

PREVALENCE AND ITS ASSOCIATED RISK FACTORS OF MALNUTRITION IN THE VILLAGE AGRA, MALAKAND AND MELA MANDRA KHEL, LAKKI MARWAT

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Abstract

The nutritional condition of children under five years old serves as a strong reflection of a nation's overall health and nutrition levels, as well as its economic condition. This study investigated different effects of some socioeconomic, environmental, demographic, education and health related factors on nutritional status of children under the age of five years in urban areas of village Mela mandra khel (district Lakki Marwat) and Agra (district Malakand), Pakistan. The study was cross-sectional and questionnaire-based survey using random sampling to select households and then using systematic sampling within household children with a child < 60 month of age in urban areas. Their health status was assessed through physical examination and through anthropometric measurements (mid upper arm circumference, head circumference, chest circumference, waist circumference, hip circumference, weight and height). This study observed that 5.79% and 5.2 % (%age of median Height for age), 9.09 and 1.02 (z score Weight for age), 58.68% and 0% (BMI) are severely malnourished in Area 1 (Agra urban area of Malakand) and Area 2 (Mela mandra khel urban area of Lakki Marwat), respectively. The main factors contributing to under five child malnutrition were found to be (hand wash before eating, wash raw edible fruits and vegetables, kind of toilet facilities household have and lack of proper food). Policies and intervention strategies focused on enhancing childhood nutrition and health should target the identified risk factors in these areas of Pakistan.

Keywords:

Socioeconomic; Environmental; Demographic; health related factors.

INTRODUCTION

1.1 Nutrition

Every child grows at their own rate and time by passing through various developmental stages. Recent evidence shows that child health and development is greatly influenced by proper nutrition, particularly good nutrition in early childhood is very necessary for a child to achieve good health. Obviously the good nutritional status of a children can indicate the nutritional status of a community. Children nutritional status is mainly described in form of anthropometry i.e. body measurements. Proper food is the basic and first need of life and without proper nourishment life cannot be sustained. According to the World Health Organization, breast milk of a mother bears all complete nutritional necessities which are needed for a baby to achieve proper healthy growth and development in their first six months of life. According to the United Nations Child Emergency Fund (UNICEF), those children who are breastfed in the first six months of life have a six times greater chance of survival as compared to those children who are non-breastfed. If the diet of child does not provide proper nutrients for their growth and maintenance or due to illness if the children are not able to properly utilize the food which they eat then those children are considered as malnourished (Vino et al., 2015).

1.2 Malnutrition

Malnutrition is a silent emergency (Pulfrey, 2006). Malnutrition actually means bad nutrition. WHO defines malnutrition as a state in which the physical capacity of an individual is impeded to the point where the person can never again keep up satisfactory bodily performance process, for example, development, pregnancy, lactation, physical work and opposing and recovering from disease (WHO, 2009).

Malnutrition is a typical condition that generally results as a lack in the intake of proper food, energy, proteins, macronutrients (carbohydrates, proteins, fats) or micronutrients (vitamins and minerals) (Mohseni et al., 2019). Macronutrient deficiencies happen when the body adjusts to a decrease in macronutrient admission by a comparing decline in movement and an expanded utilization of energy reserves (muscle and fat), while micronutrient deficiencies occur when basic minerals or vitamins are not taken in proper amount. The malnourished individuals are shorter and thinner as compared to their normal same age children with having proper nutrition provided (WHO, 2009). Three critical signs used in estimating malnutrition are stunting (low height for age), wasting (low weight for height), and underweight (low weight for age) (Mohseni et al., 2019). The global burden of malnutrition has serious impact on developmental, economic, social, and medical which are crucial and lasting, for individuals, their families, communities and for countries (WHO, 2018).

1.3 Malnutrition Types

Generally, there are two main types of malnutrition which ranges from extreme nutrient deficiencies to severe obesity

1) Under Nutrition 2) Over Nutrition

Malnutrition commonly refers to under nutrition (Kandala et al., 2011). When an individual does not get enough food to eat is referred as under nutrition. Under nutrition increases the risk of infectious diseases like diarrhea, measles, malaria and pneumonia etc (WHO, 2017).

The known sub-types of under nutrition are wasting, stunting, underweight, and deficiencies in vitamins and minerals. The children suffering from Under nutrition are particularly much more vulnerable to disease and death. Wasting is the low weight for height, Stunting is low height for age, underweight is the low weight for age while deficiencies in vitamin and minerals are grouped in Micronutrient-related malnutrition (WHO, 2018).

Over nutrition causes overweight and obesity which is when a person is too heavy for his or her height. For finding obesity and overweight Body mass index (BMI) is used which is an index of weight for height (WHO, 2018).

1.3.1 Primary Malnutrition

Primary malnutrition is because of lack of primary health care and other social or environmental factors (Ullah et al., 2014). Most of the cases of malnutrition around the globe are of primary malnutrition. Primary malnutrition in children is most commonly found in low and middle income countries. Primary malnutrition is mainly driven by social factors such as household food insecurity, poverty, inadequate maternal nutrition during pregnancy, low birth weight, suboptimal breastfeeding practices, improper complementary feeding, recurring infections, and poor access to clean water, hygiene, and sanitation. As such, the root causes of primary malnutrition are largely social rather than medical (Ahmed et al., 2012).

1.3.2 Secondary Malnutrition

Secondary malnutrition is because of the presence of some fundamental pathological conditions (Ullah, et al., 2014). Secondary malnutrition is the main cause of malnutrition in the developed countries. Secondary malnutrition is caused from an underlying disease that compromises growth directly or through its appetite disturbance and nutrients absorption. If not treated the risks of infections increases in people. (Shahrin, et al., 2015). Some other forms of malnutrition which are very necessary to understand are

1.3.3 Micronutrient Deficiencies

These are called micronutrients because these substances are needed only in little quantities. These substances enable the body to produce enzymes, hormones and other substances needed for adequate growth and development of a body. Although these substances are needed in minute amounts but their absence causes serious consequences (WHO, 2019).

When an individual does not get enough important vitamins and minerals in their diet which are crucial for their body are referred to as micronutrient deficiencies. Micronutrient deficiencies can lead to poor health and development in children under the age of five years and also in pregnant women particularly in countries with low income (WHO, 2017).

Micronutrient deficiencies leads to the following disorders:

- Iodine deficiency disorders
- Vitamin A deficiency
- Iron deficiency anemia (WHO, 2019).

1.3.4 Moderate Malnutrition (MM)

Moderate malnutrition is defined as a weight-for-age between -3 and -2 z-scores below the median of the WHO child growth standards. It may be because of a low weight-for-height or a low height-for-age or may be due to a combination of both. Similarly moderate wasting is defined as weight for height and moderate stunting is defined as height for age between -3 and -2 z-scores respectively (WHO, 2019).

1.3.5 Severe Acute Malnutrition

Severe acute malnutrition is characterized by a weight-for-height measurement that is more than three standard deviations below the median of the WHO growth standards, indicating extreme wasting, or by the presence of nutritional edema. Decrease in the number of child mortality and improving maternal health of a child depends greatly on reducing malnutrition which is responsible directly or either indirectly for 35% of deaths among children under the age of five years (WHO, 2019).

Although the median under-five case-fatality rate for severe acute malnutrition normally ranges between 30% and 50%. According to WHO guidelines case-fatality rate can be reduced about approximately by about 55% in hospital settings through management of severe acute malnutrition (WHO, 2019).

