"Seeing an Unseen": Nutritional status and Its determinants in Under-five children in Karachi,Pakistan.

Miss Hiba Javed



A Thesis Submitted in Partial Fulfillment of the Requirements
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# มองสิ่งที่ไม่เคยเห็น: สถานะโภชนาการและปัจจัยที่กำหนดภาวะโภชนาการในเด็กอายุต่ำกว่า 5 ปี ในเมืองการาจี ประเทศปากีสถาน

นางสาวฮิบา จาเว็ด



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
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| Thesis Advisor | Alessio Panza, M.D. |

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ฮิบา จาเว็ด : มองสิ่งที่ไม่เคยเห็น: สถานะโภชนาการและปัจจัยที่กำหนดภาวะโภชนาการในเด็กอายุต่ำกว่า 5 ปี ในเมืองการาจี ประเทศปากีสถาน ("Seeing an Unseen": Nutritional status and Its determinants in Under-five children in Karachi,Pakistan.) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: นพ. อเลซซิโอ พันซ่า, 95 หน้า.

โภชนาการที่เหมาะสมเป็นปัจจัยที่สำคัญอย่างยิ่งในสุขภาพของเด็ก การเจริญเติบโตและพัฒนาการโดยเฉพาะในห้าปีแรกของชีวิต ภายใต้ภาวะขาดสารอาหารยังคงเป็นปัญหาที่ซ่อนอยู่และแพร่หลายสำหรับประเทศที่กำลังพัฒนาซึ่งขณะนี้เป็นหนึ่งในภาวะสำคัญด้านสาธารณสุขปากีสถานได้ผ่านร่างรัฐธรรมนูญที่เกี่ยวข้องกับสุขภาวะและการบริการด้านสุขภาพ ในจังหวัดสินธ์ (การาจี) สุขภาวะด้านสาธารณสุขอยู่ในระดับที่ต่ำกว่าจังหวัดอื่นๆ มีการศึกษาในท้องถิ่นน้อยมากที่ดำเนินการความชุกของภาวะขาดสารอาหารในแง่ของความแคระแกร็น เสียและการมีน้ำหนักต่ำกว่าเกณฑ์ วัตถุประสงค์หลักของการศึกษาคือเพื่อศึกษาภาวะโภชนาการและปัจจัยที่มีผลกระทบ น้ำหนักและส่วนสูงของเด็กที่ถูกบันทึกไว้โดยแม่ของพวกเขา เครื่องมือการวิจัยใช้แบบสอบถาม การวิเคราะห์ตัวแปรตัวเดียว ตัวแปรสองตัว (ไคสแควร์และฟิชเชอร์) ในการตรวจสอบ และหลายตัวแปร (logistic regression) ถูกนำมาใช้ในการวิเคราะห์ข้อมูล เด็กเกือบ 4%ขาดสารอาหาร 5% มีน้ำหนักต่ำกว่าเกณฑ์ 3.5% มีลักษณะสูญเสีย และ 12.8% มีลักษณะแคระแกรน เด็กที่เกิดมามีน้ำหนักน้อยกว่า 2,500 กรัม [หรือ 7.64 (CI .932-62.64)] เป็น 7.6 เท่า มีแนวโน้มที่จะมีน้ำหนักต่ำกว่าเกณฑ์ เด็กที่มีอาการน้ำมูกไหล [OR3.35 (CI 1.31-8.54)] และไอ [หรือ 3.34 (CI 1.26-8.88)] ในช่วง 2 สัปดาห์ที่ผ่านมาเป็น 3.35 และ 3.34 เท่าที่คาดว่าจะมีน้ำหนักต่ำกว่าเกณฑ์ ลูกคนที่4ขึ้นไปจะมีการสูญเสียมากว่าลูกคนก่อนๆเป็น 4.8 เท่า [OR 4.82 (CI 1.12-20.74)] การได้รับอาหารไม่เพียงพอทำให้เห็นมีโอกาสสูญเสียมากกว่า 2.85 เท่า [OR 2.85 (CI 1.93-4.20)] ประวัติการเกิดโรคเฉียบพลันสามารถปรับเปรียบสุขภาพของเด็กได้ เด็กคือกลุ่มเสี่ยงและได้รับผลกระทบมากที่สุดเพราะความต้องการสารอาหารในการเจริญเติบโตและพัฒนาการ ลำดับการเกิดอาจปรับแก้ไขได้ ซึ่งสามารถใช้สำหรับออกแบบโปรแกรมในอนาคตได้

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2558 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

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Optimal nutrition is an important determinant of child health, growth and development especially in the first five years of life. Under-nutrition continues to be a hidden but widespread problem for developing countries which is now one of the main public health concern. Pakistan has gone through devolution of its services related public sectors including health sector in its constitution. Sindh (Karachi is capital of Sindh province) is less well positioned than other provinces. There are very few local studies that carried out the prevalence of under nutrition in terms of three categories stunting, wasting and underweight.The main objective of the study was to determine the nutritional status and its determinants. Weight and height of children were recorded along with their mothers. Questionnaire was a research tool. Univariate, Bivariate (chi-square and fisher exact test) and multivariate (logistic regression) were used to analyze data. Almost 4% children were undernourished in which 5% were underweight, 3.5% were wasted and 12.8% were stunted children.Children who born with the weight of < 2500 gm [OR 7.64 (CI .932-62.64)] were 7.6 times more likely to be underweight. Those children who had runny nose [OR3.35 (CI 1.31-8.54)] and cough [OR 3.34 (CI 1.26-8.88)] in past 2 weeks were 3.35 and 3.34 times more expected to be underweight. Those children were 4.8 times more predictable to get wasted who were > 3$^{rd}$ born [OR 4.82 (CI 1.12-20.74)]. Insufficient number and smaller amount of meals increase the chance of wasting to 2.85 times [OR 2.85(CI 1.93-4.20)]. History of acute disease may modify the health status and children are the most vulnerable and most affected group because of the high requirement for growth and development. Birth interval, birth-order are potentially modifiable; so, these can be used for designing intervention programs.



Field of Study: Public Health Student's Signature .....

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# CHAPTER I

## INTRODUCTION

### 1.1 BACKGROUND

Optimal nutrition and proper dietary patterns are important determinants of child health, growth and development especially in the first five years of life. According to sustainable development goal (SDG) 2, which targets to end all form of malnutrition by 2030 (UN-DESA, 2015). The term malnutrition generally refers both to under nutrition and over nutrition, but in this study use the term under-nutrition despite of malnutrition to refer only to a deficiency of nutrition in order to avoid confusion.(Blössner, Monika, De Onis, & Mercedes., 2005)children becomes undernourished if diet doesn't provide required calories and protein for growth or development and maintenance or the child is not able to utilize the food properly they eat due to illness.(UNICEF, 2006)Under-nutrition includes being underweight for one's age, too short for one's age (stunted), dangerously thin (wasted), and lacking in vitamins and minerals (micronutrient malnutrition)(UNICEF, 2006)

For the developing countries now one of the main public health concern is under-nutrition which causesthe increase in a risk of mortality and morbidity. Child under nutrition is the underlying cause of 3.5 million deaths,35% of the disease burden in children younger than 5 years and 11% of total globe.(Black et al., 2008)It caused 54%deaths in children living in developing countries. Children are the most and the worst affected and vulnerable group among all because of the high nutritional requirement for growth and development.(Blössner et al., 2005) central South Asian

countries (India, Bangladesh and Pakistan) has shockingly high prevalence of underweight – 46 per cent of its children – and together account for half the world's under nourished children.(UNICEF, 2006)Pakistan is in distress of high rates of child under-nutrition.Despite a reported annual growth of 4.4% in gross domestic product, 13% of the population lives under the poverty line of US 1.25 $ per day.(Cesare et al., 2015)Under nutrition in Pakistan is usually linked to poverty andthe main contributingelementsinclude foods with low nutritional value or low intake of food.(Inayat, 2004)Pakistan's under-five mortality rate per 1000 live births is 85.5 and the remaining 31.6% of them suffered from poor nutritional status.(*World Health Statistics*, 2015) Pakistan progress in child nutrition has been substantially slower than comparatively to other south Asian countries.(*World Health Statistics*, 2015) Pakistan is on high risk of new born mortality and still births as globally it is third and second highest country respectively.(Bhutta et al., 2013)Under-nutrition is very serious problem because it has long lasting effects which can be both, short and long term which may lead child to chronic illnesses and disabilities and make the child more unproductive as compare to well-nourished child. (Islam et al., 2013)Available evidence for under nutrition signifies that growth faltering in majority of such children begins at around four to six months of age, this is the time when an infant starts receiving complementary foods in addition to breast milk. This divergence from normal growth is actually a combination of poor nutrition and intra-uterine growth restriction, further aggravated by the burden of morbidity especially diarrheal diseases. Poor quality and quantity of complementary foods, as well as inadequate caring practices are the key determinants for this early phase of childhood growth retardation, which has long-term consequences in determining the late onset of the childhood growth spurt and

subsequent retardation. The process of growth faltering is essentially a series of events throughout childhood. The child suffers from repeated illnesses, inadequate appetite, deficient food and poor standard care.(Pakistan Medical Research Council (PMRC), 2011)

Pakistan shares 2% of global extreme poverty, extreme poverty defined as the people living on less than US$ 1.25 per day.Under-nutrition continues to be a hidden but widespread problem.(WHO, 2015)

**1.2 RATIONAL**

Pakistan has gone through devolution of its services related public sectors including health sector with the 18th amendment in its constitution effective from June 28, 2011. The Federal Ministry of Health (MoH) has been dissolved and now the overall responsibility for health services policy direction and planning has been devolved to the provinces. Pakistan's five-year-old devolution has given people a promise, but it is still far from fulfilled. According to one of the Executive District Officer “Devolution never actually happened". Executive District Officer expressed dissatisfaction with the transferred authority. Reports generated at the district level are often based on an extremely unreliable Health Management Information System (HMIS) which has been a victim of shortage of resources, contentious quality of data and lack of motivation and feedback among health managers.(Shiraz Shaikh et al., 2012)

Sindh (Karachi is capital of Sindh province) is less well positioned than other provinces. A weak cross-sectorial union, low district accountability and weak governance are likely to continue to undermine nutrition. Sindh has the most promising non-state sector, but there is lack of cooperation by the state.(MQSUN, 2013)but they don’t

mention the determinants or associated factors on provincial level and they don't cover the whole Karachi City

Prevalence of under-nutrition for under-five years were reported in Pakistan's National Nutritional Survey in 2011 and MICS 2014 which has not been published yet and under way in writing report, but it cannot give the clear picture for the determinants that are associated with under-nutrition at local level including Karachi, the biggest city in terms of population of Pakistan.

There are very few local studies that carried out the prevalence of under nutrition in terms of three categories stunting, wasting and underweight. Pakistan is lagging behind in the reduction of under-nutrition. The rationale behind this study is to provide the complete picture of under nutrition under-five children in the whole Karachi City and the associated factors.

## 1.3 RESEARCH QUESTION

- What is the nutritional status of under-five children inKarachi, Pakistan?
- What are the determinants associated with nutritional status of under-five children in Karachi, Pakistan?

## 1.4 SPECIFIC RESEARCH QUESTION

- What is the prevalence of stunting, wasting, underweight, normal weight and overweight in under-five children in Karachi?
- What is the association between child related factor and under-nourished, normal and overweight under-five children in Karachi?
- What is the association between mother related factor and under-nourished, normal and overweight under-five children in Karachi?
- What are the socio-demographic characteristics of under-nourished, normal and overweight under-five children in Karachi?

## 1.5 OBJECTIVES

- To find the nutritional status of under-five children in Karachi.
- To assess the determinants associated with nutritional status of under-five children in Karachi, Pakistan?

## 1.6 SPECIFIC OBJECTIVE

- To find out the prevalence of stunting, wasting and underweight, normal weight and obesity among under-five children.
- To find out the association between child related factors and under-nourished, normal and overweight under-five children.

- To find out the association between mother related factors and under-nourished, normal and overweight under-five children.
- To examine the socio-demographics of under-nourished, normal and overweight under-five children.

## 1.7 HYPOTHESIS

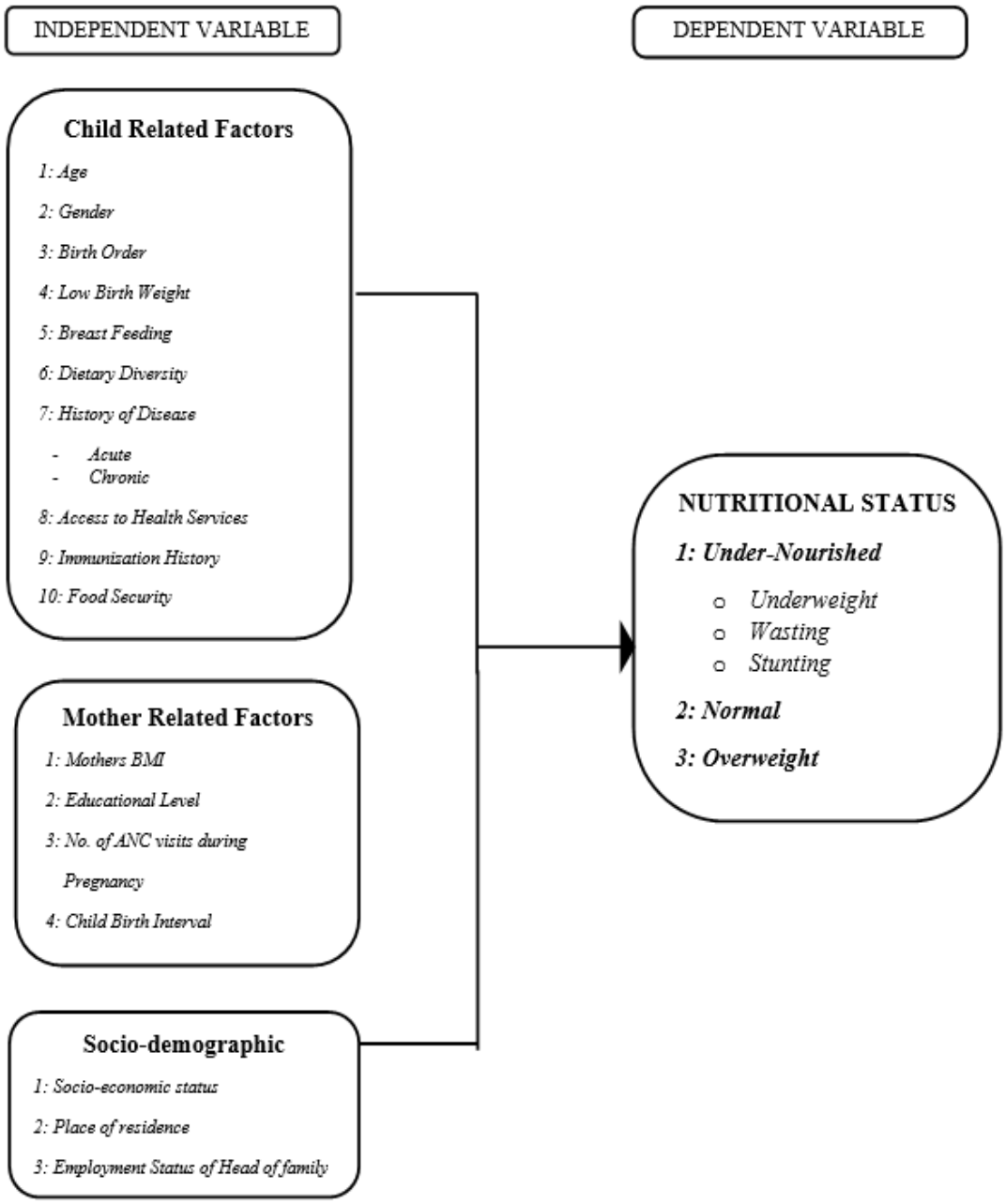
### *1.7.1 ALTERNATE HYPOTHESIS*

- There is a relationship between child related factors and under-nourished, normal and overweight under-five children.
- There is a relationship between mother related factors and under-nourished, normal and overweight under-five children.
- There is a relationship between socio-demographics of under-nourished, normal and overweight under-five children.

### *1.7.2 NULL HYPOTHESIS*

- There is no relationship between child related factors and under-nourished, normal and overweight under-five children.
- There is no relationship between mother related factors and under-nourished, normal and overweight under-five children.
- There is no relationship between socio-demographics of under-nourished, normal and overweight under-five children.

## 1.8 CONCEPTUAL FRAMEWORK



## 1.9 OPERATIONAL DEFINITIONS

- **Nutritional Status:** Refers to the child status for being undernourished, normal or overweight.
- **Under-nourished:** Refers to the state of being underweight, short stature or extremely thin due to the lack of food or insufficient consumption of food.
    - *Stunting*: It was measured as stunted children whose height-for-age Z-score is below -2 SD and children who were -3 SD from the reference median was considered severely stunted.
    - *Wasting*: Children with Z-scores -2 SD were considered wasted and children with below -3 SD weight-for-height were considered severely wasted.
    - *Underweight*: Children with below -2 SD were classified as underweight. Children whose weight-for-age below-3 SD were considered severely underweight.
- **Normal***:* Z-score between > -2 SD and < +2 SD were considered normal children.
- **Overweight***:* Children above two standard deviations (+2 SD) from the reference median were considered as overweight.
- **Height/Length:** Measurement in centimeter of child from head to heel without wearing shoes. If ≤24 months, measurement was taken while child is lying down on a length board which was placed on a flat surface. If >24 months, measurement while child was standing against a straight, vertical height board.
- **Weight:** Measurement in kilograms of child with minimal clothing and without shoes. If ≤24 months, mother was asked to stand on the weighing machine first

then set up that scale on zero again and asked to hold a child in her arms then measurement was taken. If >24 months, measurement was noted down while child is standing on weight machine straight, with minimal clothing

- **Age:** Duration of time in months from date of birth to current date .Crosschecked by the birth certificate or vaccination card. If, vaccination card or birth certificate was unavailable then we had to rely on caregiver's self-report.
- **Gender:** A biological state of being male or female.
- **Birth order:** Order or sequence number among siblings. Categorized as first born or only born, second born, third born, fourth born and others. Vaccination card or birth certificates of all siblings was checked in order to verify the birth order.
- **Low Birth Weight:** A Weight <2500 gm of child at the time of birth. It was confirmed by birth certificate or vaccination card. In case of caregiver's self-report, it was asked as very small, small, normal and big.
- **Breast Feeding:** Whether the child exclusively breastfed up to 6 months of age or not?
- **Dietary Diversity:** Refers to the variety of food that child had 24 hours prior to the survey, it was recorded in 15 food groups.
- **Disease History:**
    - Acute: It refers that whether a child has suffered an episode of diarrhea, fever, cough or runny nose in last 2 weeks.
    - Chronic: Refers that's whether child had/has cardiovascular disease, chronic kidney disease, diabetes, cancer and asthma.

- **Access to health services:** refers to health sector where mother seeks care for their child and reasons for not getting access to health service.
- **Immunization History**: whether the child had been vaccinated fully according to his/her age according to National Immunization Program of Pakistan and the vaccination status was copied from the vaccination card.
- **Food Security:** utilization of food by the surveyed child. It was categorized as rarely (once or twice in past four weeks), sometimes (three to ten time in past four weeks) and often (more than ten times in the past four weeks).
- **Maternal BMI:** It was measured as weight(kg)/height(m)$^2$and categorized as WHO recommendations underweight (<18.5), normal (18.5to < 25), overweight (25 to <30) and obese ($\geq$ 30).
- **Education Level:** Level of an education or knowledge attained by the parents categorized as No education, Primary school (grade 1-5), Above primary.
- **No. of ANC Visit:** No. of visits to receive antenatal care during the pregnancy of surveyed child; was asked as 1-3 and$\geq$4 times.
- **Birth interval:** Time interval from one child's birth until the next child's birth. It was categorized as the interval < 24 months, 24months and > 24 months
- **Place of Residence:** Refers to the areas of selected household, it was observed as rural, urban(slum) or urban(non-slum)
- **Employment status:** Refers to the current occupation of the parents. Categorized as Unemployed, Domestic worker, Labor, Salesman/woman, Clerk, Professional.
- **Socio-Economic Status:** It was measured according to wealth index and categorized in two ways: first < 52.9 (below Pakistan's IWI) $\geq$ 52.9(above or

equal to average) Secondly, categorized into 5 quintiles; lowest (poorest household), second, middle, fourth and highest (richest household).

