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# PARENTAL INFLUENCES AND MOTHERS' EXPERIENCES ON INFANT AND YOUNG CHILD FEEDING

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## **ABSTRACT**

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### **Parental influences and mothers' experiences on infant and young child feeding practices**

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The objective of this thesis was to better understand how parental factors influence feeding practices, how mothers experience feeding and what factors mothers perceive influencing feeding in different contexts. This study is largely based on STEPS Study (Steps to Healthy Development of Children), which is a longitudinal cohort of 1797 families. In addition, qualitative data was collected among mothers in Finland and Solomon Islands.

The results of this study show that different parental determinants associate with infant and young child feeding behavior and practices. Mothers with high cognitive restraint of eating introduced complementary foods earlier and neophobic mothers' breastfed exclusively for a shorter time than mothers who ranked lower in these behaviors. Fathers' poor diet quality associated with shorter total breastfeeding duration. Mothers' postnatal depressive symptoms associated with shorter duration of exclusive breastfeeding, earlier introduction of complementary foods and lower compliance of feeding recommendations. The higher amount of marital distress associated with longer duration of exclusive breastfeeding and better compliance with feeding recommendations. Mothers, who participated in qualitative interviews, described how complex interplay of individual perceptions, significant others and socio-cultural environment influenced feeding practices and behavior.

This study showed that several parental factors influence infant and young child feeding practices as well as compliance with the feeding recommendations. Maternal experiences and perceptions on child feeding relate to the context where mother-infant pair lives in. These results highlight the importance of targeting feeding support and, if needed, specific interventions to mothers and families who are in risk of poor feeding practices.

**Keywords:** Breastfeeding, Child, Complementary Feeding, Socio-cultural, Depression, Eating behavior, Food neophobia, Infant, Marital satisfaction, Nutrition

## TIIVISTELMÄ

Jenni Vaarno

Vanhempiin liittyvien tekijöiden vaikutus ja äitien kokemukset pienten lasten imetyksestä ja lisäruokien antamisesta.

Turun yliopisto, Lääketieteellinen tiedekunta, Lastentautioppi ja Turun yliopiston kliininen tohtoriohjelma (TKT).

Tämän tutkimuksen tavoitteena oli lisätä ymmärrystä siitä, miten vanhempien syömiskäyttäytyminen, ruokaneofobia ja ruokavalion laatu sekä depressio ja parisuhdetyytyväisyys liittyvät pienten lasten syöttämiseen. Lisäksi tutkittiin, miten äidit kokevat lasten syöttämisen ja minkä tekijöiden äidit ajattelevat vaikuttavan syöttämiseen kahdessa eri sosiokulttuurisessa ympäristössä. Aineisto pohjautuu suurelta osin Hyvän kasvun avaimet -pitkittäistutkimukseen, jossa on mukana 1797 perhettä Varsinais-Suomen alueelta. Laadullinen haastatteluaineisto kerättiin 1–2-vuotiaiden lasten äideiltä Turun alueella Suomessa ja Honiarassa, Salomonsaarilla.

Tutkimuksessa havaittiin, että äidit, jotka rajoittivat tietoisesti syömistään, aloittivat lisäruuat aiemmin ja uusia ruokia karttavat, ruokaneofobiset äidit imettivät kokonaisuudessaan lapsiaan lyhyemmän aikaa kuin muut äidit. Lapsia, joiden isien ruokavalion laatu oli huono, imettiin kokonaisuudessaan lyhyemmän aikaa kuin hyvän ruokavalion omaavien isien lapsia. Äitien synnytyksen jälkeinen masennus oli yhteydessä lyhyeen täysimetyksen keston, aikaiseen lisäruokien aloittamiseen ja vähäiseen ravitsemussuositusten noudattamiseen. Tyytymättömyys parisuhteeseen puolestaan oli yhteydessä pitkään täysimetyksen keston ja suositusten noudattamiseen. Kahdessa hyvin erilaisessa ympäristössä toteutetuissa laadullisissa haastatteluissa äidit kuvasivat monien, omien uskomusten ja ajatusten sekä merkityksellisten tuttavien ja sosio-kulttuuristen tekijöiden vaikuttavan syöttämiskäytökseen ja -käytäntöihin.

Tämän tutkimuksen tuloksista selviää, että monet vanhempiin liittyvät tekijät ovat yhteydessä siihen, miten lapsia syötetään ja miten vanhemmat noudattavat lasten ravitsemussuosituksia. Äitien kokemukset ja käsitykset imetyksestä ja lisäruokien antamisesta liittyivät äiti-lapsi parin elinolosuhteisiin. Tulokset korostavat vanhempiin liittyvien tekijöiden sekä perheen sosio-kulttuurisen asuin ympäristön merkitystä imetykselle ja lisäruokien aloittamiselle.

**Avainsanat:** Elinympäristö, Imetys, Imeväisen ravitsemus, Kulttuuri, Lapset, Lisäruuat, Masennus, Parisuhdetyytyväisyys, Ravitsemus, Ruokaneofobia, Ruokavalion laatu, Syömiskäyttäytyminen, Äidinmaito

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## **ABBREVIATIONS**

ANOVA	Analysis of variance
BMI	Body mass index
BF	Breastfeeding
BFHI	Baby Friendly Hospital Initiative
CF	Complementary feeding
EBF	Exclusive breastfeeding
EPDS	Edinburgh Postnatal Depression Scale
FNS	Food Neophobia Scale
HLA	Human Leukocyte Antigen
IDQ	Index of diet quality
ILO	International Labour Organization
IOTF	International Obesity Task Force
IYCF	Infant and Young Child Feeding
MDG	Millenium Development Goals
PBF	Partial breastfeeding
RDAS	Revised Dyadic Adjustment Scale
SD	Standard deviation
SDS	Standard deviation score
STAKES	National Research and Development Centre for Welfare and Health
STEPS	Steps to healthy development study
TFEQ	Three Factor Eating Questionnaire
THL	Finnish National Institute for Health and Welfare
UNICEF	United Nations Children's Fund
WHO	World health organization

## **LIST OF ORIGINAL PUBLICATIONS**

**I** Vaarno J, Niinikoski H, Kaljonen A, Aromaa M, Lagström H. Mothers' restrictive eating and food neophobia and fathers' dietary quality are associated with breast-feeding duration and introduction of solid foods: the STEPS study. *Public Health Nutr.* 2015 Aug;18(11):1991-2000

**II** Ahlqvist-Björkroth S, Vaarno J, Junttila N, Pajulo M, Räihä H, Niinikoski H, and Lagström H. Initiation and exclusivity of breastfeeding: association with mothers' and fathers' prenatal and postnatal depression and marital distress. *Acta Obstetrica et Gynecologica Scandinavica.* 2016 Apr;95(4):396-404.

**III** Vaarno J, Maelaua J, Talvia S, Niinikoski H and Lagström H. Maternal experiences of breastfeeding in two distinct contexts; Finland and Solomon Islands, a qualitative study. (Submitted)

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## **1. INTRODUCTION**

Parents and other caregivers play a critical role in structuring children's early eating environment. Child feeding practices determine the foods and portion sizes that children are offered, the frequency of eating occasions, and the social contexts in which eating occurs (Birch and Davison, 2001). What and how child eats in infancy and in early childhood may affect later eating patterns, growth, development and the overall health of the child (Birch et al., 2007; Forsyth, 2014).

Breastmilk is natural food for the babies from birth, which provides all the nutrients and many non-nutritional components infant needs for healthy growth and development during first months of life. Transition from liquid to semi-solid and solid feeding occurs usually during first year of life and to a varied diet and full use of family foods usually before the age of two. According to the World Health Organization (WHO) and UNICEF recommendation, infants should be breastfed for the first six months and thereafter receive timely, adequate, safe and appropriate complementary foods while continuing breastfeeding up to two years of age or beyond (WHO/UNICEF, 2003).

Breastfeeding is most essentially a personal experience but the surrounding realities and conditions in which mother–infant pairs live can either provide a supportive atmosphere or obstacles that impede a successful feeding experience. Thus, breastfeeding rates and practices vary widely from context to context and mother to mother. In Finland the prevalence of children ever breastfed is high (99%) but the median duration of exclusive breastfeeding is 1.4 months and total duration of any breastfeeding is six months (Erkkola et. al. 2006). The mean age for introduction of complementary foods is 3.5 months (ranging between 0.1 to eight months) in Finland. In very different context, Solomon Islands, initiation of breastfeeding is high (92.6%), mean duration of exclusive breastfeeding 5.1 months and total duration of any breastfeeding 21.7 months (Solomon Islands NSO, 2009). Complementary foods are introduced in Solomon Islands earlier than recommended six months for many children; 14.3% received some solid or semi-solid foods at 2-3 months of age and 32.9% at 4-5 months.

It is important to understand how feeding patterns evolve during first two years and what are the factors affecting child feeding practices. There are many studies investigating parental socioeconomic characteristics or medical issues but less attention has been paid on cultural or psychosocial factors association to feeding practices. The purpose of this study was to explore the association between parental eating habits and behavior, psychological health and marital satisfaction with feeding practices and following the Finnish feeding recommendations on infant and young child feeding. In addition, qualitative data was collected from two very different socio-cultural contexts, i.e. Finland in Northern Europe and Solomon Islands in the Pacific, to develop body of knowledge of mothers' experiences on infant and young child feeding in different contexts.

## 2. REVIEW OF THE LITERATURE

### 2.1 Approach to the literature review

The purpose of this literature review was to give a background for this research. This review initially describes as a background, infant and young child feeding (IYCF) definitions and recommendations and feeding practices in Finland and Solomon Islands. Next, mother and father related influences on breastfeeding and complementary feeding are reviewed and described, including the role of parental eating behavior and practices, depression and marital satisfaction. Social, cultural and societal factors influencing mothers' experiences on feeding and feeding practices are discussed next and then finally, the strategies to promote recommended feeding practices are reviewed.

A literature search was carried out mainly in PubMed database, search engine Google Scholar and electronic journals from the field of medicine, nutrition and nursing. Reference lists from retrieved publications were used for further search for other relevant literature. Internet pages of the National Institute for Health and Welfare, Ministry of Social Affairs and Health and Statistics Finland were used to find information on policies, strategies and legislation related to IYCF and searches were also conducted for data, reports and policy documents from international organizations, such as WHO, UNICEF and Save the Children.

### 2.2 Infant and young child feeding definitions and recommendations

#### 2.2.1 Terms and definitions related to infant and young child feeding

The need for consistent breastfeeding definitions gained attention already over twenty years ago and resulted in first globally developed and agreed set of breastfeeding terminology (Labbok and Krasovec, 1990). Shortly after WHO presented its *Indicators for Assessing Breastfeeding Practice* (WHO, 1991), which was updated to its current version in 2008 (WHO, 2008). The purpose of this process has been to develop breastfeeding terminology, which would enable accurate description and interpretation of breastfeeding practices. However, as recent study showed, these definitions are still not universally used in breastfeeding research limiting seriously comparability of breastfeeding patterns (Labbok and Starling, 2012). Definitions have been questioned also for not taking into consideration on how feeding is actually done, although feeding style can be important mediator or moderator for health outcomes associated with breastfeeding practices (Noel-Weiss et al., 2012). Another problem with WHO breastfeeding indicators is that they are based on the last 24-hour period, although for example term exclusive breastfeeding is often interpreted as exclusive breastfeeding since birth, instead of just last 24 hours (Aarts et al., 2000). Similar controversies exist in defining the word "weaning", which has been used to describe four different processes: taste portions of some foods without nutritional benefit, complementing nutritionally inadequate breastmilk, replace breastmilk with some foods or to stop breastfeeding (Greiner, 1996).

Terms and definitions associated with infant and young child feeding are presented in Table 1. Although term supplementary feeding could be used about solid foods given prior six months of age, in this thesis term complementary food and feeding is used on feeding any semi-solid or solid foods to the infant, whether it is prior or after six months of age.

**Table 1.** Terms and definitions associated with infant and young child feeding, modified from Greiner (1996) and WHO (2008).

Term	Definition
Exclusive breastfeeding	The infant has received only breastmilk from his/her mother or a wet nurse, or expressed breastmilk, and no other liquids or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines.
Predominant breastfeeding	The infant's predominant source of nourishment has been breastmilk. However, the infant may also have received water and water-based drinks (sweetened and flavored water, teas, infusions etc.); fruit juice; oral rehydration salts solution; drop and syrup forms of vitamins, minerals and medicines; and ritual fluids (in limited quantities). With the exception of fruit juice and sugar-water, no food-based fluid is allowed under this definition.
Full breastfeeding	This definition includes both exclusive breastfeeding and predominant breastfeeding.
Partial breastfeeding	Partial breastfeeding refers to a situation where the baby is receiving some breastfeeds but is also being given other food or food-based fluids, such as formula milk or weaning foods.
Breastfeeding	The child is receiving breastmilk, either directly from the breast or expressed. This definition may include exclusive, predominant and partial breastfeeding.
Formula-feeding	The child has received liquid or semi-solid food from a bottle with a nipple/teat. This term applies irrespective of the nature of the liquid or semi-liquid.
Artificial feeding	The baby who is artificially fed and receives no breastmilk at all.
Supplementary feeding	Supplementary feeds are feeds given to a baby under six months old to supplement his intake of breastmilk, where this is insufficient.
Complementary feeding	Complementary feeding means the introduction of other foods and drinks after six months of age. These foods are in addition to an adequate intake of breastmilk

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Weaning	The process during which the infant changes from full dependence on breast milk to complete independence from it, starts at initiation of complementary foods and ends at cessation of breastfeeding.
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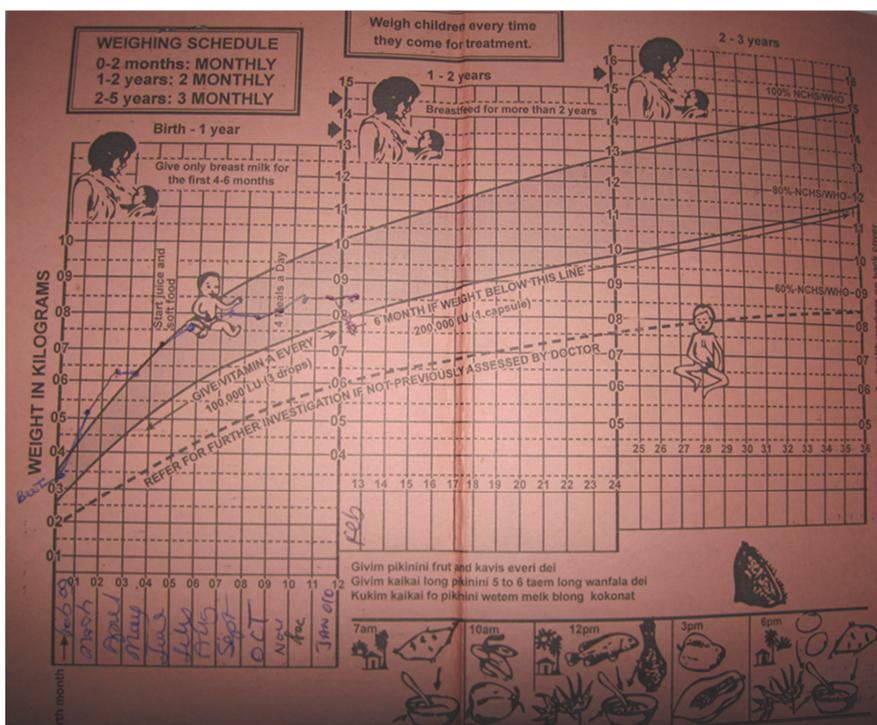
### 2.2.2 Infant and young child feeding recommendations

In 2003 WHO and UNICEF jointly published the *Global Strategy for Infant and Young Child Feeding* aiming at improving through optimal feeding practices the nutritional status, growth and development, health and survival of infants and young children (WHO/UNICEF, 2003). According to the strategy, infants should be exclusively breastfed for the first six months of life, thereafter receive complementary foods while continuing breastfeeding until two years or beyond. The recommendation of exclusive breastfeeding for the first six months was given after it was found that exclusive breastfeeding decreases morbidity and has other benefits without affecting negatively on growth (Kramer and Kakuma, 2002). Complementary foods should be timely, adequate, safe and properly fed (WHO/UNICEF, 2003). Exclusive breastfeeding should be unrestricted to ensure ample milk production. Timely refers to optimal timing of the introduction, adequate to providing all nutrients needed for growing child, safe to hygienically storing, preparing and serving complementary foods and properly fed to taking into account child's signals, ensuring meal frequency and suitable feeding method. These global recommendations may, in many cases, be adapted also to infants and young children who are born preterm, have low-birth weight, and are severely malnourished or to an emergency situation.

During the data collection for this thesis, exclusive breastfeeding was recommended until six months of age for normal-weight healthy term infants and partial breastfeeding up to one year in Finland (Hasunen, 2004). Introduction of solids was, and is still in a new recommendation, recommended to be started based on child's needs, growth and readiness at the age of four months at earliest and six months at latest. Until year 1994, it was recommended to start complementary foods from three months and after this from four to six months of age, until recommendation changed to exclusively breastfeeding up to six months of age in 2004 (Hasunen and Rynänen, 2006). In the new recommendation for child feeding, which was published early this year, exclusive breastfeeding is recommended until four to six months (THL, 2016). Changing the recommendation for the timing of introduction of solids is justified based on the potential of allergy prevention (Chin et al., 2014) or immune system development (Agostoni and Shamir, 2008).

In Solomon Islands, the global recommendations of exclusively breastfeeding immediately after birth until six months and thereafter continuing breastfeeding with appropriate and adequate weaning foods until the age of two years or more, are at use (Solomon Islands Government, 2008). The government of Solomon Islands endorses the Innocenti Declaration and is committed to protect, reinforce and support breastfeeding. Objectives of the Breastfeeding Policy are by the end of the year 2017 to have all mothers, except medically otherwise indicated, breastfeeding when leaving from maternity units, have 90% of the babies exclusively breastfed until six months of age and control the sale and use of feeding bottles throughout the country. It is not specified in the Breastfeeding Policy which foods

should be used as a complementary food and how feeding should be done. However, in the child health cards, there are some instructions on complementary feeding (Figure 1). There are pictures of times of the day when complementary foods should be fed to the children with picture of recommended food items, such as banana, pawpaw, coconut, fish and slippery cabbage (*Hibiscus manihot*). Written instructions are: give fruits and vegetables to the child every day, give food to the child five to six times during one day and cook child's food with coconut milk.



**Figure 1.** Picture of a child health card where information on child's growth and health is collected during the visits in the health care centers. The particular pages contain growth chart and breastfeeding and complementary feeding recommendations.

## 2.3 Infant and young child feeding practices

### 2.3.1 Finland

According to a Finnish nationwide survey, 92% of infants less than one month of age are breastfed and 47%, respectively, are exclusively breastfed (Uusitalo et al., 2012). At the age of four months, 68% of infants, between five and six months of age 9% of infants are breastfed and only one percent of infants are exclusively breastfed between six and seven months of age. When approaching to the age of one year, more than a third of infants are still breastfed. Sixteen percent of children aged three months and 83% of children aged five months had received some solid food in previous 24 hours (Uusitalo et al., 2012). Out of children living in Turku, 5.3% were exclusively breastfed at more than five months of age and at close to one year of age, 25% were still breastfed. Giving additional milk

is a common practice in Finland, even without medical reason. According to nationwide survey (Uusitalo et al., 2012), 71 percent of infants receive extra milk at the maternity ward. Complementary foods are introduced usually between three to five months. Among 994 children with HLA-conferred susceptibility to type 1 diabetes mellitus, the median age of introduction of first complementary foods was 3.5 months (Nwaru et al., 2010). Potato, other vegetables, berries and fruits are usually introduced first, followed by cereals (Uusitalo et al., 2012). When children are approaching one year of age, approximately 90% of the children consume protein rich animal products and 50% cow's milk in the last 24 hour period. There is a very high usage of commercial baby foods in Finland (Breastfeeding Support Association of Finland, 2011).

Despite the fact that infant and young child feeding practices are still far from recommended, there have been some improvements in breastfeeding rates over the last few decades. Proportion of exclusively or partially breastfed younger than one month old infants was larger in 1995 than in 2010 but the opposite was observed in older infants: more infants were exclusively and partially breastfed in 2010 than 25 years earlier (Uusitalo et al., 2012). Especially the prevalence of exclusively breastfed infants increased in the beginning of the century. The change was probably due to changing feeding recommendations in 2004 (Hasunen, 2004). It remains to be seen, what influence does the new feeding recommendation have on duration of exclusive breastfeeding, as recommendation has been changed again to four to six months exclusive breastfeeding (THL, 2016).

### *2.3.2 Solomon Islands*

In Solomon Islands nearly all children (92.6%) are breastfed, mean duration of exclusive breastfeeding is 5.1 months and total duration of any breastfeeding is 21,7 months (NSO, 2009). Complementary foods are introduced earlier than recommended 6 months in many children; 14.3% received some solid or semi-solid foods at two to three months of age and 32.9% at four to five months. The percentage of children ever breastfed in Honiara is slightly lower than in the whole country, 89.8 %. The median duration of exclusive breastfeeding is 3.3 months, of predominant breastfeeding 6.1 months and of total breastfeeding 18.4 months. Both exclusive and partial breastfeeding duration is shorter in Honiara than in whole country and lowest among educated mothers. Complementary foods are introduced between four to nine months; at the age of four to five months 32.9 percent of children consume any semi-solid or solid food and between six to eight months this proportion is already 82.9%. Pawpaw, sweet potato and pumpkin are most common foods introduced to young children, followed by products made from grains, tubers, root crops and other vegetables. Only 21% of breastfed children and 38.5% of non-breastfed children consume protein rich animal products. Most children (93%) over 6 months consume some solid or semi-solid foods. According a study in Malaita province, children are introduced to an adult eating pattern between one to two year of age (Akin, 1985).

Save the Children has rated Solomon Islands as fourth from the top in countries in infant and toddler feeding practice indicators, i.e. percentage of children who are put to the breast within one hour of birth, exclusively breastfed for the first 6 months, breastfed complementary foods from ages 6 to 9 months and breastfed still at age 2 years (Save the Children, 2012). In the 1989 National Nutrition Survey, all children were breastfed exclusively at three months and at the age of 21 months 50% were still breastfed. However there is concern rapid urbanization might deteriorate breastfeeding practices

(Agorau). Besides breastfeeding, also complementary feeding should be focused in interventions to improve children's health, since undernutrition remains a problem in Solomon Islands (Solomon Islands NSO, 2009), probably partly due to inadequate complementary feeding practices.

## **2.4 Parental influences on infant and young child feeding practices**

### *2.4.1 Socio-demographic factors*

Various socio-demographic characteristics, such as age, weight, education, parity or race / ethnicity, of the parents have been studied to identify variables determining infant and young child feeding practices. In general, older mothers seem to initiate and maintain breastfeeding longer and introduce complementary foods later than younger mothers, but findings of studies examining maternal age in relation to infant and young child feeding practices are inconsistent. Rates of the initiation of the breastfeeding among adolescent mothers has been found to be significantly lower than among older mothers (CDC, 2010). In Finnish nationwide survey, mothers age was associated with duration of exclusive breastfeeding (Uusitalo et al., 2012). Among less than 25 year-old mothers exclusive breastfeeding duration was shorter than in older mothers. Analogically, a study from United States found maternal age to be associated with exclusive breastfeeding duration, but not with initiation (Jones et al., 2011). Other studies found maternal age being positively associated with appropriate timing and quality of complementary foods (Andren Aronsson et al., 2013; Betoko et al., 2013; Hendricks et al., 2006; Tang et al., 2015), but only in one of these studies there was an association with breastfeeding duration (Hendricks et al., 2006). Studies examining influence of fathers' age on feeding practices are limited. One small study was found where teenage mothers with older men partner were less likely to breastfeed during hospital stay (Harner and McCarter-Spaulding, 2004). Two Swedish studies had inconsistent findings on how paternal age relates to breastfeeding. Ludvigsson and Ludvigsson (2005) found that paternal age of  $\leq 29$  years possessed an increased risk of their child being exclusively breastfed for less than 4 months, whereas Huus and others (2008) showed that short term ( $< 4$  months) exclusive breastfeeding was less common if father was more than 37 years old. Although results of the studies are not consistent with each other, maternal older age seems to be related to improved infant and young child feeding practices. This is despite the fact that delayed onset of lactogenesis, common risk factor for formula supplementation and early weaning, is more common among older than young mothers ( $\geq 30$  years) (Nommsen-Rivers et al., 2010). Thus probable explanation is not due to physiological reasons, but other factors may explain the phenomenon, such as lack of social support, level of education or income or young mothers' perception of feeling watched and judged on being mother at so young age and thus lacking confidence on infant feeding (Dykes et al., 2003; Tucker et al., 2011).

