



**Socio-Economic Correlates of Complementary Feeding Practices
Among Infants and Toddlers in Punjab**

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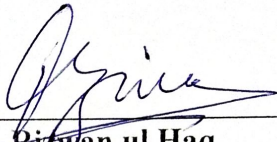
August 2020



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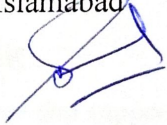
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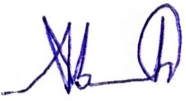
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TO MY FATHER

I am here because of your love and support

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Acronym

| | | |
|------|---|--|
| IAT | : | Infants and Toddlers |
| SDGs | : | Sustainable Development Goals |
| WHO | : | World Health Organization |
| PDHS | : | Pakistan Demographic and Health Survey |
| MDD | : | Minimum Dietary Diversity |
| MMF | : | Minimum Meal Frequency |
| MAD | : | Minimum Acceptable Diet |
| MICS | : | Multiple Indicator Cluster Survey |
| NNS | : | National Nutrition Survey |
| CFP | : | Complementary Feeding Practices |
| IYCF | : | Infant and Young Child Feeding |
| ES | : | Economic Status |
| AOC | : | Age of Child |
| GOC | : | Gender of Child |
| ME | : | Mother Education |
| POR | : | Place of Residence |

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ABSTRACT

Poor complementary feeding practices are one of the important factors of malnutrition in infant and toddler. Complementary feeding is defined as “the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants and therefore other foods and liquids are needed along with breast milk”. Minimum Acceptable Diet used as a proxy for measuring complementary feeding, it is the combination of Minimum Dietary Diversity and Minimum Meal Frequency. Malnutrition (undernutrition) is a Global problem particularly for developing countries carrying immense health consequences, mortality, and morbidity. Pakistan is also facing a double burden of nutrition due to unbalance and poor diet in this context a study on complementary feeding is of utmost importance.

The objective of the present study is to find the prevalence and correlation between the Minimum Acceptable Diet and Socio-economic and demographic factors using MICS Punjab 2017-18 data. The end result of the present research shows that only 14% breastfeed infants and toddlers (6-23 months) take Minimum Acceptable Diet in Punjab. Study results of binary logistic regression revealed that household economic status, infants and toddler’s age, mother having higher education significantly correlated with a minimum acceptable diet. While Child gender and Place of residence are insignificantly correlated with minimum acceptable diet. Therefore it is time to include strategies in the country's health plans to increase the rate of complementary feeding practices in Punjab. This will provide a road map to minimize malnutrition, mortality, and morbidity among infants and toddlers.

Chapter 1

Introduction

1.1 Introduction

Developing countries suffer from infants and toddlers malnutrition showing alarming numbers of stunting, wasting and underweight children. The situation is even worse in Sub Saharan African and South Asian countries. There are many reasons which cause malnutrition in infants¹ and toddlers² worldwide one of the reason include household food poverty. Lack of proper information about the feeding practices among mothers and caretakers is one of the key underlying causes of unbalanced and deprived diets of infants and toddlers in the developing countries (Hazir et al., 2012). Breast milk is recommended for infants up to six months of age and is regarded sufficient for infants growth until that age but beyond that exclusive breastfeeding has proved to be insufficient for infants and toddlers (IAT). For infants and toddlers between 6 to 23 months of age³ breastfeeding with complementary diets are suggested by the World Health Organization (WHO, 2001) and is defined as “the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants and therefore other foods and liquids are needed along with breast milk” (WHO⁴, 2003).

Effective strategies for reducing child malnutrition are to promote breastfeeding and appropriate complementary feeding practices (Canavan et al., 2016). The sustainable development goals (SDGs) acknowledge the importance of nutrition particularly stated in goal 2 that “End hunger achieve food security and improved nutrition and promote sustainable agriculture” and it’s directly linked to diet quality. According to the policy brief number 10 of sustainable

¹An infant is a child younger than one year of age (WHO 2013)

²A toddler is a child approximately 12 to 36 months old, although definitions vary (Barker& Robin, 2001) No slandered definition are available.

³Unit of analysis in this study are those infants and toddlers between 6-24 months of age.

⁴ Guiding principle for complementary feeding of the breastfeed child (P. 8).

development goals (2017), the quality of diet directly related with the zero hunger goal of SDG, with objectives such as security of food & better nutrition and promotion of sustainable agriculture. Furthermore, it helps to reduce the poverty, enhance well-being & health, learning and cognitive development. Resultantly, the better diet enhanced work and productivity.

1.2 Consequences of unhealthy foods

Proper nutrition is important to the human immune system (Karacabey & Ozdemi, 2012). While poor nutrition is not only associated with maternal and child nutrition but also health consequences of diseases such as HIV/AIDS, malaria and measles. The overall risk associated with poor diets are more as compare to the combine risk of alcohol, air pollution and tobacco (Gakidou et al., 2017). Six out of top nine risk factors driving the worldwide burden of disease are now linked to diet (United Nations, 2017).

Food with high salt, fat and sugar can be the source of tooth decay and iron deficiency among IAT. Infants and toddlers with improper diet intake can face different problems such as underweight, overweight, constipation, poor physical growth, being pale or lethargic, and changes in bowel habits (Children Hospital Melbourne). Every third IAT has some form of malnourished stunted children counted to be 159 million while 50 million are wasted children malnutrition is an concern that affect health cognitive improvement economic development and human rights it's estimated that under nutrition is responsible for approximately 45% of all childhood deaths worldwide (Peter, 2017).

Child malnutrition and infant mortality are the most common public health problem faced by Pakistan children morbidity and mortality associated with malnutrition responsible for approximately half of child deaths globally (Cheah et al., 2010; Arif et al., 2012). Malnutrition of primary school children increased as child grows up irrespective of their gender (khan

&Azid,2011). In India, Bangladesh and Pakistan half of the world's skinny women and children are found in these Southern Asian countries (Cheah et al., 2010).

1.3 Background of infant and toddler complementary feeding practices

Most countries suffered from mortality and morbidity of IAT due to unbalance and poor complementary feeding practices. Mothers and caretakers around the world do not know how to practice nor aware of the importance of responsive feeding even though it's the important determinant of malnutrition (Daelmans et al., 2009). It is projected that 34.8 percent of infants are exclusively breastfed in the early 6 months while the majority getting some other food or fluid in these months (WHO, 2009).

For growth development and healthy survival of IAT it is essential to provide them appropriate and balanced diets according to their age. Infants should be breastfeed from one hour of birth up to six months and after that balanced and adequate complementary foods should be included with breastfeeding up to two years of age and beyond (WHO, 2009).

According to the PDHS 2017-18, twenty percent newborns start breastfeeding at the age of one hour while forty-eight percent start under the age of six months. Furthermore, seventy percent at the age of one year while 53 percent at the age of two years. However, the statistics of national nutrition survey 2018 documented that 45 percent of infants start breastfeeding in one hour after birth and 48 percent under the age of six months. Moreover, sixty-eight percent start breastfeeding at the age of one year while 56 percent at the age of two years. In addition to above, 14.2 percent infants take minimum dietary diversity (MDD), 18.2 percent take minimum meal frequency (MMF) and only 3.6 percent take minimum acceptable diet (MAD). The statistics of MDD, MMF and MAD clearly expose that all the indicators of complementary feeding are below from the recommended guidelines.

Multiple Indicator Cluster Survey Punjab (2017-18) stated that 9.5 percent newborns starts breastfeeding in one hour of delivery while 39.4% within one day after delivery. Furthermore, only 13.8 percent infants and toddlers under age of two years got MDD, 65.7 percent MMF and only 12.1 percent received MAD. If we compare rural and urban regions, 30.4 percent of IAT between age of 0.6 and 2 years received MDD in urban area while in rural area the proportion is low as compare to urban (22.1 percent). Moreover, 70.6 percent received MMF in urban area while 57.8 percent in rural regions. Whereas, 18.6 percent got MAD in urban region and in rural region the proportion is 12.4.

