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Assesssment of malnutrition in children below 5 years of age with pneumonia and a comparison of laboratory parameters with or without malnutrition under 5 years of age.

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Globally, malnutrition is associated with ailments and deaths under 5 years' children and of note among developing countries like Pakistan is observed with the high incidence of malnutrition associated with rapid nutrition, economic and social transitions. However, there is a not enough data on malnutrition as well as on the factors allied with the problem among children belonging to local setup. To determine the frequency of malnutrition among children with pneumonia under 5 years of age and to compare the mean laboratory parameters of children having pneumonia with or without malnutrition under 5 years of age. Methodology: Cross-sectional study was conducted on 100 children selected from the Department of Pediatrics, Mayo Hospital. Lahore from September 25, 2020 to February 25, 2021. If patient had -2SD WHZ, then malnutrition was noted. Blood sample was taken to assess hemoglobin and platelet count. Data were entered and analyzed in SPSS v25.0.Among 100 children, 49(49.0%) had malnutrition. Mean hemoglobin was 7.41±1.25 g/dl with malnutrition and 8.36±1.33 g/dl among children without malnutrition. Mean platelet count was 225.35±45.44 10^9/L with malnutrition and 266.37±31.23 10^9/L among children without malnutrition. Conclusion: In our study, malnutrition is prevalent under 5 year's children i.e. 49%. Therefore, it is necessary to make progressive efforts that enhance nutritional knowledge of mothers since it explicit significant association with nutritional status of children under 5 years of age.

Keywords: ***Malnutrition, Pneumonia, Hemoglobin, Platelet Count.***

INTRODUCTION

WHO define pneumonia in a child as presence of cough and fast breathing and absence of general danger signs, chest in drawing and strider when calm. Severe pneumonia as having cough and problem in breathing with lower chest wall in drawing and very severe pneumonia by presence of danger signs like difficulty breastfeeding/drinking, central cyanosis, lethargy, vomiting of everything, convulsions, unconsciousness or head nodding along with cough and lower chest wall in drawing and strider in a calm child (WHO 2005).

Severe acute malnutrition is defined as severe wasting i.e. weight for height below -3SD with or without bilateral edema (Kliegman et al. 2015). Illness like anemia and infections are common in malnourished children

(Khan et al. 2021).Frequent and severe infections, including pneumonia, occur in malnutrition due to decline in immune function produced by a decrease in acquired cell-mediated and humoral immunity (Wicaksono 2016). UNICEF Progress report 2015 also stated high occurrence and severity of infections, including pneumonia, in undernourished children (UNICEF 2015). Malnourished children having severe pneumonia suffered more from rapid breathing (AOR 1.636, 95% CI 1.150–2.328 p = 0.006), chest wall in-drawing (AOR 1.698, 95% CI 1.113–2.590, p = 0.014), and fever (AOR 1.700, 95% CI 1.066–2.710, p = 0.026) compared to well-nourished children (Huq et al. 2021). Organisms causing pneumonia in malnourished children are different from those causing pneumonia in well-thriving children (Chishti et al. 2010).

Duration of hospital stay and recovery period also prolong in such children due to delay in clearance of infection because of decreased immunity (Bekele et al. 2017).

Pneumonia is 15 times more fatal in malnourished children than well-nourished children (Shukla et al. 2017).The morbidity, readmission rate (Ashraf et al. 2019) and mortality is also greater in malnourished children with pneumonia (Ginsburg et al. 2015).It has been reported that there was significant difference (p<0.001) observed for laboratory parameters of pneumonia in children with and without malnutrition i.e. hemoglobin (7.1±2.08 vs. 8.71±1.31) and platelet count (140.27±54.89 vs. 284.55±145.26) (Elsayh et al. 2013). Organisms causing

pneumonia in well-nourished children are *Streptococcus* (33%) and *H. influenzae* (10%) followed by *Staphylococcus Aureus* and *Klebsiella* while in malnourished children include *Klebsiella* (15%) and *Streptococcus* (15%) mainly followed by *Pseudomonas* and *Enterococcus* (10%), *MRSA* (8.3%), *E.coli* (5%) and *Staphylococcus Aureus* (1.1%) (Shukla et al. 2017).

The rationale of this research is to evaluate the frequency of malnutrition in children with pneumonia and then compare the laboratory parameters of pneumonia with or without malnutrition. This will aid in early diagnosis of malnutrition, which may be cause of less immunity control and lead to pneumonia and prompt treatment for reducing morbidity and mortality. But not much work has been done in this regard. Moreover, malnutrition is prevalent in our country and no local evidence is found in this regard. This study helps in assessing current extent of problem in local population for early recognition and proper case management for reduction of mortality and morbidity from malnutrition in children with pneumonia..

OBJECTIVES

To evaluate the frequency of malnutrition in children with pneumonia under five years of age.

To compare the mean laboratory parameters of children having pneumonia with or without malnutrition under five years of age.

MATERIALS AND METHODS

3.1 Study setting, Duration and Study Design

Cross-sectional study i.e. non-probability consecutive sampling technique was conducted on 100 patients selected from the Department of Pediatrics, Mayo HOSPITAL, Lahore from September 25, 2020 to February 25, 2021.

3.2 Sample Size

Sample size of 100 patients was estimated by using 95% confidence level, 9.5% absolute precision with expected percentage malnutrition i.e. 63.6% in children with pneumonia (Shukla et al. 2017).

3.3 Inclusion and Exclusion Criteria

Children aged 1-59 months, either gender, presenting with pneumonia were included in the study. Whereas, children with bronchiolitis, wheezy bronchitis, asthma exacerbation, chronic lung pathology, congenital anomalies affecting chest found on clinical examination and children already taking treatment for malnutrition, on medical record, were excluded.

