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**Original Research Article**

# Malnutrition and its associated factors among children in Murree, Rawalpindi

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## ABSTRACT

**Background:** Malnutrition is one of the main health issues among children. Malnutrition is more prevalent in developing countries. Malnutrition among children is affected by many factors. These factors are studied in many parts of the world but they are understudied in most the areas of Pakistan. This study aimed to assess the incidence of malnutrition and its associated factors among children in Murree, Rawalpindi, Pakistan.
**Methods:** This descriptive cross-sectional study was carried out among children of Murree, Rawalpindi for about 6 months from August 2021 to January 2022. Simple random sampling along with an established inclusion and exclusion criteria was applied to enroll 316 participants. A self-adapted questionnaire was applied to take data after taking ethical approval from the institutional research board and informed consent from the participants.
**Results:** The incidence of underweight, normal weight, overweight and obesity among school children of study population was 22.80%, 35.40%, 26.90%, and 14.90% respectively. The association between malnutrition and gender (p=0.001), birth weight (p=0.01), supplementation intake (p=0.03), filtered water use (p=0.02), hygiene (p=0.01), vaccination status (p=0.04), recurrent infection history (p=0.02), socioeconomic status (p=0.04), mother education (p=0.04), mother occupation (p=0.03), awareness of parents about balanced diet (p=0.02), and family size (p=0.04) was statistically significant, whereas association between nutritional status and age group (p=0.05) was insignificant.
**Conclusions:** The incidence of underweight, overweight, and obesity was remarkable among children. Many factors such as gender, birth weight, supplementation intake, filtered water use, hygiene, vaccination status, recurrent infection, socioeconomic status, mother education, mother occupation, parental awareness about a balanced diet, and family size were found to associate with malnutrition among children.

**Keywords:** Incidence, Malnutrition, Associated, Factors, Children, Rawalpindi

## INTRODUCTION

Malnutrition shows a decline in health due to the disproportion of nutrients and energy in the body. Malnutrition is one of the main risk factors related to children's morbidity and mortality. It is estimated that about 52.50% of child mortality is linked to malnutrition and its associated diseases.[1] Malnutrition is a crucial medical problem in approximately every region of the globe and particularly in Southern Asia and Sub-Saharan Africa. In several developing nations, stunting, underweight, and micronutrient deficiencies among children are common due to insufficient nutrition and

diseases. Children under five years of age are most susceptible to malnutrition. Malnutrition in children under five years of age is a matter of great concern all over the world. The highest rate of malnutrition (34%) was noted among children in the age range of 2-3 years, whereas, the lowest malnutrition rate (10%) was observed among children aged under 6 months.[2] A UNICEF report in 2014 showed that the incidence of underweight, stunting, and wasting around the globe was 15%, 25%, and 8%, respectively.[3]

A complete diet is a diet that has all kinds of required foods in adequate quantities and proportions. This sort of diet is needed for the healthy growth of the body and for intellectual capabilities. Excess or deficiencies of any kind of nutrients lead to physical and mental disorders. Eating more than the required amount of food could cause diabetes mellitus, heart diseases, obesity, and cancers of various parts of the body after a certain age.[4] An inadequate amount of diet is also dangerous for health. Undernutrition predisposes people to various infections (pneumonia and diarrhea). due to poor body immunity. Deficiencies of different kinds of mineral and vitamins in the diet leads to versatile diseases in the body, like deficiency of vitamin K leads to bleeding, deficiency of vitamin A causes night blindness, whereas the inadequate quantity of calcium or vitamin D makes people susceptible to bone diseases.[5] Moreover, poor diet could also lower the intellectual abilities of the children and that leads to poor performances in academics and workplaces consequently, it predisposes the affected people to lives with no excel.[6] So, all this literature review shows that malnutrition affects all aspects of life.

Nutritional status is affected by multiple factors which directly or indirectly impact it and predispose people to malnutrition. In literature, factors that are associated with the malnutrition included gender, age, low birth weight, poor feeding practices, inadequate supplementation, hygiene, unfiltered water, recurrent infection, lack of immunization, poor parental educational status, low socioeconomic status, large family, and lack of awareness of parents about balanced diet.[7-11] By working on modifiable factors, we could avoid them and consequently improve the health of our future generation.

Although malnutrition and its associated risk factors are well studied in various parts of the world, however, in literature, only a few studies about malnutrition and its risk factors were present.[3,7,8,10,11] Moreover, in the local area of Murree, Rawalpindi, Pakistan, where this study was conducted almost no study about malnutrition is present. Therefore, this study aimed to evaluate the incidence of malnutrition incidence and its determinants in the local under five years of age population of the Murree, Rawalpindi, Pakistan. By noting the incidence and factors that influence malnutrition among children, we could urge health policymakers to develop policies to control those risk factors for the prevention of malnutrition.