Severe acute malnutrition is a life-threatening condition which requires urgent treatment at time. Until recently the recommendations were to refer these severely acute malnourished children to the hospitals so that they receive proper therapeutic diets and proper medical care. But the situation changed with the arrival of ready to use therapeutic foods which allows the proper management of a large number of children above the age of 6 months who are the victims of severe acute malnutrition without medical problems with the help of outpatient settings. Community based interventions along with hospital-based interventions could save the precious lives of millions of severe acute malnourished children (WHO, 2019).

1.4 Global Distribution

Malnutrition regularly contributes to the global burden of several diseases. There are 165 million malnourished children under the age of five years around the world (Black et al.,2013). Globally, under nutrition results to at least half of all the deaths annually in children under the age of five years (Liu et al.,2015). According to World Health Organization (WHO) in 2016 nearly 155 million children under the age of five years were stunted, 52 million were wasted and 99 million children under the age of five were underweight worldwide (Figure 2.1) (WHO, 2016, Black et al, 2013).

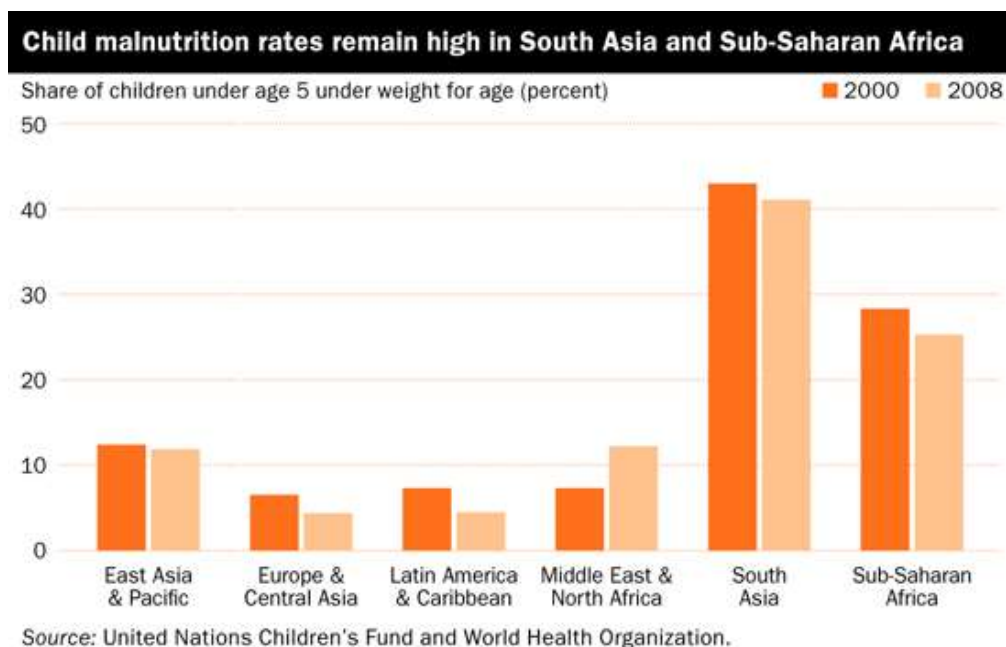


Figure 1.2: Malnutrition Prevalence in Under Five Around the Globe (%) (WHO, 2016, Black Et Al, 2013).

1.5 Malnutrition in Pakistan

Pakistan is a developing country where poverty rate is very high. Pakistan is among one of the countries in the world with the highest rates of malnutrition in children below age of five years and the progress of Pakistan in positive child nutrition and health remains slower than in other South Asian countries (Bhutta et al., 2013). In Pakistan, malnutrition is one of the major contributor of morbidity and mortality in children under the age of five years and the Pakistan ranks 22nd in the world child mortality under the age of five years (Khan et al., 2019).

The 2011 national nutrition survey reported that 44% children under the age five years in Pakistan were stunted, 15% were wasted and 31% were underweight (Bhutta et al., 2011). In Pakistan the high magnitude of all three indicators of malnutrition reflects the poor nutritional and health condition among the children of under five years of age.

1.6 Causes of Malnutrition

The causes of malnutrition in children are very complex, related to each other and multidimensional. That's why If the prevalence of malnutrition in children is to be reduced, then the most important thing is that the most frequent causes of malnutrition should be properly understood. Besides this, assessing the nutritional status of children is most important part of screening their status of health and providing data for authentic planning and implementation of interventions to minimize the morbidity and mortality related with malnutrition (Abera et al., 2017).

The status of malnutrition in a given population depends on number of social and political factors which includes political and economic situation of the population, level of education and sanitation, the season

and climate conditions, cultural and religious conditions, food production, food customs, infectious diseases in a population. It also includes presence and effectiveness of nutritional programs in a region and also presence and equality of basic health facilities in a region or state (Morris et al.,2008).

There are many major factors which contribute to Malnutrition in children, in which most of factors relates to unsatisfactory food intake or severe and repeated infections, or a combination of these. The most frequently suggested causes of malnutrition are poverty, bad breast-feeding habits, low parental education, lack of sanitation, lack of health services, low food intake, diarrhea and other infections, also poor feeding practices, family size, short birth intervals, maternal time availability, child rearing practices and seasonality. There are also economic, social, and cultural causes of malnutrition, which underscore the close link between malnutrition. Children which have low gaps between their births are at high risk of malnutrition (Abera et al.,2017). There is much higher chance of underweight for children when breast feeding is started more than an hour after birth as compared to those children who were breast feeded immediately after birth (Brhane et al.,2014).

1.7 Effects of Malnutrition

Malnutrition has serious effects on children below age of five years which may lead to death in some cases due to infectious diseases. The devastating effects of malnutrition remains in the bodies of malnourished people in form of physical abnormalities and many diseases. These effects of malnutrition includes Impaired immune responses of the body i.e. Predisposition to infection and impaired recovery of the person when become infected. Impaired wound healing in which when a body gets injury wound healing becomes difficult, takes long time to heal and healing is not normal which all results in delayd recovery (National Collaborating Centre for Acute Care (UK), 2006).

Another serious effect of malnutrition in malnourished individuals is reduced respiratory muscle strength which causes Poor cough pressure, predisposing to and delaying recovery from chest infection. Also there is a Difficulty in weaning malnourished patients from ventilators. Usually Malnourished individuals are depleted in whole body potassium, magnesium and phosphate, while simultaneously they are overloaded in whole body sodium and water content. These individuals also have reduced renal capacity to excrete a sodium and water load i.e. their renal system works abnormally. These all leads to vulnerability to re-feeding syndrome and iatrogenic sodium and water overload (National Collaborating Centre for Acute Care (UK), 2006).

Chronic under nutrition leads to serious health impairments in later stages of life of malnourished individuals. In young children under nutrition leads to delayed physical growth and motar development. Malnutrition slows down the progress of behavioral and cognitive development which results in reduced academic performance and social skills. Moreover during the early age of childhood malnutrition leads to serious long term consequences in later stages of life which increases risk of disabilities and even death. Despite of these serious consequences, malnutrition is treatable condition with immediate identification, anticipation and proper management. Malnutrition is largely a treatable condition. Therefore its immediate identification, prevention and treatment is necessary (Ansuya et al., 2018).

