attitudes toward Breastfeeding Scale (GRABS) which was developed by Kelley et al. in 1993 (225). This scale was originally developed to evaluate the gender-role attitudes about breastfeeding among 91 married primiparous mothers at 8

weeks postpartum in the United States (225). Questionnaire items in GRABS measure infant feeding method (breastfeeding, bottle feeding) as well as attitudes toward breastfeeding. This scale targets experiences of new mothers during the postpartum period and has shown acceptable reliability and validity in the original methodological study (225). The benefit of using this instrument is the ease of administration since it only consists of 6 item scores. However, the limitation is that no other studies have ever used the GRABS and reliability and validly of this tool has only been tested in the initial developmental study, and as such assessment of generalizability seems difficult.

Generally, GRABS was originally developed for use in clinical practice and it is able to predict the initiation and continuation of breastfeeding among new mothers (226). The GRABS could provide an understanding of the influence of demanding and competing roles on breastfeeding. However, an increased application to variety of populations is needed before the findings could be generalized.

Iowa Infant Feeding Attitude Scale (IIFAS) is the most commonly used scale for measuring maternal knowledge and attitudes toward infant feeding and factors influencing mothers' decision regarding infant feeding methods (222). It was proposed by De La Mora and Russell in 1999 and since then has been widely used in infant feeding literature and has been translated into several languages, including Romanian, Chinese and Arabic (199,206,222,227-234).

The IIFAS consists of 17 attitude item scores each being on a 5-point Likert scale (from "strongly disagree" to "strongly agree"). Approximately half of

the questions are worded favourable to breastfeeding, and the remaining half is favourable to formula feeding. The total score ranges from 17-85 with higher scores indicating better attitudes toward breastfeeding, and it can be grouped into 3 categories of positive to breastfeeding (70-85), neutral (49-69) and positive to formula feeding (17-48) (199, 222).

De La Mora and Russell who developed the IIFAS, tested its reliability and validity in three different studies (222). In the first two studies, the relationship between maternal attitudes and intended feeding methods was examined, and the IIFAS showed high reliability in these studies (Cronbach's alpha: 0.86 and 0.85, respectively) (222). However, the third study reported a lower Cronbach's alpha coefficient of 0.68, indicating a lower reliability among IIFAS items (222). De la Mora and Russell justified that the lower reliability of IIFAS was due to differences in sample characteristics. The first two studies included women who may or may not have chosen to breastfeed, while in the third study only breastfeeding women participated (222) and women in the latter group had higher attitude scores compared to those in studies 1 and 2 (222,226). In addition, the IIFAS scores varied more among women in the first two studies compared to those in the third, which highlights the sample differences with the first 2 studies including mothers who were either intending to breastfeed or formula feed. The lower variability in IIFAS scores in the third study may have limited the correlation coefficients among item scores, lowering the Cronbach's alpha coefficient. It has been suggested that since the IIFAS was initially tested on a sample of well-educated Caucasian women, more studies are needed to test this

self-report tool among diverse groups to understand the relationship between attitudes and demographic variables (222).

In 2008, IIFAS was translated into Romanian and a low reliability was observed in the prenatal group (α=0.5) (226,229). However, higher Cronbach's alphas were reported among multigravida women and those with university education (229). These findings might highlight the lack of infant feeding information among primigravida, less-educated Romanian women (226). In 2011, Ho et al. translated the IIFAS into Chinese and tested its ability to predict six-week breastfeeding rates (230). They concluded in their longitudinal cohort study that the IIFAS was a valid and reliable tool for use among Taiwanese women, and the maternal breastfeeding attitude was the only significant predictor of breastfeeding duration (230).

A study that used the IIFAS among parents of breastfed and formula-fed infants showed a higher IIFAS score among the former group, and concluded that maternal intentions are highly correlated with the actual infant feeding practices (218).

Overall, IIFAS has an acceptable reliability and validity to be used among a variety of samples including prenatal women, postpartum mothers, formula feeding mothers, breastfeeding mothers, fathers, low-income pregnant women and health visitors (226). This tool was originally developed for clinical use and its benefits include: simplicity, ease of use, simple wording, and therefore, being applicable to diverse groups such as fathers, adolescents and students (226). IIFAS can be used to confidently predict the choice of infant feeding and actual

feeding behaviours (reflected in behavioural intentions and breastfeeding duration) and can be applied to different groups (226).

The third breastfeeding attitude scale is Breastfeeding Attrition Prediction Tool (BAPT), which was developed by Janke in 1992 to identify women at risk of early weaning (210,211). Findings from studies using BAPT have identified maternal attitudes toward infant feeding, control over barriers, and professional support as the key variables determining the early breastfeeding attrition (210,211,226).

BAPT has been developed based on the Theory of Planned Behaviour as a means of measuring maternal attitudes, perceived control and subjective norms toward breastfeeding (210). BAPT was revised in 1994 based on the findings from initial factor analysis in the pilot study, and the revised version was used by researchers in subsequent studies (211). BAPT was tested among a variety of groups in several studies. In 2002 Dick et al. modified the BAPT and concluded that it had acceptable validity and reliability for use among women who intended to breastfeed for at least eight weeks (235). However, this study also suggested that BAPT fails to predict breastfeeding status among women who have breastfed previously (235).

In 2004, Evans and colleagues modified and evaluated the effectiveness of the BAPT for use among primiparous women who intended to breastfeed for at least eight weeks (236). They administered the BAPT in prenatal breastfeeding classes among women in their last trimester and during the first 2 days postpartum in hospital, for predicting the probability of breastfeeding cessation (236).

Findings from this study did not suggest any effectiveness in application of the modified BAPT during prenatal or postnatal period for identifying women who might wean their infants prematurely (226). In addition, no significant differences were observed between the maternal attitudes toward breastfeeding during the third trimester of pregnancy and immediate postpartum period. This study supported that maternal infant feeding decisions are formed early, even before pregnancy (226).

Overall, there are some limitations associated with using the BAPT, such as having a large number of item scores which makes it difficult to administer. In addition, this tool has not been used among culturally-diverse populations and primiparous women in order to improve its clinical utility and validity (226). Generally, BAPT has the ability to identify women at high risk of breastfeeding attrition. Health care professionals are advised to use BAPT for designing interventional programs to increase the breastfeeding duration rates according to three pillars of behaviour change, namely, attitudes, subjective norms and perceived control (226).

To summarize, based on the available evidence regarding reliability and validity of different infant feeding attitude scales, the IIFAS seems to be the most valid and reliable tool for assessment of maternal knowledge and attitudes concerning infant feeding. The ease of administration and scoring as well as its previous wide application in international studies and among diverse groups make this self-report tool a valid and reliable means of assessing maternal infant feeding knowledge and attitudes (226).

ii. Socio-demographic characteristics:

At the national (173,237-239) and international (240-243) levels, socioeconomic and demographic parameters have been consistently suggested as important determinants of infant feeding behaviours, with the major factors being education level, age, marital status, ethnicity and income (69,208,244). There is strong evidence suggesting mothers who are less-educated (69,208,244), young (69,203,208,244,245), single (69,240,244,246), economically-disadvantaged (69,208,244), and from minority racial and ethnic groups (243,247), to have lower breastfeeding initiation and duration rates. The following section presents a summary of literature review on the influence of major socio-demographic factors on breastfeeding behaviours.

Education level: At the national level, Canadian mothers with post-secondary education have shown higher rates of 6-month exclusive breastfeeding (173,237,248), and provincially, mothers from Quebec who held a university diploma had increased odds of breastfeeding for four months (239), while not completing the high school degree was a risk factor for early weaning among Ontario women (69). In addition to breastfeeding exclusivity, maternal education is also positively associated with breastfeeding initiation and continuation rates in Canada as well as in other countries (69,131,173,186,208,237-241,244,245,249-253). Similarly, mothers with lower education levels are more likely to terminate breastfeeding early in the postpartum period (69,242,250,252). Interestingly, even the type of foods and liquids that are fed to infants is influenced by maternal education level (242).

It is hypothesized that higher education allows mothers to formulate well-informed infant feeding decisions (237), and also highly-educated women are more receptive to positive health messages including breastfeeding (254,255). However, it must be noted that this association is just the opposite in the developing countries where higher maternal education is associated with lower rates of breastfeeding initiation and exclusivity (256,257). For instance, illiterate mothers in developing countries are twice more likely to breastfeed their children compared to mothers with at least 7 years of education (258). The negative association of education and breastfeeding in developing nations has been justified by the fact that educated women are more likely to be employed and hence are unable to breastfeed exclusively (257), mainly due to the short period of maternity leave in these countries (258,259).

Age: Generally, older mothers have shown higher rates of breastfeeding initiation, continuation and exclusivity (173,239-241,248,249). Evidence from numerous classic as well as more recent studies has consistently suggested younger mothers and adolescents to have lower breastfeeding intention, higher likelihood of mix feeding/formula feeding and more probability of early introduction of solids (256,260,261). Older mothers' higher breastfeeding rates might be due to having more positive attitudes toward breastfeeding and being knowledgeable about breastfeeding benefits. In addition, older mothers are more likely to have previous breastfeeding experience, which might provide them with higher confidence and self-efficacy for breastfeeding (249,262). Older mothers are suggested to have accrued experience through breastfeeding previous children,

and they have higher levels of practice and are part of supportive infant feeding networks, while younger mothers might lack enough resources and practice or might be under influence of a negative culture (242).

Marital Status: Being married or having a partner, compared to being single, has been associated with higher breastfeeding initiation, duration and exclusivity (69,222,240,244,246,262). This might be due to the fact that fathers are likely to provide support for lactating mothers, which may facilitate the feeding process and help establish exclusive breastfeeding for the first 6 months (173,263).

Household income: Findings from several studies have suggested that lower education level of fathers is significantly associated with lower rates of breastfeeding continuation and exclusivity among their partners (240,252). However, lack of knowledge about breast milk benefits does not explain this relationship (252), and instead the lower socioeconomic status, income, social ranking and unemployment associated with lower education jeopardize parents' power and self-efficacy (264). Lower social ranking, as indicated by lower education, unemployment and lower income entails a situation in which individuals have less control, status and power, and as a result have lower productivity and self-esteem (265). It has been suggested that social position influences health behaviours (including breastfeeding), and mothers of lower socioeconomic ranks and earnings often have lower coping capacities and are therefore more likely to discontinue breastfeeding (265).

Employment: According to the Health Canada, mothers who return to work after delivery are very likely to discontinue breastfeeding, holding the belief that they are unable to provide adequate breast milk (23). In addition, they might view breastfeeding as time-consuming and uncomfortable (23). Flexible work schedules, part-time nursing and the use of breast pumps to express milk have shown positive impacts on increasing breastfeeding rates among employed mothers (23).

However, there is contradicting evidence regarding the impact of employment on breastfeeding practices. Being in full-time employment or school enrollment have been associated with lower rates of breastfeeding especially in developing countries, while working full-time in home has been associated with higher breastfeeding initiation and exclusivity rates (23,257). This might be due to the environmental barriers at work and school for breastfeeding, short maternity leave in some countries or unsupportive work environments (4,5). Generally, in most cases intention to return to work jeopardizes breastfeeding duration and not the initiation (266).

In contrast, some studies mostly in the industrialized nations with longer maternity leave periods and guaranteed job security during the leave (such as Nordic European region), have shown higher breastfeeding rates among women in higher occupational ranks (267, 268). Similarly, infants whose fathers receive unemployment benefits are usually breastfed for a significantly shorter period of time compared to other infants (252).

Ethnicity: Immigration status influences breastfeeding rates markedly (269-273). According to the most recent national survey in Canada on breastfeeding rates among immigrants, foreign-born mothers were more likely to initiate and continue breastfeeding compared to Canadian-born mothers (274). However, as the number of years ethnic women lived in Canada increased, their breastfeeding rates declined significantly (274). This trend could be explained by the way breastfeeding is perceived in mothers' own country of origin compared to the Canadian perspective (274). Short-time arrival mothers carryover the breastfeeding norms from their place of origin, and they are more likely to maintain the culture, reproductive norms and other practices of their home countries (275). It has been suggested that acculturation and assimilation of immigrants into the Western society might explain this process, since as the number of residency years in the host country increases, the more it is likely that immigrants adopt the new culture and behaviours (274). However, it might also be due to the assimilation of immigrants' socioeconomic status to the local society (274).

Another possible explanation for higher breastfeeding rates among minority groups and immigrants is the availability of support in their social communities (274). Immigrants and minority groups tend to live in neighborhoods and have their own communities in which they share their experiences of their country of origin and destination (274). Immigrant communities usually have strong support for breastfeeding due to having closer ties to their home countries where breastfeeding is the norm. As the length of time

immigrants spent in the host country increases, their breastfeeding and other health behaviours shift from the norms of the native country to the standards of the host country due to the impact of local normative practices as well as assimilation of socioeconomic characteristics of immigrants to those of the new county. Another finding from the national Canadian study was that visible minority mothers in Canada had higher breastfeeding initiation and exclusivity rates, compared to non-visible minority groups (274).

However, it must be noted that findings from this national survey have major inherent limitations in the way data were collected and analyzed. One of the weaknesses stems from not differentiating mothers by ethnic groups, religion, or place of birth, while it has been proved that different ethnic groups have distinct breastfeeding beliefs and behaviours after migration to a Western country. Some immigrant mothers might face lack of role modeling and perceive that women from the host country do not breastfeed, since they are not usually seen breastfeeding in public, while formula feeding is readily available and is seen as the norm (276). In addition, transition from extended to nuclear family, availability of infant formula, lack of family support, mothers' increased interest in Western morals and the need to study/work encourage some groups of immigrants to formula feed (276,277).

Evidence suggests that breastfeeding patterns depend on the ethnic minority group being studied, the host country and the duration of residency in the host country (274). Some studies have revealed that Vietnamese mothers abandon breastfeeding completely once they settle in a Western country (278), and another

study indicated that although 73-85% of Vietnamese mothers breastfeed their children in Vietnam, after immigration to the United States this rate falls to 12-15% (279). However, small sample size is a limitation of these studies, and Vietnamese mothers have shown higher breastfeeding rates in studies conducted in Australia (280).

Generally, mothers of most ethnic origins are prone to breastfeeding cessation upon immigration into a new country, which might be explained by their acculturation into an adopted society (274). Acculturation might influence maternal health behaviours to better reflect those of the new country, and as a result immigrant mothers might abandon or limit breastfeeding practices simply to conform to local norms with regards to infant feeding (276).

The acculturation trend was clearly demonstrated in a comparative study of breastfeeding among Turkish mothers in Turkey and those in Stockholm. Findings from this study suggested that after controlling for social and cultural backgrounds, a lower breastfeeding rate is observed among Turkish immigrants in Stockholm compared to native women in Turkey (270). However, a study on Vietnamese immigrants in Canada argues that maternal infant feeding decision is not related to acculturation to local practices of the host country and instead it roots from the conflicts between configuration to new social space in Canada and the Vietnamese cultural practices (272).

Regardless of ethnicity, an important determinant of infant feeding seems to be the number of residency years in the host country, which has also been considered as a proxy measure of acculturation (281,282). The longer length of

stay in the host country is negatively associated with the initiation and duration of breastfeeding among immigrants (277,281) and could also increase the likelihood of early weaning and artificial feeding in a dose-response manner (276,277). For instance it has been shown that the median rate of exclusive breastfeeding among Mexican immigrants is 2 months if they had lived in the United States for less than 5 years, 1 month if they had lived for 6-10 years and less than one week if they had lived for 11 years (282).

It has been suggested that socioeconomic factors could mediate the relationship between length of residency in the host country and breastfeeding. For instance, Spanish-speaking mothers residing in the United States who had discussed breastfeeding with a physician and were more knowledgeable about its benefits were more likely to initiate breastfeeding post-immigration (283). Similarly, well-educated immigrants from Hong Kong living in Canada were more likely to initiate and continue breastfeeding (284). This was also confirmed in a recent study in which higher-income mothers who were highly-acculturated showed higher breastfeeding rates compared to those who were less acculturated but had the same income level. In contrast, within the most financially-deprived group breastfeeding rates declined with the increase in acculturation (284-286).

Overall, some minor ethnicities are more favourable to breastfeeding for cultural reasons (281,284,287,288). It has been suggested that the preference for breastfeeding among these groups is continued from the first generation mothers to the second, and immigrant mothers are generally encouraged and supported by their partners of the same origin (286). However, minority groups born in the

United States have shown breastfeeding initiation rates similar to those of the native-born mothers from the United States, which might be attributed to the high income, education level and health care access among these women.

In 2006, Gibson-Davis and Brooks-Gunn (269) found that foreign-born mothers in the United States had 85% higher probability of breastfeeding initiation and 66% higher odds of breastfeeding to 6 months compared to native-born American mothers. In addition, the breastfeeding rates of Black and Asian immigrants in the United Kingdom have been reported to be higher than the rates among British women (286).

Despite being an understudied group with respect to infant feeding, Middle Eastern mothers have consistently shown higher breastfeeding initiation and duration rates after immigration to Western countries (281,287,288). This could be mediated partly by their ethnicity and religion as well as their lower socioeconomic status and education (281,287,288). It has been suggested that Islamic beliefs are the most powerful reasons for higher breastfeeding rates among Muslim Middle Eastern mothers (281,287,288).

Islam for Muslim women is more than just a religion and it permeates all aspects of their being (284). The most important principles of Islamic practice are adherence to and understanding of Qur'an (holy book) and Sunnah (Islamic principles) (289-291). Breastfeeding is specifically promoted by Qur'an, which explicitly orders: "Mothers shall give suck to their children for two years for those who desire to complete the term" (Qur'an, 2:233). This verse and other directives in Islam emphasize that breastfeeding is one of the infants' primary rights and is

beneficial to mothers, children and all humanity. In Islamic culture, when breastfeeding is not possible, a wet nurse is often employed which is an uncommon practice in Canada due to lack of feasibility and economic constraints (284). By the Islamic laws, the wet nurse becomes an infant's "mother in lactation" since she offers her body and life to the baby, and as such children who are breastfed by the same woman are considered siblings and prohibited from marrying each other.

During the holy month of Ramadan, those who follow Islam observe a fast from sunrise to sunset, and although pregnant and lactating women are given a temporary exemption from fasting, all missed days must be compensated by mothers at a later time. Muslim women in Canada choose to fast with their communities since they would receive their families' and friends' support rather than having to fast alone at a later time (284). Another Islamic practice is reciting a special prayer before breastfeeding, which is usually done by a male and the aim is to call for the infant to be guided by the prayer. Taken collectively, Islam is an influential factor for higher adherence of Muslim women to breastfeeding practices.

iii. Biomedical factors:

Several variables in this category influence breastfeeding initiation and duration rates such as: obstetrics information, intra-partum experiences and perceived milk supply (69,292).

Parity: A dose-response relationship has been previously observed between parity and breastfeeding initiation and exclusivity rates among singleton

as well as twin infants (186,237,240,256). It has been suggested that the likelihood of introduction of cow's milk, formulas and early weaning is higher among infants who are the first-born in a family (250,251). Multipara women have higher self-confidence, self-efficacy, and knowledge gained through earlier breastfeeding experiences, and therefore, have higher rates of 6-month exclusive breastfeeding (256).

According to the Theory of Planned Behaviour (223), prior experience with a particular behaviour could directly influence the perceived behavioural control; and as such, having a prior breastfeeding experience increases the likelihood of future breastfeeding. It is of note that multipara women's decision to breastfeed depends largely on the infant feeding method they had chosen previously, the amount of breastfeeding experience and their attitudes toward breastfeeding (212). The more experience of child feeding a woman has, the less likely she is to listen to the experiences and advice of others, while primipara women are more likely to heed this advice (212). As a result, the experience per se does not seem to matter as much as the type of experience does, therefore if women encounter a problem while breastfeeding they are less likely to try to breastfeed again.

Overall, it is concluded that multiparity influences breastfeeding initiation and continuation rates positively by providing women with more confidence, self-efficacy and knowledge gained through prior breastfeeding experiences.

Body mass index (BMI): Maternal pre-pregnancy BMI has been negatively associated with breastfeeding intention, duration and exclusivity (237,293-295). It

has been postulated that high maternal BMI distorts prolactin production, which might result in reduced milk production (294). In addition, mothers with higher BMIs have specific psychological characteristics, such as higher perception of breast milk insufficiency, which could interfere with the breastfeeding process (295).

Smoking: Mothers who smoke during pregnancy have shown lower duration of breastfeeding and higher probability of early weaning (23,250,251,296,297). In addition, women who smoke have lower breastfeeding intention and are less likely to breastfeed their infants compared to non-smokers. Nicotine metabolites could potentially decrease the breast milk production and ejection and result in infant irritability and poor weight gain (23).

However, it is notable that higher smoking rates have been observed among those with lower educational levels in some groups. Generally, mothers who smoke are less health-attentive and motivated, which could lead them to perceive a potential threat of harming their infants by breastfeeding while smoking (237,240).

Infant's gender: Mostly in developing countries, girls are breastfed less than boys due to the boy preference that exists among populations with lower socioeconomic status (298). This gender gap in breastfeeding is an unintended consequence of mothers wanting more future sons (298). After birth of a daughter, mothers are more likely to conceive again to try for a boy, and since breastfeeding may induce temporary infertility, mothers wean their daughters early so that they can conceive again. In addition to this, mothers from some

ethnic groups such as Indians believe that girls are harder to nurse while boys are harder to wean (298).

Perceived milk insufficiency: Studies suggest that women who encounter feeding problems and are able to overcome them, are more likely to develop greater self-efficacy which is associated with continued breastfeeding (204). Perceived milk insufficiency is the most common reason cited by mothers for discontinuation of breastfeeding (4).This perception has a very strong psychological component and although only 1-5% of women in a population may actually have breast milk insufficiency (due to physical or physiological problems), as many as 50% report that their milk supply is inadequate (69).

Since milk insufficiency is generally a perception and not real, other psychological factors such as low self-efficacy in early weeks of breastfeeding, might cause women to doubt their milk output. This statement is further confirmed by the fact that women with higher self-esteem perceive their breast milk to be adequate (69,245).

c. Summary

The literature review presented in this chapter highlighted several factors associated with initiation, duration and exclusivity of breastfeeding. In general, there is a strong relationship between most socio-demographic (especially age and education) and biomedical (especially parity and BMI) variables and breastfeeding outcomes. However, the attention of recent studies has shifted to examination of modifiable psychosocial factors in relation to breastfeeding. Breastfeeding knowledge, attitudes, intention, beliefs and self-efficacy have been

consistently reported as important parameters that influence breastfeeding rates. It is now well-known that strong desire for breastfeeding, previous positive experiences and being supported by family members result in positive and prolonged breastfeeding experience. These factors are potentially modifiable and therefore development and evaluation of interventions aimed at increasing breastfeeding rates should take into account a combination of these variables in order to be more successful.

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Chapter III. Research Methodology

III.1. Study 1: Alberta Pregnancy Outcomes and Nutrition (APrON) study

a. Setting and design

The first study included in this thesis project was conducted within the framework of the Alberta Pregnancy Outcomes and Nutrition (APrON) study, the largest on-going Canadian prenatal nutrition cohort which uses repeated measures over a four-year period to assess health and nutrition outcomes in pregnant women and their children (see www.apronstudy.ca for further details). APrON is a prospective longitudinal cohort study of mother-infant dyads which started recruitment in May 2009 in Edmonton and Calgary, Alberta. This study is originally aimed at investigating the association between the maternal nutrient status during pregnancy and their mental health as well as the health and developmental outcome of the offspring (Appendix C-E).

b. Population and sampling

In the first phase of the APrON study (May 2009 – March 2010), 600 pregnant women were recruited from Edmonton and Calgary, Alberta, Western Canada. All eligible women who subsequently delivered an infant were followed up postpartum. Estimated total sample size for the APrON study was originally set at 10000 participants. Based on the power calculations for the analysis of different APrON sub-studies and in order to standardize sample sizes between them, a total of 600 pregnant women were considered for the initial cohort analysis (phase I), including the present study.

The first study in this thesis used the longitudinal data for a subsample of women recruited between May 2009 and March 2010 and their infants at approximately 3 and 6 months postpartum. Table III.1. illustrates a comparison of the characteristics of total participants in the first cohort of the APrON study (n=600) and those who had available data for 6-month postpartum (n=300) and were therefore included in our analyses.

Table III.1. Comparison of socio-demographic and lifestyle variables according to research participation: Alberta Pregnancy Outcomes and Nutrition (APrON) study[1,2]

Variables	**First phase of APrON study** n=600	**Final 6-month analyses** n=300
Parental socio-demographic factors		
Maternal age[3], *years*	31.0 (6.0)	31.0 (6.0)
Maternal marital status		
Single/Divorced/Separated	20 (3.5)	6 (2.0)
Married/Common-law partner	544 (96.5)	293 (98.0)
Maternal education level		
Less than secondary education	172 (30.6)	83 (27.7)
Completed university undergraduate degree	270 (48.0)	146 (48.7)
Completed university post-graduate degree	120 (21.4)	71 (23.7)
Paid job during pregnancy		
Yes	448 (79.9)	242 (81.5)
No	113 (20.1)	55 (18.5)
Occupational status during pregnancy[4]		
Full-time	347 (77.6)	189 (78.4)
Part-time	100 (22.4)	52 (21.6)
Mother born in Canada		
No	100 (17.9)	44 (14.9)
Yes	459 (82.1)	251 (85.1)
Mothers' length of residency in Canada[5], *years*		
≤3	16 (20.8)	7 (18.4)

>3	61 (79.2)	31(81.6)
Maternal ethnicity		
Caucasian/White	488 (87.9)	269 (90.6)
Non-Caucasian	67 (12.1)	28 (9.4)
Place of residence		
Edmonton	108 (18.0)	30 (10.0)
Calgary	492 (82.0)	270 (90.0)
Annual household income, *CAD*		
<20,000	9 (1.6)	2 (0.7)
20,000-39,000	24 (4.3)	5 (1.7)
40,000-69,000	75 (13.5)	41 (13.9)
70,000-99,000	140 (25.2)	78 (26.4)
≥100,000	307 (55.3)	169 (57.3)
Household size[3], *n*	2.0 (1.0)	2.0 (1.0)
Paternal education level		
Less than secondary education	143 (41.0)	90 (41.1)
Completed university undergraduate degree	140 (40.1)	87 (39.7)
Completed university post-graduate degree	66 (18.9)	42 (19.2)
Paternal marital status		
Single/ Divorced/ Separated	6 (1.7)	4 (1.8)
Married/Common-law partner	344 (98.3)	215 (98.2)
Paternal birth place		
Canada	278 (79.4)	181 (82.6)
Foreign countries	72 (20.6)	38 (17.4)
Paternal ethnicity details		
Caucasian	298 (85.6)	199 (91.3)
Non-Caucasian	50 (14.4)	19 (8.7)
Maternal health and lifestyle characteristics		
Smoking during pregnancy		
No	557 (98.4)	296 (99.0)
Yes	9 (1.6)	3 (1.0)
Alcohol consumption during pregnancy		
No	527 (93.1)	280 (93.6)
Yes	39 (6.9)	19 (6.4)
Recreational street drug use during pregnancy		
No	563 (99.5)	297 (99.3)
Yes	3 (0.5)	2 (0.7)
Gravida[3], *n*	2 (2.0)	2 (1.0)
Parity		
Primiparous	316 (56.3)	175 (58.9)
Multiparous	245 (43.7)	122 (41.1)
Planned pregnancy		
Yes	459 (81.2)	249 (83.6)

No	106 (18.8)	49 (16.4)
Born by assisted fertility[6]		
No	526 (93.1)	280 (94.0)
Yes	39 (6.9)	18 (6.0)
Pre-pregnancy weight[3], *kg*	63.50 (15.9)	63.63 (15.7)
Pre-pregnancy BMI[3,7], *kg/m²*	22.77 (5.4)	22.98 (5.4)
Gestational weight gain[3], *kg*	15.60 (6.4)	15.45 (6.3)
BMI at 12 weeks postpartum[3,7], *kg/m²*	24.57 (5.6)	24.47 (5.9)
IIFAS score[8,9]	66.83 (7.4)	67.27 (7.6)

CAD: Canadian dollars; BMI: Body mass index; IIFAS: Iowa Infant Feeding Attitude Scale
[1]Values are n (%), unless otherwise noted
[2]Denominators vary due to missing data
[3]Median (interquartile range (IQR))
[4]Calculated only among mothers who were employed during pregnancy
[5]Calculated only among mothers who were born outside Canada
[6]Fertility-enhancing drugs or reproductive technology
[7]BMI was calculated by dividing the weight in kilograms by square of height in meters
[8]Score ranges from 17-85, with higher scores indicating more positive attitudes toward breastfeeding
[9]Mean (standard deviation (SD))

Recruitment: APrON study recruits participants from two sites in Edmonton and Calgary. Despite having similar basic recruitment strategies, some differences exist between these 2 centers mainly due to the way obstetrical care is provided in Edmonton and Calgary.

In Edmonton, the Women and Children's Health Research Institute (WCHRI) assisted with the distribution of recruitment posters in offices of family physicians and midwives throughout the city. Moreover, obstetricians and gynecologists provided APrON satellite research sites with contact information of interested patients who had given consent to be contacted to receive more details about the study. In addition to recruitment through health clinics, several promotional activities attempted to engage women in this study. For example,

there were several media releases in local newspapers, non-profit magazines, maternity magazines, and local TV and radio stations in which APrON's principal investigator in Edmonton (Dr. Catherine Field) described the APrON project. Maternity stores in different shopping malls also put up recruitment posters, and on-site community recruitment was carried out in malls, recreational centers, and community fairs.