# CHAPTER II

## REVIEW OF LITERATURE

### 2.1 NUTRITIONAL STATUS:

#### *2.1.1Definition Of Under Nutrition*

Under-nutrition, defined as the outcome of insufficient food intake (hunger) and repeated infectious diseases. Under-nutrition includes being underweight for one's age, too short for one's age (stunted), dangerously thin (wasted), and deficient in vitamins and minerals (micronutrient malnutrition).(UNICEF, 2006)Inadequate nutrition is one of a wide range of interlinked factors which includes poverty or low income, large family size, poor education, food security, poor sanitation and services to child and mother.(Black et al., 2008)

#### *2.1.2 Stunting(Height for Age)*

Childhood stunting is one of the most significant impediments to human development, globally affecting approximately 162 million children under the age of 5 years. Stunting, or being too short for one's age, is defined as a height that is more than two standard deviations below the World Health Organization Child Growth Standards median In 2015, Stunting has long-term effects on individuals and societies, including: diminished cognitive and physical development. Stunting before the age of 2 years predicts poorer cognitive and educational outcomes in later childhood and adolescence. Factors that contribute to stunted growth and development include poor maternal health and nutrition, inadequate infant and young child feeding practices, and infection. Maternal under-nutrition accounts for 20% of childhood stunting. Stunting results from several household, environmental, socioeconomic and cultural factors. the availability

of safe water (water supply), the availability of high-quality foods (food supply) and affordability of nutrient-rich foods (socioeconomic status) will affect a family's ability to provide a healthy diet and prevent child stunting.(WHO, 2014b)one in four children (156 million) is estimated to be affected by stunting. Absolute numbers of children affected by stunting between 1990 and 2015, except the African Region, where population growth outpaced a 27% reduction in stunting prevalence. Globally, stunting fell by 41% between 1990 and 2015. Stunting and wasting remain major causes for concern. An estimated one in four children (23%), or 156 million children, in 2015, are affected by stunting globally, and are exposed to risks that include diminished cognitive and physical development.(WHO, 2015)

In south Asia, 46% of the total children are stunted. In Pakistan, 45 percent of children under age 5 are stunted, and 24 percent are severely stunted. Stunting is higher in male children (48 percent) than in female children (42 percent). Stunting is higher among children with a preceding birth interval of less than 24 months (47 percent) than among children who were first births and children with a preceding birth interval of 24-47 months or 48 months or more. More than half of children whose perceived size at birth (as reported by the mother) was very small or small are stunted.(P. National Institute of Population Studies, 2013)

### *2.1.3 Wasting (Weight for Height)*

Wasting is a reduction or loss of body weight in relation to height. Wasting is a strong predictor of mortality among children under five, Wasting is a major health problem and, owing to its associated risks for morbidity. Wasting has been shown to increase the risk of death in childhood from infectious diseases such as diarrhea, pneumonia and measles. Globally, wasting accounts for 4.7% of all deaths of children aged less than 5

years. poor access to appropriate, timely and affordable health care; inadequate caring and feeding practices (e.g. exclusive breastfeeding or low quantity and quality of complementary food); poor food and lack of a sanitary environment, including access to safe water, sanitation and hygiene services are the underlying cause of wasting.(WHO, 2014a)It's usually the result of acute significant food shortage and/or disease. Rates of severe wasting remain unacceptably high in the South-East Asia Region (4.3%), the Eastern Mediterranean Region (3.8%) and the African Region (3.3%)(WHO, 2015) Some (highly populated) countries report a prevalence of wasting of more than 10% throughout the year, such as Nigeria (10%), Pakistan (15%) and India (20%). (WHO, 2014a)

Prevalence of wasting also increases with age however the prevalence of wasting is much lower than that of stunting. Wasting rate at national level was 16.8 percent and was high in urban area (23 %) than in rural area (18%). National nutritional survey results revealed that indicators wasting were worsening during last 10 years. observed for wasting, 15.1 percent children in Pakistan were suffering from wasting in NNS 2011 as compare to 14.3 percent.(Pakistan Medical Research Council (PMRC), 2011)

### *2.1.4 Underweight (Weight for Age)*

Underweight many children in poor countries. Children with moderate malnutrition have an increased risk of mortality and MM is associated with a high number of nutrition-related deaths. If some of these moderately malnourished children do not receive adequate support, they may progress towards severe acute malnutrition (severe wasting and/or edema) or severe stunting (height-for-age less than -3 z-scores), which are both life-threatening conditions.(WHO, 2016c)The proportion of Childrenfewer than five who were underweight is estimated to have declined from 25% to 14%

between 1990 and 2015. An estimated 93 million children under five (one in seven children globally)

Suffer from the negative effects of underweight. Asia Region had 43 million underweight children in 2015, Compared to 83 million in 1990.(WHO, 2015) In Pakistan, 31.2 percent children were underweight at national level. The prevalence of underweight was high (33.1%) in rural area as compare to urban (26.5%) and 29.7 percent children were severely underweight across Pakistan. The finding of the Pakistan's national nutritional survey in 2011 revealed that education of mother was closely associated with child stunting, wasting and underweight status.(Pakistan Medical Research Council (PMRC), 2011)

## 2.2 CHILD RELATED FACTORS

A greater susceptibility of female to under nutrition hampering their reproductive, economic, educational and social roles-is regularly evoked in food policy discussions. Materials and publications from intergovernmental bodies and non-government organization often convey the notion that that an anti-female bias in intra household food allocation affecting both children and adults, existing throughout the developing countries causing excess female under-nutrition. Sometime refers to "feminization of hunger".(Marcoux, 2002) We can state this fact that girls are more expected to be under nourished comparatively to boys in South Asia.(UNICEF, 2006)but in contrast finding from 10 sub-Saharan African countries showed that male children are 36% more stunted than their female counter-parts.(Wamani, Åstrøm, Peterson, Tumwine, & Tylleskär, 2007) Female mortality rate in Pakistan is 12% higher than males between

the ages of 1 to 4 years.(Dr. Farzana Bari & Mariam S. Pal, 2000) with the likelihood of a girl being undernourished with the increase in age.(Pal, 1999)

The proportion of the malnutrition (under nutrition) increases with the birth order of the child. It increased from 57% for the first order births to 65% for children of birth order 6 and above.(S..Gunasekaran, 2008) moreover**,** children whose weight at the time of birth is less than 2500 gm refers to low birth weight. Low birth weight is one of the major issue in South Asia which comprises of 28% of total births. Low birth weight is one of the key determinant of childhood under-nutrition. Neonatal mortality, delayed physical and cognitive growth are the consequences of low birth weight. Inadequate intra uterine nutrition is major cause because there are many evidences that girls with low birth weight are likely to give birth to low birth weight babies when then grow adult.(A. Dharmalingam, K. Navaneetham, & C. S. Krishnakumar, 2010) Childhood infants suffer more diseases and low birth weight is also the predictor of the health and survival of child.(Madhur Borah & Baruah, 2015)In Pakistan, in last 5 years only 12% of total children population were weighed at the time of birth and 26% of infants were reported to have low birth weight.(P. National Institute of Population Studies, 2013)

Early and exclusive breastfeeding is considered as an important intervention that reduces infant and child mortality, breastfeeding practices for the appropriate duration are protective factors against being undernourished up to 12 months of age.(Aiga, Matsuoka, Kuroiwa, & Yamamoto, 2009) Only 36% of children younger than 6 months were exclusively breastfed in developing countries.(Chessa K. Lutter et al., 2011) In Pakistan, 38% of children are exclusively breastfed under 6 months of age.("Exclusive breastfeeding," 2011) Breast feeding is on the decline in the more developed areas of Pakistan. Urban, more educated, wealthier women are more likely to stop breast feeding

earlier, whereas rural, less educated and poor women tend to breast feed for longer.(Donald E. Morisky et al., 2002)

From the age of 6 months onwards, children require a diversified diet to supply the full range and quantities of nutrients required to support rapid growth. Increased variety is closely identified with improved quality in a diet that characteristically contains more of animal source foods than a less diversified one. Monotony in diet has been described as the hallmark of poverty and poor nutrition (Golden, 1991) A number of studies have looked at the association between some measure of dietary diversity and child nutrition outcome A consistent positive association between dietary diversity and child growth is also found in a number of countries.(Marie T. Ruel, 2002)

Child deaths in developing countries can be linked to under-nutrition which worsen the effects of disease on a health of child, diarrhea, acute respiratory infections, measles and malaria can cause malabsorption, appetite loss, and loss of nutrients and muscles breakdown, which may lead to under-nutrition.The data suggest that malnutrition is associated with an increased risk of death from diarrhea and that the risk varies by type of diarrhea. All of the community-based studies reported an increased risk of mortality from diarrhea among children who had lowweight for their age. A well-established causal relation exists between malnutrition and diarrhea. A strong and consistent association was observed between nutritional status and mortality from diarrhea. f deaths related to diarrhea in the developing world, and malnutrition is undoubtedly an important contributing factor in some of those deaths.(Amy L. Rice, Lisa Sacco, Adnan Hyder, & Robert E. Black, 2000) leads us to simultaneously address the root causes of nutritional deficiencies. Inadequate growth is a well-recognized complication of

asthma. A series of studies have demonstrated both increased energy utilization and decreased energy intake in infants with asthma.(Steven A. Abrams, 2001)

Having access to health care requires that there is an adequate supply of health services available. According to this dimension, access to health care is concerned with the opportunity to obtain health care when it is wanted or needed. Inequality and inequity in access to services is said to have increased, and important health indicators such as infant mortality rate (IMR) and maternal mortality rate (MMR) even worsened for the poor. The poor and vulnerable bear a excessively heavier burden of disease and are more likely to suffer ill health than the less poor(S.N. Kiwanukaa et al., 2008)

Food security is usually depend on three main concepts :availability, access and utilization of food of satisfactory quality and quantity to ensure sufficient intake and a healthy life for all family members, about one in every nine people in the world don't have an sufficient access or unavailability to food. It is the growing concern around the globe especially in developing countries. Where an estimated 805 million were chronically hungry in 2012-14 around the globe. With the number of 276 million which is 34.4% in South Asia.(*The State of Food Insecurity in the World*, 2014)The global fight against malnutrition needs to be complemented with a fight against infectious diseases. Children who are malnourished are nine times more likely to die from infectious diseases such as pneumonia, diarrhea, malaria and measles.

There is also evidence to show that vaccines can help prevent some of the chronic consequences of undernourishment. A study, published in 2012, suggests that children in India with up-to-date vaccines against tuberculosis, diphtheria, tetanus, measles and polio were less likely to show signs of stunting. The proportion of children who were underweight or had stunting, wasting. Children who miss DPT, OPV, and measles

immunizations are at a much higher risk of mortality, not only from missing the vaccines and having less protection against vaccine-preventable diseases, but from having a higher prevalence of malnutrition and morbidity. Risk factors that have been associated with lack of childhood immunizations in developing countries include low socioeconomic status and low level of maternal education. Children who received no immunizations came from families in which the risk of under-five child mortality was about 2.6 times higher than that for families in which children received complete immunizations.(Richard D Semba et al., 2007)

In Pakistan, 35 districts are highly food insecure and 12 are severely food insecure.(*Pakistan Food Security Bulletin* 2014)Beyond household food security is the need to encourage food distribution that ensures good nutritional status for all the members of the household. The right to an adequate standard of living, including food, is recognized in the Universal Declaration of Human Rights. Access to food, or food demand, is influenced by economic issues, physical infrastructure and consumer preferences. Since the poor are the most vulnerable to food deficits and under-nutrition, policies that increase their purchasing power will provide them with the potential to improve their nutrition.(Michael C. Latham, 1997) The access to food might be affected by the lack of purchasing power due to the increase in the food prices, lack of income or the unemployment of the head of the family or due to inappropriate consumption behavior or intra-household distribution.(Lili Mohiddin, Laura Phelps , & Walters, 2012)

## 2.3 MOTHER RELATED FACTORS

Maternal and child under-nutrition are increasingly reported in developing and developed countries as likely precursors of stunting in poorer segments of the

populations. Stunting is known to be a key indicator of long-term child malnutrition, a failure to reach one's biological potential for growth, resulting in low height for age. Studies revealed that stunting mostly occurs within the first two years of life. The primary period of malnutrition in early childhood is during fetal development brought on by malnourished mothers. Therefore, maternal nutrition during pregnancy plays a major role in a child's growth and survival.(Khin Mar Win, Marc Van der Putten, Nitaya Vajanapoom, & Kwanjai Amnatsatsue, 2013)

Narrow spaced pregnancies are usually related with the mother having very little time to recover from lost nutrient stores.(Woldemariam Girma & Timotiows Genebo 2002) Higher birth interval is expected to improve child nutrition status, because mother can get enough time for proper childcare and feeding practices. According to the studies in developing countries showed that children who born after a short birth interval (less than 24 months) have greater levels of stunting in most countries where DHS surveys have been conducted.(Marcoux, 2002).Many studies have showed the effects of parent's education on child survival and health outcomes, raising the education level can greatly improve the health of the next generation and its main goal is knowledge transmission which can facilitate mother's learning about the recognition, prevention and cure as well as the nutritional requirements, that affects the health behavior towards child.(Michelle Bellessa Frost, Renata Forste, & David W. Haas, 2004)

Education could reflect the prosperity of household which may influence nutritional status of child. Mother education is a key element of child's nutrition. Since women are primary child caregiver and responsible for dealing with child's wellbeing. Empowering women is likely to be results in an improved nutritional status for children which makes them more confident and helps them to participate more on household

and community decision making. (Burchi, 2012) Maternal education is a critical resource of child health nutrition and survival, more educated women are better to process information, acquire skills and model positive caring.(Lisa C. Smith, marie T. Ruel, & Aida Ndiaye, 2005)

## 2.4 SOCIO-DEMOGRAPHIC FACTORS

Socio-economic inequalities in under-nutrition refers to the degree to which under nourished child rate differ between more or less socially and economically advantaged group which can be seen throughout the developing world.(Van de Poel, Hosseinpoor, Speybroeck, Van Ourti, & Vega, 2008) Being poor usually meant to be deprived of good nutritional status.(Michael David A. Son & Ralph M. Menchavez 2003)Increasing rates of morbidity and mortality around the world becomes more considerable issue in the pastrecent years due to socio-economic differences. Usually children who hail from the poorest SES quintile have higher prevalence of worst nutritional status. While in contrast children who belong to richer quintile are associated with better health status.(Kanjilal, Mazumdar, Mukherjee, & Rahman, 2010)

Poverty is a leading factor of under nutrition in developing countries. House hold's living standard and economic status is often considered as one of the reflecting health status of child.(Barun Kanjilal, Papiya Guha Mazumdar, Moumita Mukherjee, & M Hafizur Rahman, 2010)Gradient of household socio-economic status remains as a crucial determinant of level of nutritional and developmental growth among children.(Kanjilal et al., 2010) Children with the low socio-economic status lack access to some basic resources which put them at the risk of developmental problems, the impact of low socio economic status depend on how long poverty lasts and the child's age when the family is poor. Vulnerable conditions during childhood also results in

adverse health outcome in adulthood.(Robert H. Bradley & Robert F. Corwyn, 2002) According to study in Ghana 60% of the children in poor household are twice on risk for being undernourished than children from the rich household.(Hong, 2007)

In the last few decade urbanization has witnessed around the globe, 54% of the world population residing in urban areas in 2014 and Africa and Asia are home to nearly 90% of the world rural population.(*World Urbanization Prospects*, 2014) Pakistan is the country with 113 million inhabitants.("National institute of Population Studies," 2016) The reason of children undernourishment results from the inequality in rural and urban of developing countries over the last few decades, the observe prevalence of under-nourished child usually considerably greater in rural areas as compare to the urban communities.(Zaida Herrador et al., 2014) Many previous studies indicated thatthe children who are living in urban communities usually have a healthier nutritional status than their rural counter parts. Urban areas offer more choices: greater availability of food, housing arrangement, health services and possibility of employment opportunities, which are widely available than rural areas.(Lisa C. Smith et al., 2005) UNICEF findings from Africa, Asia and the America (33 countries) presented that, on average, under-nutrition is 1.6 times higher in rural communities compared to urban areas.(Lisa C. Smith et al., 2005)Employment has a clear connection with education which lead to find a better superior job which is associated with better nutrition status of child, parental occupation is highly associated with health outcomes.(Michelle Bellessa Frost et al., 2004; Pal, 1999) Higher education levels are likely to increase household income and well-being similarly low education levels might lead to low income which effect ultimately in the result of increment the risk of undernourished child.(Tim Kruitbosch & Dr. M.W. Heijmans, 2014) Unemployment leads to poverty

and the health status of child depends on that how long poverty lasts.(Robert H. Bradley & Robert F. Corwyn, 2002)

# CHAPTER III

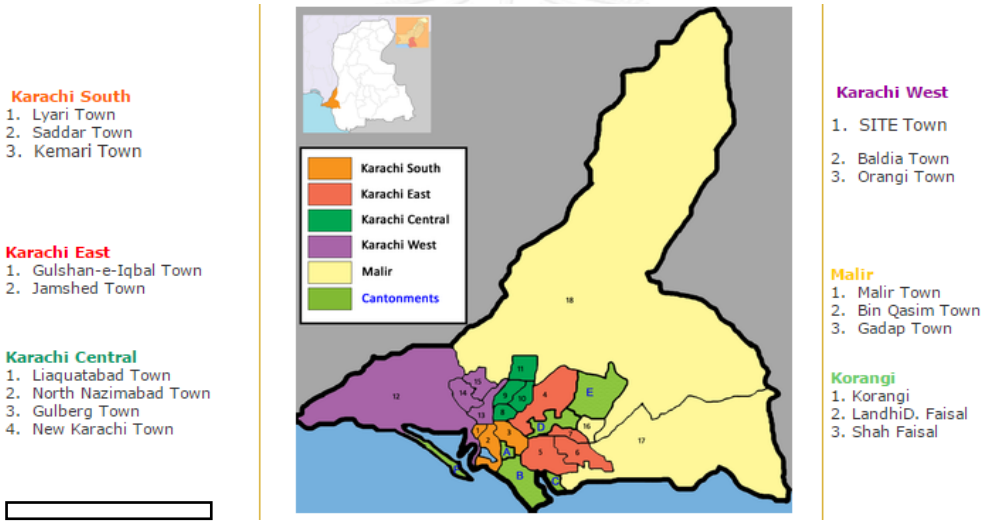
## RESEEARCH METHODOLOGY

### 3.1 STUDY DESIGN

This study was cross-sectional descriptive study.

### 3.2 STUDY AREA

The study was conducted in the most populated city of Pakistan, Karachi which comprises of 18 towns (6 districts). Karachi is located in the south of Pakistan that covers the area of 3,527 $km^{2.}$




### 3.3 STUDY DURATION

The study (Data Collection) was conducted from 1st week of May 2016 till 4th week of May 2016.

### 3.4STUDY POPULATION

The study population was mothers/child Dyad to whom 15-20 minutes face to face interview had done at their home once, currently living in Karachi, Pakistan.

### 3.5 SAMPLING TECHNIQUE

Multistage sampling technique was used to collect data from the mother/child dyad for this study.