1.8 Measuring Malnutrition

1.8.1 BMI (Body mass index)

BMI is generally used to measure rate of malnutrition in adults and is the best measure of malnutrition in adults but sometimes we also calculate BMI while measuring child malnutrition. BMI for a person is calculated by dividing the weight (in kg) of individual by his/her height (in meters square). The individuals with having edema are excluded from the malnutrition surveys to determine rate of BMI due to the bias produced by weight gain which is not related to nutritional condition of individual. BMI is calculated by the following formula,

Body Mass Index (BMI) = weight of the body (kg)/ height of the body (m²)

The cutoff values of BMI are applied equally to both males and females but not to those individuals with having edema (WHO, 2009).

1.8.2 Mid-Upper Arm Circumference

To measure the mid-upper arm circumference first of all with your fingertips locate the tip of the children shoulder. Then bend the children arm at elbow in order to make a right angle. Then measure the mid part child's arm between elbow and the shoulder with tape. But wrap the tape properly around the child's arm at selected mid part. The tape should not be pull too tightly but also the tap should not be too loose. The tape should always be flat on the skin. The finally read the measurement when your tape is in correct mark (WHO, 2009).

1.8.3 Head Circumference

Head circumference is measured by the tape. Wrap the tape around the baby's head in proper position with your fingers which should not be too loose or too much tight. Then with your fingertips locate the exact measurement value on the scale. Note that exact value which would be the head circumference (WHO, 2009).

1.8.4 Chest Circumference

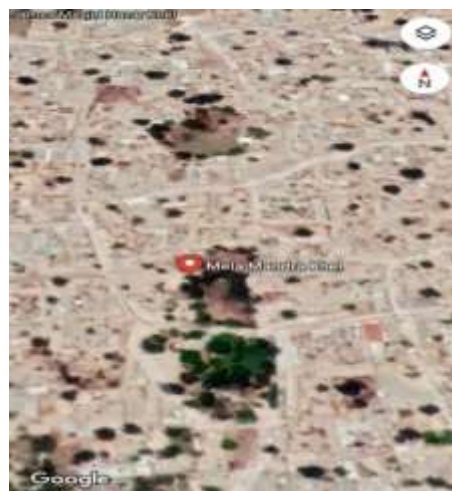
For measuring chest circumference also the tape is used. In order to measure the child's chest circumference keep one end of the tape at the child's broadest bare chest part then wrap the tap around chest of the child below arms. Locate the value on tape with your fingertip-s and note the value (WHO, 2009).

1.8.5 Waist Circumference

First of all locate the upper hip bone of child. Now place the tape at the bare upper hip bone and wrap the tape around child's body properly. Tap should not be too loose or tight. Now check the value on measuring tape and note it which is your waist circumference (WHO, 2009).



(c)



(d)

Figure 2.1: Satellite picture of Agra (a) , (b)and satellite picture of Mela Mandra khel (c), (d)

2.2 Location

Agra is rural area which lies in the north east of district Malakand. Malakand is a district of Malakand division of Khyber Pukhtunkhwa province of Pakistan. It has an area of 952km²(368sq ml) and population according to 2017 censuses was 720, 295 having a density of 760/km². In 1970 Malakand was formed PATA(provincially administered tribal area). Previously it was a tribal area and was known as Malakand protected area part of Malakand agency. From 1970 the district become part of Malakand division. Strategically Malakand is an important area which act as a gateway to Bajaur , lower Dir , Swat , and Buner. It has high mountains that were grown with trees in the past but look barren nowadays.

Mela Mandra khel is also a rural area which lies at the middle of district Laki Marwat. Lakki Marwat is a district of Bannu division of Khyber Pukhtunkhwa of Pakistan. It has an area of 3164km² having a population of 876, 182 according to the censuses of 2017 having a density of 280/km². On 1, July, 1992 it was created as administrative district before which it was a tehsil of Bannu district. The district is a combination of hills and sandy planes. The hills are located at the boundaries of the district.

2.3 Climate

The Malakand is a hilly area and its climate is warm and temperate. The approximate temperature of Malakand is 19.9°C. the average rainfall is 743mm. The warmth and driest month is June in which rain fall is very low.

The Lakki Marwat district bear nearly all the characteristics of desert. Because of its sand dunes, extremely heat and dry weather. Summer is very hot ranging from 42 to 45°C while winter is moderately cool ranging from 30 to 35°C. The rainfall in this region is very rear.

2.4 Culture

The people of Agra belongs to the tribe of Utmankhel. All the people are Muslims. All the people know each other and have close interaction with one another. AND

The people of Mela Mandra khel belongs to the tribe of Marwat. All the people are Muslims. People live in the form of community share the joy and griefs with each other.

2.5 Occupation

The people of Agra are mostly government servants and also rely on agriculture up to some extent. The major sources of income are government jobs and foreign labours.

The people of Mela Mandra khel are mostly farmers and businessmen. Other occupations of the area are government servant and labours. They mostly rely on their own agricultural crops.

2.6 Study Design and Survey

The survey conducted was a questionnaire type survey for finding malnutrition in the children having age less than 5 year and above 6 months. The study was conducted in two villages i.e. Agra district Malakand and Mela Mandra khel district Lakki Marwat. The houses selected in our survey was by systematic sampling technique in which we select every 3rd house of the village by selecting the first house randomly. In the survey the families were informed about the purpose of the survey and information about socio economic level, household detail, drainage system and details about the children health and body measurement was taken from the family member of the child. The anthropometric measurement was taken from the child. In the anthropometric measurement the height of the child was found out by the height machine and measuring tape. Weight of the children was measured in kg by weight machine. The mid arm circumference, head circumference, chest circumference, waist circumference and hip circumference was found out in cm by using the measuring tape around that particular area.

In the survey we collected the data of 121 individuals from area 1 and 98 individuals from area 2. The area 1 has 62 male individuals and 59 female individuals out of 121 while that of area 2 has 69 male and 29 female individuals out of 98.

2.7 Materials

In our data collection we used weight machine, measuring tape, and height machine for finding weight, circumferences and height respectively.

2.7.1 Weight Machine

We used digital weight machine in our survey. We weigh those children who were able to stand simply by standing on the digital weight machine, and those children who were unable to stand we found their weight by differential method i.e. finding the weight of another person and the child combinedly and then subtract the person weight from the combined weight. Figure 2.1(a).

2.7.2 Measuring Tape

We used measuring tape for finding the different circumference of the body including mid arm circumference, head circumference, chest circumference, waist circumference and hip circumference. The measuring tape used was of 1 meter length and a least count of 0.5cm. figure 2.1(b)

2.7.3 Height Machine

For measuring height we used height machine made up of wood. This machine consist of drawer channels. Head side was fixed and the feet side was movable. A measuring tape was fixed on the height machine by which the measurement of the child was observed. Figure 2.1 (c)

