

ORIGINAL ARTICLE

NUTRITIONAL STATUS AND ASSOCIATED FACTORS IN UNDER-FIVE CHILDREN OF RAWALPINDI

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Background: Malnutrition is a serious child health issue throughout the developing world. Pakistan has the second highest infant and child mortality rate in South Asia. This study was carried out to assess the nutritional status of children under 5 years of age and to determine the frequency and association of malnutrition with various demographic variables in the study group. **Methods:** A multi-centre, cross sectional study was conducted at the immunization centres of the 3 allied hospitals of Rawalpindi Medical College during March-May 2014. Healthy children of under 5 years of age without confirmed diagnosis of any disease/ailment were included. Guardians of 100 children were interviewed using a structured questionnaire. Demographic variables include age, gender, family size, family income, breastfeeding, maternal education, presence of a family member with special needs and presence of siblings under 5 years in family. Weight (kg) was measured and malnutrition was assessed by weight for age. **Results:** Malnutrition was found to be present in 32% of children. Adequately nourished children were 68%, while moderately and severely malnourished children were 14% and 18% respectively. Our study indicated malnutrition to be significantly associated with maternal illiteracy ($p=0.01$) and presence of a family member with special needs ($p=0.05$). No significant association was found between malnutrition and gender, family size, family income, breast feeding and presence of siblings under 5 years of age. **Conclusion:** There is a need to plan composite interventions to elucidate the factors that place children at greater risk for malnutrition.

Keywords: Malnutrition, Child nutrition, Child nutrition disorders, Child nutritional status, Infant nutrition disorders

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INTRODUCTION

World Food Programme (WFP) defines malnutrition as "A state in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance process such as growth, pregnancy, lactation, physical work and resisting and recovering from disease."¹ Malnutrition is a serious child health issue throughout the developing countries and the cause of approximately 50% of the 10.7 million deaths each year among under-five children in the developing world.²

The Lancet series on maternal and child under nutrition (2008) reported that 20% of underweight children younger than 5 belonged to low and middle income countries.³ After India (39%) and Bangladesh (5.7%), Pakistan (5.5%) contributes the third largest share of under-weight children in the world.⁴

Malnutrition has a complex aetiology related to several factors that alter the nutritional status of a child at varying levels. It should be kept in mind that malnutrition is totally a preventable pandemic provided that the risk factors involved are identified and combated at an early stage of child growth.⁵ Keeping in view, this study was conducted with an

objective to assess the nutritional status of children <5 years of age and to determine the frequency and association of malnutrition with various demographic variables in those children. Furthermore, it has the potential to develop better understanding of the risk factors involved in under-five malnutrition, which may strengthen related advocacy and awareness measures. The conclusions drawn from the study can be used for creating a conducive environment at local level by eliminating those risk factors. At the national level, this could be used to mobilize opinion leaders and decision makers. The study is expected to enrich the existing body of research and may herald further research aiming at defining linkage between under-five malnutrition and various demographic variables.

MATERIAL AND METHODS

This was a multi-cantered cross-sectional study conducted at the immunization centres of three allied Hospitals of Rawalpindi Medical College from March to May 2014. The allied hospitals include Benazir Bhutto Hospital (BBH), Holy Family Hospital (HFH) and District Headquarter Hospital (DHQ). The study population comprised of children presenting to the immunization centres of these three public sector hospitals. The general health status of children was assessed by taking a

detailed history from their parents/guardians. Healthy children, under-five years of age, without confirmed diagnosis of any disease/ailment, based on history taken from their guardians or absence of any illness record, were included in the study. All children either greater than five years of age or diagnosed with any morbidity or illness were excluded.

According to the reference study, the expected proportion of children with malnutrition would be 30.9%.⁶ By applying the statistical formula $n = Z^2 \frac{p(1-p)}{m^2}$ (where n =sample size, p =expected proportion of malnutrition, m =maximum tolerable error or margin of error) minimally required sample size for this study was calculated, keeping 95% confidence interval (CI) and a 10% margin of error. It came out to be 86 but a sample size of 100 was chosen. 33, 33 and 34 children were selected from HFH, DHQ and BBH respectively.