There are 6 districts in Karachi, every district is sub-divided into towns and then towns are divided in Union Council's, these Union Councils were referred as cluster in this study.

Districts in Karachi can be classified as 2 districts for each (high, middle, low) income group because of the homogeneity of the population.

*First stage*: 3 districts were selected randomly from total 6 , 1 district from each income (high, middle, low).

*Second Stage*: Out of 18 towns in the 6 districts of Karachi, 1 town was selected randomly from each 3 selected districts.

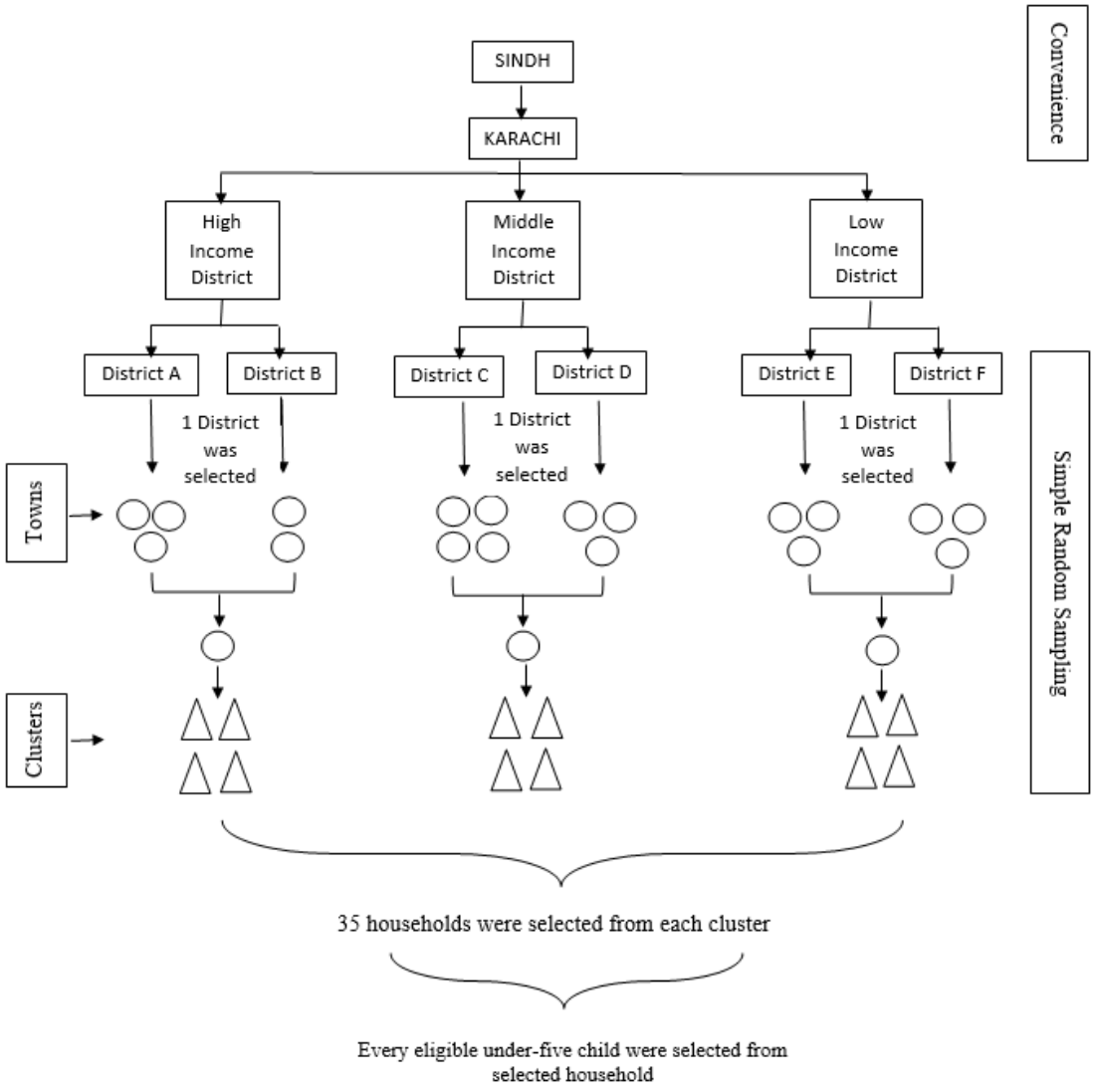
*Third stage*: Out of 25 cluster,4 clusters were selected from each town randomly as considering Union Council (sub-division of towns) as a cluster.

For first, second and third stage; computer generating random number sampling method was used to select districts, towns and clusters respectively.

*Fourth stage:* 35 samples of household was collected from each of 12 cluster by random selection through spinning a pen and the researcher followed the directions of tip of pen points**.** This method of selection was continued until we reached the samples of 35 in each cluster.(WHO, 1989)

*Fifth Stage:* All eligible children in one household were selected.(P. National Institute of Population Studies, 2013; UNHCR, 2013; WFP, 2005)

### 3.5.1 FLOW CHART OF SAMPLING TECHNIQUE



### 3.6 SAMPLE SIZE

*Taro Yamane* was used for sample size calculation.

Pakistan's population: 188,925,000

Under-five population: 21,996,000(P. National Institute of Population Studies, 2013)

Which means that by under-five population is 11.6% of total population, by keeping this as standard we calculate 11.6% of Karachi's under-five population

Karachi's population: 23,700,000

Karachi's under-five population: 2,749,200

YAMANE: $n = \frac{N}{1+N\ (e)^2}$

Whereas n = sample size

N = population size

e = Acceptable sampling error

YAMANE: $n = \frac{2{,}749{,}200}{1+2{,}749{,}200(0.05)^2}$

$$n = 399.99$$

Sample size: 400

### 3.7 MEASUREMENT TOOLS

Questionnaire was the measurement tool in this study.

The questionnaire was translated into Urdu by the translator, who must be fluent in English and Urdu as well as must be expert in the field of Nutrition.

Questionnaire in Urdu was back translated by another translator who must not be aware of the first version of English questionnaire, and the translator must also be fluent in both languages and expert of the nutrition field. If we find any differences among first and second version of English questionnaire than researcher who is fluent on both languages played the role of mediator to make the questionnaire consistent with the translations.

Questionnaire is divided into four parts.

*Part I* is regarding general information; in which field work team noted down the district, town, cluster no, household no., date and the ID of the respondent.

*Part II* is about child related factors;

i. Age; was measured in completed months, we confirmed by birth certificate or vaccination card by asking the mother to show and permission was taken to copy down the details in order to minimize the recall bias by old mothers if unavailable then we had to rely on self-report of mothers. No efforts were made to get access the information from the health center due limited time.

ii. Height was measured in centimeter, from child's head to heel without wearing shoes. If $\leq$24 months, measurement was taken while child is lying down on a length board which should be placed on a flat surface. If >24 months, measurement was noted down while child is standing against a straight, vertical height board.

iii. Weight was measured in Kgs. If ≤24 months, ask mother to stand on the weighing machine first then set up that scale on zero again and ask her to hold a child in her arms then measurement was taken. If >24 months, measurement was noted down while child is standing on weight machine straight, with minimal clothing.

iv. Birth order was asked that the child is first or only born, 2nd born, 3rd born, 4th born or other.

v. Child's birth weight was copied from birth certificate; if unavailable then we relied on self-report of caregiver by asking that the child was very small or small(<2500 gm) normal (2500-4000 gm) or big (>4000) at the time of birth.

vi. Whether the child breastfed up to the age of 6 months or not.

vii. Childs' dietary diversity was recorded by having 24 hour dietary recall with the help of 15 groups; cereals, vitamin A rich vegetables and tubers, roots, green vegetables, other vegetables, vitamin A rich fruits, other fruits and its juices, organ meat, flesh meat, eggs, seafood, legumes/nuts or seeds, milk and milk products, oil and fats and sweets.

viii. History of disease was asked, whether the child suffer from acute illness as diarrhea, fever, cough and runny nose in last 2 weeks and whether the child suffered or suffering from chronic illness like cardiovascular disease, chronic kidney disease, diabetes, asthma or cancer.

ix. Access to health facility was measured in three main categories of *public sector* which includes government hospital, dispensary, basic health center , *private sector* includes private hospital, private clinic, private physician pharmacy,

dispenser/compounder and *other sources* includes relatives, friends, homeopath, traditional practitioner.

If somebody denied to access than the reasons was classified as couldn't afford care, didn't know where to find care, couldn't get appointment anywhere and none available.

Immunization schedule was copied down from the vaccination card if available.

x. Food security was measured by asking the availability, access and consumption of food in last 4 weeks, with the cut-off of rarely (once or twice in past four weeks), sometimes (three to ten times in past four weeks) or often (more than ten times in past four weeks).

*Part III* is regarding mother related factors;

i. Mothers education status (illiterate, primary grade 1-5, and above primary)
ii. Number of antenatal care(1-3 or ≥4 times) received while pregnancy.
iii. Birth interval between elder child and the surveyed one.(<24 months or ≥24 months)



*Part IV*is about socio-demographic; which consists of residential area wasobserved as rural, urban(Slum), urban (non-Slum), employment status of head of family (unemployed, domestic worker, Labor, Salesman Clerk, Professional) and International Wealth Index. IWI is the comparable asset based index for household's long-term economic status that can be used for all low and middle income countries. IWI is calculated by the formula which was based on the possession of the assets. The assets includes;

i. Consumer durables (possession of television, refrigerator, telephone, car, bicycle, cheap utensil and expensive utensils)

ii. Housing characteristics; which is divided into quality of floor material, toilet facility, which was measured in low, medium and high quality and number of sleeping rooms which were measured in zero or one, two, three or more sleeping room.

iii. Public utilities; access to electricity was measured in yea or no and the quality of water resources were noted down as low, medium or high quality.

**3.8 VALIDITY AND RELIABILITY**:

The validity of the questionnaire was checked by

*Construct validity*:

i. Question no.11; Childs' weight at the time of birth is taken by "*CDC Pediatric Nutrition Surveillance System Health Indicators"*.(CDC, 2009)

ii. Question no.12 about exclusive breastfeeding duration is picked from "*Multiple Indicator Cluster Survey of Balochistan"*. (MICS, 2010)

iii. Question no 13 regarding dietary diversity taken by the *"guidelines for measuring household and individual dietary diversity". (FAO, 2008)*

iv. Question no 15a about care seeking taken from "*Multiple Indicator Cluster Survey of Balochistan"*. (MICS, 2010)

Question 15b; access to health care is taken by "*Research ANd Development (RAND)"* Cooperation. (RAND, 1997)

v. Question 16/16.1; about vaccination and its record are taken from *"Multiple Indicator Cluster Survey of Balochistan"*. (MICS, 2010)

vi. Question 17 and 17.1.1 are taken from *"Community Food Security Assessment Toolkit".*(Barbara Cohen, 2002)

vii. Question 18, 18.1, 19,19.1, 20 and 20.1 are picked from *"Household Food Insecurity Access Scale (HFIAS)"*. (USAID, 2007)

viii. Question no.23 about the number of visits to antenatal care is picked from *"Pakistan Demographic Health Survey"*.(P. National Institute of Population Studies, 2013)

ix. Question 27regarding International Wealth Index are opted from *"Pakistan Demographic Health Survey"*.(P. National Institute of Population Studies, 2013)

*Content validity:*

Dr Alessio Panza, Assoc. Prof Ratana Somrongthong and Dr Mohsina Ibrahim evaluated the questionnaire, who are experts in child and public health.

*Face validity:*

3 mothers validate the 5 questions regarding acute and chronic disease history of child, birth order of child among siblings, birth interval between surveyed child and elder one(if any), educational status of mother and employment status of head of family.

To maintain the clarity of words, and to avoid misinterpretation of questions of the questionnaire, a test-retest reliability was conducted with 20 mothers of under-five children at Lahore, Pakistan, which shares the same characteristics as Karachi. This test was conducted with the same mothers on both times, under same condition and with the one week difference.

## 3.9 TRAINING OF RESEARCH ASSISTANTS

Three research assistants were nutritionist, one day prior to the interview, the research assistants were trained by the researcher. In which they were explained about the about the objectives of this study, selection of participants, explanation and interpretation of questionnaires, and face-to-face interviewing method. Role play was used as a method to facilitate research assistants to respondent's interaction and making objective relevant.

## 3.10 CRITERIA

*3.10.1 Inclusion criteria:*

- Mother/Child Dyad

*3.10.2 Exclusion criteria:*

- Those mother/Child Dyad, who were not psychologically prepared or unwilling to continue towards the completion of the survey due to the fear, stress or trauma and who did not sign the consent form to participate in this study.
- Physically disable children, because of the deformities it would not be possible to measure height and weight properly and to compute Z-score which is necessary to measure all three dependent variables (Khor et al., 2009)
- Twins or triplets.(Mark Miller, 2014; Stanley Onah et al., 2014; Zhenyu Yan, 2014)

## 3.11 ETHICAL CONSIDERATION

The topic of this study is under-nutrition among under-five children, who are vulnerable group, their parents that may experience pains while sharing their conditions regarding socio-economic status, employment status. Thus, ethical approval to conduct the said study was taken from Ethics Review Committee of Chulalongkorn University.

## 3.12 DATA ANALYSIS

Data was entered and coded into Statistical Package for Social Science (SPSS) for analysis.

*Descriptive Statistics*

Descriptive statistics were calculated in frequency and percentages as dependent and independent variable are categorical.

Child Related Factor

Data was categorized into specific *age group*, 0-11 months, 12-23 months; 24-35 months; 36-47 months; 48-59 months. (WHO, 2016b). *Sex* was categorized as male and female. 1st, 2nd, 3rd, 4th and others were the categories of *birth order*. *Birth weight* was divided into three categories < 2500 gm, 2500gm - 4000 gm, >4000gm.*Disease history* was categorize into 8 major and common acute and chronic illness. *Food security* was measured into three main categories availability, access and utilization. Dichotomous variables *Immunization history, access to health service* and *breastfeeding* were measured as Yes/No. *Dietary diversity* was measured as ordinal variable low, medium and high. These 3 categories were made on the consumption of food groups. It is also important to know which food groups are predominately consumed at different levels of the dietary diversity score. This provides information on which foods are eaten by those with the lowest dietary diversity, and which foods are added for those with a higher score.

*Dummy Table 1:Frequency and percentage distribution by Child Related Factor*

| ***Independent Variable*** | | ***Frequency*** | ***Percentage*** | ***Cumulative Percentage*** |
|---|---|---|---|---|
| ***Age*** | | | | |
| *0-11 months* | | | | |
| *12-23 months* | | | | |
| *24-35 months* | | | | |
| *36-47 months* | | | | |
| *48-59 months* | | | | |
| ***Sex*** | | | | |
| *Male* | | | | |
| *Female* | | | | |
| ***Birth Order*** | | | | |
| *1st* | | | | |
| *2nd* | | | | |
| *3rdor more* | | | | |
| ***Low Birth weight*** | | | | |
| < 2500 gm | | | | |
| 2500-4000 gm | | | | |
| > 4000 gm | | | | |
| ***History of Disease*** | | | | |
| ***Acute*** | *Diarrhea* | | | |
| | *Fever* | | | |
| | *Runny Nose* | | | |
| | *Cough* | | | |
| ***Chronic*** | *CVD* | | | |
| | *CKD* | | | |
| | *Diabetes* | | | |
| | *Asthma* | | | |
| ***Breastfeeding*** | | | | |
| *Yes* | | | | |
| *No* | | | | |
| ***Dietary Diversity*** | | | | |
| *Low(≤3 food groups)* | | | | |
| *Med (4-5 Food Groups)* | | | | |
| *High( ≥6 Food Groups)* | | | | |

Mother Related Factor

Child *birth interval* was categorized into two categories < 24 months and ≥ 24 months. *No. of ANC visits* were categorized as two 1-3 and ≥ 4. *Mothers' educational level* was measured and categorized as literate, Primary and above Primary. We classified BMI, recommended by WHO and National Institutes of Health for the general population: underweight (<18.5), normal (18.5to < 25), overweight (25 to <30) and obese (≥ 30). (Joyce W. Tang et al., 2012)

*Dummy Table 2: Frequency and percentage distribution by Mother Related Factor*

| ***Independent Variables*** | ***Frequency*** | ***Percentage*** | ***Cumulative Percentage*** |
|---|---|---|---|
| ***Birth interval*** | | | |
| *< 24 months* | | | |
| *≥24 months* | | | |
| ***No of ANC visits*** | | | |
| *1-3* | | | |
| *≥4* | | | |
| ***Educational level*** | | | |
| *Illiterate* | | | |
| *Primary* | | | |
| *Above primary* | | | |
| ***BMI*** | | | |
| *Underweight* | | | |
| *Normal* | | | |
| *Overweight* | | | |
| *Obese* | | | |

Socio-demographic Characteristics

*Place of residence* was categorized as rural, urban(slum and urban(non-slum). *Employment status* was divided into 6 categories unemployed, domestic worker, labor, salesman, clerk and professional.

*Dummy Table 3 Frequency and percentage distribution by socio-demographic characteristics*

| **Socio-demographic characteristics** | **Frequency** | **Percentage** | ***Cumulative Percentage*** |
|---|---|---|---|
| ***Place of residence*** | | | |
| Rural | | | |
| Urban (non-slum) | | | |
| Urban (slum) | | | |
| ***Employment Status of Head of Family*** | | | |
| Unemployed | | | |
| Domestic Worker | | | |
| Labor | | | |
| Salesman | | | |
| Clerk | | | |
| Professional | | | |

*IWI values* were categorized into two sets:

i. Below the average IWI of Pakistan and above the average IWI of Pakistan based on the IWI of Pakistan which is 52.9

ii. IWI values were categorized into five categories mentioned as follow:

≤ 20.00 (lowest quintile-poorest household), 20.01 - 40.00 (second), 40.01 - 60.00 (middle), 60.01 - 80.00 (fourth) and '≥ 80.01' (highest quintile: richest household).

*Dummy Table 4:Frequency and percentage distribution by socio-demographic characteristics*

| **Independent Variable** | **Frequency** | **Percentage** | ***C.Percentage*** |
|---|---|---|---|
| ***IWI (international wealth Index)*** | | | |
| *Below average* | | | |
| *Above average* | | | |
| ***IWI Quintiles*** | | | |
| ≤ 20.0 | | | |
| 20.1 - 40.0 | | | |
| 40.1 - 60.0 | | | |
| 60.1 - 80.0 | | | |
| ≥ 80.0 | | | |

In this study height and weight of children was converted into Z-score based on national center for health statistics reference population recommended by WHO, thus who are below -2SD was consider as undernourished children.

*Dummy Table 5: Prevalence of undernourished, normal and overweight.*

| ***Dependent Variable*** | | ***Frequency*** | ***Percentage*** | ***C. Percentage*** |
|---|---|---|---|---|
| *Weight for Age* ***(n=383)*** | *Overweight (>+2 SD)* | | | |
| | *Normal (-2 SD – +2 SD)* | | | |
| | *Underweight (<-2SD)* | | | |
| | *Severely Underweight(<-3SD)* | | | |
| *Weight for Height* ***(n=383)*** | *Overweight(>+2 SD)* | | | |
| | *Normal(-2 SD – +2 SD)* | | | |
| | *Wasted(<-2SD)* | | | |
| | *Severely wasted(<-3SD)* | | | |
| *Height for Age.* ***(n =383)*** | *Normal(-2 SD – +2 SD)* | | | |
| | *Stunted(<-2SD)* | | | |
| | *Severely stunted(<-3SD)* | | | |

*Bivariate Analysis:*

In Bivariate analysis the association of various independent variables (child related factors, mother related factor and socio-demographic factor) with the dependent variables (undernourished, normal, overweight) was done using chi-square test or fisher exact test where applicable(when any cell had observed cell count less than 5)to show the effect of each dependent variable on independent variable. Results were considered statistically significant at a 5% ($P < 0.05$) significance level.