## METHODS

This descriptive cross-sectional study was carried out among under five years children in Murree, Rawalpindi, Pakistan and it was completed in almost 6 months from August 2021 to January 2022. Data was collected after taking ethical approval from the institutional review board. Written consent from parents was acquired before data collection. The sample size was calculated by using the World Health Organization **(**WHO) calculator for sample size calculation and it was 316. An established inclusion and exclusion criteria and simple random sampling were applied among children for their selection. Children of both gender male and female, with an age range from 2 years to 5 years, who had birth weights up to 4000 grams, and who were willing to participate were recruited in the study. Individuals whose age with age less than 2 years or above 5 years, had any congenital abnormality, had a birth weight of more than 4000 grams, and who were not willing to participate were excluded from the study. Data was collected through a self-designed questionnaire which consisted of options for each question in it. It had two sections, section 'A' of questionnaire was related to the potential risk factors for the malnutrition and these included gender (male or female), age group (2-3 years, 3-4 years, 4-5 years), birth weight (low=less than 2500 grams, normal=between 2500 grams to 4000 grams), supplementations intake (yes or no), filtered water use (yes or no), hygiene by assessing oral, nail and body hygiene (good or poor), immunization status till age (vaccinated or non-vaccinated), history of recurrent infection by asking about the episodes of infections in last 6 months (yes=2 or more episodes or no=less than 2 episodes), socioeconomic status based on monthly income (low=less than 20,000 pkr, middle=20,000 to 60,000 pkr, high=above 60,000 pkr) mother education (illiterate, primary, middle, matric, above matric), mother occupation (house wife or working lady), awareness of parents about balanced diet by asking about the definition of balanced diet, its components and effects of their deficiencies on human bodies i.e. carbohydrates, proteins, lipids, minerals and vitamins (yes or no), and family size based on family numbers (small=family number less than 5, large=family number more than 5). While section 'B' was about the calculation of the body mass index (BMI). For the measurement of the height and weight, we used measuring tape for height in meters and a weighing machine for weight in kilograms. The nutritional status of the study population was assessed by the commonly used method such as Centers for disease control and prevention (CDC) BMI for age growth charts. It has been applied in international studies as well as a tool for the evaluation of the nutritional status.[12] BMI depends upon the two factors height and weight and it is calculated by the formula i.e. BMI=weight/height$^2$, weight is measured in kilograms while height is in meters. After CDC BMI for age calculation, CDC BMI for age was plotted into growth charts to assess their nutritional status. According to CDC BMI for age growth charts, participants could belong to any of these below-given classes. Underweight: on a growth chart with less than 5$^{th}$

percentile, Normal: on a growth chart with percentile 5th to less than 85th percentile, Overweight: on a growth chart with percentile from 85th to less than 95th, obese: on a growth chart with percentile from 95th or above). After the completion of the data collection, data was entered in the statistical package for social sciences (SPSS) software version 25 for the statistical analysis of the data. The dependent variable was malnutrition/nutritional status based on the BMI of the children, whereas, independent variables included gender, age group, birth weight, supplementation, filtered water, hygiene, immunization status, history of recurrent infection, use of filtered water, frequency of meals per day, daily breakfast, number of siblings, socioeconomic status, educational status of the mother, mother occupation, awareness of parents about a balanced diet, and family size. A pilot study was conducted to assess the validity and inter-scale reliability of the used questionnaire in the present study population of 50 participants. Cronbach alpha was calculated to check the validity and inter-scale reliability of the questionnaire and it was 0.81 which indicates high inter-scale reliability. Data analysis was done by using the SPSS version 25. Descriptive and inferential statistics were applied. During descriptive analysis mean and standard deviation for quantitative variables while for categorical variables, frequencies and percentages were calculated. While during inferential statistics association of malnutrition with sociodemographic variables was assessed by using the Chi-square test. A p value less than 0.05 was considered statistically significant.

## RESULTS

Out of 316 participants were boys 149 (47.15%) while were girls 167 (52.85%). The incidence among children of different nutritional statuses was underweight (22.80%), normal weight (35.40%), overweight (26.90%), and obese (14.90%). The means of age and BMI for the study population were 3.29 with SD (standard deviation) ±1.59 years and 15.40 with SD±1.53 respectively.

Figure 1 shows the distribution of the study population based on gender.