1.4 Research Gap

Complementary feeding practices are substantially linked with infants and toddlers nutritional status, growth and development. But little attention has been given to this topic in previous research in Pakistan. Previous study conduct earlier mainly focus on the breast feeding and time of introduction of complementary food beside this these studies are conducted in limited scale i.e., district, community, and hospital. One study by (Na et al., 2017) tries to do it on national level survey i.e., PDHS 2012 13 but it mainly consider community level factors by applying multilevel model. . In this backdrop, a thorough study of major correlates of complementary feeding practices on provincial representative data is lacking. Therefore this study has been conducted to fill this research gap by using the largest and updated data of MICS Punjab and by focusing individual level factors.

1.5 Study Significance

Undernourishment among children is a global public health problem but South Asian countries and Sub-Saharan African counties are more suffered from it. This study critically analyzes the available data about the current pattern, causes of poor complementary feeding and its correlated factors and to identify the most vulnerable group from different Scio economic background.

Furthermore exploring the possible solution will help to improve and manage IAT feeding practice to reduce malnutrition morbidity and mortality among children.

1.6 Research Questions

This study has been conducted to address the following queries:

- What are the patterns of complementary food intake by the infants and toddlers?
- How could complementary food intake be correlated with socioeconomic and demographic factors in Punjab?

For responding to these questions the proposed study has developed some objectives.

1.7 Objectives

The study aims to

- Find Prevalence and intake of recommended food groups of complementary food given by 6-23 months old infants and toddlers in Punjab.
- To find the correlation between socioeconomic and demographic factors and complimentary food consumption.

Chapter 2

Review of Literature

A balanced diet is crucial for infant and toddler's growth and development and to minimize the risk of malnutrition morbidity and mortality. This chapter of the literature review provides rich literature and theoretical foundation about unbalanced insufficient and poor complementary feeding practices and resulted in health consequences in different communities. This information from the literature review will help us for understanding Complementary Feeding Practices (CFP) deeply among infants and toddlers.

2.1 Theoretical Section

Minimum Acceptable Diet (MAD) is required for the growth and improvement of infants and toddlers without it IAT are exposed to under-nutrition particularly stunting and micronutrient deficiency which cause morbidity and mortality among IAT. MAD⁵ is the combination of Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF). Minimum Meal⁶ Frequency is a proxy for IAT energy requirements, Breastfed IAT is considered to be consuming MMF if they receive solid, semisolid, or soft foods at least twice a day for infants 6-8 months and at least three times for children 9-23 months or more during the previous day (WHO, 2008). While Minimum Dietary Diversity⁷ (MDD) means feeding the child foods from at least four out of seven standard food groups that are Grains roots and tubers, legumes and nuts, Dairy products, Flesh foods, Eggs, Vitamin-A rich fruits and vegetables and Other fruits and vegetables (WHO, 2008).

⁵The MAD for breastfed children age 6-23 months is defined as receiving the MDD and MMF (MICS Punjab, 2017-18; (WHO, 2008).

⁶ Meals include both meals and snacks (other than trivial amounts) and frequency is based on caregiver report. (WHO 2008) WHO don't consider meal amount and only focus on frequency which is ambiguous.

⁷ The indicator is based on consumption of any amount of food from at least 4 out of the 7 food groups.

Table 2.1 WHO Recommended seven food group with principle nutrients

| S no | Food Group | Principle Nutrients |
|------|--|--|
| 1 | Grain roots and root crops | Carbohydrates, Dietary Fiber, Proteins, Fats, etc. |
| 2 | Legumes peanuts Nuts | Protein, Carbohydrates, Dietary fiber, minerals and vitamins, many B group vitamins, vitamin E., etc |
| 3 | Dairy Products (Milk, Cheese, Yogurt) | Calcium, Protein, Energy, and B vitamins, etc. |
| 4 | Meat Foods (Meat, Poultry, Fish, and Liver Meat) | Protein, Zinc, Iron, and Vitamin A. etc. |
| 5 | Eggs | Protein, Fat, Iron, Vitamin. |
| 6 | Vitamin-A-rich fruits and vegetables | Carrots, sweet potatoes, Apricots, spinach, kale, collard greens, mangoes, Red Grapefruit, Watermelon. |
| 7 | Other Fruits and Vegetables | It depends on the fruit and the type of vegetable |

Source: Author

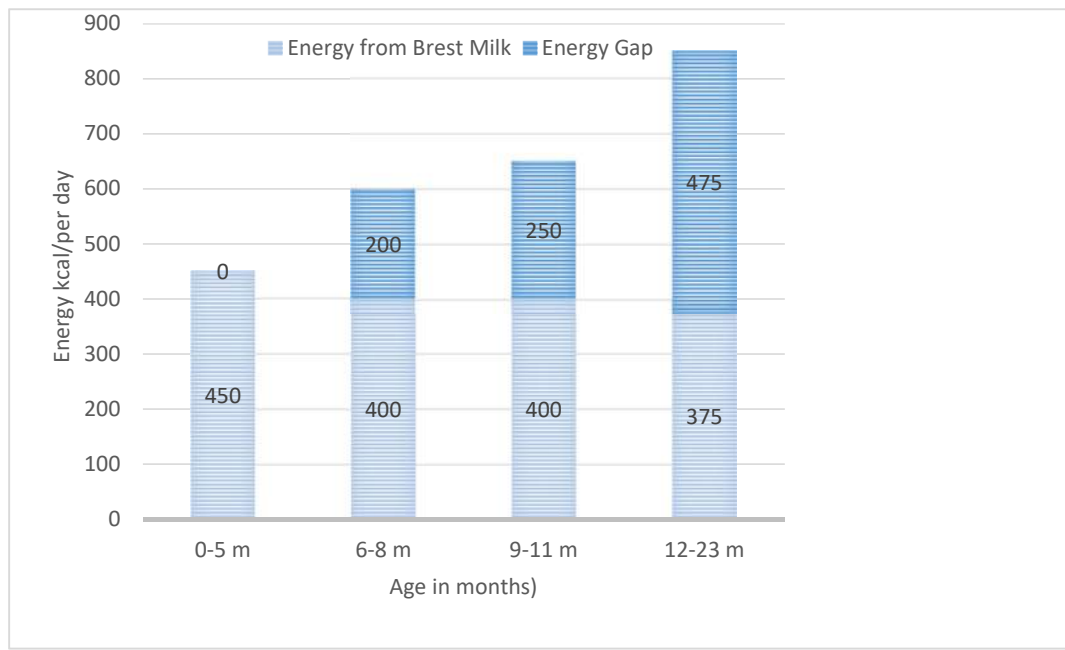
Table 2.2 Guidance on quality frequency and quantity of food offered to breastfed Infant and Toddlers

| Age in months | The energy required per day ⁸ | Texture | Frequency per day | quantity of food IAT will eat at each meal |
|---------------|--|---|--|--|
| 6-8 | 200kcal | initiate with thick porridge well-mashed food | 2-3 meals depending on infant hunger 1-2 snacks might be offered | Initially two to three table spoon per feed rising regularly to one and half of 250 ml cup |
| 9-11 | 300kcal | Mashed foods | 3-4 meals depending on child hunger 1-2 snacks might be offered | ½ to 250 ml cup |
| 12-24 | 550kcal | family foods chopped or mashed if essential | 3-4 meals Depending on toddler hunger 1-2 snacks might be offered | ¾ to full 250 ml cup |

⁸If we see column no 2 we easily have known that how many energy needed in calories by infants and toddlers according to their age. But MICS questionnaire of dietary intake used question by simply asking 'how many time did (name) eat any solid, semi solids or soft foods yesterday during the day or night?' and "Asking about everything that (name) ate yesterday during the day or the night?" by these questions we did not know how many energy a child had consumed in last 24 hours. MICS questionnaire of dietary intake should be developed in such way where energy intake in calories calculated.