In Calgary, family physicians referred pregnant women to one of the "Primary Care Network" prenatal clinics as soon as pregnancy was confirmed. As women attended their first appointments in prenatal clinics, they were approached by research assistants or nurses and were provided information about the APrON study through brochures which contained contact information of the study personnel. In addition, APrON staff contacted pregnant women in some of the radiology clinics at the time of their first (12th week) or second (18th week) ultrasound visits. Several promotional events took place in Calgary, including advertisement through posters in the offices of midwives and family physicians and extensive media coverage to create awareness about this study.

In addition to these, interested participants could obtain more detailed background information about the study through the official webpage of the APrON study (www.apronstudy.ca) and fill in a form online requesting to be contacted by one of the APrON team's research assistants.

Inclusion criteria: Pregnant women were eligible to participate in the APrON study if they met the following inclusion criteria: 1) residing in Calgary/Edmonton or surrounding areas, 2) planning to stay in the region for at

least 6 months, 3) being ≤27 weeks gestation, 4) being ≥16 years of age, 5) being able to speak and write in English, and 6) completing a consent form by mothers for themselves and their infants to participate in the APrON study.

Of the total 600 participants in the first phase of the APrON study, 470 had available infant data for 12-week postpartum and 355 for 24-week postpartum, respectively. For the purpose of this research, all records with inconsistencies, errors and missing values for any of the feeding variables were excluded (n=29 from the 3-month and n=24 from the 6-month postpartum data). In addition, only infants who were healthy (without medical conditions or congenital malformations), singleton, term (>37 weeks gestational age) and with normal birth weight (weighing >2500 grams at birth) were considered. The final analyses included the 3-month data for 402 infants (85.53%) and the 6-month data for 300 infants (63.83%), respectively.

According to the World Health Organization (WHO) guidelines, preterm and low birth weight (LBW) infants might need formula during the first few days after birth, and they are generally less likely to be breastfed (1). Therefore, including preterm and LBW infants in the present study could have overestimated the number of non-exclusive breast-feeders. We also excluded multiple births as these infants are more likely to be preterm and of lower birth weights (1). In addition, twin infants are more likely to be weaned early and less likely to be exclusively breastfed compared to their singleton peers, which could have biased our results (2). None of the mothers in the present study had any medical

conditions or consumed any medications that contraindicated breastfeeding based on the WHO guidelines (1).

c. Measurements

Generally, women were asked to visit APrON research sites once during each trimester of pregnancy and once at approximately 3 months post-delivery. Each visit took about 1-1.5 hours and after the last visit postpartum, participation is continued through mailed questionnaires until the child reaches 3 years old. Approximately a total of 35 hours over 3.5 years is expected of participants. APrON questionnaires have been developed based on the available literature, similar national and international large-scale surveys (3,4), and consultation with perinatal experts. Permission to use copyrighted questionnaires was sought from principal investigators before administration.

For the purpose of this study, a wide range of potential predictors of infant feeding practices were considered, which were derived from structured questionnaires of the APrON study administered at different time points during prenatal and postpartum periods.

Baseline measurements: Information concerning parental socio-demographic indicators (e.g., age in years, marital status, education level, occupational status, birth place, length of residency in Canada, ethnicity, place of residence, annual household income and household size) and maternal health and lifestyle variables (e.g., smoking, alcohol consumption, recreational street drug use, gravida, parity, birth information, chronic disease history, medication use, and anthropometric measures) were collected during the prenatal visits.

At the third trimester of pregnancy, maternal knowledge and attitudes toward breastfeeding were assessed using the Iowa Infant Feeding Attitude Scale (IIFAS) (5). IIFAS is a self-report tool comprised of 17 items on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree" (Appendix F) (5). Approximately half of the IIFAS items are worded favourable toward formula feeding and the remaining questions are favourable toward breastfeeding (5). Findings from a systematic review of measures assessing maternal knowledge, attitudes and confidence regarding breastfeeding recommended the use of IIFAS as a valid and reliable tool (6). For calculation of total IIFAS score, formula-favouring items were reverse-coded to make a total score ranging from 17 to 85. Higher scores indicate an attitude that favours breastfeeding (5).

Follow-up measurements: After delivery, mothers were approached at approximately 3 months postpartum through face-to-face visits and at 6 months postpartum by mailed questionnaires, and detailed information about maternal and infants' health and feeding practices were collected. Generally, infants' characteristics (e.g., gender, gestational age, birth weight, health and medical conditions) were collected from hospital charts. Infant weight at 3 months postpartum was obtained through direct measurement. Infant feeding practices were examined at 3 and 6 months postpartum using "Child Food and Liquid Intake" Questionnaire, which is comprised of a set of structured questions on breastfeeding and formula feeding (6 questions) and a detailed 40-item qualitative food frequency questionnaire (FFQ). The FFQ collects retrospective data on the age of introduction and intake frequency of breast milk, formula, liquids and solid

foods on a scale ranging from “less than once per week” to “more than 3 times per day”.

Other variables related to infant feeding behaviours, such as infants’ vitamin/mineral supplementation, feeding on-demand/scheduled feeding, and sources of infant feeding information were also explored. Some nominal variables, such as “person in charge of preparing infant’s food” had open-ended options for response.

To minimize the risk of recall bias, responses to 3-month infant feeding questionnaire were initially used and data from the 6-month questionnaires were only used to cover the 3-6 month period.

III.2. Study 2: Ethnographic study

a. Ethnography

"How we talk about, write about, and present ethnographic research to others is part of the extended research relationship we establish with respondents…in this sense, ethnographers are story-tellers"

(Grills 1998, P.14) (7)

The second study included in this thesis project took an ethnographic approach to qualitative data collection and analysis. This section provides the principles of ethnographic research and the justification for using this design in the present study.

Why ethnography?

Given our intention to explore the social, political and cultural context of Middle Eastern mothers' infant feeding experience in Canada, ethnography was chosen as it functionally and historically concerns itself with the study of human culture. Ethnography is a deliberate scientific and investigative approach to learning about the cultural and social life of institutions, communities and other settings in which the researcher is the primary tool for data collection (8). Ethnography provides a means for exploring cultural groups and it builds on the perspectives of the people in the research setting (8). The end goal of an ethnographic research is to provide "thick description": a narrative that describes in great details all specifics of a culture (9).

How is the "culture" defined?

In this approach, culture is an abstract concept that accounts for the beliefs, values and behaviours of cohesive groups of people (10). Culture is a narrower term than "race", which refers to biological variations. A racial group may consist of many different cultures while a cultural group may also contain members of different races (10). Although cultural groups might account for a particular nationality, cultures might cross the political boundaries of a country. On the other hand, a nation might consist of different cultural groups. Culture in this sense is responsive to change; people may adapt to new cultures since culture accounts for the perceptions by which people view their worlds (10).

In general terms, culture may be described as the "beliefs, behaviours, attitudes, norms, social arrangements and forms of expression" that form describable patterns in the lives of members of a community, institution or a cohesive group (10,11). Within each cultural group, meanings and values are shared and behaviours are patterned, while these patterns differ from culture to culture. In line with this definition, in the present study, we considered mothers from different countries located in the Persian Gulf region (i.e., Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, Syria, United Arab Emirates and Yemen) to be our potential participants, since these people share common beliefs and values.

What types of questions are addressed?

Ethnography is always contextual, holistic and reflexive and is presented from the emic perspective (12). Strategies used in ethnographic research are generally aimed to elicit the features embedded in a culture. In ethnography, the

researcher explores the phenomena within the cultural contexts from an emic perspective (perspective of members of cultural groups involved).

What is the researcher's stance?

Ethnography always takes place in the natural setting so that the researcher studies the lives of members of cultural groups directly through systematic observation in order to become as integrated as possible into their lives (10). Through an ethnographic approach, differences between perceptions of participants and researcher are well clarified and an overall understanding of the topic is gained from participants' point of view (13). This is particularly important as the goal of ethnography is to examine the insiders' views focusing on the consumers' rather than the health care providers' behaviours.

For the purpose of this thesis project, we were integrated into the native culture and lives of Middle Eastern mothers to gain access to their infant feeding experiences, beliefs, and practices after immigration to Canada. Specifically, ethnographic design fitted well with the lower literacy level and limited English proficiency of our participants (13).

What is the research process?

Despite falling under the general umbrella of qualitative research, ethnography is rooted in culture. Through generalized thinking from the concrete to bottom-up inductive reasoning, an ethnographer builds theories of cultures and explanations of how people think, believe, and behave (11). As an applied science, ethnographic research is problem-oriented and seeks to address problems

in a community context through entering the research field as an invited guest; as a result, no aspect of the environment is controlled (11).

How the data are collected?

In accordance with the ethnographic research methodology, in the present study data were collected in multiple phases to increase the completeness of research. In addition, different data collection strategies (e.g., survey, observations (field notes), analytical memos, and focus group discussions) were used to provide a rich description of cultural norms, perspectives, patterns and characteristics. Specifically, we used survey data to complement and clarify the emerging themes from focus group discussions, while observational field notes and analytical memos enriched the interaction data analyses by providing us contextual descriptions as detailed as facial expressions of mothers, dominance of participants and the flow of discussions.

During different phases of this study, we first went through the stage of "negotiating entry", in which we were acquainted with the community being studied and recorded analytical memos and observational field notes (14). In the second stage, as we were more familiar with the social context of the group, we shifted to identifying key informants and conducting the focus groups and analyses. In the third stage, on the other hand, we had already gained the trust of participants, and we were accepted into their groups. Most of the data for our study were collected in this final stage and theoretical formulations were developed consequently. To avoid the bias of losing objectivity in conducting observations and analyses, we went through the last stage of "withdrawal" in

which data were collected only if needed to address the ambiguities. In this stage, the main focus was on the analyses of data collected in previous phases of our study (10).

Since the principal investigator in this study (M.J.) was from the same ethnicity as the participants, the investigator held an insider's perspective to the culture being studied. However, we attempted to be aware of our roles throughout the research by declaring the values, biases and cultural beliefs at the beginning of the study and discussing them with co-investigators who viewed the subject matter from an etic perspective.

b. Human ecological theory

We applied the human ecological model to the themes from our ethnographic research to conceptualize the overlapping spheres of influence (15), and provide contextual presentation of factors influencing Middle Eastern mothers' infant feeding decisions in Canada.

In this approach, interactions of humans with their external environments are considered as a whole system. Within this framework, social, physical and biological aspects of individuals are considered within their environments (i.e., natural world, reality, social and cultural milieu) (15). It must be noted that processes operating in these external systems are bidirectional and dependent on each other (16).

Although the human ecological model is one the earliest family theories, it contains many evolving elements that are emerging as the knowledge of interaction among human being and environment is being unfolded. This model is

often portrayed by concentric circles with the individual at the center and the social elements of relationships, settings, groups, social institutions and social class in the outer layers (15). Efforts to promote health based on this model consider the interactions between various environments and how the social system is maintained (15).

In the present study, we used the human ecological model to better understand the influence of external environments on feeding practices of immigrant and refugee mothers, since one of the significant components of change for immigrant mothers is their external living environment. In addition, the appropriateness of this model in the present study was confirmed by testing whether mothers' reported experiences fitted in the categories of mother/infant dyad, family, healthcare system, community and society/culture that are proposed in this theory (17).

Overall, using this theoretical approach enabled us to systematically categorize the many different factors that influence infant feeding decisions of Middle Eastern mothers, and to account for the interdependence and interactions among different variables.

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Chapter IV. Manuscript 1

Predictors of 6-month Exclusive Breast Feeding: Observations from the Alberta Pregnancy Outcomes and Nutrition (APrON) study

IV.1. Introduction

Compelling evidence from epidemiological research suggests that breastfeeding is an unequalled means of infant feeding which provides numerous short- and long-term health benefits to both infants (1-9) and mothers (4,10). According to a recent systematic review (4), the short-term health risks associated with formula feeding and early weaning include increased risk of common childhood infections such as otitis media and diarrhea (11) as well as increased susceptibility to some relatively rare but serious diseases, such as leukemia (4,12) and severe lower respiratory tract infections (4,13). In addition, infants who are never breastfed have a 56% higher risk of sudden infant death syndrome (4). In the long-term, breastfeeding is associated with prevention of a host of major chronic diseases and conditions, such as childhood obesity (14), type 2 diabetes (15) and asthma (4). Exclusive breastfeeding confers several health benefits such as decreased rates of gastrointestinal tract infections and all-cause mortality (16,17). Breastfeeding mothers also may have delayed fertility, lower risk of postpartum bleeding, faster return to pre-pregnancy weight, and decreased risk of breast and ovarian cancers (4,18).

In spite of numerous benefits of breastfeeding, 1.5 million infants die annually from being deprived of or receiving insufficient amounts of breast milk (19). In recognition of this, the World Health Organization (WHO) recommended

in 2001 that all infants be exclusively breastfed for the first 6 months of life with continued breastfeeding for 2 years and beyond (17,20). This recommendation was subsequently endorsed by the Public Health Agency of Canada, the Canadian Paediatric Society and Health Canada in 2004 (21,22).

Unlike the breastfeeding initiation rate in Canada, exclusive breastfeeding for the first 6 months remains elusive (23-26). Generally, the main concern is the early supplementation of infants' diets which results in 81%, 89% and 100% of Canadian infants being fed solid foods before 3, 5 and 6 months of age (27). Based on the Canadian studies, exclusive breastfeeding is commonly practiced among highly-educated, multiparous, older women who are living with a partner, have lower body mass indices (BMIs) and are residing in urban areas (23,24,28). However, previous studies in Canada have not determined the role of maternal knowledge and attitudes in infant feeding behaviours, while a growing body of research attests to the idea that a mother's attitude is a better predictor of her infant feeding decisions than are socio-demographic factors (29-32). According to the "Theory of Reasoned Action", an individual's intention to perform a behaviour is the primary determinant of the behaviour (33), which is itself also influenced by an individual's attitude toward performing the behaviour (34). In addition, maternal attitude may provide a greater potential target for interventional studies than unmodifiable socioeconomic parameters (35).

Gaining a better understanding of the predictors of exclusive breastfeeding, including knowledge and attitude influences, might support development of more effective and targeted programs to promote breastfeeding

exclusivity and bring the population closer to the WHO infant feeding guidelines (23). However, no previous studies in Alberta have assessed infant feeding transitions during the first 6 months postpartum, and similarly, the determinants of 6-month exclusive breastfeeding among Albertan mothers are not well-known. Most importantly, it is yet unknown whether Canadian women's knowledge and attitudes toward infant feeding influence their decisions and actual feeding practices. The gaps and limitations of previous studies, changes over time in infant feeding practices (36,37), and the striking provincial differences in breastfeeding rates in Canada (23) necessitate closer scrutiny of infant feeding patterns in different Canadian provinces.

The aims of the present study were therefore to evaluate in a longitudinal birth cohort: a) the transitions in infant feeding practices between 3 and 6 months postpartum according to the WHO guidelines; b) the predictability of 6-month exclusive breastfeeding using parental/infant characteristics; and c) the reliability and validity of the Iowa Infant Feeding Attitude Scale (IIFAS) (30), as a measure of prenatal infant feeding knowledge and attitude, and its sensitivity to differences between exclusive and non-exclusive breastfeeding mothers.

IV.2. Materials and methods

Population and sampling

This study was conducted within the framework of the Alberta Pregnancy Outcomes and Nutrition (APrON) study, the largest on-going Canadian prenatal nutrition cohort which uses repeated measures over a four-year period to assess health and nutrition outcomes among pregnant women and their children (see

www.apronstudy.ca for further details). During the first phase of the APrON study (May 2009-March 2010), 600 pregnant women were recruited from Edmonton and Calgary, Alberta (Western Canada), through advertisements in the media and direct contact in several maternity clinics. Pregnant women who delivered a baby were then followed up postpartum. The inclusion criteria for the APrON study were: 1) residing in Calgary/Edmonton or surrounding areas, 2) planning to stay in the region for at least 6 months, 3) being ≤27 weeks gestation, 4) being ≥16 years of age, 5) being able to speak and write in English, and 6) completing consent forms by mothers for themselves and their infants to participate in the APrON study.

Of the 600 pregnant women who participated in the first cohort of the APrON, 9 had miscarriages, 6 moved out of the Alberta province, and 19.17% were lost to follow-up, leaving a total of 470 participants who completed infant records for the 3-month postpartum follow-up (response rate=78.34%) (Figure IV.1.). For the purpose of the present study, all records with inconsistencies, errors or missing values for any of the infant feeding variables were excluded (n=29 from the 3-month, and n=24 from the 6-month postpartum data). In addition, only infants who were healthy (without medical conditions or congenital malformations), singleton, term (>37 weeks gestational age) and with normal birth weight (weighing >2500 grams at birth) were considered. Eventually, the 3-month data for 402 and the 6-month data for 300 infants were available for analyses (Figure IV.1.).

The characteristics of participants included in the final analyses of the present research (n=300) were similar to those of the total participants of the first cohort of the APrON study (n=600) (Table III.1.). The median (interquartile range (IQR)) of maternal age among both the participants of the first cohort of the APrON study and those included in the present research was 31.0 (6.0) years, and the median (IQR) pre-pregnancy BMIs were 22.77 (5.4) and 22.98 (5.4) kg/m^2 among these groups, respectively. The proportion of women holding post-graduate degrees among first cohort participants was 21.4%, compared to 23.7% of participants in the present study. Of total participants of the first APrON cohort, 43.7% were multiparous, which is similar to 41.1% of women being multiparous in our final analyses. Mean (standard deviation (SD)) IIFAS scores among first cohort APrON participants and those included in the present study were 66.83 (7.4) and 67.27 (7.6), respectively. In addition, 41.0% of fathers in the first APrON cohort and 41.1% of those included in the final analyses of this paper did not have university degrees.

Measurements

Participants were recruited during their first (1-13 weeks) or second (14-26 weeks) pregnancy trimesters and were asked to visit APrON research sites once in each trimester and once for a subsequent assessment at approximately 3 months postpartum. After the last face-to-face visit, participation is continued through mailed questionnaires until the child is 3 years old. In the present study, we analyzed the baseline parental information in addition to the data collected at 3

and 6 months postpartum for a subsample of participants from the first cohort of the APrON study.

a. Baseline assessments

We included a wide range of baseline parental variables collected during pregnancy as potential predictors of exclusive breastfeeding. Parental socio-demographic and economic factors such as age in years, marital status, education level, occupational status, annual household income, household size, birthplace, length of residency in Canada, ethnicity and place of residence were assessed by self-report questionnaires. In addition, maternal health and lifestyle characteristics including smoking, alcohol consumption, recreational street drug use, gravida, parity, birth information, chronic disease history, medication use and pre-pregnancy weight were also evaluated. Height was directly measured at the first prenatal visit by trained research staff using digital stadiometers (Charder HM200P Portstad Portable Stadiometer, USA).

Iowa Infant Feeding Attitude Scale (IIFAS): During the third trimester, women were asked to complete the IIFAS to assess maternal knowledge and attitudes toward breastfeeding (30). The permission to use this questionnaire was sought from the principal researcher (A. de la Mora) who developed it (30). Generally, the IIFAS is a self-report tool comprised of 17 items on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree”. Approximately half of the IIFAS items are worded in a way that favours formula feeding and the remaining questions favour breastfeeding (30). Total IIFAS score ranges from 17-85 and is calculated by reverse-coding the items favouring formula feeding and

then summing all item scores (30). Total score is grouped into 3 categories: positive to breastfeeding (70-85), neutral (49-69) and positive to formula feeding (17-48) (29,30). Previous studies have shown high internal consistency and adequate construct, content and predictive validity of the IIFAS among a variety of populations, including prenatal and postpartum women, formula feeding and breastfeeding women, low-income women, health visitors (community health nurses) and fathers (38).

b. Follow-up assessments

During the 3-month postpartum visit, maternal weight was directly measured using digital scales with mothers wearing light clothing without shoes. Weight was recorded to the nearest 0.01 kg (Healthometer Professional 98 752KL, Pelstar LLC, IL, USA). In addition, information regarding infants' general characteristics and feeding behaviours were collected through hospital charts and questionnaires. Infants' general information such as gender, gestational age, birth weight, number of siblings, birth problems and medical conditions were collected from hospital charts. Infants' weight at 3 months postpartum was obtained through direct measurement. In addition, mothers completed a "Child Food and Liquid Intake" questionnaire at approximately 3 and 6 months postpartum (retrospective recall). This questionnaire is comprised of structured questions on breastfeeding and formula feeding practices (6 questions) and a detailed 40-item qualitative food frequency questionnaire (FFQ) concerning the intake frequency and age of introduction of each food item. Other infant feeding practices and behaviours (e.g., vitamin/mineral supplementation, feeding on-

demand/scheduled feeding, and primary sources of infant feeding information) were also collected using this tool. For nominal variables such as "person responsible for preparing infant's food", an open-ended response option was also employed.

Definition of terms

The latest WHO definitions of infant feeding practices were strictly used in the present study to categorize infants' feeding patterns as "exclusive breastfeeding", "predominant breastfeeding", "complementary feeding" and "not breastfeeding" (Table II.2.) (39). The main outcome of this study was exclusive breastfeeding, which was defined as the intake of breast milk (e.g., directly, expressed or from wet nurse) without any additional liquids or solid/semi-solid foods (40). However, infants who consume oral rehydration solution (ORS), drops or syrups (e.g., vitamins, minerals, and medications) in addition to the breast milk are also considered as exclusive breastfeeding (39). Predominant breastfeeding, on the other hand, was defined as the intake of breast milk as the primary source of nourishment (39) while consuming certain liquids (e.g., water and water-based drinks and fruit juice). Ritual fluids, ORS, drops or syrups (e.g., vitamins, minerals, and medications) are also allowed in this feeding category, while consuming anything else (e.g., infant formula, food-based liquids, and solids) is not allowed (39).

Complementary feeding as defined by the WHO requires that infants are fed breast milk (e.g., directly, expressed or from wet nurse) in addition to solid or semi-solid foods (39). In line with previous studies (41), we used the term

"replacement feeding" for this infant feeding category since formula, foods or liquids introduced during the first 6 months of an infant's life "replace" the breast milk rather than "complementing" it (42,43). In addition, many infants are given infant formula in addition to the breast milk while no solids or liquids have been introduced to their diets; this explicitly suggests that breast milk is being replaced by infant formula (41). In analyses of the present study we did not make any distinctions between milk and non-milk infant formula (e.g., soy formula).

Statistical analysis

All statistical analyses were performed using Statistical Package for Social Sciences version 18.0 (SPSS Inc.; Chicago, IL, USA, 2009). A p-value was set at alpha< 0.05 for a two-tailed test. Categorical variables were expressed in percentages and were compared between feeding categories using the Pearson's chi-square, Yates' correction for continuity or Fisher's exact tests, as appropriate. To report continuous predictors across the feeding categories, mean (SD) or median (IQR) were used depending on the normality of distribution. Kolmogorov-Smirnov test was applied to all continuous variables prior to analyses to investigate whether data fitted a normal distribution ($p>0.05$). If normality was confirmed, independent sample t-test or one-way analysis of variance (ANOVA) with Tukey's HSD post-hoc test were used considering the equality of variance assumption (Levene's test>0.05). On the other hand, if variables did not follow a normal distribution, Mann-Whitney U test or Kruskal-Wallis test (with Mann-Whitney post-hoc test and Bonferroni correction, $p<0.017$) were used alternatively to compare the continuous characteristics.

The reliability (internal consistency) of the IIFAS for use in the present study was assessed using Cronbach's alpha (44), and predictive validity of this tool was explored through its association with actual infant feeding practices. To assess the probability of 6-month exclusive breastfeeding among the IIFAS score quartile categories, p-trend for probability was calculated using the regression coefficient.

To predict the potential determinants of 6-month exclusive breastfeeding and to identify the unique contribution of each variable to this behaviour, direct logistic regression analysis was conducted after checking test assumptions. Multi-collinearity among variables was examined using the collinearity diagnosis function of linear regression test. Although all variables had normal tolerance (> 0.10), variance inflation factors (VIF) for pre-pregnancy BMI and BMI at 3 months postpartum were high (7.849 and 7.853, respectively) and therefore BMI at 3 months postpartum was excluded from the logistic regression models to avoid violation of test assumptions.

Finally, direct binary logistic regression models were generated to define the potential predictors of 6-month exclusive breastfeeding (dependent variable) by inclusion of significant variables found at bivariate analyses. The order of entering variables in the regression equation was based on the literature review and a priori hypothesis. The IIFAS score as a behavioural factor was hypothesized to be the most important predictor of infant feeding practices and was entered first. Parity was entered in the regression model as the second variable since having previous breastfeeding experience could potentially influence maternal

self-efficacy and actual infant feeding behaviours. Maternal education and BMI were the last factors to be entered into the regression models as the role of socio-demographic and biomedical factors in infant feeding practices seems to be weaker than that of behavioural variables (29-32).

The practical utility of each logistic solution was evaluated by comparison of each model to a hypothetical perfect model using the Hosmer-Lemeshow test (45) in addition to comparison of Nagelkerke R^2 effect sizes. The final logistic regression analysis was performed solely on cases that did not have any missing data on any of the four variables included in the model of best fit (IIFAS score, parity, education and pre-pregnancy BMI). This condition reduced the sample size to 253, representing an attrition rate of 15.67% of the original sample. A check was then done to determine whether cases excluded from the regression analyses (n=47) were significantly different from those included (n=253) on the basis of all 4 variables. The series of chi-square tests, Mann-Whitney U test and independent-sample t-test indicated that none of the 4 variables significantly distinguished the two groups (Table IV.1.).

Ethical considerations

This study was approved and sponsored by the Alberta Heritage Foundation for Medical Research (AHFMR), now known as Alberta Innovates-Health Solutions. Ethical approval was obtained from Health Research Ethics Board at the University of Alberta and the Conjoint Health Research Ethics Board at the Faculty of Medicine, University of Calgary. Participants were provided with full orientation to the study with an emphasis on their right not to participate

and the confidentiality and anonymity of their data. Parents then provided informed written consents for their own and their infants' participation.

IV.3. Results

Infant feeding practices

According to the retrospective data, 98.6% of infants were reported to have been "ever breastfed" during the first 6 months of life, of which 18.3% were weaned from breastfeeding before 6 months of age (data not shown). The most commonly-cited reason for breastfeeding cessation was perceived milk insufficiency/breastfeeding problems (50.9%), followed by infants' unwillingness to suck at the breast (16.4%) and self-weaning among infants (10.9%). Fewer mothers reported painful/sore nipples or breasts (9.0%) and fatigue (5.5%) to be the principal reasons for abandoning breastfeeding (data not shown).

Since 54.7% of infants had received infant formula at some point during the first 6 months of life and 76.0% had been fed other liquids (excluding formula), semi-solids or solid foods, the prevalence of "exclusive breastfeeding" for the first 3 and 6 months postpartum fell to 54.0% and 15.3%, respectively (Figure IV.2.). It is concerning that during a short period between 3 and 6 months postpartum, 71.0% of Albertan infants started to experience the transition of learning to eat solid/semi-solid foods (excluding formula) and accepting the variety of flavors, while this transition was paralleled with only a 9.4% increase in "ever formula feeding" (data not shown). Overall, feeding transitions resulted in 38.7% attrition in the rate of exclusive breastfeeding between 3 and 6 months postpartum (Figure IV.2.).

As presented in Figure IV.3., during the first 3 months postpartum "exclusive breastfeeding" was the main method of infant feeding among Albertan mothers (54.0%) followed by "complementary feeding/replacement feeding". However, at the end of 6 months there was a marked trend toward practicing "complementary feeding/replacement feeding" followed by "non-breastfeeding". It is noteworthy that during the first 3 months, the majority of infants in the complementary feeding/replacement feeding category received only infant formula in addition to breast milk, without consuming solid/semi-solid foods (36.3%). However, between 3 and 6 months postpartum due to a sharp increase (52.5%) in the proportion of infants being fed dual modality of solids/semi-solid foods in addition to breast milk, the proportion of breastfed infants receiving infant formula declined markedly by 27.6% (Figure IV.3.).

Few infants were categorized into the predominant breastfeeding group and it increased marginally (2.1%) between 3 and 6 months postpartum. A detailed breakdown of feeding categories revealed that mothers favoured supplementing their breast milk with plain water and water-based liquids (tea/coffee) (2.3%) than supplementing with fruit juice/fruit juice with water (0.3%) (Figure IV.3.). Generally, the major feeding transition that occurred in infants' diets could be attributed for the most part to the increase in proportion of infants receiving complementary feeding/replacement feeding between 3 and 6 months postpartum.

Potential correlates of 6-month exclusive breastfeeding

a. Baseline factors

The relationship between several baseline parental factors and breastfeeding exclusivity for 6 months was assessed (Table IV.2.). Parental socio-demographic and economic variables as well as maternal health and lifestyle parameters (including attitudes toward breastfeeding) were evaluated as potential predictors of infant feeding behaviours.