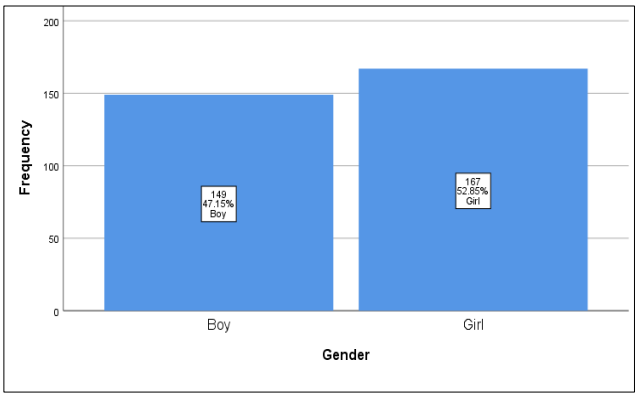


**Figure 1: Percentages of boys and girls in the study population.**

Figure 2 manifests the study population division based on nutritional status.

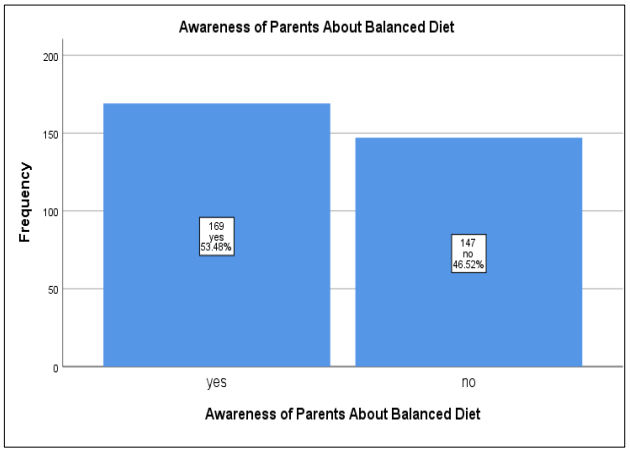


**Figure 2: Percentages of different nutritional statuses in the study population.**

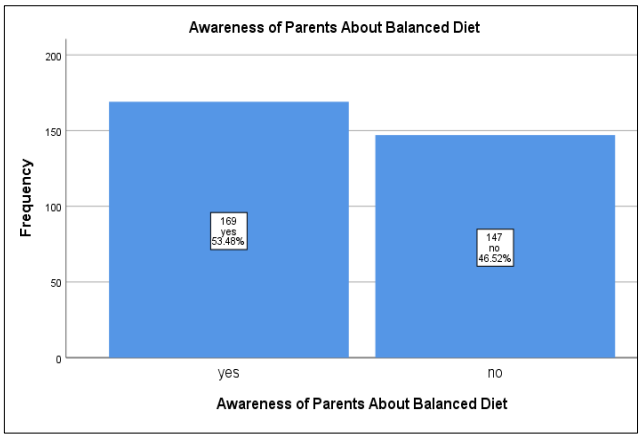


**Figure 3: Percentages of parents of the study population based on their awareness of a balanced diet.**

Figure 3 elaborates percentages of parents of children who had awareness about a balanced diet and who had not.

Table 1 indicates the association between nutritional status and gender, birth weight, supplementation, filtered water use, hygiene, immunization, recurrent infection, socioeconomic status, mother educational status, mother occupation, parents' awareness about a balanced diet, and the family size was significant statistically, while, the association between nutritional status and age group was not significant. It has been also noted that underweight was more common among the children who had male gender, age group 3-4 years, low birth weight, no supplementation intake, used unfiltered water, poor hygiene, non-vaccinated status, recurrent infection history, low socioeconomic status, mothers with low educational level, working lady as a mother, parents with no awareness about a balanced diet and had large family size. While the overweight and obesity were more prevalent among the

children who had female gender, age group 4-5 years, normal birth weight, supplementation intake, used filtered water, poor hygiene, vaccinated status, no recurrent infection history, high socioeconomic status, mothers with low educational level, housewife as a mother, and parents with no awareness about a balanced diet. The trend for overweight and obesity in regard to family size was mixed.