Parental body size has been associated with breastfeeding and complementary feeding practices. It has been well established that overweight or obese mothers initiate breastfeeding less often and breastfeed for a shorter time than mothers with normal weight (Donath and Amir, 2008; Huus et al., 2008; Kitsantas et al., 2012; Krause et al., 2011; Mäkelä et al., 2014; Verret-Chalifour et al., 2015). Maternal overweight and obesity seem to be associated also with poorer complementary feeding practices. Mäkelä and her collaborators (2014) found overweight women introduced complementary foods on average 0.2 months earlier than normal weight women. In another study, obese mothers

were more likely to introduce solid foods before the age of 4 months and add cereal to the infant formula than normal weight mothers (Kitsantas et al., 2012). There may be various physiological, psychological and sociocultural reasons why overweight or obese mothers have worse feeding practices than normal weight mothers. Women with large-breasts may find breastfeeding difficult (Brown et al., 2013) or there may be metabolic challenges of lactation, such as delayed onset of lactogenesis (Nommsen-Rivers et al., 2010) or hormonal imbalances or mammary hypoplasia (Bever Babendure et al., 2015). It has been hypothesized that infant feeding behavior might differ according to parental weight status, since in toddlers more mealtime pressure has been observed in parents with high BMI (Haycraft and Blissett, 2008). However, a recent study does not support this hypothesis, as maternal weight status was not related to using food to calm the baby, concern about eating too little or awareness of infant cues or feeding to a schedule (Rametta et al., 2015). An Italian study found that overweight mothers had more difficulties in emotion regulation, were more psychologically distressed and had poorer feeding interaction with their babies, which could have all influenced feeding practices and behaviors (de Campora et al., 2014). Also lack of confidence or comfort with own body, common among overweight or obese women, may explain shorter breastfeeding duration (Hauff and Demerath, 2012). Relationship between maternal weight and breastfeeding seems to be culturally specific, since there are cultures where maternal weight status has no obvious association with feeding practices. For example in Solomon Islands there are high levels of overweight and obesity, yet very high levels of breastfeeding (Solomon Islands NSO, 2009). The relationship between fathers weight status and infant and young child feeding has been less studied, but there seems to be similar association as with paternal than maternal weight and breastfeeding (Huus et al. 2008). However, the plausible mechanism for such association is lacking.

Maternal high education has been related most clearly with positive feeding behaviors. In Finnish nationwide survey differences in duration of both exclusive and total breastfeeding between mothers having the highest compared with lowest education level were about 2.5 fold; 42 % of mothers with high education were exclusively breastfeeding at four months and 88% were breastfeeding at six months, whereas among mothers with the lowest education level the same percentages were 18 and 33, respectively (Uusitalo et al., 2012). Many other studies have had similar findings on maternal education having positive influence on breastfeeding initiation and duration (Acharya and Khanal, 2015; Betoko et al., 2013; Brown et al., 2011; Hendricks et al., 2006; Office, 2009; Smith et al., 2015b). Low maternal education has also been associated with feeding style during the first six months postpartum, encouraging feeding, limiting feeding, monitoring and concern for weight (Brown and Lee, 2013). Also complementary feeding practices are closer to recommended among highly educated mothers. Low maternal educational level has been related to early introduction of solid foods (Andren Aronsson et al., 2013; Betoko et al., 2013; Norris et al., 2002; Tang et al., 2015), delayed (beyond 6 months) introduction of complementary foods (Senarath et al., 2012) or low quality of complementary foods (Betoko et al., 2013; Hendricks et al., 2006; Senarath et al., 2012). The reasons on why higher education is related to recommended infant and young child feeding practices are likely to be complex. One explanation is that more educated mothers being more likely to belong to more privileged social class, which has been found to be a strong predictor of optimal feeding practices. However Skafida (2009) suggested that maternal education would be even better factor than social class in explaining and understanding differences in infant and young child feeding practices, as longer education may make mothers more aware of recommendations and perhaps also

more willing, able and likely to pursue feeding practices that are related with optimal child development and growth.

Results from studies exploring parity and feeding practices have been somewhat conflicted. In Finland breastfeeding duration and prevalence of breastfeeding was shorter among primiparous (=having given birth for the first time) than multiparous (=having had 2 or more birth) mothers (Uusitalo et al., 2012). The breastfeeding was most common among mothers having more than 2 subsequent births. Primiparous mothers, when compared with multiparous mothers, have also been found to have more early breastfeeding problems, mixed feeding at hospital discharge and decreased likelihood to breastfeed through 6 months and meet the intended breastfeeding duration (Hackman et al., 2015) or initiate complementary foods timely (Shumey et al., 2013). However in some studies multiparity has had negative relation with breastfeeding. For example in study by Li and others (2002) multiparous women were less likely to initiate breastfeeding and Kruse and others (2006) found decreasing prevalence of exclusive or any breastfeeding from the first to the second delivery. It is likely that there is no straightforward connection between number of children and infant and young child feeding practices. Child feeding seems not to be a persistent behavior what mother does similarly from first to subsequent child, but fluctuating in nature and influenced by earlier experiences. Greater influence on nature of earlier experiences, and not number of children is supported by a studies where multiparous women with no or short previous breastfeeding experience were increased risk of short duration of exclusive breastfeeding and early weaning compared with women having breastfed their subsequent child for a longer period (Bai et al., 2015; Phillips et al., 2011; Sutherland et al., 2012). This is probably due to increased confidence and self-efficacy if earlier breastfeeding experiences have been successful. However, women who have breastfed their previous infants have been found to have shorter current breastfeeding duration, suggesting that multiparous mothers may have other barriers, such as time constrains or lower motivation influencing negatively to their infant and young child feeding practices (Bai et al., 2015; Nagy et al., 2001).

Feeding practices and behaviors are known to vary by race or ethnicity. In United States substantial variability in breastfeeding rates have been observed across races or ethnic groups; breastfeeding is initiated at higher rates for Hispanic and non-Hispanic whites than Black infants and same disparities exist in exclusive and total breastfeeding duration (CDC, 2010). In Hawaii, breastfeeding rates were the lowest among Asian, Pacific Islanders and black mothers (Hayes et al., 2014). On the contrary, in UK, the highest breastfeeding rates were observed among black and Asian and lowest among white mothers (Kelly et al., 2006). In Ireland, Irish citizens and Irish-born mothers were less likely initiate breastfeeding compared with non-Irish citizens or mothers born elsewhere (Ladewig et al., 2014). Similar results of immigrant women having higher breastfeeding initiation rates and longer duration than native women have been found also in United States (Singh et al., 2007). Consequently, ethnic differences exist, but disparities seem to be geographically patterned and there are contextual sources of variation. Socioeconomic status of the families has been identified as a possible reason for the observed racial and ethnic disparities (Belanoff et al., 2012; Gibson et al., 2005; Kelly et al., 2006). However, when Street and Lewallen (2013) examined how culture influenced breastfeeding in two ethnic groups; African American and white mothers, most women did not acknowledge culture influencing their feeding practices, suggesting influences of family and friends and knowledge may transcend race's and ethnicity's influences for IYCF.

#### *2.4.2 Parental eating disorders, behavior and practices*

It has been proposed that a child's feeding practices are affected by the child's and the parents' eating behaviors, and vice versa (Birch and Davison, 2001). However, there are a limited number of studies investigating how the parents' own eating disorders, behaviors and practices associate with infant and young children's feeding practices.

Mothers with eating disorders tend to breast-feed for shorter periods than do mothers without eating disorders (Hoffman et al., 2011; Patel et al., 2002), although in study from UK association was opposite; mothers with eating disorder were more likely to breastfeed than other mothers (Micali et al., 2009). Large Norwegian study found mothers with anorexia nervosa and otherwise specified-purging subtype eating disorder had increased risk for cessation of breastfeeding, but no association was seen with exclusive breastfeeding (Torgersen et al., 2010). Eating disorder history may also predispose mother using restrictive special approaches in child feeding, such as limiting processed foods or feeding only organic foods (Hoffman et al., 2014). Inconsistencies in these study results may be due to factors related to study design, or be explained by different strategies mothers with eating disorder take in decision making about infant feeding. A qualitative study of women with pre-existing eating disorder found, that some women wanted to breastfeed for its significance for "good" mothering and opportunity to consume treats without gaining weight (Stapleton et al., 2008). In contrast, mothers planning to formula feed justified their decision for quickly resuming practices related to their eating disorder to shed weight gained during pregnancy.

So, the studies on relationship between parental eating behavior and infant and young child feeding are still scarce, but there are some studies suggesting maternal eating behavior could be an important determinant for the feeding choices and practices (Brown, 2014; Brown et al., 2011). Three characteristics are often measured in explaining eating behavior : 1) cognitive restraint, 2) uncontrolled eating, and 3) emotional eating (Karlsson et al., 2000). Cognitive restraint of eating refers to a person's attempts to cognitively control food intake, uncontrolled eating is the failure to restrict eating and emotional eating refers to overeating due to negative emotions. Maternal restrained, external and emotional eating has been associated with higher levels of concern over baby's weight and using restriction and controlling in feeding (Brown et al., 2011). In a recent study, restrained and external eating behaviors in the mother, but not emotional eating behaviors, were associated with decreased likelihood of breastfeeding from birth, as well as shorter breastfeeding duration (Brown, 2014). Moreover, mothers with high restraint and external eating were more likely to feed their children based on a maternal- than an infant-led routine.

Much remains to be understood about the interplay between food neophobia; an unwillingness to taste or eat unfamiliar foods or fear of these foods, and feeding of children. Child's food neophobia is likely to influence parental child feeding behaviors and vice versa. In a recent study parents of neophobic children were using often ineffective feeding behaviors to promote healthy food preferences, such as forcing to eat, offering child only liked foods, restricting food intake and begging child into eat (Russell et al., 2015). In study by Cassels et al. (2014) mother using of negative feeding practices at 4 months was associated with child's food neophobia at 2 years, suggesting early feeding practices may influence later expression of food neophobia in children. As mothers and children have been found to display similarities in food neophobia, it may be that also parental food neophobia

influences child feeding practices. Yet mothers high in food neophobia were shown to give less healthy foods to their children and to impose more weight-related food restrictions (Tan and Holub, 2012). However, the impact of parental food neophobia on early infant feeding has been poorly studied. Mendes Ribeiro found in her Master's Thesis (2013) no significant association between food neophobia and breastfeeding intention, or actual feeding practices. Poor maternal diet, limited consumption of fruits and vegetables and a lack of time to eat healthy food have all been associated with shorter breastfeeding duration and earlier initiation of complementary foods (Amir and Donath, 2007; Galloway et al., 2003; Lee et al., 2005; Robinson et al., 2007). Maternal dietary quality has been found to influence also dietary quality of infants and young children. In Japanese (Okubo et al., 2014) and German (Stimming et al., 2015) studies, dietary patterns young children were more likely healthy, if their mothers had also healthy dietary patterns.

The relationship between fathers' eating behaviors and child-feeding practices has been studied even less than that of mothers', and most of these studies have focused on school-aged children (Oliveria et al., 1992; Thorsdottir et al., 2006). There seems to be a relationship between fathers and young children in terms of eating certain foods, such as fish, fruits and vegetables; however, this effect is fairly small (Hall et al., 2011; Shrivastava et al., 2012; Svensson et al., 2015; Walsh et al., 2015).

#### *2.4.3 Parental mental health*

Parental mental health problems are common public health concern. For example, the incidence of maternal perinatal depression was 7–13% in Finnish studies (Pajulo et al., 2001; Tammentie et al., 2002) and paternal perinatal depression 10% in international meta-analysis (Paulson and Bazemore, 2010). Parental poor mental health may have many adverse consequences on their child's health and wellbeing (Atif et al., 2015; Rahman et al., 2008). The association between mental health and feeding practices is explained by poor mental health impairing on parent's ability to provide effective care to meet child's needs (WHO, 2004). Vice versa, also breastfeeding practices can help to maintain mothers mental health postpartum (Kendall-Tackett, 2015). Mothers' successful breastfeeding experience has been associated with fewer symptoms of postpartum depression (Gregory et al., 2015) and lower risk of hospital admission for schizophrenia, bipolar affective disorders, and mental illness due to substance use (Xu et al., 2014).

Recent review found no association between maternal prenatal anxiety and breastfeeding initiation or quantity (Fallon et al., 2015). However, the high anxiety was related with reduced breastfeeding intention and exclusivity. In study by Smith et al. (2015a), prevalence of ever breastfeeding was lower among mothers reported having poor or fair mental health compared with mothers with excellent mental health, but no association was found between mental health and breastfeeding duration. Another study showed a positive association between maternal mental health (anxiety, depression, stress or overall maternal psychological distress) and energy intake among 0-6 months old infants as well as intake of breads and cereals among 4-6 months old infants (Hurley et al., 2015). A few studies have found associations between maternal prenatal depression and breastfeeding (Figueiredo et al., 2014; Rahman et al., 2015; Weobong et al., 2014). According to two of these studies, mothers' prenatal depression is associated with shorter duration of EBF (Figueiredo et al., 2014; Rahman et al., 2015). In addition, continuity of depressive symptoms from the antenatal to postnatal period seems to influence breastfeeding success. In the studies by Pippins and others (2006) and Rahman

and others (2015), women with persistent depression from the prenatal to postnatal period were more likely to breastfeed for a shorter time, whereas depression in either of the time points was not associated with breastfeeding duration. Mothers with postnatal depression are less likely to initiate breastfeeding at all or to stop breastfeeding earlier than non-depressed mothers (Mathews et al., 2014). In some studies, a higher level of postnatal depression has also been associated with reduced likelihood of EBF and shorter duration of EBF (Annagur et al., 2013; Jain et al., 2014).

Many studies have found that also paternal mental health influences child's emotional and behavioral development (Kvalevaag et al., 2013; Parfitt et al., 2013; Wong et al., 2015b). However there is much less research on the relationship between fathers' than mothers' mental health and breastfeeding. Up till now, no impact of paternal depression or other mental disorders on breastfeeding has been found (Falceto et al., 2004; Paulson et al., 2006).

#### *2.4.4 Marital status and satisfaction*

The mother typically provides the majority of daily care, including feeding to her child, and traditionally focus in research has mainly focused on mother-infant dyadic relationship. However, father or partner may have also an important role for infant and young child feeding practices. Marital status has been associated with initiation of breastfeeding, breastfeeding duration and timing of the introduction of solid foods (Clark et al., 2014; Hunter, 2014; Kristiansen et al., 2010; Thulier and Mercer, 2009; Tromp et al., 2013). In Finland both duration of exclusive and total breastfeeding was longer in the families with a father present (Uusitalo et al., 2012). Furthermore, in qualitative study conducted with mothers, paternal emotional, practical and physical support has been identified as very important factors in promoting successful breastfeeding experience (Tohotoa et al., 2009). In another study mothers expressed feeling more capable and confident about breastfeeding, when they received encouragement and fathers were actively involved in breastfeeding activities (Mannion et al., 2013). Fathers, in turn, acknowledge benefits of breastfeeding and their role as breastfeeding supporters by valuing breastfeeding mothers and sharing child care and housework responsibilities (Mitchell-Box and Braun, 2012; Rempel and Rempel, 2011). However, men may experience also feelings of being left out of infant feeding, belief of formula feeding being more convenient than breastfeeding and being uncomfortable with breastfeeding in public (Mitchell-Box and Braun, 2012).

Nowadays there are several different kinds of families besides just married couples and single mothers, which possibly influence also infant feeding practices. Gibson-Davis and Brooks-Gunn (2007) examined breastfeeding prevalence in four relationship types; married, cohabiting, romantically involved but not cohabiting and non-romantically involved mothers. They found that compared to married mothers, cohabiting and not cohabiting mothers were less likely to initiate breastfeeding, and compared to cohabiting mothers, not cohabiting but romantically involved mothers were less likely to breastfeed (Gibson-Davis and Brooks-Gunn, 2007). In another study, stronger parental bonds were associated with initiation of breastfeeding and likelihood of breastfeeding more than 6 months (Kiernan and Pickett, 2006). The results suggest that in addition to marital status also paternal co-residence and nature of the relationship are important influences on breastfeeding choices.

Results from studies exploring marital distress and breastfeeding have been somewhat conflicted. Falceto, Giugliani & Fernandes (2004) found no association between the interruption of breastfeeding

and the quality of a couple's relationship. Papp (2012), instead, found that longer duration of breastfeeding predicted improvement in the quality of mothers' pair relationships, but that this was not the case with the fathers. This study also showed that a "good" couple relationship is associated with more support for the breastfeeding from the father.

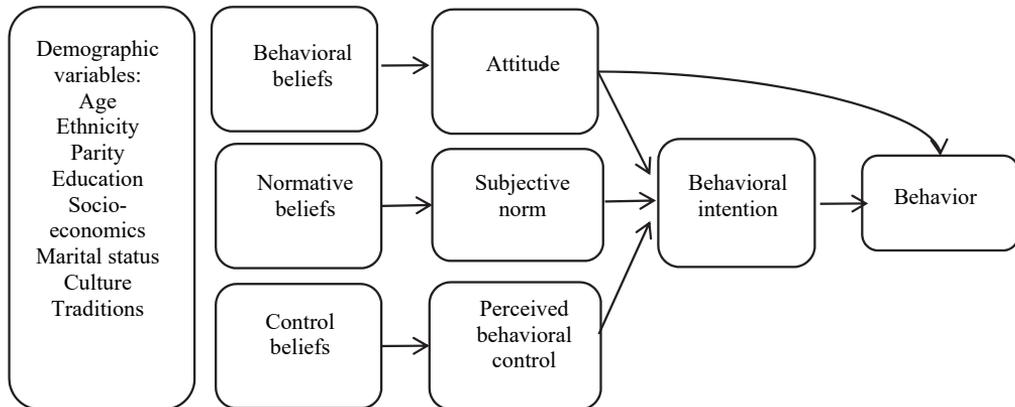
#### *2.4.5 Parental knowledge, attitudes and beliefs*

Knowledge has been defined as a belief that is correct and justified by data already by Platon thousands of years ago. Improving parental knowledge on optimal infant and young child feeding practices may have a beneficial effect on actual feeding practices. In many studies prenatally given breastfeeding information for mothers has been positively associated with breastfeeding confidence (Chezem et al., 2003; Kronborg et al., 2012), initiation of breastfeeding (Stuebe and Bonuck, 2011; Yu et al., 2015), and breastfeeding duration (Chezem et al., 2003; Kellams et al., 2015; Rosen et al., 2008). However some studies have not found association between antenatal breastfeeding education and breastfeeding duration (Lin et al., 2008; Wong et al., 2014; Yu et al., 2015). These contradictory findings may be due to using many different breastfeeding education methods, in different cultures and societies and other methodological limitations in the studies. Thus no specific form of antenatal breastfeeding education is recommended (Lumbiganon et al., 2012). Postnatal breastfeeding education has been found to increase breastfeeding in some studies (Aksu et al., 2011; Susin et al., 1999), although all have not found any association (Khreshneh et al., 2011). Maternal knowledge appears to have a beneficial influence to initiation of complementary foods (Kavlashvili et al., 2014; Semahegn et al., 2014) and quality of complementary foods (Fahmida et al., 2015; Negash et al., 2014), although besides education of mothers also economic access or acceptability of healthy foods may be needed to be considered to ensure optimal complementary feeding (Fahmida et al., 2015).

Fathers have important role in providing mother support for the infant feeding (Tohotoa et al., 2009) and their knowledge about breastfeeding has been identified as one of the main attributes related to fathers support to breastfeeding (Sherriff et al., 2014). Many studies in different populations suggests that fathers often have misperceptions or limited knowledge on optimal infant and young child feeding, and would benefit on interventions to enhance their knowledge to improve feeding practices (Brown and Davies, 2014; Kenosi et al., 2011; Sherriff et al., 2014; Taspinar et al., 2013). Providing education to fathers has been found to influence the actual feeding practices; in Brazil it was observed that fathers' better knowledge increased changes of infant being exclusively breastfed at the end of first and third month (Susin et al., 1999). Similar benefit of paternal education was seen in a recent Turkish study (Ozluses and Celebioglu, 2014).

In addition to knowledge, also beliefs and attitudes toward breastfeeding and complementary feeding may influence actual feeding practices. Knowledge on breastfeeding and positive attitudes are related, but there are some studies suggesting attitudes may be even better predictors of feeding intention and behavior than knowledge (Losch et al., 1995; Marrone et al., 2008). Benefits of breastfeeding seem to be well known, but positive attitude towards breastfeeding is needed for successful outcome in infant feeding. According to a Theory of Reasoned action (Ajzen and Fishbein, 1980) antecedents of intention and actual behavior are subjective norms, perceived behavioral control and attitudes towards that behavior, which in turn are based on underlying beliefs on advantages and disadvantages of the behavior. Broad demographic characteristics contribute to the beliefs and attitudes, norms and

perceived behavioral control. Identifying attitudes and underlying beliefs of mothers could help to improve infant and young child feeding practices, as attitudes and beliefs are significant factors for feeding decision and more easily modifiable than socio-demographic characteristics (Cox et al., 2015; O'Campo et al., 1992). Both beliefs and attitudes often vary depending upon behavior, culture and society (Bai et al., 2011; Lawton et al., 2012).



**Figure 2.** Theory of Planned behavior, modified from Ajzen and Fishbein (1980) and Bai et al. (2011). Behavioral intention is direct predictor of the behavior. As for attitude, subjective norms and perceived behavioral control are predictors of intention, but attitude can directly influence also behavior. There are underlying beliefs related to behavior, opinion or attitude of others and control over performance of behavior influencing predictors of intention. Broad variety of demographic variables are indirectly influencing to behavior through predictors of intention and intention.

Based on Theory of Planned Behavior, Bai and others (2011) identified three categories of beliefs influencing feeding choice and practices; behavioral, normative beliefs and control beliefs. Behavioral beliefs includes for example beliefs of feeding methods convenience, naturalness and health benefits, beliefs of influence on the mother-infant relationship, economic influences and public breastfeeding (O'Campo et al., 1992). Normative beliefs are mother's perception of what feeding method other people wanted her to perform. Control beliefs are beliefs about individual's control over performance of behavior; for example does mother believe she can carry out breastfeeding (Heinig et al., 2006). All categories of beliefs have been found to influence infant feeding intention and practices. Beliefs of breastfeeding leading to healthy infant, saving money and making it difficult to leave the infant strongly influenced the breastfeeding intention and intenders and non-intenders differed significantly in their belief strength (Ismail et al., 2014). Mothers' normative beliefs also influenced on breastfeeding intention and normative belief strength was different between intenders and non-intenders. Amongst multi-ethnic sample in UK, beliefs of benefits of breastfeeding were related to breastfeeding intention, beliefs of convenience to bottle-feeding intention and both breastfeeding and bottle-feeding beliefs to mixed-feeding intention (Cabieses et al., 2014). In study by Heinig and others (2006) mother mentioned beliefs about importance and difficulty of infant feeding practices and perception on opinion of family members and health care personnel influencing their infant feeding decision and practices. Common beliefs related to introduction of complementary foods are baby being old enough and seeming hungry or solid foods being effective in changing infant behavior, such as sleeping longer or decreasing fussy behavior (Clayton et al., 2013; Doub et al.,

2015; Heinig et al., 2006). Although many studies have shown the importance of mothers' beliefs and perception of their spouses' thoughts and attitudes on infant and young child feeding decision and choice, only few studies have examined fathers' own feeding beliefs and their determinants. Rempel and Rempel (2004) found that fathers' prenatal beliefs influenced strength of mothers' breastfeeding intention and predicted breastfeeding behavior even over and above mothers' intention. Fathers, like mothers, may consider breastfeeding 'something natural' and be surprised if difficulties emerge (Sherriff et al., 2014).