Parental socio-demographic and lifestyle factors

Table IV.2. presents the baseline characteristics of a subsample of families participating in the first cohort of the APrON study. Age of mothers surveyed ranged from 17-44 years and those who practiced exclusive breastfeeding to 6 months were one year older than those who did not (median (IQR): 32.0 (5.0) vs. 31.0 (6.0) years; p= 0.022). Compared to 20.5% of non-exclusive breastfeeding mothers holding university post-graduate degrees, 41.3% of exclusive breast-feeders had post-graduate education (p= 0.007). The majority of mothers in both groups worked at a paid (81.5%) full-time (78.4%) job, were Caucasian (90.6%) and had annual household incomes of more than 100,000 Canadian dollars (57.3%) (CAD). Similarly, 19.2% of participating fathers held university post-graduate degrees and 91.3% were Caucasian. Generally, fathers' characteristics did not have statistically significant effects on their partners' exclusive breastfeeding behaviours.

During pregnancy, few mothers smoked (1.0%), consumed alcohol (6.4%) or used recreational street drugs (0.7%), and these were not related to their infant feeding practices. The proportion of multiparous women was significantly higher in the exclusive breastfeeding category than in non-exclusive breastfeeding group

(58.7% vs. 37.8%; p=0.013). While generally 64.5% of mothers in both groups had entered pregnancy with normal BMIs (18.6-24.9 kg/m^2), those in the exclusive breastfeeding category had significantly lower pre-pregnancy BMIs compared to non-exclusive breastfeeding mothers (median (IQR): 22.12 (5.3) vs. 22.99 (5.4) kg/m^2; p= 0.048).

Maternal infant feeding knowledge and attitudes

Reliability and validity of the IIFAS: Since the reliability (internal consistency) and validity of a scale depend on the sample in which it is being used, we assessed the internal consistency and validity of the IIFAS among our sample of Albertan pregnant women. The IIFAS was found to be a reliable and valid tool for assessment of infant feeding attitudes and knowledge of prenatal women. After reverse coding the scale items favourable to formula feeding, internal reliability of the IIFAS was robust with a Cronbach's α= 0.81 (cut-off point=0.70). In agreement with this high level of internal consistency, all but two of the IIFAS items had positive significant corrected item-total correlations (>0.2). These 2 items were item #4 ("breast milk is lacking in iron") and item 17 ("a mother who occasionally drinks alcohol should not breast feed her baby") (30).

Predictive validity of the IIFAS was reflected in the finding that obtaining higher scores during pregnancy was significantly associated with higher odds of exclusive breastfeeding (OR: 1.08, 95%CI: 1.03-1.14; p= 0.002) and any breastfeeding (OR: 1.26, 95%CI: 1.08-1.47; p= 0.004) during the first 6 months postpartum (data not shown). In addition, after adjusting the binary logistic

regression model for potential confounders (parity, education, pre-pregnancy BMI), those in the highest quartile of the IIFAS score (pro-breastfeeding), had 4.29 times higher probability of exclusive breastfeeding to 6 months (95%CI: 1.31-14.08), compared to those in the lowest quartile (pro-formula feeding) (p-trend<0.001) (Figure IV.4.).

Comparison of infant feeding knowledge and attitudes: Total IIFAS score among prenatal women in the present study was in the neutral range (means (SD): 67.27±7.59), although it was significantly higher among mothers who exclusively breastfed for 6 months (mean (SD): 70.67 (6.44); range=57-82) compared to those who did not (mean (SD): 66.60 (7.63); range=39-83) (p-value=0.001) (Table IV.2.)

More detailed analyses revealed that out of the total 17 IIFAS items, the mean values for six items were significantly higher among mothers who exclusively breastfed to 6 months compared to those who did not (Table IV.3.). Generally, exclusive breastfeeding mothers were less likely to consider formula feeding more convenient than breastfeeding, compared to non-exclusive breast feeding mothers (p=0.04). In addition, mothers who exclusively breastfed for 6 months were less likely to believe that "women should not breastfeed in public places" (mean (SD): 4.64±0.58 vs. 4.30±0.83; p=0.002) or "formula is a better option for mothers who plan to return to work" (p=0.026). Similarly, mothers who exclusively breastfed for 6 months were more aware of the nutritional superiority of the breast milk to formula and were of the opinion that formula feeding mothers miss one of the greatest joys of motherhood (mean (SD): 3.76±1.03 vs.

3.29±1.08; p=0.009). The majority of mothers in both groups, however, strongly agreed that breast milk is cheaper (83.3% of exclusive breastfeeding, and 77.1% of non-exclusive breastfeeding mothers).

b. Follow-up factors

Table IV.4. shows the results of bivariate analyses for the follow-up maternal and infant characteristics in relation to 6-month exclusive breastfeeding. As presented, BMI at 3 months postpartum was significantly lower among mothers who practiced exclusive breastfeeding compared to those who did not (median (IQR): 23.82 (5.01) vs. 24.48 (5.95) kg/m^2; p= 0.048). Generally, 59.6% of exclusive breastfeeding mothers and 45.3% of those who did not breastfeed exclusively had normal BMI values (p=0.049).

Of total infants, 53.2% were male and their mean (SD) weight gain during the first 3 months was 2.63 (0.68) kg. Among breastfed infants, 23.3% were not fed any supplements (including vitamin D). In addition, 58.0% of mothers "always" fed their infants on-demand and 33.0% avoided "scheduled feeding" (data not shown). Mothers' main sources of infant feeding information were: books/brochures (72.0%), common sense (65.0%), health care professionals (60.7%), and governmental documents (60.0%).

Potential correlates of infant feeding

In addition to the aforementioned analyses, in order to have a better picture of infant feeding practices in the "non-exclusive breastfeeding" category, this group was further categorized into two different subcategories of "predominant breastfeeding /complementary feeding" and "non-breastfeeding"

(Tables IV.5. and IV.6.). The rationale behind this decision was to account for the health benefits conferred through "some breast milk" that infants in the former group have received during the first 6 months of life.

Kruskal-Wallis test did not reveal a significant difference in maternal age across the three feeding patterns [X^2 (2, n=300)=5.29]; however, mothers in the exclusive breastfeeding group were older (Median=32 years) than those in the other two feeding categories (median=31 years; p=0.071).

Paternal educational status, was significantly different among the three feeding groups, although the post-hoc test failed to show any significant difference among the feeding categories (p>0.017). Mothers who were exclusively breastfeeding for 6 months were more likely to be multiparous compared to those who were not offering their infants breast milk (p=0.011). Findings from Kruskal-Wallis test with post-hoc Bonferroni adjustment showed that non-breastfeeding mothers compared to both "exclusive breastfeeding" and "predominant breast feeding/complementary feeding" groups had higher pre-pregnancy weights and pre-pregnancy BMIs (p=0.003). In addition, the BMI value at 12 weeks postpartum was significantly higher (median (IQR): 27.14 (9.27) kg/m^2) in "non-breastfeeding group", as compared to "predominant breast feeding/complementary feeding" group (median (IQR): 24.10 (5.04) kg/m^2) (p=0.002). Figure IV.5. presents the means plot for the IIFAS score across the three feeding categories during the first 6 months postpartum. As can be seen, the lowest mean (SD) IIFAS score was reported among mothers who were not breastfeeding (61.89 (8.9)) compared to mothers who were either exclusively

breastfeeding (70.67 (6.4)) or were practicing "predominant breast feeding/complementary feeding" (67.82 (6.77)) ($p<0.001$).

Predictors of exclusive breastfeeding to 6 months

Table IV.7. shows the results of direct logistic regression models for potential predictors of breastfeeding exclusivity for 6 months. These results represent the contribution of each specific variable over and above the effect of other variables. According to the Wald criterion, 3 variables made statistically significant contributions to the prediction (IIFAS score, multiparity and post-graduate education) and were retained in the final logistic regression model (X^2 (5, n=253): 24.50, $p <0.001$). The Hosmer-Lemeshow test revealed a good fit (X^2 = 13.31, p=0.10) and this model correctly classified 84.2% of cases overall (percentage accuracy in classification). The logistic regression results did not have convergence problems and standard errors as well as bivariate correlation coefficients were small.

The final regression model suggested that the odds of 6-month exclusive breastfeeding were increased 1.08 times for a unit increase in attitude score recorded by women during pregnancy (95%CI: 1.02-1.13; p= 0.006). Being multiparous also increased the probability of exclusive breastfeeding for 6 months by 2.21 fold (95% CI: 1.08-4.52; p=0.031), compared to being primiparous. Likewise, mothers who held post-graduate degrees were 3.76 times (95% CI=1.30-10.92) more likely to exclusively breastfeed to 6 months compared to women who did not have a university education (p=0.015). Although, the probability of exclusive breastfeeding to 6 months seemed to be lower among

those with higher pre-pregnancy BMIs, this relationship did not achieve statistical significance (p=0.255).

IV.4. Discussion

Significant deviations from the current infant feeding recommendations of the WHO and Health Canada were observed in the present study. We documented a dramatic transition in feeding patterns of Albertan infants during the first 6 months of life, a transition from a diet of virtually nothing but breast milk, formula or both for the first 3 months of life to a diet mainly comprised of all food groups as infants reached 6 months of age. Despite almost all Albertan infants having been breastfed at some point, only about half of them were exclusively breastfed for 3 months and 15.3% remained exclusively breastfed for 6 months. The choice of exclusive breastfeeding was strongly influenced by maternal education, parity and attitudes towards breastfeeding. Pregnant women in the highest quartile category of the IIFAS score were more than 4 times as likely to breastfeed exclusively for 6 months compared to those in the lowest category.

This study is the first longitudinal cohort study to report the infant feeding transitions and predictors among Albertans based on a comprehensive list of potential paternal, maternal and infant factors assessed during prenatal and postnatal periods. In the present study, exclusivity of breastfeeding was mainly jeopardized by introduction of solid/semi-solid foods and infant formula. Evidence from this research clearly shows that during the period from 3 to 6 months postpartum, a large proportion of infants were formula-fed on a regular basis and even a higher proportion were fed semi-solid/solid foods before they

reached 6 months of age. This sequence resulted in a shift in feeding patterns of Canadian infants from exclusive breastfeeding directly to "complementary feeding/replacement feeding" without passing through predominant breastfeeding.

A shift in feeding patterns that excludes a period of predominant breastfeeding in this research is consistent with a previous study conducted in Quebec and suggests that Canadian mothers favour "complementary feeding/replacement feeding" as opposed to predominant breast feeding from an early age (46). Although water and water-based drinks are frequently introduced to infants at an early age, the rare practice of predominant breastfeeding requires that no other foods or food-based liquids are introduced. However, Canadian infant feeding practices may be improved if they mirrored European practices. More European infants experience the transition from exclusive breastfeeding to predominant breastfeeding and fewer receive complementary foods during the first weeks of life (41,47-51). These differences in feeding patterns between Europe and North America may be explained by the more aggressive marketing of infant formula in North America compared to the Europe, or they may solely represent cultural differences between the two regions (46). Early complementary feeding practices of Canadian mothers may reflect their intention to replace breast milk or wean infants prematurely (41,52,53), or it may represent unresolved feeding problems (54), all of which contributing to the shorter breastfeeding duration in North America (28,55,56).

The breastfeeding rates of Albertan mothers observed in this study are in accordance with those reported by national Canadian surveys (25,26) and other

developed nations (57). Generally, in industrialized countries the breastfeeding duration is short, with the notable exception of the Nordic European region (57-60). According to the Canadian Maternity Experiences Survey (MES), despite 90.3% of Canadian and 94.6% of Albertan mothers initiating breastfeeding, the prevalence of 3-month "any breastfeeding" and "exclusive breastfeeding" are 67.6% and 51.7% in Canada, and 73.2% and 53.1% in Alberta, respectively (61). During the first 6 months postpartum, the rates of "any breastfeeding" and "exclusive breastfeeding" drop to 53.9% and 14.4% in Canada and 58.9% and 15.8% in Alberta, respectively (61). However, higher rates were reported in the Canadian Community Health Survey (CCHS) (25), where the breastfeeding initiation rate was 87.2% and the prevalence of 6-month exclusive breastfeeding was 27.7%.

Notably, caution should be exercised when interpreting and comparing the breastfeeding rates across different studies. Variations in breastfeeding rates may result from methodological limitations and artifacts (such as recall bias or sample selection bias), design limitations, failure to report infants' birth weights and gestational ages, and the use of different measurements and infant feeding definitions (62). Most importantly, since the majority of surveys have descriptive designs in which data are collected retrospectively through questionnaires, the results are prone to recall biases (24,62). It has been suggested that long-term recalls of breastfeeding (>6 months) are inaccurate and may significantly overestimate the duration of exclusive breastfeeding (63). However, the 24-hour

or 48-hour dietary recalls also do not accurately represent feeding patterns since birth and may only be useful for describing population trends (41,63).

Generally, research participants are more likely to recall positive than negative memories (62) and although the experience of breastfeeding might be exhausting, mothers are still more likely to recall positive breastfeeding experiences than the negative ones, and therefore the breastfeeding incidence and duration might be inflated and potentially overestimated (62).

Sample selection biases may also influence the breastfeeding rates. Although the reason for non-participation is not known from the studies, it might include mothers who choose not to breastfeed and therefore the duration and incidence of breastfeeding could be elevated falsely (62). In addition, differences between respondents and non-respondents could influence the results significantly as generally women who participate in research are Caucasian, older, and from a higher socioeconomic status, while these characteristics are also associated with incidence and duration of breastfeeding (64-67). Ambiguous and unclear infant feeding definitions used in previous studies are also major barriers for interpreting the results (41,68,69). In the absence of a consistent breastfeeding definition, comparison of true incidence and duration rates of breastfeeding across different studies is difficult. Despite the efforts made, no whole-country system exists for categorizing infant feeding practices and so many complexities and inaccuracies remain in the way breastfeeding practices are reported (41,62,68,69).

In the present study, several aspects of infant feeding practices were of concern, including formula feeding in hospital which is typically unnecessary,

unless it is medically indicated (70). Early supplementation of infants' diets should be avoided as it could lead to later feeding problems and earlier cessation of breastfeeding (71). Routine formula feeding in hospitals raises the question as to whether its use is recommended in most circumstances, and it highlights the necessity of expanding Baby Friendly Hospital Initiatives across more hospitals in Canada.

Moreover, lack of vitamin D supplementation among more than 20% of breastfeeding mothers in this highly-educated Albertan sample calls for an immediate action, although this is in line with findings of a national study which reported that only about half of exclusively breastfeeding mothers are giving vitamin D supplements to their infants (24). This finding is a concern considering that a daily dose of 400 IU vitamin D has been recommended for all breastfed full-term infants in Canada since 1967 (72). This recommendation is mainly due to the northern geographic latitude where people are at greater risk for vitamin D deficiency, and also to compensate for the inadequate amounts of vitamin D in breast milk (21,72,73). Exclusively breastfed infants who do not take vitamin D supplements are at greater risk of vitamin D deficiency and insufficiency as well as rickets, which are not yet eradicated in Canada (21,73).

Another concerning issue among participants of this study is that more than half of mothers discontinued breastfeeding based on a perceived sense of milk inadequacy. Being the most commonly cited reason for breastfeeding cessation (74), perceived milk insufficiency has a very strong psychological component and may be rooted in low self-esteem during the early postpartum

period (75). It has been suggested that only 1-5% of women in a population actually have insufficient physiological milk supply, while as many as 50% hold the belief of milk insufficiency (75). The necessity of targeting maternal perceptions becomes clear when one considers that mothers who are able to overcome breastfeeding problems develop a greater sense of self-efficacy associated with continued breastfeeding (76).

This is the first Canadian study to determine the psychometric properties of the IIFAS and apply it to a sample of prenatal women to evaluate their infant feeding knowledge and attitudes in relation to infant feeding practices. In agreement with a recent review (77), our study proved that IIFAS is a valid and reliable measure of infant feeding attitudes among prenatal women. This self-report tool has several advantages over other scales used to assess attitudes toward infant feeding, including simplicity, ease of use, simple wording, and applicability to a wide range of groups (77). The IIFAS offers health professionals a pragmatic means of learning about knowledge and attitudes of women toward infant feeding, which could help clinicians identify and focus their support and education for women who are unfavourable to breastfeeding.

In the present study, the ability of pregnant women's attitudes concerning breastfeeding to mold their subsequent infant feeding behaviours was shown through the consistently increasing probability of 6-month exclusive breastfeeding among mothers with higher IIFAS scores. In addition, a large proportion of women had neutral attitudes toward breastfeeding, which is in line with about half of mothers practicing formula feeding during the first 6 months postpartum.

Women's neutral attitudes suggest that during the prenatal period their attitudes toward breastfeeding were not yet fully formed, and therefore targeting maternal knowledge and attitudes during pregnancy might provide a great opportunity for administering educational and support programs.

Interestingly, the highest IIFAS item score among both exclusive and non-exclusive breastfeeding mothers was achieved for "breastfeeding in public places". This reflects women's overwhelming approval of their right to breastfeed in public and confirms the results of previous studies conducted in the United States, United Kingdom, Canada and Scotland, which have shown perceptions and attitudes toward breastfeeding in public to be positive, especially among younger and more-educated individuals (32,78-80). Administering the IIFAS as a needs assessment tool to the general public could potentially provide an understanding of the attitudes towards breastfeeding and pinpoint the gaps in knowledge in order to develop breastfeeding promotion programs.

In line with several international (81,82) and Canadian studies (23,28,64,66,67,83,84), maternal socio-demographic and lifestyle factors were also found to play roles in determining maternal infant feeding behaviours. Maternal education in the present study was the strongest predictor of breastfeeding exclusivity with mothers holding post-graduate degrees being more than 3.5 times more likely to breastfeed exclusively to 6 months, compared to those without a secondary education. This association has also been observed in other Canadian studies at national (23,24,85) and provincial levels (28,84). Evidence from studies conducted in Canada (24,28,84,85) and other countries

(31,81,82,86) suggests that maternal education is associated with breastfeeding initiation and continuation as well as with types of liquids and solids that are fed to infants. It is hypothesized that higher maternal education allows mothers to formulate well-informed infant feeding decisions and be more receptive to positive health messages including breastfeeding (23,78).

Maternal education may also influence infant feeding practices through its relationship with employment status as generally those with higher education are more likely to work at paid jobs during and after pregnancy. In the present study, information on maternal employment status during the post-delivery period was not available and therefore, employment status during pregnancy was considered as a proxy measure. Our findings suggested that Albertan mothers who worked at paid jobs during pregnancy were more likely to choose "non-breastfeeding" compared to "exclusive breastfeeding" during the first 6 months postpartum, although this association did not reach statistical significance. This finding may have potential implications for policy makers since modifying the duration of maternity and paternity leaves, job benefits and job security might facilitate breastfeeding for a longer period among employed mothers.

In the present study, mothers with children were more than two times as likely to breastfeed exclusively for 6 months than those who were having their first baby. This finding is in agreement with previous studies which suggest a dose-response relationship between parity and breastfeeding initiation and exclusivity among mothers of both singleton and twin infants (23,26,36,81,87). In addition, being the first-born in a family increases the likelihood of early weaning

and early introduction of cow's milk and formula (88). Multiparous women have generally higher self-confidence, self-efficacy and infant feeding knowledge gained through earlier breastfeeding experiences, and therefore are more likely to breastfeed exclusively for 6 months (36).

By the same token, young maternal age was associated with lower rates of 6-month exclusive breastfeeding in the present research. This finding is in agreement with those of the previous studies suggesting older mothers to have higher rates of breastfeeding initiation, continuation and exclusivity (24,28,81,82,85,89). Evidence from the classic as well as more recent studies has consistently demonstrated lower breastfeeding intention, higher likelihood of mix-feeding/formula feeding and higher probability of introduction of solids and early-weaning among adolescents and younger mothers (24,28,36,51,57,62,65,80-82,86,88-90). Older mothers might have more positive attitudes toward breastfeeding and be more knowledgeable about breastfeeding benefits, which could influence their infant feeding behaviours. In addition, older mothers are more likely to have had breastfed previously which could in turn increase their confidence for breastfeeding (89).

Study results are also in agreement with the literature whereby maternal pre-pregnancy BMI has been found to be negatively related to breastfeeding intention, duration and exclusivity (23,91,92). It has been postulated that prolactin production is reduced as a result of high body weight (92). It is also likely that the behaviour of women is responsible for the association between weight status and breastfeeding, as mothers with higher BMIs often have specific psychological

characteristics (such as perceptions of breast milk insufficiency) which could independently interfere with the breastfeeding process (23). The effect of maternal BMI on breastfeeding exclusivity in this study seems to have been mediated through other covariates since this variable did not emerge as significant in logistic regression model. In addition, since the pre-pregnancy BMI in this study was only marginally lower among mothers who exclusively breastfed to 6 months compared to those who did not, the association between pre-pregnancy BMI and 6-month exclusive breastfeeding may not be clinically-relevant.

Several strengths are inherent in findings from the present research. This is the first Canadian study to assess the psychometric properties of the IIFAS and to apply this self-report tool to a sample of prenatal women to predict 6-month exclusive breastfeeding. This research is also the first longitudinal cohort study in Alberta to report on infant feeding transitions and predictors using a comprehensive list of potential paternal, maternal and infant factors assessed during prenatal and postnatal periods. Given the provincial disparities in infant feeding practices in Canada (23,24), closer scrutiny of infant feeding might provide insights into the role of determinants of feeding behaviours in a specific region. One of the important strengths of this study is the use of the latest WHO infant feeding definitions to evaluate feeding practices since birth using a prospective cohort design (39). Reliance on short-term recalls (3-month intervals) is yet another significant feature of this study contributing to overall reliability of results through avoidance of recall bias.

However, limitations of this study should also be considered before implications are discussed. First, this study is prone to recruitment bias towards inclusion of mothers from higher socioeconomic status, although this issue has also been reported in other infant feeding studies conducted in industrialized countries (93,94). This problem limited our ability to compare different ethnic and socioeconomic groups and to observe significant associations between a wide range of parental/infant variables and infant feeding practices. Second, the finding of a significant independent association between maternal attitude scores and breastfeeding exclusivity might only be generalizable to highly-educated, high-income prenatal women due to specific characteristics of our sample. Moreover, there is a risk that social desirability to breastfeed has influenced mothers' recall of the breastfeeding and resulted in over-reporting of the breastfeeding rates. Finally, this study would have benefited from information on partners' support and attitudes toward breastfeeding.

IV.5. Conclusion

Despite the high proportion of infants being breastfed, the prevalence of exclusive breastfeeding for 6 months was 15.3%. Breastfeeding promotion programs in Alberta seem to have been successful in achieving high rates of breastfeeding initiation; however, a shift in the focus of these programs is now required to promote breastfeeding exclusivity and bring the infant feeding practices of Albertan women closer to the WHO guidelines.

The province-specific knowledge acquired in the present study regarding the socio-demographic, biomedical, and behavioural determinants of

breastfeeding exclusivity is crucial for designing structured, effective and targeted promotional programs. While targeting the socio-demographic factors seems impractical since these variables are not amenable to change, maternal infant feeding knowledge and attitudes are malleable and subject to change in response to behavioural and educational interventions. The IIFAS could help health care professionals understand infant feeding attitudes of women and people influencing them; nonetheless, further empirical testing must be done to prove its value among different ethnic groups and samples with more diversity.

Findings from this study could be used as a basis for designing and implementing educational programs to address pregnant women's misconceptions about convenience of formula feeding. Knowing that exclusive breastfeeding for 6 months is less likely among lower-educated primiparous women may help health practitioners to focus their support and education for this group. These results could also inform policy makers of the necessity to prioritize provision of more nursing rooms to facilitate breastfeeding in public places.

These findings await replication in large-scale cohort studies involving ethnically diverse women, adolescents and mothers' social networks to better understand and address the differences in social contexts and perspectives which influence infant feeding practices.

Table IV.1. Comparison of cases excluded from the regression models due to missing values for any of the potential predictors of exclusive breastfeeding and those included in the final regression models: Alberta Pregnancy Outcomes and Nutrition (APrON) study

Variables	**Excluded from regression analyses** n=47	**Included in regression analyses** n=253	**p-value**
IIFAS score[1]	62.67 (5.77)	67.32 (7.60)	0.292[2]
Parity[3]			
Primiparous	31 (70.5)	144 (56.9)	0.129[4]
Multiparous	13 (29.5)	109 (43.1)	
Maternal education[3]			
Less than secondary education	16 (34.0)	67 (26.5)	0.567[5]
Completed university undergraduate degree	21 (44.7)	125 (49.4)	
Completed university post-graduate degree	10 (21.3)	61 (24.1)	
Pre-pregnancy BMI[6,7], kg/m^2	22.40 (5.12)	22.98 (5.55)	0.575[8]

IIFAS: Iowa Infant Feeding Attitude Scale; BMI: Body mass index
[1]Mean (standard deviation (SD))
[2]Based on independent sample t-test
[3]n (%)
[4]Based on Yates' correction for continuity
[5]Based on Pearson's chi-square test
[6]Median (interquartile range (IQR))
[7]Body mass index was calculated by dividing the weight in kilograms by square of height in meters
[8]Based on Mann-Whitney U test

Table IV.2. Baseline characteristics of a subsample of participants from the first cohort of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to breastfeeding exclusivity for 6 months[1,2]

Characteristics	Total	Exclusive breastfeeding for 6 months		p-value
		No n=254	Yes n=46	
Parental socio-demographic factors				
Maternal age[3], *years*	31.0 (6.0)	31.0 (6.0)	32.0 (5.0)	0.022[4]
Maternal marital Status				
Single/Divorced/Separated	6 (2.0)	5 (2.0)	1 (2.2)	0.999[5]
Married/Common-law partner	293 (98.0)	248 (98.0)	45 (97.8)	
Maternal education level				
Less than secondary education	83 (27.7)	75 (29.5)	8 (17.4)	0.007[5]
Completed university undergraduate degree	146 (48.7)	127 (50.0)	19 (41.3)	
Completed university post-graduate degree	71 (23.7)	52 (20.5)	19 (41.3)	
Paid job during pregnancy				
Yes	242 (81.5)	209 (83.3)	33 (71.7)	0.100[6]
No	55 (18.5)	42 (16.7)	13 (28.3)	
Occupational status during pregnancy[7]				
Full-time	189 (78.4)	163 (78.4)	26 (78.8)	0.999[5]
Part-time	52 (21.6)	45 (21.6)	7 (21.2)	
Canadian-born mother				
No	44 (14.9)	37 (14.7)	7 (15.9)	0.820[5]
Yes	251 (85.1)	214 (85.3)	37 (84.1)	
Mothers' length of residency in Canada[8], *years*				
≤3	7 (18.4)	7 (21.9)	0 (0.0)	0.569[5]
>3	31 (81.6)	25 (78.1)	6 (100.0)	
Maternal ethnicity				
Caucasian/White	269 (90.6)	228 (90.8)	41 (89.1)	0.570[5]
Southeast Asian	16 (5.4)	14 (5.6)	2 (4.3)	
Latin American	4 (1.3)	3 (1.2)	1 (2.2)	
Other[9]	8 (2.7)	6 (2.4)	2 (4.3)	
Place of residence				
Edmonton	30 (10.0)	26 (10.2)	4 (8.7)	0.999[5]
Calgary	270 (90.0)	228 (89.8)	42 (91.3)	
Annual household income , *CAD*				
<20,000	2 (0.7)	2 (0.8)	0 (0.0)	0.992[5]

20,000-39,000	5 (1.7)	5 (2.0)	0 (0.0)	
40,000-69,000	41 (13.9)	35 (14.1)	6 (13.0)	
70,000-99,000	78 (26.4)	66 (26.5)	12 (26.1)	
≥100,000	169 (57.3)	141 (56.6)	28 (60.9)	
Household size[3], *n*	2.0 (1.0)	2.0 (1.0)	3.0 (1.0)	0.135[4]
Paternal education level				
Less than secondary education	90 (41.1)	79 (43.2)	11 (30.6)	0.055[10]
Completed university undergraduate degree	87 (39.7)	74 (40.4)	13 (36.1)	
Completed university post-graduate degree	42 (19.2)	30 (16.4)	12 (33.3)	
Paternal marital status				
Single/Divorced/Separated	4 (1.8)	3 (1.6)	1 (2.8)	0.515[5]
Married/Common-law partner	215 (98.2)	180 (98.4)	35 (97.2)	
Paternal birth place				
Canada	181 (82.6)	150 (82.0)	31 (86.1)	0.638[5]
Foreign countries	38 (17.4)	33 (18.0)	5 (13.9)	
Paternal ethnicity details				
Caucasian/white	199 (91.3)	167 (91.8)	32 (88.9)	0.214[5]
Southeast Asian	6 (2.8)	6 (3.3)	0 (0.0)	
Latin American	5 (2.3)	4 (2.2)	1 (2.8)	
Other[11]	8 (3.7)	5 (2.7)	3 (8.3)	
Maternal health and lifestyle characteristics				
Smoking during pregnancy				
No	296 (99.0)	250 (98.8)	46 (100.0)	0.999[5]
Yes	3 (1.0)	3 (1.2)	0 (0.0)	
Alcohol consumption during pregnancy				
No	280 (93.6)	240 (94.9)	40 (87.0)	0.091[5]
Yes	19 (6.4)	13 (5.1)	6 (13.0)	
Recreational street drug use during pregnancy				
No	297 (99.3)	251 (99.2)	46 (100.0)	0.999[5]
Yes	2 (0.7)	2 (0.8)	0 (0.0)	
Gravida[3], *n*	2.0 (1.0)	2.0 (1.0)	2.0 (2.0)	0.548[4]
Parity				
Primiparous	175 (58.9)	156 (62.2)	19 (41.3)	0.013[6]
Multiparous	122 (41.1)	95 (37.8)	27 (58.7)	
Planned pregnancy				
Yes	249 (83.6)	207 (82.1)	42 (91.3)	0.136[5]
No	49 (16.4)	45 (17.9)	4 (8.7)	
Born by assisted fertility[12]				
No	280 (94.0)	236 (93.7)	44 (95.7)	0.999[5]
Yes	18 (6.0)	16 (6.3)	2 (4.3)	
Pre-pregnancy weight[3], *kg*	63.63 (15.66)	64.09 (15.71)	61.36 (13.40)	0.089[4]