*ummy Table 6: Association between child related factor and stunting.*

| **Child Related Factor** | **Stunting** | $x^{2*}$ | **P-Value** |
|---|---|---|---|
| **Sex** | | | |
| Male | | | |
| Female | | | |
| **Birth order** | | | |
| 1st or only born | | | |
| 2nd born | | | |
| 3rd born | | | |
| 4th born | | | |
| other | | | |
| **Weight at birth** | | | |
| <2500 gm | | | |
| 2500-4000 gm | | | |
| ≥4000 gm | | | |

*Fisher`s Exact tests results

*Dummy Table 7: Association between child related factor and wasting.*

| Child Related Factor | Wasting | $x^{2*}$ | P-Value |
|---|---|---|---|
| **Sex** | | | |
| Male | | | |
| Female | | | |
| **Birth order** | | | |
| 1st or only born | | | |
| 2nd born | | | |
| 3rd born | | | |
| 4th born | | | |
| other | | | |
| **Weight at birth** | | | |
| <2500 gm | | | |
| 2500-4000 gm | | | |
| ≥4000 gm | | | |

*Fisher`s Exact tests results

*Dummy Table 8: Association between child related factor and underweight.*

| Child Related Factor | Underweight | $x^{2*}$ | P-Value |
|---|---|---|---|
| **Sex** | | | |
| Male | | | |
| Female | | | |
| **Birth order** | | | |
| 1st or only born | | | |
| 2nd born | | | |
| 3rd born | | | |
| 4th born | | | |
| other | | | |
| **Weight at birth** | | | |
| <2500 gm | | | |
| 2500-4000 gm | | | |
| ≥4000 gm | | | |

*Fisher`s Exact tests results

*Multivariate Analysis:*

Binary logistic regression was done for the variables which were statistically significant. Multivariate analysis were constructed using the variables which get ($p$<0.2) from binary logistic regression.

*Dummy Table 9: Multivariate analysis of factors associated with underweight/wasting/stunting*

| ***Variables*** | ***p-Value*** | ***Crude OR[95% CI]*** | ***p-Value*** | ***Adjusted OR[95% CI]*** |
|---|---|---|---|---|
| ***Weight at Birth*** | | | | |
| *<2500 gm* | | | | |
| *2500-4000 gm* | | | | |
| *≥4000 gm* | | | | |
| ***Birth Order*** | | | | |
| *1st or only born* | | | | |
| *2nd born* | | | | |
| *3rd born* | | | | |
| *4th born* | | | | |

# CHAPTER IV

## RESULT

This chapter presents the findings from the statistical analysis of the data, collected during the cross sectional survey.

### 4.1 DESCRIPTIVE ANALYSIS

#### *4.1.1 Univariate Analysis*

Descriptive analysis includes frequencies, percentages and cumulative percentages of various independent variable and dependent variables under the three different parts; child related factors, mother related factor and household socio-demographic factors.

As presented in table 1, the total studied population was 383 from three different towns. Each town contributed 35.2%, 36.8% and 27.9% of the population from low, middle and high income towns respectively.

Age were categorized into 5 groups; 0-11 months,12-23 months,24-35 months, 36-47 months,48-59 months. Majority of the children (32 percent) belonged to the age group of 12-23 months. Male children were 56.1percent of the total population and the rest were female (43.9percent) children and 52.2percent of children were first born.

Table 1: Frequency and percentage distribution by Child Related Demographic Factors

| ***Independent Variable*** | ***Frequency*** | ***Percentage*** | ***C. Percentage*** |
|---|---|---|---|
| ***Town(n=383)*** | | | |
| Orangi Town | 135 | 35.2 | 72.1 |
| Liaquatabad Town | 141 | 36.8 | 36.8 |
| Saddar Town | 107 | 27.9 | 100.0 |
| ***Age(n=383)*** | | | |
| *0-11 months* | 54 | 14.1 | 14.1 |
| *12-23 months* | 126 | 32.9 | 47.0 |
| *24-35 months* | 88 | 23.0 | 70.0 |
| *36-47 months* | 79 | 20.6 | 90.6 |
| *48-59 months* | 36 | 9.4 | 100.0 |
| ***Sex(n=383)*** | | | |
| *Male* | 215 | 56.1 | 56.1 |
| *Female* | 168 | 43.9 | 100.0 |
| ***Birth Order(n=383)*** | | | |
| *1st* | 200 | 52.2 | 52.2 |
| *2nd* | 110 | 28.7 | 80.9 |
| *3rd* | 48 | 12.5 | 93.5 |
| *4th* | 13 | 3.4 | 96.9 |
| *Other* | 12 | 3.1 | 100.0 |

Almost, 72percent of population were born with normal birth weight followed by 16.2percent children who born with low birth weight. Majority of the children 76.2percent were exclusively breastfed during the first 6 months of life. 46.7percent of children took 4-5 food groups as per reported by 24 hour dietary recall, which is grouped as medium dietary diversity. 31.1percent and 22.2percent children had a high and low dietary diversity respectively.

Table 2: Frequency and percentage distribution of Child Related Factors by Nutritional Characteristics

| *Independent Variable* | *Frequency* | *Percentage* | *C. Percentage* |
|---|---|---|---|
| ***Low Birth weight(n=383)*** | | | |
| < 2500 gm | 62 | 16.2 | 16.2 |
| 2500-4000 gm | 275 | 71.8 | 88.0 |
| > 4000 gm | 46 | 12.0 | 100.0 |
| ***Breastfeeding(n=383)*** | | | |
| *Yes* | 292 | 76.2 | 76.2 |
| *No* | 91 | 23.8 | 100.0 |
| ***Dietary Diversity(n=383)*** | | | |
| *Low (≤3 food groups)* | 85 | 22.2 | 22.2 |
| *Med (4-5 Food Groups)* | 179 | 46.7 | 68.9 |
| *High (≥6 Food Groups)* | 119 | 31.1 | 100.0 |

The results of the disease history in Table 3 shows that 24.5percent children had fever and 22.5percent children had runny nose in past 2 weeks. 8 children in total had chronic disease as well from which 6 of them had asthma and one each for cardiovascular disease and diabetes.

Table 3: Frequency and percentage distribution of Child Related Factors by Disease History

| *Independent Variable* | | | *Frequency* | *Percentage* |
|---|---|---|---|---|
| ***History of Disease*** | | | | |
| ***Acute*** | *Diarrhea (n=383)* | *Yes* | 61 | 15.9 |
| | | *No* | 322 | 84.1 |
| | *Fever (n=383)* | *Yes* | *94* | 24.5 |
| | | *No* | *289* | 75.5 |
| | *Runny Nose (n=383)* | *Yes* | *86* | 22.5 |
| | | *No* | *297* | 77.5 |
| | *Cough (n=383)* | *Yes* | *61* | 15.9 |
| | | *No* | *322* | 84.1 |
| ***Chronic*** | *CVD* | | *1* | *0.3* |
| | *CKD* | | *0* | *0* |
| | *Diabetes* | | *1* | *0.3* |
| | *Asthma* | | *6* | *1.6* |

The results of table 4 reveled that majority of children (91.4percent) needed medical care in last 6 months and 35.5percent of them visits public health care sector and

29percent of them goes to government hospital while 50.9percent of total goes to private health care sector in which 23.2percent prefers to visit private hospital and clinics whereas only 5percent of mothers rely on other sources for their child. Not getting an appointment was main reason (18.5percent) by the mothers for not getting a care for their child. Only 22 vaccination cards were available, 14 of those children were identified as fully immunized with valid doses who had reached the minimum age for vaccine and were administrated, rest of 8(36 percent) children were not fully vaccinated according to their age.

Table 4: Frequency and percentage distribution of Child Related Factors by Health Service Use

| ***Independent Variable*** | | ***Frequency*** | ***Percentage*** | ***C. Percentage*** |
|---|---|---|---|---|
| ***Medical Care Needed in Last 6 months(n=383)*** | | | | |
| *Yes* | | 350 | 91.4 | 91.4 |
| *No* | | 33 | 8.6 | 100.0 |
| ***Preference in Health Sector Use(n=383)*** | | | | |
| *Public Sector* | | 136 | 35.5 | 35.5 |
| *Private Sector* | | 195 | 50.9 | 86.4 |
| *Other* | | 19 | 5.0 | 91.4 |
| *Question not relevant* | | 33 | 8.6 | 100.0 |
| ***Preference in Health Sector Use(details)*** | | | | |
| *Public* ***(n=38*** | *Government Hospital* | 111 | 29.0 | 29.0 |
| | *Dispensary* | 25 | 6.5 | 35.5 |
| | *Private and others* | 247 | 64.5 | 100.0 |
| *Private* ***(n=383)*** | *Private Hospital or Clinic* | 89 | 23.2 | 23.2 |
| | *Private Physician* | 63 | 16.4 | 39.7 |
| | *Private Pharmacy* | 43 | 11.2 | 50.9 |
| | *Public and Others* | 188 | 49.1 | 100.0 |
| *Other* ***(n=383)*** | *Relative* | 5 | 1.3 | 1.3 |
| | *Friend* | 5 | 1.3 | 2.6 |
| | *Homeopath* | 7 | 1.8 | 4.4 |
| | *Traditional Practitioner* | 2 | .5 | 5.0 |
| | *Public and Private* | 364 | 95.0 | 100.0 |
| ***Reasons For Not Getting Care (n=383)*** | | | | |
| *Couldn't Afford Care* | | 31 | 8.1 | 8.1 |
| *Didn't know where to find care* | | 23 | 6.0 | 14.1 |
| *Couldn't get appointment anywhere* | | 71 | 18.5 | 32.6 |
| *None available* | | 1 | .3 | 32.9 |
| *Other(never happened)* | | 131 | 34.2 | 67.1 |
| *No Reason* | | 126 | 32.9 | 100.0 |
| ***Availability of Vaccination Card*** | | | | |
| *Yes* | | 22 | 5.74 | 5.74 |
| *No* | | 361 | 94.25 | 100.0 |
| ***Validity of Doses (n=22)*** | | | | |
| *Valid doses* | | 14 | 63.63 | 63.63 |
| *Invalid doses* | | 8 | 36.36 | 100.0 |

According to the results of food security in table 5 variety of food were available to 96.3percent of the population and it was affordable to 71.8percent of them. 5.2percent of children had to eat limited variety of food which happened three to ten times in past four weeks with 2.9percent of the population.

Almost, 5.2percent children had less than 3 meals per day and had smaller amount of food as well which happened to 2.1percent and 2.6percent of the population, three to ten times in past four week respectively.

Table 5: Frequency and percentage distribution of Child Related Factors by Food Security

| | ***Independent Variable*** | ***Frequency*** | ***Percentage*** | ***C. Percentage*** |
|---|---|---|---|---|
| ***AVAILABILITY*** | ***Variety Of Food Available(n=383)*** | | | |
| | *Yes* | 369 | 96.3 | 96.3 |
| | *No* | 14 | 3.7 | 100.0 |
| | ***Affordability to Household(n=383)*** | | | |
| | *Yes* | 275 | 71.8 | 71.8 |
| | *No* | 94 | 24.5 | 96.3 |
| | *Question N/A* | 14 | 3.7 | 100.0 |
| ***ACCESS*** | ***Child Ate Limited Variety Of Food(n=383)*** | | | |
| | *Yes* | 20 | 5.2 | 5.2 |
| | *No* | 363 | 94.8 | 100.0 |
| | ***Frequency Of Eating Limited Variety(n=383)*** | | | |
| | *Rarely* | 3 | .8 | .8 |
| | *Sometimes* | 11 | 2.9 | 3.7 |
| | *Often* | 6 | 1.6 | 5.2 |
| | *Question N/A* | 363 | 94.8 | 100.0 |
| ***UTILIZATION*** | ***Insufficient no. of Meals Per Day(< 3)(n=383)*** | | | |
| | *Yes* | 20 | 5.2 | 5.2 |
| | *No* | 5 | 1.3 | 6.5 |
| | *Question N/A* | 358 | 93.5 | 100.0 |
| | ***Frequency of Insufficient Meals(n=383)*** | | | |
| | *Rarely* | 6 | 1.6 | 1.6 |
| | *Sometimes* | 8 | 2.1 | 3.7 |
| | *Often* | 6 | 1.6 | 5.2 |
| | *Question N/A* | 363 | 94.8 | 100.0 |
| | ***Ate Smaller Amount Of Food When Meals Are Insufficient(n=383)*** | | | |
| | *Yes* | 20 | 5.2 | 5.2 |
| | *No* | 5 | 1.3 | 6.5 |
| | *Question N/A* | 358 | 93.5 | 100.0 |
| | ***Frequency Of Eating Smaller Meals(n=383)*** | | | |
| | *Rarely* | 7 | 1.8 | 1.8 |
| | *Sometimes* | 10 | 2.6 | 4.4 |
| | *Often* | 3 | .8 | 5.2 |
| | *Question N/A* | 363 | 94.8 | 100.0 |

In table 6 mothers' BMI revealed that 64.8percent of were normal and 21.7percent of them were overweight and majority 90.3percent of mothers had an above primary (> 5

grade) education. 82percent of the mothers reported that they had made more than 4 visits for antenatal care during pregnancy. 17percent said that they visited for 1-3 times and only 1percent didn't pay a visit for a single time.52.2percent children were first born and 33.68 had > 24 months birth interval and 14.1percent had < 24 month birth interval compared to their elder sibling.

Table 6:Frequency and percentage distribution by Mother Related Factors

| ***Independent Variables*** | ***Frequency*** | ***Percentage*** | ***C. Percentage*** |
|---|---|---|---|
| ***BMI(n=383)*** | | | |
| *Underweight* | 13 | 3.4 | 3.4 |
| *Normal* | 248 | 64.8 | 68.1 |
| *Overweight* | 83 | 21.7 | 89.8 |
| obese I | 39 | 10.2 | 100.0 |
| ***Educational level(n=383)*** | | | |
| *Illiterate* | 12 | 3.1 | 3.1 |
| *Primary* | 25 | 6.5 | 9.7 |
| *Above primary* | 346 | 90.3 | 100.0 |
| ***No of ANC visits(n=383)*** | | | |
| *None* | 4 | 1.0 | 1.0 |
| *1-3* | 65 | 17.0 | 18.0 |
| *≥4* | 314 | 82.0 | 100.0 |
| ***Birth interval(n=383)*** | | | |
| *≤24 months* | 54 | 14.1 | 14.1 |
| *>24 months* | 129 | 33.68 | 47.7 |
| *1st born* | 200 | 52.2 | 100.0 |

Table 7 showed that 81.7percent were living in the urban (non-slum), the 56.4percent of the head of the family were professionally employed and 21.4%, 7.6% and 6.8% were salesman, labor and clerk respectively.

Table 7 Frequency and percentage distribution by household socio-demographic factors

| **Household Socio-demographic Factors** | **Frequency** | **Percentage** | ***C. Percentage*** |
|---|---|---|---|
| ***Place of residence(n=383)*** | | | |
| *Urban (non-slum)* | 313 | 81.7 | 81.7 |
| *Urban (slum)* | 70 | 18.3 | 100.0 |
| ***Employment Status of Head of Family(n=383)*** | | | |
| *Unemployed* | 15 | 3.9 | 3.9 |
| *Domestic Worker* | 15 | 3.9 | 7.8 |
| *Labor* | 29 | 7.6 | 15.4 |
| *Salesman* | 82 | 21.4 | 36.8 |
| *Clerk* | 26 | 6.8 | 43.6 |
| *Professional* | 216 | 56.4 | 100.0 |

International wealth index were categorized as below and above average. For each possession of household item 1 score was given and for every high, medium and low quality of floor material, toilet material and water sources 3, 2 and 1 scores were given respectively. Total score becomes 20 and then below and above average were taken as per Pakistan's international wealth index which in 52.9.

93.2percent of the household were above Pakistan's' international wealth index average and 76.5percent of household were in the highest quintile.

*Table 7 Frequency and percentage distribution by household socio-demographic factors (Cont.)*

| Household Socio-demographic Factors | Frequency | Percentage | *C. Percentage* |
|---|---|---|---|
| ***IWI (international wealth Index) (n=383)*** | | | |
| *Below average* | *26* | *6.8* | *6.8* |
| *Above average* | *357* | *93.2* | *100.0* |
| ***IWI Quintiles(n=383)*** | | | |
| *≤ 20.0 (Lowest)* | 0 | 0.0 | 0.0 |
| *20.1 - 40.0 (Second)* | 16 | 4.2 | 4.2 |
| *40.1 - 60.0 (Middle)* | 33 | 8.6 | 12.8 |
| *60.1 - 80.0 (Fourth)* | 41 | 10.7 | 23.5 |
| *≥ 80.1 (Highest)* | 293 | 76.5 | 100.0 |



Table 8 *displays the prevalence of undernourished, normal and overweight children. 91.4percent of children were normal or well nourished.*

*Table 8: Frequency and percentage distribution of Children Nutritional Status*

| ***Dependent Variable*** | **Frequency** | **Percentage** | *C. Percentage* |
|---|---|---|---|
| Undernourished | 14 | 3.7 | 3.7 |
| Normal | 350 | 91.4 | 95.0 |
| Overweight | 19 | 5.0 | 100.0 |

Table 9the three most commonly used anthropometric indices to assess child growth status are weight-for-age, weight-for-height, height-for-age. These three indices in table 9 are stated in calculated z-score as per WHO Global Database on Child Growth and Malnutrition recommendation.

In term of weight for age 94.8 percent children were normal and 3.9 percent were underweight. As per weight for height 91.6 percent children were normal, 4.7 percent of them were overweight and 1.8 percent were wasted and severely wasted. According to the results for height for age 87.2 percent were normal and 11.2 percent were stunted.

Table 9: Frequency and percentage distribution by Undernourished Status

| ***Dependent Variable*** | | ***Frequency*** | ***Percentage*** | ***C. Percentage*** |
|---|---|---|---|---|
| *Weight for Age* ***(n=383)*** | *Overweight (>+2 SD)* | 1 | .3 | .3 |
| | *Normal (-2 SD – +2 SD)* | 363 | 94.8 | 95.0 |
| | *Underweight (<-2SD)* | 15 | 3.9 | 99.0 |
| | *Severely Underweight(<-3SD)* | 4 | 1.0 | 100.0 |
| *Weight for Height* ***(n=383)*** | *Overweight(>+2 SD)* | 18 | 4.7 | 4.7 |
| | *Normal(-2 SD – +2 SD)* | 351 | 91.6 | 96.3 |
| | *Wasted(<-2SD)* | 7 | 1.8 | 98.2 |
| | *Severely wasted(<-3SD)* | 7 | 1.8 | 100.0 |
| *Height for Age.* ***(n =383)*** | *Normal(-2 SD – +2 SD)* | 334 | 87.2 | 87.2 |
| | *Stunted(<-2SD)* | 43 | 11.2 | 98.4 |
| | *Severely stunted(<-3SD)* | 6 | 1.6 | 100.0 |

## 4.2 INFERENTIAL ANALYSIS

### *4.2.1 Bivariate Analysis*

Bivariate analysis shows the association of various independent variables (child related factors, mother related factors and household socio-demographic factors) and dependent variables (weight for age, weight for height, height for age) by using chi-square test or fisher exact test.