Attitudes towards infant feeding are often measured with Iowa Infant Feeding Attitude Scale (Mora et al., 1999), which has proved to be valid instrument in many populations (Charafeddine et al., 2015; Ho and McGrath, 2011; Nanishi and Jimba, 2014; Twells et al., 2014; Wallis et al., 2008). Studies examining attitudes association with actual infant feeding practices have used total score of this instrument. In many studies mother's general positive attitude towards breastfeeding has been associated with intention to breastfeed and longer duration of both exclusive and any breastfeeding in different populations (Chen et al., 2013; Cox et al., 2015; Mitchell-Box et al., 2013) and introduction of complementary foods (Newby et al., 2014). However not all the studies have found positive attitudes to be associated with initiation of breastfeeding (Holbrook et al., 2013) or exclusive breastfeeding duration (Yu et al., 2015). More specifically also attitudes towards breastfeeding in public have been found to be associated with earlier discontinuation of breastfeeding in many European countries (Scott et al., 2015).

Findings on influence of father's attitude on infant feeding are contradictory. Mothers' and fathers' attitudes have been found to be strongly correlated (Mitchell-Box et al., 2013). Mothers who perceived their partner having negative attitudes regarding breastfeeding planned to formula-feed (Freed and Fraley, 1993; Freed et al., 1993; Scott et al., 1997) and chose formula-feeding as feeding method (Arora et al., 2000; Wolfberg et al., 2004). In study by Giugliani et al. (Giugliani et al., 1994) mothers' perception of fathers' attitude was the main reason associated with breastfeeding shortly after birth. However, studies have shown that mothers' perceptions of fathers' attitudes are not always accurate (Freed et al., 1993) and that even though many fathers would consider breastfeeding as best option for feeding, they do not necessarily discuss infant and young child feeding practices with mothers (Taspinar et al., 2013). Fathers seem to defer the feeding decision to the mothers, even when their own attitudes differ from those of the mothers (Avery and Magnus, 2011; Kenosi et al., 2011). This is supported by studies where fathers' attitudes have not influenced neither breastfeeding intention (Scott et al., 2004) nor duration of it (Karande and Perkar, 2012).

#### *2.4.6 Mother – infant dyad*

Infant and young child feeding is not just mother or caregiver providing nourishment to the child, but relational process consisting of both parties involvement. Infants start to signal their hunger to mothers shortly after birth with irritability and sucking at the level depending of infants own hunger and rate of supply of food from the mother (Wells, 2003). Mothers response to infants' behavioral signs depends on information coming from the child about timing, amount, preference, pacing and eating capability, but also parental perception of this information and infant characteristics (Satter, 1986).

Parental perception about appropriate size and growth are important determinants of infant and young child feeding behavior. If child is small at birth or born preterm, they are often breastfed for a shorter time exclusively and totally, and introduced complementary foods earlier than normal sized or term babies (Erkkola et al., 2010; Kronborg et al., 2015; Uusitalo et al., 2012), although not all studies have had similar findings (Pineda, 2011; Sencan et al., 2013). This may be due to infants difficulties in sucking, but also mothers experiencing stress and anxiety of their child's size and doubt over their own ability to provide adequate nutrition for their child (Sisk et al., 2006). In a recent study lower birth weight was uniformly associated with higher levels of concern for weight, monitoring and encouraging feeding style in infants (Brown and Lee, 2013). Concern for infant's weight was also associated with early introduction of solid foods. Parental perception of ideal body size may also influence feeding practices. If mother has large body size herself, she may prefer larger sized infants resulting possibly to adopting poor feeding practices, such as formula feeding or early weaning (Redsell et al., 2010).

Parental impression of infants needs may be influenced by variability of infant behavioral characteristics. Mothers perception of infants easy temperament has been related to longer duration of breastfeeding and later weaning from the breast (Vandiver, 1997). Infants with more difficult temperament were less likely to be breastfed fully at 6 months, but after one year, there was no longer an association between difficult temperament and breastfeeding (Niegel et al., 2008). These studies are consistent with the results obtained by Kielbratowska and others (2015), who found that breastfed newborns demonstrated higher activity and intensity to reactions and were considered by their mothers less irritable during feeding than formula-fed newborns. It was suggested that in a society where breastfeeding is valued, successful breastfeeding experience may lead to more favorable perception of the child by mothers. On the contrary, formula fed three month old infants were rated by their mothers having overall easier temperaments, less distress, more smiling, laughing and vocalization and higher soothability compared with breastfed or mixed fed infants (Lauzon-Guillain et al., 2012). The study did not, however, exclude the possibility of babies with easier temperaments being breastfed longer, but suggested that breastfeeding could be challenging for babies which can lead to more crying and fussing behavior in order to get they needs met.

Studies from some developing countries suggest that there are differences in breastfeeding practices according to child's gender. Boys are breastfed for a longer time than daughters in India (Jayachandran and Kuziemko, 2011) and in Egypt (Chakravarty, 2015). It is suggested that in the cultures where boys are valued over girls, mothers with a daughter wish to conceive soon again to have a son and thus limit duration of breastfeeding. Families may also give boys more and better quality food than girls (Fledderjohann et al., 2014; Ng et al., 2012; Office, 2009). In a Finnish nationwide survey girls were in some age groups breastfed more than boys, but there was no difference in initiation or exclusivity of breastfeeding according to sex of the child (Uusitalo et al., 2012).

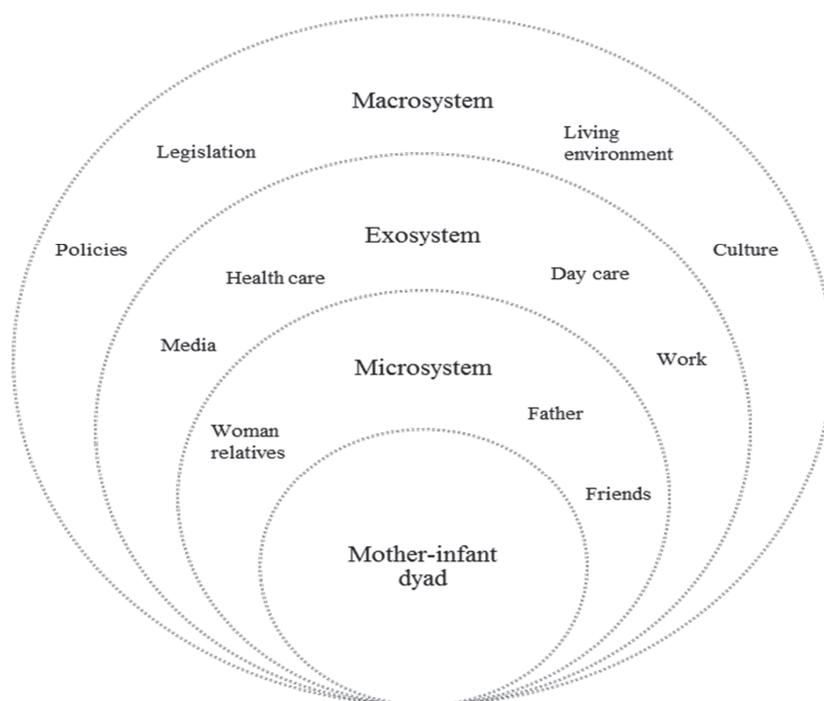
#### *2.4.7 Economic status and food security*

Infant and young children's feeding is also a matter of money. Even though recommended infant and young child feeding practices, especially breastfeeding, are generally cost-saving, infants in low socio-economic families are less likely to be breastfed or breastfed for a shorter period and introduce

solid foods earlier than infants in families having better socioeconomic status (Barros et al., 1986; Flacking et al., 2007; Gibbs and Forste, 2014; Oakley et al., 2013; Thu et al., 2012). Qualitative study conducted in Kenya found mothers food insecurity and hunger led to experiencing milk insufficiency, anxiety about infant hunger and perception that own intake of food was not sufficient for successful breastfeeding (Webb-Girard et al., 2012). Economic status may influence also the quality of foods provided for the children. In four South Asian countries prevalence of children having adequate dietary diversity, i.e. receiving foods from four or more food groups, was the lowest in the poorest families (Senarath et al., 2012). Formula-milk and especially foods containing plenty of protein and micronutrients are typically expensive, which makes low income families unable to purchase them for their children (Darmon and Drewnowski, 2015). This probably applies also to countries with higher income. In UK mothers with higher socioeconomic status fed their children with wider variety and healthier foods than mothers from lower socioeconomic groups (McAndrew et al., 2012), although in another study rate of exposure to variety of foods was not associated with socioeconomic status (Townsend and Pitchford, 2012). In addition to the actual price of foods, disparities in feeding practices according to socioeconomic status may be due to negative attitudes, lack of knowledge related on optimal feeding practices or lack of social support (Mitra et al., 2004).

## **2.5 External parental influences on infant and young child feeding practices**

Consideration of parental characteristics alone gives an incomplete picture on factors influencing breastfeeding and complementary feeding practices and behavior. The surrounding realities and conditions where families live in can either provide supportive atmosphere or obstacles that impede successful feeding experience. The socio-ecological models have been developed to address all levels of social and environmental factors that influence individuals' health behaviors (Bronfenbrenner and Urie, 1994; McLeroy et al., 1988; Stokols, 1996). According to the models in order to understand human behavior, we must understand the context in which the behavior occurs and the intertwined relationship between individual and their surrounding environment. Bronfenbrenner's ecological systems model defines spheres of influence from individual factors to society and environment, affecting health behavior (Bronfenbrenner and Urie, 1994). Although in the model different levels are separate in order to illustrate of how they individually contribute to each behavior, levels overlap and influence each other. Ecological models have been used to study healthy eating in school students (Townsend and Foster, 2013), children's body image (Evans et al., 2008), overweight and obesity (Dev et al., 2013) and infant and young child feeding in various cultures and societies (Dunn et al., 2015; Rayment et al., 2015; Reeves and Woods-Giscombe, 2015; Tiedje et al., 2002; White-Traut and Norr, 2009). Figure 3 provides a graphical representation Bronfenbrenner's ecological system applied to infant and young child feeding. The four categories emerging from this model are macrosystems, exosystems, microsystems and separately from microsystems, mother and infant levels. Mother, infant and many father related factors are described in previous chapter and other influences from other levels in the following, including mothers perception of father as 'significant other'.



**Figure 3.** Ecological framework with four categories; mother-infant dyad, microsystem, exosystem and macrosystem, for determinants of infant and young child feeding modified from Bronfenbrenner and Urie (1994).

Microsystem includes interpersonal relations experienced by the mothers; significant others in mothers life. Exosystem involves features social setting in which mothers do not have an active role, such as media or day care setting. Overarching exosystem is macrosystem, which are laws, policies and culture.

### 2.5.1 The significant others

In mother's circle of acquaintances there may be many people that mother perceive influencing infant and young child feeding practices. These 'significant others' may be fathers of the children, relatives, friends or acquaintances for example living in the same neighborhood or having similar life situation. Mothers may also name themselves as significant other for infant feeding (McInnes et al., 2013). Anyway, a mother needs to have a trusting relationship and belief to their knowledge in order for person to have a significant influence on the mother's behavior (Kessler et al., 1995; McInnes et al., 2013). How much she leans on significant others concerning feeding (McInnes et al., 2013) depends on the mothers confidence and self-efficacy.

In many studies mothers have perceived child's fathers to have most influence on feeding practices and behavior (Avery and Magnus, 2011; Kessler et al., 1995; Mueffelman et al., 2015; Nickerson et al., 2012; Rempel and Rempel, 2011). In study by Kessler et al. (1995), women's intention to breastfeed was more strongly influenced by fathers than other significant persons. Similarly in a study

by Mueffelmann and others (2015) mothers were more likely to intend to exclusively breastfeed if they perceived father preferring exclusive breastfeeding. Fathers influence may, however, be related to mothers' expectation of couple and gender roles. In study by McInness and others (2013), some women described sharing everything in their couple relationship and involving father equally in infant feeding, whereas other women made decisions on infant feeding by themselves. Mothers seemed to name their partners as a significant influence if partners and their own attitudes were similar, suggesting mothers seek support from fathers more on their predetermined ideas than change their attitude according to fathers one. In developing world men seem to have an even more limited role in child feeding and nutrition (Aubel, 2012).

In many societies older and more experienced women, especially grandmothers, possess an important role in transmitting behavioral norms and influencing feeding practices of the mothers (Aubel, 2012). Grandmothers may act as advisors for the mothers and often also as caregivers for the mothers to concentrate to breastfeeding or for children, if for example mother starts working (Wasser et al., 2013). Grandmother's role is significant especially in developing societies, where transgenerational households are common, but influential also in the Western countries. In United States (Kessler et al., 1995; Wasser et al., 2013) and in Scotland (McInnes et al., 2013) grandmothers have been found influencing mothers child feeding decision and practices. Mothers described needing grandmothers support, but were concerned on grandmothers lack of knowledge and false beliefs hindering their ability for breastfeeding advocacy (Grassley and Eschiti, 2008). Grandmothers position themselves as being available for support and advice concerning child care and feeding, but are unsure if their expertise and experience is valued enough for this purpose (Reid et al., 2010). Mothers do not always trust grandmothers' support in infant feeding, and grandmothers do not necessarily provide support and advice if not asked for it; this may be related to modernization and explain the greater influence the grandmothers have in child feeding in developing countries (Bezner Kerr et al., 2008). Grandmothers support and advice does not always lead to positive impact on feeding practices, probably due to lack of knowledge and experience on breastfeeding by themselves or other negative attitudes related to feeding (Susin et al., 2005). If grandmother acts as a caregiver of the child the feeding method is for obvious reasons often formula instead of breastfeeding (Bernie, 2014; Chen et al., 2008). This finding is supported by the studies, where practical support by grandmothers was associated with lower levels of breastfeeding (Emmott and Mace, 2015) and involvement of grandmother or other non-maternal caregiver in feeding was related to greater odds of shorter breastfeeding and feeding child with more juice and fruits (Wasser et al., 2013). These results support educating also grandmothers to achieve optimal feeding practices.

Other significant people for child feeding may be other female relatives, friends, colleagues, or women belonging to same parent or baby group or to online forums (McInnes et al., 2013). However, these persons were less frequently named as significant others than fathers or grandmothers. For mothers being in same life situation was particularly important and they were mentioned especially around introducing complementary foods into child's diet. Interaction with non-relatives seems to be mostly distant and they are not usually involved in actual feeding or child care (Wasser et al., 2013).

### *2.5.2 Health care system*

Most women in modern-day world encounter with health care system during pregnancy, delivery and postpartum. Thus, it is not surprising that health care system has an influence on infant and young child feeding directly through the personnel meeting parents and indirectly through healthcare clinical practices and operating procedures. Global Strategy of Infant and Young Child Feeding (WHO/UNICEF, 2003) acknowledges the importance of health care system for feeding practices and calls upon support for families from health care to initiate and sustain appropriate feeding practices and to prevent and help manage problems when they occur. There are good opportunities for providing support for infant feeding in a regular care, but also services provided for sick children.

Mothers perceive health care professionals as significant others influencing infant feeding in addition to grandmothers and fathers (McInnes et al., 2013). Especially primiparous mothers rely on health professionals for advice and professionals mentioned were midwives and health visitors, named often around introducing complementary foods and doctors, named in situations related to poor growth or breast infection. Mother's perception of health professional preference feeding style has also been related to breastfeeding intention; if mothers perceived health provider preferred mixed or formula feeding or were neutral about the type of infant feeding, they probably did not initiate breastfeeding at birth (Bentley et al., 1999; Odom et al., 2014) or breastfed exclusively for a shorter duration (Ramakrishnan et al., 2014). Also not knowing what feeding style is preferred by health care professionals was related to never breastfeeding, highlighting the importance of bringing up health care providers positive view on breastfeeding. However, health care providers' advice may have limited influence on feeding decision, if it conflicts with mothers' opinion and thoughts on feeding (Chaput et al., 2015; McInnes et al., 2013). Advice and support given to the mothers should be women-centered, understanding and respecting mothers' views.

Finnish clinical practice guideline for breastfeeding support also recommends evidence based, uninterrupted support by health care professionals from antenatal care to maternity hospital and to postnatal care in child welfare clinics (Hannula et al., 2010). Antenatal breastfeeding education seems to increase breastfeeding duration, although it is unknown what education method is most effective (Lumbiganon et al., 2012; Wong et al., 2015a). Maternity hospital practices are also known to influence breastfeeding. Especially practices based on WHO and UNICEF's Baby-Friendly Hospital Initiative (BFHI) has been proven as an effective way to support breastfeeding (Chung et al., 2008; Merten et al., 2005; Renfrew et al., 2009; Yotebieng et al., 2015) and to reduce socio-economic disparities in breastfeeding (Hawkins et al., 2015). The practices of BFHI include immediate skin-to-skin contact after birth, early initiation of breastfeeding and exclusive breastfeeding (WHO, 2009). In addition one of the hospital practices influencing breastfeeding initiation and duration is in-hospital supplementation. There are some medical conditions when using breastmilk substitutes is medically indicated, such as hypoglycemia that does not respond to breastfeeding (WHO/UNICEF, 2009). However, this concerns only few mothers and children and majority of the infants receive formula for other than medical reasons (Tender et al., 2009), such as perceived milk insufficiency, signs of inadequate intake and poor latching or breastfeeding (Chantry et al., 2014). In Finland 71% of children received either donated breastmilk or formula at the hospital in 2010 (Uusitalo et al., 2012). Formula supplements during hospital stay has been associated with delayed initiation of breastfeeding (Mattsson et al., 2015), not meeting the exclusive breastfeeding intention (Perrine et al., 2012), and

shorter duration of exclusive or any breastfeeding (Chantry et al., 2014; Parry et al., 2013; Tarrant et al., 2015). Tarrant et al. (2015) also suggests that there would be a dose response pattern in formula supplementation for the risk of breastfeeding cessation (Tarrant et al., 2015). However, there does not seem to be link between mothers perception of her ability to breastfeed and in-hospital supplementation (Koskinen et al., 2014). In order to effectively promote optimal infant feeding practices, mothers should not be left without support after hospital discharge. It seems that prenatal interventions combined with postnatal ones is most effective in prolonging the duration of breastfeeding (Chung et al., 2008a). Influential methods for postnatal health services could be home visits, support by telephone calls and establishing special breastfeeding centers (Hannula et al., 2008).

### *2.5.3 Living environment*

Urbanity level of the living environment of mother and infant have been associated to infant feeding practices. In North Carolina, United States, urban mothers are more likely to initiate breastfeeding than women in rural areas (Lynch et al., 2012). These differences are suggested to reflect the differences in economic resources, work environments and social support in urban and rural environments (Sparks, 2010). In Finland, exclusive breastfeeding has been more common in rural than in urban areas in the breastfeeding initiation phase, but differences have levelled off after first months and there were no difference in total breastfeeding duration according to place of residence (Uusitalo et al., 2012). In many developing countries breastfeeding is initiated more quickly in urban than in rural areas, probably due to larger proportion of birth taking place in medical facilities (Smith et al., 2005; Thu et al., 2012). Despite of early start of breastfeeding, exclusive and total breastfeeding duration is shorter in urban areas, as breastfeeding cessation rates are higher in urban areas in many developing countries. However, poorer breastfeeding practices and earlier introduction of solid foods are compensated by providing more and better quality complementary foods, leading to better overall nutrition status in urban than in rural areas (Smith et al., 2005). This is likely due to the higher education level and socioeconomic status of the mothers as well as better availability of food in urban areas.

In addition to urban rural disparities, broader contextual variations in immediate neighborhood need to be considered for understanding variations in breastfeeding behavior. Neighborhoods commonly share socioeconomic characteristics, physical and social environments and public services, all of which possibly can influence health behavior, such as infant feeding, beyond individual socioeconomic characteristics of the family. Furthermore as visual experience of breastfeeding has been associated with breastfeeding initiation and duration (Dykes et al., 1998), mothers living in an environment with high prevalence of breastfeeding may increase opportunities for mothers actually seeing breastfeeding and thus breastfeed also themselves, despite of their individual socioeconomic status. In a Swedish study the mothers living in the neighborhoods where high proportion of families had low purchasing power were likely to stop breastfeeding before four months (Almquist-Tangen et al., 2013). When adjusting with various individual level characteristics, risk for breastfeeding cessation in deprived neighborhoods before 4 months was smaller, but still significant. Studies from United States have had conflicting results on neighborhood level variations in breastfeeding practices. Cubbin and others (2008) found no differences in breastfeeding initiation between different

neighborhoods, whereas Burdette (2013) findings suggested initiating and sustaining breastfeeding was associated with neighborhood characteristics, especially education status.

#### *2.5.4 Culture*

Culture is proposed having three dimensions; 1) knowledge; shared ideologies, beliefs, values, norms and meanings of individuals, 2) practice; group of individuals sharing and deploying cultural knowledge and change; 3) constantly evolving culture through dynamic relationship between cultural knowledge and practice (Asad and Kay, 2015). Infant and young child feeding is performed always in the context of broader cultural environment, which shapes mothers feeding expectations, behavior and experiences. Despite the fact that breastfeeding is a biological norm for all mammals, the process and meaning of breastfeeding, and how it is integrated in the society vary, making breastfeeding strongly culturally constructed (Van Esterik, 1996).

One cultural feature which possibly influences infant and young child feeding practices is perception of motherhood. In many studies conducted in Western countries the breastfeeding decision and practices have largely been comprised by mothers of breastfeeding being natural part of motherhood (Marshall, 2011; Schmied and Lupton, 2001; Tully and Ball, 2014). Picturing breastfeeding as natural part of motherhood and best for the baby throws aside real experiences of breastfeeding and different challenges that the mothers may face (Foss, 2010). It has been suggested that women who conceptualize breastfeeding as natural and easy are less likely to succeed at breastfeeding than women who believe on their abilities to breastfeed and consider breastfeeding as a learned skill (Avery et al., 2009). Similarly widely prevalent ideology in Western countries of scientific motherhood; a belief of mother needing scientific and medical expert advice to raise or feed their children healthfully (Apple, 1995) or biomedical breastfeeding discourse, emphasizing nutritional and health benefits of breastmilk and thus viewing breastmilk as a product may influence negatively to breastfeeding practices (Auerbach, 1995; Dykes, 2002). The mentioned cultural features position breastfeeding as nutrition instead of nurture and the only proper feeding choice for good mothers, leading easily to decreased trust on mother's ability to produce breastmilk adequately (Auerbach, 1995; Dykes and Flacking, 2010; Torres, 2014). Maternal confidence has been identified in earlier studies as important determinant for breastfeeding success (Blyth et al., 2002; Otsuka et al., 2008). In addition to mothers confidence also commitment to breastfeed despite obstacles is needed for successful breastfeeding experience (Avery et al., 2009).

Baby-led feeding style where the baby determines the frequency and duration of breastfeeding is recommended over scheduled breastfeeding where parent decides the feeding patterns (Kent, 2007; WHO/UNICEF, 2003). Baby-led feeding supports supplying sufficient amount of milk for the demand of infant nourishment. However, especially concerning breastfeeding duration there may be cultural norms hampering mothers wish to follow baby-led approach in weaning. In many Western countries extended breastfeeding is viewed as unacceptable, bizarre and pointless, even if infant or mother would like to continue breastfeeding (Dowling and Brown, 2013; Rempel, 2004; Stearns, 2011). This may be explained by cultural belief of breastfeeding servings only for nutritional function and being suitable to very young infants (Dettwyler, 1995). Also culture emphasizing highly on individualism, as in Finland (Alasuutari, 1991), may lead mother to choose parent-led feeding style with using formula instead of breastmilk to have greater independence from their infant (Brown et

al., 2011). In such a culture parent-led feeding approach with formula feeding or early introduction of complementary foods may be thought also to promote infants independence, although breastfeeding has been found possibly fostering secure attachment (Britton et al., 2006), which in turn seems to increase child's confidence in strange situations (Malatesta et al., 1989).

Traditionally breasts have been viewed as means to nourish and nurture a child, yet in Western culture breasts are perceived as sexual objects creating contradiction for mother's bodies (Stearns, 1999). Woman's body should not be simultaneously sexual and maternal making lactating breasts something to hide and not suitable for public view. Discomfort of public breastfeeding has been found to be a common barrier for breastfeeding (Callaghan and Lazard, 2012; Scott et al., 2015). Due to this dilemma mothers may choose not to initiate breastfeeding, breastfeed for a shorter duration or express and bottle feed their child when in public places (Amir, 2014).