Pre-pregnancy BMI[3,13], *kg/m²*	22.98 (5.4)	22.99 (5.4)	22.12 (5.3)	0.048[4]
Pre-pregnancy BMI categories[13], *kg/m²*				
Underweight (≤18.5)	10 (3.4)	1 (0.7)	9 (5.9)	0.019[5]
Normal (18.6-24.9)	189 (64.5)	86 (61.0)	103 (67.8)	
Overweight (25-29.9)	56 (19.1)	33 (23.4)	23 (15.1)	
Obese (≥30)	38 (13.0)	21(14.9)	17 (11.2)	
IIFAS score[14,15]	67.27 (7.59)	66.60 (7.63)	70.67 (6.44)	0.001[16]

CAD: Canadian dollars; BMI: body mass index; IIFAS: Iowa Infant Feeding Attitude Scale

[1]Values are n (%), unless otherwise noted

[2]Denominators vary due to missing data

[3]Median (interquartile range (IQR))

[4]Mann-Whitney U Test

[5]Fisher's exact test

[6]Yates' correction for continuity

[7]Calculated only among mothers who were employed

[8]Calculated only among mothers who were born outside Canada

[9]Includes Black, Aboriginal and South Asian

[10]Pearson's chi-square

[11]Includes Aboriginal and South Asian

[12]Fertility-enhancing drugs or reproductive technology

[13]BMI was calculated by dividing the weight in kilograms by square of height in meters

[14]Score ranges from 17-85, with higher scores indicating more positive attitudes toward breastfeeding

[15]Mean (standard deviation (SD))

[16]Independent sample t-test

Table IV.3. Comparison of significant items in the Iowa Infant Feeding Attitude Scale (IIFAS) between mothers who exclusively breastfed to 6 months and those who did not: Alberta Pregnancy Outcomes and Nutrition (APrON) study [1,2]

IIFAS items	**Exclusive breastfeeding for 6 months**		**Difference Mean± SD**
	No Mean± SD n=254	**Yes Mean± SD** n=46	
Formula feeding is more convenient than breastfeeding (R)[3]	4.03±0.97	4.36±0.82	-0.32±0.16
Formula feeding is the better choice if the mother plans to go back to work (R)[3]	3.74±0.89	4.07±0.78	-0.33±0.15
Mothers who formula feed miss one of the great joys of motherhood	3.29±1.08	3.76±1.03	-0.48±0.18
Women should not breastfeed in public places such as restaurants (R)[3]	4.30±0.83	4.64±0.58	-0.34±0.11
Formula is as healthy for an infant as breast milk (R)[3]	3.43±1.00	3.81±0.80	-0.38±0.14
Breastfeeding is more convenient than formula	3.97±0.96	4.33±0.79	-0.37±0.16

SD: Standard deviation

[1]Of total 17 IIFAS items, only statistically significant scale items (n=6) are shown (Independent sample t-test, 2-sided p-value<0.05)

[2]IIFAS is comprised of 17 items and responses are on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree". Total score ranges from 17-85, with higher scores indicating more positive attitudes toward breastfeeding

[3](R) indicates reverse-coded items

Table IV.4. Follow-up postnatal characteristics of a subsample of participants from the first cohort of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to breastfeeding exclusivity for 6 months[1,2]

Characteristics	Total	Exclusive breastfeeding for 6 months		p-value
		No n=254	Yes n=46	
Maternal characteristics				
Gestational weight gain[3], *kg*	15.45 (6.32)	15.59 (6.61)	14.77 (5.34)	0.719[4]
BMI at 12 weeks postpartum[3,5], *kg/m²*	24.47 (5.94)	24.48 (5.95)	23.82 (5.01)	0.048[4]
BMI categories at 12 weeks postpartum[5], *kg/m²*				
Underweight (≤18.5)	3 (1.0)	1 (0.7)	2 (1.3)	0.049[6]
Normal (18.6-24.9)	153(52.8)	63 (45.3)	90 (59.6)	
Overweight (25-29.9)	88 (30.3)	47 (33.8)	41 (27.2)	
Obese (≥30)	46 (15.9)	28 (20.1)	18 (11.9)	
Infant characteristics				
Gender				
Female	140 (46.8)	118 (46.6)	22 (47.8)	0.999[7]
Male	159 (53.2)	135 (53.4)	24 (52.2)	
Gestational age[3,8], *wks*	39.0 (2.0)	39.0 (2.0)	39.0 (2.0)	0.945[4]
Birth weight[9,10], *kg*	3.48 (0.46)	3.47 (0.46)	3.53 (0.49)	0.464[11]
Weight gain during the first 12 weeks[9,10], *kg*	2.63 (0.68)	2.61(0.68)	2.73(0.66)	0.319[11]
Vitamin/mineral supplement intake[12]				
Yes	184 (76.7)	148 (76.3)	36 (78.3)	0.928[7]
No	56 (23.3)	46 (23.7)	10 (21.7)	
Primary person for preparing child's food				
Mother	283 (96.9)	239 (96.8)	44 (97.8)	0.999[6]
Father/grandfather	9 (3.1)	8 (3.2)	1 (2.2)	
Maternal main sources of infant feeding information[13]				
Grandmother	104 (34.7)	88 (34.6)	16 (34.8)	0.999[6]
Other relatives (mother-in-law, family, sisters, grandparents)	75 (25.0)	68 (26.8)	7 (15.2)	
Governmental documents	180 (60.0)	153 (60.2)	27 (58.7)	
Health care professionals	182 (60.7)	155 (61.0)	27 (58.7)	
Books/brochures	216 (72.0)	183 (72.0)	33 (71.7)	
Common sense	195 (65.0)	167 (65.7)	28 (60.9)	
Supermarket or advertisement (e.g., media)	7 (2.3)	7 (2.8)	0 (0.0)	
Previous experience	110 (36.7)	87 (34.3)	23 (50.0)	
Internet	33 (11.0)	26 (10.2)	7 (15.2)	

Friends	22 (7.3)	21 (8.3)	1 (2.2)
Training, formal education	6 (2.0)	5 (2.0)	1 (2.2)

BMI: body mass index
[1]Values are n (%), unless otherwise noted
[2]Denominators vary due to missing data
[3]Median (interquartile range (IQR))
[4]Mann-Whitney U Test
[5]BMI was calculated by dividing the weight in kilograms by square of height in meters
[6]Fisher's exact test
[7]Yates' correction for continuity
[8]Calculated only among term infants due to initial exclusion of pre-term infants from the analyses
[9]Calculated only among infants weighing >2.5 kilograms due to initial exclusion of low birth weight infants from the analyses
[10]Mean (standard deviation (SD))
[11]Independent-sample t-test
[12]Calculated only among breast-fed infants
[13]Subjects could choose more than one option and therefore categories are not mutually exclusive

Table IV.5. Baseline characteristics of a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to three feeding categories during the first 6 months postpartum[1,2]

Characteristics	Infant feeding categories			p-value
	Exclusive breastfeeding n=46	**Non-exclusive breastfeeding** n=254		
		Predominant breastfeeding/ complementary feeding n=195	**Non-breast feeding** n=59	
Parental socio-demographic factors				
Maternal age[3], *years*	32.0 (5.0)	31.0 (5.0)	31.0 (7.0)	0.071[4]
Maternal marital Status				
Single/Divorced/Separated	1 (2.2)	3 (1.5)	2 (3.4)	0.487[5]
Married/Common-law partner	45 (97.8)	192 (98.5)	56 (96.6)	
Maternal education level				
Less than secondary education	1 (2.2)	15 (7.7)	7 (11.9)	0.074[5]
Completed trade, technical or vocational school or business/community college	7 (15.2)	39 (20.0)	14 (23.7)	
Completed university undergraduate degrees	19 (41.3)	99 (50.8)	28 (47.5)	
Completed university post-graduate degree	19 (41.3)	42 (21.5)	10 (16.9)	
Paid job during pregnancy				
Yes	33 (71.7)	158 (81.9)	51 (87.9)	0.109[5]
No	13 (28.3)	35 (18.1)	7 (12.1)	
Occupational status during pregnancy[6]				
Full-time	26 (78.8)	123 (78.3)	40 (78.4)	0.999[5]
Part-time	7 (21.2)	34 (21.7)	11 (21.6)	
Canadian-born mother				
Yes	37 (84.1)	163 (84.9)	51 (86.4)	0.914[5]
No	7 (15.9)	29 (15.1)	8 (13.6)	
Mothers' length of residency in Canada[7], *years*				
≤3	0 (0.0)	7 (26.9)	0 (0.0)	0.224[5]
>3	6 (100.0)	19 (73.1)	6 (100.0)	
Maternal ethnicity				

Caucasian/White	41 (89.1)	173 (90.1)	55 (93.2)	0.725[5]
Southeast Asian	2 (4.3)	11 (5.7)	3 (5.1)	
Latin American	1 (2.2)	2 (1.0)	1 (1.7)	
Other[8]	2 (4.3)	6 (3.1)	0 (0.0)	
Place of residence				
Edmonton	4 (8.7)	17 (8.7)	9 (15.3)	0.312[5]
Calgary	42 (91.3)	178 (91.3)	50 (84.7)	
Annual household income , *CAD*				
<20,000	0 (0.0)	2 (1.1)	0 (0.0)	0.649[5]
20,000-39,000	0 (0.0)	2 (1.1)	3 (5.1)	
40,000-69,000	6 (13.0)	25 (13.2)	10 (16.9)	
70,000-99,000	12 (26.1)	50 (26.3)	16 (27.1)	
≥100,000	28 (60.9)	111 (58.4)	30 (50.8)	
Household size[3], *n*	3 (1.0)	2 (1.0)	2 (1.0)	0.294[4]
Paternal education level				
Less than secondary education	11 (30.6)	58 (38.9)	21 (61.8)	0.026[5]
Completed university undergraduate degree	13 (36.1)	65 (43.6)	9 (26.5)	
Completed university post-graduate degree	12 (33.3)	26 (17.4)	4 (11.8)	
Paternal marital status				
Single/Divorced/Separated	1 (2.8)	1 (0.7)	2 (5.9)	0.063[5]
Married/Common-law partner	35 (97.2)	148 (99.3)	32 (94.1)	
Paternal birth place				
Canada	31 (86.1)	122 (81.9)	28 (82.4)	0.861[5]
Foreign countries	5 (13.9)	27 (18.1)	6 (17.6)	
Paternal ethnicity details				
Caucasian/white	32 (88.9)	136 (91.3)	31 (93.9)	0.180[5]
Southeast Asian	0 (0.0)	6 (4.0)	0 (0.0)	
Latin American	1 (2.8)	2(1.3)	2 (6.1)	
Other[9]	3 (8.3)	5 (3.4)	0 (0.0)	
Maternal health and lifestyle characteristics				
Smoking during pregnancy				
No	46 (100.0)	192 (99.0)	58 (98.3)	0.728[5]
Yes	0 (0.0)	2 (1.0)	1 (1.7)	
Alcohol consumption during pregnancy				
No	40 (87.0)	184 (94.8)	56 (94.9)	0.163[5]
Yes	6 (13.0)	10 (5.2)	3 (5.1)	
Recreational street drug use during pregnancy				
No	46 (100.0)	192 (99.0)	59 (100.0)	0.999[5]
Yes	0 (0.0)	2 (1.0)	0 (0.0)	
Gravida[3], *n*	2 (2.0)	1(1.0)	2 (2.0)	0.169[4]

Parity				
Primiparous	19 (41.3)[*]	117 (60.3)	39 (68.4)[*]	0.017[10]
Multiparous	27 (58.7)	77 (39.7)	18 (31.6)	
Planned pregnancy				
Yes	42 (91.3)	163 (84.0)	44 (75.9)	0.110[5]
No	4 (8.7)	31 (16.0)	14 (24.1)	
Born by assisted fertility[11]				
No	44 (95.7)	182 (93.8)	54 (93.1)	0.879[5]
Yes	2 (4.3)	12 (6.2)	4 (6.9)	
Pre-pregnancy weight[3], *kg*	61.36 (13.4)[*]	63.02 (15.2)[†]	68.04 (24.0)[*,†]	0.001[4]
Pre-pregnancy BMI[3,12], *kg/m²*	22.12 (5.3)[*]	22.45 (4.8)[†]	24.22 (6.0)[*,†]	0.002[4]
IIFAS score[13,14]	70.67 (6.4)[*]	67.82 (6.8)[†]	61.89 (8.9)[*,†]	<0.001[15]

CAD: Canadian dollars; BMI: body mass index; IIFAS: Iowa Infant Feeding Attitude Scale

[*]Statistically significant difference between "exclusive breastfeeding" and "non-breastfeeding" ($p<0.017$)

[†]Statistically significant difference between "predominant breastfeeding/ complementary feeding" and "non-breastfeeding" ($p<0.017$)

[1]Values are n (%), unless otherwise noted

[2]Denominators vary due to missing data

[3]Median (interquartile range (IQR))

[4]Kruskal-Wallis test with Mann-Whitney post-hoc test and Bonferroni correction

[5]Fisher's exact test

[6]Calculated only among mothers who were employed during pregnancy

[7]Calculated only among mothers who were born outside Canada

[8]Includes Black, Aboriginal and South Asian

[9]Includes Aboriginal and South Asians

[10]Pearson's chi-square

[11]Fertility-enhancing drugs or reproductive technology

[12]BMI was calculated by dividing the weight in kilograms by square of height in meters

[13]Score ranges from 17-85, with higher scores indicating more positive attitudes toward breastfeeding

[14]Mean (standard deviation (SD))

[15]One-way analysis of variance test with Tukey's HSD post-hoc test

Table IV.6. Follow-up postnatal characteristics of a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study in relation to three feeding categories during the first 6 months postpartum[1,2]

Characteristics	Infant feeding categories			p-value
	Exclusive breastfeeding n=46	**Non-exclusive breastfeeding** n=254		
		Predominant breastfeeding/ complementary feeding n=195	**Non-breast feeding** n=59	
Maternal characteristics				
Gestational weight gain[3], *kg*	14.77 (5.34)	15.63 (6.15)	15.53 (7.72)	0.735[4]
BMI at 12 weeks postpartum[3,5], *kg/m²*	23.82 (5.01)	24.10 (5.04)*	27.14 (9.27)*	<0.001[4]
Infant characteristics				
Gender				
Female	22 (47.8)	93 (47.9)	25 (42.4)	0.746[6]
Male	24 (52.2)	101 (52.1)	34 (57.6)	
Gestational age[3,7], *wks*	39 (2.0)	39 (2.0)	39 (2.0)	0.915[4]
Birth weight[8,9], *kg*	3.53 (0.49)	3.46 (0.46)	3.49 (0.44)	0.734[10]
Weight gain during the first 12 weeks[8,9], *kg*	2.73 (0.66)	2.57 (0.69)	2.73 (0.65)	0.186[10]
Primary person for preparing child's food				0.999[11]
Mother	44 (97.8)	183 (96.8)	56 (96.6)	
Father/grandfather	1 (2.2)	6 (3.2)	2 (3.4)	
Maternal main sources of infant feeding information[12]				
Grandmother	16 (34.8)	66 (33.8)	22 (37.3)	0.888[11]
Other relatives (mother-in-law, family, sisters, grandparents)	7 (15.2)	53 (27.2)	15 (25.4)	
Governmental documents	27 (58.7)	118 (60.5)	35 (59.3)	
Health care professionals	27 (58.7)	115 (59.0)	40 (67.8)	
Books/brochures	33 (71.7)	142 (72.8)	41 (69.5)	
Common sense	28 (60.9)	126 (64.6)	41 (69.5)	
Supermarket or advertisement (e.g., media)	0 (0.0)	6 (3.1)	1 (1.7)	
Previous experience	23 (50.0)	70 (35.9)	17 (28.8)	
Internet	7 (15.2)	22 (11.3)	4 (6.8)	
Friends	1 (2.2)	18 (9.2)	3 (5.1)	
Training, formal education	1 (2.2)	4 (2.1)	1 (1.7)	

BMI: body mass index
[*]Statistically significant difference between "predominant breastfeeding/ complementary feeding" and "non-breastfeeding" ($p<0.017$)
[1]Values are n (%), unless otherwise noted
[2]Denominators vary due to missing data
[3]Median (interquartile range (IQR))
[4]Kruskal-Wallis test with Mann-Whitney post-hoc test and Bonferroni correction
[5]BMI was calculated by dividing the weight in kilograms by square of height in meters
[6]Pearson's Chi-square test
[7]Calculated only among term infants due to initial exclusion of pre-term infants from the analyses
[8]Calculated only among infants weighing >2.5 kilograms due to initial exclusion of low birth weight infants from the analyses
[9]Mean (standard deviation (SD))
[10]One-way analysis of variance test
[11]Fisher's exact test
[12]Subjects could choose more than one option and therefore categories are not mutually exclusive

Table IV.7. Direct (forced-entry) logistic regression analysis of best-fitting model for predictors of 6-month exclusive breastfeeding among a subsample of participants from the first cohort of Alberta Pregnancy Outcomes and Nutrition (APrON) study[*†]

Model, predictor	*β*[1]	*SE*[2]	Wald	p-value	*Exp (B)*[3]	*95% CI*[4]
Model 1						
IIFAS score	0.08	0.03	9.76	0.002	1.08	1.03-1.14
Constant	-6.96	1.75	15.86	0.000	0.001	
Model 2						
IIFAS score	0.07	0.03	8.78	0.003	1.08	1.03-1.13
Multiparity	0.63	0.35	3.30	0.070	1.88	0.95-3.73
Constant	-7.01	1.75	15.96	0.000	0.001	
Model 3						
IIFAS score	0.07	0.03	7.82	0.005	1.08	1.02-1.13
Multiparity	0.77	0.36	4.54	0.033	2.16	1.06-4.39
Completed university undergraduate degree	0.58	0.51	1.29	0.257	1.79	0.66-4.87
Completed university post-graduate degree	1.50	0.53	7.91	0.005	4.46	1.57-12.63
Constant	-7.77	1.92	16.46	0.000	0.000	
Model4[5]						
IIFAS score	0.07	0.03	7.70	0.006	1.08	1.02-1.13
Multiparity	0.79	0.37	4.65	0.031	2.21	1.08-4.52
Completed university undergraduate degree	0.52	0.52	1.00	0.318	1.68	0.61-4.63
Completed university post-graduate degree	1.33	0.54	5.93	0.015	3.76	1.30-10.92
Pre-pregnancy BMI[6]	-0.05	0.05	1.30	0.255	0.95	0.87-1.04
Constant	-6.52	2.30	8.05	0.005	0.001	

IIFAS: Iowa Infant Feeding Attitude Scale; BMI: body mass index

[*]Reference categories include: parity (primiparous); education (less than secondary education)

[†]IIFAS score and pre-pregnancy BMI were entered into models as continuous variables, while multiparity and maternal education were entered as categorical factors

[1]Coefficient of regression

[2]Standard error

[3]Exponential value of β

[4]95% confidence interval of the exponential value

[5]Nagelkerke R2 =0.16; Hosmer-Lemeshow test: (X^2 = 13.31, p= 0.10); positive predictive value= 60.00%; negative predictive value= 84.67%

[6]BMI was calculated by dividing the weight in kilograms by square of height in meters

Figure IV.1. Recruitment details: reasons for non-participation and non-eligibility among a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study

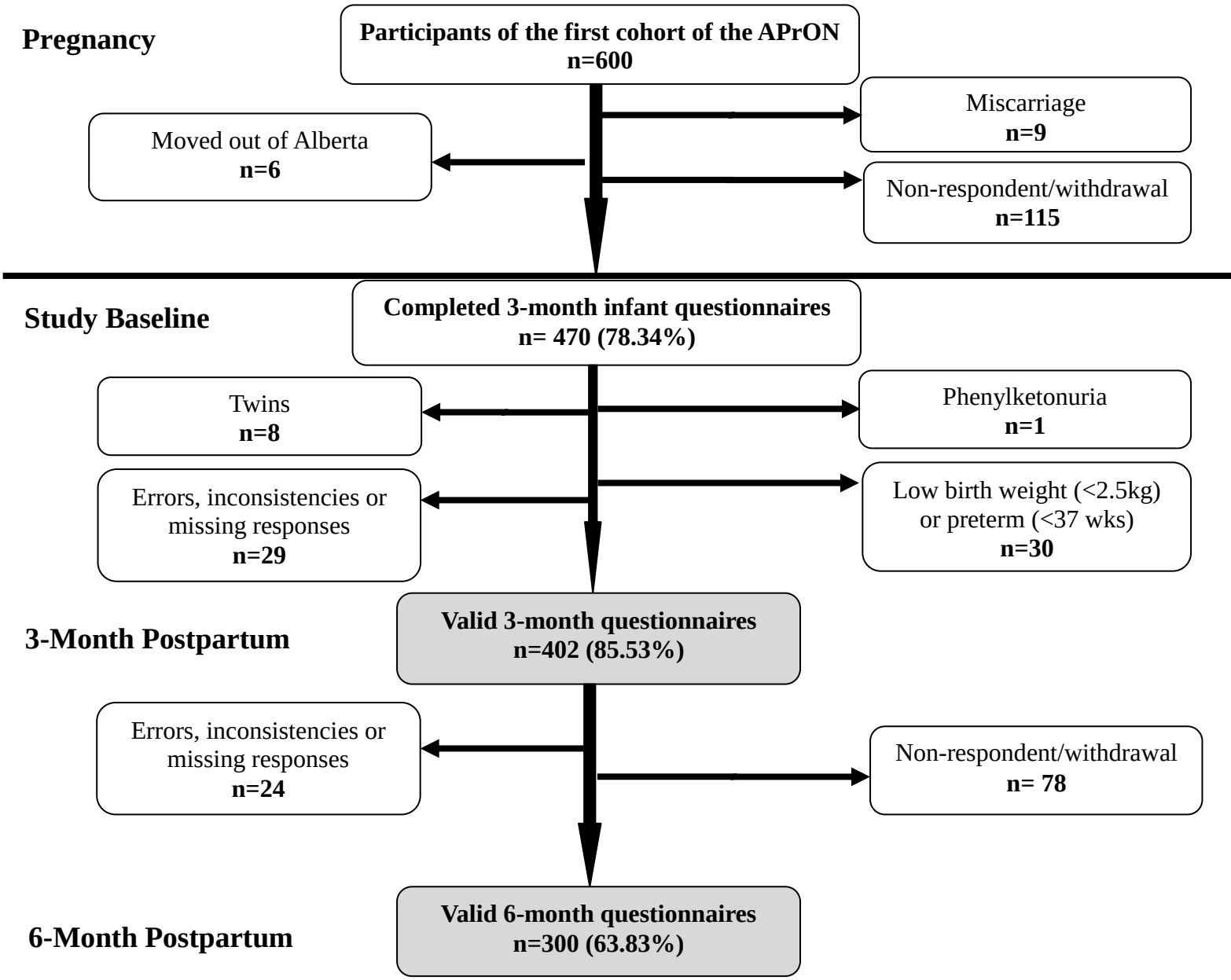
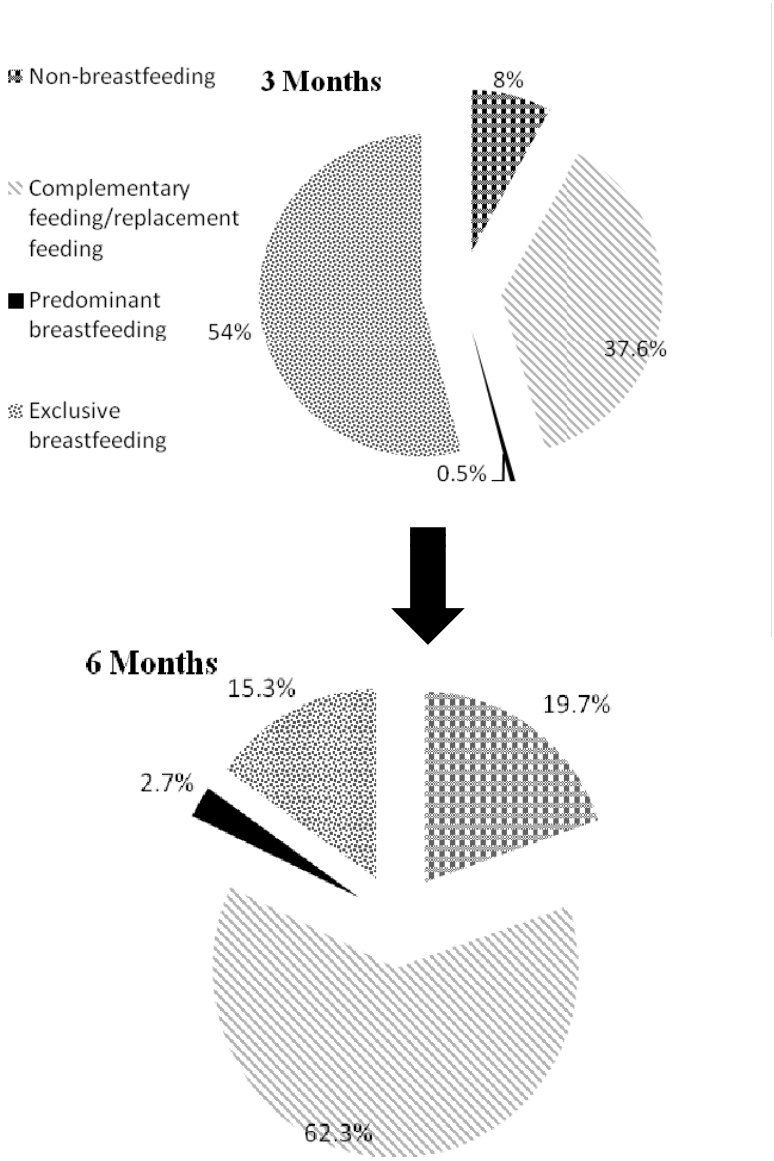


Figure IV.2. Infant feeding patterns and transitions between 3 months (n=402) and 6 months (n=300) postpartum in a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study [1,2]

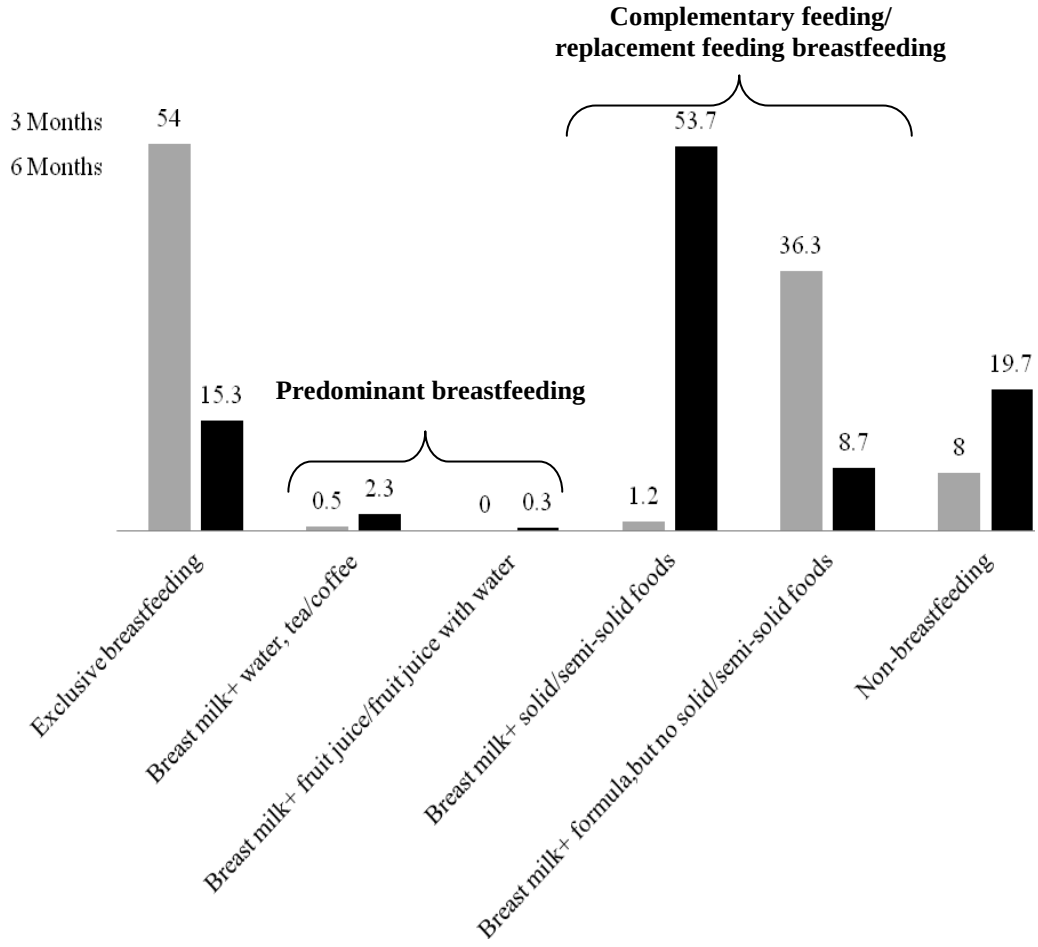


[1]Categories were defined based on the infant feeding guidelines of the World Health Organization

[2]**Non-breastfeeding:** infants have received no breast milk (directly, expressed or from wet nurse) and could be fed any solid/semi-solid foods or liquids including non-human milk. **Complementary feeding/replacement feeding:** infants have received breast milk (directly, expressed or from wet nurse) and solid/semi-solid

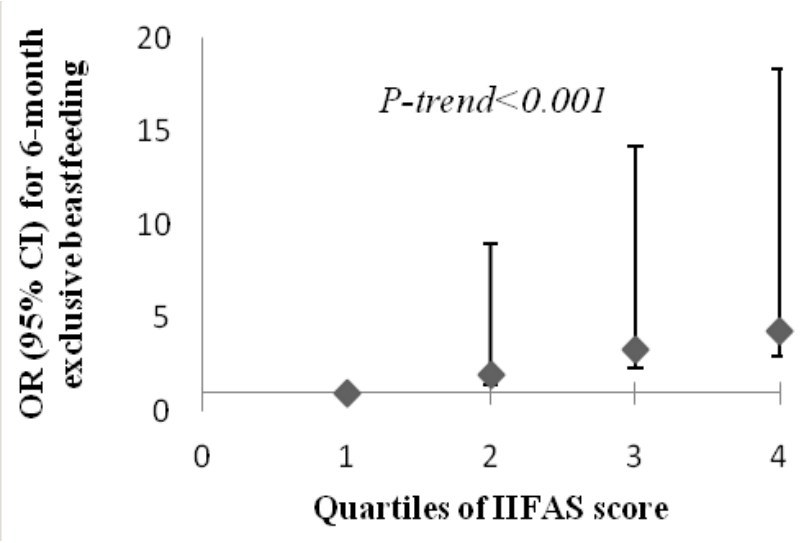
foods, food-based liquids or non-human milk. **Predominant breastfeeding:** infants have received breast milk (directly, expressed or from wet nurse) as the main source of nourishment, and feeding of certain liquids (water and water-based drinks, and fruit juice), ritual fluids, ORS, drops and syrups (vitamins, minerals, and medicines) were allowed. Infants in this category have not received anything else especially non-human milk and food-based liquids. **Exclusive breastfeeding:** infants have received breast milk (directly, expressed or from wet nurse) and only ritual fluids, ORS, drops and syrups (vitamins, minerals, and medicines) were allowed. Infants in this group were not allowed to receive anything else.