When the energy density of meals is about 0.8 to 1 kcal/g then the above amount is recommended otherwise the mother or caregivers should have to increase the amount of food or increase the density of meal by adding up unique foods. The responsive feeding principle is to recognize the signs of starvation and satiety these signs should direct the mother to increase the quantity of food at every meal and the necessitate for snacks. (WHO, 2009)

Figure 2.1 Required energy by age and energy gap after 6 months



Source: WHO

Above figure 2.1 shows that energy requirement for under six-month infants is fulfilled by breastfeeding alone but beyond that age, infant required 200 kcal/day if infants' age is from 6-8 months and 250kcal/day and 475kcal/day if toddlers are from 9-11 and 12-23 months of age respectively (WHO, 2009).

Literature about complementary feeding shows that due to poor and inappropriate CFP the risk of malnutrition increases in infants and toddlers (Srivastava, 2006). As per WHO recommendation if breast and complementary feeding practices promoted it can stop up to 19

percent of all babyhood deaths in developing countries (Aggarwal et al., 2008). Less than 50 % of IAT consume four food groups as recommended by WHO (Sawadogo et al., 2010). Out of seven recommended groups, most IAT consume less than two groups which are below the standard (Lander et al., 2010). Inappropriate and poor CFP among 6-23 months IAT is associated with maternal illiteracy larger families' size it highlights the need for dietary counseling on child feeding practice (Kassa et al., 2016).

Complementary feeding practices are not up to the standard among Indonesian IAT between 6-24 months of age (Blaney et al., 2015). Recommended minimum meal frequency is more likely to practice by Iranian mothers (Olang et al., 2012). Breastfeeding, bottle feeding, MMF and MDD significantly correlated with stunting, wasting, underweight and overweight among Chinese toddlers 12-36 months of age (Ma, 2012). Ghana Infant and toddlers living in the poor household having working, illiterate mothers were significantly less likely to receive recommended MMF, MDD and MAD (Saaka et al., 2015).

2.2 Review of national research articles

Article who meet the following criteria are included

- Participants: infant and toddler's age between 0-2 years their mothers and caretakers.
- Outcomes: Adequacy and timing of complementary feeding practices and barriers/promoters towards it.
- Studies conducted after 2000

Table 2.3 National articles

| S.no | Title | Authors | Data type | Region | Participants | Sample size | Outcomes |
|------|---|------------------------|---------------|--|--|------------------------------------|--|
| 1 | Lactation breastfeeding supplementation and nutrition | Ahmad et al., (2001) | cross section | Mansehra KP | Mother of IAT at THQ Hospital oghi | ten mothers of infant and toddlers | MDD include: Milk (cow milk, formula milk, cerelac, cheese etc) Banana, Cerelac, Apple and homemade foods. Time of Introduction CF for current feeds: 20% Cerelac, 30% Apple and banana while 10% cow milk. Advice: knowledge about CF is comes from magazines, radio television and from older women to younger mother within house. Factors of poor CF: household where there are few IAT and lack of knowledge is a hurdle. |
| 2 | Knowledge of CF of Mothers Having Infants younger than 2 years of age | (Dev et al., 2013) | cross section | Karachi | Bilal & Bhain colony | 355 mothers of IAT | MDD: mothers from bilal colony used house foodstuff preparation more than mothers from bhains colony. 93% of homemade foods contain rice and pulses in bhains colony as compared 42% in bilal colony. 37% mothers in bhains colony provided processed CF as compared it 21% in bilal colony. MMF: 48% of IAT from bilal colony take meal 3 times/day as 35% of bhains colony. Timing: infant and toddlers from Bilal colony take 20% earlier than 6 m 27% at 6 m 27% at 7–11 m 15.3% at 1–2 years. In Bhains colony 36.3, 5.0, 26.3 and 18.4%, respectively. Advice: Traditional norms about CF reach within those families which difference with suggestion from health workers. Factor: Lack of knowledge about CF is main barrier. |
| 3 | Exploring & optimizing Maternal & Infant nutrition | Dykes et al., (2012) | cohort | Nahaqi in KP province | Nahaqi | Sixteen health workers | MDD: meals comprise bread rice potato & banana. Timing: start of CF prior to 6 m is ordinary. Factor: women from poor household don't afford milk, meat and fruits due to these food limitation and insufficient milk causes early CF. pregnant mothers are more likely to cease breastfeeding and start CF early. |
| 4 | Trends in BF & CF practice in PaK:1990-2007 | (Hanif et al., 2011) | cross section | Pakistan | Survey data Pakistan | 168,332 household | Timing: beginning time of CF rated as poor comparative to WHO guiding principle this was also the case for bottle & breastfeeding. 32% & 36% were have CF at 6–9 m during 1990–91. |
| 5 | Determinant of inappropriate timing of introducing CF to infants in Pakistan PDHS 2006–2007 | (Hazir et al., 2012) | cross section | Pakistan | PDHS 2006–07 Participants | 941 infant | Timing: 50% IAT were not receiving soft foods at recommended time while 10 % of 3-5 months infant take CF earlier than 6 months although there was geographical variation. Factor: complementary feeding practiced more by those women who are from wealth quintile or from urban area with high level of education. Baluchistan and Sindh were those provinces where CF were less likely as compared to Punjab. |
| 6 | Meat consumptions is associated with less stunting | Krebs et al., (2011) | cross section | Karachi [with Guatemala, Zambia and Congo] | Karachi | 531 infant and 516 toddlers | MDD: 25 % of infants receive meat while 50% receive eggs and milk product and 23 % receive beans lentils peanuts etc. MMF: 50 % IAT receive 1 to 2 times CF/day while 37% receive three or more than three times/day. Factors: Price of meat is barrier |
| 7 | Maternal education level and CF practices | Liaquat et al., (2006) | cross section | Islamabad | Patients attending Services Hospital Islamabad | 500 mothers of infant and toddlers | Timing: 64% illiterate mother start complementary feeding after 12 months while 17 % educated mothers do it. Advice: the educated and joint family has significant role in behind the mother and helpful of infant and toddlers. Factors: CF and maternal education linked positively but poverty is significant reason for inappropriate complementary feeding. |

| | | | | | | | |
|----|---|------------------------|-----------------|--|--|------------------------|---|
| 8 | Understanding care & feeding practices;.... | Lingam et al., (2014) | Qualitative | Rawalpindi in Pakistan and Rajasthan India | Patients of Rawalpindi | Sixty-nine contacts | <p>MDD: food given to IAT is grains & legumes while cerelac, boiled potato and banana were common among affluent families. Kitchri pulses and rice pudding is also common.</p> <p>Timing: Complementary feeding started between 4- 8 months old infants.</p> <p>Factors: Poor families were not as much of likely to have suitable CF as compared to wealthy families cultural attitude also had a huge power on complementary feeding.</p> |
| 9 | Breastfeeding and Weaning: Awareness in a Tertiary Care Hospital... | (Mehkari et al., 2014) | cross section | Karachi | Health professionals working at hospital | Ninety-four mothers | <p>MDD: Complementary food that are given commonly are dayla, kitchri rice and pulses, kheer and mashed potato</p> <p>Timing: 78 % mothers know CF must be started at 6 m.</p> <p>Factors: early cessation of breast feeding occur due to professional and employment-related issues.</p> |
| 10 | Assessment of infant FP at tertiary care hospital | Memon et al., (2010) | cross sectional | Hyderabad | Infant and toddlers aged 0-24 months | 500 mothers | <p>MDD: 33% of IAT age between 6-11 months were given specially prepared meals.</p> <p>MMF: 50% toddler's age 12-24 months received appropriate frequency of complementary food.</p> <p>Timing: 21% of infant age between 2-4 months received CF, while 50% toddlers from 12-23 months received complementary food.</p> <p>Factor: Rich families were more likely to have adequate CF practices than poor, maternal education is associated with CF but some time health worker give wrong advice to mothers and getting pregnancy earlier cause failure to BF for full 6 months.</p> |
| 11 | Knowledge Attitude and Practices of Mothers regarding CF | (Mohsin et al., 2014) | cross-section | Civil Hospital, Karachi | Mothers attending Hospital Karachi | 138 mothers of infants | <p>MDD: 46% mother used commercial food for complementary feeding and its quality was inadequate.</p> <p>MMF: 55 % IAT take food 3 times/day and 39% twice/day while 3 % once a day.</p> <p>Timing: Only 13% of mothers know the correct time while 84% think that correct time is less than 6 months of age.</p> <p>Advice: for 52% of mothers source of information about CF is doctor, 25 % know from relative and 17% know from electronic media.</p> <p>Factors: mostly mothers are unaware of appropriate time of complementary feeding while cultural beliefs about hot and cold food also one of important factor.</p> |