### *2.5.5 Infant and young child feeding related policies and legislation*

As data indicating importance of feeding practices for child's growth, health and development has emerged, promotion of optimal infant and young child feeding practices have arrived on the policy agenda. Nowadays most public health initiatives to promote, protect and support optimal infant and young child feeding practices are based on the WHO Global Strategy of Infant and Young Child Feeding published in 2003 (WHO/UNICEF, 2003). The strategy urges governments to develop and implement comprehensive policy on infant and young child feeding, provide skilled support for mothers to meet the recommended feeding practices, empowering health workers to provide effective feeding counselling and implement national legislation to protect especially breastfeeding. It emphasizes engagement of all relevant stakeholders in efforts to promote optimal feeding practices. A document called: Protection, promotion and support of breastfeeding in Europe: a blueprint for action, provided framework for the development of policies and strategies on IYCF in European countries (EU Project on Promotion of Breastfeeding in Europe, 2004). It is largely based on the WHO strategies and goals.

The Global Strategy of Infant and Young Child Feeding builds upon past initiatives, such as World Declaration and Plan of Action for Nutrition (FAO/WHO, 1992), Innocenti Declaration (WHO/UNICEF, 1990), Convention on the Rights of the Child (OHCHR, 1990), Baby-friendly Hospital Initiative (BFHI) (BFHI, 2010) and Millenium Development Goals (MDGs). Innocenti Declaration was released in 1990 by WHO and UNICEF. It recognized the importance of breastfeeding to the health and wellbeing of both mother and child, declared how infants and young child should be fed and how to reach these targets. At the same year Convention on the Rights of the Child was published, where in Article 24 it is stated that governments must combat disease and malnutrition through provision of adequate nutritious foods and clean drinking water and ensure all sectors of society, in particularly children and their families are informed, have access to education and are supported in the use of basic knowledge of child health and nutrition, including the advantages of breastfeeding (OHCHR, 1990). Baby Friendly Hospital Initiative was originally developed in year 1989 (WHO/UNICEF, 1989) to provide ten step programme for maternity services to support and encourage mothers to breastfeed (BFHI, 2010). Although at the beginning Baby-friendly Initiative focused solely on maternity services, initiative has been expanded to include other community services and is nowadays widely used in many countries. In the beginning of millennium, eight

Millennium Development Goals (MDGs) were compacted internationally to tackle injustice and inequality in the world. Although Millennium Development Goals (MDGs) do not mention infant and young child feeding practices, feeding choice and practices are related to all MDGs (Bartle, 2013). In particular IYCF practices have important role especially to MDG 1: Eradicate extreme poverty and hunger, MDG 4: Reduce child mortality and MDG 5: Improve maternal health.

In addition to strategies and policies, legislation is important in enabling achieving good infant and young child feeding practices. These include especially legislation regulating promotion and marketing of breast milk substitutes and facilitating breastfeeding of working mothers. Until the first commercial formulas became available over 100 years ago, breastfeeding was almost universal all over the world (Palmer, 2009). Undoubtedly breastmilk substitutes are good option if breastfeeding is not possible. However formula feeding may lead to increased infant mortality due to poor hygiene and sanitation facilities and short- and long term morbidities and promotion of breastfeeding should be priority (Kler et al., 2015). In order to protect mothers from companies pressuring to use substitutes for breast milk, World Health Assembly adopted in 1981 the International Code of Marketing Breast-milk Substitutes, hereafter referred as the Code, providing guidelines on monitoring, implementing and regulating the marketing of breast milk substitutes (WHO, 1981). The aim of the Code was: *to contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breast-feeding, and by ensuring the proper use of breast-milk substitutes, when these are necessary, on the basis of adequate information and through appropriate marketing and distribution.* It applies to breast-milk substitutes marketed or represented to be suitable for use of replacement of breastmilk and related equipment's; feeding bottles and tits and prohibits any related advertising or gifts. A few years ago, 37 out of 199 countries have passed laws covering all recommendations of the Code, 69 countries fully prohibit advertising breast-milk substitutes and 45 countries have implementation and monitoring system in place (WHO, 2011). Violations of the Code are widespread in both developed and developing countries, resulting familiarization of mothers to certain formula milk brands and believing formula feeding is as good as or even better than breastmilk in feeding their children (Brady, 2012). Legislation covers rarely other foods or beverages for the use of young children, although there is international concern about prevalent marketing of foods high in fat, salt and sugar and increasing prevalence of non-communicable diseases among children, especially overweight and obesity (WHO, 2010). Thus WHO encourages countries designing new and strengthening existing policies to improve children's food environment and ensure their healthy development.

Facilitation of breastfeeding by working mothers is another important aspect of global efforts for improving infant and young child feeding practices. To meet this goal, International Labour Organizations (ILO) has established minimum international standards, Conventions, which after ratifying by member states are binding and country's laws must be brought into conformity with the Convention (WABA, 2003). First Convention recognizing importance of maternity protection at work was adopted already in 1919 (C3), second in 1952 (C103) and the third in 2000 (C183). Of these C183 and its accompanying Recommendation No. 191 calls especially for helping to initiate, establish and maintain optimal breastfeeding practices. Maternity protection covers seven elements in general; scope, leave, benefits, health protection, job protection, non-discrimination, breastfeeding breaks and facilities, of which especially maternity leave and paid nursing breaks and facilities are important for facilitating breastfeeding. The ILO's international minimum standard for maternity

leave is 14 weeks. Twenty nine countries have ratified the Convention 183, including many former Soviet-Union countries and Italy, Portugal, Switzerland and Austria (ILO, 2000). In many studies positive association has been found with longer duration of maternity leave and breastfeeding practices (Cooklin et al., 2012; Guendelman et al., 2009; Huang and Yang, 2015; Skafida, 2009; Smith et al., 2015b).

In Southwestern Finland, only Salo hospital has been certified as baby-friendly hospital (THL, 2009). There is a national action programme on breastfeeding promotion, which defines the policies of future breastfeeding promotion. Statutes 1326/2010 and VNA 338/2011 regulate health education given at the maternity clinics, including breastfeeding counselling and maternity clinic guide provides detailed directions for breastfeeding promotion (Klementti & Hakulinen-Viitanen, 2013). When data for this research was collected, the guideline entitled 'Child, Family and Food' was a nutrition guideline for the families with small children and contained breastfeeding and complementary feeding recommendations (Hasunen, 2004). In this guideline, exclusive breastfeeding was recommended to continue until six months and complementary feeding to be started based on individual needs by from four to six months at the latest. In the new guideline entitled 'Let's eat together', published early this year, exclusive breastfeeding recommendation has been changed to 4-6 months (THL, 2016). In addition to complementary feeding, breastfeeding is instructed for at least 12 months. Breastmilk substitutes are widely used in Finland and Finland has partially adopted the International Code of Marketing of Breastmilk (Breastfeeding Support Association in Finland, 2011). There is a governmental support for maternity leave for about four months starting at latest 30 days before estimated date of delivery and parental leave after maternity leave for slightly over six months (Kela). Only mother can have maternity leave and parents can share parental leave; however mothers use vast majority of the parental leave (Haataja, 2009). When mothers return to work after parental leave, only few mothers breastfeed anymore (Uusitalo et al., 2012) and Finland has not ratified ILO Convention 183 2000, regarding maternity protection and breastfeeding breaks.

In Solomon Islands, The National Referral Hospital in Honiara was the first hospital in the Pacific to meet expanded standards of the Baby Friendly Hospital Initiative in 2012 and already at least 10 years before implemented related activities at the hospital (Agorau; UNICEF, 2012). The first National Breastfeeding policy was endorsed in 1996 and again on 2008 for years 2010 to 2017, but it is unknown is the newer policy officially adopted (WHO, 2011). The International Code of Marketing of Breastmilk Substitutes has not been adopted, but there has been voluntary agreement with formula manufacturers (Agorau). Maternity leave is 12 weeks on full pay in both public and private sector (ILO). However maternity leave related law does not mention women working in informal sector and it is unknown whether women working in informal sector receive maternity leave. Law states that nursing mothers should be allowed to leave their work for nursing for maximum of an hour twice a day. There are no voluntary mother-to-mother support groups in Honiara, neither trained peer counsellors. National policies, laws or programmes are all about breastfeeding, and no attention is paid to complementary feeding.

## **2.6 Influencing infant and young child feeding practices**

As achieving optimal infant and young child feeding is important public health goal, many types of interventions have been implemented in various settings to improve breastfeeding and

complementary feeding practices. Many studies can be found especially on effectiveness of interventions on improving breastfeeding practices (Chung et al., 2008b; Fairbank et al., 2000; Haroon et al., 2013; Ibanez et al., 2012; Ingram et al., 2010; Jolly et al., 2012; Sinha et al., 2015), but fewer on complementary feeding (Daniels et al., 2015; Fabrizio et al., 2014; Hetherington et al., 2015). There are working solutions for improving feeding practices; however no intervention fits all contexts. Interventions can be implemented in many different settings; health systems and services, home and family environment, community environment and work environment (Sinha et al., 2015). Interventions should be adapted to meet the unique characteristics of each setting to have most influence.

Health systems and services are related to interventions implemented in the sphere of influence of health care and can include education and training of the staff and patients by health professionals, clinical practices or policies and initiatives related to IYCF. According to a recent review and meta-analysis, at health system settings BFHI was most effective intervention to improve any breastfeeding rates (Sinha et al., 2015). Results concerning education and counselling by health professionals are inconsistent. Chung and others (2008b) found that formal breastfeeding education or individual level professional support were not effective in increasing breastfeeding initiation or duration. However more recent review and meta-analysis found breastfeeding education and counselling having positive influence on exclusive breastfeeding rates and decreasing no breastfeeding rates at birth, below 1 months and between 1 to 5 months (Haroon et al., 2013). Similarly other studies have found that counselling or education delivered by health staff increased odds of breastfeeding initiation (Sinha et al., 2015) and still breastfeeding at infant's age of 3 months among low-income women (Ibanez et al., 2012). Combined individual and group counselling may have larger effect than either of alone (Haroon et al., 2013). Also interventions in developed countries have been found to have smaller impact than interventions in developing countries. In societies, where food insecurity is common, nutritional education combined with provision with appropriate complementary foods or nutrition counseling alone, has been proven to reduce risk of stunting in children under 2 years of age (Imdad et al., 2011; Lassi et al., 2013).

Peer support, counseling and education or support by father or significant others can be home and family environment interventions. Interventions based on peer support have been found to increase breastfeeding continuation (Ingram et al., 2010; Jolly et al., 2012; Sinha et al., 2015; Sudfeld et al., 2012). However, context seems to influence to the effectiveness of the intervention. Effect of peer support was smaller in communities having high prevalence of formula-feeding (Sudfeld et al., 2012), developed countries compared with low- or middle income countries (Jolly et al., 2012) and with universal peer support compared with targeted interventions (Ingram et al., 2010). Intervention combining peer support or counseling with usual health care or other settings seem to be most effective in increasing breastfeeding rates (Chung et al., 2008b; Sinha et al., 2015). Support from family or other social contacts hasn't been found to have significant influence on breastfeeding initiation, exclusive breastfeeding duration, total breastfeeding duration or any breastfeeding rates (Sinha et al., 2015).

Community environment includes group support and counseling, social mobilization, mass media or social media. Interventions in community setting has been found to influence early initiation of breastfeeding and promotion of exclusive breastfeeding, continuing of breastfeeding (Sinha et al.,

2015). Of specific intervention types, group counseling influenced significantly initiation of breastfeeding and integrated mass media, counseling and community mobilization influenced to exclusive breastfeeding duration. Also Hall and others (2011) found community based interventions improving exclusive breastfeeding duration in low- and low-middle income countries. Fairbank et al. (2000) also suggested group health education would be especially effective in improving breastfeeding practices. In addition to interventions implemented only in community setting, interventions combining different settings with community has been found to be effective and it was suggested that instead of educating only mothers, increasing awareness of whole communities would benefit most (Sinha et al., 2015).

Maternity leave, workplace support and employment status of the mother which often influence infant feeding practices, are categorized here as work setting. Interventions in work setting may include facilitating longer maternity leaves, expressing breastmilk at work or having breastfeeding breaks during work day. Interventions in the work environment had no influence on initiation of breastfeeding, small insignificant influence on probability of exclusive breastfeeding, but significant positive effect for total breastfeeding duration and prevalence of any breastfeeding (Sinha et al., 2015). Especially paid maternity leave was associated with continued breastfeeding at 10 months and not-working at all to prevalence of any breastfeeding. Results suggest working environment influences breastfeeding, but the influence is fairly small.

In addition, policies and legislation, related to breast-milk substitutes or national maternal and child nutrition and health policies or incentives as a method of intervention, may influence infant and young child feeding practices (Bassani et al., 2013; Moran et al., 2015; Sinha et al., 2015). However, due to limited amount of interventions on policy environment and breastfeeding, it was only found that using breastmilk substitutes hampered breastfeeding continuation. Incentives outside of health care setting, such as providing breast pumps, gifts, vouchers, money, food or help with a household chores has been tested to improve breastfeeding practices (Moran et al., 2015). However in the lack of high-quality studies examining these effects and it is not known, do incentives have effect on breastfeeding. Review by Bassani and others (2013) suggests, that the influence of financial incentives is low in promoting breastfeeding, but there can be potential positive impact on feeding colostrum, initiation of breastfeeding and duration of exclusive and total breastfeeding. In addition, provision of complementary foods has been found to result in improvements in growth among young children in developing countries (Imdad et al., 2011; Lassi et al., 2013).

### **3. AIMS OF THE STUDY**

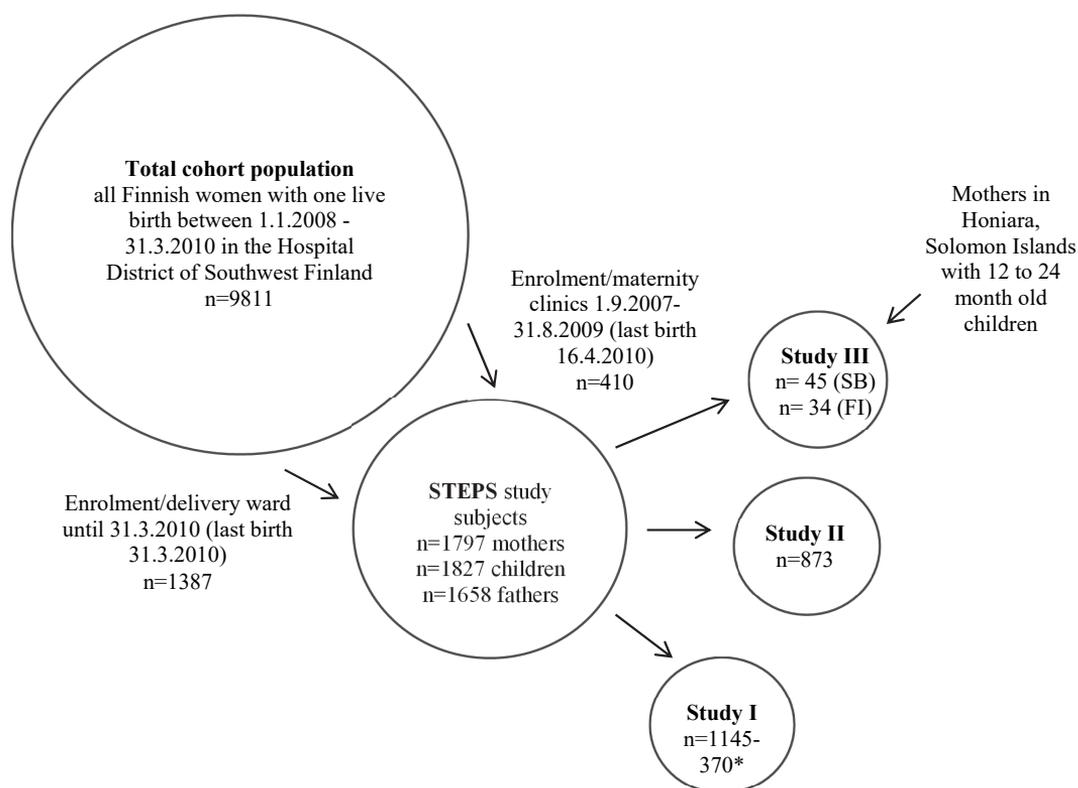
The aims of this study were to provide information on parental influences on infant and young child feeding practices and behavior in Finland, and to study how mothers in two different contexts; i.e. Finland and Solomon Islands, experienced infant and young child feeding. The objectives were:

1. to study how maternal and paternal eating behavior, diet quality and food neophobia associates to breastfeeding duration and complementary feeding initiation (Study I)
2. to study how maternal and paternal prenatal and postnatal marital satisfaction and depression influence initiation of breastfeeding and exclusive breastfeeding duration (Study II)
3. to examine how mothers experience breastfeeding and complementary feeding in two different contexts, i.e. in Finland and Solomon Islands, and their perception of contextual factors that influence feeding behavior and practices (Study III)
4. to study how maternal and paternal eating behavior and practices, marital satisfaction and depression influence compliance with the feeding recommendations (unpublished analysis)

## 4. METHODS

### 4.1 Subjects and study design

The flow chart of this study is presented in Figure 2. This study was largely based on data from children and parents participating in a longitudinal cohort, Steps to the Healthy Development of Children (the STEPS study), which has been described in detail elsewhere (Lagstrom et al., 2013). The cohort population consisted of all mothers who gave birth to a living child / children between January 1<sup>st</sup> 2008, and April 31<sup>st</sup>, 2010, in the Hospital District of Southwest Finland, along with these mothers' children (in total, 9811 mothers and 9936 children). Of this cohort, 1797 mothers with 1827 children and 1658 partners decided to participate in the study during pregnancy at the maternity healthcare clinics or after delivery at the hospitals. These are the participants in the intensive follow-up group of the STEPS study. This thesis focused on the first 2 years of life.



**Figure 2.** Flow chart of the study

\* Depending on study question and the number of available responses

Subjects for the study investigating the association of parental eating behavior with breastfeeding and complementary feeding (Study I), were selected from families participating intensive follow-up group of the STEPS study, from whom we had data on breastfeeding, introduction of complementary foods and one or more aspects of parental eating behaviors or dietary patterns. The inclusion criterion for

study investigating the association of parental depression and marital satisfaction with feeding practices (Study II), was that we had data on mothers' and father's marital satisfaction, depression status and breastfeeding initiation, exclusive breastfeeding and partial breastfeeding duration (n=873). The qualitative study exploring maternal experiences on infant and young child feeding (Study III) included mothers of children aged 12 to 24 months from STEPS study in Finland and mothers from general population in Honiara, Solomon Islands who wanted to participate to the interviews (n=45 in Solomon Islands and 34 in Finland).

Recruitment-based selection bias was minimized in the Studies I and II by collecting data from participants of the STEPS study, who represent the general mother, father and children population of mothers, fathers and children, irrespective of their feeding and eating patterns. Similarly, for qualitative interviews mothers were not selected based on feeding or eating, but on having child/children between one to two years of age and living in the mentioned area.

#### 4.2 Sampling and data collection

Data in this study were collected from pregnancy until the child was at the age of two years. Data collection is shown in detail in Table 2. The collected background information on the mothers and fathers included information on education, working status, household economics, health and parity.

**Table 2.** Data collection of this study from pregnancy to two years of age.

Time point	Data source	Information collected
Gestation weeks 10	Questionnaires	Background information from both mother and father
Gestation weeks 20	Questionnaires	Edinburgh Postnatal Depression Scale (EPDS) Revised Dyadic Adjustment Scale (RDAS)
Birth	Register data from Longitudinal Census File	Child's birth weight, gestational age and gender
Child 4 months	Questionnaires	Three-Factor Eating Revised 18-item Questionnaire (TFEQ-R18) Edinburgh Postnatal Depression Scale (EPDS) Revised Dyadic Adjustment Scale (RDAS)
Child 13 months	Questionnaires	Food Neophobia Scale (FNS) Index of Diet Quality (IDQ)
Child 0-24 months	Study visit Follow-up diary	Weight and height of the mothers and fathers Breastfeeding and introduction of complementary feeding
Child 12-24 months	Interviews	Background information of the families, Food security questionnaire (only SB), qualitative exploration of maternal experiences on IYCF

### **4.3 Background characteristics of the parents and children**

#### *4.3.1 Mothers and fathers*

For the Study I, information regarding marital status, biological family, total family income, number of siblings, mother's age, and mothers' and fathers' working status, education and profession were obtained from questionnaires self-administered by mother or father of the unborn child during the prenatal period. Family income was classified into two categories: high income ( $\geq 3000$  €/month net) and low income ( $< 3000$  €/month net). Mothers' age was classified into two categories according to a split by the mean age of women giving birth in Finland in 2012. Occupational class was classified into the following categories: (i) professionals (in high positions, e.g. managerial, but also in intermediate positions, such as nurses); and (ii) and others (blue-collar workers in industry or agriculture and service workers). Education was classified into either advanced education or low education based on the education that the parents had completed for their professions. The educational levels of those who had the highest levels of vocational training (such as a 4-year programme at a polytechnic institute) or any academic degree (bachelors, masters, licentiate or doctoral degree) were regarded as advanced education. Mothers' and fathers' weight and height was measured during their study visit, when their children were about 13 months old. Heights of the parent or both parents attending the study visit were measured to the nearest millimeter with a Harpenden stadiometer (Holtain, Crymych, UK) and weights were measured to the nearest 0.1 kg with an electronic scale (Tanita WB110MA; Tanita Corporation, Tokyo, Japan). Parents' BMI were calculated as  $\text{kg/m}^2$  and classified as normal weight ( $< 25.0$   $\text{kg/m}^2$ ) and overweight ( $\geq 25.0$   $\text{kg/m}^2$ ).

For the Study III information on demographic characteristics were collected by interviewing mothers. Information collected included mothers and fathers' age, working status, education, ethnicity, religion, marital status, smoking, the use of alcohol, parity, household characteristics, place of residence, food procurement and expenditure, cooking place and style and perception of family's welfare.

#### *4.3.2 Children*

For Study I, information on children's birth weight, gestational age and sex were obtained from the Longitudinal Census Files. Birth weight was classified according to a split at 3000 g and gestational age according to a split at 37 weeks to preterm and term babies.

On children participating to Study III, information on birthday, birth weight, place of birth, health of the child, visits to health care centers and mother's perception on child's nutritional status and factors influencing feeding practices was collected by interviewing mothers.

### **4.4 Parental questionnaires measuring eating behavior and practices**

#### *4.4.1 Three factor eating questionnaire*

Three-Factor Eating Revised 18-item Questionnaire (TFEQ-R18) is used to measure three characteristics of eating behavior; cognitive restraint, uncontrolled eating and emotional eating

(Karlsson et al., 2000). Cognitive restraint of eating refers to a person's attempts to cognitively control food intake, uncontrolled eating is the failure to restrict eating and emotional eating refers to overeating due to negative emotions. Cognitive restraint is measured with six items (e.g. 'How likely are you to consciously eat less than you want?'), uncontrolled eating with nine items (e.g. 'I am always hungry, so it is hard for me to stop eating before I finish the food on my plate') and emotional eating with three items (e.g. 'When I feel blue, I often overeat'). All items are coded on a 4-point scale of frequency or truthfulness of the behavior. Higher total scores indicated more of each behavior type. The TFEQ has mainly been used in overweight and obese individuals, but it is also valid in distinguishing eating behaviors in the general population, including in Finland (Anglé et al., 2009; de Lauzon et al., 2004). In this study Finnish translation of TFEQ-R18 was included in the questionnaire filled by either or both of the parents at child's age of 4 months. Cognitive restraint, uncontrolled eating and emotional eating for each participant were recorded as either low or high behaviors, according to the median split (Porter and Johnson, 2011). Cronbach's  $\alpha$  values for cognitive restraint, uncontrolled eating and emotional eating were 0.73, 0.86 and 0.88, respectively, indicating reasonable internal consistency.