**Table 1: Association between nutritional status and all considered factors among the study population.**

| Parameters | Cross tabulation and Chi-square test analysis | | | | | |
|---|---|---|---|---|---|---|
| | Nutritional status (%) | | | | | P value |
| | Underweight | Normal weight | Overweight | Obese | Total | |
| | 72 (22.80) | 112 (35.40) | 85 (26.90) | 47 (14.90) | 316 (100) | |
| **Gender** | | | | | | |
| Boys | 41 (56.90) | 72 (64.30) | 19 (22.40) | 17 (36.20) | 149 (47.20) | 0.001 |
| Girls | 31 (43.10) | 40 (35.70) | 66 (77.60) | 30 (63.80) | 167 (52.80) | |
| **Age group in years** | | | | | | |
| 2-3 | 16 (22.20) | 44 (39.30) | 18 (21.20) | 13 (27.70) | 91 (28.80) | 0.05 |
| 3-4 | 44 (61.10) | 34 (30.40) | 23 (27.10) | 4 (8.50) | 105 (33.20) | |
| 4-5 | 12 (16.70) | 34 (30.30) | 44 (51.70) | 30 (63.80) | 120 (38.00) | |
| **Birth weight** | | | | | | |
| Normal | 17 (23.60) | 37 (33.00) | 43 (50.60) | 25 (53.20) | 122 (38.60) | 0.01 |
| Low | 55 (76.40) | 75 (67.00) | 42 (49.40) | 22 (46.80) | 194 (61.40) | |
| **Supplementations intake** | | | | | | |
| Yes | 29 (40.30) | 67 (59.80) | 54 (63.50) | 35 (74.50) | 185 (58.50) | 0.03 |
| No | 43 (59.70) | 45 (40.20) | 31 (36.50) | 12 (25.50) | 131 (41.50) | |
| **Filtered water use** | | | | | | |
| Yes | 24 (33.30) | 75 (67.00) | 45 (52.90) | 24 (51.10) | 168 (53.20) | 0.02 |
| No | 48 (66.70) | 37 (33.00) | 40 (47.10) | 23 (48.90) | 148 (46.80) | |
| **Hygiene** | | | | | | |
| Good | 13 (18.00) | 73 (65.20) | 42 (49.40) | 23 (48.90) | 151 (47.80) | 0.01 |
| Poor | 59 (82.00) | 39 (34.80) | 43 (50.60) | 24 (51.10) | 165 (52.20) | |
| **Vaccination status** | | | | | | |
| Vaccinated | 20 (27.80) | 80 (71.40) | 50 (58.80) | 30 (63.80) | 180 (57.00) | 0.04 |
| Non-vaccinated | 52 (72.20) | 32 (28.60) | 35 (41.20) | 17 (36.20) | 136 (43.00) | |
| **Recurrent infection** | | | | | | |
| Yes | 49 (68.10) | 47 (42.00) | 40 (47.00) | 22 (46.80) | 158 (50.00) | 0.02 |
| No | 23 (31.90) | 65 (58.00) | 45 (53.00) | 25 (53.20) | 158 (50.00) | |
| **Socioeconomic class** | | | | | | |
| Low | 54 (75.00) | 54 (48.20) | 26 (30.60) | 8 (17.00) | 142 (44.90) | 0.04 |
| Middle | 6 (8.30) | 25 (22.30) | 23 (27.10) | 21 (44.70) | 75 (23.70) | |
| Upper | 12 (16.70) | 33 (29.50) | 36 (42.30) | 18 (38.30) | 99 (31.40) | |
| **Mother educational status** | | | | | | |
| Illiterate | 45 (62.50) | 10 (8.90) | 11 (13.00) | 17 (36.10) | 83 (26.30) | 0.04 |
| Primary | 10 (13.90) | 23 (20.50) | 35 (41.20) | 15 (31.900) | 83 (26.30) | |
| Middle | 7 (9.70) | 24 (21.40) | 21 (24.70) | 6 (12.80) | 58 (18.40) | |
| Matric | 6 (8.30) | 36 (32.10) | 3 (3.50) | 3 (6.40) | 48 (15.10) | |
| Above matric | 4 (5.60) | 19 (17.00) | 15 (17.60) | 6 (12.80) | 44 (13.90) | |
| **Mother occupation** | | | | | | |
| House wife | 25 (34.70) | 74 (66.10) | 57 (67.10) | 36 (76.60) | 192 (60.80) | 0.03 |
| Working lady | 47 (65.30) | 38 (33.90) | 28 (32.90) | 11 (23.40) | 124 (39.20) | |
| **Parents' awareness about balanced diet** | | | | | | |
| Yes | 28 (38.80) | 81 (72.30) | 37 (43.50) | 23 (48.90) | 169 (53.50) | 0.02 |
| No | 44 (61.20) | 31 (27.70) | 48 (56.50) | 24 (51.10) | 147 (46.50) | |
| **Family size** | | | | | | |
| Small | 22 (30.60) | 40 (35.70) | 40 (47.00) | 25 (53.20) | 127 (40.20) | 0.04 |
| Large | 50 (69.40) | 72 (64.30) | 45 (53.00 | 22 (46.80) | 189 (59.80) | |