2.2.1 Other National article Review

Na et al (2017) analyzed DHS data of 2012-13 to fill the knowledge gap of deprived complementary feeding practices in children age between 6-23 months. The multilevel model was applied to the sample of 2827 kids aged between 6-23 months. The percentage of children meeting MMF, MDD and MAD criteria was 63%, 22% and 15% respectively. Younger child age, especially (6-11) and late maternal postnatal health check were important individual-level risk factors that constantly increased the odds of not meeting three criterion examined. less antenatal visits predicted the odds of achieving intro and MMF. Younger maternal age and family poverty predicted the odds of achieving MDD and MAD. Community-level factors integrated geographic area and common admittance to maternal and child health care services.

Khan et al (2017) Assess Children feeding practices in rural Sindh. Primary data collected from mothers of IAT of both gender between ages 6-23 months. The total sample size was 2166 of both genders. Bivariate and multivariate regression was used. As a result, 70% of mothers introduced CF at 6–8 months of age, Mothers whose ages are from 25 to 29 years being literate, and higher-income was more likely to had improved MDD. Being an employed mother and from higher-income families were more likely to have MAD. They conclude that children feeding practices are below the recommended intensity and correlated with maternal education age being without a job and family wealth position. Importance should be given to develop maternal education level and reduce poverty to develop children feeding practices.

Arif et al (2015) this study aims to analyze the understanding of mothers about breastfeeding and complementary feeding and to assess compliance with health guidelines sample of 230 mothers of infants were selected in the rural area of ChowkAzam district Layyah. For statistical analysis, chi-square test was applied. Results show that 72% of mother and caretaker start CF before six

months of age and 3% mother were delayed CF and 18% mother practicing CF at recommended guidelines. 56% of mothers giving homemade complementary food 19% using commercially prepared food while 24% giving both types of foods to their children. The study concludes that there is a need to educate mothers regarding the appropriate timing of complementary feeding.

2.3 Review of International Article

Issaka et al (2015) scrutinize the DHS surveys data conducted in 4 African countries. The study aims to find determinants of CF practices amongst infants and toddlers. The researchers applied the WHO's standards to compare the practices of MMF among IAT 6 to 23 months they found that the age of IAT, access to media, and the number of antenatal visits were the risk factors for not gathering the MMF in 4 African countries. Those others who have toddlers 18-23 m are 18% less likely to give their children MMF as compared to the mothers who have infant 6-11 months. Mothers who listened to the radio programs were 31% less likely to account that their IAT was not meeting MMF as compar to the mothers who did not listen radio. Mothers who attend four antenatal visits were 40% less likely to account that their IAT was not meeting MMF as compare to mothers who did not attend any antenatal visits.

Kassa et al (2016) the objectives of study were to determine the patterns of CF and its key factor among infant and toddlers in Ethiopia. The sample size was 611 mothers who had infants and toddlers 6-23 months. The result shows that 73% of mothers introduce complementary food according to guidelines. Result also shows that the mother education level and size of the family are the significant predictors of CF practices. Mothers with no formal education and had large family size practicing inappropriate CF practices. Study recommend that awareness and nutrition education are a significant factor to be provided to mothers and caretakers in south Ethiopia.

Issaka et al (2015) analyze data of a DHS survey conducted in 2008 in Ghana. The researchers studied the patterns of CF practices and risk factors which were correlated with inappropriate CF in Infant and toddlers in Ghana. The sample included 822 mothers and their IAT aged 6 to 23 months. Logistic regressions were performed to analyze data of health and demographic survey in Ghana. The researcher found that the level of practicing the WHO's minimum standards of meal frequency was low among IAT. About 46% of IAT aged 6 – 23 months met the WHO recommended MMF. The researchers also found that 51.4% of IAT met the MDD of the WHO's guideline in Ghana. About 29.9% children met the MAD of the WHO guideline. Mothers who unable to seek postnatal care were less likely to meet the WHO's standard of meeting the MDD as compared to mothers who visited health workers for the post-natal checkup. The status of the delivery of mothers at the health facilities was significantly correlated with meeting the MDD of the WHO's standard. Mothers who delivered at the health facilities were 1.9 times more likely to practice the standard of MDD as compared to mothers who delivered at homes. Lower knowledge of mothers regarding the WHO's standards of complementary feeding practices accounted for such noncompliance.

Koksal et al (2015) applied a study to measure CFP among mothers in Turkey. Comparing the WHO's standard for the right time to introduce CF for infants, the researchers show that 45% of the mothers introduced CF before the age of 6 months to infants. These mothers introduced bread, rice, vegetables, and dairy before the age of 6 months and meat, poultry, and fish after the age of 6 months. Comparing the WHO's standard of meeting minimum food diversity among mothers, the researchers found that over 90% of infants were served vegetables, fruits, yogurt, and bread. Over 70% of infants were served meat (poultry, beef, and sheep) and over 60% of

them were served fish and cow milk. The researchers concluded that infants and young children ate nutritionally diverse food in Turkey.

Marriott et al, (2007) conduct a review of demographic and health surveys that were operationalized in twenty developing countries from 1999 to 2003 to evaluate the levels of understanding and practice of caregivers regarding complementary feeding. The results of the review household surveys showed that the majority of mothers and caregivers had minimal knowledge regarding appropriate CF practices. The researchers found that caregivers were occasionally served semi-solid foods to their IAT before the age of 6 months in many developing countries.

According to Roy et al. (2009), about 29% of the mothers had proper knowledge regarding the right time of introduction of complementary foods for their infants in Kolkata India. The researchers also found that social and economic factors were among the factors that influenced the practice of complementary feeding in Kolkata, India. The researchers recommended that health and nutrition education can play a key position in improving suitable complementary feeding practices among communities in India.

In a cross-sectional survey conducted in Tajikistan to determine the patterns of CFP among mothers, the results of the survey showed that About 7.8% of mothers 'decisions were influenced by their mothers-in-law to introduce CF to their infants about 5.1% of mothers introduced CF for their infants because they did not have sufficient breast milk. The researchers found that there was an association between the process of initiation of CF and weight loss in infants. 12% of mothers reported that their children have lost weight while CF was introduced to them. The researchers concluded that mothers had insufficient knowledge regarding the right time to introduce complementary foods. The findings of this research study were applied to design

health education and behavior change programs to promote appropriate CFP in rural areas in Tajikistan (Action against Hunger International, 2007).