#### *4.4.2 Food Neophobia*

Parents' food neophobia can be assessed using Pliner and Hobden's Food Neophobia Scale (FNS) (Pliner and Hobden, 1992). In this study the Finnish translation of the FNS was used, which is previously validated in the Finnish adult population (Tuorila et al., 2001). The FNS consists of ten statements (e.g. 'If I don't know what is in a food, I won't try it'), each rated on a 7-point scale from 'strongly disagree' (scored as 1) to 'strongly agree' (scored as 7). The responses for half of the statements worded to indicate food neophilia (e.g. 'I will eat almost anything') were reversed and the food neophobia score was calculated as a sum of the responses. In this study the total score ranged from 10 to 65. FNS can be used as a continuous variable or to classify scores into groups regarding levels of food neophobia. In this study, participants were divided into three groups using the 33rd and 66th percentile points as cut-off values (Falciglia et al., 2000; Tuorila et al., 2001). Those who scored 10–16 were categorized as food neophilics, those who scored 17–39 were categorized as average and those who scored 40–65 were categorized as food neophobic. The Cronbach's  $\alpha$  for FNS was 0.88. The same Cronbach's  $\alpha$  value was reported when the FNS was developed (Pliner and Hobden, 1992).

#### *4.4.3 Index of Diet Quality*

Diet was assessed using the Index of Diet Quality (IDQ), which was validated with 7 d food records and has been described in detail previously (Leppälä et al., 2010). IDQ measures adherence to health promoting diet and nutrition recommendations with a set of eighteen questions, resulting in a total score ranging from 0 to 15 points; the higher the points, the better the adherence to the nutrition recommendations. The IDQ consists of eighteen questions designed to measure six different aspects of diet: meal pattern and the use of vegetables, fruits and berries, sugar, wholegrain products, fat-containing products and dairy products. Six sub-scores include between one and four questions, with the potential range of maximum sub-score being 1 to 4 points. In this study the IDQ score was used in its original form by setting the statistically defined cut-off value at 10, with scores below 10 points indicating unhealthy diets and non-adherence. Scores of 10–15 points indicate a health-promoting

diet and adherence to a health-promoting diet and dietary guidelines. Internal consistency, as computed by means of the Cronbach's  $\alpha$  for IDQ, was 0.43.

#### **4.5 Parental depression and marital satisfaction**

##### *4.5.1 Depressive symptoms*

Edinburgh Postnatal Depression Scale (EPDS) is a 10-item self-reported questionnaire for screening postnatal depression in mothers. EPDS can also be used to screen for depression in mothers during pregnancy (Murray and Carothers, 1990), and in fathers (Areias et al., 1996; Matthey et al., 2001). The maximum score in the scale is 30 and the minimum is 0, with higher score indicating more depressive symptoms. The EPDS score was used as a continuous variable and dichotomous variable; for mothers' prenatal cut-off score  $\geq 15$  and postnatal cut-off score  $\geq 13$  and for fathers' in both time points a cut-off score  $\geq 10$  was used to indicate major depressive signs (Matthey et al., 2001). The Cronbach's alpha for the EPDS in the whole STEPS study sample ( $n=1387$ ) was 0.85 for mothers and 0.81 for fathers.

##### *4.5.2 Marital satisfaction*

Marital distress was assessed using the 14-item Revised Dyadic Adjustment Scale (RDAS) (Busby et al., 1995). RDAS is found to be effective in distinguishing couples with marital distress from non-distressed couples. In this study, the item scales were inverted and each item was coded on a 5-point scale between 1 and 6, so that there was a minimum score of 14, and a maximum of 84. The measure was used as continuous numeric variable, with lower score indicating less marital distress and higher score indicating more marital distress. When the variable was used as dichotomous, a cut-off score of 36 was used. The Cronbach's alphas for the RDAS in the sample ( $n=1387$ ) were 0.804 for mothers and 0.794 for fathers.

#### **4.6 Breastfeeding and complementary feeding practices**

Information about feeding practices was collected with self-administered follow-up diary. Follow-up diary consists of the information regarding on the date when exclusive and partial breastfeeding started and the date when ended, whether child was fed formula and the label of formula used. Exclusive breastfeeding was defined as follows: the infant had received only breastmilk, and no other liquids or solids, with exception of water, drops or syrups consisting of vitamins, mineral supplements or medicines. Although giving water is not included in WHO definition of exclusive breastfeeding as described in page 14, the Finnish definition of exclusive breastfeeding may include small amounts of water (Uusitalo et al., 2012). Partial breastfeeding was defined as infant receiving breastmilk and any liquid or food including non-human milk and formula. Follow-up diary included also information on complementary feeding; on what date specific complementary foods or food groups were introduced to child's diet. Families were instructed to record information about feeding to the follow-up diary in real-time to avoid memory related bias. Data from follow-up diaries was retrieved from the families at one and two years of age during study visits and recorded into electronic database. Data on infant and young child feeding was used as continuous and dichotomous variables.

## 4.7 Qualitative interviews

### 4.7.1 Description of the study sites: Turku, Finland and Honiara, Solomon Islands

Finland is a Northern European welfare state, classified into very high human development category (UNDP, 2013). Turku is a city in Southwestern coast of Finland and with sub-regions it has approximately 300 000 inhabitants. Population structure is typical for industrialized country by proportion of over 65 year old people outnumbering the proportion of people aged zero to fourteen years; 19.4 % and 16.4 %, respectively (Statistics Finland). While Finland developed into industrialized society, concept of family changed from extended family to nuclear family (Yesilova, 2009). Intergenerational or kinship based co-residence is rare in Finland and high geographical proximity due to low population density and work-related migration of families with small children hinders social intercourse and sharing the care of the children with the kin. Society has taken the role for supporting families instead of kin and provides various benefits for families, such as child health clinic system, day-care services and family leave system (STM, 2013). Under-five mortality is among the lowest in the world in Finland, but diseases of the circulatory system remain as a leading cause of death and new public health problems on the increase are, such as diabetes, allergies, obesity, alcohol abuse and health inequalities (Teperi and Vuorenkoski, 2006). Practically all children are born in public maternity hospitals in Finland and there are three hospitals with maternity wards in Southwestern Finland. There is a national action programme on breastfeeding promotion and nutrition guideline for the families with small children containing breastfeeding and complementary feeding recommendations (Hasunen, 2004; THL, 2009). There is a governmental support for maternity leave for about four months starting at latest 30 days before estimated date of delivery and parental leave after maternity leave for bit over six months (Kela). Only few mothers continue breastfeeding when returning to work after the parental leave (Uusitalo et al., 2012) and Finland has not ratified ILO Convention 183 2000, regarding maternity protection and breastfeeding breaks.

In contrast, Solomon Islands is an archipelago in the Pacific classified as a lower middle-income country (WHO, 2012). Honiara is the capital city with the population of approximately 65 000 people (NSO, 2009). Honiara was the main scene for ethnic conflict in 1998-2003; until the arrival of a regional peacekeeping force. The situation has remained fairly stable until now, but potential for a new conflict arising still exists. Solomon Islands' population has young age structure; over half (53 %) of the population are aged 20 or under and the population growth 2.8% is among the highest in the area (NSO, 2009; WHO, 2012). Family and kin unit is the most important social group in Solomon islands, and people belonging to the same family, clan or *wantok* are compelled to help one another when needed, for example co-residence, sharing food or responsibility for children (Sutherland, 1998). Mean household size in urban areas is 6.3 people, over 20% of households having nine or more members (NSO, 2009). Solomon Islands is in a phase of epidemiological transition. Although communicable and emerging diseases still burden the country, non-communicable diseases, such as diabetes and cardiovascular disease are highly prevalent due to unhealthy diets and physical inactivity (WHO, 2012). Inability to obtain healthy affordable food, high dependence on food imports and consuming cheaper, nutrient poor foods rather than healthier alternatives, are the main reasons for deteriorating food patterns in Solomon Islands (Eason et al., 1987). Most births (94%) in Honiara take place at the hospital (NSO, 2009). The first National Breastfeeding policy was endorsed in 1996

and again on 2008 for years 2010 to 2017, but it is unknown whether the newer policy is officially adopted (WHO, 2011). Maternity leave is 12 weeks on full pay in both public and private sector (ILO). Law states that nursing mothers should be allowed to leave their work for nursing for maximum of an hour twice a day.

#### 4.7.2 Data collection

Data were collected primarily with in-depth interviews with open-ended questions. Informal observations provided a supplemental data source for the analysis of the interviews. Individual interviews were chosen as a method to provide a confidential environment to mothers to share freely their personal experiences and thoughts and to enable greater flexibility for the time and place of the interviews. The author lived in both communities and used informal observation to collect information on socio-cultural experiences and practices of infant and young child feeding, not only on study participants, but also on other people in the community. These field notes were included as part of the data analysis.

An interview guide was constructed based on nationwide surveys in Finland and Solomon Islands. The global feeding recommendations (NSO, 2009; Uusitalo et al., 2012; WHO/UNICEF, 2003) gave the interviews general directions concerning topics discussed. A semi-structured questionnaire was used to guide the discussion during the interviews (Table 3).

**Table 3.** Tentative semi-structured questionnaire used to guide the discussion during the interviews.

<b>Breastfeeding</b>
Have you ever been breastfeeding your child?
Why / when did you start breastfeeding?
How long after birth did you first put (name) to the breast?
How often did you feed your child during first months?
How did you feel about breastfeeding, was it easy or difficult for you? Did you have any problems breastfeeding?
Are you still breastfeeding?
If yes; how often? how long are you going to continue?
If not; when and how did you stop breastfeeding?, why?
<b>Formula feeding</b>
Have you ever fed your child with a bottle? Why?
What did you give from the bottle, how was it prepared?
When did you start feeding with a bottle?
<b>Complementary feeding</b>
When did you start giving any semi-solid or solid foods to the child? Why?
First foods; ingredients, preparation?
Feeding behavior, how many times a day and how feeding was done?
Next foods; ingredients, preparation? When? Why? How prepared and fed?
<b>Advice on IYCF</b>
Have you been given advices on how to feed your child (breastfeeding, other foods)?
By whom and where, when?

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What kind of advice?

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Child's eating now

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What is child eating now; ingredients, preparation?

Does your child eat same food than other family or separate food? Why?

How many times per day?

Does he/she eat any snacks between meals? What kind of?

Is child fed or does child eat by him-/herself

What type of food does your child likes to eat most?

What type of food does your child likes to eat the least?

How do you decide when to stop feeding?

What do you do, if your child does not want to eat?

What foods do you give your child if she/he is sick?

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Beliefs and thoughts related to feeding and nutrition

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Why do you think children are measured regularly?

What are growth charts used for?

Is there some foods, you did not eat during pregnancy/lactation period? Why?

Is there some foods that are good for children? Why?

Is there some foods that are bad for children? Why?

How do you select food for your child?

Does what child eats, affects her/his health? Why? How?

Are you sometimes concerned what your child eats? Why?

What is balanced meal for children or adults?

What causes people to become overweight or obese?

Does overweight or obesity has some health implications?

---

In Solomon Islands interviews were conducted in collaboration with a Nutrition Officer in the Ministry of Health of Solomon Islands, in English or Solomon Pidgin *lingua franca*, according to mother's choice. In Finland all interviews were conducted in Finnish language. In order to mitigate cross-cultural research barriers (Liamputtong and Pranee, 2010), the author lived in Honiara for three months preceding interviews to make the acquaintance with local language and culture. The Nutrition Officer provided her expertise from the planning to the analysis process to confirm study findings to reflect the culture of the interviewees. Interviews in Finland were conducted after Solomon Islands which enabled the author to look her own culture partly from outsiders' perspective. The interviews were recorded on an audiotape and they took on average one hour.

#### 4.8 Statistical analyses

##### *Study I: Parental eating behavior and practices and infant and young child feeding*

A t-test for independent samples and an analysis of variance were used for testing about differences of duration of exclusive breastfeeding, total duration of breastfeeding and the age at introducing of the complementary foods by family, parents' and children's characteristics and parental eating behavior. Families', parents' and children's characteristics and parental eating behavior variables, except food neophobia, were coded as dichotomous variables. After examining these unadjusted

associations, we examined potentially confounding factors and adjusted the model for the following variables: marital status, biological family, number of siblings, maternal age, BMI, occupational class and education, paternal BMI, occupational class and education and child's sex and birth weight. A regression analysis was used to study the adjusted estimate of the association between parental eating behavior with full BF, total duration of BF and the introduction of complementary foods. Statistical analyses were performed using the SPSS statistical software (International Business Machines Corp., Armonk, NY, USA), version 16, and SAS 9.3 (SAS Institute Inc., USA). The statistical significance was set to a level of  $p < 0.05$  in all analyses.

*Study II: Parental marital satisfaction, depression and breastfeeding initiation and continuation*

Structural equation models were performed using Mplus, version 6.1. The models were fitted into the covariance matrix using the Maximum Likelihood method. The overall fit of models was considered to be acceptable with  $\chi^2$  values of less than three times the degree of freedom (df) value, comparative fit index (CFI) of 0.90 or higher, Tucker-Lewis index (TLI) of 0.90 or higher, and root-mean-square error of approximation (RMSEA) as well as Standardized Root Mean Square Residual (SMSR) values below 0.08 (30). The relations between mothers' and fathers' depressive symptoms, marital satisfaction and EBF were studied with path modeling. The regression coefficients and the p-values of the standardized model results are reported. The analyses consisting of dichotomous or categorical variables were conducted using independent sample t-test or one-way ANOVA. The Tukey's post-hoc test was used for post hoc analyses. These analyses and descriptive statistics were performed using SPSS statistical software (International Business Machines Corp., Armonk, NY, USA), version 22.0.

*Unpublished data analysis*

Current Finnish feeding recommendations recommends exclusive breastfeeding for 4 to 6 months, introduction of solids at six months at latest and partial breastfeeding up to 1 year or more (THL, 2016). Although the earlier guideline valid during data collection of this research recommended exclusive breastfeeding until 6 months of age, exclusive breastfeeding duration until 6 months is very rare (Uusitalo et al., 2012) and thus 4 to 6 months exclusive breastfeeding was considered compliant to the Finnish feeding recommendations in these analyses. Exclusive breastfeeding duration was dichotomized into two groups; exclusive breastfeeding duration of 4-6 as compliant to the Finnish feeding recommendations and exclusive breastfeeding duration of < 4 months or > 6 months as not compliant to the feeding recommendations. The age of introduction of complementary foods was also dichotomized similarly into compliant to the recommendations or not. Total breastfeeding duration was dichotomized into those breastfeeding totally  $\geq 12$  months as recommendation compliant and those breastfeeding totally for a shorter duration into non-compliant. Foods fed to the child as complementary foods were categorized into six groups based on the Finnish recommendations of when to particular food groups should be introduced at earliest to child's diet. Whether following one feeding recommendation was associated with following the other feeding recommendations and whether maternal and paternal eating behavior, depressive signs or marital satisfaction were associated with following the feeding recommendations was tested with Chi square test.

## 4.9 Qualitative data analyses

### *Study III: Maternal experiences on infant and young child feeding in two different contexts*

Audiotapes of interviews were transcribed by a professional service in the original language used in the interviews to give more accuracy for the data (Liamputtong and Pranee, 2010). The quality, completeness and accuracy of the transcriptions were reviewed by the author with a Solomon Islander collaborator, concerning transcriptions from Solomon Islands and a Finnish colleague, concerning transcriptions from Finland. The transcripts were read by the author multiple times to ensure familiarity of the data. Transcribed data was systematically coded, organized and analyzed by using QRS International NVivo9 software. Thematic content analysis guided the data analysis (Braun and Clarke, 2006). Separate descriptive summaries of both study sites were created by the author and then compared for shared themes on mothers' experiences and influences of breastfeeding. The notes from observations, research diary, dietary recalls and informal conversations were used for triangulation, helping to validate trustworthiness of the findings. Confidentiality of the participants is maintained by using only country codes in quotes; FI for Finland and Sb for Solomon Islands.

## 4.10 Ethics

The main STEPS Study was approved by the Hospital District of Southwest Finland Ethics Committee on 27<sup>th</sup> of February 2007. The Study III was approved by the Solomon Islands Ministry of Health's Ethics Committee on 19<sup>th</sup> of November, 2009, and by the Ethics Committee of the University of Turku on 18<sup>th</sup> of October, 2010. Written informed consent was obtained from all parents in STEPS study and from Solomon Islands mothers in Study III. Subjects were free to drop-out from the study at any time without any specific reason. The protocol of the STEPS Study and this study is consistent with the principles of the Declaration of Helsinki.

## 5. RESULTS

### 5.1 Characteristics of the study subjects and feeding practices

Characteristics of families, mothers, fathers and children participating to the STEPS study (n=1797) are presented in Table 4. The mean age of mothers at the birth of their children was 30.7 years (SD 4.6) and that of fathers was 32.7 years (SD 5.5). The majority of mothers (56.4%) were married to their partners at the time of enrolment. At the time of enrolment, the mean BMI for mothers was 24.3 kg/m<sup>2</sup> (SD 4.8) and that for fathers was 26.0 kg/m<sup>2</sup> (SD 3.5). When the children reached 13 months, the mean BMI of mothers was 25.2 kg/m<sup>2</sup> (SD 5.3) and that of fathers was 26.9 kg/m<sup>2</sup> (SD 3.9). The child studied was the firstborn in 53.1% of the families, and the study population included more boys than girls (52.1% vs. 47.9%). The mean birth weight of the children was 3502g (SD 561g) and 5.6 % of the children were born preterm (< 37 weeks).

**Table 4.** Background characteristics of the families, mothers, fathers and children participating to the STEPS study and Study III.

Variable	The STEPS Study	Study III Finland	Study III Solomon Islands
<i>Family</i>			
Marital status, married (%)	58.0	97.1	91.1
Biological family <sup>a</sup> , (%)	84.8		
No previous children	53.1	41.2	42.2
Family income <sup>b</sup> , high (%)	45.6		
<i>Mothers</i>			
Age in years <sup>c</sup> , < 30.3 years (%)	45.7	73.5	17.8
BMI status, overweight or obese (%)	25.2		
Working status <sup>c</sup> , working (%)	72.8	32.4	24.4
Occupational class <sup>f</sup> , professional (%)	60.8		
Education <sup>g</sup> , advanced (%)	60.4	61.8	8.9
<i>Fathers</i>			
BMI status, overweight or obese (%)	62.5		
Working status <sup>c</sup> , working (%)	88.0		
Occupational class <sup>f</sup> , professional (%)	56.6		
Education <sup>g</sup> , advanced (%)	45.9		
<i>Children</i>			
Sex, boys (%)	52.1	38.2	62.2
Birthweight, < 3000g (%)	85.1		
Gestational age, term (%)	94.4		
Age ≤15 months, %		41.2	64.4
Age ≥20 months, %		32.3	22.2

<sup>a</sup> All members of the family related by blood or marriage.

<sup>b</sup> Aggregation of income of family members, high income over and, and low income below 3000 €/month

<sup>c</sup> The mean age of women giving birth in Finland in 2012

<sup>d</sup> Measured at child's age of 13 months. BMI < 25 kg/m<sup>2</sup> normal weight and BMI ≥ 25kg/m<sup>2</sup> overweight

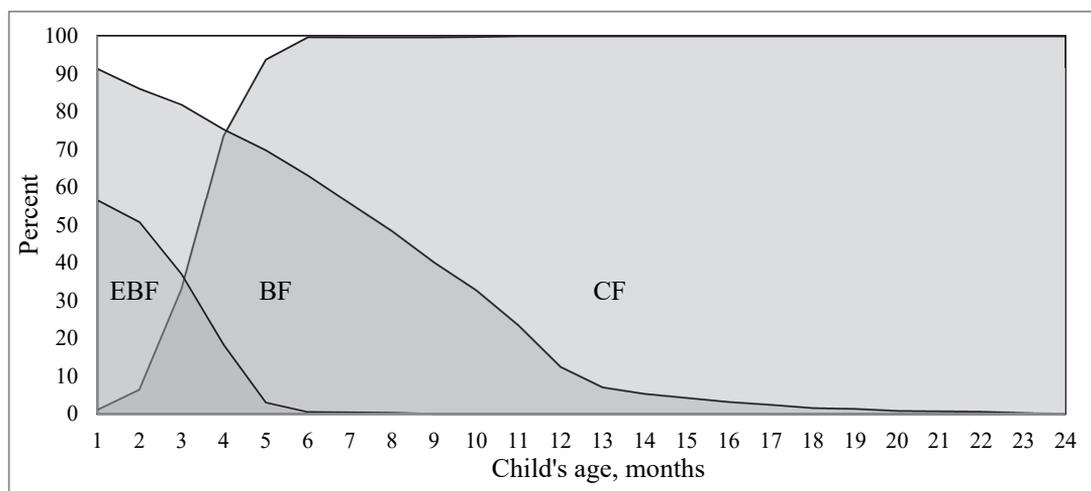
<sup>f</sup> Professionals (in high positions) vs others (bluecollar/agriculture/service workers).

<sup>g</sup> Advanced education (highest vocational training or any academic degree vs. lower education.

<sup>h</sup> Tertiary education

Among STEPS study participants, exclusive breastfeeding continued, on average, for 2.4 months, whereas the average total duration of BF was 8.1 months. At one, four and six months of age, 64.4%, 33.2% and 1.9% of the infants were exclusively breastfed and 90.7%, 73.3% and 54.4% exclusively or partially breastfed, respectively. At one year and two years of age 13.4% and 0.3% of the children were still breastfed. Proportion of children exclusively and totally breastfed by child's age in months are presented in Figure 3. Over half (54%) of the children used only formula or formula with breast milk when they were introduced to complementary foods.

In Study III, all mothers in both Finland and Solomon Islands, had been breastfeeding their child in infancy. Most Finnish children were no longer breastfed at the time of the interviews; however, 5 mothers were still breastfeeding their children but all of them were in a process of weaning or intended to wean their child soon. In Solomon Islands 30 of the toddlers were still breastfed at the time of the interviews.



**Figure 3.** Proportion of children exclusively breastfed (EBF), breastfed (BF) and introduced of complementary foods (CF) by age among STEPS study participants (Turku, Finland).

Among STEPS study participants, the first solid food was introduced into children's diets on the average at the age of 3.9 months. At 5 months, 90% of infants had been introduced to at least some solid food. The first food introduced was usually potato or carrot, or sometimes cereal (e.g., corn, rice or oats).

Finnish mothers participating to the Study III had started feeding solids at the median of four months (range 3-6 mo). Approximately 80% of the toddlers were given same food as rest of the family members were eating, but often with less spices and only little bit of salt. Over half the mothers with children under 20 months of age fed their child, but when the child approached to two years of age most of the children had started to eat by themselves. In Solomon Islands mothers reported having introduced solid foods to their children at the median age of six months (range 3-9 mo). At the time of the interviews, almost half of the toddlers were still fed with separate food than rest of the family and their mother or caregiver fed them. When the toddlers approached two years of age they mostly ate by themselves and consumed the same food as rest of the family.

## 5.2 Maternal factors association with feeding practices

### 5.2.1 Maternal characteristics

Mothers who were older than the average or were professionals were more likely to breastfeed their children for a longer duration and introduce complementary foods later than other mothers. Mothers with normal BMIs ( $<25\text{kg/m}^2$ ), who were highly educated, who were married, or who had two or more children were more likely to continue exclusive and total breastfeeding longer and introduce complementary foods later than other mothers. All members of the family being related to each other by blood or by marriage were associated with longer durations of exclusive BF and the later introduction of complementary foods. Further demographic details and their associations with infant feeding are shown in Table 5.

In qualitative interviews, parity influenced mothers' experiences of infant and young child feeding. Many primipara (first time mothers) had less confidence how to position baby on the breast or when to breastfeed compared to multiparas (mothers with earlier children). In Finland many first time mothers gave up on breastfeeding and started using formula when confronted difficulties. Mothers with earlier children seemed more confident and didn't stress over success of breastfeeding. One mother expressed this: *He was true battle, breastfeeding did not start at all, luckily he was not the first so I had experience, didn't feel stress. It (breastfeeding) didn't start at all and he didn't eat at all and got dry, I had to give him formula for long time... I started pump milk and thought to get him eat, for one and half months he was eating from the bottle and then started to eat breast.* Earlier experiences also contributed to the mothers' experience on introduction of solid foods and other feeding practices. In both countries, mothers with at least one previous child based their decision on timing of introduction solid foods or selection of foods given on their experiences with older children. If mothers in Finland had noted unsuitability of some food for their older child, this food was avoided also in younger child's diet. Multiparous mothers expressed confidence on their feeding decision, even when it differed from that recommended by health care personnel.

**Table 5.** The differences of exclusive breastfeeding (EBF), total duration of BF and introduction of complementary foods (CF) by maternal characteristics. Two-sample t-test (Modified from Vaarno et al. 2015).