Figure IV.3. Detailed breakdown of infant feeding categories during 3 and 6 months postpartum in a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study [1]



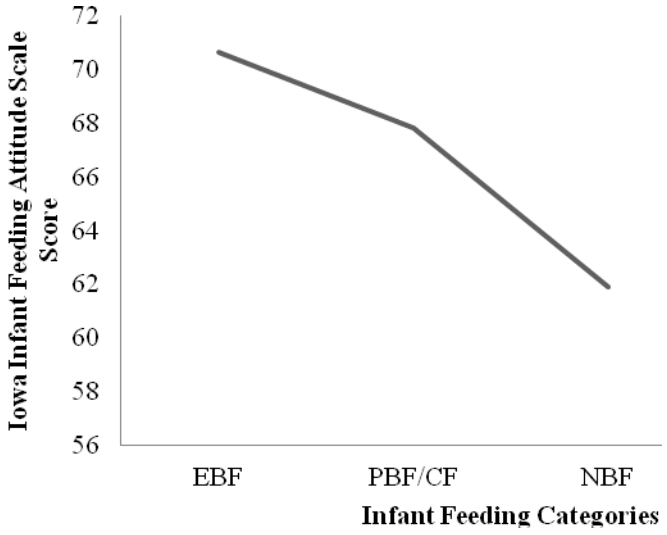
[1]Categories were defined based on the infant feeding guidelines of the World Health Organization

Figure IV.4. Adjusted odds ratios (OR) with 95% confidence intervals (CI) for probability of exclusive breastfeeding for 6 months across the quartiles of Iowa Infant Feeding Attitude Scale (IIFAS) score among a subsample of participants from the first phase of Alberta Pregnancy Outcomes and Nutrition (APrON) study[1,2]



[1]Logisitic regression model of best fit was adjusted for parity (categorical), education (categorical) and body mass index (continuous)
[2]IIFAS score range: Quartile 1: 17.00-62.25; Quartile 2: 62.26-67.00; Quartile 3: 67.01-73.00; Quartile 4: 73.01-85.00

Figure IV.5. The means plot of Iowa Infant Feeding Attitude Scale (IIFAS) score across the three feeding categories during the first 6 months postpartum: Alberta Pregnancy Outcomes and Nutrition (APrON) study[1]



[1]EBF= Exclusive breastfeeding; PBF= Predominant breastfeeding; CF= Complementary feeding; NBF= Non-breastfeeding

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Chapter V: Manuscript 2

Invisible Middle Eastern Mothers in Canada: an Ethnographic Study

"…Mothers should give suck to their children for two whole years, for those parents who desire to complete the term." (Verse 2:233, Qur'an)

V.1. Introduction

Adequate nutrition from birth to two years of age is a critical window for promotion of health, growth and behavioural development (1). Breast milk is well- recognized as the best form of infant nutrition which yields better neurological and cognitive development (2,3) and lowers the risk of infections (4-6), allergy (4,7-9), obesity (8-10), gastroenteritis (4), diabetes (11), cancers (12) and sudden infant death (4). Similarly breastfeeding mothers also benefit from faster post-delivery recovery and weight loss (8,9,13), improved child spacing due to lactational amenorrhea (8,14-16), enhanced maternal-infant bonding and improved psychosocial status (17). In addition, breastfeeding mothers have lower risk of postmenopausal breast cancer (18), osteoporosis (4), anxiety (19,20), and type 2 diabetes (21).

In spite of numerous benefits of breastfeeding, 1.5 million infants die annually from being deprived of or receiving insufficient amounts of breast milk (22), and unlike breastfeeding initiation rates, exclusive breastfeeding rates for the first 6 months has shown little or no improvement over the past few decades. Generally, early cessation of breastfeeding occurs in favour of commercial breast milk substitutes and unnecessary supplementation (22).

In Canada, despite the high prevalence of breastfeeding initiation (87.9 %), the rates of "any breastfeeding" and "exclusive breastfeeding" for 6 months postpartum have been reported at 51% and 16.4%, respectively (23-25). On average, 38.87% and 69.86% of Canadian infants are fed solid foods under the age of 5 and 6 months, respectively (26,27). However, breastfeeding is a complex behaviour, constructed and practiced within the social living environment of a woman, and therefore variations exist in breastfeeding rates amongst different socioeconomic and cultural groups (7,28-30). Ethnic differences exist in breastfeeding rates, with lower rates being reported among multi-ethnic groups (31-34). However, this is not the case for the Middle Eastern immigrants who have shown the greatest rates of breastfeeding compared to the women from other ethnic groups as well as those from the host country (31,35,36). This finding may highlight the role of very strong mediating factors that are mutually shared by Middle Eastern mothers and may be independent of acculturation to the local practices of the host country.

To our knowledge, no previous studies have evaluated the cultural beliefs of new-settler Arab and Persian mothers with regards to infant feeding from an emic perspective. This is of note, especially in the Canadian context where the Middle Eastern population (West Asians and Arabs) constitutes the fastest growing group to influx Canada (37,38). The aim of the present study was therefore to assess the perceptions, experiences, attitude, beliefs and cultural values that shape infant feeding practices of Middle Eastern women residing in Canada. In addition, infants' food and drink intake was also evaluated. Providing

this contextually-detailed description of infant feeding may generate new valuable insights about factors and constraints which influence infant feeding practices of Middle Eastern settlers in Canada, as only the women themselves can reveal what affects their decisions.

V.2. Materials and methods

Research design

An ethnographic approach guided the concurrent data collection and analysis to investigate the cultural background of infant feeding amongst Middle Eastern mothers (39). Ethnography is a description of the link between culture and behaviour from the participants' point of view and it explores the values, behaviours and thoughts of a group of people who share the same experience in order to inform culturally-sensitive care (40,41). In ethnographic research, the interaction of participants in a setting is explored as well as the way in which they interpret their experiences (42). Using this design, differences in perceptions of participants and researchers are clarified and researchers gain an understanding of the topic from the participants' point of view. The knowledge gained in this approach is emic in nature, which conforms to our objective of understanding mothers' experiences of infant feeding (43).

Sampling

Protocols and procedures of the present study were approved by Women & Children's Health Research Institute (WCHRI) and Health Research Ethics Board at the University of Alberta, Canada (Appendix G). The purpose and procedures of the present study were described to mothers before the data

collection began and all women signed the informed written consent forms provided in their native languages (Appendices H and I). Since informed consent was new to most mothers and some were not literate, focus group (FG) facilitator checked with each participant, read through the form and addressed questions before consent forms were signed. Mothers were assured of the confidentiality of focus group discussions, and were encouraged to share and respect each other's opinions and to understand that there is no right or wrong answer to the questions.

In total, 22 Middle Eastern mothers (6 Iranian, 16 Arab) participated in the present study according to the following eligibility criteria: being over 18 years of age, being born and raised in the Middle East, being healthy (absence of health conditions that contraindicated breastfeeding), and having healthy infants less than one year of age (Table V.1.). Mothers were recruited from community agencies in the Edmonton area (AB, Canada) via flyers and word of mouth. To ensure good attendance, transportation to the focus groups (described below) was arranged for those who needed it.

Since "ethnic group" lacks an objective definition, researchers are required to construct their own definition of ethnicity (44) and therefore, we defined "Middle Eastern" people as those born and raised in one of the countries located in the Persian Gulf region (i.e., Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, Syria, United Arab Emirates and Yemen). This corresponds with Statistics Canada's definition of ethnicity which is focused on the "birthplace" as opposed to language or religion, for categorizing immigrant groups (45,46). Except for Iranians who speak Farsi, the official language of

other Middle Eastern countries is Arabic and the majority of people in these countries follow the Islamic religion (from 70% in Lebanon to 100% in Bahrain and Saudi Arabia)(45,47). The Persian Gulf countries have undergone rapid economic and social changes during the past two decades, and have similar cultural, socioeconomic and demographic characteristics as well as common health beliefs and problems (48).

Data collection and analysis

Focus group discussions: Focus group was the best data collection strategy to be used in this research as it provides access to participants' own language and concepts and captures information on their real-world experiences on topics where data are limited (41). Although the focus group approach is sometimes criticized due to its inability to address sensitive topics and the possibility of being influenced by dominant participants, it is a useful strategy to collect data from those with limited power and influence, such as ethnic minorities with lower literacy levels (49). Specifically, focus groups align well with the strong oral tradition in Arabic culture (50), and the mutual support that occurs in the focus groups might be an asset to participants since they are able to build on each other's responses (51). Focus groups may be particularly sensitive to cultural and sub-cultural values since participants primarily talk to each other rather than to the researcher. In addition, focus groups address interactions among participants and provide an opportunity to evaluate the construction and co-construction of meaning (52). In focus groups, the group dynamic is mainly at the hands of participants, rather than the researcher, which helps generate new

thinking about a topic. Overall, focus group is an egalitarian research method in which participants have an active role in the research process and data analysis. This research method has been recognized as one of the most "empowering" techniques, which justifies its increasing popularity (52).

According to the Krueger and Casey (53), three focus groups with the same type of participants are generally sufficient to gain topic saturation; however, we left the option open to conduct additional focus groups until no new issues emerged. Data were collected through four focus groups each including 4-6 participants, since smaller focus groups yield development of more in-depth ideas (54). In addition, previous studies conducted among Middle Eastern populations have shown that the voluble oral tradition of Arab women often results in participants holding side conversations and talking at the same time during focus groups, which lead to losing part of the data (50).

Each focus group session was approximately 1:15-1:45 hour in length and ended by mutual agreement of participants and facilitator that all topics have been adequately addressed. Focus group discussions took place in the community agencies near mothers' own area of residence and in a time that did not interfere with Muslims' five daily prayers. As recommended, the facilitator did not have any other connections to this project (55-57). As the principal investigator (M.J.) and focus group facilitator were both from the same gender and ethnic background as the participants' and were fluent in written and spoken Farsi, Arabic and English, the cultural concerns, inner values and beliefs of participants were interpreted with more sensitivity. Since religion permeates all aspects of

Middle Eastern people's lives, being of the same religion and gender of Muslim participants is essential for meaningful discussion of most topics (50). In the present study, focus groups were conducted and analyzed in mothers' respective languages (3 Arabic and 1 Farsi focus groups) to maximize the quality of data, since none of participants were fluent in English (51).

Open-ended focus group questions were initially constructed based on the review of literature and were then reviewed and modified by independent expert faculty members, Health Canada's nutrition advisors and community facilitators. We also piloted guiding questions and focus group procedures among a group of 5 Middle Eastern mothers to confirm the clarity, relevance and comprehension of questions (Appendix J). Focus group questions targeted methods of infant feeding, reasons for and factors affecting this choice, beliefs around infants' health, mothers' feeding intentions during pregnancy and sources of infant feeding information. Beyond this, an open and flexible approach was taken ensuring that mothers directed the discussions and not the moderator (58).

During focus groups, discussion of almost all questions developed a lively dialogue and interaction among participants, who were frequently interrupted by each other. The researcher and facilitator ensured participation of all mothers in responding each question by bringing back the dialogue when it went off on a tangent. In accordance with the qualitative emergent design, when new topics emerged that were not included in the predetermined questions, we asked opinions of every member on those issues and discussed them with subsequent participants (e.g., breastfeeding in public, breastfeeding in Ramadan and

workplace support). Questions were supplemented by transition questions as well as by clarifying, probing and challenging questions to yield more in-depth responses (53).

Focus groups were audio-taped and professionally transcribed verbatim immediately after each focus group to have a permanent record of discussions. Transcripts were used for analyses after being verified with audiotapes. In addition, field notes taken during the focus group sessions (mainly of participants' interactions and non-verbal expressions) and analytical memos written periodically during the study were used to inform the analyses. Thematic analyses of mothers' comments were performed in the language of focus groups by both the principal investigator and the facilitator independently (41,59). Focus group transcripts were not translated from Arabic and Persian into English in order to preserve their linguistic authenticity (51).

Data were analyzed line by line and words/phrases that captured the emerging issues or key ideas were highlighted. These words and phrases formed the initial coding scheme and were then categorized into meaningful clusters. The categorized recurrent themes were discussed with the research team and further refinement of the overall coding was performed upon reaching the 100% agreement. Patterns and relationships between the categories were then identified and main themes were synthesized, which reflected maternal beliefs and cultural values about infant feeding.

Interaction data were analyzed using the congruent methodological approach (60). For each theme or sub-category, judgments were made about

frequency (number of times a topic was mentioned), extensiveness (number of mothers who mentioned the topic), intensity (the depth of feelings expressed), specificity (the use of personal specific experiences), and level of agreement (60), which determine the importance given to each topic (53).

To ensure the trustworthiness in this study, credibility, dependability, transferability, and conformability were established according to Lincoln and Guba's definition (61). Participants were compensated with a $25 gift card to a local large retail store at the conclusion of each focus group and snacks were provided in the tradition of Middle Eastern hospitality (50).

Survey: In order to fully understand the living contexts of women in ethnic Muslim communities, this qualitative ethnographic study was complemented by collecting survey data at the end of each focus group. Data were collected on socio-demographic characteristics, health status and feeding patterns since birth using pre-tested questionnaires of the Alberta Pregnancy Outcomes and Nutrition (APrON) study (see www.apronstudy.ca for further details). In addition, information on breastfeeding and formula feeding practices, timing of introduction and intake frequency of liquid/solid foods, supplement intakes and main sources of infant feeding information were collected. Permission to adopt these questionnaires was sought by the supervisor (A.F), who is an investigator of the APrON study.

Questionnaires, consent forms and recruitment posters were translated by bilingual researcher and facilitator, and were available in English, Farsi and Arabic. Translations, including the final focus group themes, were checked for

accuracy and then back-translated into English by bilingual community leaders of Middle Eastern mothers to ensure reliability. Quantitative survey data were analyzed by simple descriptive statistics using the Statistical Software for the Social Sciences, version 18.0 (SPSS Inc., Chicago, IL, USA, 2009). Since the number of participants in each ethnic group was small, data were not analyzed separately for each ethnic group.

V.3. Results

Quantitative findings

Table V.1. shows the key characteristics of the Middle Eastern mothers in the present study. The median (interquartile range(IQR)) age of participants was 25.5 (10.0) years, and the number of children in each family ranged from 1 to 6. All participants followed Islam and most were high school graduates and currently unemployed (68.2%). The majority of Middle Eastern families had an annual income of less than $40,000 (86.3%), and the last pregnancy of 36.4% of mothers was unplanned. None of participants smoked, used recreational street drugs or consumed alcoholic beverages; and except for one widow, all participants were in married relationships. Infants' fathers had mostly some or complete trade, technical, vocational school or business/community college education (59.1%) and were employed for wages (63.6%).

At the time of this study, all mothers were breastfeeding since birth except for one, who was exempted by a physcian due to contraindication of her prescription drugs with breastfeeding (Table V.2.).Two infants were being fed by a combination of breast milk and formula to compensate for mothers' milk

insufficiencies, and nine had been formula fed only once after birth at the hospital. Overall, none of mothers were exclusively breastfeeding since birth (i.e., only breast milk and medicines) due to the initial formula fed at the hospital, current formula feeding practices or early introduction of solid foods and liquids. All participants reported avoiding feeding foods to their infants that were not Halal (Arabic word meaning "permitted"), while only six were also concerned about allergenic foods. Vitamin D supplements were not given to 18.2% of infants due to its high cost and not being a priority.

The first food commonly fed to infants was mashed dates (Halawi), followed by rice pudding (Muhallabia/Ferni) and sugared water/tea (Table V.3.). Except for three infants who were below 6 months of age, all others were fed table foods before they reached 6 months. As presented in Figure V.1., none of mothers had introduced soy milk, evaporated milk or other plant-based milks (e.g., rice milk, almond milk, or hemp milk) to their infants. On average, infants were fed sweet drinks at 8.8 weeks, followed by breakfast cereals at 12 weeks, goat's milk at 13.6 weeks, water at 13.9 weeks and sweet foods at 15.3 weeks.

Qualitative findings

Eighteen mothers in this study brought their youngest child to the focus groups and they frequently breastfed their infants during the discussions. At the beginning of the focus groups, mothers tended to mention only the factors that encouraged them to breastfeed. However, with little prompting, they became more forthright, starting to criticize the Canadian health care system and the Western society that they felt did not support breastfeeding. Women consistently

compared the Canadian feeding practices to the norms in their home countries. Throughout the focus groups, women were speaking enthusiasticlly and loudly at the same time and discussions were far ranging and freely flowing. These Muslim mothers talked from a very broad perspective; when they were asked of their infant feeding practices, they talked about their living conditions, beliefs and values and how these factors influence their choice. Infant feeding perceptions of these women were deeply rooted in their spiritual beliefs, cultural values and experiences.

Data analyses identified several factors that influenced breastfeeding behaviours at five different levels of: I) society/culture, II) community, III) health care system, IV) family/friends, and V) mother-infant dyad. We applied human ecological framework to breastfeeding in order to cohesively conceptualize these overlapping spheres of influence (Figure V.2.)(62,63). The human ecological model considers processes operating in different layers to be bidirectional and have impacts on each other. The following section begins with describing the macro-level influences and continues through the micro-level factors:

I) Societal/Cultural influences

Being an ethnographic study, most comments made by mothers concerned religious, cultural and societal factors.

Religion: Despite all forces and pressures that negatively influenced Middle Eastern mothers' breastfeeding decisions, almost all participants were breastfeeding and intended to continue for at least two years. Mothers claimed that 100% of Muslim women intend to breastfeed and would do so if they could.

Participants were extremely motivated to continue breastfeeding and they had made this decision from childhood due to Islamic practices. Mothers attributed much of their breastfeeding success to cultural and religious beliefs rather than to support and encouragements of health care professionals. Islam is an integral part of Middle Eastern mothers' lives and was seen as a strong motivator for breastfeeding in the present study. Muslim women mentioned that breastfeeding for two whole years has been explicitly recommended in the holy book (Qur'an) and also by Prophet Mohammad, and therefore disobeying was a sin. They strongly believed that breast milk is essentially produced to be fed to the baby:

> *P_1"I knew that I was going to breastfeed and I was set. I was supposed to breastfeed because I know it is healthy and good for the baby… and from an Islamic point of view we are supposed to breastfeed for 2 years if we can…and when it is in Qur'an I feel like it is important otherwise it wouldn't be in there if it was not for a health benefit."(FG 3)*
>
> *P_2"Breastfeeding takes lots of patience and you have to work at it. You should be very determined for sure…I was about to stop long time ago as it was so difficult for me, but I thought when Allah says you have to do it there must be some benefits."*
>
> *P_3"You should have very strong motive and encouragement and I do not think if you do not have strong motivation you could ever succeed. That is why many Western women give up [breastfeeding] early because they do not have the faith in it."*

P_4"Even if you have lots of support, it [breastfeeding] blocks your liberty as a new mother. Although we [Muslims] have spiritual motivation that we know it is in Qur'an, sometimes I feel that "yes I am going to quit"… but still it gives me an encouragement to think that Allah has advised us to breastfeed so there are some benefits to it…be patient and try again."

P_3"Through all the loneliness and lack of support I have continued [breastfeeding] as it is a commitment written in Qur'an… and although it was so hard for me that I could quit but I knew it is best for him."

P_4"Here [in Canada] they just breastfeed for one year or even less…. my neighbor breastfed her first child for 4 months and the second only for 2 months; and her sister had a child also and she didn't breastfeed at all! It depends on how much determination they have and many other things…"

Some women stated that a combination of religious beliefs and family traditions influenced their final decision to breastfeed:

P_1"Two main factors influenced my feeding decisions: the family and Sunnah [practice of Prophet Mohammad], and what Qur'an recommends…my mother has breastfed us and that influenced me and my sisters a lot. She taught us breastfeeding as opposed to bottle feeding and she always says that is what Allah wants us to do." [Speaks while breastfeeding] (FG 3)

P_2 "For me it was mainly the influence of Islam and my family…they said because you get the milk you have to feed your baby and it does not cost you anything, I mean it is convenient and ready and baby likes it…"

P_3"I did not give up because according to the Qur'an breastfeeding is mandatory for 2 years…So, that is why in our cultures we must give our children the breast milk; it is the best for them. Now that I am experienced it is a piece of cake for me, like I can do it [breastfeeding] anywhere, anytime."

Mothers considered the inability to practice some of the religious traditions as an obstacle, examples of which being the tradition of forty days of rest post-delivery and adopting a "wet nurse" to breastfeed the child when mother encounters a problem. Mothers described their experiences as follows:

P_1"When my first baby was born in my country, I could not breastfeed because my milk was so thick and I was so depressed during that period… I wanted to feed him formula but my mother said: "no!"… they asked my cousin, who had just given birth, to feed my baby too and she helped a lot until my milk problem was solved… this helped prevent my infant from getting used to the bottles."(FG 2)

P_2"Me too. For my son, my milk was not enough so my sister did that [breastfeeding] for me and alhamdulilah [praise to Allah] it worked well cause she had lots of milk…I did not want my baby to have formula and bottle so it was so fortunate for us."

P_3"Islamic traditions such as forty days of rest after delivering a baby are legends here [in Canada][laughs]; I wish I had one week of rest. In addition to that, during the first few months that I had feeding problems, if

there was someone who could breastfeed my baby it would have been great and my baby could benefit a lot…"

P_4"It is so much support if in emergency situations you have someone to breastfeed your baby, it is an ease of mind."

These religious practices were not possible in the Canadian context since the wet-nurse should be Muslim; someone whom the mother knows and is confident of her trustfulness and proper Islamic behaviours. It is believed that the morals of the wet-nurse influence those of the child. In addition, mothers stated that Western women are unaware of such practices:

P_1"Our relatives and friends live so far away and I have been struggling so hard to feed my baby and there was no one here I knew [to feed my son], and I do not trust foreign people here. On the other hand, if you tell them [Western mothers], they will laugh at you, I am quite sure, they have never even heard of it [wet-nurse]! But even Prophet Mohammad (peace be upon him) was fed like that, you know…" (FG 4)

P_2"In Western countries, breast is a sexual thing and if you ask them [to be wet-nurse] they might even get mad at you. Also, a Muslim should feed your baby not everyone is allowed."

P_3"If I saw somebody breastfeeding my child here [in Canada], I would not like it at all, because I do not know people…No, never, never... I can't trust Western people."

Since the present study was conducted immediately before Muslims' month of fasting (Ramadan), milk insufficiency concern as a result of fasting was

also raised. All mothers had decided to fast and supplement infants' diets with foods, if necessary:

P_1"...I do not want to miss the Ramadan; I would like to accompany my husband." (FG 4)

P_2"I can tolerate fasting quite well…I was pregnant with my first baby in Ramadan and I fasted the whole month."

Everyone: "MashaAllah." [appreciation]

P_2 "...And the next year, I was breastfeeding him and I fasted the whole month."

Everyone: "MashaAllah" [appreciation]

P_2"I intend to do the same this year for my daughter…although summer days are too long in Canada but Allah will help InshaAllah [if Allah wills]."

Everyone: "InshaAllah" [If Allah wills]

In a focus group, one of mothers mentioned milk bank, which was unfamiliar to all other participants. Generally mothers did not support the idea from an Islamic point of view:

P_1"I have heard Canada has milk banks, but nurses did not talk about it when I had problems." (FG 4)

P_2"Milk bank?"

P_3"What is that?"

P_4"I do not know."

P_1"Like a lady makes a lot of milk, she pumps her milk and gives it to a company and they store it; and then if you don't have any milk, you can go there and they could give it to you."

P_2"Even if they [physicians] tell us that it is necessary, we cannot use it because we do not know who that milk is coming from."

P_4"Yes, we must be sure of the morals of donator, just like the wet-nurse."

P_1"In Islam if you donate or get milk from someone, your babies will be sisters and brothers and then cannot marry, although feeding should happen 15 times but still…I do not like the idea because not everyone is proper to feed my baby, and I should know that person."

Culture: Cultural traditions such as cessation of breastfeeding during pregnancy and feeding babies solid foods and liquids during first days of life (pre-lacteal feeding) were commonly practiced by all women in our study. Mothers believed that Middle Eastern culture is not well-respected in the Canadian society:

P_1"As you come here, they [Canadians] try to change your habits and cultural practices, somehow you can feel it. Just because you look different, they try to change you without knowing what your practices are…they have this feeling that we are always wrong."(FG 3)

P_2"Yes…back home breastfeeding is a social and cultural issue. Women gather every day and they bring their kids and you are exposed to it [breastfeeding] and you are supported. But here we are alone and no one knows of our traditions."

Society: Lack of social support for breastfeeding and negative attitudes of Western population towards this practice were criticized. Mothers mentioned that they believed Canadian society viewed breastfeeding as an out-dated, time-consuming, and restrictive task which was harmful to women's physical attractiveness. Mothers thought of Western society as a non-supportive, discouraging environment for breastfeeding, and they believed that they would have stopped if they did not deeply believe in breastfeeding:

> *P_1"One of my coworkers always warns me: "you are destroying your body at such a young age…your breasts would deflate and your body will be so awful after a year"… When I was pregnant, the same woman used to tell me that my nipples would be cracked and bleeding, but they did not!" (FG 4)*
>
> *P_2"….sometimes neighbors tell me: "breast feeding takes much of your time…and it is a very old way of feeding, maybe for a woman of hundred years ago, women now have other priorities".....as a Muslim I do not care for what they say I believe it [breastfeeding] from my heart."*
>
> *P_3"When I was pregnant, once I talked about breastfeeding to my employer's wife and she said "I have never breastfed" and when I asked the reason she answered: "breastfeeding reminds me of cow, a peasants' practice and I cannot accept someone drinking milk out of me"….it was really off-putting for me as a pregnant woman."*
>
> *P_1"…like the woman I visited at the infant ward in hospital, she told me: "why do you resist the formula? You are starving the baby. You would be*

better forgetting this nonsense breastfeeding"….When I told my husband he said that they could say whatever they wanted, and that I should not let anyone discourage me from what Allah has advised us to do."

II) Community influences

At the community level, employment policies, breastfeeding in public places and community services emerged as the most important factors influencing breastfeeding practices:

1) Employment: Financial need made employed mothers return to work 4 months after delivery, although most women worked from home to save the costs of day care/day home, take care of their multiple children, breastfeed when necessary, and make Halal foods for children who would not be fed so in day cares/day homes. Those who worked outside home were dissatisfied with having to pump milk in the washrooms due to the lack of nursing rooms at the worksites. Pumping milk in the washroom was not a pleasant experience, especially (as mothers mentioned) "*for shy Muslim mothers who were gazed at by colleagues":*

"In the beginning, I used to work in a chain store and I had to pump my milk to keep it from drying up…it was so hard for me because I had to pump in the washroom and everyone kept on asking me: "what are you doing in the washroom?". After 1 or 2 weeks all women in the store knew my story…it was so embarrassing the way they looked at me."(FG 1)

The most cited theme within this category concerned the high costs of child care facilities:

P_1"I cannot go back to work because of the cost and problems that these child care centers have…With the day home, you need to know the owner and it does not even have that minimum supervision of day cares. Children are looked at as business and not as humans."(FG 4)

P_2"The cost of day home is more than our apartment's monthly rent, let alone the day care which is even more expensive. The quality of care is so poor in both…I do not have anyone to leave the kids with and so I do not go to work."