Isingoma et al, (2017) analyzed the meal frequency practice of complementary foods among mothers as compared to the WHO standard principles for CF of the breastfed child given offering 2 meals at the age of 6 – 8 months, 3 meals at the age of 9-23 and 4 meals at the age of 6 – 23 months for the non-breastfed IAT in Uganda. The researchers concluded that the meal frequency practice of complementary foods among mothers was low as compared to the WHO's guideline. About 24.2% of infants aged 7 to 8 months were provided with 2 meals. About 29.2% of infants aged 11- 12 months were provided with 3 meals and 48.5% of children aged 12-24 were provided with 4 meals. The researchers recommended that providing counseling to mothers is important for promoting complementary feeding practices. Mothers needed more support to utilize locally available resources to improve the nutritional intake of IAT at the community and household levels. Improving coordination and collaboration between different sectors empower the communities to promote complementary infant feeding practices. The researchers concluded that more than 50% of children did not meet the recommended meal frequency of complementary foods as per the WHO's guideline. Promoting appropriate complementary infant feeding practices at the household level need to be prioritized to prevent the negative consequences of malnutrition in early childhood in Uganda.

Betal et al., (2010) study found that certain foods were excessively consumed by infants in Lebanon. For instance, infants and toddlers from rural region take more vegetables and from urban region take more fruits. Meats were in use lesser by IAT in the rural region. Avoidance of consumption of meat, poultry, and fish may influence the optimal growth of children in Lebanon.

According to the UNICEF report (2014), MDD was considered as the most important indicator to progress the nutritional status of infants and toddlers in Solomon Island. The researchers found that 19% of infants were met the minimum standard of 4 or more diverse complementary foods in Solomon Island. The researchers also found that 38% of infants ate animal flesh, 15% ate dairy, 33% ate fruits, and 95% ate vegetables, rice, and bread.

Paul et al (2011) applied a mixed-methods research design to assess the role of contextual factors in influencing complementary feeding practices in poor communities in Sub-Saharan Africa. The researchers found that social, cultural, and physical factors were influenced by the patterns of complementary feeding practices in poor African countries.

Chapter 3

Data and Methodology

3.1 Data

In this study multiple indicator cluster surveys Punjab was used which is part of the global MICS program carried out by the “*Bureau of Statistics Planning and Development Board Government of Punjab*” in association with the “*United Nations children's Fund (UNICEF)*”. The MICS Punjab is a district-based survey covering all 36 districts and 210 indicators.

3.1.1 Survey Sampling Frame

The main objective of the MICS 2017-2018 survey is to provide the factors of children and women situation at district level in Punjab separately for urban and rural regions which covered all districts of Punjab. Further, the household samples were chosen at two stages with strata sampling method. The total sample size of this survey was 53840 households.

3.1.2 Data Limitation

The relevant and important information required for study, the possible causes of poor complementary feeding practices are included in the data. Yet other accurate indicator related to complementary feeding practices like Adequate and Safe food, timely and properly fed etc are missing from the data which greatly effect Complementary feeding practice. Despite these data limitation, present research tries to capture all possible information and make best use of them to study complementary feeding practices in Punjab.

3.2 Methodology

3.2.1 Unit of Analysis

Unit of analysis for this study is infants and toddlers who are currently breastfeeding between 6 and 23 months. The age group is more susceptible to malnutrition in this age group due to rapid physical growth and lack of knowledge about complementary feeding practices.

3.2.2 Statistical Analysis of complementary feeding practices

The three infant feeding indicator of complementary feeding which are MMF, MDD and MAD are reported in this study. The prevalence of complementary feeding practices was obtained by using descriptive statistics (Pie chart). In the bivariate analysis cross-tabulation was used for measuring the relationship in each of the independent variable and dependent variable that is Minimum Acceptable Diet (MAD).

3.2.3 Logistic Regression Analysis

For Multivariate analysis, binary logistic regression has been performed for which dependent variable that is MAD converted to a dichotomous variable i.e if the child receives MAD than it coded as 1 and if the child deprived MAD than coded as 0. Furthermore, p-value which is set as less than 0.01 considered for significance level (p-value <0.01) Categorical variable of interest associated with MAD are determined by using Chi-Square test (χ^2) and adjusted odd ratio (aRO) are reported. When the dependent variable response is in the binary form then binary logistic regression is employed while the explanatory variable may be categorical quantitative or mixed. Suppose the chances of an event Y is.

$P(Y=1)$ based on many descriptive variants such as $X_1, X_2, X_3, \dots, X_k$

The functional form of logistic regression is as:

$$P = P [Y = 1 / (X_1, X_2, X_3, \dots, X_k)] = e^Z / [1 + e^Z] \quad Z = (\exp(Z)) / (1 + \exp(Z))$$

Where Z is the direct (linear) function of a set of descriptive variables, $X_1, X_2, X_3, \dots, X_k$

$$Z = b_0 + b_1X_1 + b_2X_2 + \dots + b_kX_k,$$

$b_0, b_1, b_2, \dots, b_k$ are the coefficients.

Taking the natural log P is found which is the $\log [(p / 1 - p)] = Z$

The quantity $[(p / 1 - p)]$ is called the odds and hence $\log [(p / 1 - p)]$ the log odds.

3.3 Dependent variable (MAD)

minimum acceptable diet (MAD) for breastfed IAT 6-23 months is defined as receiving the minimum dietary diversity and the minimum meal frequency (MICS Punjab, 2017-18; WHO, 2008). For analysis, we take it as a dependent variable converted to a dichotomous variable if the child receives MAD than it coded as 1 and if the child deprived MAD than coded as 0.

3.4 Predictor Variables

- i. **Economic Status:** Families that belong to upper-income quintiles are more likely to have adequate CF practices than those who are from lower-income quintiles (Memon et al., 2010). Poverty is one of the reasons for stopping mothers from affording milk meat fruit and other health foods (Dykes et al., 2012). Economic Status of households taken as one of the independent variables here (Wealth index quintile are available in the data) this variable is used in the categorical form in bivariate and multivariate analysis.
- ii. **Age of Child:** Those mothers who have toddlers 18-23 months were 18% less expected to account that their IAT not meeting the recommended MMF compared to those who have infants 6-11 months (Issaka et al., 2015). We take this variable as an independent variable in categorical form and further divided it by four age groups from 6-8 months 9-11, 12-17, and 18- 23months for bivariate and multivariate analysis.
- iii. **Child Gender:** The gender of infants and toddlers is an important independent variable for analysis variables further categorized as male and female infants and toddlers and used in the categorical form in the analysis.
- iv. **Mother Education:** Mothers who had no formal education were less likely to begin complementary foods to infants and toddlers compared to mothers who had formal education (Issaka et al., 2015). Due to this importance, we take mother education as one

of the important independent variable different categories of education is available in the dataset like no formal education, up to primary level, lower secondary, upper secondary and higher education this variable is used in categorical form for both bivariate and multivariate analysis.

- v. **Place of residence:** Children from urban settings take more fruits and meat while rural areas children take more vegetables and fewer fruits and meat (Betal et al., 2010). Due to these differences between different geographic areas CF practices are also different from place to place, so we take division and area that is rural and urban region as the independent variable.