Variable	EBF duration			Total BF duration			Age of introduction CF		
	n	Mean (SD)	p	n	Mean (SD)	p	n	Mean (SD)	p
Mothers characteristic									
Age in years <sup>a</sup>									
< 30.3 years	477	2.35 (2.1)	0.897	400	7.79 (4.6)	0.040	469	3.86 (1.0)	0.026
≥ 30.3 years	624	2.37 (2.0)		506	8.42 (4.6)		639	4.00 (1.0)	
BMI status <sup>b</sup>									
Normal <sup>d</sup>	635	2.59 (2.0)	<0.001	519	8.93 (4.5)	<0.001	641	4.03 (0.9)	0.003
Overweight <sup>d</sup>	403	2.01 (2.1)		336	7.25 (4.8)		403	3.84 (1.1)	
Working status									
Working	834	2.31 (2.1)	0.184	695	8.26 (4.5)	0.219	844	3.93 (1.0)	0.553
Not working	281	2.50 (2.1)		224	7.82 (5.0)		278	3.97 (0.9)	
Occupational class <sup>c</sup>									
Professional	633	2.38 (2.1)	0.257	526	8.63 (4.4)	0.001	643	4.01 (0.9)	0.002
Others	349	2.22 (2.0)		284	7.46 (5.0)		346	3.80 (1.1)	
Education <sup>d</sup>									
Advanced	718	2.47 (2.0)	0.023	600	8.67 (4.3)	<0.001	725	4.01 (0.9)	0.005
Low	386	2.17 (2.1)		310	7.19 (5.2)		386	3.82 (1.1)	
Marital status									
Married	685	2.55 (2.1)	< 0.001	558	8.47 (4.5)	0.011	688	4.01 (0.9)	0.006
Not married	434	2.09 (2.1)		363	7.67 (4.8)		438	3.84 (1.1)	
Parity									
1	612	2.10 (2.0)	<0.001	527	8.65 (4.8)	0.004	610	3.84 (1.0)	<0.001
2 or more	516	2.68 (2.1)		401	7.77 (4.5)		525	4.07 (1.0)	

<sup>a</sup> The mean age of women giving birth in Finland in 2012 ([https://www.tilastokeskus.fi/ti/synt/2012/synt\\_2012\\_2013-04-12\\_tie\\_001\\_en.html](https://www.tilastokeskus.fi/ti/synt/2012/synt_2012_2013-04-12_tie_001_en.html))

<sup>b</sup> Measured at child's age of 13 months. BMI < 25 kg/m<sup>2</sup> normal weight and BMI > 25kg/m<sup>2</sup> overweight

<sup>c</sup> Professionals (in high positions, e.g. managerial, but also in intermediate positions, such as nurses) vs others (bluecollar workers in industry or agriculture and service workers).

<sup>d</sup> Advanced education (highest level of vocational training (such as a 4-year program of a polytechnic institute) or any academic degree (bachelor's, master's, licentiate or doctoral degree) vs. lower education

**Table 6.** The differences of exclusive breastfeeding (EBF), total duration of breastfeeding (BF) and introduction of complementary foods (CF) by mothers eating behavior and practices. Two-sample t-test and analysis of variance (modified from Vaarno et al., 2015).

Variable	EBF duration			Total BF duration			Age of introduction CF		
	n	Mean (SD)	p	n	Mean (SD)	p	n	Mean (SD)	p
Mothers eating behavior									
Cognitive restraint <sup>a</sup>	448	2.21 (2.1)	0.029	382	7.72 (4.5)	0.008	446	3.84 (1.0)	0.006
	590	2.49 (2.0)		471	8.58 (4.8)		600	4.02 (1.0)	
Uncontrolled eating <sup>a</sup>	505	2.33 (2.1)	0.511	416	8.19 (4.9)	0.791	510	3.95 (1.0)	0.963
	453	2.42 (2.1)		369	8.28 (4.6)		456	3.96 (1.0)	
Emotional eating <sup>a</sup>	425	2.27 (2.1)	0.593	353	8.02 (4.6)	0.948	426	3.93 (1.0)	0.811
	427	2.34 (2.1)		347	8.00 (4.4)		432	3.92 (1.0)	
Food neophobia <sup>b</sup>	136	2.01 (2.1)	0.002	106	7.23 (4.8)	0.018	168	3.95 (1.1)	0.922
	728	2.55 (2.0)		610	8.48 (4.7)		738	3.96 (1.0)	
Neophilic	167	2.10 (2.2)		135	8.39 (3.8)		139	3.99 (0.9)	
Dietary quality <sup>c</sup>	461	2.50 (2.1)	0.124	381	8.77 (4.4)	0.003	464	4.03 (1.0)	0.027
	546	2.30 (2.1)		449	7.81 (4.9)		554	3.90 (1.0)	

<sup>a</sup> Dichotomized at the median split<sup>b</sup> Post hoc tests: average vs. neophilic  $p < 0.05$ , average vs. neophobic  $p < 0.05$ <sup>c</sup> Good dietary quality index of diet quality (IDQ) total score of 10–15 and poor dietary quality IDQ score of 0–9.

### 5.2.2 Maternal eating behavior and practices

Maternal cognitive restraint was significantly associated with all measured aspects of child feeding practices (Table 6). Mothers with low cognitive restraint breastfed their child exclusively and for a longer total time than mothers with high cognitive restraint ( $p=0.03$  and  $p=0.008$ , respectively). The introduction of complementary foods was undertaken earlier by mothers with high cognitive restraint than by mothers with low cognitive restraint ( $p=0.006$ ). Uncontrolled eating and emotional eating did not have significant associations with child-feeding practices. After adjusting for potential confounding factors, high maternal cognitive restraint was found to be associated with earlier introduction of complementary foods ( $F(1, 442)=4.92$ ,  $p=0.027$ ).

In unadjusted analysis, maternal food neophobia was associated with the durations of full and total breastfeeding (Table 6). Exclusive breastfeeding duration was shortest with neophobic mothers (2.01 months), slightly longer with neophilic mothers (2.10 months) and longest with average mothers (2.55 months) ( $p=0.002$ ). This difference was statistically significant between average and neophobic mothers (post hoc test,  $p<0.05$ ) and between neophilic and average mothers (post hoc test,  $p<0.05$ ). Even after controlling for confounding factors, the exclusive breastfeeding duration was significantly longer for average mothers than for neophobic or neophilic mothers ( $F(2, 431)=5.00$ ,  $p=0.007$ ). However, there were no significant associations between maternal neophobia and the total duration of breastfeeding and the age of introduction of the first solid foods.

Mother's dietary quality was associated with child-feeding practices in unadjusted analyses. Higher maternal IDQ points, indicating better adherence to nutritional recommendations, measured when children reached 13 months, were associated with a longer total BF duration and later introduction of complementary foods ( $p=0.003$  and  $p=0.027$ , respectively; Table 6). A similar trend was seen in the duration of exclusive BF, but the association was not significant ( $p=0.124$ ). After controlling for confounding variables, maternal dietary quality had no significant association with BF duration or the introduction of complementary foods.

### 5.2.3 Maternal depression and marital satisfaction

First, a separate t-test was conducted with the mothers' data to test whether prenatal depressive symptoms and marital distress predicted the initiation of breastfeeding. The initiation of breastfeeding was used as dichotomous variable. Neither the mothers' prenatal depressive symptoms [ $t(786) = 1.071$ ,  $p = 0.284$ ] nor their prenatal marital distress [ $t(767) = 0.167$ ,  $p = 0.868$ ] was significantly associated with the initiation of the breastfeeding.

Second, a structural equation model, including both pre- and postnatal factors, was conducted to test the association of the mothers' pre- and postnatal depressive symptoms and marital distress with duration of exclusive and total breastfeeding and age of introduction complementary foods. After autocorrelations were allowed, the fit of the model was acceptable:  $\chi^2$  (df) 6.42(2),  $p = 0.04$ ; CFI 0.99; TLI 0.96; RMSEA 0.05; SRMR 0.02. The significant regression coefficients ( $p<0.05$ ) and correlations are presented in Figure 4. Prenatal depressive symptoms predicted postnatal depressive symptoms and the postnatal depressive symptoms were associated with the duration of exclusive breastfeeding in a way that higher amount of depressive symptoms was associated with shorter

duration of exclusive breastfeeding. Higher amount of prenatal marital distress was associated with longer duration of exclusive breastfeeding and prenatal marital distress strongly predicted postnatal marital distress. Altogether, the model explains 3.4% of variance in the duration of exclusive breastfeeding. These associations were also modeled separately with pre- and postnatal factors and no differences in the explanation levels were found compared to the model presented above. Prenatal or postnatal depressive symptoms or marital satisfaction was not associated with the total breastfeeding duration. Postnatal depressive symptoms predicted the age of introduction of complementary foods. In addition, higher amount of depressive symptoms at child's age of 4 months was associated with earlier introduction of complementary foods.

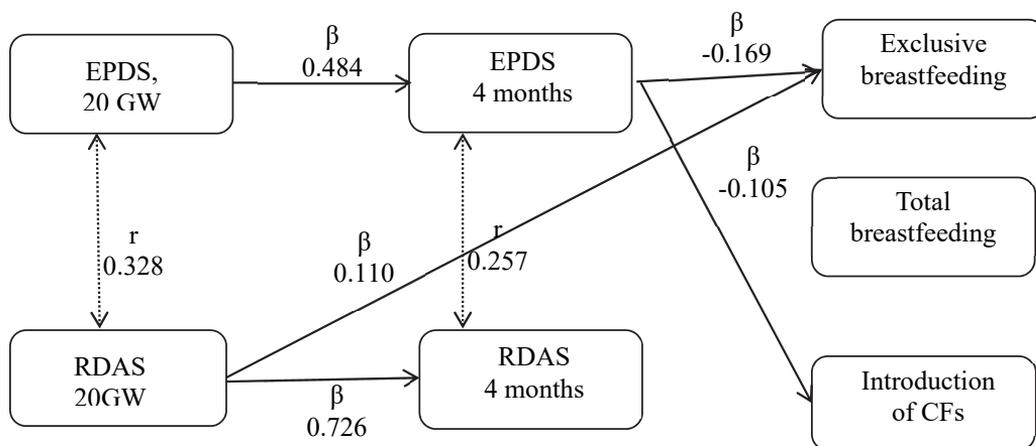


Figure 4. Significant regression coefficients ( $\beta$ ) and correlations ( $r$ ) in structural equation model of mothers' prenatal; measured at 20 gestational weeks (GW's) and postnatal; measured at 4 months, depressive symptoms and marital satisfaction and feeding practices. Depressive symptoms were measured with Edinburgh Postnatal Depression Scale (EPDS) and Marital Satisfaction with Revised Dyadic Adjustment Scale (RDAS). CFs stands for complementary foods.

#### 5.2.4 Maternal knowledge, beliefs and attitudes on child feeding

The majority of mothers in both Finland and Solomon Islands believed that breastfeeding is natural and obvious part of being a mother. Question of why to breastfeed caused amusement and astonishment among many mothers in Solomon Islands, as breastfeeding was perceived as an essential part of the mothers' care of an infant. One mother said: *I breastfeed my baby, because I have to breastfeed, because its food of the babies (Sb)*. Many Finnish mothers also described not having made any conscious decision about breastfeeding, but just thought that breastfeeding goes with having a child. Two Finnish mothers said: *Isn't breastfeeding pretty natural thing... ... I have never questioned it (breastfeeding) (FI)* and *I think it goes without saying that breastfeeding belongs to motherhood (FI)*.

Mothers in Solomon Islands and Finland were motivated to breastfeed because they considered breastmilk an optimal form of nutrition for infants. Many mothers in Solomon Islands thought breastmilk was just the best and only suitable food for the children. One mother put it: *It's best for*

*my baby, breastfeeding, better than milk, so when he was born, I started breastfeeding him... best for my baby (Sb).* Breastfeeding was not just seen as providing nourishment, but also nurturance and comfort to the baby. Finnish mothers often highlighted their knowledge on benefits of breastfeeding and brought up breastmilk composition and breast milk's superior nutritional properties into discussion. One mother said: *Breastfeeding is to me very important thing, just lifeblood I think and that kind of, for child's and mother relationship very important and it is rich in nutrients, just made for him (FI).* On the contrary, in Solomon Islands only few highly educated mothers talked about nutritional content of breastmilk. None of the mothers in either country mentioned breastfeeding being of benefit also for mother's health, but in Finland some mothers regarded breastfeeding helpful for mothers to lose weight. As motivators for breastfeeding, easiness, convenience and experienced closeness with the baby were also mentioned often by Finnish mothers.

Although breastfeeding was considered the best option, Finnish mothers often described thoughts of just giving breastfeeding a try, but anyhow suspecting struggle and failure of breastfeeding. Perception of insufficient milk production was the most common challenge, although some mothers had experienced also milk oversupply. Mothers were very heterogeneous in the ways they described their breastfeeding challenges. Some described having only minor difficulties and getting through them easily, some reported major challenges, putting up a fight and winning the battle, whilst some experienced insurmountable challenges of which they fought against for some time and then gave up. One mother explained: *I started to breastfeed, but somehow there wasn't enough milk. She was born small, so she was very hungry and it was very hard that beginning... it always went at different times, when I had breasts full and there would have been milk, she didn't want to eat and the other way around...It was so awful when she didn't take the tit. Then we realized she was hungry and started the bottle... It was about four months I coped with that breastfeeding thing (FI)* Cessation of breastfeeding before intended point led to feelings of failure and upset among many mothers, but a few mothers expressed also relief from getting rid of breastfeeding, activity they did not like and enjoy. In Solomon Islands mothers described also similar challenges with breastfeeding as the Finnish mothers, especially at the early postpartum period. However, mothers considered these problems minor or easily manageable. One mother said: *It (breastfeeding) was bit difficult first, because I had pain in the nipples... I just continued to breastfeed without caring of the pain and it went by (Sb).*

Mothers felt confident feeding 1 to 2 year-old children both in Solomon Islands and in Finland and thought they provided the best possible food for their children for good growth and to keep them healthy. One mother from Solomon Islands said: *What he eats makes him healthy... Because food we are giving him is just good for him (Sb).* Children were fed mostly the food perceived healthy by the mothers and in both countries mother had similar thoughts of local, home-cooked and unprocessed foods being best foods for the children. These mothers explained; *Basic home cooked meals, somehow I think that... Potato, minced meat, sauce, so just self-made, so somehow those basic foods are good and with those you are better off (FI).* *I give her a lot of local foods, which I think that is good for her, sweet potato or cassava, not canned food (Sb).* In lesser extent other aspects were related to healthy eating, such as freshness, organic food, good atmosphere during eating, child willingness to eat or low food costs.

### 5.2.5 Mother's perception of child's cues and signs

In qualitative interviews in both study sites mothers considered infant cues and signs important for breastfeeding practices. In Solomon Islands infants' interest in food, attempts to reach food or crying after breastfeeding at around 6 months of age were viewed as an indication to start giving solid foods to infant. Later, mothers ceased breastfeeding because of infants' refusal to breastfeed or lack of interest in breastfeeding. Breastfeeding mothers planned to continue breastfeeding as long as the child would like to breastfeed. One mother said: *Now he plays and when he doesn't want to play anymore, he comes to breast, but during night time... I don't know how many times he eats, but many. I think I will stop breastfeeding when he is 3 years and wants less breastmilk (Sb)*. In Finland signs from infant, such as too frequent feeds, crying during or after breastfeeding or refusing to go to breast were the main reasons for supplementary feeding or feeding entirely with the formula and ceasing breastfeeding. One mother said: *She stopped herself (breastfeeding)... she got formula in a meanwhile, so she just stopped like that. I tried to offer her and so, but no... she just started yelling and then, then I decided that it's enough; I don't want to make her scream again (FI)*. When approaching toddlerhood, child's behavior, such as ability to walk or child to ask for breastmilk him/herself, also served for the mother as an indicator of breastfeeding cessation. Although many mothers indicated that they listen to their infant's signals, desire to control over quantity, frequency or duration of child's eating was a common feature in many mothers' talk in Finland. Many mothers were worried about the adequacy of breastmilk, even when their baby seemed to be satisfied. Quantity of breastmilk was considered hard to measure and some mothers felt relief from switching from breastfeeding to formula or from starting to give complementary foods and getting rhythm in the daily life.

When children grew older the kind of food offered was based on what the child wanted to eat, with the exception of foods perceived by mothers to be unhealthy. Mothers explained; *Healthiness is important for me and also that what will be really eaten. So I try to make such a food that tastes also (FI). I select what he likes to eat, if foods from the store, candies I don't give him (Sb)*.

### 5.3 Paternal and family level factors influencing feeding practices

Characteristics of the father's and their association with infant feeding can be found in Table 7. Fathers' professional occupation and advanced education were associated with longer duration of exclusive breastfeeding ( $p=0.021$  and  $0.002$ , respectively), longer total breastfeeding duration ( $p=0.003$  and  $p<0.001$ , respectively) and later introduction of complementary foods ( $p=0.032$  and  $0.001$ , respectively). Neither father's BMI status nor working status had an association with feeding practices. All members of the family being related to each other by blood or by marriage were associated with longer durations of exclusive BF and the later introduction of complementary foods.

**Table 7.** The differences of exclusive breastfeeding (EBF), total duration of BF and introduction of complementary foods (CF) by paternal characteristics. Two-sample t-test. (modified from Vaarno et al., 2015).

Variable	EBF duration			Total BF duration			Age of introduction CF		
	n	Mean (SD)	p	n	Mean (SD)	p	n	Mean (SD)	p
Fathers' characteristic									
BMI status <sup>a</sup>									
Normal	327	2.56 (2.1)	0.046	267	8.62 (4.7)	0.061	333	3.98 (1.0)	0.941
Overweight	529	2.27 (2.1)		443	7.94 (4.7)		534	3.97 (0.9)	
Working status									
Working	984	2.36 (2.1)	0.675	808	8.11 (4.4)	0.482	987	3.94 (1.0)	0.604
Not working	115	2.45 (2.1)		95	8.46 (6.0)		118	3.89 (1.0)	
Occupational class <sup>b</sup>									
Professional	537	2.45 (2.1)	0.021	447	8.55 (4.4)	0.003	543	3.98 (0.9)	0.032
Others	368	2.12 (2.0)		310	7.47 (5.1)		367	3.84 (1.0)	
Education <sup>c</sup>									
Advanced	520	2.56 (2.1)	0.002	432	8.88 (4.1)	<0.001	524	4.02 (0.9)	0.001
Low	554	2.17 (2.0)		455	7.45 (5.0)		557	3.84 (1.0)	
Family characteristic									
Biological family <sup>d</sup>									
yes	955	2.44 (2.1)	0.004	782	8.20 (4.5)	0.483	962	3.98 (1.0)	0.019
no	141	1.94 (1.8)		119	7.88 (5.7)		141	3.76 (1.0)	
Family income <sup>e</sup>									
High income	523	2.42 (2.1)	0.401	435	8.25 (4.5)	0.455	526	3.98 (0.9)	0.233
Low income	583	2.32 (2.1)		478	8.02 (4.8)		586	3.90 (1.0)	

<sup>a</sup> Measured at child's age of 13 months. BMI < 25 kg/m<sup>2</sup> normal weight and BMI ≥ 25kg/m<sup>2</sup> overweight

<sup>b</sup> Professionals (in high positions, e.g. managerial, but also in intermediate positions, such as nurses) vs others (bluecollar workers in industry or agriculture and service workers).

<sup>c</sup> Advanced education (highest level of vocational training (such as a 4-year program of a polytechnic institute) or any academic degree (bachelor's, master's, licentiate or doctoral degree) vs. lower education.

<sup>d</sup> All members of the family related by blood or marriage.

<sup>e</sup> Aggregation of income of family members, high income over and, and low income below 3000 €/month

In qualitative interviews, fathers were mentioned to have a significant role in feeding infants while mothers were away from home, providing food or deciding foods eaten in the family, but not on breastfeeding. Family's economic status was described to have an effect to formula use and quality of the complementary diet in both countries. In Finland impact was less evident due to better general economic situation of the families. Some mothers mentioned economic advantages of breastfeeding over formula as a reason to initiate breastfeeding. Fresh fish or vegetables during winter were used less in some families because of high price. However, most mothers felt that the cost of food didn't influence diets they provided to their children, and they rather fed their children more expensive food and had themselves cheaper foods. In Solomon Islands many families were classified as food insecure. Price of formula was considered very high and accessible only for affluent families. If prescribed by doctor, formula was possible to lay hold of through charity organization, but only for a limited period of time and amount, and due to price fruit juices were preferred food for infants over formula. Lower income households experienced also limited access to animal-source food, especially fresh marine fish. Urban environment with no possibility of subsistence gardening or fishing combined with availability of less expensive less-nutritious foods influenced to diets of many children.

### *5.3.1 Paternal eating behavior and practices*

No significant associations were found between paternal cognitive restraint, uncontrolled eating or emotional eating and child feeding practices (Table 8). Moreover, fathers' neophobia ratings did not relate to infant feeding practices. Children of fathers with good dietary quality were breastfed for longer time ( $p=0.011$ ) and introduced to complementary foods later ( $p=0.014$ ) than children of fathers with poor dietary quality. However after controlling for confounding variables, only association between fathers' diet quality and total BF duration was significant ( $F(1, 369)=4.33, p=0.038$ ).

### *5.3.2 Paternal depression and marital satisfaction*

Neither fathers' prenatal depressive symptoms [ $t(726) = 0.681, p = 0.496$ ] nor marital distress [ $t(721) = -0.325, p = 0.745$ ] predicted the initiation of the breastfeeding. Sum scores of mothers' and fathers' depressive symptoms and marital distress were used to test family-level depression and family-level marital distress. The prenatal family-level depressive symptoms [ $t(742) = 1.759, p = 0.079$ ] or the marital distress [ $t(717) = 0.128, p = 0.898$ ] did not predict the initiation of the breastfeeding.

**Table 8.** The differences of exclusive breastfeeding (EBF), total duration of breastfeeding (BF) and introduction of complementary foods (CF) by fathers eating behavior and practices. Two-sample t-test and analysis of variance (modified from Vaarno et al., 2015).

Variable	EBF duration			Total BF duration			Age of introduction CF			
	n	Mean (SD)	p	n	Mean (SD)	p	n	Mean (SD)	p	
Fathers eating behavior										
Cognitive restraint	High	383	2.37 (2.1)	0.957	313	8.12 (4.5)	0.857	385	4.00 (1.0)	0.209
	Low	441	2.36 (2.0)		365	8.18 (4.9)		443	3.91 (1.0)	
Uncontrolled eating	High	452	2.36 (2.1)	0.552	363	8.28 (4.8)	0.656	454	3.95 (1.0)	0.887
	Low	422	2.45 (2.1)		355	8.12 (4.6)		427	3.96 (1.0)	
Emotional eating	High	332	2.38 (2.2)	0.899	272	8.06 (4.5)	0.779	338	3.96 (1.0)	0.951
	Low	457	2.40 (2.0)		379	8.16 (4.7)		457	3.96 (1.0)	
Food neophobia	Neophobic	161	2.12 (2.1)	0.151	134	7.85 (5.1)	0.594	131	3.97 (1.1)	0.758
	Average	607	2.40 (2.1)		496	8.27 (4.6)		609	3.93 (0.9)	
	Neophilic	161	2.57 (2.0)		109	7.97 (3.7)		168	4.00 (0.9)	
Dietary quality	Good	252	2.55 (2.1)	0.131	205	8.84 (4.4)	0.011	253	4.06 (0.9)	0.014
	Poor	574	2.32 (2.1)		475	7.86 (4.7)		581	3.89 (1.0)	

<sup>a</sup> Dichotomized at the median split<sup>b</sup> Post hoc tests: average vs. neophobic  $p < 0.05$ , average vs. neophobic  $p < 0.05$ <sup>c</sup> Good dietary quality index of diet quality (IDQ) total score of 10–15 and poor dietary quality IDQ score of 0–9.

After autocorrelations were allowed, the model fit the data acceptably:  $\chi^2$  (df) 8.43(2),  $p = 0.01$ ; CFI 0.99; TLI 0.94; RMSEA 0.05; SRMR 0.02. The significant regression coefficients and correlations are presented in Figure 5. The results of the model showed that the fathers' prenatal depressive symptoms or marital distress did not predict the duration of exclusive or total breastfeeding or age of introduction of complementary foods. No significant associations were found between postnatal factors and feeding practices. The fathers' prenatal depressive symptoms strongly predicted postnatal depressive symptoms. Similarly, the fathers' prenatal marital distress strongly predicted their postnatal marital distress.