P_3 "That's why I decided not to work as my husband said: "the money you make if you have to put it in a day care, that is really no point because you are not going to take much money home if you have to pay 800 dollars on day home for one of the kids". If I go to work I will earn $1000 so I would rather stay at home and make hand-made gift boxes, I prefer working from home."

These Muslim mothers were also concerned about culture and religion of day home owners and their practices:

P_1"…There are some other issues with day homes as well, like babies get the culture of that home and I am not comfortable with that. Also, only one woman takes care of 4 or 5 kids in a day home; what if she gets tired?"(FG 4)

P_2"I searched a lot for finding a Muslims' day home, and I found one alhamdulilah [praise to Allah]. The owners are two Muslim sisters and

now I am confident that everything would be fine and they would not feed him non-Halal foods."

P_3"Canadian mothers mostly stay at home for one year after delivery; so if the government subsidizes child care costs, it would be the most beneficial to people like us who are not wealthy enough and need to return to work early."

The regulations at day cares/day homes and the quality of meals served in these facilities were also criticized:

P_1"There is also a problem with foods because they [day home owners] do not often care what they feed the baby. I checked with other mothers and they said that day home owners do not feed babies their milk…and the food is of poor quality."(FG 3)

P_2"….Also in day cares they have schedules for everything. They make children sleep when it is sleep time no matter if they are tired or not, and for instance, if it is play time and kids are tired then they would not let them sleep!"

P_3"I used to work in a day care myself and I know how bad it is; they just pretend that they work well in front of patents. I have seen children crying so much in day cares because of being tired and sleepy, but they did not let them go to sleep."

P_1"I have seen that in day homes they put these poor innocent kids into boxes called "play rooms"; it is a really small space… and then at lunch time they take the kids out, feed them and again put them into the play

rooms. It is inhumane; they do not care what happens to the baby in future."

With respect to worksite policies, employed mothers did not feel supported as they had been in their own countries. Especially, this situation was intolerable for Middle Eastern women, who had received much worksite support in their countries through policies such as "nursing breaks" (30 minutes break per 2 hours of work), long-term paid maternity leave, and on-site subsidized child care facilities. Mothers suggested that these strategies had provided them with flexibility to work and breastfeed in their countries without being concerned.

2) Public places: For these Muslim mothers, breastfeeding in public was a dilemma due to feelings of shame and prudency. Breastfeeding in public was not a concerning issue for Muslim mothers in their home countries due to existence of "Mosalas" (mosques) in all public places. Mosalas have private segregated sections for women in which they could comfortably breastfeed and men are not allowed to enter. The main challenges that women faced in Canada were rooted from lack of nursing rooms in most public places, inappropriate structure of some nursing (family) rooms which allow male parents to enter, and negative attitudes of Western people towards breastfeeding in public even if it is done under nursing covers. Mothers noted that infants did not feed under nursing covers or hijabs while at the same time standing in public washrooms to breastfeed was not pleasant:

P_1"This [breastfeeding in public] is my biggest problem. I always go to washrooms, so I am in a store and then I have to go to the washroom and

spend an hour or so standing breastfeeding and burping and then changing and…I hate going out."(FG 4)

P_2"But my question is: are we really supposed to feed a baby in a washroom? That is what I was wondering…because we are not supposed to eat in a washroom...My husband always asks: "how do you feed her like that?", and I say when the baby is crying you do not have any other choice."

P_1"Like I last week went to a mall and they had this room that had a changing table and a sink, and then there were few chairs so you could breastfeed in there but the ridiculous thing is that it was a family room…So when I went in there a woman and her husband were there changing their baby, so I waited until they left because I cannot feed the baby in front of men …Then I do not know if guys are allowed to come in, what is the point of nursing rooms?"

[Group admits]

Women explained how they had coped with this problem:

P_1"I have made myself a very big nursing cover that I use for outside and it is extremely helpful. I use it even in front of women." (FG 2)

P_2"If I want to stay long at a mall or store, I pick the malls that have breastfeeding rooms, which is good because I know it is easy for me… I know it [breastfeeding] is for the best and I have made it my priority."

P_3"My sister has sent me this from Kuwait [takes a nursing cover out of her bag] and I have used this everywhere since she [baby] was few

months old… and it is so convenient for me, you do nurse your baby without exposing yourself…"

Mothers compared the situation in Canada with that in the Middle East where "Mosalas" are commonly used for breastfeeding outside home:

P_1"In the Middle East we have Masalas in all public places: every mall, every university and store, airports and...everywhere. You can go in there anytime and breastfeed because women have a specific place that men do not enter…it is very private and there is no man, so it is a kind of community support for breastfeeding that we do have back home."(FG 2)

P_2 "Yes…breastfeeding is the most natural thing and we should be able to do this…In the Middle East we had Mosalas in all public places for breastfeeding; in our culture this [breastfeeding] is a normal thing and everyone approves of it…Also, people are all Muslim and covered, and you know, it is not just you."

The above-mentioned difficulties made immigrant/refugee mothers to formula feed or feed solid foods to infants from an early age when going outside of home:

P_1"I always have some mashed dates or Muhallabia (rice pudding) with me when I go outside cause it is just easier….I don't feel comfortable [breastfeeding] even around women, I do not want them to see…"(FG 4)

P_2"I usually pump and take my milk outside but that doesn't always happen because sometimes you are in a hurry and haven't really planned ahead… and it is really hard especially in summer, to plan and bring ice

and keep the milk clean…so as she said, sometimes it is just easier to take a bottle of homo-milk or foods outside."

P_3"I used to have lots of problems in the beginning, I mean for example for going out you are always feeling embarrassed: what if the baby wants milk?....and you prefer to stay at home so if he wants milk you could feed him. Then after 3 months it became much easier, because I take out the snacks and when I cannot breastfeed I could give him those"

Negative attitude of Western society towards breastfeeding in public was yet another concern:

P_1"I am not comfortable breastfeeding outside home, because even when you are breastfeeding under nursing covers, all passers-by stare at you as if you are committing a crime…this is really off-putting."(FG 1)

P_2"That is why I never believe when they say Canadian women also breastfeed; we never see them do and they are generally so negative about it…The way they look at you with wonder makes you prefer staying at home."

[Group agrees]

3) Community services: Except for one, none of mothers were aware of community resources for breastfeeding support (e.g., prenatal and postnatal classes). This lack of knowledge was attributed to reliance of these support facilities on word of mouth and networking.

P_1"Somehow the awareness should increase cause not all immigrants and refugees know of the community services available to them, so they do not

use them…they do not know the places they could go like prenatal classes, and all the services that government is providing…These are there for us to use but lots of people don't know."(FG 4)

P_2 "What classes?"

P_3 "Prenatal class?"

P_2 "We have never heard of that."

P_1 "You go to these classes when you are pregnant…For me it was just so good, because they give you information on how to cope with everything while you are pregnant and after your baby is born. Because our income was low, they did not even charge us for the class...they had breastfeeding education class that I went to and they showed me how to latch and everything."

P_2 "Was it free?"

P_1"Yes, for us and for the low-income women. I recommend that awareness is increased; see! These women did not even know about it [prenatal class]…so advertise these stuffs."

P_3"Where are they [prenatal classes], I am pregnant now." [laughs]

Mothers recommended that community and peer support is strengthened:

"*I wish there was some community support in Canada, for example, a mother who has breastfed or formula-fed previously and is from our communities. It is a real support to sit and talk to each other because they have been through all these problems themselves and they can support you a lot." (FG 3)*

III) Health care system influences

There was a general agreement among participants that the Canadian health care system is less supportive of breastfeeding, than the system in their home countries. Two components of health care system (health care staff and health care policies) that were mainly criticized are as follows:

1) Health care staff: Mothers frequently cited medical staff as unsupportive of breastfeeding. Health care professionals had not encouraged breastfeeding initiation, unless mothers had explicitly expressed their interest. Participants believed that nurses and physicians had a pre-assumption that mothers are not willing to breastfeed, which was viewed as an unacceptable indication of clinician's lack of enthusiasm and support.

P_1"The nurse who vaccinated him [baby] asked if I breastfed, and when I said: "I do", she got so amazed and repeatedly said that I had to continue and that this was a beautiful decision. Here [in Canada] most mothers breastfeed for 1 or 2 months and then they stop."(FG 2)

P_2"I have heard that they [Canadian mothers] use a drug to stop the milk production."

P_1"Wallah [by Allah], I cannot believe that!"

This was also confirmed in another focus group:

P_1"When I told the doctor that I had breastfed my older ones [children] for 2 years he really got surprised."(FG 1)

P_2"Yes, they really wonder."

P_3"Yes, when you tell nurses "two years", they just say: "oh!""

P_4"My physician, he asks me every time: "well, didn't you feed him formula?" It seems as if he is waiting for me to do that so he gets happy. I do not mean that he is recommending formula but it is so normal for him…It is not like our country where doctors never recommend formula. Maybe it is because of our religion."

P_2"In the Middle East, everyone in the health care team would tell you not to introduce formula and instead they encourage breastfeeding. But in Canada, physicians are very open to formula feeding, so mothers do not feel guilty if they formula feed because they are supported by physicians"

Several factors contributed to maternal mistrust of healthcare professionals, the most important of which being differences in attitudes toward breastfeeding among clinicians:

P_1"The nurse at the breastfeeding clinic encouraged me a lot and she gave me some pills to improve my milk output. But when I showed the pills to my physician to see whether they were safe, he smiled ironically saying: "if you let them [breastfeeding clinic nurses], they would suggest breastfeeding until the child is 10-year old! Why don't you feed the formula instead?""(FG 1)

P_2"I agree, health care staff confuse you a lot. After delivery, the nurse told me not to feed formula, and I did not while my baby cried for like half a day. From his sound of crying, other nurses came to see what is wrong and they asked:"why don't you give him some formula?", and I said: "your head nurse told me not to", and they said the head nurse had

recommended that for the day-time only, and during the night he should be formula-fed. So I did [formula feeding] because nurses said: "if you don't, your baby's brain will be damaged"…Even though the head nurse thought I shouldn't have done that."

Women believed that nurses refrained from educating mothers on appropriate breastfeeding methods because they had found it more convenient to provide free formula to infants in hospital. From mothers' perspectives, this was of concern because of the possible negative influence of bottle feeding on infants' suckling ability and their subsequent latching success. Primiparous mothers were more vulnerable and likely to take up bottle feeding habits due to not having the confidence and experience:

P_1"I had natural childbirth delivery for my third daughter and I did not have any problems, so I was just sitting on the bed breastfeeding when the nurse suddenly came holding a box of liquid formula, and Allah! she was shocked seeing me breastfeeding. She said: "oh …you know how to do it!", and I said: "yes! This is my third child"... and so she left. I mean, she was just ready to start bottle feeding while for my previous children in Iran, they [health care staff] did not offer any formula, although I did not know how to breastfeed then. In Iran, nurses gave me time and education and encouraged me and insisted that I could succeed; that is the way I managed to do it." (FG 1)

P_2"Yes, I totally agree. Here [in Canada] they [nurses] do not spend time on teaching how to breastfeed and what to do if problems occurred…lucky

are those mothers who have had previous children in the Middle East and with support from the family, friends and medical staff have learned how to do it [breastfeeding]."

Similarly, women reported that they had not been supported and encouraged by Western physicians who recommended formula feeding whenever problems occurred:

"If you do not have the motivation, I mean to be just like Western mothers you would easily give up [breastfeeding] as the physicians are ready to recommend formula feeding, whatsoever." (FG 3)

In addition to lack of support and encouragement for breastfeeding, clinicians did not emotionally support Middle Eastern mothers, which was especially embarrassing for these new mothers from minority groups with the least support system available to them. Mothers mentioned that in the Middle East the strong and continuous support from health care team encourages mothers to initiate and continue breastfeeding for at least 2 years:

"If I ever knew that there would be no support from health care team, I would not have delivered a baby here in Canada, really. I would have at least waited for my family to come here…This has been the most difficult time of my life and I still have problems; without the guidance and support of nurses and my family I feel so lost."(FG 1)

Participants were of the same opinion that discharging new mothers without training them on how to deal with feeding difficulties had detrimental implications especially for primiparous women.

P_1"Two days after discharge and I had nipple ulcers and severe breast pain. I did not know what to do and where to go, I do not know how their system [health care] works and I did not want to call back home and make my family worried. Finally, I asked a sister [Muslim friend] who also had a baby and she gave me an ointment. You cannot believe, when I used it all ulcers disappeared. She said even if the baby swallows some of it on the breast there would be no problem, it is safe."(FG 1)

P_2"I have also heard of it [ointment], but have never used it because I am afraid that it might be dangerous for the baby. It smells like gasoline."

P_3"Where did you get it [ointment] from? I did not have any problems in hospital but soon my whole breast got so painful and I had nipple ulcers. I did not know what to do and I was too shy to ask anyone, even my family."

P_1"They [health care professionals] do not inform us of possible breastfeeding problems and how to handle them; after child birth we are left alone."

Mothers had found post-discharge follow-ups to be rather scarce and dissatisfactory if anything. They mentioned that the 2-hour postnatal nursing visit was not adequate or beneficial. Mothers had found confusing differences between infant feeding recommendations offered in their own countries and those offered in Canada. A mother commented that healthcare professionals overlooked the educational needs of multiparous women:

P_1"Once the physician found that I have previously had children he stopped offering me information on what to feed my baby and how. Last

month I took my child to his [physician] office and he figured she [infant] had anemia, and asked me about the foods that I feed her. I was so proud to tell that I only feed her home-made foods, but he shouted at me saying I have to give her ready foods." (FG 1)

P_2"Like fast foods?"

P_1"No, he meant baby foods…and I told him that I had fed my other infants in the same way and none had developed anemia or anything."

P_3"I think that is because in the Middle East iron supplementation is mandatory from 4 months, but it is not in Canada."

P_1"Yes, that is correct. Regardless of differences between the countries, they [physicians] expect you to remember all infant feeding details from your previous children, and they do not teach you anything."

2) Health care policy: Women believed that many aspects of Canadian health care policy were problematic, particularly the lack of consensus and uniformity among infant feeding advices of hotline services (available through Alberta Health Services), brochures, nurses, physicians, and other health care staff. Women felt that these discrepancies had undermined their trust in the Canadian health care system. Mothers believed that clinicians provided guidance based on their own experiences and beliefs, and not according to a standardized protocol:

"It seems that their [physicians'] recommendations change over time, or there are just too many discrepancies between them. With my daughter they said you could start homo-milk at 9 months because my milk was not

enough, and with my son they said: "no! Leave it to 1 year", and then with him [points to her son who is sleeping in her arms] the doctor said it is safe. I was worried but he said it was okay to start at 6 months because his growth is so good mashaAllah [appreciation]. So yes… he [physician] said baby's size is large so you could start…it mainly depends on the doctor; each doctor says something different, some say "no" some say "yes!""(FG 3)

This was supported by another comment:

"My milk was just 15 cc in the beginning, so before discharge I asked the nurse and she said that it was enough for the baby...I came home and breast-fed him for two days but he did not stop crying, until the postnatal nurse came to visit us at home. She said: "you have been starving him, he needs at least 40 cc each time to become full"… and I was confused because the hospital nurse advised differently."(FG 1)

Mothers thought that some of the clinicians' feeding advices were impractical. One woman explained:

"They [nurses] referred me to a breastfeeding clinic but it was of no use. The latching techniques they taught me were exactly the same as those that I knew. They do not have anything new to offer; they repeat what we already know." (FG 2)

Others also commented that some advices were "unnatural" (e.g., scheduled feeding with certain amounts of milk):

P_1"My grandmother and mother say: "when babies cry, feed them". But here [in Canada] they [physicians] put you on a schedule and say, for example, "breastfeed every 2 hours!""(FG 3)

P_2"I believe what our culture dictates is correct. Breast milk is easier to digest and it should be given whenever baby is hungry. In Canada, people violate the laws of nature just too much."

P_3"Exactly, that is why one of my Canadian friends stopped [breastfeeding] at 2 months; she was using timed-interval breastfeeding schedules like in the army. Even if the baby cried she said: "no, there must be some other problems, she is not hungry"…That is so wrong!"

P_4"I think in the West, physicians are too focused on employed mothers; so they have come up with these schedules to make infant feeding more comfortable for them…but it ignores all cues in the baby and contradicts the natural ways of infant feeding."

When mothers were asked about their health care use, often enthusiastic long discussions were ignited. Women felt that they had not been informed about the Canadian health care system and the way it works. Due to poor health care utilization, mothers felt desperate when problems were raised and they tried to solve them through contacting the family members, whom they trusted and could communicate with more easily:

P_1"Four or five days after birth, my son started crying non-stop and it went on for some days…It was my first child so I did not know what was wrong and I could not calm him down no matter what I did. I was so

frustrated and tired of struggling to feed him and being unsuccessful. When I was discharged from hospital no one told me what to do or where to go if these problems occurred. So finally, I called back home and my mother said that it was stomach ache. We gave him sugary mint water and he calmed down and relaxed alhamdulilah [praise to Allah]. Grandmothers' experience is invaluable."(FG 1)

P_2"Yes, definitely. Our main issue is the lack of support from family and friends as well as from the health care team…you either have to call back home for every problem that you encounter and make your family worried, or rely on trial and error to gain experience…that is why some of new-comers just give up [breastfeeding]."

P_1"Yes, especially with your first child everything is new and you have plenty of questions. In Canada, we do not know who to go to because clinicians do not seem so passionate about breastfeeding."

The Majority of Middle Eastern mothers in the focus groups were unaware of breastfeeding clinics and hotline services available through Alberta Health Services, and their overall health care utilization was low:

"…After discharge I was feeling guilty that my milk was not enough cause I wanted to feed him [the baby] myself…so after 3 weeks when I went to a gynecologist, I asked her if there were any possibilities that I could breastfeed him without formula, and she then referred me to the breastfeeding clinic. I did not know such facilities existed. However, because of the long waiting list I was visited when my baby was 1.5

months old, and it was too late because I had pumped and fed him breast milk in bottle since birth and he was used to it. I think that during pregnancy, they [clinicians] should inform us of these options in case problems occurred."(FG 1)

Those who had used health care services in Canada found it inefficient, due to the long waiting list for maternity clinics and high costs of medical insurance, drugs and supplements:

"The breastfeeding clinic nurse recommended a pill for increasing my milk that costs $100, which is too much for me…I would rather give my baby table foods cause we cannot afford it"(FG 1)

Mothers also criticized hotline services for asking the same demographic information each time, providing impractical solutions to infant feeding problems (e.g., formula feeding, scheduled feeding), being provided in English only, and having long waiting duration. The most significant problems that hindered Middle Eastern mothers from using the health care system were clinicians' lack of cultural competency, provision of health care and information resources only in English language, and mothers' own lack of language proficiency:

P_1"My English is not good especially when talking on the phone. For me, it is really hard to understand someone talking so fast in English on the phone [hotline], and asking questions that I do not understand… I have never had self-confidence; being shy and everything, you know… So I have to wait for my husband to come back [from work] and call the

Alberta Health Link; although these calls are so time-consuming that you prefer not to call them at all." (FG 3)

P_2"Yes, those nurses ask lots of questions…I know many people, including myself, who are put-off by the low quality of hotline services…Even if you call them two times in a day they would ask the same questions on age and gender and etcetera every time. It is so annoying."

P_3"At least if that nurse spoke our own language or even talked a little bit slower, I could take it. It is very important because it relates to the health of our babies…My physician also talks very fast and with an accent that I don't understand; my husband is very busy and cannot accompany me [to the hospital] all the time… If they [clinicians] really want us to use these services, they should consider our language abilities."

One of the mothers suggested:

P_1"If breastfeeding is this important and they really want to invest in it, they should know that our English is not that good to communicate with clinicians easily…also, we do not have much contact with the society to learn it fast… I think clinics should have one nurse from each ethnic group, a bilingual nurse who knows our culture…at least for new comers until we learn the language…this will make us confident and we could express our problems more easily." (FG 1)

P_2"…Why Canada with this many immigrants and refugees does not provide health care in different languages? If it did, we would have known

that even if we go there [hospitals] without our husband or children, there is one nurse who understands what we say."

P_1"Believe me it is so different to explain your problem in your own native language. If we had a representative of our culture in health centers we could even trust them more easily."

P_2"Eh, It seems more like a dream…"[smiles sadly]

In another focus group, one of women described her own experience of being in a hospital in Canada:

"Some times ago my baby was sick so I took her to the clinic. While I was waiting for my husband to come and speak with the doctor, a nurse came and started talking to me. I was so frustrated because I did not understand what she says, and I did not have any family or friends with me to help…you cannot imagine how bad I felt. I was ashamed because no one knew my language."(FG 3)

Generally, these Middle Eastern mothers relied on their husband and children for communicating with health care team:

"I have to wait for my older children to get back from school and call on my behalf to the Alberta Health Link when I have problems with my younger one…but sometimes I really do not want to take too much of my children's time, so I just let go and try to find out a solution myself. I do not need to learn the language because I go everywhere with my husband and children." (FG 3)

Mothers did not use brochures as sources of infant feeding information, mostly due to their lack of language proficiency and lower literacy levels:

> *P_1"I do not read those brochures because my English is not good and the information is just too much…Also, not all the times those brochures are right for you. I mean, you might have different problems and issues, so I think it is safer to ask your questions from physicians instead. Brochures only provide general information, you know." (FG 4)*
>
> *P_2"Also, not all brochures are trustful cause as she said, some of them have wrong information like feeding the baby every 2 hours. It [scheduled feeding] did not work for me and I believe this is not for me, and when I asked my mother she said: "no, no, no! Do not go with that, you go with what you feel you are more comfortable with.""*

Another problem with hospital services that influenced maternal dietary intakes after delivery and hence their milk output was the inadequacy of hospital meals. Refugee mothers had often felt hungry during their hospital stays since they had to share the meals with their husbands who stayed with them at the hospital. They were concerned and dissatisfied especially because they did not have their friends and relatives in Canada to bring in food for them from home:

> *"I had not taken any food with me to the hospital and I did not have anyone to bring me some as well. My husband was staying with me during hospitalization and he was also hungry, so we had to share the food which was a small portion size really."(FG 4)*

IV) Family/friends influences

Despite living far away from home, mothers still depended on advice and support of family and friends since they viewed them as tangible moral and emotional sources of support, reliable sources of information, and successful role models. Mothers reported that having been breastfed, being exposed to breastfeeding from an early age and having a previous positive breastfeeding experience were the important factors influencing their feeding decisions. Generally, these Muslim women trusted the advice of family and friends more than that of the healthcare team.

> *"For my first child, my breasts were so painful in the beginning that I did not want to breastfeed at all, but my mother insisted that I had to tolerate. Even though I cried a lot and did not want to [breastfeed], she held my shoulders so that he [child] could feed….if my mother was not around during those days I would have given up [breastfeeding] then."(FG 2)*

The role of family support was also confirmed in another focus group:

> *"I had a really difficult time in the beginning especially because with breastfeeding you do need much support and I did not have my family around." (FG 4)*

Most mothers trusted the advice of family and friends more than those from health care professionals:

> *P_1"I trust my mother's advice because she has breastfed 9 children and had raised us healthy and without any problems. Those hotlines and health services recommend you things that are not practical; they lack the*

experience component. Maybe their guidelines do not work for the Middle Eastern mothers, I do not know…" (FG 3)

P_2"We are better off practicing our own traditional ways of infant feeding. Our mothers' experiences are priceless, and they support you a lot… My mother has always answers to my questions because she knows me and my issues as well."

P_3"And they talk your language!"

Breastfeeding support from Muslim fathers played a major role in their partners' feeding decisions, as husbands were the only significant others in the lives of these immigrant/refugee women in Canada:

"My baby was burping in the first few days and it was very new to me and I…I wanted to give up, I said: "you know what, I am not going to do this [breastfeeding] anymore", but my husband said: "just give it a few more days, you would regret if you give it up now". And I am glad that I did not [give up], I am glad that I continued. So he always supports me in that way." (FG 3)

However, first-time mothers lacked enough confidence in their own breastfeeding abilities, mainly due to not having the support and supervision of grandmothers, female friends and relatives:

P_1"Lonliness is a big issue, especially with your first child. You have to go through the labor and everything is new for you. In the beginning, my baby cried a lot and I did not know what to do…. you have your millions of options: does he need to be changed? Is he hungry? I did not know!

After struggling for 2 days, the nurse came to visit us at home and she said that my milk was not coming enough so the baby might be hungry…If my mother was here with me, I am 100% sure that she would have figured from the beginning; she would have told me: "yes [snaps her fingers], your milk is not enough, obvious!". Now that I am experienced I could tell too, but in the beginning no one helped." (FG 4)

P_2"I always call my mother when I have such problems, why didn't you call?"

P_1"Well, even if you call it is not like when she sees you in person. When I called her later she told me what the problem was, but then it was too late as I already knew it from the nurse...Here [in Canada] your mother and relatives are not always your first options, and you should rely on your own experience gained over time, cause you do not want to make your family worried all the time, right?"

Lack of assistance and support of family and friends with housework and taking care of children was yet another problem encountered by refugee/immigrant mothers. This issue was also viewed as a contributor to the low economic status of Middle Eastern families, as the burden of household duties prevented mothers from working outside home and earning money:

"Having household help is very important. If my family or friends were here to help me with my duties I could breastfeed my baby without being stressed…In the beginning, the nurse told me I had to work with him [child] to establish latching but I had lots of other things to do so I just

could not spend too much time struggling…if I had the help of a female relative at home, the tension on me would be much less and I could concentrate on breastfeeding." (FG 4)

These Muslim women were even more burdened since their husbands were not culturally supposed to help them with the household chores, which are considered as "feminine tasks":

P_1"We only have our husbands here and in our culture men are not responsible for household duties, you know what I mean…Receiving support from a female relative, especially mother, is always different."(FG 4)

P_2"But guys also have their own issues. They have the power and are always struggling with jobs and income problems…we cannot expect much from them."

V) Mother-infant dyad influences

Participants enumerated many individual problems that they and their peers had experienced challenging their breastfeeding experience. These factors could be categorized as medical problems, feeding difficulties, lack of information, and maternal characteristics.

1) Medical problems: Several medical conditions such as post-cesarean infection, sore nipples, breast pain and ulcers, milk duct blockage, inverted nipples, mastitis, and baby blues/depression contributed to maternal infant feeding practices:

"Right after delivery, I wanted to breastfeed her [child] but my milk did not come and the nurse gave her formula. So for one month I used formula in addition to my milk, but then I stopped because formula was so expensive. I had to pay 30 dollars for a box of formula which was finished in about a week…So I am just breastfeeding her and then every once in a while I give her some Roz-belhalib (rice dessert)." (FG4)

Primiparous women also experienced fear, shame and lack of confidence which added to the stressfulness of breastfeeding practice. The following infant health problems had interfered with breastfeeding in the present study: immaturity, inability to suckle milk, low birth weight, colic, jaundice, cardiac problems and respiratory diseases:

"After birth, he was hospitalized in NICU for 5 or 6 days. He had some breathing problems and it was a big issue for me to establish breastfeeding because he was there and I had to go every day to try him. I was so stressed and frustrated and I wasn't feeling well at all... They [nurses] gave him formula in the beginning since my milk was not coming and I used to pump so my milk flows. When he was discharged, he was already used to the bottle and since then I have to pump my milk and bottle-feed him…it is a huge work for me because it is, you know, double feeding." (FG 3)

Most of these young mothers had experienced postpartum depression, although they attributed it to the long winters in Canada, language barriers,

loneliness, lack of support, burden of household duties, and being culturally-restricted from having close contact with the society:

P_1"After discharge I was so depressed that I cried all day and night…I did not know why I am like that, but I was sorrowful…It had even influenced my breastfeeding negatively…Then after a week my husband called Alberta Health Link and they [nurses] said that it was "baby blues". I never knew of something like that but they said that it was normal." [Mother used the word "baby blues" in English] (FG 1)

P_2"What is this "baby blues"?"

P_3 "Is it when baby gets blue out of crying?"

P_1"No, it is actually related to mother and not the baby. It is a kind of depression after delivery. I used to cry uncontrollably while I was happy to be back home with the baby…It took me about 2 or 3 weeks to recover and during that period my milk supply was so low that I had to bottle-feed also."

P_2"I was in the same situation, but I think it is mainly because of being alone and without support…you think you need someone to be with you and at least burden some of your duties, but there is nobody there and you get depressed."

P_3"I agree."

2) Feeding difficulties: The most commonly cited problems clustered around the concern of milk insufficiency in addition to poor latching, thickness of milk, and low milk outflow:

P_1"My main problem was with him not latching on. The first few days at the hospital they [nurses] fed him free formula but then I insisted a lot that I want to breastfeed him, so the nurse gave me these small nipples that are attached to my breasts…so alhamdulilah [praise to Allah] he has been feeding out of me since then and it meant a lot to me. Allah provides babies with food without asking us to do anything in return, you know…I am nourishing him and I am so thankful." (FG 2)

P_2"I had the same problem. One of my nipples is deep inside and it is flat so I have to use nipple shields to express my milk. I have been doing that for four months now."

P_3"My problem was that I had breast pain and ulcers, so I had to pump my milk and feed her through bottle so that my breasts recover…Because my milk was not enough I always mixed it with other liquids...Since two months ago that my breasts recovered, everything has been fine alhamdulilah [praise to Allah] and I have been breastfeeding since then. I tolerated and struggled with pain for my kid's sake."