3.5 Econometric Model

$$Y_i = f(X_1, X_2, X_3, X_4 \dots)$$

Y_i denotes Minimum Acceptable Diet (MAD) which is dependent variable $Y = 1$ if the infants and toddlers receiving MAD and $Y = 0$ if infants and toddler (IAT) is deprived MAD. Household Economic Status (ES), Age of Child (AOC), Gender of Child (GOC), Mother Education (ME), and Place of Residence (POR) are the various independent variable that affects MAD positively or negatively. The following model is constructed for this research thesis.

$$MAD = \beta_0 + \beta_1 ES_{ij} + \beta_2 AOC_{ij} + \beta_3 GOC_{ij} + \beta_4 ME_{ij} + \beta_5 POR_{ij} + \epsilon_{ij}$$

1= If IAT received MAD

0= If IAT deprived MAD

Chapter 4

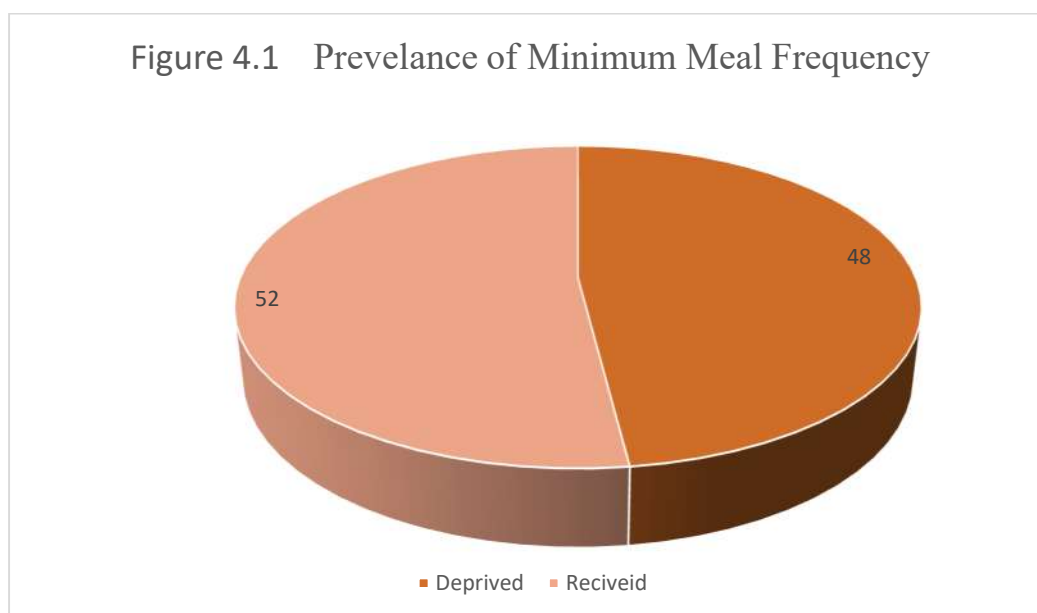
Prevalence of Complementary feeding

This chapter highlights the results of data analysis concerning the first objective of the study i.e. Explore Prevalence and utilization of recommended food groups of complementary food utilized by 6-23 months old infants and toddlers in Punjab.

4.1 Prevalence of Complementary feeding

4.1.1 Prevalence of Minimum Meal Frequency

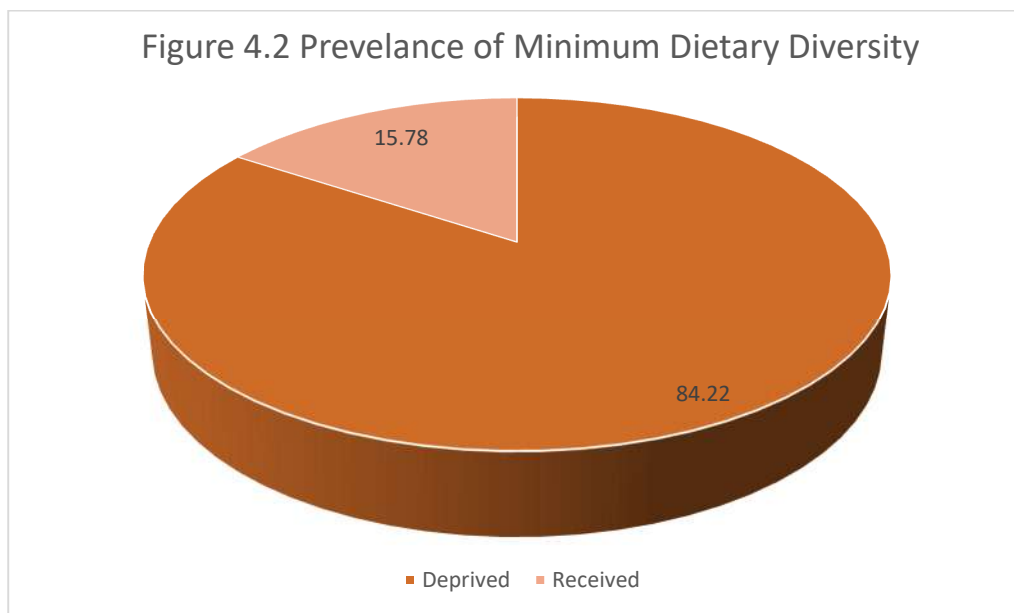
According to (WHO, 2008) indicator about MMF with currently breastfeeding infants and toddlers is that IAT who also receive solid semi-solid or soft food 2 times or more daily for infants-age between 6-8 months and 3 times or more daily for IAT age between 9-23 months. The study finding shows that the prevalence of MMF among the above age group IAT is 52% (Figure 4.1). This result shows that a high proportion (48%) of children deprived recommended meal frequency.



Source: MICS Punjab, 2017-18

4.1.2 Prevalence of Minimum Dietary Diversity

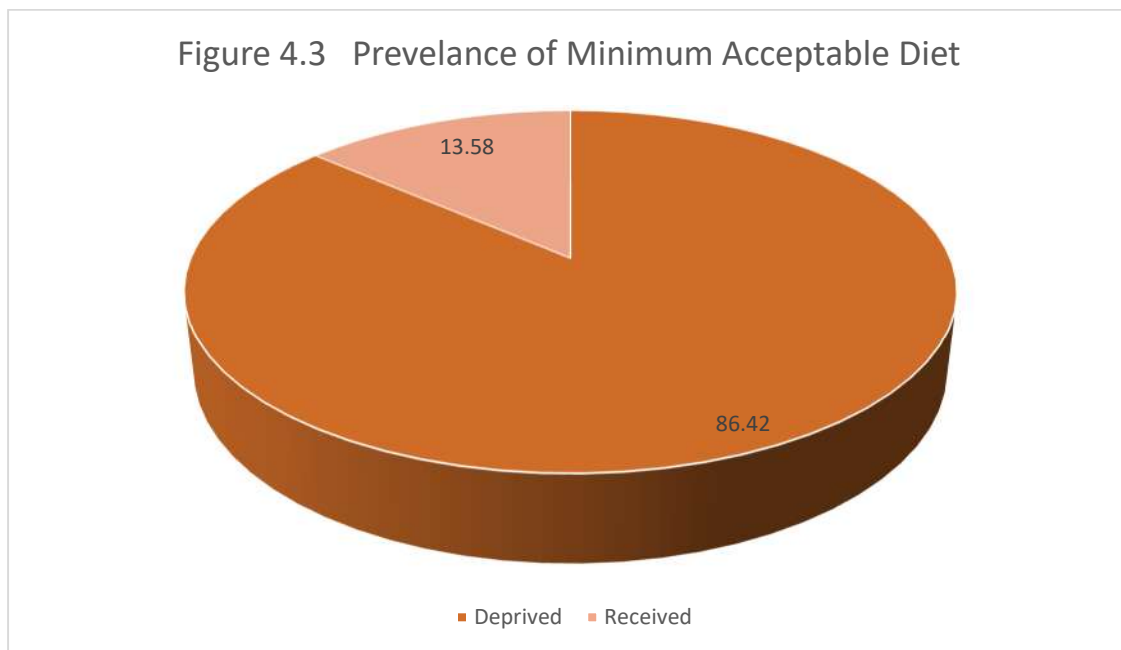
According to WHO indicator about MDD with currently breastfeeding children is that children who also receive at least four out of seven standard foodstuff groups that are Grains roots and tubers, legumes and nuts, Dairy products, Flesh foods, Eggs, Vitamin-A rich fruits and vegetables and other fruits and vegetables (WHO, 2008). Study finding shows that the prevalence of MDD among infants and toddlers is only 16% (Figure 4.2). This result shows that 84% of children don't receive the recommended dietary diversity.