#### *4.2.1.1 Bivariate analysis weight for age*

There is a significant association (0.002) between weight for age and age groups. Children at the age of 36-47 months have highest number of underweight cases than any other age group. Females were more underweight and severely underweight comparatively to males but it doesn't show any significance statistically. *(Table 10)*

Table 10: Association between Child Related Demographic Factors and weight for age

| ***ndependent Variable*** | ***Weight for Age*** | | | | ***χ2*** | ***p-value*** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Underweight f (%)*** | ***Severely Underweight f (%)*** | | |
| ***Town(n=383)*** | | | | | | |
| Liaquatabad | 1(0.26%) | 133(34.72%) | 5(1.30%) | 2(0.52%) | .580 | .691 |
| Orangi | 0 (0%) | 126(32.89%) | 8(2.08%) | 1(0.26%) | | |
| Saddar | 0 (0%) | 104(27.15%) | 2(0.52%) | 1(0.26%) | | |
| ***Age (n=383)*** | | | | | | |
| *0-11 months* | 0 (0%) | 52(13.57%) | 2(0.52%) | 0 (0%) | .035 | ***.002*** |
| *12-23 months* | 1(0.26%) | 123(32.11%) | 2(0.52%) | 0 (0%) | | |
| *24-35 months* | 0(0%) | 87(22.71%) | 0(0%) | 1(0.26%) | | |
| *36-47 months* | 0(0%) | 69(18.01%) | 8(2.08%) | 2(0.52%) | | |
| *48-59 months* | 0(0%) | 32(8.35%) | 3(0.78%) | 1(0.26%) | | |
| ***Sex(n=383)*** | | | | | | |
| *Male* | 1(0.26%) | 205(53.52%) | 8(2.08%) | 1(0.26%) | .561 | .539 |
| *Female* | 0(0%) | 158(41.25%) | 7(1.82%) | 3(0.78%) | | |
| ***Birth Order(n=383)*** | | | | | | |
| *1st* | 0(0%) | 197(51.43%) | 3(0.78%) | 0(0%) | <.001 | ***<.001*** |
| *2nd* | 0(0%) | 100(26.10%) | 8(2.08%) | 2(0.52%) | | |
| *3rd* | 0(0%) | 44(11.48%) | 4(1.04%) | 0(0%) | | |
| *4th* | 0(0%) | 11(2.87%) | 0(0%) | 2(0.52%) | | |
| *Other* | 1(0.26%) | 11(2.87%) | 0(0%) | 0(0%) | | |

*Fisher`s Exact tests results

Being 2nd born is highly (<0.001) associated with underweight and severely underweightBirth with <2500 gm weight is also as .s) ociatedp-value with low (0.002 weight forage.*(Table 11)*



Table 11: Association between Child Related Factors by Nutritional Characteristics and weight for age

| ***Independent Variable*** | ***Weight for Age*** | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Underweight f (%)*** | ***Severely Underweight f (%)*** | | |
| ***Low Birth weight(n=383)*** | | | | | | |
| < 2500 gm | 0(0%) | 53(13.83%) | 6(1.56%) | 3(0.78%) | .001 | ***.002*** |
| 2500-4000 gm | 0(0%) | 266(69.45%) | 8(2.08%) | 1(0.26%) | | |
| > 4000 gm | 1(0.26%) | 44(11.48%) | 1(0.26%) | 0(0%) | | |
| ***Breastfeeding(n=383)*** | | | | | | |
| *Yes* | 1(0.26%) | 274(71.54%) | 12(3.13%) | 4(1.04%) | .687 | .850 |
| *No* | 0(0%) | 88(22.97%) | 3(0.78%) | 0(0%) | | |
| ***Dietary Diversity(n=383)*** | | | | | | |
| *Low(≤3 groups)* | 0(0%) | 82(21.40%) | 3(0.78%) | 0(0%) | .684 | .684 |
| *Med (4-5 groups)* | 1(0.26%) | 171(44.64%) | 5(1.30%) | 2(0.52%) | | |
| *High ( ≥6 groups)* | 0(0%) | 110(28.72%) | 7(1.82%) | 2(0.52%) | | |

*Fisher`s Exact tests results

history in which runny nose and cough in past 2 weeks reveals the Acute disease .associaation which is statistically significant at 0.016 and 0.014*(Table 12)*

Table 12: Association between Child Related Factors by Disease History and weight for age

| ***Independent Variable*** | | ***Weight for Age*** | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|---|
| | | ***Overweight f (%)*** | ***Normal f (%)*** | ***Underweight f (%)*** | ***Severely Underweight f (%)*** | | |
| ***Disease History*** | | | | | | | |
| *Diarrhea* ***(n=383)*** | *Yes* | 1(0.26%) | 57(14.88%) | 2(0.52%) | 1(0.26%) | .132 | .185 |
| | *No* | 0(0%) | 306(79.89%) | 13(3.39%) | 3(0.78%) | | |
| *Fever* ***(n=383)*** | *Yes* | 0(0%) | 86(22.45%) | 6(1.56%) | 2(0.52%) | .284 | .232 |
| | *No* | 1(0.26%) | 277(72.32%) | 9(2.34%) | 2(0.52%) | | |
| *Runny Nose* ***(n=383)*** | *Yes* | 0(0%) | 77(20.10%) | 6(1.56%) | 3(0.78%) | .022 | ***.016*** |
| | *No* | 1(0.26%) | 286(74.67%) | 9(2.34%) | 1(0.26%) | | |
| *Cough* ***(n=383)*** | *Yes* | 0(0%) | 54(14.09%) | 4(1.04%) | 3(0.78%) | .007 | ***.014*** |
| | *No* | 1(0.26%) | 309(80.67%) | 11(2.87%) | 1(0.26%) | | |
| *Asthma* ***(n=383)*** | *Yes* | 0(0%) | 6(1.56%) | 0(0%) | 0(0%) | 0.95 | 1.00 |
| | *No* | 1(0.26%) | 357(93.21%) | 15(3.91%) | 4(1.04%) | | |

*Fisher`s Exact tests results

Table 13: Association between Child Related Factors by Health Service Use and Weight for Age

| ***Independent Variable*** | *Weight for Age* | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Underweight f (%)*** | ***Severely Underweight f (%)*** | | |
| ***Medical Care Needed in Last 6 months(n=383)*** | | | | | | |
| *Yes* | 1(0.26%) | 331(86.42%) | 14(3.65%) | 4(1.04%) | .905 | 1.000 |
| *No* | 0(0%) | 32(8.35%) | 1(0.26%) | 0(0%) | | |
| ***Health Sector(n=383)*** | | | | | | |
| *Public Sector* | 0(0%) | 129(33.68%) | 6(1.56%) | 1(0.26%) | .983 | .975 |
| *Private Sector* | 1(0.26%) | 184(48.04%) | 7(1.82%) | 3(0.78%) | | |
| *Other* | 0(0%) | 18(4.69%) | 1(0.26%) | 0(0%) | | |
| *Question N/A* | 0(0%) | 32(8.35%) | 1(0.26%) | 0(0%) | | |

*Fisher`s Exact tests results

Unavailability of food variety in market is low associated (0.048) with underweight and severely underweight although utilization of sufficient number of meals per day that is 3 or more and consumption of smaller amount of food is highly associated (<0.001) with underweight and severely underweight *(Table 14)*

Table 14: Association between Child Related Factors by Food Security and Weight for Age

| *Independent Variable* | *Weight for Age* | | | | *χ2* | *p-value** |
|---|---|---|---|---|---|---|
| | *Overweight f (%)* | *Normal f (%)* | *Underweight f (%)* | *Severely Underweight f (%)* | | |
| ***Variety Of Food Available(n=383)*** | | | | | | |
| *Yes* | 1(0.26%) | 352(91.90%) | 12(3.13%) | 4(1.04%) | .007 | ***.048*** |
| *No* | 0(0%) | 11(2.87%) | 3(0.78%) | 0(0%) | | |
| ***Child Ate Limited Variety Of Food(n=383)*** | | | | | | |
| *Yes* | 0(0%) | 18(4.69%) | 2(0.52%) | 0(0%) | 509 | .377 |
| *No* | 1(0.26%) | 345(90.07%) | 13(3.39%) | 4(1.04%) | | |
| ***Sufficient no. of Meals Per Day(3 Or More)(n=383)*** | | | | | | |
| *Yes* | 0(0%) | 18(4.69%) | 2(0.52%) | 0(0%) | <0.001 | ***<0.001*** |
| *No* | 0(0%) | 1(0.26%) | 2(0.52%) | 2(0.52%) | | |
| *Question N/A* | 1(0.26%) | 344(89.81%) | 11(2.87%) | 2(0.52%) | | |
| ***Ate Smaller Amount Of Food When Meals Are Insufficient(n=383)*** | | | | | | |
| *Yes* | 0(0%) | 18(4.69%) | 2(0.52%) | 0(0%) | <0.001 | ***<0.001*** |
| *No* | 0(0%) | 1(0.26%) | 2(0.52%) | 2(0.52%) | | |
| *Question N/A* | 1(0.26%) | 344(89.81%) | 11(2.87%) | 2(0.52%) | | |

*Fisher`s Exact tests results

Result to see the association between mother related factors and weight for age reveals that mother BMI has an association (0.046) moreover children whose birth interval between them and their elder sibling is $\leq$ 24 months are also associated with low weight for age .*(Table15)*

Table 15: Association between Mother related factors and Weight for Age.

| *Independent Variable* | *Weight for Age* | | | | *χ2* | *p-value** |
|---|---|---|---|---|---|---|
| | *Overweight f (%)* | *Normal f (%)* | *Underweight f (%)* | *Severely Underweight f (%)* | | |
| ***BMI(n=383)*** | | | | | | |
| *Underweight* | 0(0%) | 11(2.87%) | 2(0.52%) | 0(0%) | .015 | ***.046*** |
| *Normal* | 0(0%) | 238(62.14%) | 9(2.34%) | 1(0.26%) | | |
| *Overweight* | 0(0%) | 77(20.10%) | 3(0.78%) | 3(0.78%) | | |
| obese I | 1(0.26%) | 37(9.66%) | 1(0.26%) | 0(0%) | | |
| ***Educational level(n=383)*** | | | | | | |
| *Illiterate* | 0(0%) | 11(2.87%) | 1(0.26%) | 0(0%) | .978 | .734 |
| *Primary* | 0(0%) | 24(6.26%) | 1(0.26%) | 0(0%) | | |
| *Above primary* | 1(0.26%) | 328(85.63%) | 13(3.39%) | 4(1.04%) | | |
| ***No of ANC visits(n=383)*** | | | | | | |
| *None* | 0(0%) | 4(1.04%) | 0(0%) | 0(0%) | .662 | .490 |
| *1-3* | 0(0%) | 60(15.66%) | 5(1.30%) | 0(0%) | | |
| *$\geq$4* | 1(0.26%) | 299(78.06%) | 10(2.61%) | 4(1.04%) | | |
| ***Birth interval(n=383)*** | | | | | | |
| *$\leq$24 months* | 1(0.5%) | 51(27.86%) | 2(1%) | 0(0%) | .004 | ***.007*** |
| *>24 months* | 0(0%) | 116(63.38%) | 9(4.91%) | 4(2.18%) | | |

*Fisher`s Exact tests results

Table 16and 17 doesn't show any association between household socio-demographic factors and weight for age.

Table 16: Association between household Socio-demographic factors and Weight for Age

| *Independent Variable* | *Weight for Age* | | | | *χ2* | *p-value** |
|---|---|---|---|---|---|---|
| | *Overweight f (%)* | *Normal f (%)* | *Underweight f (%)* | *Severely Underweight f (%)* | | |
| ***Place of residence(n=383)*** | | | | | | |
| *Urban (non-slum)* | 1(0.26%) | 299(78.06%) | 10(2.61%) | 3(0.78%) | .436 | .337 |
| *Urban (slum)* | 0(0%) | 64(16.71%) | 5(1.30%) | 1(0.26%) | | |
| ***Employment Status of Head of Family(n=383)*** | | | | | | |
| *Unemployed* | 0(0%) | 14(3.65%) | 1(0.26%) | 0(0%) | .063 | .069 |
| *Domestic Worker* | 0(0%) | 14(3.65%) | 1(0.26%) | 0(0%) | | |
| *Labor* | 0(0%) | 26(6.78%) | 3(0.78%) | 0(0%) | | |
| *Salesman* | 0(0%) | 76(19.84%) | 4(1.04%) | 2(0.52%) | | |
| *Clerk* | 1(0.26%) | 23(6.0%) | 1(0.26%) | 1(0.26%) | | |
| *Professional* | 0(0%) | 210(54.83%) | 5(1.30%) | 1(0.26%) | | |
| ***IWI (international wealth Index)(n=383)*** | | | | | | |
| *Below average* | 0(0%) | 24(6.26%) | 2(0.52%) | 0(0%) | .706 | .491 |
| *Above average* | 1(0.26%) | 339(88.51%) | 13(3.39%) | 4(1.04%) | | |
| ***IWI Quintiles(n=383)*** | | | | | | |
| *≤ 20.0 (Lowest)* | 0(0%) | 0(0%) | 0(0%) | 0(0%) | .789 | .478 |
| *20.1-40.0(Second)* | 0(0%) | 14(3.65%) | 2(0.52%) | 0(0%) | | |
| *40.1-60.0(Middle)* | 0(0%) | 31(8.09%) | 2(0.52%) | 0(0%) | | |
| *60.1-80.0 (Fourth)* | 0(0%) | 39(10.18%) | 1(0.26%) | 1(0.26%) | | |
| *≥ 80.1(Highest)* | 1(0.26%) | 279(72.84%) | 10(2.61%) | 3(0.78%) | | |

*Fisher`s Exact tests results

### *4.2.1.2 Bivariate analysis Weight for Height*

Table 17: Association between Child Related Demographic Factors and weight for height

| *Independent Variable* | ***Weight for Height*** | | | | *χ2* | *p-value** |
|---|---|---|---|---|---|---|
| | *Overweight f (%)* | *Normal f (%)* | *Wasted f (%)* | *Severely Wasted f (%)* | | |
| ***Town*** | | | | | | |
| *Liaquatabad* | 5(1.30%) | 132(34.46%) | 2(0.52%) | 2(0.52%) | .664 | .721 |
| *Orangi* | 10(2.61%) | 119(31.07%) | 3(0.78%) | 3(0.78%) | | |
| *Saddar* | 3(0.78%) | 100(26.10%) | 2(0.52%) | 2(0.52%) | | |
| ***Age(n=383)*** | | | | | | |
| *0-11 months* | 0(0%) | 51(13.31%) | 2(0.52%) | 1(0.26%) | .008 | - |
| *12-23 months* | 11(2.87%) | 115(30.02%) | 0(0%) | 0(0%) | | |
| *24-35 months* | 2(0.52%) | 85(22.19%) | 0(0%) | 1(0.26%) | | |
| *36-47 months* | 2(0.52%) | 70(18.27%) | 4(1.04%) | 3(0.78%) | | |
| *48-59 months* | 3(0.78%) | 30(7.83%) | 1(0.26%) | 2(0.52%) | | |
| ***Sex(n=383)*** | | | | | | |
| *Male* | 14(3.65%) | 195(50.91%) | 4(1.04%) | 2(0.52%) | .131 | .129 |
| *Female* | 4(1.04%) | 156(40.73%) | 3(0.78%) | 5(1.30%) | | |
| ***Birth Order(n=383)*** | | | | | | |
| *1st* | 10(2.61%) | 187(48.82%) | 2(0.52%) | 1(0.26%) | .020 | .069 |
| *2nd* | 5(1.30%) | 99(25.84%) | 3(0.78%) | 3(0.78%) | | |
| *3rd* | 1(0.26%) | 44(11.48%) | 2(0.52%) | 1(0.26%) | | |
| *4th* | 0(0%) | 11(2.87%) | 0(0%) | 2(0.52%) | | |
| *Other* | 2(0.52%) | 10(2.61%) | 0(0%) | 0(0%) | | |

*Fisher`s Exact tests results

Association between child related factors and weight for height in which low weight at birth is highly associated (<0.001) with wasting and severe wasting although exclusive breastfeeding has low association (0.040).*(Table 18)* History of disease in past two weeks shows that fever and runny nose is associated with wasting and severe wasting. (*Table 19)*

Table 18: Association between Child Related Factors by Nutritional Characteristics and weight for height

| ***Independent Variable*** | ***Weight for Height*** | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Wasted f (%)*** | ***Severely Wasted f (%)*** | | |
| ***Low Birth weight(n=383)*** | | | | | | |
| < 2500 gm | 0(0%) | 56(14.62%) | 3(0.78%) | 3(0.78%) | .000 | ***.000*** |
| 2500-4000 gm | 6(1.56%) | 262(68.40%) | 3(0.78%) | 4(1.04%) | | |
| > 4000 gm | 12(3.13) | 33(8.61%) | 1(0.26%) | 0(0%) | | |
| ***Breastfeeding(n=383)*** | | | | | | |
| *Yes* | 18(4.69%) | 263(68.66%) | 6(1.56%) | 5(1.30%) | .095 | ***.040*** |
| *No* | 0(0%) | 88(22.97%) | 1(0.26%) | 2(0.52%) | | |
| ***Dietary Diversity(n=383)*** | | | | | | |
| *Low(≤3 groups)* | 7(1.82%) | 75(19.58%) | 2(0.52%) | 1(0.26%) | .388 | .381 |
| *Med (4-5 groups)* | 7(1.82%) | 168(43.86%) | 2(0.52%) | 2(0.52%) | | |
| *High( ≥6 groups)* | 4(1.04%) | 108(28.19%) | 3(0.78%) | 4(1.04%) | | |

*Fisher`s Exact tests results

Table 19: Association between Child Related Factors by Disease History and weight for height

| ***Independent Variable*** | | ***Weight for Height*** | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|---|
| | | ***Overweight f (%)*** | ***Normal f (%)*** | ***Wasted f (%)*** | ***Severely Wasted f (%)*** | | |
| ***Disease History*** | | | | | | | |
| *Diarrhea* ***(n=383)*** | *Yes* | 2(0.52%) | 58(15.14%) | 0(0%) | 1(0.26%) | .627 | .836 |
| | *No* | 16(4.17%) | 293(76.50%) | 7(1.82%) | 6(1.56%) | | |
| *Fever* ***(n=383)*** | *Yes* | 0(0%) | 89(23.23%) | 2(0.52%) | 3(0.78%) | .063 | ***.021*** |
| | *No* | 18(4.69%) | 262(68.40%) | 5(1.30%) | 4(1.04%) | | |
| *Runny Nose* ***(n=383)*** | *Yes* | 2(0.52%) | 77(20.10%) | 4(1.04%) | 3(0.78%) | .048 | ***.047*** |
| | *No* | 16(4.17%) | 274(71.54%) | 3(0.78%) | 4(1.04%) | | |
| *Cough* ***(n=383)*** | *Yes* | 3(0.78%) | 54(14.09%) | 1(0.26%) | 3(0.78%) | .274 | .240 |
| | *No* | 15(3.91%) | 297(77.54%) | 6(1.56%) | 4(1.04%) | | |
| *Asthma* ***(n=383)*** | *Yes* | 0(0%) | 6(1.56%) | 0(0%) | 0(0%) | 0.90 | 1.00 |
| | *No* | 18(4.69%) | 345(90.07%) | 7(1.82%) | 7(1.82%) | | |

*Fisher`s Exact tests results

Public and private health sectors and unavailability of care needed in last 6 months were not shown to be significant.*(Table20)*Unavailability of variety of food, insufficient number and small quantity of food appeared to be linked and statistically significant at

0.009, 0.002 and 0.002 respectively with wasted and severely wasted children. *(Table 21).*Table 22 doesn't show any impact of mother related factors on child wasting.