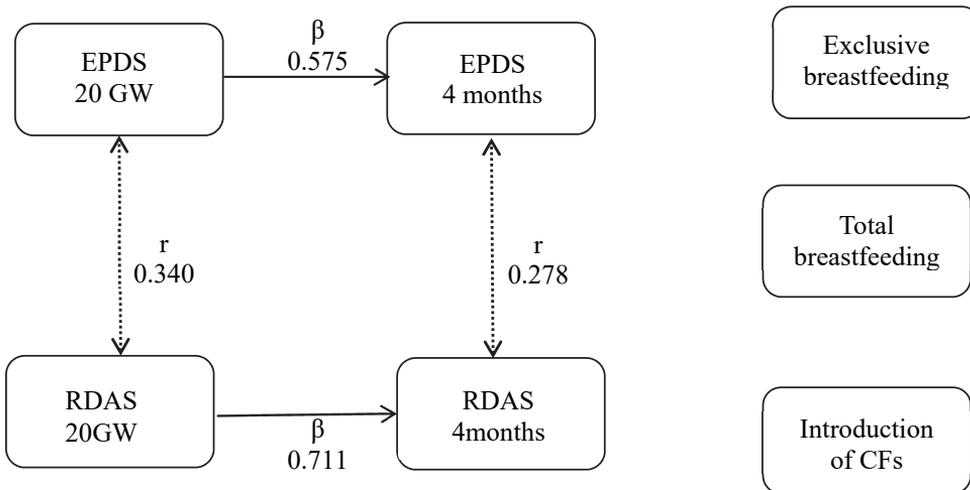


Figure 5. Significant regression coefficients ( $\beta$ ) and correlations ( $r$ ) in structural equation model of fathers' prenatal; measured at 20 gestational weeks (GW's), and postnatal; measured at 4 months, depressive symptoms and marital satisfaction and feeding practices. Depressive symptoms were measured with Edinburgh Postnatal Depression Scale (EPDS) and Marital Satisfaction with Revised Dyadic Adjustment Scale (RDAS). CFs stands for complementary foods.

Furthermore, the structural equation models were used to test the impact of the family-level pre- and postnatal depressive symptoms and marital distress on the duration of the exclusive breastfeeding. Based on most of the fit indexes the model fit the data acceptably:  $\chi^2$ (df) 81.562 (11),  $p < 0.001$ ; CFI 0.960; TLI 0.855; RMSEA 0.092; SRMR 0.040. Autocorrelations were allowed also in this model. Neither prenatal family-level depressive symptoms and marital distress nor postnatal family-level depressive symptoms and marital distress were associated with the duration of the exclusive breastfeeding.

## 5.4 External influences on feeding practices

### 5.4.1 Significant others

Mothers mentioned female family members and relatives as sources of support and valuable information and role models for breastfeeding. Mothers' knowledge of possible problems which close female relatives had faced while breastfeeding made mothers uncertain about their own ability to

breastfeed. One Finnish mother put it: *I didn't know how breastfeeding would succeed and how long to continue. My mother was not able to breastfeed for a long time, my other sister for varying times, so I thought that let it go as it goes and I was surprised, that I succeeded this long (FI)*. In turn, mothers who knew they had been breastfed themselves or who remembered seeing relatives or friends breastfeeding described themselves often being confident as breastfeeders. Especially babies' grandmothers were important sources of information and practical advice for mothers on breastfeeding technique, starting of complementary feeding and breastfeeding cessation in both countries. One mother described: *My mother-in-law gave me advice on breastfeeding when the baby was born... she told me to start giving other foods for the baby at 7 months, because it's the right time, she advised to breastfeed until the baby is 2 years old or more (Sb)*. In Solomon Islands grandmothers started looking after the child when the mother started working outside from home. In a few families, grandmother took the entire responsibility of childcare. In Finland mothers asked grandmothers' experiences on breastfeeding, especially if grandmothers had professional experience on health care or on children. However, Finnish grandmothers' advices were not always narrated in a positive way. Some mothers, especially if they already had many children, felt grandmothers or other relatives were meddling with their life by advising about child feeding and left their opinions unheeded. Many mothers in both countries indicated that they shared information with sisters or friends who were working with children or had children of their own. In Solomon Islands older relatives instructed mothers on food taboos during breastfeeding period. Only a few mothers in both study sites mentioned fathers or other male relative's involvement on feeding choice or practices.

#### 5.4.2 Health care

Health care workers were an important source of information and support on breastfeeding, particularly for the first time mothers. Mothers in Solomon Islands had received advice according to global recommendations on infant and young child feeding (WHO/UNICEF, 2003). In Solomon Islands majority of mothers tried to feed the child according the advice given by the nurses at the child health clinics. Mothers described that they had been told in the clinics why and how long time to breastfeed and when and how to start giving solid foods. Mothers in Finland, on the other hand, had mixed experiences on health care workers' breastfeeding support. In Finland advice was to start complementary food before six months of age and to wean the child from breast at age of one year at the latest, since it was not considered useful for the children anymore. Many mothers felt they were encouraged to breastfeed and that they got practical advice on the challenges. One mother described: *It started then, when there came this racy aunty, just grabbed my breast "Just here like this and girl like that and head like that and there". And then it started. "But nothing comes out there" "Yes it will, see, and then breast to mouth there and..." That was good. That was brilliant to me (FI)*. However, some mothers felt they were not supported to breastfeed at the hospital because the child had been given formula without consulting the mother or because they were not given advice on breastfeeding if the mother didn't realize to ask. One mother felt being forced to breastfeed regardless of the challenges she were facing with it and she was frustrated over the whole health care system: *I'm so disappointed to all operations of child health clinics... it is idealizing breastfeeding so much. It is that kind of breastfeeding mafia that no one dares to say that child might be hungry and that a little bit formula should be offered. It is way more important, that her stomach is full than breastfeeding (FI)*.

### 5.4.3 Working environment

In Solomon Islands most women who were working, were among the highly educated and had returned to work at 12 weeks following birth. Strategies to manage infant feeding and working included formula feeding while the mother was at work or early initiation of complementary feeding. Most working mothers had good knowledge about healthy feeding and nutrition and were financially capable to buy formula. In Finland, due to long parental leave, most women stopped breastfeeding before returning to work. If breastfeeding continued until the mother started working or studying, the child was fed with complementary foods and cow's milk while the mother was at work. None of the mothers interviewed mentioned having breastfeeding breaks during workdays or pumping breastmilk at work.

### 5.4.4 Culture

In Solomon Islands, those mothers who still breastfed their toddler at the time of the interviews felt that they need to breastfeed as long as the child is growing well, is 'big enough' or learns to eat 'strong' adult food, which was considered to take place between 2 and 5 years of age. In Solomon Islands, long term breastfeeding was considered to help the baby to get more strength and to grow up to be big, whilst in Finland long term breastfeeding was described as a behavior to get rid of in order to get the baby to grow up and retain more independence. One mother explained: *Now it is not nice anymore. And it is somehow, it is not nice when he in every place starts to tear shirt and that kind of things, so I want out of it. And he would become normal when he has got used to fall asleep like that and all that kind of things. That way he will be a big boy (FI)*. Independence was highly valued in Finland for both mothers and children and mothers often said they needed a time away from their child care duties or that the child needed to get more independence to grow up. In Solomon Islands most mothers formed a tight unit with their children and were rarely separated from each other. Besides nursing for nourishment, babies were also breastfed for comfort in Solomon Islands. In Finland, although most mothers described breastfeeding their infant based on their cues, some felt child being "too demanding" or "needy" if he/she wanted to eat very frequently. Infants' desire to eat at nighttime after the age of six months was not considered necessary or described to spoil the child. In Solomon Islands, mothers talked also on foods that belonged to their culture and should be fed to children, such as pawpaw, banana, coconut and sweet potato. Other foods, imported from other countries and sold in the shops were seen as "white mans" food and not suitable for Solomon Islanders.

## 5.5 Factors influencing compliance to the feeding recommendations

Among STEPS study participants over one third (36.3%) of the mothers breastfed exclusively for 4 to 6 months, 64.1% introduced complementary foods between 4 to 6 months and 15.4% breastfed for 12 months or more. Mothers who breastfed exclusively for a recommended duration 4 to 6 months introduced complementary foods at recommended age and also continued partial breastfeeding according to the recommendations more often than mothers who breastfed exclusively for < 4 months or > 6 months (both  $p < 0.001$ ).

Foods were categorized into 6 groups based on Finnish guidelines on when foods should be introduced to the children's diet. Proportions were then calculated of children following these recommendations (Table 9). Majority of children met the recommendations; however, especially vegetables, fruits and berries were often started at earlier age than recommended.

Table 9. Recommended age of introduction of complementary foods in Finland (Hasunen et. al. 2004), and proportion of study children meeting these recommendations.

Recommendation	Variables from diary	Start at earliest	Proportion meeting the recommendation
<i>Introduction of potato, fruits, vegetables or berries can be started customized at the age of 4 to 6 months</i>	Apple, banana, other fruits, potato, carrot, cabbages, pumpkin, zucchini, tomato, tomato puree, other vegetables, corn	4 months	68 %
<i>If needed, meat and porridge can be started at the age of 5 months</i>	Rice, wheat, barley, rye, buckwheat, pork, beef, chicken and other poultry	5 months	80 %
<i>At the age of 6 months everyone are offered solid foods as purées. In addition to previously mentioned, fish can be introduced to the diet</i>	Fish and shellfish	6 months	81 %
<i>Beans are not recommended to infants. Fresh cooked pulses can be tried at the age of 7 to 8 months</i>	Pea and green beans	7 months	100 %
<i>Milk products and bread can be started at the age of 10 months</i>	Milk and fermented milk products	10 months	99 %
<i>Vegetables containing nitrates are avoided in infancy. Eating of them can be started after infancy.</i>	Turnip, parsnip and swede	12 months	100 %

Maternal cognitive restraint of eating, food neophobia, dietary quality and depression and marital distress measured at child's age of 4 months were associated with meeting the Finnish feeding recommendations (Table 10). Higher proportion of mothers having low cognitive restraint of eating, good dietary quality or no or minor depressive signs at child's age of 4 months were breastfeeding exclusively and introduced complementary foods at recommended age compared with mothers with

high cognitive restraint of eating, poor dietary quality or major depressive signs. Mothers being average on their food neophobia status or having low marital distress at child's age of 4 months were more likely to follow the recommendation on exclusive breastfeeding duration than other mothers. No significant association was found between maternal characteristics and following the recommendation on total breastfeeding duration.

Paternal dietary quality was associated with following the feeding recommendations (Table 11). Children whose fathers had a good dietary quality were breastfed exclusively and introduced complementary foods more often according to the Finnish feeding recommendations.

**Table 10.** The differences in proportion of mothers compliant with Finnish feeding recommendations on exclusive breastfeeding (EBF, 4-6 months), introduction of complementary foods (CF, 4-6 months) total duration of breastfeeding (BF,  $\geq 12$  months) by mothers eating behavior, depression and marital satisfaction.  $\chi^2$ -test.

Variable	Proportion compliant with Finnish feeding recommendations					
	EBF	p	of CF's	p	Total BF	p
Cognitive restraint <sup>a</sup>	High	32.6	59.4		12.6	
	Low	40.0	0.014	68.0	0.005	0.058
Uncontrolled eating <sup>a</sup>	High	36.6		65.3		16.3
	Low	36.6	0.977	63.2	0.510	0.626
Emotional eating <sup>a</sup>	High	35.1		63.2		15.5
	Low	34.9	0.960	62.0	0.706	0.672
Food neophobia <sup>b</sup>	Neophobic	31.1		57.8		14.0
	Average	40.0		67.0		17.0
	Neophilic	30.2	0.019	63.6	0.080	0.548
Dietary quality <sup>c</sup>	Poor	34.1		60.6		14.5
	Good	40.6	0.033	69.2	0.005	0.164
Depressive signs, at 20GW <sup>d</sup>	Major	23.4		63.3		15.6
	No or minor	34.4	0.075	63.8	0.939	0.809
Depressive signs, at 4 months <sup>d</sup>	Major	14.8		51.0		9.3
	No or minor	35.4	0.002	65.1	0.046	0.154
Marital distress, at 20GW <sup>e</sup>	High	34.2		66.2		16.1
	Low	34.0	0.960	63.2	0.489	0.856
Marital distress, at 4 months <sup>e</sup>	High	27.5		60.7		14.1
	Low	36.3	0.047	65.1	0.338	0.474

<sup>a</sup> Dichotomized at the median split, <sup>b</sup> Post hoc tests: average vs. neophobic  $p < 0.05$ , average vs. neophobic  $p < 0.05$

<sup>c</sup> Good dietary quality index of diet quality (IDQ) total score of 10-15 and poor dietary quality IDQ score of 0-9.

<sup>d</sup> Major depressive signs, prenatally total score  $\geq 15$ , postnatally  $\geq 13$ , <sup>e</sup> High marital distress, total score  $\geq 36$ .

**Table 11.** The differences in proportion of fathers compliant with Finnish feeding recommendations on exclusive breastfeeding (EBF, 4-6 months), introduction of complementary foods (CF, 4-6 months) total duration of breastfeeding (BF,  $\geq 12$  months) by fathers eating behavior, depression and marital satisfaction.  $\chi^2$ -test.

Father Variable	Proportion compliant with Finnish feeding recommendations						
	EBF	p	of CF's	p	Total BF	p	
Cognitive restraint <sup>a</sup>	High	37.1	67.5		14.6		
	Low	38.1	0.763	62.2	0.116	15.4	0.788
Uncontrolled eating <sup>a</sup>	High	37.4		66.0		17.4	
	Low	36.9	0.507	63.8	0.502	14.3	0.273
Emotional eating <sup>a</sup>	High	36.7		66.0		15.6	
	Low	38.7	0.571	63.9	0.562	14.4	0.685
Food neophobia <sup>b</sup>	Neophobic	32.3		64.0		20.3	
	Average	38.2		65.6		14.5	
	Neophilic	38.6	0.362	64.7	0.942	8.6	0.054
Dietary quality <sup>c</sup>	Poor	34.8		62.7		14.1	
	Good	44.0	0.012	70.1	0.043	16.8	0.404
Depressive signs, at 20GW	Major	28.3		66.1		16.7	
	No or minor	34.4	0.339	63.9	0.745	16.2	0.928
Depressive signs, at 4 months	Major	35.0		64.7		20.0	
	No or minor	35.1	0.992	64.4	0.977	15.9	0.622
Marital distress, at 20GW	High	38.5		63.7		17.5	
	Low	32.9,	0.206	64.1	0.927	16.1	0.693
Marital distress, at 4 months	High	42.9		64.4		12.5	
	Low	33.4	0.056	64.2	0.973	17.0	0.239

<sup>a</sup> Dichotomized at the median split, <sup>b</sup> Post hoc tests: average vs. neophobic  $p < 0.05$ , average vs. neophobic  $p < 0.05$

<sup>c</sup> Good dietary quality index of diet quality (IDQ) total score of 10-15 and poor dietary quality IDQ score of 0-9.

<sup>d</sup> Major depressive signs, total score  $\geq 10$ , <sup>e</sup> High marital distress, total score  $\geq 36$ .

## **6. DISCUSSION**

### **6.1 Feeding practices**

In this study, BF and complementary feeding patterns were comparable with infant feeding patterns in Finland in general (Uusitalo et al., 2012). Both in this study and in a Finnish nationwide survey, 92% of infants less than one month of age were breastfed, and 43% and 47% of infants in this study and in a Finnish nationwide survey, respectively, were exclusively breastfed. At the age of four months, breastfeeding was more prevalent in this sample: 76% were still breastfed compared to 68% in the nationwide survey. The proportion of exclusively breastfed 4-months-old infants was as lower in the present study (19%) than in the nationwide survey (23%). Interestingly, more than a third of infants were still breastfed at around one year of age in the nationwide survey, whilst the rate in this study was only 14%. Data on the introduction of complementary foods were not comparable between the present study and the nationwide because of differing reporting methods, but they do show a similar tendency, which is a sharp increase in the frequency of starting solid foods between 3 and 5 months of age, most often in the form of vegetable purees. Not many mothers followed the feeding recommendations, but those breastfeeding the longer duration were likely to meet the recommended timing in introducing solids also, similarly to earlier study (Burdette et al., 2006).

Infant and young child feeding practices in Honiara were also largely consistent with large studies conducted in Solomon Islands (NSO, 2009). All mothers initiated breastfeeding at birth. High initiation rate seems to apply also in general population: approximately 93% initiate breastfeeding in Solomon Islands. The breastfeeding patterns in Solomon Islands were largely concordant with global recommendation (WHO/UNICEF, 2003): breastfeeding exclusively for six months, thereafter continuing breastfeeding with complementary foods and intention to continue breastfeeding until age 2 years or beyond.

### **6.2 Maternal influences on infant and young child feeding**

In this study mother's demographic characteristics, eating behavior and practices, depression, marital satisfaction and attitudes, and knowledge and beliefs were associated with infant and young child feeding practices. Of maternal demographic characteristics, older age, normal body weight, being married or having higher education and professional status associated with longer breastfeeding duration or later introduction of complementary foods, similarly to earlier studies (Doub et al., 2015; Holbrook et al., 2013; Rametta et al., 2015).

Mothers with high restrictive eating were more likely to breastfeed for a shorter duration and to introduce solid foods sooner than mothers who scored lower in these behaviors, but only the association between restrictive eating and introduction of complementary foods was independent of various demographic characteristics. Maternal restrictive eating also associated with compliance with the feeding recommendations. Parentally restrained eating has been suggested to result from BMI and body dissatisfaction and has been widely studied as a contributing factor for children being overweight or obese through child-feeding behaviors (Birch and Fisher, 2000; Farrow and Blissett, 2009; Hood et al., 2000; Rodgers et al., 2013), but to my knowledge, only one previous study has focused on early infant feeding practices (Brown, 2014). Studies suggest that restrictive eating on the

part of the parents predicts restrictive infant feeding, which may negatively affect the child's eating behavior by increasing the intake of, and preference for, palatable foods, thus increasing the child's weight (Bartok and Ventura, 2009; Johannsen et al., 2006). However, conflicting results exist, and an earlier study linked mothers' dietary restraint to healthier food choices for their children (Contento et al., 2005). In infancy, due to the infant-led nature of breastfeeding, parents who want to control their children's eating may choose to feed infants formula from birth or to stop breastfeeding earlier, making the feeding easier to control (Brown, 2014; Brown and Lee, 2013; Brown et al., 2011). The same mechanism may lead to too early initiation of complementary foods, but the reasons behind our findings of a mother's cognitive restraint being negatively associated with BF duration and the initiation of complementary foods needs to be further elucidated. In our study sample, uncontrolled or emotional eating behaviors on the part of the parents did not have significant associations with child-feeding practices or following the feeding recommendations, although this could have been assumed based on earlier studies conducted with older children (Kröller et al., 2013; Wardle et al., 2002).

Mothers with high levels of food neophobia were more likely to breastfeed exclusively and in total for shorter durations than other mothers. The longest breastfeeding duration was found among mothers who were considered average, according to their FNS scores. There was a statistically significant difference between average and neophobic mothers with regard to both exclusive and total breastfeeding durations. Only the difference with regard to exclusive breastfeeding duration appeared also in adjusted analysis. Similarly, there was an association between maternal food neophobia and compliance with the recommendations on exclusive breastfeeding, compliance with the feeding recommendations being highest among average mothers. Previously, studies examining the association between parental food neophobia and child feeding have been conducted with older children, and a recent study found an association between maternal neophobia and restriction, on one side, and children's weight and poor child-feeding practices, on the other (Tan and Holub, 2012). The results of that study suggested that maternal neophobia is inversely related to healthy feeding, which is in line with our study. Why neophobic mother's child-feeding practices were worse than an average mother's is unknown, and further studies are thus needed on this subject. Previous studies have also shown a connection between maternal dietary quality and feeding practices (Amir and Donath, 2007; Galloway et al., 2003; Lee et al., 2005; Robinson et al., 2007), but in this study such connection was observed only in unadjusted analysis and not after considering confounding factors. This may be due to methodological differences, as in this study IDQ measured maternal eating according to Nordic Dietary Recommendations (Leppälä et al., 2010). However, maternal dietary quality was associated with compliance with the recommendations of exclusive breastfeeding duration and introduction of complementary foods.

In this study, the amount of postnatal depressive symptoms was inversely associated with the duration of exclusive breastfeeding and also with later introduction of complementary foods, similarly to earlier study (Gaffney et al., 2014). Similarly, postnatal depressive symptoms were associated with compliance of exclusive breastfeeding and complementary feeding recommendations. No association was found between depression and initiation of breastfeeding or total breastfeeding duration. Continuity of depressive symptoms seems also to influence feeding practices, since the amount of maternal prenatal depressive symptoms predicted the amount of postnatal depressive symptoms and

the duration of exclusive breastfeeding was the shortest among the mothers who had continuing depressive symptoms from the prenatal to postnatal period. The mothers who only experienced postnatal depressive symptoms had a slightly longer duration of exclusive breastfeeding than the mothers with continuing symptoms, yet it was shorter than mothers who only experienced prenatal depressive symptoms. In study by Rahman et al. (2015), continuity of depressive symptoms from the prenatal to postnatal period was also associated with a shorter duration of breastfeeding. The depressive symptoms that started during the prenatal time have been reported to be related to especially severe postnatal symptoms (PACT Consortium, 2015). The depression symptom severity, in turn, could lead to failure in breastfeeding, although a recent study by Bogen et al. (2010) found no association between the severity of depressive symptoms and duration of breastfeeding at 2 and 12 weeks postpartum. The same study found breastfeeding intention to be the most influential factor in explaining the duration of breastfeeding (Bogen et al., 2010) and there is a study that suggests prenatal depression may cause mothers to intend less to breastfeed (Fairlie et al., 2009). This finding may explain why the breastfeeding duration is longer in mothers who only experience depressive symptoms in the postnatal period in comparison to mothers who experience depressive symptoms in the prenatal period. Additional studies to explore these findings in greater detail are needed to obtain additional insights on the effect of more persistency, timing and severity of maternal depressive symptomatology on breastfeeding practices and compliance with feeding recommendations.

During postnatal period depressive symptoms have more direct and negative affect on mothers' perceptions of themselves as caregivers and thereby also on their decisions related to breastfeeding (Field, 2011). In study by Rahman et al. (2015), depressed mothers were more likely to report insufficient milk production, although there were no differences in quantity of milk produced. Mother's perception of milk insufficiency may, in turn, lead mother feeding supplemental drinks, such as formula or water, to the infant (Flores-Quijano et al., 2008). Dennis and McQueen (2007) found that mothers with postnatal depression were more often dissatisfied with progression of breastfeeding, chosen infant feeding method, and had low breastfeeding self-efficacy. These findings indicate that postnatal depression increases mothers' risk for negative cognition and low self-esteem, which may lead to negative perceptions related to infant feeding and earlier interruption of exclusive breastfeeding and introduction of complementary foods.

Earlier studies have found marital satisfaction to be associated with diminished initiation of breastfeeding (Gibson-Davis and Brooks-Gunn, 2007) or early breastfeeding cessation (Sullivan et al., 2004), the findings that are divergent from this study, where higher maternal prenatal distress was associated with longer duration of exclusive breastfeeding. This finding may be explained by a "compensation theory" (Engfer, 1988), as mother who is experiencing distress in her marital relationship may cause to more strongly invest in the relationship with the child, and thereby compensate for the lack of love and intimacy from her spouse. This explanation is supported by the research of Kouros and others (2014), who found an association between mothers' lower level of postnatal marital quality and better mother-child relationship and study by James and others (2014), where a very low-quality relationship due to intimate partner violence in the postnatal period did not influence the initiation or duration of breastfeeding.