It is notable that in one of the focus groups, a mother did not contribute to half of interactions (dominance of others). When this participant rejoined the discussion, she received an obviously negative feedback from others in the group, as described in the following interaction:

P_1"At first my milk flow was good, like 400-500cc, but since 2 months ago it has reduced to less than 300cc a day…" (FG 1)

P_2"Sorry to interrupt you but I think 300cc is inadequate for a 6-month old baby. You should mix it with formula or homo-milk…"

P_3"… I think 900-1100cc milk is what your baby needs…"

P_4"Why don't you mix it with some formula?"

P_1"Well, in the morning I breastfeed her before I go to work, and I also pump and leave some milk at home so that my older children could feed her when I am out…but the nurse who vaccinated her told me that her growth is poor and I should feed her more…but you know how costly the formula is…also, she does not cry to let me know that she is still hungry!"

P_2"You are so cruel to her! Even though she does not cry, you should not starve her to death…It is a shame!"

P_3"I agree."

[Pause in interactions for 10 seconds]

From participants' points of view, milk insufficiency was resulted from poor dietary intakes and lack of enough rest. Several factors contributed to mothers' lack of rest and their eventual breastfeeding difficulties, among which lack of help and support from husbands in daily household chores was the most influential factor. However, mothers noted that in their patriarchal culture men are not supposed to help with feminine household tasks and that it was expected. Although mothers were working to cover some of the living expenses, yet they had major burden of domestic responsibilities and they were challenged facing multiple roles as employees, mothers and wives:

"Two months after delivery I found a good job, which is taking too much of my time though. I put her [points at the baby who is being breastfed] at a Muslims' day home while my other children are at school. Although I pump milk at work, it is not as much as before and it does not flow well… My mother says it is because I work too hard and do not rest enough, but I have to... I still enjoy breastfeeding, although I also feed her sugary water or Muhallabia (rice pudding) when she is not full. You cannot believe [laughs], when I get home from work I sit on the floor like this breastfeeding and my other kids are around me while I am chopping foods and making dinner before my husband arrives." (FG 3)

Mothers mentioned that since Middle Eastern men are not culturally supposed to help their wives with household chores, women have to shoulder all household responsibilities which often results in their high levels of stress:

P_1"When I get up at 5 to do the morning prayers, I do not go back to bed because I have 3 kids to take care of…I prepare the breakfast and lunch for my children and husband, breastfeed the younger one and take her to the day home and then go to work. Although I had a cesarean delivery, I have been working from the first day I was discharged from hospital because there is no one else to take care of these responsibilities for me. In Islam, mothers are advised to rest for 40 days after delivery in order to recover, and during that period all your relatives and friends help out with your duties." (FG 1)

P_2"In our patriarchal culture, you do not expect men to help you with home duties…"

P_1"But they also have their every-day issues and problems that we are unaware of. Anyways, my milk has never been enough because I am always under pressure, so I bottle feed the baby with sugary water, herbal water and formula sometimes. I still breastfeed just to satisfy myself that I have not stopped, but in fact I know that my milk is not enough. When breasts are full, they become heavy and mother would know, but mine are not like that anymore…I really like to breastfeed her fully, but it is not possible because my milk is not enough and she keeps on crying when she is hungry."

One mother explained how she has managed milk insufficiency problem:

"I did not have any problems in the first week, but then one night when I breastfed him he did not fall asleep and he cried a lot…I did not know what to do so I called my mother and she said that my milk was not enough, and she was right…She suggested that I feed him formula or sugary water at nights so that I could rest and make some milk for the next day, and I am doing this and it has helped a lot…Financial problems make you work hard during the day, and at night you have to get up and feed the baby; these affect your milk output a lot. I have struggled a lot to continue breastfeeding and if I did not really believe in it, I would have weaned her long time ago."(FG 2)

Poor maternal dietary intake was resulted from poverty and cultural traditions, since these Middle Eastern mothers often sacrificed their own needs for the sake of health and food security of others in the family, especially when resources were low:

> *"In the Persian Gulf countries, mothers sacrifice their own needs during financial hardship so that the needs of their husband and children are taken care of. In Kuwait, they believe that the amount of foods a mother eats influences her milk output, which is logical because you need energy to make milk, right?"(FG 2)*

3) Lack of information: Although mothers were generally well-informed about breastfeeding benefits, their knowledge of exclusive breastfeeding and infant feeding problems was scarce. They had never received education on these issues and had to solve problems based on their own common sense:

> *P_1"My son was hospitalized at 4 months only because of my lack of knowledge and experience… At that time I was informed that my father has passed away and I was extremely sad because I could not attend the funeral…I used to cry all day and night and could not eat anything…After a day or two my milk did not come anymore so I started feeding him table foods but he did not like it. I had heard that if you keep picky eaters hungry they would eventually surrender and feed…But he still insisted after 3 or 4 days and did not eat anything, and even if he did, he immediately threw them up …there was no one to take care of us or even let me know what to do and I was down enough not to care…After 5 or 6*

days, all of a sudden he fainted; I was so frustrated and doctors said it was because of his blood pressure going down." (FG 1)

P_2"Hypotension you mean?"

P_1"Yes, and he was hospitalized for 2 weeks…the issue was that he had only been fed from the breast and so he could not take the bottle…Finally, they [nurses] attached a tube to his nose and fed him through that…Then the nurse told me: "take this nose tube home with you and formula feed him by that", and I said: "never, I would never accept that. My baby is suffering and he does not like it and I do not know how to work with this." Just imagine if he wanted milk when we were outside the home."

P_3"No, it is not practical. Baby feeds every 3 hours!"

P_1"Anyways, the physician said he [baby] would not be discharged until they ensure that I am able to feed him adequately, and I told them: "please, do something to increase my milk so that I could breastfeed him". It was then that the physician gave me some pills to increase my milk supply, although they were so expensive that I stopped taking them once he was discharged. Right now I breastfeed him 3 times a day and supplement it with Shir-berenj (rice dessert)…All these things happened because of my lack of knowledge and misbelieves."

4) Maternal characteristics: Maternal attitudes, confidence and self-efficacy played important roles in breastfeeding decision-making. These Muslim mothers had such positive attitudes toward breastfeeding that all but one who was medically-exempt, were breastfeeding at the time of study and intended to

continue for at least two years. Mothers' strong belief in breastfeeding superiority was shaped through their Islamic background, advice from family and friends back home, and mothers' own previous positive experiences with breastfeeding. Mothers enumerated several benefits for the breast milk, such as being hygienic and easily digestible, having the potential to relieve infants' pain, being cost-effective and accessible and preventing several infant diseases. The breastfeeding experience was often described by words such as "pleasant", "natural" and "healthy", and the mother-infant bonding developed during breastfeeding was considered a rewarding experience. Generally, mothers believed that if breastfeeding is stopped voluntarily, the purpose of motherhood is under question.

> *"I guess breastfeeding is different from formula feeding in that children get hungry faster with the breast milk; it could even be every hour…So in the beginning especially, it took lots of my time and I have other children too. But I do not really mind, I mean, some people might mind but I just tell myself that I know it is for the best and I have made this a priority. I am just okay so breastfeeding is my priority."(FG 3)*

Part of mothers' confidence and problem-solving ability resulted from their consultation with families and friends back home, and another part was from their own previous experiences. Generally, Middle Eastern mothers turned to feeding solid foods and liquids when they faced breastfeeding problems, which is due to their cultural beliefs as well as the lower cost and convenience of solid feeding:

P_1"In the beginning nurses told me to feed him some formula because my milk was not enough and I did, but just a little bit because I could not afford it really…A refugee friend told me once to dilute the formula but I never did, because in Islam we love our children and even if I do not eat anything myself I try to feed the family properly." (FG 4)

P_2"I think cost is a very important factor and government should work on it. We could handle other issues such as lack of nursing rooms and worksite problems, but what can we do with the high cost of foods and formula?"

P_3"Exactly, that is another reason why we struggle to breastfeed." [laughs]

P_4"It is like $28 for 1 can of formula, and even though I was not formula feeding regularly it finished in just about 2 weeks. Those mothers who completely rely on it [formula] must be paying too much, that is so expensive."

P_1"Even if you go for the cheapest brand, the price is not that different, it might be $25 or so, 3-4 dollars saving is not too much."

P_4"Yes, but still… [smiles bitterly and sighs]. If you have to formula feed every time, then it would be better to choose the cheapest brand."

P_1"Breastfeeding is definitely the cheapest way to go."

[Group laughs bitterly]

V.4. Discussion

Comments from Middle Eastern mothers with children under one year of age shed light into the cultural/societal, community, health care system, social networks and mother-infant dyad factors that could influence their breastfeeding behaviours after migration to Canada. Cultural and religious beliefs about breastfeeding emerged as the most important factors influencing infant feeding decisions, with the power to overcome all external barriers to breastfeeding. All mothers except for one, who had medical problems, had been breastfeeding since birth and intended to continue for at least two years. However, none of the mothers were exclusively breastfeeding due to having the formula introduced at the hospital and the cultural custom of pre-lacteal feeding. Traditional foods were fed at the mean age of 2 weeks and the order in which different foods were introduced was not consistent with Canadian feeding recommendations.

High breastfeeding rates observed in the present study are in accordance with those in previous research which have shown that Middle Eastern mothers have the highest rates of breastfeeding intention, initiation and duration both in their home countries (mean breastfeeding duration= 21 months) (64) and after migration to Western societies (31,35,36). Mothers in the present study enumerated several health benefits to breastfeeding, and mentioned that it had healing potential, and was convenient and cost-effective. This is consistent with previous studies which have shown that Arab mothers support breastfeeding and consider it as the easiest and most nutritious method of feeding (31,35).

Generally, Middle Eastern mothers' decision to breastfeed was shaped by their spiritual and religious beliefs, which in turn affected their behaviours. Despite a variety of factors operating at the community, health care, and individual level that negatively influenced infant feeding decisions, these women continued breastfeeding. Studies conducted in Persian Gulf countries support this notion by indicating that the most common reason for cessation of breastfeeding is a "new pregnancy", since Middle Eastern mothers believe that changes in breast milk volume or composition during pregnancy are associated with dangerous health outcomes (65).

Islamic teachings and advice from the Qur'an influence all aspects of culture and tradition in the Middle East. The Islam faith formally recommends two years of breastfeeding as a right of a Muslim child (66-69). In the Islamic culture, offering breast milk to infants is necessary and not to do so is considered a sign of maternal cruelty. In addition, Muslims are advised not to feed animal milk to their infants, and instead foster a "wet-nurse" in situations where mother is unable to breastfeed (70). This would help infants preserve their suckling abilities, gain weight properly, and benefit from the breast milk. However, since the wet-nurse must be a trustful Muslim woman, this practice was not available for mothers in this study, since these new-settlers did not know or trust anyone, even if Muslim, and preferred to feed solid foods when they were unable to produce enough milk. In addition, in Islamic teachings, children who are breastfed by the same woman are considered siblings (although there is no biological relationship) and are prohibited from marrying each other (Quran, verse 4:23),

which must be considered when establishing donor human milk programs in Muslim communities (71). Generally, participants in this study preferred feeding solid foods and liquids when they encountered feeding problems.

Fasting during Ramadan was another Islamic practice with implications for breastfeeding. Although from an Islamic point of view, breastfeeding mothers are temporarily exempt from fasting, all mothers in the present study indicated their intention and willingness to fast. This is in line with previous studies and could be attributed to mothers' unawareness of breastfeeding rules in Islam. Also, there is the belief that milk production is not jeopardized by fasting and even if it is, solid foods could replace the breast milk during the month of Ramadan. Another justification for mothers' decision to fast during breastfeeding might be their willingness to accompany their husbands and family in the fasting rather than having to fast alone at a later time, since all missed fasting days should be compensated by nursing mothers once they stop breastfeeding (70). Fasting during breastfeeding exemplifies a practice that contradicts religious teachings and offers a useful opportunity for development of educational campaigns to target Muslim mothers through the support of their religious leaders.

Unlike Islamic practice which has shown to have a positive influence on the continuation of breastfeeding, some aspects of Middle Eastern culture has a negative impact on its exclusivity by promoting introduction of solids at an early age. Previous studies conducted in the Persian Gulf countries, have indicated high rates of pre-lacteal feeding and mixed-feeding among this group (72). In Saudi Arabia for instance, mixed feeding is the most popular method of infant feeding

(73). Despite a high median duration of breastfeeding, the rate of exclusive breastfeeding among Middle Eastern mothers is low, rarely exceeding one month in most countries (72). Interestingly, the types of foods and liquids that immigrant/refugee mothers fed their infants in Canada were the same as those commonly consumed in the Middle East. Most mothers in the Gulf countries feed their infants ghee (melted clarified butter), dates, honey and water from the first days of life, while glucose and herbal water are introduced during the first week in the belief that they provide colic relief (74). In the Middle Eastern cultural traditions, ghee is fed to infants during the first three days of life to strengthen their bodies and lubricate and sanitize their intestines (74).

In Arabic countries, fruits, vegetables, Muhallabia (rice pudding), yogurt and egg yolk are normally introduced at 3-5 months of age, and by 6-8 months, infants are fed almost all food items, especially starchy foods (staples such as rice, bread, and potatoes) and some meat, poultry and legumes (72). As an Islamic ritual, shortly after birth, a small piece of softened date is rubbed on infants' palate. The purpose of this ritual is to expose the infant to the taste of sweetness, and the ingestion of date or foods per se is not the aim, which should be understood by health care professionals to alleviate parental concerns (66).

Participants consistently compared the governmental and community support for breastfeeding in the Middle East with those in Canada, and cited the Middle Eastern policies as facilitators of breastfeeding. This finding is in line with those of the previous studies which have suggested that the Islamic religion and support systems within the Middle East are the underlying reasons for higher

breastfeeding rates among mothers from these countries (36). At the community level, Canadian worksite policies were criticized when compared to the flexible Middle Eastern policies such as full paid leave, nursing breaks, and subsidized child care facilities (74). In addition, providing Muslim mothers with private nursing rooms in all public places is one other strength of breastfeeding policies established in these traditional societies. In Western countries, lack of private nursing rooms in most public places and also the open concept of neonatal hospital units often interfere with the modesty and privacy of Muslim mothers (66). It is recommended that health care staff practice culturally-sensitive care and administer practical strategies, such as using portable privacy screens or baby blankets to ensure privacy when Muslim mothers need to breastfeed (68).

At healthcare system level, participants claimed that the Islamic structure of Persian Gulf countries has a tremendously positive influence on breastfeeding attitudes of healthcare professionals and on implementation of uniform breastfeeding policies. As a result, contradictory advice from some of the clinicians in Canada seemed unacceptable to new-settler mothers in the present study and led them to mistrust the Canadian healthcare system. This is in line with previous migrant studies which have suggested that recommendations from medical staff are often perceived as vague, negative and inconsistent (55). In addition, mothers believed that some of the Western health care professionals needed to update their information about infant feeding, and they were dissatisfied with the routine practice of bottle feeding in the Canadian hospitals, which they thought could potentially harm infants' sucking ability.

Mothers suggested that provision of culturally-relevant health care (e.g., hotlines, brochures and community nurse) in their own native languages could enhance their confidence and health care use. There is a need for health care professionals to support new-settlers from the Middle East by considering Islamic instructions and the strong cultural link between their religion and infant feeding practices. It is pertinent to understand that breastfeeding is not simply a nutritional or health care choice, but has a religious basis in this population.

At the individual level of influence, several maternal characteristics influenced infant feeding practices. In Canada, higher education and socioeconomic status have been linked with increased rates of breastfeeding initiation and exclusivity (23,75,76). In addition, maternal education has been associated with the types of foods and liquids that are fed to infants (77), which could be justified by the fact that higher education helps mothers formulate well-informed infant feeding decisions (75). However, in contrast to Western countries, women with higher education in developing countries have lower rates of breastfeeding initiation and exclusivity, which might be due to their social transition and westernization (73,78). Mothers in the Gulf countries are usually illiterate or have lower education levels, which is favourably associated with longer duration of breastfeeding (74). In addition, the social support from grandmother, husband, friends, and others in the support network could greatly impact maternal breastfeeding behaviours (79-81).

Moreover, lower socioeconomic status and poverty among participants in the present study had resulted in mothers sacrificing their own needs in order to

ensure food security for the entire family. Maternal self-sacrifice is a common tradition in the Middle Eastern countries, and has resulted in maternal poor nutritional status and breast milk insufficiency in the present study. In Arabic culture, societal expectations often compromise women's health especially after delivery when women are expected to continue their role of taking care of husband and children and doing the housework without complaining, otherwise they would be labeled as a "bad wife" (82). Upon migration to Western countries, women may have to also shoulder financial responsibilities due to economic demands by working and returning to work soon after delivery, all of which jeopardizing mothers' health. Overall, ethnic mothers often suffer from cultural, racial and language barriers which influence their social and health status as well as their infants' health (83).

Finally, among several concerning infant feeding practices in the present study, lack of vitamin D supplementation needs an immediate action. This is particularly important among Muslim groups who cover their bodies and are not exposed to the sunlight adequately; especially in Canada where infants might be at high risk of vitamin D deficiency (84-87). Since the high cost of vitamin D supplements and the higher recommended daily requirement of vitamin D for dark-skinned Middle Eastern children were the main barriers to supplementation, implementing interventional strategies to address the cost issue seems promising.

There are several strengths associated with the present research. This is the first study to evaluate Middle Eastern mothers' infant feeding beliefs and practices after migration to a Western country using an ethnographic design.

Secondly, conducting focus groups in mothers' native languages by bilingual researchers, translating and back-translating the data and final codes, and analyzing the data in the language of interviews were significant features of this research which enriched our findings (51). The limitation of this study, however, is inherent in its qualitative design. Being a pilot hypothesis-generating study, only a small number of participants were recruited, although Sharp suggests that theoretical generalization arising from a non-representative sample is valid and it generates theoretical explanation of the phenomena (88).

Findings from the present study inform an urgent need for development of in-service educational strategies targeting exclusive breastfeeding, complementary feeding, and maternal nutrition among Middle Eastern mothers in Canada. Health care professionals need continuing education that provides common messaging to avoid inconsistencies, since practitioners' behaviours are the most influential front lines in perceptions of ethnic mothers from primary health care. Some other suggestions made by mothers that are thought to improve the current infant feeding situation include: 1) offering equal services and benefits to citizen and non-citizen infants, 2) subsidizing medical insurance, drugs and supplement costs for those who cannot afford, 3) employing bilingual health care staff and providing translated educational resources which include ethnic foods, 4) monitoring the day care/day home costs, and 5) increasing governmental support for employed mothers and for breastfeeding in public.

Although our findings might be of relevance to many young refugee/immigrant Middle Eastern mothers in Canada, it is suggested that further

research is conducted to determine if these findings resonate with other mothers of similar socioeconomic context in Canadian society.

V.5.Conclusion

Comments from the focus groups reinforced a model for successful breastfeeding which is rooted in communities with continuous, seamless and reinforcing interventions. Media campaigns are recommended to target Middle Eastern families focusing on the importance of exclusive breastfeeding and timely introduction of complementary foods. In addition, clinicians should support breastfeeding through demonstrating respect for Islamic beliefs and by differentiating them from cultural practices. Interventions to promote breastfeeding practices must occur at different levels of influence and consider religious beliefs and socioeconomic status in order to be successful. The long-term implication of this study is development of effective and culturally-acceptable educational interventions to reduce the likelihood of introduction of solids to infants before 6 months of age.

Table V.1. Key characteristics of the Middle Eastern mothers in an ethnographic study in Edmonton, AB, Canada[1]

Characteristics	Values
Age[2], *years*	25.5 (10.0)
Marital status	
Married	21 (95.5)
Widowed	1 (4.5)
Education level	
Illiterate	1 (4.5)
<High school degree	1 (4.5)
Completed high school degree	15 (68.2)
Some college or university[3]	3 (13.6)
Completed college or university degree	2 (9.1)
Employment status	
Employed for wages	2 (9.1)
Self-employed	5 (22.7)
Unemployed	15 (68.2)
Ethnicity (Birth place)	
Iran	6 (27.3)
Iraq	4 (18.2)
Kuwait	6 (27.3)
Saudi Arabia	6 (27.3)
Religion[4]	
Islam	22 (100.0)
Length of residency in Canada	
<1 y	1 (4.5)
1-3 y	12 (54.5)
4-5 y	5 (22.7)
>5 y	4 (18.2)
Annual household income, *CAD*	
< 20,000	7 (31.8)
20,000-39,000	12 (54.5)
40,000-69,000	2 (9.1)
70,000-99,000	1 (4.5)
Smoking/recreational street drug abuse	0 (0.0)
Alcohol consumption	0 (0.0)
Parity[2], *n*	2.0 (1.0)
Gestational age[2], *weeks*	39.0 (1.0)
Chronic disease history	
Cardiovascular disease	2 (9.1)
Diabetes	2 (9.1)
Goiter	2 (9.1)
None	16 (72.7)
Planned pregnancy	

Yes	14 (63.6)
No	8 (36.4)
Body mass index[2], *kg/m²*	27.3 (7.4)
Partner's education	
Some high school (grades 10-11)	1 (4.5)
Completed high school degree	3 (13.6)
Some trade, technical, vocational school or business/community college	7 (31.8)
Completed trade, technical, vocational school or business/community college	6 (27.3)
Completed university undergraduate degree	3 (13.6)
Completed university post-graduate degree	2 (9.1)
Partner's employment	
Employed for wages	14 (63.6)
Self-employed	7 (31.8)
Unemployed	1 (4.5)

CAD: Canadian dollars

[1]Values are n (%), unless otherwise noted

[2]Median (interquartile range (IQR))

[3]Have some post-secondary education, but not completed

[4]Although participants were not asked about their religion, when asked of their ethnicity, all women indicated that they followed Islam

Table V.2. Infant feeding practices of Middle Eastern mothers in an ethnographic study in Edmonton, AB, Canada

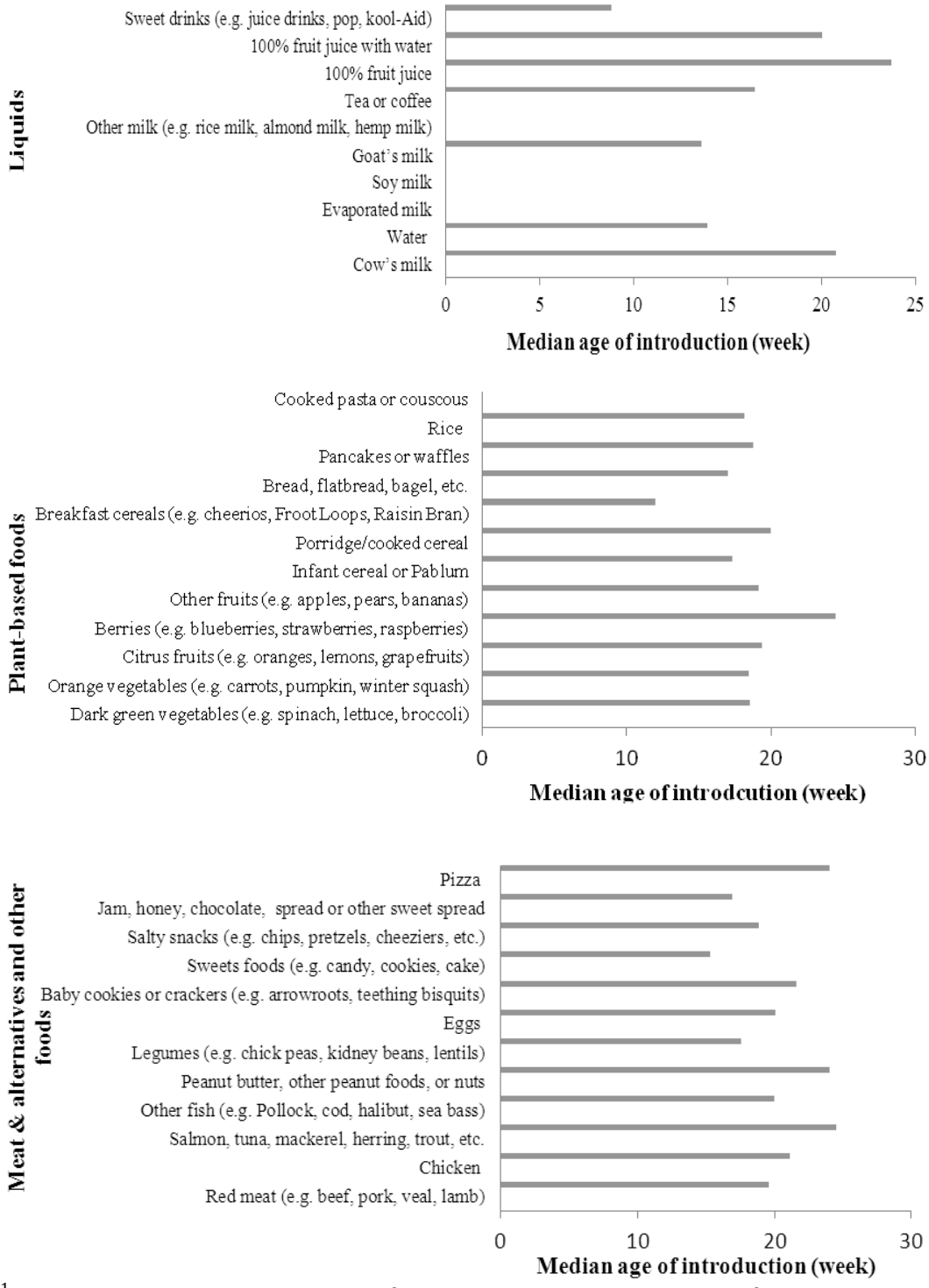
Characteristics	n (%)
Any breastfeeding	
Breastfeeding from birth and still continuing to do so	21 (95.5)
Breastfeeding from birth but have stopped	1 (4.5)
Reason for stopping breastfeeding	
Drug interaction (physician's advice)	1 (4.5)
Any formula feeding	
Introduced formula and still continuing to do so	2 (9.0)
Introduced formula but have stopped	9 (40.9)
Never introduced formula	11 (50.0)
Timing of introduction of formula	
Not yet introduced	11 (50.0)
First day at hospital	9 (40.9)
Before 3 months postpartum	2 (9.0)
Reasons for stopping formula feeding	
Did not like to feed artificial milk	7 (31.8)
High cost of formula	2 (9.1)
Exclusive breastfeeding	0 (0.0)
Reasons to avoid feeding some types of foods[1]	
Not being Halal (e.g., pork, alcohol, gelatin and meat not slaughtered ritually)[2]	22 (100.0)
Grandmother's advice	1 (4.5)
Baby's lack of interest	3 (13.6)
Food allergy	6 (27.3)
Types of foods avoided for infants[1]	
Non-Halal[2]	22 (100.0)
Egg	3 (13.6)
Nut	1 (4.5)
Oat	1 (4.5)
Vitamin/mineral supplementation[3]	
Vitamin D	18 (81.8)
None	4 (18.2)
Methods of infant feeding	
Bottle	7 (31.8)
Sippy cup without valve	1 (4.5)
Open cup	14 (63.6)
Person responsible for preparing infants' foods	
Mother	22 (100.0)
Main sources of infant feeding information	
Grandmother	9 (40.9)
Grandmother and relatives	9 (40.9)
Previous experience	4 (18.2)

[1]Subjects chose more than one option and therefore categories are not mutually exclusive
[2]Although not included in the original questionnaire of the Alberta Pregnancy Outcomes and Nutrition (APrON) study, this category was added by mothers themselves
[3] Note: In the Middle East unlike Canada, breastfed infants are not recommended to take vitamin D supplements since birth

Table V.3. Complementary foods introduced to the Middle Eastern infants in an ethnographic study in Edmonton, AB, Canada

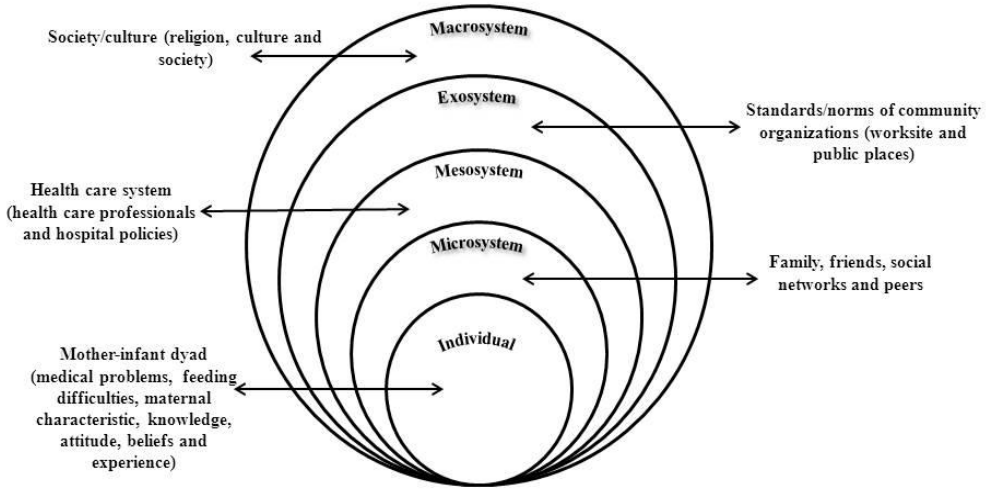
Complementary feeding	**n (%)**
First complementary foods introduced	
Mashed dates (Halawi)	6 (27.3)
Rice pudding (Muhallabia/Ferni/Harire badam)	5 (22.7)
Sugared water/tea	5 (22.7)
Rice water	4 (18.2)
Butter (ghee) and sugar	1 (4.5)
Rice dessert (Roz-belhalib/Shir-berenj)	1 (4.5)
Timing of introduction of table foods	
Not yet introduced (<6 months)	3 (13.6)
12 weeks	1 (4.5)
16 weeks	6 (27.3)
18 weeks	4 (18.2)
20 weeks	6 (27.3)
22 weeks	1 (4.5)
24 weeks	1 (4.5)

Figure V.1. Age of introduction of liquids and solid foods to the Middle Eastern infants in an ethnographic study in Edmonton, AB, Canada[1,2]



[1]Data are presented only among infants who have consumed these food items
[2]Traditional food items are not included

Figure V.2. Different levels of influence explaining the breastfeeding behaviours of Middle Eastern mothers in Canada according to the human ecological framework



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Chapter VI: Conclusions and Future Directions

VI.1. Summary of findings

Little is known about the transitions in Canadian infants' dietary patterns during the first six months of life and whether the current feeding practices meet the World Health Organization (WHO) guidelines (1). In addition, even less is known about the characteristics of parents who choose not to exclusively breastfeed their infants for 6 months. Specifically, no previous studies in Canada have assessed the role of prenatal women's attitudes towards infant feeding in their actual feeding decisions postpartum. On the other hand, a paucity of data exists on the potential role of culture and ethnicity in infant feeding practices of immigrant/refugee mothers residing in Canada, while foreign-born individuals comprised 20% of Canada's total population in 2006 (2).