Table 20: Association between child related factors by Health Service Use and Weight for Height

| ***Independent Variable*** | ***Weight for Height*** | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Wasted f (%)*** | ***Severely Wasted f (%)*** | | |
| ***Medical Care Needed in Last 6 months(n=383)*** | | | | | | |
| *Yes* | 16(4.17%) | 321(83.81%) | 6(1.56%) | 7(1.82%) | .779 | .703 |
| *No* | 2(0.52%) | 30(7.83%) | 1(0.26%) | 0(0%) | | |
| ***Health Sector(n=383)*** | | | | | | |
| *Public Sector* | 8(2.08%) | 124(32.37%) | 2(0.52%) | 2(0.52%) | .751 | .531 |
| *Private Sector* | 6(1.56%) | 181(47.25%) | 4(1.04%) | 4(1.04%) | | |
| *Other* | 2(0.52%) | 16(4.17%) | 0(0%) | 1(0.26%) | | |
| *Question N/A* | 2(0.52%) | 30(7.83%) | 1(0.26%) | 0(0%) | | |

*Fisher`s Exact tests results

Table 21: Association between child related factors by Food Security and Weight for Height.

| ***Independent Variable*** | ***Weight for Height*** | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Wasted f (%)*** | ***Severely Wasted f (%)*** | | |
| ***Variety Of Food Available(n=383)*** | | | | | | |
| *Yes* | 17(4.43%) | 341(89.03) | 5(1.30%) | 6(1.56%) | .001 | ***.009*** |
| *No* | 1(0.26%) | 10(2.61%) | 2(0.52%) | 1(0.26%) | | |
| ***Child Ate Limited Variety Of Food(n=383)*** | | | | | | |
| *Yes* | 1(0.26%) | 18(4.69%) | 1(0.26%) | 0(0%) | .669 | .565 |
| *No* | 17(4.43%) | 333(86.94%) | 6(1.56%) | 7(1.82%) | | |
| ***Sufficient no. of Meals Per Day(3 Or More)(n=383)*** | | | | | | |
| *Yes* | 1(0.26%) | 18(4.69%) | 1(0.26%) | 0(0%) | .000 | ***.002*** |
| *No* | 0(0%) | 2(0.52%) | 1(0.26%) | 2(0.52%) | | |
| *Question N/A* | 17(4.43%) | 331(86.42%) | 5(1.30%) | 5(1.30%) | | |
| ***Ate Smaller Amount Of Food When Meals Are Insufficient(n=383)*** | | | | | | |
| *Yes* | 1(0.26%) | 18(4.69%) | 1(0.26%) | 0(0%) | .000 | ***.002*** |
| *No* | 0(0%) | 2(0.52%) | 1(0.26%) | 2(0.52%) | | |
| *Question N/A* | 17(4.43%) | 331(86.42%) | 5(1.30%) | 5(1.30%) | | |

*Fisher`s Exact tests results

Table 22 Association between mother related factors and Weight for Height.

| *Independent Variable* | *Weight for Height* | | | | $\chi^2$ | *p-value** |
|---|---|---|---|---|---|---|
| | *Overweight f (%)* | *Normal f (%)* | *Wasted f (%)* | *Severely Wasted f (%)* | | |
| ***BMI(n=383)*** | | | | | | |
| *Underweight* | 1(0.26%) | 11(2.87%) | 1(0.26%) | 0(0%) | .376 | .234 |
| *Normal* | 14(3.65%) | 225(58.74%) | 5(1.30%) | 4(1.04%) | | |
| *Overweight* | 1(0.26%) | 79(20.62%) | 0(0%) | 3(0.78%) | | |
| obese I | 2(0.52%) | 36(9.39%) | 1(0.26%) | 0(0%) | | |
| ***Educational level(n=383)*** | | | | | | |
| *Illiterate* | 1(0.26%) | 11(2.87%) | 0(0%) | 0(0%) | .541 | .479 |
| *Primary* | 3(0.78%) | 22(5.74%) | 0(0%) | 0(0%) | | |
| *Above primary* | 14(3.65%) | 318(83.02%) | 7(1.82%) | 7(1.82%) | | |
| ***No of ANC visits(n=383)*** | | | | | | |
| *None* | 0(0%) | 4(1.04%) | 0(0%) | 0(0%) | .998 | 1.00 |
| *1-3* | 3(0.78%) | 60(15.66%) | 1(0.26%) | 1(0.26%) | | |
| *≥4* | 15(3.9%) | 287(74.93%) | 6(1.56%) | 6(1.56%) | | |
| ***Birth interval(n=383)*** | | | | | | |
| *≤24 months* | 2(1.09%) | 50(27.3%) | 1(0.54%) | 1(0.54%) | .341 | .289 |
| *>24 months* | 6(3.27%) | 114(62.29%) | 4(2.18%) | 5(2.73%) | | |

*Fisher`s Exact tests results

Table 23 displayed that in international wealth index those household which are below the average of Pakistan's average index that is 52.9 were moderately associated (p-value 0.032) with below -2 SD z-score for weight for height and IWI quintiles were also shown to be linked with low weight for height in which second quintile (20.1-40) had a the highest ratio of children that is 12.5percent of total who falls in the category of second quintile.

Table 23 Association between household socio-demographic factors and Weight for Height.

| *Independent Variable* | *Weight for Height* | | | | $\chi^2$ | *p-value** |
|---|---|---|---|---|---|---|
| | *Overweight f (%)* | *Normal f (%)* | *Wasted f (%)* | *Severely Wasted f (%)* | | |
| ***Place of residence(n=383)*** | | | | | | |
| *Urban (non-slum)* | 12(3.13%) | 292(76.24%) | 5(1.30%) | 4(1.04%) | .087 | .052 |
| *Urban (slum)* | 6(1.56%) | 59(15.40%) | 2(0.52%) | 3(0.78%) | | |
| ***Employment Status of Head of Family(n=383)*** | | | | | | |
| *Unemployed* | 1(0.26%) | 14(3.65%) | 0(0%) | 0(0%) | .255 | .128 |
| *Domestic Worker* | 0(0%) | 14(3.65%) | 1(0.26%) | 0(0%) | | |
| *Labor* | 4(1.04%) | 22(5.74%) | 1(0.26%) | 2(0.52%) | | |
| *Salesman* | 5(1.30%) | 73(19.06%) | 2(0.52%) | 2(0.52%) | | |
| *Clerk* | 1(0.26%) | 24(6.26%) | 0(0%) | 1(0.26%) | | |
| *Professional* | 7(1.82%) | 204(53.26%) | 3(0.78%) | 2(0.52%) | | |

*Fisher`s Exact tests results

*Table 23 Association between household socio-demographic factors and Weight for Height.(Cont.)*

| ***Independent Variable*** | *Weight for Height* | | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | ***Overweight f (%)*** | ***Normal f (%)*** | ***Wasted f (%)*** | ***Severely Wasted f (%)*** | | |
| ***IWI (international wealth Index)(n=383)*** | | | | | | |
| *Below average* | 4(1.04%) | 20(5.22%) | 1(0.26%) | 1(0.26%) | .034 | ***.032*** |
| *Above average* | 14(3.65%) | 331(86.42%) | 6(1.56%) | 6(1.56%) | | |
| ***IWI Quintiles(n=383)*** | | | | | | |
| *≤ 20.0 (Lowest)* | 0(0%) | 0(0%) | 0(0%) | 0(0%) | .048 | ***.023*** |
| *20.1-40.0(Second)* | 3(0.78%) | 11(2.87%) | 1(0.26%) | 1(0.26%) | | |
| *40.1-60.0(Middle)* | 2(0.52%) | 30(7.83%) | 1(0.26%) | 0(0%) | | |
| *60.1-80.0 (Fourth)* | 3(0.78%) | 36(9.39%) | 0(0%) | 2(0.52%) | | |
| *≥ 80.1 (Highest)* | 10(2.61%) | 274((71.54%) | 5(1.30%) | 4(1.04%) | | |

*Fisher`s Exact tests results

### *4.2.1.1 Bivariate analysis Height for Age*

Male were reported to be highly (18.60 percent) stunted and severely stunted as compare to female (5.35 percent) of the total population of males (n=215) and females (n=168). Gender was statistically highly significant (p-value <0.001) to stunting and severe stunting. (Table 24)

Table 24: Association between Child Related Demographic Factors and height for age

| ***Independent Variable*** | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|
| | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***Town*** | | | | | |
| Liaquatabad Town | 120(31.33%) | 18(4.69%) | 3(0.78%) | .527 | .389 |
| Orangi Town | 117(3.54%) | 15(3.91%) | 3(0.78%) | | |
| Saddar Town | 97(25.32%) | 10(2.61%) | 0(0%) | | |
| ***Age(n=383)*** | | | | | |
| *0-11 months* | 73(19.06%) | 7(1.82%) | 1(0.26%) | .621 | .605 |
| *12-23 months* | 87(22.71%) | 15(3.91%) | 3(0.78%) | | |
| *24-35 months* | 74(19.32%) | 12(3.13%) | 1(0.26%) | | |
| *36-47 months* | 70(18.27%) | 6(1.56%) | 0(0%) | | |
| *48-59 months* | 30(7.83%) | 3(0.78%) | 1(0.26%) | | |
| ***Sex(n=383)*** | | | | | |
| *Male* | 175(45.69%) | 35(9.13%) | 5(1.30%) | .001 | ***<.001*** |
| *Female* | 159(41.51%) | 8(2.08%) | 1(0.26%) | | |
| ***Birth Order(n=383)*** | | | | | |
| *1st* | 176(45.95%) | 22(5.74%) | 2(0.52%) | .963 | .907 |
| *2nd* | 94(24.54%) | 13(3.39%) | 3(0.78%) | | |
| *3rd* | 42(10.96%) | 5(1.30%) | 1(0.26%) | | |
| *4th* | 12(3.13%) | 1(0.26%) | 0(0%) | | |
| *Other* | 10(2.61%) | 2(0.52%) | 0(0%) | | |

*Fisher`s Exact tests results

Low birth weight displayed to be linked *(p-value 0.038)* with stunting and severe stunting. 22.58percent of children *(n=62)* were reported to be stunted and severely stunted who born with <2500gm of birth weight. *(Table 25)*

Table 25*: Association between Child Related Factors by Nutritional Characteristics and height for age*

| ***Independent Variable*** | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|
| | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***Low Birth weight(n=383)*** | | | | | |
| < 2500 gm | 48(12.53%) | 11(2.87%) | 3(0.78%) | .044 | ***.038*** |
| 2500-4000 gm | 244(63.70%) | 29(7.57%) | 2(0.52%) | | |
| > 4000 gm | 42(10.96%) | 3(0.78%) | 1(0.26%) | | |
| ***Breastfeeding(n=383)*** | | | | | |
| *Yes* | 255(66.57%) | 32(8.35%) | 5(1.30%) | .884 | .944 |
| *No* | 79(20.62%) | 11(2.87%) | 1(0.26%) | | |
| ***Dietary Diversity(n=383)*** | | | | | |
| *Low(≤3 groups)* | 77(20.10%) | 6(1.56%) | 2(0.52%) | .647 | .605 |
| *Med (4-5 groups)* | 154(40.20%) | 23(6.0%) | 2(0.52%) | | |
| *High ( ≥6 groups)* | 103(26.89%) | 14(3.65%) | 2(0.52%) | | |

*Fisher`s Exact tests results

Table 26 and 27 doesn't show any association between child related disease history and health service use factors and height for age.

Table 26: Association between Child Related Factors by Disease History and height for age

| ***Independent Variable*** | | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|---|
| | | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***Disease History*** | | | | | | |
| *Diarrhea* ***(n=383)*** | *Yes* | 49(12.79%) | 11(2.87%) | 1(0.26%) | .184 | .147 |
| | *No* | 285(74.41%) | 32(8.35%) | 5(1.30%) | | |
| *Fever* ***(n=383)*** | *Yes* | 80(20.88%) | 12(3.13%) | 2(0.52%) | .750 | .676 |
| | *No* | 254((66.31%) | 31(8.09%) | 4(1.04%) | | |
| *Runny Nose* ***(n=383)*** | *Yes* | 73(19.06%) | 10(2.61%) | 3(0.78%) | .259 | .244 |
| | *No* | 261(68.14%) | 33(8.61%) | 3(0.78%) | | |
| *Cough* ***(n=383)*** | *Yes* | 53(13.83%) | 5(1.30%) | 3(0.78%) | .055 | .084 |
| | *No* | 281(73.36%) | 38(9.92%) | 3(0.78%) | | |
| *Asthma* ***(n=383)*** | *Yes* | 6(1.56%) | 0(0%) | 0(0%) | 0.63 | 1.0 |
| | *No* | 328(85.63%) | 43(11.22%) | 6(1.56%) | | |

*Fisher`s Exact tests results

*Table 27*: Association between child related factors by Health Service Use and Height for Age

| ***Independent Variable*** | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|
| | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***Medical Care Needed in Last 6 months(n=383)*** | | | | | |
| *Yes* | 305(79.63%) | 39(10.18%) | 6(1.56%) | .743 | .872 |
| *No* | 29(7.57%) | 4(1.04%) | 0(0%) | | |
| ***Health Sector(n=383)*** | | | | | |
| *Public Sector* | 118(30.80%) | 16(4.17%) | 2(0.52%) | .711 | .784 |
| *Private Sector* | 168(43.86%) | 23(6.0%) | 4(1.04%) | | |
| *Other* | 19(4.96%) | 0(0%) | 0(0%) | | |
| *Question N/A* | 29(7.57%) | 4(1.04%) | 0(0%) | | |

*Fisher`s Exact tests results

Table 28 displays that insufficient (<3) number of meals and small quantity of meals were stated to be interrelated *(p-value 0.010)* with low height for age.

Table 28: Association between child related factors by Food Security and Height for Age

| ***Independent Variable*** | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|
| | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***Variety Of Food Available(n=383)*** | | | | | |
| *Yes* | 320(83.55%) | 43(11.22%) | 6(1.56%) | .344 | .508 |
| *No* | 14(3.65%) | 0(0%) | 0(0%) | | |
| ***Child Ate Limited Variety Of Food(n=383)*** | | | | | |
| *Yes* | 19(4.96%) | 1(0.26%) | 0(0%) | .547 | .793 |
| *No* | 315 (82.24%) | 42(10.96%) | 6(1.56%) | | |
| ***Sufficient no. of Meals Per Day(3 Or More)(n=383)*** | | | | | |
| *Yes* | 19(4.96%) | 1(0.26%) | 0(0%) | .000 | ***.010*** |
| *No* | 3(0.78%) | 0(0%) | 2(0.52%) | | |
| *Question N/A* | 312(81.46%) | 42(10.96%) | 4(1.04%) | | |
| ***Ate Smaller Amount Of Food When Meals Are Insufficient(n=383)*** | | | | | |
| *Yes* | 19(4.96%) | 1(0.26%) | 0(0%) | .000 | ***.010*** |
| *No* | 3(0.78%) | 0(0%) | 2(0.52%) | | |
| *Question N/A* | 312(81.46%) | 42(10.96%) | 4(1.04%) | | |

*Fisher`s Exact tests results

Mother related factors *(table 29)* and household socio demographic factors *(table 30)* doesn't show any association between them and stunting and severe stunting.

*Table 29*: Association between mother related factors and Height for Age

| ***Independent Variable*** | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|
| | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***BMI(n=383)*** | | | | | |
| *Underweight* | 13(3.39%) | 0(0%) | 0(0%) | .437 | .400 |
| *Normal* | 215(56.13%) | 31(8.09%) | 2(0.52%) | | |
| *Overweight* | 72(18.79%) | 8(2.08%) | 3(0.78%) | | |
| obese I | 34((8.87%) | 4(1.04%) | 1(0.26%) | | |
| ***Educational level(n=383)*** | | | | | |
| *Illiterate* | 10(2.61%) | 1(0.26%) | 1(0.26%) | .179 | .130 |
| *Primary* | 23(6.0%) | 1(0.26%) | 1(0.26%) | | |
| *Above primary* | 301(78.59%) | 41(10.70%) | 4(1.04%) | | |
| ***No of ANC visits(n=383)*** | | | | | |
| *None* | 3(0.78%) | 1(0.26%) | 0(0%) | .240 | .182 |
| *1-3* | 55(14.36%) | 7(1.82%) | 3(0.78%) | | |
| *≥4* | 276(72.06%) | 35(9.13%) | 3(0.78%) | | |
| ***Birth interval(n=383)*** | | | | | |
| *≤24 months* | 48(26.22%) | 5(2.73%) | 1(0.54%) | .822 | .764 |
| *>24 months* | 109(59.56%) | 17(9.28%) | 3(1.63%) | | |

*Fisher`s Exact tests results

Table 30: Association between household socio-demographic factors and Height for Age.

| ***Independent Variable*** | *Height for Age.* | | | ***χ2*** | ***p-value**** |
|---|---|---|---|---|---|
| | ***Normal f (%)*** | ***Stunted f (%)*** | ***Severely Stunted f (%)*** | | |
| ***Place of residence(n=383)*** | | | | | |
| *Urban (non-slum)* | 274(71.54%) | 35(9.13%) | 4(1.04%) | .626 | .542 |
| *Urban (slum)* | 60(15.66%) | 8(2.08%) | 2(0.52%) | | |
| ***Employment Status of Head of Family(n=383)*** | | | | | |
| *Unemployed* | 12(3.13) | 3(0.78%) | 0(0%) | .147 | .157 |
| *Domestic Worker* | 14(3.65%) | 1(0.26%) | 0(0%) | | |
| *Labor* | 24(6.26%) | 3(0.78%) | 2(0.52%) | | |
| *Salesman* | 66(17.23%) | 13(3.39%) | 3(0.78%) | | |
| *Clerk* | 24(6.26%) | 2(0.52%) | 0(0%) | | |
| *Professional* | 194(50.65%) | 21(5.48%) | 1(0.26%) | | |
| ***IWI (international wealth Index)(n=383)*** | | | | | |
| *Below average* | 23(6.0%) | 2(0.52%) | 1(0.26%) | .538 | .405 |
| *Above average* | 311(81.20%) | 41(10.70%) | 5(1.30%) | | |
| ***IWI Quintiles(n=383)*** | | | | | |
| *≤ 20.0 (Lowest)* | 0(0%) | 0(0%) | 0(0%) | .609 | .456 |
| *20.1 - 40.0 (Second)* | 14(3.65%) | 1(0.26%) | 1(0.26%) | | |
| *40.1 - 60.0 (Middle)* | 28(7.31%) | 5(1.30%) | 0(0%) | | |
| *60.1 - 80.0 (Fourth)* | 34(8.8%) | 6(1.56%) | 1(0.26%) | | |
| *≥ 80.1 (Highest)* | 258(63.36%) | 31(8.09%) | 4(1.04%) | | |

*Fisher`s Exact tests results

*Summary Table for bivariate analysis*

| ***Independent Variables*** | ***Dependent Variables*** | | |
|---|---|---|---|
| | ***Underweight (p-value)*** | ***Wasted (p-value)*** | ***Stunted (p-value)*** |
| *Town* | 0.691 | 0.725 | 0.389 |
| *Age* | **0.002** | - | 0.605 |
| *Sex* | 0.539 | 0.129 | **<0.001** |
| *Birth Order* | **<.001** | 0.069 | 0.907 |
| *Low Birth weight* | **0.002** | **<0.001** | **0.038** |
| *Breastfeeding* | 0.850 | **0.040** | 0.944 |
| *Dietary Diversity* | 0.684 | 0.381 | 0.605 |
| *Diarrhea* | 0.185 | 0.836 | 0.147 |
| *Fever* | 0.232 | **0.021** | 0.676 |
| *Runny Nose* | **0.016** | **0.047** | 0.244 |
| *Cough* | **0.014** | 0.240 | 0.080 |
| *Medical Care Needed in Last 6 months* | 1.000 | 0.703 | 0.872 |
| *Type of Health Sector* | 0.975 | 0.531 | 0.784 |
| *Variety Of Food Available* | **0.048** | **0.009** | 0.508 |
| *Child Ate Limited Variety Of Food* | 0.377 | 0.565 | 0.793 |
| *Sufficient no. of Meals Per Day(3 Or More)* | **<0.001** | **0.002** | **0.010** |
| *Ate Smaller Amount Of Food When Meals Are Insufficient* | **<0.001** | **0.002** | **0.010** |
| *BMI of Mother* | **0.046** | 0.234 | 0.400 |
| *Educational level* | 0.734 | 0.479 | 0.130 |
| *No of ANC visits* | 0.490 | 1.000 | 0.182 |
| *Birth interval* | **0.007** | 0.289 | 0.764 |
| *Place of residence* | 0.337 | 0.052 | 0.542 |
| *Employment Status of Head of Family* | 0.069 | 0.128 | 0.157 |
| *International Wealth Index* | 0.491 | **0.032** | 0.405 |
| *IWI Quintiles* | 0.478 | **0.023** | 0.456 |

### 4.2.2 MULTIVARIATE LOGISTIC REGRESSION

Binary logistic regression was used to analysis the association between each of independent and dependent variable separately. These multivariable model includes those independent variables in binary logistic regression which have p-value <0.20

#### *4.2.2.1 Multivariate analysis: Weight for Age*

As displayed in table 31 that age , low birth weight, runny nose, cough, insufficient no. of meals per day, birth interval and employment status of head of family were included in this multivariate model because they had a significant *p-value <0.20* and the rest of them were not added because of higher p-value.