## DISCUSSION

This study with the cross-sectional design of the study has shown the incidence of malnutrition and its associated factors among the children with age up to 5 years of Murree, Rawalpindi, Pakistan. The incidence of underweight, normal weight, overweight, and obesity among children was 72 (22.80%), 112 (35.40%), 85 (26.90%), and 47 (14.90%) respectively. The prevalence of underweight, overweight, and obesity in a study that was also conducted in Pakistan was less than our study 19.54%.[9] Research that was carried out in various countries of South Asia including Pakistan reported the following prevalence of overweight and obesity at 3.20% and 1.70% which was very low than the incidence we noted in this study.[13] This big difference in the prevalence could be due to different characteristics of this study population from the characteristics of the study population that was researched. Current study results indicate that the various nutritional statuses demand action from policymakers of health departments, especially in the regional area.

Nutritional status was significantly associated with gender, birth weight, supplementation intake, filtered water use, hygiene, immunization, recurrent infection, socioeconomic status, mother educational status, mother occupation, parent's awareness about a balanced diet, and family size, whereas, nutritional status was not associated with age group significantly. It was also observed that underweight was more common among the children who had male gender, age group 3-4 years, low birth weight, no supplementation intake, used unfiltered water, poor hygiene, non-vaccinated status, recurrent infection history, low socioeconomic status, mothers with low educational level, working lady as a mother, parents had no awareness about a balanced diet, and had large family size. While the overweight and obesity were more prevalent among the children who had female gender, age group 4-5 years, normal birth weight, supplementation intake, used filtered water, poor hygiene, vaccinated status, no recurrent infection history, high socioeconomic status, mothers with low educational level, housewife as a mother, and parents with no awareness about a balanced diet. The trend for overweight and obesity in regard to family size was mixed, as obesity was common in children with small families and overweight was more prevalent among children with large families.

In literature, different researches that were conducted in Ghana and Ethiopia also reported that nutritional status was associated with gender and birth weight. These researches also showed that nutritional status in contrast to this study where the association between nutritional status and age was insignificant statistically.[1,2] Other studies that were performed in the various countries also presented similarly as noted in this study that the association between nutritional status and supplementation intake, environmental factors like water filtration and hygiene, recurrent illness vaccination status, and socioeconomic status, was significant.[3,7,9] Mother education and mother occupation were also observed in research projects as significant factors that impact the nutritional status among children under five.[8,14] Studies conducted in Pakistan and Iran also supported these research findings that small size and parents with adequate awareness about the balanced diet cause improvement in the health of children.[9,15]

After completing the comparison of this study's results with many studies in the literature, we are at the point to say that this study has presented essential knowledge regarding the current nutritional status and its associated risk factors among the children of Murree, Rawalpindi. Now it's the duty of health-related lawmakers and health associated departments to establish strategies for the prevention of the malnutrition among children in any of its forms like underweight, overweight, and obesity by working on the preventable risk factors of malnutrition and by implementing some particular measures for the unpreventable risk factors of malnutrition. With the reduction in malnutrition incidence, the quality of life of children could be improved. This would lead to not only the betterment in present and future lives of these children but it would also cause prosperity and growth of the nation and children are known as the future of any nation.

### *Limitations*

Besides the fact that this study has highlighted an important issue in society, especially for children. This study has a restriction which is its cross-sectional study design, because of which this study could not find the way these associated factors cause the malnutrition or predispose children to malnutrition. Therefore, more research is needed to check how these factors could lead to malnutrition.

## CONCLUSION

This present study indicated a high incidence of malnutrition in all three forms underweight, overweight, and obesity among the children. Furthermore, it showed that malnutritional incidence in underweight form was more common among the children who had male gender, age group 3-4 years, low birth weight, no supplementation intake, used unfiltered water, poor hygiene, non-vaccinated status, recurrent infection history, low socioeconomic status, mothers with low educational level, working lady as a mother, parents with no awareness about a balanced diet, and had large family size, whereas, malnutrition in overweight and obesity forms were more prevalent among the children who had female gender, age group 4-5 years, normal birth weight, supplementation intake, used filtered water, poor hygiene, vaccinated status, no recurrent infection history, high socioeconomic status, mothers with low educational level, housewife as a mother, and parents with no awareness about a balanced diet. Overweight was more prevalent among the children who had large families, whereas, obesity was more common among the small families. In a nutshell, it's agreeable here

that all these factors have a role in the determination of malnutrition in children. Therefore, special measures are needed to avoid malnutrition in any form like underweight, overweight, and obesity for the control of the controllable factors and particular interventions for non-modifiable factors.

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