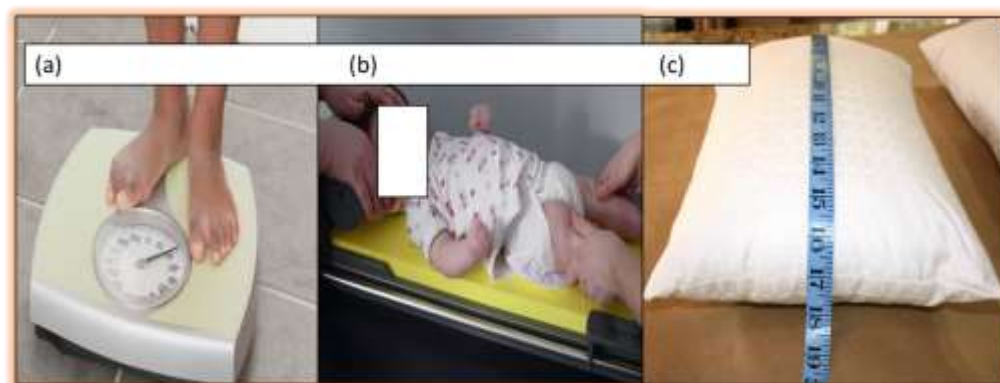


Figure 2.1: (a) weight machine (b) height machine (c) measuring tape

2.8 Data Analysis

The data collected was filled in the Microsoft excel manually. Then we find out the z-scores for weight for height, height for age and weight for age , percentage of median for weight for height, height for age, and weight for age and calculated the body mass index (BMI) of the children by the formulae 1, 2 , 3 given below respectively. The reference table for finding z-score and percentage of median was taken from the two manual which are “measuring and interpreting malnutrition and mortality and WHO child growth standards and the identification of severe acute malnutrition in infants and children. Then we categorized all the z-score values , percentage of median and BMI according to the table given in the measuring and interpreting malnutrition and mortality manual (table 2.1, 2.2, 2.3). The data was imported to the STATA SOFTWARE for statistical analysis (WHO, 2009).

$$1) \text{ Z score} = \frac{\text{measured value} - \text{median weight of reference population}}{\text{Standard deviation of reference population}}$$

$$2) \text{ Percentage of median} = \frac{\text{measured value} * 100}{\text{median weight of reference population}}$$

$$3) \text{ BMI} = \frac{\text{weight of the body in kg}}{\text{height of the body in meter}^2} \quad (\text{WHO, 2009}).$$

3. RESULTS

3.1 Analysis of Anthropometric Measurement

The means of different anthropometric measurement are 35.91 and 32.98 of age in months, 89 and 87.76 of height in cm, 12.65 and 13.57 of weight in kg, 14.82 and 14.72 of mid arm circumference in cm, 47.97 and 46.97 of head circumference in cm, 49.27 and 48.88 of chest circumference in cm, 48.45 and 49.51 of waist circumference in cm and 49.32 and 49.92 of hip circumference in cm of the children's for area1 and area2 respectively (table 3.1-3.8).

Table 3.1:Age (in months) of the Children in Study Areas.

→	Gender	Male	Female	Total
AREA 1	Mean	34.92	36.97	35.91
	Mean	34.92	36.97	35.91
	S.D	15.85	15.2	15.50
	Min	8	7	7
	Max	59	59	59
AREA 2	Observtion	69	29	98
	Mean	34.84	28.56	32.98
	S.D	14.38	15.04	14.78
	Min	6	2.15	2.15
	Max	59	54	59

Table 3.2: Height (in cm) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	88	89	89
	S.D	12	11	11
	Min	66	66	66
	Max	107	107	107

AREA 2	Observtion	69	29	98
	Mean	89.09	84.62	87.76
	S.D	12.63	12.83	12.79
	Min	60.9	55.8	55.8
	Max	111	101.6	111

Table 3.3: Weight (Kg) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	12.77	12.52	12.65
	S.D	3.64	2.89	3.29
	Min	6	7	6
	Max	23	19	23
AREA 2	Observtion	69	29	98
	Mean	13.96	12.66	13.57
	S.D	3.34	3.26	3.35
	Min	7.5	5.7	5.7
	Max	20.4	18	20.4

Table 3.4: Mid-Arm Cercumference (cm) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	14.91	14.72881	14.82
	S.D	1.08	1.03	1.06
	Min	13	12.5	12.5
	Max	18	17	18

AREA 2	Observtion	69	29	98
	Mean	14.80	14.57	14.74
	S.D	1.50	1.93	1.64
	Min	11.2	10.9	10.9
	Max	17.78	17.8	17.8

Table 3.5: Head cercumfernce (cm) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	48.13	47.78	47.96
	S.D	2.30	2.26	2.28
	Min	42	42	42
	Max	54	52	54
AREA 2	Observtion	69	29	98
	Mean	47.52	45.66	46.97
	S.D	3.45	2.87	3.38
	Min	38.1	38.1	38.1
	Max	56.6	48.7	56.6

Table 3.6: Chest cercumference (cm) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	49.74	48.78	49.27
	S.D	3.18	2.99	3.12
	Min	43	42.5	42.5
	Max	55	55	55

AREA 2	Observtion	69	29	98
	Mean	49.34	47.80	48.88
	S.D	3.62	3.05	3.52
	Min	39.3	39.1	39.1
	Max	61.5	53	61.5

Table 3.7: Waist Cercumference (cm) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	48.55	48.35	48.45
	S.D	4.18	4.05	4.10
	Min	38	39	38
	Max	58	58	58
AREA 2	Observtion	69	29	98
	Mean	49.68	49.09	49.51
	S.D	3.74	3.43	3.64
	Min	40.6	40.6	40.6
	Max	59.1	53.4	59.1

Table 3.8: Hip cercumference (cm) of the children.

→	Gender	Male	Female	Total
AREA 1	Mean	62	59	121
	Mean	49.33	49.30	49.32
	S.D	4.10	4.25	4.16
	Min	41	41	41
	Max	58	58	58

AREA 2	Observtion	69	29	98
	Mean	49.92	49.94	49.92
	S.D	4.03	3.97	3.99
	Min	41.9	39.1	39.1
	Max	58.8	55.8	58.8

3.2 Z-Score weight for Length, Height for Age, Weight for Age Analysis

It was found that the area 1 shows 9.09 percent of severe malnutrition in z-score weight for age while the area two has 1.09 percent severe malnutrition in z-score weight for age shown in table 3.11. There was no malnutrition observed in z-score weight for length, and z-score height for age in both the areas (table 3.9-3.11).

Table 3.9: Malnutrition measured as z-score Weight for length

→	WFL cat	Adequate	Total
Area 1	Freq.	121	121
	Percent	100	100
	Cum.	100	
Area 2	Freq.	98	98
	Percent	100	100
	Cum.	100	

Table 3.10: Malnutrition measured as z-score Height for age

→	WFL cat	Adequate	Total
Area 1	Freq.	121	121
	Percent	100	100
	Cum.	100	
Area 2	Freq.	98	98
	Percent	100	100
	Cum.	100	

Table 3.11: Malnutrition measured as z-score Weight for age

→	WFL cat	Adequate	Total	Sever	Total
Area 1	Freq.	95	15	11	121
	Percent	78.51	12.4	9.09	100
	Cum.	78.51	90.91	100	
Area 2	Freq.	91	6	1	98
	Percent	92.86	6.12	1.02	100
	Cum.	92.86	98.98	100	

3.3 Percentage of median weight for length, height for age, and weight for age analysis

According to percentage of median' Severe Malnutrition was observed in percentage of median height for age and percentage of median weight for age. The severe malnutrition in percentage of median height for age were approximately similar in both the areas i.e. 5.79 in area 1 while 5.1 in area 2. The severe malnutrition percentage of median weight for age was observed in area 2 i.e. 9.18 while negligible in area 1 i.e. 0.83 (tables 3.12-3.14).