Birth weight >4000 gm was set as a reference category, normal birth weight 2500-4000 gm [OR 1.52 (*CI* .188-12.31)] had a 1.52 times more chance to get low weight for age, however children who born with the weight of less than 2500 gm [OR 7.64 (*CI* .932-62.64)] were 7.6 times more likely to be underweight.

Those children who had runny nose [OR3.35 (*CI* 1.31-8.54)] and cough [OR 3.34 (*CI* 1.26-8.88)] in past 2 weeks were 3.35 and 3.34 times more expected to have a low weight according to their age.

Children who had insufficient no. of meals per day (<3 meals) were 1.86 time more prone to be underweight.[OR 1.86 (*CI* .797-3.93)].

While in the last model when the odds ratio was adjusted, all of them except for the low birth weight lost significance [OR 23.60 (*CI 1.24-47.16*)]. It was shown to have 20 times more chance to get underweight than those whose weighted normal at birth.

Table 31: Multivariate analysis: Weight for Age

| ***Independent variable*** | ***Crude O.R (95% CI)*** | ***Adjusted O.R (95% CI)*** |
|---|---|---|
| ***Age*** | | |
| *0-11 months* | .34(.021-5.798) | .290(.014-6.097) |
| *12-23 months* | .51(.030-8.671) | .157(.011-2.333) |
| *24-35 months* | 3.89(.454-33.458) | .137(.008-2.307) |
| *36-47 months* | 3.61(.371-35.293) | 1.57(.237-10.466) |
| *48-59 months* | 1 | 1 |
| ***Low Birth weight*** | | |
| < 2500 gm | 7.64 (.932-62.64) | *23.60(1.24-47.16)* |
| 2500-4000 gm | 1.52 (.188-12.31) | *3.00(0.218-41.56)* |
| > 4000 gm | 1 | 1 |
| ***Runny nose*** | | |
| *No* | 1 | 1 |
| *yes* | 3.35 (1.317-8.545) | *1.68(0.393-7.24)* |
| ***Cough*** | | |
| No | 1 | 1 |
| Yes | 3.34(1.262-8.886) | *4.71(0.908-24.51)* |
| ***Insufficient no. of Meals Per Day(< 3)*** | | |
| Yes | 1.86(.797-3.93) | *0.88(0.758-1.032)* |
| No | 1 | 1 |
| ***Birth interval(n=383)*** | | |
| *≤24 months* | 0.35(0.077-1.616) | *4.39(0.613-31.51)* |
| *>24 months* | 1 | 1 |
| ***Employment Status of Head of Family(n=383)*** | | |
| *Unemployed* | 0.000 | 1.14*(0.034-38.96)* |
| *Domestic Worker* | 1.71(.152-19.359) | *0.000* |
| *Labor* | 1.08(.111-10.559) | *5.35(0.834-34.33)* |
| *Salesman* | .66(.036-12.270) | *1.72(0.261-11.37)* |
| *Clerk* | .44(.046-4.235) | *0.76(0.05-11.10)* |
| *Professional* | 1 | 1 |



### *4.2.2.2 Multivariate analysis: Weight for Height*

Those children were 4.8 times more predictable to get wasted who were 3rd, 4th or 5thborn [OR 4.82 (*CI* 1.12-20.74)] and in contrast to low weight for age children with low birth weight [OR 0.23 (*CI 0.74-0.77*)]are less probable to be wasted. Runny nose contributed [OR 3.67(*CI* 1.25-10.77)] 3.6 time more to wasting of children. Those children who didn't had the availability of food variety were 8.87 [OR 8.87(*CI* 2.16-36.37)] time more predicted to be wasted. Insufficient number and smaller amount of meals increase the chance of wasting to 2.85 times [OR 2.85(*CI* 1.93-4.20)]. In final model of adjusted OR, availability of food variety, insufficient and smaller amount of meal, place of residence and IWI quintiles got excluded from the model and remaining were also not found significant.(*Table 32)*

Table 32: Multivariate analysis: Weight for Height

| ***Independent variable*** | ***Crude O.R (95% CI)*** | ***Adjusted O.R (95% CI)*** |
|---|---|---|
| ***Sex*** | | |
| *Male* | .574(.195-1.68) | *1.03(0.24-4.33)* |
| *Female* | 1 | 1 |
| ***Birth Order*** | | |
| *1st* | 1 | 1 |
| *2nd* | 3.78(0.92-15.45) | *1.73(0.27-10.95)* |
| *3rd or more* | 4.82(1.12-20.74) | *4.37(0.69-27.41)* |
| ***Low Birth weight*** | | |
| < 2500 gm | .23 (.074 - .773) | *5.95(0.42-84.28)* |
| 2500-4000 gm | .18 (.019 - 1.689) | *1.17(0.80-15.94)* |
| > 4000 gm | 1 | 1 |
| ***Breastfeeding*** | | |
| Yes | 1 | 1 |
| No | 0.87(0.23-3.19) | *1.46(0.28-7.58)* |
| ***Fever*** | | |
| *No* | 1 | 1 |
| *yes* | 0.57(0.18-1.75) | *0.80(0.19-3.30)* |
| ***Runny nose*** | | |
| No | 1 | 1 |
| Yes | 3.67(1.25-10.77) | *2.32(0.51-10.44)* |
| ***Variety of food available*** | | |
| Yes | 1 | - |
| No | 8.87(2.16-36.37) | - |
| ***Insufficient number of meals per day(<3)*** | | |
| Yes | 2.85(1.93-4.20) | - |
| No | 1 | - |
| ***Ate Smaller Amount Of Food When Meals Are Insufficient*** | | |
| Yes | 2.85(1.93-4.20) | - |
| No | 1 | - |
| ***Place of residence*** | | |
| Urban (slum) | 2.59(0.84-8.00) | - |
| Urban(non-slum) | 1 | - |
| ***Employment Status*** | | |
| *Unemployed* | 0.00 | *0.00* |
| *Domestic Worker* | 3.01(0.32-27.59) | *0.36(0.04-3.74)* |
| *Labor* | 4.86(1.09-21.56) | *4.15(0.13-12.62)* |
| *Salesman* | 2.16(0.56-8.26) | *1.16(0.20-6.67)* |
| *Clerk* | 1.68(0.19-15.03) | *1.06(0.07-14.98)* |
| *Professional* | 1 | 1 |
| ***IWI (international wealth Index)*** | | |
| *Below average* | 2.39(0.50-11.32) | *0.00* |
| *Above average* | 1 | 1 |
| ***IWI Quintiles*** | | |
| *≤ 20.0 (Lowest)* | - | - |
| *20.1-40.0(Second)* | 4.50(0.88-22.85) | - |
| *40.1-60.0(Middle)* | 0.98(0.12-8.03) | - |
| *60.1-80.0 (Fourth)* | 1.61(0.33-7.76) | - |
| *≥ 80.1 (Highest)* | 1 | - |

### *4.2.2.3 Multivariate analysis: Height for Age*

In table 33 males [OR 0.24 (*CI* 0.11-0.52)] were less likely to be stunted than female whereas, when it was adjusted in final model it showed that males [OR 4.89( *CI* 2.19-10.91)]were 4.89 times more susceptible to be stunted. Insufficient number of meals and smaller amount of meal were reported to be 12 times more likely to be associated with stunted children. [OR 12.66 (*CI* 0.85-18.90)]. Children with birth weight <2500 gms were 3.91 time more prone to get low height for age.[OR 3.91(*CI* 1.07-14.28)]

Table 33: Multivariate analysis: Height for Age

| ***Independent variable*** | ***Crude O.R (95% CI)*** | ***Adjusted O.R (95% CI)*** |
|---|---|---|
| ***Sex*** | | |
| *Male* | 0.24 (0.11-0.52) | 4.89(2.19-10.91) |
| *Female* | 1 | 1 |
| ***Low Birth weight*** | | |
| < 2500 gm | 3.06(0.93-10.25) | 3.91(1.07-14.28) |
| 2500-4000 gm | 1.33(0.44-3.97) | 1.25(0.39-3.99) |
| > 4000 gm | 1 | 1 |
| ***Breastfeeding*** | | |
| Yes | 1 | 1 |
| No | 1.04(0.52-2.10) | 1.07(0.49-2.34) |
| ***Diarrhea*** | | |
| *No* | 1 | 1 |
| *Yes* | 1.88(0.92-3.86) | 1.71(0.78-3.73) |
| ***Cough*** | | |
| No | 1 | 1 |
| Yes | 1.03(0.45-2.33) | 0.85(0.32-2.22) |
| ***Insufficient number of meals per day(<3)*** | | |
| Yes | 1 | 1 |
| No | 12.66(0.85-18.905) | 1.19(0.65-5.56) |
| ***Insufficient amount of meals*** | | |
| Yes | 1 | - |
| No | 12.66(0.85-18.90) | - |
| ***Educational Level*** | | |
| *Illiterate* | 1.33(0.28-6.30) | 1.98(0.26-14.94) |
| *Primary* | 0.58(0.13-2.55) | 0.66(0.13-3.31) |
| *Above primary* | 1 | 1 |
| ***No of ANC visits*** | | |
| *None* | 2.42(0.24-23.87) | 1.03(0.05-19.54) |
| *1-3* | 1.32(0.62-2.80) | 1.10(0.46-2.60) |
| *≥4* | 1 | 1 |
| ***Employment Status*** | | |
| *Unemployed* | 2.20(0.57-8.41) | 1.68(0.32-8.65) |
| *Domestic Worker* | 0.63(0.07-5.02) | 0.62(0.07-5.45) |
| *Labor* | 1.83(0.63-5.30) | 2.46(0.72-8.34) |
| *Salesman* | 2.13(1.06-4.31) | 2.08(0.95-4.54) |
| *Clerk* | 0.73(0.16-3.32) | 0.70(0.14-3.31) |
| *Professional* | 1 | 1 |

# CHAPTER V

## DISCUSSION

The key objective of this study was to define the nutritional status mainly focusing on under-nourished; weight for age, weight for height and height for age in under-five years of children in Karachi, Pakistan. This section discuss those variable only which were significant and associated with child related factors, mother related factors and household socio demographic factors.

### 5.1 Nutritional Status of Pakistani under-five children

Nutritional status was measured as normal, undernourished and overweight. The undernourished status was calculated by z-score of BMI for age(WHO, 2016a)and it's not the sum of three indices; underweight, wasting and stunting z-score. According to our cross sectional survey the prevalence of undernourished children in Karachi was 3.7 percent. In contrast, results from the Sindh provincial department of health (of which Karachi is capital) indicated 6.1 percent of under-five were undernourished (WHO, 2011) Perhaps the striking difference between 3.7 percent and 6.1 percent prevalence in Karachi; provincial capital and the province as a whole could be the reason that this study has been conducted only in one city which is the biggest city of Pakistan in terms of population, so it doesn't gives the clear picture of whole province because even though there were a lot of undernourished children but, as they are the resident of a big city which may provide a lots of factors which alter their health.

In our survey, 5 percent of children were found to be overweight. Similarly, study which was also conducted in Karachi indicated 4.4 percent of overweight children between the ages of 5-6 years.(Jafar et al., 2008) Whereas, study in Lahore which is the second

biggest and capital of Punjab province, found 11.5 percent overweight children of 5-6 years of age group. Punjab province has better under nutritional indices across Pakistan, so this might be the reason for higher prevalence of overweight.(Mushtaq et al., 2011)

In our study almost 4 percent of children were underweight and 1 percent were severely underweight but in contrast to national nutritional survey the prevalence of underweight is very high in Pakistan as 26percent children were reported underweight. The two prevalence of our study and national are not completely comparable because national study didn't split the underweight and severe underweight in two different measurements. If we sum up percentage of underweight and severely underweight it becomes 5 percent against 26 percent, which is 5 times lower prevalence in our study. In comparison to FATA (Federal Administrative Tribal Area) province, has lowest rate (13 percent) of underweight children. Whereas, Sindh has the highest ratio of 40 percent, although the problem of malnutrition has been never small throughout the history of Sindh.(Zulfiqar A Bhutta, 2011)

This study reveals much lower percentage of wasted and severely wasted children in Karachi which is 1.8 percent for each. Whereas, a study of 1-5 years old children which was carried out in semi urban northern city; Abbottabad, found that 13 percent children were wasted and 4 percent were severely wasted. A study, in urban squatter within the 7 km of Islamabad, stated that 13 percent of children with the age of 5-6 were wasted and 5 percent were severely wasted.

Across Pakistan, national nutritional survey stated 9.3 percent wasted and 5.8 percent severely wasted children(Zulfiqar A Bhutta, 2011).As per demographic health survey of Pakistan, Wasting is highest in Sindh, with more rural than urban children in the province being wasted and severely wasted.

In our study prevalence of stunting and severe stunting were found to be 11.2 percent and 1.6 percent respectively, study in Abbottabad found 17 percent stunted and 3 percent severely stunted (Hassam Saqib Lodhi, Mahmood-Ur-Rehman, Fahd Saqib Lodhi, Salim Wazir, & Jadoon, 2010)study in urban squatter near Islamabad reveal outrageously high number of stunted and severely stunted children which is 35 percent and 10 percent respectively Most of the residents had been displaced by financial sufferings or conflicts in their home village. (Raheela M.A. Mian , Mohammed Ali , Paola A. Ferroni, & Underwood, 2002)Another study found 20 percent of up till the age of 14, stunted street children in twin cities (Rawalpindi and Islamabad) of Pakistan. This difference could be the reason of all them were poor and came from large families which had recently moved to the city in search of economic opportunities.(Ali, Shahab, Ushijima, & de Muynck, 2004).

Dissimilarity in 3 indices; weight for age, weight for height and height for age of under nutrition, between this study and the other studies could be explained by the fact that we include all well off, middle income and low income towns. In addition, low income towns were included in the study and despite being off low income town, majority of them have had access to electricity, water sources.

Moreover, in this study, not a single household were included from rural area whereas, Pakistan is low middle income country and 64 percent of its population(National Institute of Population Studies, 2013)lives in the rural areas. Although, our study is conducted in urban area, whose low income households are better than the rural areas, low income households. Which have much more chance for getting undernourished as compare to urban areas, that’s why health and nutrition surveys which were conducted previously, had more proportion of undernourished children. Roughly 25 percent of the

rural children population have more health problems than the urban children(Amanda Stansell & T. F. McLaughlin, 2013)

**5.2 Socio Demographic Characteristics of Participants**

Majority of children who were studied in Pakistan demographic health survey were belong to the age group of 12-23 months (21.8 percent) similarly 32.9 percent of same age group children were studied for this research.

Almost 18 percent of the studied household for our study belonged to urban slum areas and the rest of 82 percent households were in non-slum area. The largest slum settlement in Karachi is *orangi town* which was included in our study. Although, notable achievements had been done in terms of community development work, as now many of slums have access to electricity and water connections, too little has been done effectively for poverty and poor shelter conditions. (UN-Habitat, 2003)

**5.3 Association between undernutrition and child related factors**

The proportion of underweight children was highest 2 percent in the, age group of 36-47 months, in our study which is similar to the results of a study in Nepal (Sapkota VP & Gurung CK, 2009) which 36-47 months old children had the highest,8 percent of the prevalence of underweight. In the Nepalese study however the prevalence of underweight in this age group which was 4 times higher than our study. On the contrary, the Pakistani national prevalence of underweight was highest,34 percent among the age group of 9-11 months and 12-17 months (National Institute of Population Studies, 2013) In Pakistan's national nutritional survey of 2011 indicated that most of the children with mild, moderate and severe underweight belonged to 24-35 months age group, whereas 36-47 months children were second most likely to be underweight(Zulfiqar A Bhutta, 2011)

As few as, 9 percent of children with 36-47 months age group were reported to be wasted (5 percent) and severely wasted (4 percent) in our study. Study in Bangladesh on under-five children similarly reported the 11.5 percent of wasted and severely wasted children in same age group of 36-47 months (Israt Rayhan & M. Sekander Hayat Khan, 2006b) but according to (National Institute of Population Studies, 2013) Wasting and severe wasting was highest (20 percent) among children age of 6-8 months.

In this study analysis by age groups showed that stunting was maximum at 12-23 months with 14 percent and severe stunting was also highest (3 percent) in our study. However, demographic health survey of Pakistan stated the highest rate (52 percent) of stunting and severe stunting (31 percent) at 24-35 months. Trend of increment of percentage with can be observed in PDHS and it was also indicated as the most prevalent indice of undernutrition at national, urban and rural level.(Zulfiqar A Bhutta, 2011)

A notable difference in the prevalence of nutritional indices in our study and demographic health survey and national nutritional survey, probably be due to the different sampling technique. Simple random sampling was done for national survey and every child got the equal chance to be selected. Whereas, mine was multistage convenience, purposive and random sampling. Only one high, middle and low income town for each was selected by random selection. So, every child in the city doesn't get the chance to be selected.

Findings of our study indicates that prevalence of stunting was almost 20 percent in males which is four times higher than stunted female (5 percent) children. Similarly, some studies presented that all the three indices of undernutrition was significantly higher among boys than girls. Study in Iran on 2-5 years old children presented that 20

percent boys were found to be stunted whereas, 17 percent of girls were stunted in urban areas.(Ghassemi, Harrison, & Mohammad, 2002).Demographic health survey also present the same trend of boys(48 percent) to be more stunted than girls(41 percent) (National Institute of Population Studies, 2013)Study in Botswana which was conducted in under three years old children showed that girls( 30 percent) were 33 percent less stunted than boys(45 percent).(Salah E.O. Mahgoub, Maria Nnyepi, & Bandeke, 2006)

Male children appeared to be more exposed to stunted than female children. There is no obvious explanation for this gender difference. But gender difference could be attributed to boys' preference over girls in South Asia. Contrary to an earlier studies, conducted in Tanzania (Mbago & Namfua, 1992) among children under four years of age which concluded that males(20 percent) had better nutritional status than females(28 percent).