Multistage sampling technique, incorporating stratified random sampling of hospitals, simple random sampling of 3 immunization days per week, followed by selection of children through systematic random sampling for each day was used for this study.

The study was approved by the Ethical Review Board of Rawalpindi Medical College and allied Hospitals. A pre-tested questionnaire was used to collect information from the guardians of the children after taking their informed oral consent. Demographic variables include age, gender, family size, family income, breastfeeding, maternal education, presence of a person with special needs in the family and the presence of siblings <5 years of age in the family. Weights (kg) of the children were measured using standard measuring devices in all the three hospitals.

The World Health Organization (WHO) classification of weight-for-age (W/A) index was used to assess the nutritional status of the children. Underweight, based on weight-for-age, is a composite measure of stunting and wasting and is recommended as the indicator to assess changes in the magnitude of malnutrition over time.⁷

Results were expressed in terms of Z-score system of malnutrition classification. According to this classification, children having Z-score > -2 and <+2 are considered to be adequately nourished. Whereas those having Z-score < -2 and < -3 are classified as moderately and severely malnourished children, respectively. This is the preferred method of expressing prevalence of malnutrition obtained through survey results.⁸

Z-score is defined as the difference between the value for an individual and the median

value of the reference population for the same age or height, divided by the standard deviation of the reference population. This can be written in equation form as:

$$Z\text{-score (or SD-score)} = \frac{\text{Observed value} - \text{median reference value}}{\text{Standard deviation of reference population}}$$

The nutritional status of children in our study population is compared with the WHO Child Growth Standards.⁹

The data was entered and analysed using Statistical Package for Social Sciences (SPSS) version 22. Weight-for-age (W/A) Z-scores were calculated using WHO Anthropometric Calculator version 3.2.2. For categorical variables, frequencies and proportions were calculated and for continuous variables means and standard deviations were calculated. On the basis of Z-score, the frequencies of malnutrition were assessed according to each variable studied. To determine any existing statistical association between variables (age group, gender, maternal education, and presence of a family member with special needs) and nutritional status of children, Chi-square test at 5% level of significance was applied. For dichotomized variables where the Chi-square test was not applicable due to deficient expected count in more than 10% of cells of cross tabulation, Fisher's exact test was applied at 5% level of significance, to determine the association between variables (family size, family income, breastfeeding, presence of siblings <5 years of age) and nutritional status of a child. A p -value of less than 0.05 was taken as statistically significant. For determination of associations, status of malnutrition was also dichotomized as adequately nourished/malnourished, while the severity of malnutrition was not taken into account.

RESULTS

A total of 100 subjects were included in this study comprising 59 males and 41 females with a mean age of 20.31 (SD+14.59) months ranging from 0–60 months. According to the Z-score system of classification, 68% children in our study had adequate nutritional status while 32% children were found to be malnourished, 14% being moderately and 18% being severely malnourished. The mean Z-score of the sample was -1.68 (SD+1.77). Mean Z-scores of the three groups are mentioned in table-1. The association of each factor with nutritional status was determined and their findings are displayed in table-2.

The frequency of malnutrition was highest in the 16–30 months age group and was comparatively lower in other groups. No significant association was

found between malnutrition and gender. It occurred with the same frequency in both males and females.

A statistically significant ($p=0.01$) relationship was established between maternal education and malnutrition in our study. The frequency of malnutrition was higher in the children whose mothers had no or very little education. Our results indicated a statistically significant ($p=0.05$) association between malnutrition and the presence of a person with

special needs in the family, though marginal. No significant association was found between malnutrition and family size, family income, breastfeeding and presence of siblings <5 years of age in the family.

Table-1: Mean Z-scores of the three groups.