Breastfeeding was considered by mothers an essential part of motherhood, natural and optimal nutrition for the babies irrespective of the culture and context of living. In many earlier studies,

mothers have comprised breastfeeding decision and practices by similar reasoning as in this study (Marshall, 2011; Schmied and Lupton, 2001; Tully and Ball, 2014). Recent study by Shloim et al. (Shloim et al., 2015), explored mother's accounts of motherhood and feeding in two different contexts (UK and Israel), and found that mode of feeding was connected to experience of motherhood. In the study mothers described their motherhood experiences as "ideal", "good enough" and / or as a "burden". Such representations of motherhood existed also in this study, especially among Finnish mothers, as breastfeeding was considered "ideal" across countries, failure to breastfeed created mothers sense of "burden" to the mothers, but doing one's best even when not succeeding to breastfeed was considered acceptable, "good enough" mothering. Sense of burden, often described by Finnish mothers, may be due to biomedical breastfeeding discourse in Western societies, emphasizing nutritional and health benefits of breastmilk and thus positioning breastfeeding as the only proper choice for feeding infants for good mothers and decreasing woman's trust on ability to produce breastmilk adequately (Auerbach, 1995; Torres, 2014). Interestingly, although many mothers in Solomon Islands connected breastfeeding to motherhood, breastfeeding was not equated with ideal or good mothering, and inability to maintain breastfeeding was not described to result unsuccessful or poor motherhood. It is unknown whether this is because Solomon Islands has such a strong culture of breastfeeding, or because, unlike in Finland, medicalization and scientific motherhood (Apple, 1995) had not reached mothers in Solomon Islands. It might also be that harder life circumstances could have resulted with inability to admit to the struggles of motherhood (Shloim et al., 2015). However, to our knowledge the studies of mothers' experiences of motherhood and infant feeding are mostly performed in the Western world, which makes further studies definitely warranted.

Mothers in both study sites described having many similar problems with breastfeeding, but management of these problems differed between two countries. Those Finnish mothers who ceased breastfeeding after experiencing difficulties with breastfeeding expressed feelings of shame and inadequacy, which could emerge from breastmilk is the best and good motherhood discourse, similarly reported in earlier studies (Hegney et al., 2008; Thomson et al., 2015). Although shame is part of normal social interactions, self-internalized shame may lead to reticence of seeking out help for the breastfeeding problems due to fear of condemnation from others. Even though many mothers in Solomon Islands reported difficulties as they initiated breastfeeding, they were able to overcome obstacles and continue breastfeeding with confidence. Also parity was linked on how mothers described managing breastfeeding problems; multipara mothers expressed more self-assurance over their feeding choice, in line with earlier study from Finland (Laanterä et al., 2012). Maternal confidence has been identified in earlier studies as important determinant for breastfeeding success (Blyth et al., 2002; Otsuka et al., 2008). In addition to mothers confidence also commitment to breastfeed despite obstacles is needed for successful breastfeeding experience (Avery et al., 2009). Comments on expectations on failure before initiating breastfeeding were nonexistent in Solomon Islands, whilst common in Finland. Many Finnish mothers' comments on prenatal period indicate most of them wanted and were going to try to breastfeed their child and only few described making firm choice to breastfeed, reflecting neither confidence nor commitment. In a study by Avery et al. (2009) it was suggested that women who conceptualize breastfeeding as natural and easy are less likely to succeed at breastfeeding than women who believe on their abilities to breastfeed and consider breastfeeding as a learned skill. Realistic antenatal preparation and timely and parent-centered support

in postnatal period from skilled practitioners combined with effective social support could help mothers to find committed confidence with breastfeeding (Fox et al., 2015; Hegney et al., 2008).

It was interesting that many (especially Finnish) mothers lacked confidence on breastfeeding, they gained their feeding confidence back when child grew older and believed they provided their toddlers the best and healthiest food. It may be that mothers perceived less pressure to feed their toddlers than when breastfeeding. There are many options how to compile healthy diet from different foods, but a breastfeeding mother either succeeds or fails in feeding. Concept of healthiness has been found to influence everyday food selection (Oellingrath et al., 2013). However people definition of healthy eating may differ from dietary guidelines, which represent scientific knowledge on what healthy food consists of (Margetts et al., 1997). In this study, mothers in both contexts conceptualized local, home-cooked and unprocessed food as ‘healthy food’, as observed in earlier studies (Falk et al., 2001; Goto et al., 2014). Neuman et al. (2014) calls this an “inauthenticity discourse”, where instead of focusing on health and nutrients and their influence in the body, people are focusing aspects far from themselves. Eating local food may be good for the local economy, community’s wellbeing and environment (Derkatch and Spoel, 2015), although is not synonym for healthy food in medical discourse. When planning national campaigns to improve quality of complementary feeding practices, it is essential to consider the perception of healthy eating and feeding according to the context.

### **6.3 Paternal influences on infant and young child feeding**

Findings of this study suggests, that also fathers are associated with infant and young child feeding practices, although in much smaller scale than mothers. In this study, the fathers’ eating behaviors (measured with TFEQ and FNS) did not have a significant association with child-feeding practices, but an association was observed between the mothers’ and fathers’ dietary qualities and child-feeding practices. Good diet quality on the parts of both fathers and mothers was associated with longer breastfeeding duration and the later introduction of complementary foods in unadjusted analysis. Interestingly, when confounding factors were considered, association between fathers, but not mothers, dietary quality and total BF duration remained statistically significant. Poor eating practices of fathers were also associated with poorer adherence to exclusive breastfeeding and initiation of complementary feeding recommendation. Poor eating practices on the part of a father may relate to the father’s attitude regarding eating and feeding recommendations and breastfeeding and, thus, the support provided by the father to the mother. In other studies, good diet quality on the part of a mother has been linked to longer durations of breastfeeding and better adherence to infant-feeding guidelines (Leslie et al., 2012), but no studies are available on the possible links between a father’s diet quality and infant feeding practices.

Previous studies (Falceto et al., 2004; Paulson et al., 2006) have found no association between postnatal paternal depressive symptoms with total breastfeeding duration and, to our knowledge, no previous study has examined the influence of paternal prenatal depressive symptoms and breastfeeding initiation and exclusive breastfeeding. In this study paternal depressive symptoms, either pre- or postnatally, did not seem to influence the duration of exclusive and total breastfeeding or timing of the introduction of complementary foods. Paternal postpartum depression may limit fathers’ capacity to provide emotional support to the mothers (Melrose, 2010), but mothers may have

other social networks supporting them to start and continue breastfeeding and compensate for a lack of support from the spouse. In addition, about half of the families in this study were first-time parents. Previous studies about first-time fathers have shown a higher amount of depressive symptoms during pregnancy (Condon et al., 2004). At least some amount of the higher paternal prenatal depressive symptomatology found in this study may, therefore, be related to the stronger psychological process of transitioning to parenthood. Also the cumulative effect of mothers' and fathers' depressive symptoms and marital distress was also explored in order to understand the family-level influence on breastfeeding initiation and EBF. The evaluation did not reveal a statistically significant association between family-level depressive symptoms and breastfeeding initiation or exclusivity. The lack of family-level association with feeding suggests that mothers' own self-reported experience is more important in predicting breastfeeding than an accumulation of symptoms at the family level (Kerstis et al., 2013).

Fathers in many countries and cultures have been identified by mothers having important role in mothers' decision to initiate and continue breastfeeding and introduce complementary foods (Bich et al., 2014; Mueffelmann et al., 2015; Nickerson et al., 2012; Rempel and Rempel, 2011). On the contrary, in this study fathers were rarely mentioned by mothers, when they discussed about issues related to feeding practices or behaviors. This may be due retrospective nature of this study. Mothers were interviewed when children were already 1 to 2 years old, not in the infancy when problems with feeding are common and thus more support would be needed. In a study where fathers were mentioned often as significant others, mothers were interviewed two times within first six months of child's life (McInnes et al., 2013). Also phrasing of questions may have influenced of the findings. Mothers were asked in the interviews to identify persons who have provided advice and support in child feeding, not directly on mothers' perception of fathers' role to feeding practices and behavior. Mothers may have perceived this question to mean more of an advice than practical support fathers often provide to breastfeeding mother (Rempel and Rempel, 2011). As fathers cannot have direct experience on breastfeeding and also their knowledge may be limited on issues related to infant and young child feeding (Taspinar et al., 2013), mother may not believe father could advise them on feeding practices. Earlier studies have found that, in order to the person to have a significant influence on the mother's feeding behavior, mothers need to have a belief of the person's knowledge on the issue (Kessler et al., 1995; McInnes et al., 2013). Mothers' perception of fathers influence may be related also to mother's expectation of couple and gender roles.

#### **6.4 External determinants of infant and young child feeding**

This study identified complex interplay between social, cultural and societal factors influencing mother's experiences on breastfeeding and breastfeeding practices. Although infant feeding is essentially a dyadic activity between children and mother or other primary caregiver, surrounding realities and conditions where mother-infant pair live in can either provide supportive atmosphere or obstacles that impede successful feeding experience.

Child feeding occurs in specific social environment, which can influence breastfeeding self-efficacy by vicarious experiences (e.g. seeing other women breastfeed) or verbal persuasion (e.g. encouragement or discouragement to breastfeed from significant others) (Bandura, 1977; Dennis, 1999). Social environment, and thus opportunities for seeing or learning to breastfeed from people

around differed between the study sites. As in many other non-western societies, in Solomon Islands extended and/or intergenerational family households were common way of living, where older and experienced women, especially grandmothers, played an active role as advisors transmitting breastfeeding skills and giving reliable advice and support for the mothers (Aubel, 2012). Mothers in Honiara had also much more opportunities actually seeing breastfeeding than mothers in Finland, due to breastfeeding culture as well as different age structures of societies and thus number of children around. This visual experience of breastfeeding has been associated with breastfeeding initiation and duration (Dykes et al., 1998). Although grandmothers and other relatives were important also for Finnish mothers, they lived usually far away from their relatives and were less in contact with each other. It was likely that the grandmothers had little or no experience on successful breastfeeding, since most of the grandmothers were mothers themselves in the 1970's, when breastfeeding prevalence was the lowest in Finland (Verkasalo, 1980).

Health care personnel were important source of breastfeeding information and support for primipara mothers in Solomon Islands and Finland. Multiparas mostly were not given much information on infant feeding or acted independently of health care provider's advice. Some Finnish mothers felt that support provided was inadequate and inconsistent between health care professionals. Across countries mothers have reported inconsistencies in breastfeeding support by health care professionals influencing negatively their breastfeeding experience, especially among primipara mothers (Almqvist-Tangen et al., 2012; Cross-Barnet et al., 2012; Humenick et al., 1998; Smith and Lucas). Further, mothers' experiences with health care personnel have been associated with breastfeeding duration (Cross-Barnet et al., 2012; DiGirolamo et al., 2003, 2008; Szucs et al., 2009). This applied to the experiences of many Finnish mothers: those who had negative experiences on breastfeeding messages, and perception of inadequate or inconsistent advice from hospital staff and child health clinic nurses had difficulties overcoming breastfeeding problems. Initiation of infant formula started for many children at the maternity hospitals or early in postnatal period. In-hospital donated milk or formula supplementation is common practice in Finland, in 2010 71% of the newborns were given other milk than own mother's in the delivery hospital (Uusitalo et al., 2012). Mothers found in-hospital supplementation unsupportive of their breastfeeding efforts leading to more challenges with initiation of breastfeeding and shorter breastfeeding duration, as recent studies also suggest (Chantry et al., 2014; Odom et al., 2014; Parry et al., 2013). Only few mothers were able to transfer back to exclusive breastfeeding, after formula feeding was started. When mothers sought help from health care professionals, they felt they were not given referrals to available resources for breastfeeding support, whether professionals or peer support groups. In Solomon Islands mothers were satisfied with the information and support provided by the health care personnel and found information consisted and adequate. Although limitations in breastfeeding knowledge has been identified as common barrier in breastfeeding counselling (Laanterä et al., 2011), pure lack of knowledge is unlikely to explain differences in mothers experiences of consistency and adequacy of support in Finland and Solomon Islands (Nelson, 2007). It is likely that in Solomon Islands consistency and adequacy of support is related to professionals' positive personal experiences and attitudes on breastfeeding in society where breastfeeding is a norm, lack of ongoing debate on optimal feeding practices in the society and abundance of breastfeeding support from informal social network to the mothers making them rely less on health professionals.

Influence of working for feeding practices was seen mostly among mothers in Solomon Islands, but not in Finland, by ceasing breastfeeding and introducing complementary foods way ahead of return to work. Most of the mothers were not employed at the time of the interviews in Honiara, but there were some mothers who returned to formal full-time employment within only 12 weeks postpartum, which posed challenge for breastfeeding continuation and led often to using infant formula or early introduction of complementary foods. However many mothers were able to continue partial breastfeeding during evenings and night times after returning to work. Later returning to work or ensuring nursing mothers could have de jure breastfeeding breaks could enable mothers to better continue breastfeeding and avoid early introduction of complementary foods (Ahmadi & Moosavi 2013, Bai et al. 2014).

Despite breastfeeding is a biological norm for all mammals, the process and meaning of breastfeeding, and how it is integrated in the society varies, make breastfeeding strongly culturally constructed (Van Esterik, 1996). Cultural features, such as medicalization of feeding, concept of motherhood and classification of foods were noticed to influence especially breastfeeding practices and experiences, as discussed in the earlier sections. Another cultural aspect influencing both breastfeeding and complementary feeding practices was infant-mother mutual reliance (Negayama et al., 2012), as supported by this study. Infant-led style associated with breastfeeding, even at toddlerhood was well accepted in Solomon Islands, whereas it clashed with Finnish cultural norms of independence and autonomy. Despite of strong cultural pressure to breastfeed in Finland in early infancy, breastfeeding lost positive attributes and started distracting mothers and child's autonomy and individuality at the latest when approaching toddlerhood. This may be explained by Finnish culture emphasizing individualism highly (Alasuutari, 1991). Further, breastfeeding culture many have similar fundamental assumptions as elsewhere in the Western world where breastfeeding serves only nutritional function and, thus, breastfeeding should be limited to young infants (Dettwyler, 1995). On the other hand Solomon Islands breastfeeding culture lacked these assumptions and mothers valued breastfeeding as a source of nourishment, but also nurture. Differences noticed in mothers' thoughts on infant-mother mutual reliance may explain the high acceptability of night feedings of toddlers in Solomon Islands and unacceptability in Finland.

Cultural factors influenced also mothers' interpretation of infant's cues. In both countries solid foods were introduced to many children because mothers felt their baby just wanted or needed solid foods, consistently with other studies on the subject (Clayton et al., 2013; Scott et al., 2009; Walsh et al., 2015). Yet the age in which mothers perceived infant needing or wanting solid foods differed in study sites. In Solomon Islands most mothers started introducing solids at 6 months and in Finland at 4 months. In Solomon Islands behaviors such as reaching or grasping of foods from other family members were common preceding introduction of solids, whereas in Finland fewer infants were described having such behaviors, but more perceiving dissatisfied and hungry. As in this study, Wright et al. (Wright et al., 2011) suggested that the age at child's readiness for solid foods is strongly culturally determined and mothers interpret baby's cues varied greatly in different contexts. Furthermore Finnish mothers were not acting solely on their own intuition and many cited professional influence being important in their decision to introduce solid foods, even when it occurred at 4 months. Later age in general at introducing solids in Solomon Islands coincidences with developmental readiness of eating (Naylor and Morrow, 2001), suggesting using more infant led-

approach in feeding than in Finland. However, there were some mothers in Solomon Islands who exclusively breastfed until age of 7 months or more, although infants are recommended to start solid foods by the age of 6 months (WHO, 2002). Infant-led approach in introducing solids is usually feasible for most infants, but if child is not reaching or mouthing food by the age of 6 months, should solids be started despite the lack of developmental signs of readiness (Wright et al., 2011).

### **6.5 Strengths and limitations**

This study was done using mixed method research methodology by combining quantitative and qualitative methods, which is the main strength of this study. Integration of multiple methods gave the author more depth understanding on the factors that influence infant and young child feeding practices than any of the methods alone. Moreover, we collected data for the quantitative studies using many several well-known and recognized questionnaires from both mothers and fathers. In addition, this study consisted of longitudinal prospective data on infants' and young children's feeding. The qualitative research in two very different settings allowed may have opened up new possibilities for interpretations and seeing things in a new way. Earlier comprehensive research on the association between parental determinants with IYCF being scant, the current study expands the existing knowledge on this topic.

However, some limitations must be taken into account in considering the results of this study. Some limitations are related to the study design. The STEPS cohort sample was somewhat skewed toward middle-class families in comparison to the general population (Lagstrom et al., 2013). Thus generalization of the results to predominantly less educated populations should, therefore, be done with caution.

Potential weakness of this study lies in the use of self-report instruments to determine parental eating behavior, eating practices, depressive symptoms and marital satisfaction. For depressive symptoms there are more accurate diagnostic tools available in health care, but for this study using diagnostics were not methodologically possible. However, the rates of both maternal and paternal prenatal and postnatal depression that were found were comparable with the incidence estimates reported earlier for mothers in Finland (Pajulo et al., 2001; Tammentie et al., 2002) and fathers (Paulson and Bazemore, 2010). We also used parental reports through follow-up diaries to determine exclusive BF, total BF duration and the date of introduction of complementary foods. Parental reporting is a frequently used method, but its reliability and validity in studying infant-feeding practices have been questioned, especially when data is collected retrospectively (Coit et al., 2012; Li et al., 2005). In our study, the parents were instructed to fill in their data in real-time, when exclusive or total breastfeeding was ceased or solid foods introduced, but it is not known whether all parents followed these instructions.

Timing of the data collection may pose other limitation to this study. In this study, we wanted to discover how parental eating behaviors association with infant and young child feeding practices, but the data on parental eating behaviors were, in some cases, collected after the data on child feeding. The TFEQ was collected when infants were 4 months of age, and the FNS and IDQ were collected at 13 months. At 4 months, most infants were not fully breastfed anymore and had already started solid foods, and by 13 months, most mothers had stopped breastfeeding. According to previous studies,

food neophobia has been found to be fairly stable at the age range of the parents in our study (McFarlane and Pliner, 1997; Tuorila et al., 2001). Research on the effects of age or pregnancy on factors measured with TFEQ is sparse. However, there is a small study that also suggests that mothers' dietary restraints do not change significantly from the prenatal to the postnatal period (Stein and Fairburn, 1996). This study implies that parents' eating behaviors may be fairly stable. The collected data had also limited information about depressive symptoms prior to pregnancy and that inhibited us from studying the relationship between EBF and depressive symptoms, which have lasted longer than the perinatal period.

In qualitative part of this study mothers were asked to recall infant feeding patterns that took place one to two years before the interviews. This retrospective nature of our study possibly affected mothers' ability to remember exactly how they had fed their child in the past or how they had experienced the situation when breastfeeding. Therefore, it rather presents mothers later perceptions and rationalizations of the previous events (Haaga, 1988). Secondly, due to the qualitative nature of the study, the findings cannot be generalized, but are meant for exploring what feeding choices were made by mothers and the reasoning behind these choices. Interviews were conducted in Solomon Islands in English or Solomon Pidgin, according to choice of the mother. This may have influenced in interpreting the results of the study, although interviews were conducted and data analysis implemented in collaboration with local counterpart speaking fluently both English and Solomon Pidgin.

## 7. CONCLUSIONS

The results of this study provide evidence, that parental characteristics, eating behavior and practices and depression and marital satisfaction associate with infant and young child feeding practices. The main conclusions of this study can be summarized as follows:

- 1) Mothers with high cognitive restraint of eating are more likely to introduce complementary foods earlier than mothers with low cognitive restraint and mothers with high level of food neophobia are more likely to breastfeed for a shorter duration than mothers who are considered average according their FNS score. Paternal eating behavior and food neophobia does not associate with feeding practices; however children of fathers having good dietary quality are more likely to be totally breastfed for a longer duration than children of fathers with low dietary quality.
- 2) Maternal postnatal depressive symptoms associate with shorter duration of exclusive breastfeeding and earlier introduction of complementary foods. Prenatal depressive symptoms seem to influence feeding practices through postnatal depressive symptoms. Mothers with high amount of maternal marital distress breastfeed exclusively for a longer duration than mothers with low marital distress. Paternal depressive symptoms are not associated with feeding practices.
- 3) Mothers in Finland and Solomon Islands reported no single influence determining infant and young child feeding, but complex interplay of individual perceptions, significant others and socio-cultural context influencing feeding practices and behavior. Benefits of breastfeeding were well recognized in both study sites, although mothers in Solomon Islands displayed more positive attitude towards it than mothers in Finland. In Solomon Islands, breastfeeding practices were very close to optimal, probably due to many cultural and societal factors promoting breastfeeding. In Solomon Islands breastfeeding was normal activity, even beyond infancy, highly valued for nourishment and nurture and widely visible and acceptable in the society. Initiation of complementary feeding was also mainly done in compliance with global feeding recommendations, although variety and quality of complementary foods had room for improvement. In Finland breastfeeding initiation rates were high, but many of those who start, discontinued breastfeeding rapidly and introduce complementary foods early for socio-cultural pressures of ideal motherhood, perception of insufficient breastmilk and low societal support for breastfeeding. Feeding choices were mostly mother-led, whereas in Solomon Islands infant-led feeding was practiced by most of the mothers. According to the results, socio-cultural context seems to be highly influential to infant and young child feeding behavior and practices.
- 4) Mothers with high restrictive eating, high neophobia or poor dietary quality are less likely to comply with the infant and toddler feeding recommendations than mothers with low restrictive eating, average neophobia and good dietary quality. Also children of fathers having poor dietary quality are less likely to be fed according to the feeding recommendations than children of fathers having good dietary quality, but food neophobia and eating behavior of fathers does not associate with complying with feeding recommendations.

## **8. IMPLICATIONS FOR PRACTICE**

Feeding practices have long lasting influence on children's nutrition and health, highlighting the importance of the identification of factors influencing parental feeding decision and practices and the potential intervention strategies to improve infant and young child feeding practices. While infant and young child feeding counseling is already included to routine antenatal and postnatal care for all women in Finland, it could be beneficial to study the effect of targeting more support for the groups at risk of discontinuing breastfeeding or introducing complementary foods too early (Hannula et al., 2010). This study provides suggestions on possible risk groups for poor feeding practices among Finnish parents and of context-specific factors influencing feeding practices and behavior in Finland and in Solomon Islands.

Mothers having problems with their own eating or with depressive symptoms could be identified into risk groups for poor feeding practices, since maternal restrained eating, food neophobia and depressive symptoms, especially those persisting throughout perinatal time, seems to associate negatively breastfeeding duration or introduction of complementary foods. These results support the importance of tackling mothers about familial eating behaviors and practices in routine care during pregnancy or after birth to improve feeding practices. In addition, screening of mothers' depressive symptoms may be warranted to be started already during pregnancy with frequent follow-ups throughout the perinatal period. Early support and treatment should also be offered to these mothers during pregnancy. The alleviation of maternal depressive symptoms during pregnancy prevents the continuity of the symptoms, which is important from the point of view of the development of both the fetus and the infant, and may also increase the duration of breastfeeding and delay the introduction of complementary foods.

In the process of development of comprehensive intervention strategies to improve feeding practices, contextual influences need to be taken also into account. Despite of infant feeding practices close to recommended in Solomon Islands and cultural and environmental factors support optimal feeding practices, the rare situations when baby cannot be breastfed should be efficiently addressed by providing access to formula to food insecure families. Interventions focused on quality of complementary foods could also be beneficial for children's nutritional status. In Finland breastfeeding initiation rates are high, but many of those who start, discontinue rapidly for various reasons, which are often socio-culturally constructed. Increasing knowledge on benefits of optimal feeding practices is not enough, as benefits are quite well known. Interventions should focus more on creating positive attitude and committed confidence towards breastfeeding. This could be done by ensuring that mothers receive consistent and adequate support and counselling from all health care professionals starting from pregnancy. Establishing peer support groups for mothers in same situation of life or using social media to disseminating evidence based information could be beneficial for ensuring optimal feeding practices.

More research is needed on the associations between parental eating behaviors and child feeding, as well as on eating behaviors later in childhood. Another unanswered question is whether parents' eating behaviors can predict a child's later health outcomes, such as their being overweight or obese. Additional studies would be needed also on the effect of more persistency, timing and severity of maternal depressive symptomatology on breastfeeding practices. In the qualitative part of this study

we found child influencing on feeding practices by communicating with the mothers. To study the influence of infant related factors on feeding practices, it would be interesting in the future to investigate how infant-related factors, such as difficult temperament and low responsiveness to stimulation are related to feeding practices.

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