Table 3.12: Malnutrition measured as percentage of median Weight for length

→	WFL Cat	Adequ-Ate	Mild Malnutrition	Moderately Malnutrition	Severely Malnutrition	Total
Area 1	Freq.	96	16	8	1	121
	Percent	79.34	13.22	6.61	0.83	100
	Cum.	79.34	92.56	99.17	100	
Area 2	Freq.	98	0	0	0	98
	Percent	100	0	0	0	100
	Cum.	100	100	100	100	

Table 3.13: Malnutrition measured as percentage of median Height for age

→	WFL Cat	Adequ-Ate	Mild Malnutrition	Moderately Malnutrition	Severely Malnutrition	Total
Area 1	Freq.	68	33	13	7	121
	Percent	56.2	27.27	10.74	5.79	100
	Cum.	56.2	83.47	94.23	100	
	Freq.	48	28	17	5	98

Area 2	Percent	48.98	28.57	17.35	5.1	100
	Cum.	48.98	77.55	94.9	100	

Table 3.14: Malnutrition measured as percentage of median weight for age

→		Moderate Malnutrition	Severe Malnutrition	Total
Area 1	Freq.	120	1	121
	Percent	99.17	0.83	100
	Cum.	99.17	100	
Area 2	Freq.	89	9	98
	Percent	90.82	9.18	100
	Cum.	90.82	100	

3.3 Analysis of BMI of the children

It was observed from the analysis of BMI that the area 1 shows very high severe malnutrition of 58.68 percent while that of area 2 shows zero percent malnutrition (table 3.13)

Table 3.15: Malnutrition measured as BMI of the children

→		Category	Adequate Malnutrition	Moderate Malnutrition	Severe Malnutrition
Area 1	Freq.		37	13	71
	Percent		30.58%	10.74%	58.68%
	Cum.		30.58	41.32	100
Area 2	Freq.		77	21	0
	Percent		78.57	21.43	0
	Cum.		78.57	100	100

3.4 Risk factors as assessed by z-score weight for age

Toilet outdoor, kind of toilet facility, cover food, wash raw edible fruits and vegetables, eat meal at agriculture fields, hand washing before eating, hand washing after toilet, piped sewerage discharged, malnutrition as perceived by parents, under nutrition by parents, stunted growth as perceived by parents, fish/meat consumption, fruits/vegetables consumption, milk/milk supplements consumption, fuel for cooking, monthly income of household, number of individuals in household, no of children in household are the different risk factors of malnutrition as measured by z-score weight for age in the children of Area 1 and area 2 (table 3.16).

Table 3.16: Association of risk factors with malnutrition as measured by Z-score Weight for age**Denotation:** A = Adequate**M.M** = Moderately malnourished**S.M** = Severely Malnourished

Variables	Responses	A	Mo.A	S.M	Total
Source of drinking water	Piped in dwelling	19 (9.84%)	0	0	19 (8.68%)
	public tap	45 (23.32%)	4 (26.67%)	1 (9.09%)	50 (22.83%)
	tube well or orehole	125 (64.77%)	11 (73.33%)	10 (90.91)	146 (66.67%)
	Protected dug well	4 (2.07%)	0	0	4 (1.83%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
toilet outdoor*	Yes	114 (59.07%)	8 (53.33%)	9 (81.82%)	131 (59.82%)
	No	79 (40.93%)	7 (46.67%)	2 (18.18%)	88 (40.18%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
What kind of toilet facilitation does your household have*	flush toilet	94 (48.70%)	14 (93.33%)	11 (100%)	119 (54.34%)
	pit toilet	51 (26.42%)	0	0	51 (23.29%)
	No facility	48 (24.35%)	1 (6.67%)	0	49 (22.38%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Boil drinking water	Yes	2 (1.04%)	0	0	2 (0.91)
	No	191 (98.96%)	15 (100%)	11 (100%)	217 (99.09%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Cover food*	Frequently	112 (58.03%)	14 (93.33%)	11 (100%)	137 (62.56%)
	Occasionally	69 (35.75%)	1 (6.67%)	0	70 (31.96%)
	Rarely	12 (6.22%)	0	0	12 (5.48%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
	Frequently	108 (55.96%)	12 (80%)	11 (100%)	131 (59.82%)

Wash raw edible fruits and vegetables*	Occasionally	69 (35.75%)	1 (6.67%)	0	70 (31.96%)
	Rarely	15 (7.77%)	1 (6.67%)	0	16 (7.31%)
	Never	1 (0.52%)	1 (6.67%)	0	2 (0.92%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Does Child play with dirt	Frequently	167 (86.53%)	14 (93.33%)	10 (90.91%)	191 (87.21%)
	Occasionally	11 (5.70%)	1 (6.67%)	1 (9.09%)	13 (5.94%)
	Rarely	11 (5.70%)	0	0	11 (5.02%)
	Never	4 (2.07%)	0	0	4 (1.83%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Does child eat meals at agriculture plots/fields*	Frequently	68 (35.23%)	8 (53.33%)	9 (81.82%)	85 (38.81%)
	Occasionally	29 (15.03%)	4 (26.67%)	0	33 (15.07%)
	Rarely	77 (39.90%)	3 (20%)	1 (9.09%)	81 (36.99%)
	Never	19 (9.85%)	0	1 (9.09%)	20 (9.13%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Hand wash before eating*	Yes	178 (92.23%)	15 (100%)	9 (81.82%)	202 (92.24%)
	No	15 (7.78%)	0	2 (18.18%)	17 (7.76%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Hand wash before toilet*	Yes	57 (29.53%)	0	0	57 (26.03%)
	No	136 (70.47%)	15 (100%)	11 (100%)	162 (73.98%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Piped sewerage discharge*	Yes	4 (2.07%)	0	1 (9.09%)	5 (2.28%)
	No	189 (97.93)	15 (100%)	10 (90.91%)	214 (97.72%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
	Yes	24	6	4	34

Malnourished as perceived by parents *		(12.44%)	(40%)	(36.36%)	(15.53%)
	No	169	9	7	185
		(87.57%)	(60%)	(63.64%)	(84.48)
	Total	193	15	11	219
		(100%)	(100%)	(100%)	(100%)
Underweight as perceived by parents*	Yes	36	8	4	48
		(18.65%)	(53.33%)	(36.36%)	(21.92%)
	No	157	7	7	171
		(81.35%)	(46.67%)	(63.64)	(78.08%)
	Total	193	15	11	219
		(100%)	(100%)	(100%)	(100%)
Stunted or delayed growth As perceived by parents*	Yes	33	7	4	44
		(17.10%)	(46.67%)	(36.36%)	(20.09%)
	No	160	8	7	175
		(82.90%)	(53.33%)	(63.64%)	(79.91%)
	Total	193	15	11	219
		(100%)	(100%)	(100%)	(100%)
Fish/meat*	≤2 times	114	10	3	127
		(59.07%)	(66.67%)	(27.27%)	(57.99%)
	3-4 times	74	4	8	86
		(38.34%)	(26.67%)	(72.73%)	(39.27%)
	>5 times	5	1	0	6
		(2.59%)	(6.67%)		(2.74%)
	Total	193	15	11	219
		(100%)	(100%)	(100%)	(100%)
Fruits/vegetables *	≤2times	24	0	0	24
		(12.44%)			(10.96%)
	3-4 times	144	14	11	169
		(74.61%)	(93.33%)	(100%)	(77.17%)
	>5 times	25	1	0	26
		(12.95%)	(6.67%)		(11.87%)
	Total	193	15	11	219
		(100%)	(100%)	(100%)	(100%)
Milk/milk supplements*	≤2times	111	14	8	133
		(57.52%)	(93.33%)	(72.73)	(60.73%)
	3-4 times	25	1	0	26
		(12.95%)	(6.67%)		(11.87%)
	>5 times	57	0	3	60
		(29.53%)		(27.27%)	(27.40%)
	Total	193	15	11	219
		(100%)	(100%)	(100%)	(100%)
Fuel for cooking*	Electricity/gas	39	5	6	50
		(20.21%)	(33.33%)	(54.55%)	(22.83%)
	Wood	126	10	5	141
		(65.28%)	(66.67%)	(45.45%)	(64.38%)
	Dung	28	0	0	28
		(14.51%)			(12.79%)