Source: MICS Punjab, 2017-18

4.1.3 Prevalence of Minimum Acceptable Diet

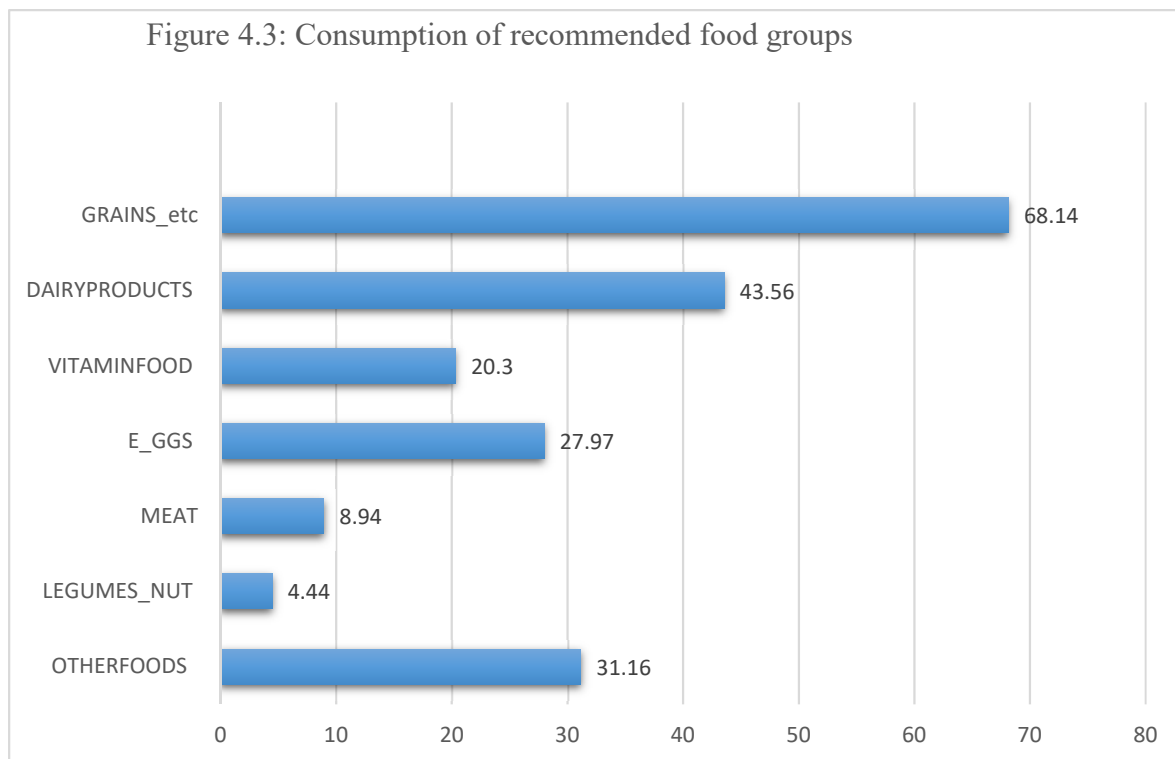
According to WHO (2008) indicator of MAD for breastfeeding infants and toddlers age 6-23 months is that IAT who receive MAD during the previous day. (The MAD for breastfed children age 6-23 months is defined as receiving the MDD and MMF (MICS Punjab, 2017-18 & WHO, 2008). This study finding shows that the prevalence of MAD among infants and toddlers is 14% (Figure 4.4). This result shows that a high proportion (86%) of children deprived the recommended Minimum Acceptable Diet.



Source: MICS Punjab, 2017-18

4.2 Consumption of recommended food groups

Figure 4.3 presents the food consumption as per (WHO, 2008) recommended 7 food groups in breastfeeding Infants and toddlers. In Punjab use of grains roots and tubers are 68% and use of legumes and nuts are only 4%. Consumption of Dairy Product is (44%) Vitamin A food is (20%) Eggs is (28%) Other food is (31%) and Meat is only (9%).



Source: Authors calculations based on MICS Punjab, 2017-18

Chapter 5

Data Analysis

This chapter highlights the results of data analysis concerning the second objective of the study i.e. To check the correlation between socioeconomic and demographic factors and complementary food consumption.

5.1 Bivariate Analysis of Complementary Feeding Practices

Different socio-economic, demographic factors are responsible for complementary food consumption. These factors are analyzed from data to get an insight into the significant factor for complementary food consumption.

Table 5.1 Result of Bivariate Analysis for Complementary Feeding Practices

| Explanatory Variable | Minimum Acceptable Diet n [%] |
|------------------------------------|-------------------------------|
| Household Economic Status (N=6659) | 904 [13.58] |
| 1 st Quintile (n=1585) | 125 [7.88] |
| 2 nd Quintile (n=1347) | 169 [12.53] |
| 3 rd Quintile (n=1299) | 187 [14.41] |
| 4 th Quintile (n=1290) | 201 [15.57] |
| 5 th Quintile (n=1138) | 222 [19.55] |
| Child Age 6-23 months (N=6659) | 904 [13.58] |
| 6-8 months (n=1574) | 59 [3.74] |
| 9-11 months (n=1177) | 110 [9.37] |
| 12-17 months (n=2531) | 415 [16.4] |
| 18-23 months (n=1377) | 320 [23.24] |
| Child Gender (N=6659) | 904 [13.58] |
| Male (n=3447) | 451 [13.08] |
| Female (n=3212) | 453 [14.12] |
| Mother Education (N=6659) | 904 [13.58] |
| No formal education (n=2872) | 290 [10.08] |
| Primary (n=1298) | 187 [14.45] |
| Middle (n=654) | 88 [13.50] |
| Secondary (n=921) | 163 [17.67] |

| | |
|--------------------|-------------|
| Higher (n=914) | 176 [19.27] |
| Area (N=6659) | 904 [13.58] |
| Rural (n=4495) | 580 [12.90] |
| Urban (n=2164) | 324 [14.99] |
| Division (N=6659) | 904 [13.58] |
| Bahawalpur (n=708) | 56 [7.96] |
| DG Khan (n=791) | 94 [11.88] |
| Faisalabad (n=774) | 127 [16.36] |
| Gujranwala (n=873) | 102 [11.65] |
| Lahore (n=1045) | 106 [10.20] |
| Multan (n=766) | 141 [18.43] |
| Rawalpindi (n=636) | 129 [20.25] |
| Sahiwal (n=470) | 56 [11.89] |
| Sargodha (n=596) | 93 [15.60] |

Source: Author

Table 5.1 presents the bivariate analysis of complementary feeding practices with each explanatory variable. Household economic status and MAD show a positive association. Literature also supports our finding that better household wealth has been positively correlated with higher MAD (Na et al., 2017). Results for age show that there is an upward trend between MAD and age. A similar finding can be seen by literature that MAD and age are positive associated with each other (Charmaine et al., 2011). Results indicate that there is no correlation between gender and the Minimum Acceptable Diet. Female children have a slightly higher proportion of MAD than male children. Similar results can be seen from the literature that gender preferences towards MAD have not been observed considerably (UNICEF, 2017). Results of Mother Education and MAD show an upward trend as mother education went upward from preschool to higher education MAD also increases. A similar finding can be seen from another study that mother education plays a vital role in improving complementary feeding practices (Liaquat et al., 2006). The type of residence is indicated through region and division. Results for

the region indicate that there is no association between MAD and rural, urban areas. Literature also indicates that there is no association between area and MAD among children (Dhami et al., 2019). Unlike the results between regions, divisions have a strong association with MAD according to the results Rawalpindi, Multan, Faisalabad and Sargodha division has the highest MAD score While Bahawalpur, Lahore, Gujranwala, DG Khan and Sahiwal division have the lowest MAD score. Another study also indicates that there is much variation between different regions concerning MAD (UNICEF, 2017).