Nutritional Status	Mean	SD. Deviation
Adequately Nourished	-0.77	+0.87
Moderately Malnourished	-2.40	+0.33
Severely Malnourished	-4.56	+1.64

Table-2 Association of different variables with malnutrition

Baseline characteristics	Total F (100%)	Adequately Nourished	Moderately Malnourished	Severely Malnourished	p-value
Age Group (mo)					
0-15	41 (100%)	28 (68.29%)	7 (17.07%)	6 (14.63%)	0.55
16-30	39 (100%)	24 (61.53%)	5 (12.82%)	10 (25.64%)	
31-45	10 (100%)	8 (80%)	0 (0%)	2 (20%)	
46-60	10 (100%)	8 (80%)	2 (20%)	0 (0%)	
Gender					0.97
Male	59 (100%)	40 (67.79%)	8 (13.55%)	11 (18.64%)	
Female	41 (100%)	28 (68.29%)	6 (14.63%)	7 (17.07%)	
Maternal Education					**0.01
Primary or Nil	49 (100%)	31 (63.26%)	4 (8.16%)	14 (28.57%)	
More than primary	51 (100%)	37 (72.55%)	10 (19.61%)	4 (7.84%)	
Presence of a family member with special needs					*0.05
Yes	41 (100%)	22 (53.65%)	8 (19.51%)	11 (26.82%)	
No	59 (100%)	46 (77.96%)	6 (10.16%)	7 (11.86%)	
Family Size					0.83
Members < 5	39 (100%)	27 (69.23%)	6 (15.38%)	6 (15.38%)	
Members > 5	61 (100%)	41 (67.21%)	8 (13.11%)	12 (19.67%)	
Family Income(Rs)					0.81
<8000	31 (100%)	22 (70.97%)	2 (6.45%)	7 (22.58%)	
>8000	69 (100%)	46 (66.67%)	12 (17.39%)	11 (15.94%)	
BreastFeeding					0.51
Nil	12 (100%)	7 (58.33%)	3 (25%)	2 (16.66%)	
Yes	88 (100%)	61 (69.32%)	11 (12.50%)	16 (18.18%)	
Presence of siblings <5 years in family					0.80
Yes	77 (100%)	53 (68.83%)	10 (12.99%)	14 (18.18%)	
No	23 (100%)	15 (65.22%)	4 (17.39%)	4 (17.39%)	

*significant **highly significant

DISCUSSION

Worldwide, malnutrition is an underlying cause of death for 2.6 million children each year.¹⁰ To combat such a high mortality rate, a vigilant identification and comprehension of each factor influencing malnutrition is required. To our knowledge, this is probably the first study to recognize the associated factors of under-five malnutrition in Rawalpindi. Our study, which was conducted in 2014, found malnutrition to be present in 32% of children. Whereas in our neighbouring countries like Iran, India, China, Bangladesh and Nepal, the prevalence rate of underweight children was reported as 4.1%, 43.5%, 3.4%, 36.8% and 29.1% respectively.¹¹ According to Pakistan Panel Household Survey (PPHS-2010) micro-data, 56.9% children were adequately nourished, 15.7% were moderately malnourished and 23.7% were severely

malnourished, whereas, in our study the results were 68%, 14% and 18% respectively.¹²

In the first place, according to a study conducted in Iran (2011), male gender was considered as a protective factor against malnutrition, whereas, females were found to be more strongly related to under-nutrition¹³, however, as per a study from Luangprabang province, Laos, males were more likely to be underweight¹⁴. On the other hand, in our findings, gender is not a key indicator of malnutrition.

Secondly, our study has shown that the frequency of malnutrition was highest in the age group of 16-30 months as compared to remaining age groups. Conversely, a study of Oromia indicated the highest prevalence of underweight in children aged 48-59 months.¹⁵ A similar study conducted in Sialkot found the highest proportion of malnourished children in 13-36 months age group.¹⁶ This demands further research to probe if this is a high-risk group in

our population and to explore factors responsible for it. Likewise, In Peshawar 31.7% cases of malnutrition were reported in large sized families, whereas, in our study this frequency was found to be 32.7%, the results being somewhat consistent.¹⁷ Furthermore, poverty and nutritional status of the child are not the directly correlating factors in this study, a finding consistent with a similar study carried out in India.¹⁸ In addition to that, previous studies have suggested malnutrition to be significantly associated with breastfeeding. Whereas this factor remained insignificant in our study contrary to previous results.^{19,20}