Total		193 (100%)	15 (100%)	11 (100%)	219 (100%)
Weekly meat consumption	≤2times	115 (60.21%)	10 (66.67%)	4 (36.36%)	125 (57.08%)
	3-4 times	74 (38.34%)	5 (33.33%)	7 (63.64%)	86 (39.27%)
	>5 times	4 (2.07%)	0	0	4 (1.83%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Monthly income of household (Rs)*	5-20 thousand	96 (49.74%)	5 (33.33%)	1 (9.09%)	102 (46.58%)
	20-30 thousand	44 (22.80%)	5 (33.33%)	3 (27.27%)	52 (23.74%)
	30-40 thousand	18 (9.33%)	3 (20%)	3 (27.27%)	24 (10.96%)
	40-50 thousand	4 (2.07%)	1 (6.67%)	1 (9.09%)	6 (2.74%)
	Above 50 thousand	31 (16.06%)	1 (6.67%)	3 (27.27%)	35 (15.98%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Number of individuals in household*	3-8	119 (61.66%)	5 (33.33%)	3 (27.27%)	127 (57.99%)
	Above 8	74 (38.34%)	10 (66.67%)	8 (72.73%)	92 (42.01%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)
Number of children in household*	1-4	81 (41.97%)	9 (60%)	3 (27.27%)	93 (42.47%)
	4 and above	112 (58.03%)	6 (40%)	8 (72.73%)	126 (57.53%)
	Total	193 (100%)	15 (100%)	11 (100%)	219 (100%)

3.5 Risk factors as assessed by percentage of median Height for age

Source of drinking water, kind of toilet facility, boil drinking water, cover food, wash raw edible fruits and vegetables, eat meal at agriculture fields, hand washing before eating, hand washing after toilet, malnutrition as perceived by parents, under nutrition by parents, stunted growth as perceived by parents, fruits/vegetables consumption, milk/milk supplements consumption, fuel for cooking, monthly income of household, number of individuals in household, no of children in household are the different risk factors of malnutrition as measured by percentage of median height for age in the children of Area 1 and area 2 (table 3.17).

Table 3.17: Association of risk factors with malnutrition as measured by percentage of median Height for age

Denotation: A = Adequate

Mi.M = Mildely malnourished

Mo.M = Moderately malnourished **S.M** = Severely Malnourished

Variables		A	Mi.M	Mo.M	S.M	Total
Source of drinking water	Piped in dwelling	17 (10.83%)	2 (4.76%)	0	0	19 (8.68%)
	public tap	43 (27.39%)	7 (16.67%)	0	0	50 (22.83%)
	tube well / borehole	93 (59.24%)	33 (78.57%)	13 (100%)	7 (100%)	146 (66.67%)
	Protected dug well	4 (2.55%)	0	0	0	4 (1.83%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
toilet outdoor	Yes	94 (59.87%)	26 (61.90%)	7 (53.85%)	4 (57.14%)	131 (59.82%)
	No	63 (40.13%)	16 (38.10%)	6 (46.15%)	3 (42.86%)	88 (40.18%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
What kind of toilet facilitation does your household have*	flush toilet	70 (44.59%)	31 (73.81%)	12 (92.31%)	6 (85.71%)	119 (54.34%)
	pit toilet	47 (29.94%)	4 (9.52%)	0	0	51 (23.29)
	No facility	40 (25.48%)	7 (16.67%)	1 (7.69%)	1 (14.29%)	49 (22.38%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Boil drinking water*	Yes	1 (0.64%)	0	1 (7.69%)	0	2 (0.91%)
	No	156 (99.36%)	42 (100%)	12 (92.31%)	7 (100%)	217 (99.09%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Cover food*	Frequently	85 (54.14%)	32 (76.19%)	13 (100%)	7 (100%)	137 (62.56%)
	Occasionally	61 (38.85%)	9 (21.43%)	0	0	70 (31.96%)
	Rarely	11 (7.01%)	1 (2.38%)	0	0	12 (5.48%)

	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Wash raw edible fruits and vegetables*	Frequently	86 (54.78%)	30 (71.43%)	10 (76.92%)	5 (71.43%)	131 (59.82%)
	Occasionally	60 (38.22%)	8 (19.5%)	2 (15.38%)	0	70 (31.96%)
	Rarely	9 (5.73%)	4 (9.52%)	1 (7.69%)	2 (28.57%)	26 (7.31%)
	Never	2 (1.28%)	0	0	0	2 (0.92%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Does Child play with dirt	Frequently	136 (86.62%)	37 (88.10%)	11 (84.62%)	7 (100%)	191 (87.21%)
	Occasionally	8 (5.1%)	3 (7.14%)	2 (15.38%)	0	13 (5.94%)
	Rarely	9 (5.73%)	2 (4.76%)	0	0	11 (5.02%)
	Never	4 (2.55%)	0	0	0	4 (1.83%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Does child eat meals at agriculture plots/fields*	Frequently	54 (34.39%)	21 (50%)	6 (46.15%)	4 (57.14%)	85 (38.81%)
	Occasionally	21 (13.38%)	7 (16.67%)	3 (23.08%)	2 (28.57%)	33 (15.07%)
	Rarely	69 (43.95%)	8 (19.05%)	3 (23.08%)	1 (14.29%)	81 (36.99%)
	Never	13 (8.28%)	6 (14.28%)	1 (7.69%)	0	20 (9.13%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Hand wash before eating*	Yes	144 (91.72%)	41 (97.62%)	10 973.92%)	7 (100%)	202 (92.24%)
	No	13 (8.28%)	1 (2.38%)	3 (23.07%)	0	17 (7.76%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Hand wash after toilet*	Yes	53 (33.76%)	4 (9.52%)	0	0	57 (26.03%)
	No	104 (66.25%)	38 (90.48%)	13 (100%)	7 (100%)	162 (73.98%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
	Yes	3 (1.91%)	2 (1.76%)	0	0	5 (2.28%)
	No	154	40	13	7	214