The present research was conducted in response to global health concerns regarding the impact of early-life feeding practices on future health problems (1).To address the aforementioned gaps in the literature, this thesis research included two distinct studies to create a descriptive profile of infant feeding status and its potential predictors in Alberta province.

Study one of this thesis project, was undertaken within the framework of a large-scale cohort study to longitudinally evaluate infant feeding transitions during the first 6 months postpartum, and to investigate the potential predictors of 6-month exclusive breastfeeding among Albertan mothers. This study revealed a low prevalence of 6-month exclusive breastfeeding and at the same time found high rates of early feeding of solid foods among Albertan women. Education,

parity and maternal knowledge and attitudes towards infant feeding were recognized as independent predictors of 6-month exclusive breastfeeding among Albertan mothers. In the present study, maternal knowledge and attitudes were assessed prenatally and overall the majority of Albertan mothers had a neutral attitude toward breastfeeding. This study was also the first Canadian study to evaluate psychometric properties of the Iowa Infant Feeding Attitude Scale (IIFAS) (3). Our findings suggested that the IIFAS is a valid and reliable measure of infant feeding attitudes for use among prenatal women.

Despite the several strengths inherent in the first study of this thesis, a major limitation of this research was the homogeneity of sample with regards to socio-demographic and economic variables. To address this limitation, we conducted a second study among a group of new-settler, low-income Middle Eastern mothers in Alberta to evaluate from the Middle Eastern mothers' perspective, the experience of infant feeding and the attributes of health care system, community and society on their infant feeding decisions after migration to Canada. Using a two-part ethnographic approach, we obtained a comprehensive understanding of the maternal beliefs, cultural/religious values, knowledge and attitudes concerning infant feeding. In this study, several feeding problems and concerns were observed among Middle Eastern mothers including pre-lacteal feedings and lack of vitamin D supplementation. Mothers' focus groups identified five layers of influence which describe Middle Eastern women's process of decision making: society/culture, community, health care system, family/friends, and mother-infant dyad. Religious beliefs were the strongest determining factors

dismissing all negative influences on breastfeeding; however, cultural practices promoted early introduction of certain foods and liquids and thus jeopardized breastfeeding exclusivity. Religious belief was an umbrella theme that was woven throughout all discussions in the second study and was found within the other themes. Findings suggest a need for interventional programs using ecological approach to consider the socio-cultural and contextual factors influencing maternal feeding decisions. Generally, our data underscored the necessity of integrating Middle Eastern mothers' cultural practices into developing and implementing interventional strategies in order to improve infant feeding practices among this vulnerable group.

Together, both studies provide a descriptive profile of Albertan infants' feeding patterns and their most important predictors. Our sample in study one was a highly-educated, high-income Caucasian sample of Albertan families which might have implications for the generalization of findings to the whole population of Alberta. However, study two partly compensated for this limitation by studying solely a group of new-comer, low-income, immigrant/refugee mother-infant dyads in Alberta. Notably, a disconnect was observed between ethnic women's infant feeding practices and their preference and enthusiasm for providing the best care to their children, which could be attributed to their cultural and religious norms and their lower levels of literacy. It is suggested that this issue is explored in future studies.

Overall, behavioural determinants of health seem to play important roles in determining the feeding decisions among women and infants residing in

Alberta, and therefore, more attention should go into targeting these modifiable factors in order to close the gap between current infant feeding practices and the national and international guidelines.

VI.2. Implications, recommendations and future directions

Findings from this research project make a number of important contributions to the literature in understanding the current patterns and transitions in infant feeding practices in relation to national and international guidelines. Providing a longitudinal account of infant feeding as well as exploring the perceptions and cultural norms and values of Albertan mothers with regards to infant feeding were novel approaches taken in this thesis project in an attempt to compensate for the limitations of previous studies.

The high breastfeeding initiation rates in Alberta in addition to low rates of 6-month exclusive breastfeeding observed in this study highlight the success of breastfeeding promotion programs in increasing the breastfeeding rates during the early postpartum period, although a shift is needed now to focus on the exclusivity of breastfeeding and improving its sustainability.

These findings have implications for health care professionals to be more aware of the challenges and concerns women might face over time with regards to infant feeding. Provision of professional advice focusing on pregnant women's knowledge, attitudes and misperceptions, as potential targets for focused interventions, is necessary in this population. Our findings support the use of the IIFAS as a valid and reliable tool for screening women prenatally in order to understand their attitudes toward breastfeeding and to identify whether actions are required to improve maternal infant feeding knowledge and beliefs (3). These findings could be potentially used as a basis for designing and implementing educational programs among similar populations to address pregnant women's

misconceptions about convenience of formula feeding, which was a common belief in this study. Public health campaigns focusing on social acceptability of breastfeeding may also prove effective in addressing the cultural barriers to breastfeeding in Alberta.

The second study also makes an important contribution to our understanding of the way Middle Eastern women conceptualize infant feeding after migration to Canada, their common concerns, cultural beliefs and practices, and the way these factors work together to shape infant feeding decisions. Findings from this research offer new insights into how religion and culture converge to form choice of child feeding and how important these concepts are in a Middle Eastern woman's life. In addition, these findings serve an additional purpose in that they could be used to leverage support and resources for developing culturally-appropriate and sustainable programs to address the specific needs of Middle Eastern infants in order to improve their feeding status.

The benefit of using a two-phase ethnographic approach was that it allowed women's experiences to be addressed in a discovery-oriented and inductive way rather than the deductive way. It enriched our understanding of the reasons behind Middle Eastern mothers' high rates of breastfeeding as well as the rarity of exclusive breastfeeding among this group. By pursing this research, we hoped to understand the feeding behaviours among a migrant population in Canada based on the reflections of the "lived experience" discussed by the participants.

Future studies are suggested to address the barriers to proper infant feeding practices at different layers of influence according to the Human Ecological Model (4). Using an ecological approach, the status of infant feeding in Canada could be improved substantially among both the Canadian-born infants as well as immigrant/refugee groups.

VI.3. References

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Chapter VII. Appendices

Appendix A

Ten Steps to Successful Breastfeeding

Every facility providing maternity services and care for newborn infants should:
Step 1: Have a written breastfeeding policy that is routinely communicated to all health care staff.
Step 2: Train all health care staff in skills necessary to implement this policy.
Step 3: Inform all pregnant women about the benefits and management of breastfeeding.
Step 4: Help mothers initiate breastfeeding within a half-hour of birth.
Step 5: Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants.
Step 6: Give newborn infants no food or drink other than breast milk, unless medically indicated.
Step 7: Practise 24-hour rooming-in.
Step 8: Encourage breastfeeding on cue.
Step 9: Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.
Step 10: Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

Source: *World Health Organization, United Nations Children's Fund. Protecting, promoting and supporting breastfeeding: The special role of maternity services. Geneva: WHO/UNICEF;1989.*

Appendix B

Summary of the International Code of Marketing of Breast Milk Substitutes

- No advertising of these products to the public.
- No free samples to mothers.
- No promotion of products in health care facilities.
- No company mothercraft nurses to advise mothers.
- No gifts or personal samples to health workers.
- No words or picture idealizing artificial feeding, including pictures of infants, on the labels of the products.
- Information to health care workers should be scientific and factual.
- All information on artificial infant feeding, including the labels, should explain the benefits of breastfeeding, and the costs and hazards associated with artificial feeding.
- Unsuitable products, such as sweetened condensed milk, should not be promoted for babies.
- All products should be of a high quality and take account of the climatic and storage conditions of the country where they are used.

Source: *World Health Organization. The international code of marketing of breast milk substitutes [Internet]. 1981 [cited 2012 Feb 12]. Available from: http://www.who.int/nutrition/publications/code_english.pdf*

Appendix C

Ethics Approval
Re-Approval Form

Date:	February 14, 2011
Principal Investigator:	Catherine Field
Study Title:	Alberta Pregnancy Outcomes and Nutrition (APrON)
Approval Expiry Date:	February 13, 2012
Sponsor/Funding Agency:	AHFMR - Alberta Heritage Foundation for Medical Research

The Health Research Ethics Board - Biomedical Panel has reviewed the renewal request and file for this project and found it to be acceptable within the limitations of human experimentation.

The re-approval for the study as presented is valid for one year. It may be extended following completion of the annual renewal request. Beginning 45 days prior to expiration, you will receive notices that the study is about to expire. Once the study has expired you will have to resubmit. Any proposed changes to the study must be submitted to the HREB for approval prior to implementation.

All study-related documents should be retained, so as to be available to the HREB on request. They should be kept for the duration of the project and for at least five years following study completion.

Sincerely,

S.K.M. Kimber, MD, FRCPC
Chair, Health Research Ethics Board - Biomedical Panel

Note: *This correspondence includes an electronic signature (validation and approval via an online system).*

Appendix D

Study Information

MATERNAL INFORMATION SHEET

TITLE: Alberta Pregnancy Outcomes and Nutrition (APrON)[1]

INVESTIGATORS:, Catherine J. Field[2], Bonnie J. Kaplan,[1]Deborah Dewey[1], Rhonda Bell[2], Francois Bernier[1], Marja Cantell[1], Michael Eliasziw[1], Anna Farmer[2], Lisa Gagnon[1], Laksiri A. Goonewardene[2], Libbe Kooistra[1], Donna Manca[2], Linda McCargar[2], Maeve O'Beirne[1], Victor J.M. Pop[3], Nalini Singhal[1]
[1]University of Calgary, [2]University of Alberta, [3]University of Tilburg (The Netherlands)
Edmonton contact: **780-492-4667 or 780-240-1133**; Project Manager Dave Johnston at 403-955-2771

BACKGROUND AND PURPOSE

What we eat and drink tends to influence our health, both mental and physical. We would like to learn more about how nutrition influences pregnancy. Specifically we are interested in the role(s) of nutrition in women's health, baby's health, and the long term health and development of the child.

To help answer these questions, we are inviting you to join us in a study of 10,000 pregnant Albertan women and their children. The purpose of APrON is to learn how nutrition during pregnancy may affect women's physical and mental health, the health of the baby, and child health and development later on. The results of the study will be presented to parent groups, health professionals, food producers, day cares, and school boards. Our findings may improve the health and wellness of women and the health and development of children.

WHAT WOULD I HAVE TO DO?

Because this study will follow women through pregnancy and for several years after their babies are born, many measures will be collected over time:

1. Questionnaires. We are asking you to complete questionnaires at 8 time points:
    a. When you first agree to be in the study (which will hopefully be in your first trimester)
    b. Between 13-27 weeks of pregnancy (second trimester)
    c. Between 28-40+ weeks of pregnancy (third trimester)
    d. 2 - 3 months after your baby is born
    e. Six months after your baby is born
    f. Twelve months after your baby is born
    g. Two years after your baby is born
    h. Three years after your baby is born

[1] The full title is the AHFMR Interdisciplinary Team Grant on the Impact of Maternal Nutrient Status during Pregnancy on Maternal Mental Health and Child Development.

The questionnaires will ask about *what you eat, how you feel, and what your pregnancy experience is like*. After your baby is born, the questionnaires will also ask you about *your baby's health, eating, crying, and behaviour.*
The questionnaires do not have to be done all at once; they can be completed in more than one sitting. Some of the questionnaires can be completed on: a) a secure University internet site, b) paper, or c) by telephone interview. In other words, *we will try to make these questionnaires fit into your busy life*. We estimate the questionnaires will take about two hours to complete at each of the eight time points.

2. Blood samples from you. You will be asked to provide a blood sample a total of 4 times during the study (3 times during pregnancy and once more, 3 months after your baby is born). The blood will allow us to look at the nutrient levels in your blood (e.g., vitamins, hormones, and measures of how they break down in your blood). Each blood sample is about 2.5 Tablespoons. On 2 occasions we will also ask you for a urine sample. The urine will be used to look at other nutrients. Each blood sample will take about 15 minutes.
3. Cheek swab or saliva sample from you. If there is no blood sample from you, we may ask you to rub a small brush inside your cheek (a cheek swab), or to provide a saliva (spit) sample. The cheek swab or saliva sample will be put in a plastic bag and returned to us in a pre-addressed and stamped, confidential envelope. The cheek swab or saliva sample will determine how genetics might relate to nutrition and health.
4. Body measurements. On 3 occasions during your pregnancy and at least one after birth we will measure your height and weight, arm and waist circumferences, and skin-fold thickness. We estimate this will take about 15 minutes.
5. Biological father questionnaires, and cheek swab or saliva sample. Around the middle of your pregnancy we will invite the biological father to participate in the study. The biological father is not required to take part. If you give us permission to contact him we will ask him to: a) complete a questionnaire during the pregnancy and after the delivery, and b) rub a small brush inside of his cheek or to provide a sample of his saliva. The sample and consent form are to be returned to us pre-addressed and stamped, confidential envelope. The cells from inside the cheek or the saliva will allow us to study whether the biological father's genetics relate to the child's health and development. We estimate this will take 5 minutes of his time.
6. Breast milk sample. If you are breast feeding, we will ask you to provide a few drops of your breast milk about 3 months after your baby is born. We will examine the nutrient content of the breast milk. A small piece of paper will be provided for this. The paper can be mailed back to us in a pre-addressed and stamped envelope or given to us when you meet with a member of our group. We estimate this will take about 5 minutes.
7. Blood sample from your baby. About 3 months after your baby is born we will ask if you are willing to allow us to take a small blood sample of

about 1 teaspoon. Blood samples will be taken by a trained nurse or technician. As with your own blood sample, your baby's blood sample will allow us to look at the nutrient levels in the blood (e.g., vitamins, and hormones). From the blood, we will also look at how genetics might relate to the nutrition and health of your baby. Your baby's blood sample should take about 15 minutes and it will be done when you are providing your own blood sample. Other options for getting samples from your baby may be available, including cheek swabs or saliva samples for genetics and heel pricks for nutrition.

8. Assessment of your child. When your child reaches three years of age, we may ask if we can assess his/her development, thinking, and learning ability. If you agree, a series of tests will be used to look at your child's learning and behavioural development. These tests will take about 1 ½ to 2 hours and will take place at a time of your choosing. Trained professionals will conduct these tests. You will be provided with verbal and written feedback about your child's performance.
9. Access to health records. We are asking for permission to access the health records for your pregnancy, delivery, and your child. Also, if you move and we lose touch with you, we ask your permission to contact Alberta Health and Wellness for your contact information so we can find out if you would like to continue your participation.

We estimate that the total time commitment for you and your child for study participation will be approximately 30-35 hours over the 4 year period.

WHAT ARE THE RISKS OF MY PARTICIPATING?

1. Blood samples: Blood will be taken from an arm vein by a person trained to draw blood (nurse, technician). Risks associated with blood draws include infection, bruising, blood clots, or inflammation. Steps will be taken to limit or avoid these risks.
2. Cheek swabs or saliva samples: A small brush will be used to rub against the inside of the cheek (cheek swab). A saliva sample will be provided by spitting on a piece of paper. The cheek swab or saliva sample poses no risk.
3. Heel pricks: If you do not wish your infant to have a needle for blood draws, a heel prick may be used instead. A few drops of blood will be collected on a piece of paper by pricking the infant's heel. Some minor bruising may occur and it may cause a small amount of pain to your infant.
4. All other measures: It is possible that answering questions about your health history or mental state may raise some feelings of sadness or distress. If at any point during the study you are having any difficulty with your mood or stress level, or feel you need some help with your mental health, please call your family doctor, the Distress Line at 780-482-4357 or the Edmonton Mental Health Clinic at 780-427-4444.

WILL I BENEFIT IF I TAKE PART?

If you agree to take part in this study there may or may not be a direct benefit to you. If your child takes part in the in-depth testing at age 3, we will provide you a summary of his/her results. If the testing identifies early development or learning problems, we would recommend that you discuss the results with your child's regular doctor. By participating in APrON you will become a member of our team of participants and have access to a special website that will keep you updated on how the study is going.

DO I HAVE TO PARTICIPATE?

Taking part in this study is voluntary. You may choose not to answer some questions, not to take part in some tests, or to withdraw from the study at any time without affecting your health care. You can withdraw by contacting the Edmonton Project Coordinator at **780-492-4667 or 780-240-1133**.
Similarly, if you are unable to complete the study information in a suitable timeframe, the study staff may withdraw you.

WHAT ELSE DOES MY PARTICIPATION INVOLVE?

APrON will be following participants over a period of 3-4 years. At the end of the study, all samples (blood, cheek swabs) including DNA and all clinical data will be securely held by the researchers. It is possible more studies will develop from APrON. As a result, participants and their children may be followed beyond the first period of 3-4 years. You and your child may be asked to take part in these future studies. Access to the data and the samples will only be allowed for studies that have been approved by a Research Ethics Board. By signing below, you agree to have your information and left over samples examined in the future by other researchers. If at any point you decide you do not want researchers to keep your samples and data, by providing researchers with a written request you can always ask that your data and samples be destroyed.

I agree to have my own and my child's left over biological samples (blood and DNA) available to researchers for future studies which have been approved by a Research Ethics Board. No further consent will be needed from me in order for this to happen. I understand that these samples will only be released with non-identifying information. I can still request my samples be destroyed at any time

Signature: _____Date: __day ___month ____year

WILL I BE PAID FOR PARTICIPATING, OR DO I HAVE TO PAY FOR ANYTHING?

You will not be paid for participating, but we also want to ensure that your participation does not cost you anything. We will reimburse any traveling or parking costs related to you taking part in this study.

WILL MY RECORDS BE KEPT PRIVATE?

The consent forms and any questionnaire information you provide will be kept in locked filing cabinets or scanned and shredded in a locked confidential bin. Your privacy and your identity will be kept confidential. The questionnaire and study information you provide will only be accessed by the researchers and will be kept locked in a secure research area. The study database will be stored on a computer drive protected by a password.

All samples will be stored in locked freezers in a secure research facility. The labeling of samples will be done with a study code number and will not identify you by name, health care number or initials.

By signing the consent form you give permission for the collection and use of your medical records. Even if you withdraw from the study, the medical information that is obtained from you for study purposes will not be destroyed, unless a written request is received from you.

All participants will receive regular newsletters, updating them on the progress of this study. At the end the whole study, or even at completion of parts of the study, we will send a summary to each participant. All the information contained in our summaries will be anonymous, and based on group data. Any report published as a result of this study will not identify you by name, address or any other personal information.

IF I SUFFER A RESEARCH-RELATED INJURY, WILL I BE COMPENSATED?

In the event that you suffer injury as a result of participating in this research, you will not be compensated in any way by the funder (AHFMR,) the University of Calgary, Calgary Health Region, the University of Alberta, Capital Health Region, Alberta Health Services, or the Researchers. You still have all your legal rights. Nothing said in this consent form alters your right to seek damages.

If you have further questions related to this research, please contact:

Dr. Catherine Field (APrON Edmonton) **780- 492-4667**
Or
APrON Project Manager: Dave Johnston at 403-955-2771

If you have any concerns about any aspect of the study, please contact Health Research Ethics Board office, University of Alberta 780-492-9724.

Appendix E

Consent Form

MATERNAL CONSENT FORM

Title of Project: Alberta Pregnancy Outcomes and Nutrition (APrON)

Principal Investigator: Dr**.** Catherine Field Phone: 780-492-4667

Co-Investigators: Dr. Linda McCargar, Dr. Rhonda Bell, Dr. Anna Farmer, Dr. Donna Manca

Please circle your answers:

Do you understand that you have been asked to take part in a research study?
Yes No

Have you received and read a copy of the attached Information Sheet?
Yes No

Do you understand the benefits and risks involved in taking part in this research study?
Yes No

Have you had an opportunity to ask questions and discuss this study with the researchers?
Yes No

Do you understand that you can refuse to participate or withdraw from the study at any time?
Yes No

You do not need to give a reason for withdrawing. Refusing to participate or withdrawing will not affect the medical care you receive.

Has the issue of confidentiality been explained to you?
Yes No

Do you understand who will have access to your information?
Yes No

Do you want the investigators to inform your family doctor that you are participating in this research study?
Yes No

Doctor's name: _____

Do you agree to be contacted for future research studies and programs?
Yes No

I agree to take part in this research study.

_____	_____	_____
Printed Name of Participant	Signature of Participant	Date
_____	_____	_____
Printed Name of Witness	Signature of Witness	Date

I believe that the person signing this form understands this study and voluntarily agrees to participate.

_____	_____	_____
Printed Name of Investigator	Signature of Investigator	Date

Appendix F

Iowa Infant Feeding Attitude Scale (IIFAS)

The copyrighted questionnaire may be found at:
De La Mora A, Russell DW, Dungy C, Losch M, Dusdieker L. The Iowa Infant Feeding Attitude Scale: Analysis of reliability and validity. J Appl Soc Psychol. 1999;29:2362-2380.

Appendix G

Ethics Approval
Notification of Approval – Amendment

Date:	July 8, 2011	
Amendment ID:	Pro00022960_AME3	
Principal Investigator:	Mahsa Jessri	
Study ID:	MS2_Pro00022960	
Study Title:	Barriers to compliance with infant feeding recommendations among diverse ethno-cultural groups in Edmonton	
Supervisor:	Anna Farmer	
Sponsor/Funding Agency:	Women and Children's Health Research Institute	WCHRI
Approved Consent Form:	Approval Date 6/13/2011	Approved Document Consent Form
Approval Expiry Date:	June 11, 2012	

Thank you for submitting an amendment request to the Research Ethics Board 3 . This amendment has been reviewed and approved on behalf of the committee. The following has been approved: Change in Inclusion Criteria and Methods (pertaining to language). It is noted that a basic knowledge of English is no longer required, and that the recruitment form, consent form, focus group guide and 2 questionnaires have been translated into Arabic.

Sincerely,

Dr. Wendy Rodgers

Chair, Research Ethics Board 3

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix H

Study Information

University of Alberta
Title of Research Study: Attitudes toward infant feeding among ethno-cultural groups in Edmonton
Principal investigator: Mahsa Jessri

For More Information Please Contact:
Mahsa Jessri or **Dr. Anna Farmer** at **780.492.8837**

Volunteers Needed for the Infant Feeding Project

What are you talking about??
This study is being conducted for credit by a graduate student (Mahsa Jessri) at the University of Alberta in partnership with Women and Children Health Research Institute, funded by the Stollery Children's Hospital Foundation. We are interested in knowing your views and experiences during and after pregnancy regarding the infant feeding choice and decision.

Who can participate?
We are looking for **mothers aged ≥18** who have **babies less than 1 year old**
What do I have to do??

1. Meet with a group of other mothers for about 1.5-2 hours
2. Participate in a brief taped focus group discussion with Mahsa Jessri
   - We'll ask some questions but mostly we're there to listen to you
   - You will receive a $25 gift certificate, infant feeding brochures from Health Canada and some refreshments for participating in the focus group
3. Answer some questions about yourself and the way you feed your infant

How much time will it take??
You will be asked to volunteer about 1.5-2 hour of your time. You can withdraw from the study at any time without penalty and you would still receive the gift card

Appendix I

Consent Form

University of Alberta
Title of Research Study: Attitudes toward infant feeding among ethno-cultural groups in Edmonton
Principal investigator: Mahsa Jessri
For more information please contact: Mahsa Jessri or Dr. Anna Farmer at 780.492.8837

Consent Form

This study is being conducted for credit by a graduate student (Mahsa Jessri) at the University of Alberta in partnership with Women and Children's Health Research Institute, funded by the Stollery Children's Hospital Foundation. The purpose of this research is to learn more about your views toward infant feeding (e.g., bottle feeding, breast feeding) during the time when you were pregnant and now that you have given birth. The information that you tell the researcher will be used to create resources to support the nutrition information needs of multiethnic women in Canada. They may also be used in public presentations, journals and conferences.

You will be asked to take part in a 1.5-2-hour focus group and will be asked to answer questions about your experiences regarding infant feeding. The researcher will be taking notes and discussions will be audio-taped to ensure the accuracy of our future reports and also for back-up purposes. However, if you do not want to be recorded we will take note of your statements alternatively, after obtaining the agreement of other mothers in the group. After the focus group you will be asked to fill in 2 questionnaires about your general characteristics and the way you feed your infant. All the information that you give will be held **strictly confidential** and **anonymous**. You will not be personally identified in any reports of this study. No one but the principal investigator, supervisor and research committee will have access to the information and it will be kept secure under lock and key in Dr. Farmer's office in Agriculture/Forestry Center at the University of Alberta for a minimum period of five years. However, we cannot guarantee that others in the focus group will maintain the confidentiality of what is said. In addition, there is always the risk that you might feel upset or uncomfortable by some of our questions. The principal investigator would be happy to provide a list of appropriate services if you would like to discuss your reaction to our questions in more detail.

The possible benefits to you of participating in this study would be having a chance to talk about your experiences to women who are in the same situation and also receiving infant feeding brochures from Health Canada describing proper infant feeding practices. You will also receive a $25 gift certificate and some refreshments for participating in the focus group.

You will receive a copy of this Consent Form and you can ask more about the study if you wish at any time. If you want to provide your home or email address, you will receive a report of the study findings.

If you have concerns about your rights as a study participant, you may contact the Research Ethics Office at (780)492-2615. This office has no affiliation with the study investigators.

I hereby consent to participate in the above research project. I understand that my participation is voluntary and that I may change my mind and refuse to participate or withdraw at any time without penalty and I would still receive the gift card. I may refuse to answer any question or I may stop the discussion. I understand that some of the things I say might be directly quoted in the text of the final report and subsequent publication but my name will not be associated with that text. I understand that I have the right to ask questions about the study and my role.

I give permission to audio recording **□Yes** **□ No**

I agree to participate in the study as described above and on the Information Sheet.

Participant Printed Name
Signature Date
Principal investigator Printed Name
Signature Date
Witness Printed Name
Signature Date

Appendix J

Interview Guide for Focus Groups

University of Alberta

FOCUS GROUP WITH MOTHERS

Discussions will be conducted in Arabic/Persian. All conversations will be audio-taped then typed out in English except for each person's name.

Introduction (10 minutes)

- Review voluntary participation and anonymity of responses
- Discuss the purpose and nature of the study and selection process
- Inform participants that you are interested in their opinion and personal experiences
- Inform participants that their responses will not compromise their involvement with the Multicultural Health Brokers
- Inform participants that even if they withdraw, they will receive the gift card
- Inform participants that they are being taped
- Inform participants that all interview data will be combined and analyzed for major themes
- Inform them that they are free to interrupt and ask for clarification (You should not worry about disagreeing with each other – everyone should feel free to say what they think, even if it is different from what others in the group say)

Themes of the Focus Group

We are interested in understanding maternal attitudes, perceptions and motivation toward infant feeding during the perinatal and postnatal periods. Due to the exploratory nature of this study, the first focus group will be conducted to shape the questions that will be targeted at these women. However the main areas of the focus group discussions are listed below:

Question area 1: Experiences of feeding infants

1. Please tell me more about how you feed your infant(s)? (for example, breastfeeding or bottle feeding)
2. How did you learn about this method of feeding? Was it recommended to you? Did you make this decision on your own without recommendation from others?
3. Why did you choose this method? Did you feel any pressure in choosing this method of infant feeding? And if yes, can you tell us about it?
4. Since you started feeding your infant, have you encountered any barriers or problems (for example, lack of family or social support)? And if yes how have you managed it?

5. Is the infant feeding method that you have chosen here in Edmonton different from the one practiced in your own country? If yes, in what ways does it differ?
6. Are you satisfied with the way you feed your infants? Why or why not?

Question area 2: Services available

1. Have you ever used infant feeding information resources such as those provided by Health Canada) or other services such as those provided by the Multicultural Health Brokers to help you get information about feeding your infant? If so, please tell us which services/programs you chose? If not, why not?
2. How did you learn about those resources or services?
3. What are the most and the least helpful aspects of these resources and services? Were they offered in your own language? Were you aware of resources written in Arabic?
4. Do you think these programs consider the barriers encountered by mothers of your ethnic group?

Do you have any other comments about the problems you have encountered choosing the best infant feeding method for your baby here in Edmonton and do you have any suggestions for improving the current situation?