In our study, underweight was significant with birth order as they have the more occurrence with 2$^{nd}$ birth order comparatively to 1$^{st}$ born. Only 1.5 percent of those children were found to be underweight who were first born, comparatively 10 percent of children who born on 2$^{nd}$ birth order were underweight. One more study in west Bengal on 0-59 months children, presented that the higher the birth order, higher the prevalence of underweight. Almost,45 percent of first born were underweight but 2$^{nd}$ born were 53 percent (I.Dey & R.N.Chaudhuri, 2008). Study in Uganda among under five children also revealed that underweight increases with birth order as 1$^{st}$ birth order has a prevalence of 7 percent and 2$^{nd}$ birth order had 22 percent of underweight children.(Habaasa, 2015)Indian study among 0-59 month children displayed that 24 percent and 30 percent were underweight who were 1$^{st}$ and 2$^{nd}$ born

respectively(*National Family Health Survey*, 2006). Birth Order appeared as an important factor to determine the nutritional status of children, higher the birth order, higher the risk of undernutrition. Report from Bangladesh among under-five children found a greater risk of stunting with higher birth order. (Israt Rayhan & M. Sekander Hayat Khan, 2006a)On the other hand, study in Egypt on under-five didn't find any relationship between birth order and under nutrition.Birth order is one of the common factor which may operate in increase of undernutrition.(*Egypt Demographic Health Survey*, 2014)

In our study, 14.5%, 9.6% and 22.5% children were found underweight, wasted and stunted respectively, of who were born with <2500 gm. Being born with the low birth weight appears to carry a higher risk of being undernourished in the first five years of life. Study in urban slum of Ludhiana also reports a same pattern that 50 %, 50% and 81% were underweight, wasted and stunted respectively. (Paramita Sengupta, Philip, & Benjamin, 2010)

Mothers in underprivileged socio-economic conditions usually have low birthweight infants which may be stated by the fact that the child's low birthweight could be the reason of mothers poor nutrition and health over a long period of time, including during pregnancy or from pregnancy complications shared by poverty. Smaller the child, it's more important to monitor his/her growth after birth.

In our study, wasting was reported more (1.56 percent) in those children who were not exclusively breastfed until the age of 6 months. Study in urban Allahabad among under five children reported that 5.6 percent children were found wasted(Kumar, Goel, Mittal, & Misra, 2006)However, a great percentage; 42 percent were shown in study of Ludhiana in similar age group of 0-59 months children, who didn't exclusively

breastfed till 6 months of age and are wasted.(Paramita Sengupta, Nina Philip, & A. I. Benjamin, 2010)

Breast milk is a natural resource that has a major impact on child's health, growth and development and it is recommended for at least the first two years of a child's life and has a lots of protective effects children's nutritional status and it is found to be an important part because it may reduce the occurrence of under nutrition among children. Deprivation of breastfeeding in first 6 months of birth is significant risk factor for under nutrition in children.

In this study, 11 percent and 10 percent children had cough and runny nose respectively in past two weeks and they were found associated with underweight. In last two weeks, 8 percent runny nose and 5 percent fever were reported in those children who were wasted. Study in Honduras among 12-71 months old children showed the similar results that ratio of underweight, wasting and stunting were higher comparatively to those who didn't had any acute disease in past two weeks. Almost 26 percent underweight and wasted children had cough and 1.2 percent had runny nose in past two weeks (Penelope Nestel, Alejandro Melara, Jorge Rosado, & Jose O. Mora, 1999) However, study in rural china indicated that cough and runny nose doesn't appear to be associated with underweight, wasting and stunting (Zhang, Shi, Wang, & Wang, 2009)

History of acute disease may modify the health status and children are the most vulnerable and most affected group because of the high requirement for growth and development. Sometimes, acute diseases may alter the weight for height status for temporary period and becomes well-nourished after getting back to normal health status.

Very few vaccination cards (n=22) were found to validate the immunization status of children. 63 percent children were reported to receive valid doses and rest of the (36 percent) had partially or invalid immunization status.

National nutritional survey reported that Sindh (of which Karachi is capital city) appeared as the food security deprived province.33.8 percent of household were stated to be moderately food insure. Study in Colombia reveals that 41.8%, 17.1% and 49.5% children were underweight, wasted and stunted who were moderately food insecure. On the other hand, this study indicated that on average 60%, 47% and 40% of children were underweight, wasted and stunted respectively who didn't had an availability of variety , insufficient number <3 meals per day and smaller quantity of food.

**5.4 Association between undernutrition and mother related factors**

Our study reported that 16 percent of those children were underweight, whose mother were underweight (BMI <18.5). Study in Bangladesh stated that Mothers BMI was found to be one of the important determinants related to nutritional status of children. The risk of being under nourished decreased with the increase in mothers BMI(Mostafa, 2011). Though, (PDHS, 2013) stated 44.3 percent of total underweight children's mother were also underweight.

The prevalence of underweight in children were found to be higher 44.4 percent in those with birth interval <24 months in one of the study in Ludhiana (Paramita Sengupta, Philip, et al., 2010) however, this study only report 3.70 percent of children underweight whose birth interval was <24 months with their elder siblings.

If a pregnancy occurs too soon or before 24 months, mother may not have recovered her nutritional status, which can contribute to low birth weight for next child. Sufficient birth interval allows women to recover and be healthy for her next

pregnancy. Mothers who adequately space their pregnancies are able to provide their children with the necessary nutrition for growth development, which reduce the likelihood of childhood undernutrition.

### 5.5 Association between undernutrition and household socio-demographic factors

International wealth index were used to determine the household socio economic status. 7.69 percent of the children were wasted who belonged to those household which were below Pakistan's IWI average and second quintile which was the lowest quintile in this study showed that 14.28 percent of those households' children were wasted and severely wasted. Similarly, study in Bangladesh indicated that children of second quintile households have 2.35 more chance to be stunted. (Mostafa Kamal S, 2011)

## LIMITATIONS

- Due to the large sample size I didn't use the formula which can calculate the cluster effect therefore I use less desirable but still used *Taro Yamane Formula* for sample size estimation.
- Due to time constraints I choose every under-five child in a household rather than choosing only the youngest one.
- Because of the large number of unavailability of vaccination cards, we didn't had a valid method for assessing vaccination status and the analysis of 22 children with vaccination card had a very less power to detect association. Even the recall vaccination method suggested by EPI program assessment was not successful with mothers, they couldn't recall vaccination status except for Polio.
- BCG is the only vaccine which can be verified by its scar without vaccination card, but we didn't verify it because we overlooked it in the preparation of our research methodology.

- Since I studied only one city so the data cannot be generalized for the whole country.

## RECOMMENDATIONS

### *For Further Research*

- In conducting research with cluster sampling, cluster design effect for calculating sample size should never be overlooked or ignored.
- Only one or youngest child should be selected from each household to avoid in recording similar socio-demographic and parental characteristics for every eligible children.
- In case of the unavailability of vaccination cards, efforts should be made to get access to vaccination cards from EPI centers and to obtain to obtain information by caretaker's memory recall and BCG scar on child's arm.
- The results of study can be a baseline for other nutritional researches to follow up changes over three or five years and to gain more informative situation analysis for program decision making.
- Research on knowledge attitude practice could be conducted among mothers regarding child under nutrition.
- Research could be conducted on protein calorie malnutrition or protein energy malnutrition by taking as account the signs of kawashikor and marasmus.

***For Program***

- The risk factors identified for under nutrition can be used, both to design and target preventive interventions. Birth interval, birth-order are potentially modifiable; so, these can be used for designing intervention programs.
- Agriculture sector in Sindh (of which Karachi is capital) need proper attention at the provincial level to utilize the potential to reduce the food insecurity.
- Local government should invest in advertising and education should be done via television, social or print media, exclusive breastfeeding of infants until 6 months of age, in continued breastfeeding with diet diversity until 2 years of age.
- Educational programs should be planned in EPI centers or health care facilities to educate mothers about the importance of breastfeeding, proper weaning practices and dietary diversity and knowledge to combat with under nutrition.

**CONCLUSION**

Under nutrition among under-five Pakistani children is one of the serious public health issues as well as the most prevalent cause of morbidity and mortality among young children in Pakistan. The factors of under nutrition are multiple and are prevalent at the individual, community, and nation level.

In conclusion, in our study prevalence of all three indices of under nutrition; underweight, wasting and stunting were found to be much better than provincial and national level because of the urban and the largest city of Pakistan. Males were found to be more stunted than females. Higher birth order and low weight at birth were also significant. Children with exclusive breastfeeding till 6 months of age were comparatively more well-nourished then those who didn't breastfed exclusively. Fever,

cough and runny nose in past two weeks were found to be associated. Mother's low BMI and birth interval less than 24 months also plays a role in poor growth and development of children. Poor or financially weak households were more prone to have undernourished children. It appears vital to take an account of each of these factors to reduce under nutrition in Pakistan.

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## APPENDIX

## WORK SCHEDULE (TIMELINE)

| Activities | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July |
|---|---|---|---|---|---|---|---|---|---|---|
| Literature Review | ← | — | → | | | | | | | |
| Research Proposal development | | | ← | — | → | | | | | |
| Proposal Exam | | | | | ↔ | | | | | |
| Ethics Committee Approval | | | | | | ← | — | → | | |
| Data collection | | | | | | | | ← | — | → |
| Data analysis&Thesis writing | | | | | | | | | ↔ | |
| Thesis Defense | | | | | | | | | | ✖ |

## BUDGET

| Item | Unit | Cost Per Unit (THB) | Total (THB) |
|---|---|---|---|
| ***Travelling (Intercity travelling by public transport)*** | 3 persons for 30 days | 50 / day/ person | 4500 |
| ***Incentives for research team*** | 3 persons | 2700 / person | 8100 |
| ***Weighing/Height Scale*** | 1 | 2000 | 2000 |
| ***Recumbent Measuring Board*** | 1 | 1500 | 1500 |
| ***Questionnaire/Consent Form/ Information Sheet Photocopies*** | 12 pages per set × 400 | 12 | 4800 |
| ***Stationary*** | 3 sets | 50 | 150 |
| ***Printing of thesis*** | 5 copies | 500 | 2500 |
| ***Binding of thesis*** | 5 copies | 100 | 500 |
| | | | |
| ***Total*** | | | ***24,050 THB*** |

**QUESTIONNAIRE**

***PART I (General Information)***

01: District ……..……. 02: Town…….

03: Cluster No……... 04: Household No……..

05: Date: Day ☐☐ Month ☐☐ Year ☐☐☐☐

06: ID of Respondent……..

***Part II (Child Related Factor)***

07: Age in months☐☐ 08: Sex ○Male/ ○Female

09: Body measurements

09.1: Height☐☐☐.☐☐cm 09.2: Weight☐☐.☐☐Kg

10: What is the number of the child (Surveyed) among all siblings?

| | |
|---|---|
| 1st or only born | ◯ |
| 2nd born | ◯ |
| 3rd born | ◯ |
| 4th born | ◯ |
| Other | ◯ |

11: What was the weight of the child at the time of birth?

| | |
|---|---|
| < 2500 gm | ◯ |
| 2500-4000 gm | ◯ |
| >4000 gm | ◯ |

12: Was the child exclusively breastfed up to 6 months of age?

◯ Yes ◯ No

13:Now I would like to ask you about liquids and food that may have had yesterday during the day or the night. I am interested to know whether _____ (*name*) had the item even if combined with other foods. (More than 1 answers acceptable)

Did child drank/eat?

| | | ***Yes*** | ***No*** | ***D.K*** |
|---|---|---|---|---|
| ***Cereal*** | *Cerelac, Bread, Rice, Noodles, Porridge, or Other Foods Made From Grains?* | ○ | ○ | ○ |
| ***Roots*** | *Potatoes, Turnip, or any Other foods Made From Roots?* | ○ | ○ | ○ |
| ***Vitamin A Vegetables*** | *Pumpkin, Carrots, Squash or Sweet Potatoes That Are Yellow or Orange Inside?* | ○ | ○ | ○ |
| ***Green Vegetables*** | *Any dark green, leafy vegetables such as Spinach), lettuce?* | ○ | ○ | ○ |
| ***Other Vegetables*** | *Any other vegetables like beet Root, eggplant, okra and cabbage?* | ○ | ○ | ○ |
| ***Vitamin A Rich Fruits*** | *Ripe Mangoes, apricot, peaches or Papayas?* | ○ | ○ | ○ |
| ***Other Fruit and 100%Fruit*** | *Any other fruits like orange, water Melon, dates etc.?* | ○ | ○ | ○ |
| ***Organ Meat*** | *Liver, Kidney, Brain or Other Organ Meats?* | ○ | ○ | ○ |
| ***Flesh meat*** | *Any Meat, such as beef, Lamb, Goat, or Chicken?* | ○ | ○ | ○ |

| | | ***Yes*** | ***No*** | ***D.K*** |
|---|---|---|---|---|
| ***Egg*** | *Eggs?* | ○ | ○ | ○ |
| ***Seafood*** | *Fresh or dried fish or prawn?* | ○ | ○ | ○ |
| ***Legumes, Nuts And Seeds*** | *Any foods made from beans, peas, lentils, Chickpeas or nuts?* | ○ | ○ | ○ |
| ***Milk And Its Product*** | *Milk such as tinned, powder or fresh animal milk* | ○ | ○ | ○ |
| | *Infant formula* | ○ | ○ | ○ |
| | *Yogurt* | ○ | ○ | ○ |
| | *Cheese or other food made from milk?* | ○ | ○ | ○ |
| ***Oil And Fats*** | Oil, fats or butter added to food or used for cooking | ○ | ○ | ○ |
| ***Sweets*** | Sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes | ○ | ○ | ○ |

14: In the past 2 weeks; (more than 1 answers acceptable)

| History of disease | Yes | No | D.K |
|---|---|---|---|
| Did the child suffered from diarrhea over the past 2 weeks? | ◯ | ◯ | ◯ |
| Did the child suffered from fever over the past 2 weeks? | ◯ | ◯ | ◯ |
| Did the child suffer from cough over the past 2 weeks? | ◯ | ◯ | ◯ |
| Did the child suffer from runny nose over the past 2 weeks? | ◯ | ◯ | ◯ |
| Did doctor ever told you that your child is suffering from any of the following disease?(Cardiovascular Disease, Cancer, Chronic Kidney Disease, Diabetes, Asthma ) | ◯ | ◯ | ◯ |

15: During the last 6 months, did you child ever need medical care?

◯ Yes ◯ No

15.1: If yes;from where did your seek any advice or treatment for your child?

| | |
|---|---|
| ***Public Sector*** | ◯ Govt. Hospital ◯ Dispensary<br>◯ Basic health center ◯ Other *(Specify* |
| ***Private Sector*** | ◯ Private hospital/Clinic ◯ Private Physician<br>◯ Private Pharmacy ◯ Dispenser/Compounder<br>◯ Other *(Specify* |
| ***Other Source*** | ◯ Relative ◯ Friend<br>◯ Homeopath ◯ Traditional Practitioner<br>◯ Other *(Specify)* |

15.2: Sometimes people have difficulties in getting medical care when they need it. **IF** it has already happened to you that the last time you needed but did not get medical care, what was the main reason?

| | |
|---|---|
| Couldn't afford care | ◯ |
| Didn't know where to find care | ◯ |
| Couldn't get appointment anywhere | ◯ |
| None available | ◯ |
| Other(never happened) | ◯ |
| No Reason | ◯ |

16:Do you have a card where vaccinations are written down?

◯ Yes ◯ No

16.1: If yes; copy dates from the card

| **Vaccine** | | ***Date of Immunization*** |
|---|---|---|
| | | *Day/Month/Year* |
| ***BCG*** | *BCG* | |
| ***Polio at Birth*** | *OPV0* | |
| ***Polio 1*** | *OPV1* | |
| ***Polio 2*** | *OPV2* | |
| ***Polio 3*** | *OPV3* | |
| ***DPT 1*** | *DPT 1* | |
| ***DPT 2*** | *DPT 2* | |
| ***DPT 3*** | *DPT 3* | |
| ***HepB at Birth*** | *H0* | |
| ***HepB1*** | *H1* | |
| ***HepB2*** | *H2* | |
| ***HepB3*** | *H3* | |
| ***Measles (or MMR)*** | | |
| ***Influenza*** | | |

17: Is a variety of food available in market?

◯ Yes ◯ No (skip to question 18)

17.1: If yes: are the available foods affordable to your households?

◯ Yes ◯ No

18: In the past four weeks, did your child eat a limited variety of foods due to a lack of resources?

◯ Yes ◯ No (skip to question 21)

18.1: If yes, how often did this happen?

| | |
|---|---|
| Rarely (once or twice in the past four weeks) | ◯ |
| Sometimes (three to ten times in the past four weeks | ◯ |
| Often (more than ten times in the past four weeks) | ◯ |

19: In the past four weeks, did you or any household member have to eat fewer meals (< 3) in a day because there was not enough food?

◯ Yes ◯ No (skip to question 21)

19.1: If yes, how often did this happen?

| | |
|---|---|
| Rarely (once or twice in the past four weeks) | ◯ |
| Sometimes (three to ten times in the past four weeks | ◯ |
| Often (more than ten times in the past four weeks) | ◯ |

20: In the past four weeks, did your child have to eat a smaller meal because there was not enough food?

◯ Yes ◯ No (skip to question 21)

20.1: If yes, how often did this happen?

| | |
|---|---|
| Rarely (once or twice in the past four weeks) | ◯ |
| Sometimes (three to ten times in the past four weeks | ◯ |
| Often (more than ten times in the past four weeks) | ◯ |

***PART III (Mother Related Factors)***

21: Body measurements

21.1: Height□□□.□□cm 21.2: Weight□□.□□Kg

22: Educational Status

| | |
|---|---|
| Illiterate | ◯ |
| Primary | ◯ |
| Above Primary | ◯ |

23: How many times did you receive antenatal care during the pregnancy of (Surveyed) child?

| | |
|---|---|
| None | ◯ |
| 1-3 | ◯ |
| ≥4 | ◯ |
| Don't Know | ◯ |

24: What is the birth interval between the elder child and the (surveyed) one?

| | |
|---|---|
| < 24 months | ◯ |
| ≥ 24 months | ◯ |

***PART IV (Socio-Demographic)***

25: Place of Residence ◯ Rural ◯ Urban (non-slum) ◯ Urban (slum)

26: Employment status of Head of family

| Relation To Child | Employment Status |
|---|---|
| | ◯Unemployed ◯Domestic Worker ◯Labor ◯Salesman/Woman ◯ Clerk ◯ Professional |

27: Socio-Economic Status (International Wealth Index)

27.1: Do you currently own the following consumer durables?

| | | | |
|---|---|---|---|
| 27.1.1 | **Television** | ◯ Yes | ◯ No |
| 27.1.2 | **Refrigerator** | ◯ Yes | ◯ No |
| 27.1.3 | **Telephone** | ◯ Yes | ◯ No |
| 27.1.4 | **Car** | ◯ Yes | ◯ No |
| 27.1.5 | **Bicycle** | ◯ Yes | ◯ No |
| 27.1.6 | **Cheap utensils** | ◯ Yes | ◯ No |
| 27.1.7 | **Expensive utensils** | ◯ Yes | ◯ No |

27.2: Housing characteristics (Record Observation)

| 27.2.1 **FLOOR** (*Material Used For The Construction Of The Floor)* | | |
|---|---|---|
| **HIGH** ◯ | **MEDIUM** ◯ | **LOW** ◯ |
| Finished floor with parquet, Carpet, Tiles, Ceramic | Cement, Concrete, Raw wood | None, Earth, Dung |

| 27.2.2 **TOILET FACILITY**(*Quality Of Toilet Facility)* | | |
|---|---|---|
| **HIGH** ◯ | **MEDIUM** ◯ | **LOW** ◯ |
| Private flush toilet | Public toilet, Improved pit latrine | Traditional pit latrine, Hanging toilet, or No toilet facility |

27.3: Number of Sleeping Rooms

| | |
|---|---|
| Zero or one | ◯ |
| Two | ◯ |
| Three or more | ◯ |

27.3.1: Public Utilities (Record Observation)

| | | |
|---|---|---|
| Access to electricity | ◯ Yes | ◯ No |

| 27.3.2 **WATER SOURCE** (*Quality Of Water Supply)* | | |
|---|---|---|
| **HIGH** ◯ | **MEDIUM** ◯ | **LOW** ◯ |
| Bottled water, Water piped into dwelling or premises | Public tap, Protected well, Tanker | Unprotected well, Borehole, Spring, Surface water, |



***Thank You for Your Time and Participation***

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