Piped sewerage discharge		(98.09%)	(95.24%)	(100%)	(100%)	(97.72%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Malnourished as perceived by parents *	Yes	20 (12.74%)	9 (21.43%)	3 (23.08%)	2 (28.57%)	34 (15.53%)
	No	137 (87.26%)	33 (78.57%)	10 (76.92%)	5 (71.43%)	185 (84.48%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Underweight as perceived by parents*	Yes	28 (17.83%)	10 (23.81%)	6 (46.15%)	4 (57.14%)	48 (21.92%)
	No	129 (82.17%)	32 (76.19%)	7 (53.85%)	3 (42.86%)	171 (78.08%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Stunted or delayed growth As perceived by parents*	Yes	24 (15.29%)	12 (28.57%)	5 (38.46%)	3 (42.86%)	44 (20.09%)
	No	133 (84.71%)	30 (71.43%)	8 (61.54%)	4 (57.14%)	175 (79.91%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Fish/meat*	≤2 times	95 (60.56%)	22 (52.38%)	7 (53.85%)	3 (42.86%)	127 (57.99%)
	3-4 times	56 (35.67%)	20 (47.63%)	6 (46.15%)	4 (57.14%)	86 (39.27%)
	>5 times	6 (3.82%)	0	0	0	6 (2.74%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Fruits/vegetables*	≤2times	22 (14.01%)	2 (4.76%)	0	0	24 (10.96%)
	3-4 times	118 (75.16%)	32 (76.19%)	12 (92.31%)	7 (100%)	169 (77.17%)
	>5 times	17 (10.83%)	8 (19.05%)	1 (7.69%)	0	26 (11.87%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Milk/milk supplements*	≤2times	87 (55.41%)	29 (69.05%)	11 (84.62%)	6 (85.71%)	133 (60.73%)
	3-4 times	19 (12.10)	7 (16.67%)	0	0	26 (11.87%)
	>5 times	51 (32.48%)	6 (14.29%)	2 (15.38%)	1 (14.29%)	60 (27.40%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Fuel for cooking*	Electricity/ Gas	33 (21.02%)	13 (30.95%)	1 (7.69%)	3 (4.86%)	50 (22.83%)

	Wood	97 (61.78%)	28 (66.67%)	12 (92.31%)	4 (57.14%)	141 (64.38%)
	Dung	27 (17.20%)	1 (2.38%)	0	0	28 (12.79%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Weekly meat consumption	<2times	94 (59.87%)	24 (57.14%)	8 (61.54%)	3 (42.86%)	129 (58.91%)
	3-4times	59 (37.58%)	18 (42.86%)	5 (38.46%)	4 (57.14%)	86 (39.27%)
	>5 times	4 (2.55%)	0	0	0	4 (1.83%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Monthly income of household (Rs)*	5-20 thousand	83 (52.87%)	11 (26.19%)	5 (38.46%)	3 (42.86%)	102 (46.58%)
	20-30 thousand	35 (22.29%)	11 (26.19%)	5 (38.46%)	1 (14.29%)	52 (23.74%)
	30-40 thousand	12 (7.64%)	10 (23.81%)	1 (7.69%)	1 (14.29%)	24 (10.96%)
	40-50 thousand	4 (2.55%)	2 (4.76%)	0	0	6 (2.74%)
	Above 50 thousand	23 (14.65%)	8 (19.05%)	2 (15.38%)	2 (28.57%)	35 (15.98%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Number of individuals in household*	3-8	100 (63.69%)	22 (52.38%)	3 (23.08%)	2 (28.57%)	127 (57.99%)
	Above 8	57 (36.33%)	20 (47.62%)	10 (76.92%)	5 (71.43%)	92 (42.01%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)
Number of children in household*	1-4	62 (39.49%)	25 (59.52%)	5 (38.46%)	1 (14.29%)	93 (42.47%)
	4 and above	95 (60.51%)	17 (40.48%)	8 (61.54%)	6 (85.71%)	126 (57.53%)
	Total	157 (100%)	42 (100%)	13 (100%)	7 (100%)	219 (100%)

3.7 Risk factors as assessed by percentage of median weight for age

Source of drinking water, toilet outdoor, kind of toilet facility, cover food, wash raw edible fruits and vegetables, child play with dirt, child eat meal at agriculture fields, hand washing after using toilet, malnutrition as perceived by parents, under nutrition by parents, stunted growth as perceived by parents, fruits/vegetables consumption, milk/milk supplements consumption, fuel for cooking, monthly income of

household, number of individuals in household, no of children in household are the different risk factors of malnutrition as measured by percentage of median weight for age in the Area 1 and area 2 (table 3.18).

Table Error! No text of specified style in document..18: Association of risk factors with malnutrition as measured by percentage of median weight for age

Denotation: A = Adequate

Mi.M = Mildely malnourished

Mo.M = Moderately malnourished

S.M = Severely Malnourished

Variables	Responses	A.	Mi.M	Mo.M	S.M	Total
source of drinking water*	Piped in dwelling	10 (5.95%)	4 (13.79%)	4 (23.53%)	1 (20%)	19 (8.68%)
	public tap	36 (21.43%)	8 (27.59%)	6 (35.29%)	0	50 (22.83%)
	tube well or borehole	119 (70.83%)	16 (55.17%)	7 (41.18%)	4 (80%)	146 (66.67%)
	Protected dug well	3 (1.79%)	1 (3.45%)	0	0	4 (1.83%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
toilet outdoor*	Yes	115 (68.45%)	7 (24.14%)	7 (41.18%)	2 (40%)	131 (59.82%)
	No	53 (31.55%)	22 (75.86%)	10 (58.82%)	3 (60%)	88 (40.18%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
What kind of toilet facilitation does your household have*	flush toilet	112 (66.67%)	4 (13.79%)	1 (5.88%)	2 (40%)	119 (54.34%)
	pit toilet	23 (13.69%)	18 (62.07%)	9 (52.94%)	1 (20%)	51 (23.29%)
	No facility	33 (19.65%)	7 (24.14%)	7 (41.18%)	2 (40%)	49 (22.38%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Boil drinking water	Yes	2 (1.19%)	0	0	0	2 (0.91%)
	No	166 (98.98%)	29 (100%)	17 (100%)	5 (100%)	217 (99.09%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Cover food*	Frequently	128 (76.19%)	5 (17.24%)	2 (11.76%)	2 (40%)	137 (62.56%)
	Occasionally	33 (19.64%)	21 (72.41%)	13 (76.47%)	3 (60%)	70 (31.96%)

Variables	Responses	A.	Mi.M	Mo.M	S.M	Total
	Rarely	7 (4.17%)	3 (10.34%)	2 (11.76%)	0	12 (5.48%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Wash raw edible fruits and vegetables*	Frequently	115 (68.45%)	10 (34.48%)	5 (29.41%)	1 (20%)	131 (59.82%)
	Occasionally	40 (23.81%)	17 (58.62%)	10 (58.82%)	3 (60%)	70 (71.96%)
	Rarely	11 (6.55%)	2 (6.90%)	2 (11.76%)	1 (20%)	16 (7.31%)
	Never	2 (1.20%)	0	0	0	2 (0.92%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Does Child play with dirt*	Frequently	152 (90.48%)	22 (75.86%)	13 (76.47%)	4 (80%)	191 (87.21%)
	Occasionally	8 (4.76%)	2 (6.90%)	2 (11.76%)	1 (20%)	13 (5.94%)
	Rarely	6 (3.57%)	3 (10.34%)	2 (11.76%)	0	11 (5.02%)
	Never	2 (1.19%)	2 (6.90%)	0	0	4 (1.83%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Does child eat meals at agriculture plots/fields*	Frequently	77 (45.83%)	6 (20.69%)	2 (11.76%)	0	85 (38.81%)
	Occasionally	27 (16.07%)	4 (13.79%)	1 (5.88%)	1 (20%)	33 (15.07%)
	Rarely	53 (31.55%)	15 (51.72%)	12 (70.59%)	1 (20%)	81 (36.99%)
	Never	13 (6.55%)	4 (13.79%)	2 (11.76%)	3 (60%)	17 (7.76%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Hand wash before eating	Yes	156 (92.86%)	26 (89.66%)	15 988.24%)	5 (100%)	12 (7.14%)
	No	10 (7.14%)	3 (10.34%)	2 (11.76%)	0	17 (7.76%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Hand wash after toilet*	Yes	36 (21.43%)	12 (41.38%)	7 (41.18%)	2 (40%)	57 (26.03%)
	No	132 (78.58%)	17 (58.62%)	10 (58.82%)	3 (60%)	162 (73.98%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)