5.2 Multivariate Regression Results

To find out the most significant factors for complementary feeding practices binary logistic regression is run. The response variable minimum acceptable diet here is converted into dichotomous having two categories which are zero and one. The finding (Table 5.1) indicates the value of significance, beta coefficients, odds ratios and other model fitness values. Odd ratios express the likelihood of MAD across every variable keeping all other factors constant. The sign of the beta coefficient shows a positive or negative relationship between variables. The trend shown in multivariate analysis is consistent with bivariate analysis for almost all the factors.

| Explanatory Variable | Beta coefficient | Significant value | Odd ratio |
|---|------------------|-------------------|-----------|
| Economic Status ⁹ 1st Quintile | -0.723* | 0.00 | 0.484 |
| 2nd Quintile | -0.269* | 0.02 | 0.764 |
| 4th Quintile | 0.127 | 0.27 | 1.136 |
| 5 th Quintile | 0.342* | 0.01 | 1.408 |

Reference Categories:

⁹ 3rd Quintile

| | | | |
|--|------------|------|-------|
| Age ¹⁰ (6-8 months) | -0.853* | 0.00 | 0.425 |
| (12-17 months) | 0.665* | 0.00 | 1.946 |
| (18-23 months) | 1.109* | 0.00 | 3.031 |
| Female children ¹¹ | 0.073 | 0.32 | 1.076 |
| Mother Education ¹² preschool | -0.126 | 0.37 | 0.881 |
| Primary | 0.327 | 0.81 | 1.033 |
| Secondary | 0.206 | 0.16 | 1.229 |
| Higher Secondary | 0.357* | 0.01 | 1.429 |
| Urban Residents ¹³ | -0.146 | 0.13 | 0.863 |
| Division ¹⁴ Bahawalpur | -0.824 | 0.18 | 0.752 |
| DeraGazi khan | 0.320 | 0.09 | 1.378 |
| Faisalabad | 0.206 | 0.26 | 1.229 |
| Gujranwala | -0.320 | 0.08 | 0.725 |
| Lahore | -0.442* | 0.02 | 0.642 |
| Multan | 0.513* | 0.00 | 1.671 |
| Rawalpindi | 0.296 | 0.10 | 1.344 |
| Sargodha | 0.251 | 0.18 | 1.286 |
| Constant | -2.297* | 0.00 | 0.100 |
| Model Chi-square | 473.03 | | |
| Model Significance | 0.00 | | |
| Log likelihood | -2424.9291 | | |

¹⁰ 9-11 Months

¹¹ Male children

¹² Middle

¹³ Rural residents

¹⁴Sahiwal division

* Indicates significance of variable

Results show that children who belong to the poorest and poor families are 0.4 and 0.7 times less likely to receive MAD than Middle-income families, while rich and richest families are 1.1 and 1.4 times more likely to receive MAD than children who belong to middle-income families. Study results also suggest that likelihood of Minimum Acceptable Diet increase as age increase children whose age group are 6-8 months are 0.4 times less likely to receive MAD than that whose age is from 9-11 months similarly children whose age group are from 12-17 months and 18-23 months are 1.9 and 3.0 times more likely to receive MAD respectively. Findings also show that female children are 1.07 times more likely to take MAD than male children and children whose mother are illiterate are 0.8 times less likely to feed their children MAD than those whose mother education attainment is up to the middle level while mother whose education attainment are secondary and higher secondary are 1.2 and 1.4 times more likely to feed children MAD respectively compare to those mothers whose education attainment are up to middle level. Children from urban are 0.8 times less likely to receive MAD than rural children this result is slightly contradictory from the binary result. Children from Bahawalpur, Gujranwala and Lahore are less likely to receive MAD than children from Sahiwal division while children from DG Khan, Faisalabad, Multan, Rawalpindi and Sargodha division are more likely to take MAD than Sahiwal division children.

Significance factor towards MAD is children's age, economic status except 4th Quintile, mother having higher education and children from Lahore and Multan division. The insignificant factor includes Child gender, Area, mother having secondary and lower education and children from Bahawalpur, DG Khan, Faisalabad, Gujranwala, Rawalpindi and Sargodha division. The p-value of 0.00 for model significance indicates that the overall model is statistically significant.

Chapter 6

Conclusion and Recommendation

The study finding shows that 48% of infants and toddlers (6-23 months) deprived MMF and 84% of infants and toddlers deprived MDD. The prevalence of MAD among infants and toddlers is only 14% this result shows that a high proportion (86%) of children deprived the recommended acceptable diet. Results also show that use of grains roots tubers and dairy products is highest and use of legumes and nuts Vitamin A food Eggs and other food and Meat is lowest.

The objective of this study is to check the correlation between socioeconomic and demographic factors and complimentary food consumption. According to the results, the Minimum Acceptable Diet increase as the age of the child increases, mother education attainment increases and economic status increases from lower to higher. Prevalence of MAD is slightly high among female infants and toddlers than male infants and toddlers while infants and toddlers from the urban area than a rural area. Infants and Toddlers from Rawalpindi, Multan, Faisalabad and Sargodha division are more prevalent to receive MAD as compared to Bahawalpur, Lahore, Gujranwala, DG Khan and Sahiwal division.

Along with the background and Scio economic characteristics result of the multivariate analysis shows that infants' and toddler's age, economic status, mother having higher education and children from Lahore and Multan division are significant determinants of MAD. While Child gender, Area, mother having secondary or lower education and children from Bahawalpur, DG Khan, Faisalabad, Gujranwala, Rawalpindi and Sargodha division are the insignificant determinants of Minimum Acceptable Diet.

6.1 Recommendations

The study provides a comprehensive understanding of the complementary feeding practices among infants and toddlers in Punjab. It gives evidence that CF practices are very low in infants and toddlers. Moreover, strategies to overcome this concern are not incorporated in health strategy of the country to combat malnutrition. In this backdrop, the suggestion for policies and interventions are needed for tackling this issue, some of the policy direction is recommended below:

Low CF practices are one of the reasons for malnutrition in infants and toddlers. A specific comprehensive diet strategy should be design where vulnerable infants and toddlers prioritize on an emergency basis as well as those infants and toddlers who are at risk of not having adequate complementary feeding practices should be targeted. This study show that lower age groups and lower wealth quintile infants and toddlers are more vulnerable than upper age groups and rich quintile. The most vulnerable groups should be targeted for the improvement of CFP before the rest of the other groups. In the finding, a very high variation has been seen between division that division should prioritize which are most vulnerable and diet strategy should be implemented at the district level under the provisional ministry of food and agriculture with the collaboration of the ministry of health Punjab. The mother and caretaker should be specifically literate about to introduce complementary foods with breastfeeding at six months of age. Minimum meal frequency is 52% in our findings its means that half of infants and toddlers are hungry so meal frequency should be encouraged to combat hunger and malnutrition. Food diversity should be encouraged which are very low in our results (at least 4 out of 7 food groups should be given) through spreading awareness about the consequences of one or two types of food given to infants and toddlers. All these recommendations should be implemented through the Punjab lady health worker program at the community level.

6.2 Scope for future research

Future research on complementary feeding practices can encompass the following suggestion.

- Survey questioner should be designed in the way in which energy given (calories) can measure instead of meal frequency and food diversity.
- The present study has included only currently breastfeed infants and toddlers which are very important, however the other perspective like nonbreastfeeding children and their relation with CF practices should also be studied to get insight into the subject.
- Relationship between CF practices and stunting, wasting and underweight infants and toddlers should be studied in the future.

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