Moreover, Bahawaluddin J *et al*²¹ concluded in 2012 that the maternal illiteracy plays a major contributing role to child malnutrition. Another study in Ludhiana found 40.7% cases of malnutrition associated with maternal illiteracy.²² Identically, our results also established a statistically significant association between malnutrition and maternal education and found 36.73% cases of malnutrition associated with maternal illiteracy. Similarly, Henry FJ *et al*²³ stated an increased risk of malnutrition among children with siblings under-five years old. Our results also identified a comparatively higher percentage of malnourished children in families having more than 1 child under 5 years of age. However, this result was not statistically significant.

Besides other factors, an interesting finding of our study was a significant association between malnutrition and the presence of a family member with special needs (i.e., disabled or diseased). This risk factor has only been taken into consideration by Mahgoub *et al* in 2006, but no significant association was observed.²⁴ The reason of this contrast might be the difference in the social and cultural set-up of the families in the two regions. In our social setting, the majority of households have large family size due to which there is unequal division of resources among the members. In addition to the economic burden posed by a person with special needs, an extra amount of time and attention which is to be provided by the caretaker of the household, which in our setup is mostly the mother, may also compromise a child's health and nutrition. Therefore, in order to affirm relation between malnutrition and the presence of a family member with special needs, further research is recommended in this area as very little has been reported about it in earlier studies.

The specific objectives of this study target child-survival and well-being. These have been a focus of public health communities for over last two decades. Unfortunately, they still remain an important issue in a developing country like Pakistan. This is reflected in United Nations Millennium Development Goals 4 (MDG 4) and 1 (MDG 1).

MDG 4 sets its targets (from 1990 to 2015) as a reduction in under-five mortality by two-thirds and MDG 1 as a reduction in prevalence of under-weight children by half. According to the United Nations Development Programme (UNDP) report in Pakistan, progress on all indicators is lagging in MDG 1. Progress on MDG 4, in all but 1 target, is also off-track. Currently, Pakistan stands among the worst in child and infant mortality. The child mortality rate has only marginally decreased, from 117 per thousand live births in 1990–91 to 94 per thousand in 2006–07.²⁵ The performance of Pakistan in achieving these goals is severely lagging and it is likely to miss them. The need, of measuring progress towards meeting these goals, has always been strongly felt by public health professionals and policy makers. Our study has tried to help satisfy this need by developing a better understanding of the individual contribution of each factor towards malnutrition. This may go a long way in strengthening the impact of the Child Nutritional Programmes in Pakistan.

Some of the limitations of this study need to be noted. The sample size of this study was small due to limited resources and time, but to make it representative, the study population was taken from three different healthcare facilities, located in three different areas of Rawalpindi, to include population with varied socio-demographic backgrounds. Moreover, data was collected only from the immunization centres of three public hospitals, and the children not accessing immunization services from public health facilities were missed in our study therefore the results cannot be generalized to all the children of Rawalpindi as a whole but still represent a large population. In this regard, a community-based survey with large sample, including the children visiting the private setup in addition to public facilities is strongly recommended in the future.

CONCLUSION

Children are the most vulnerable members of the society and to allow their development to be affected by poor nutrition is a waste of human potential. This research study would be of little value if the assessment is not followed-up by policy actions, which are most likely to have the greatest impact on child malnutrition if directed at an early stage of child growth. In order to attain better nutritional outcomes for their children, women must be educated beyond primary school level.

Moreover, offering frequent nutritional education programs can also be beneficial to the mothers, particularly those with no or very little education. The Government should take an initiative to provide financial and professional support to the families having members with special needs like

disabled or diseased. An appropriate surveillance system should be devised for prompt and timely diagnosis of malnutrition in children and its management in our country.

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AUTHOR'S CONTRIBUTION

SM, MM, SN, TS, UA: Study conception and design & Acquisition of data. SM: Drafting of Questionnaire. SM, TS, Interpretation of data. SM, TS, MM, SN: Drafting of manuscript, Final Approval of the version to be published. SM, TS, US: Critical revision

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