Variables	Responses	A.	Mi.M	Mo.M	S.M	Total
Piped sewerage discharge	Yes	5 (2.98%)	0	0	0	5 (2.28%)
	No	163 (97.02%)	29 (100%)	17 (100%)	5 (100%)	214 (97.72%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Malnourished as perceived by parents*	Yes	31 (18.45%)	1 (3.45%)	2 (11.76%)	0	34 (15.53%)
	No	137 (81.55%)	28 (96.55%)	15 (88.24%)	5 (100%)	185 (84.48%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Underweight as perceived by parents*	Yes	44 (26.19%)	2 (6.90%)	2 (11.76%)	0	48 (21.92%)
	No	124 (73.81%)	27 (93.10%)	15 (88.24%)	5 (100%)	171 (78.08%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Stunted or delayed growth As perceived by parents*	Yes	37 (22.02%)	3 (10.34%)	2 (11.76%)	2 (40%)	44 (20.09%)
	No	131 (77.98%)	26 (89.66%)	15 (88.24%)	3 (60%)	175 (79.91%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Fish/meat*	≤2 times	82 (48.81%)	26 (89.66%)	14 (82.35%)	5 (100%)	127 (57.99%)
	3-4 times	81 (48.21%)	3 (10.34%)	2 (11.76%)	0	86 (39.27%)
	>5 times	5 (2.98%)	0	1 (5.88%)	0	6 (2.74%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Fruits/vegetables *	≤2times	13 (7.74%)	7 (24.14%)	3 (17.65%)	1 (20%)	24 (10.96%)
	3-4 times	138 (82.14%)	18 (62.07%)	11 (64.71%)	2 (40%)	179 (77.17%)
	>5 times	17 (10.12%)	4 (13.79%)	3 (17.65%)	2 (40%)	26 (11.87%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Milk/milk supplements*	≤2times	116 (69.05)	11 (37.93%)	4 (23.52%)	2 (40%)	133 (60.73%)
	3-4 times	14 (8.33%)	6 (20.69%)	6 (35.29%)	0	26 (11.87%)
	>5 times	38	12	7	3	60

Variables	Responses	A.	Mi.M	Mo.M	S.M	Total
		(22.62%)	(41.38%)	(41.18%)	(60%)	(27.40%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Fuel for cooking*	Electricity/ gas	45 (26.79%)	3 (10.34%)	2 (11.76%)	0	50 (22.83%)
	Wood	107 (63.69%)	18 (62.07%)	11 (64.71%)	5 (100%)	141 (64.38%)
	Dung	16 (9.53%)	8 (27.59%)	4 (23.53%)	0	28 (12.79%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Weekly meat consumption*	≤2times	87 (51.79%)	24 (82.76%)	13 (76.47%)	5 (100%)	129 (58.91)
	3-4times	78 (46.43%)	5 (17.24%)	3 (17.65%)	0	86 (39.27%)
	>5 times	3 (1.79%)	0	1 (5.88%)	0	4 (1.83%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Monthly income of household (Rs)*	5-20 thousand	65 (38.69%)	22 (75.86%)	13 (76.47%)	2 (40%)	102 (46.58%)
	20-30 thousand	45 (26.79%)	4 (13.79%)	2 (11.76%)	1 (20%)	52 (23.74%)
	30-40 thousand	22 (13.10%)	1 (3.45%)	0	1 (20%)	24 (10.96%)
	40-50 thousand	5 (2.98%)	0	0	1 (20%)	6 (2.74%)
	Above 50 thousand	31 (18.45%)	2 (6.90%)	2 (11.76%)	0	35 (15.98%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Number of individuals in household*	3-8	84 (50%)	24 (82.76%)	14 (82.35%)	5 (100%)	127 (57.99%)
	Above 8	84 (50%)	5 (17.24%)	3 (17.65%)	0	92 (92.01%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)
Number of children in household*	1-4	65 (38.69%)	17 (58.63%)	9 (52.94%)	2 (40%)	93 (42.47%)
	4 and above	103 (61.31%)	12 (41.38%)	8 (47.06%)	3 (60%)	126 (57.53%)
	Total	168 (100%)	29 (100%)	17 (100%)	5 (100%)	219 (100%)

4. Discussion

This study identifies the risk factors contributing to child malnutrition specifically stunting, underweight, and wasting among children under five in Pakistan. These conditions are key indicators of a child's nutritional health. The severity of malnutrition observed highlights the urgent need for interventions aimed at improving children's nutritional status in the country (khan et al., 2019). Childhood malnutrition is a major issue in developing countries which requires interventions. malnutrition is associated with poor development and poor school performance in children. Malnourished children face long term results such as marked impairment of mental and intellectual capacity. Chronic malnutrition in females may cause difficulty in future pregnancies and impaired physical and mental development in their offspring. In this study the prevalence of stunting and wasting was found to be 16.5 per cent and 21 per cent, respectively, and the overall prevalence increased with age. This suggests that both acute and chronic malnutrition are prevalent in rural areas (Khuwaja et al., 2005).

Economic status and poverty were significant factors that contributed to malnutrition in this study. The significant factors identified (hand wash before eating, hand wash after using the toilet, wash raw edible fruits and vegetables, toilet facility in household and malnourished as perceived by parents) are all results of poverty. Other studies also shown the significant role of poverty with malnutrition (Mohseni et al., 2019)

According to this study 5.79% and 5.2 % (%age of median Height for age), 9.09 and 1.02 (z score Weight for age) , 58.68% and 0% (BMI) are severely malnourished in Area 1 (Agra urban area of Malakand) and Area 2 (Mela mandra khel urban area of Lakki Marwat), Pakistan respectively.

In Pakistan, the rate of malnutrition among children under five is alarmingly high at 44%, surpassing that of neighboring countries such as Bangladesh (36%) and Nepal (35.8%). Compared to the country's earlier Demographic and Health Survey from 1990–1991, stunting has decreased by only 5%, indicating that its prevalence has remained persistently high over the past two decades (Khan et al., 2019)

The opinions of different experts and organizations on what constitutes malnutrition and recommendations for avoiding the problem of malnutrition have been different at different times and redefined over times. Early studies of ninety's suggested most dangerous deficiency as that of proteins deficiency in the diets of malnourished children. Proteins are the prime important component of the body and forms many structural elements of the body which carry out most important cellular processes. Now a days recent surveys suggests that lack of vitamins and minerals, especially Vitamin A, iodine and iron gives rise to serious health problems (Larry brown et al., 1996). According to global public health guidelines, exclusive breastfeeding during the first six months of life is essential for optimal growth, development, and overall health of a child. To support healthy growth, children should then receive adequate and appropriate nutritious foods, while continuing breastfeeding up to two years of age or longer (Ansuya et al, 2018).

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