3.4 Data collection procedure

Total 100 children with pneumonia fulfilling the inclusion criteria were included in the study from Emergency of Department of Pediatrics, Mayo Hospital, and Lahore. After taking written informed consent from parents, socio-demographics like age, gender and duration of pneumonia were noted. Then patients were assessed for weight and height and nutritional status was also assessed. If patient had -2SD WHZ, then malnutrition was noted and patients were divided in two groups. Then blood sample was taken by using 3cc disposable syringe and sent to the laboratory of the hospital for assessment of laboratory parameters including hemoglobin and platelet count. Reports were assessed and levels were noted. Management of patients is done as per standard protocol.

3.5 Data analysis plan

Data was tabulated and analyzed in SPSS v25.0. Qualitative variables like gender and malnutrition was analyzed through frequency and percentage. Quantitative variables like age, duration of pneumonia, height, weight, Z-score and laboratory parameters including hemoglobin and platelet count were presented as Mean±S.D. Laboratory parameters were compared in children with or without malnutrition by applying independent samples t-test. Data were stratified for age, gender, weight and duration of pneumonia. Post-stratification, chi-square test was applied. A p-value ≤0.05 was considered as significant.

3.6 Ethical Approval

Before the study took place; the ethical approval was obtained from the Pediatrics Department Unit II, Mayo Hospital, Lahore, Pakistan. After getting approval; informed consent was obtained from the participants and data on the research was collected in a comfortable environment as well as it was ensured that their privacy and anonymity was maintained and remains confidential in future.

RESULTS

Frequency distribution and Stratification of malnutrition with respect to demographic variables

The frequency distribution of demographic variables was presented in Table 1. Among 100 children presenting with pneumonia; children with ages between 1 to 59 months with mean age of 33.1±15.6 months. Most of the children 44(44.0%) were in 12-36 months of age group, while 15(15.0%) and 41(41.0%) were in <12 months and 36-59 months of age groups respectively. Furthermore, 71(71.0%) were male and 29(29.0%) were female. According to weight of child, 36(36.0%) had weight between 7-12 kg and 64(64.0%) had between 13-18 kg. According to duration of pneumonia, 40(40.0%) had pneumonia for <5 days and 60(60.0%) had for >5 days. In addition to this, stratification of malnutrition with respect to demographic variables was also presented in Table 1; which showed that out of 100 children, 49(49.0%) had malnutrition whereas, 51 (51%) had shown no symptoms of malnutrition.

Table 1: Frequency distribution and Stratification of malnutrition with respect to demographic variables

Frequency distribution and Stratification of malnutrition with respect to demographic variables				
Demographic Variables	**Total (%) (N=100)**	**Malnutrition**		**p-value**
		Yes 49 (49%)	**No 51 (51%)**	
Age group				
<12 months 12-36 months 36-59 months	15 (15%) 44 (44%) 41 (41%)	5 (33.3%) 21 (47.7%) 23 (56.1%)	10 (66.7%) 23 (52.3%) 18 (43.9%)	**0.33**
Gender				
Male Female	71 (71%) 29 (29%)	37 (52.1%) 12 (41.4%)	34 (47.9%) 17 (58.6%)	**0.49**
Weight of child				
7-12 kg 13-18 kg	36 (36%) 64 (64%)	16 (44.4%) 33 (51.6%)	20 (55.6%) 31 (48.4%)	**0.31**
Duration of pneumonia				
<5 days >5 days	40 (40%) 60 (60%)	15 (37.5%) 34 (56.7%)	25 (62.5%) 26 (43.3%)	**0.04***

***Statistically significant (p ≤ 0.05)**

Table 2: Comparison of hemoglobin levels and platelet count with and without malnutrition

Comparison of hemoglobin levels and platelet count with and without malnutrition (N=100)					
	Malnutrition	**n**	**Mean**	**Std. Deviation**	**p-value**
Hemoglobin (g/dl)	Yes	49	7.41	1.25	**0.00042***
	No	51	8.36	1.33	
Platelet count (10^9/L)	Yes	49	225.35	45.44	**0.00001***
	No	51	266.37	31.23	

***Statistically significant (p ≤ 0.05)**

4.2. Comparison of hemoglobin levels and platelet count with and without malnutrition

The comparison of hemoglobin levels and platelet count with and without malnutrition was tabulated in Table 2; in which mean hemoglobin was 7.41±1.25 g/dl with malnutrition and 8.36±1.33 g/dl among children without malnutrition and mean platelet count was 225.35±45.44 10^9/L with malnutrition and 266.37±31.23 10^9/L among children without malnutrition.

DISCUSSION

The international pressure against malnutrition must include commendable efforts against infectious diseases and also emphasis on nutritional management such as promoting healthy breastfeeding practices, educating mothers, encouraging micronutrient supplementation and improving safe water supply and sanitation facility (Chakraborty et al. 2014).Malnutrition in under 5 years children is considered to be the major public health problem which was somewhat common in developing countries including Pakistan. Our research findings revealed that approximately half of the children i.e. 49 % are malnourished.

These findings were found comparable with (Ali et al. 2005) and National Nutritional Survey (2011) who documented 41% and 46% stunting respectively in their researches. The NNS, 2011 also predicted that the

frequency of stunting had worsened in the last 10 years. Whereas, in current study 13.5% children were wasted; which was found relatively low than national statistics of National Nutritional Survey, 2011 in which 16% and 31% children fall in malnutrition wasting and underweight category respectively (Bhutta et al. 2011).

The result of current study was also found similar with (Peiris and Wijesinghe 2011; Hirani 2012; Damor et al. 2013) studies conducted in Sri Lanka, KPK (Pakistan) & India respectively. Contrary to this, (Chakraborty et al. 2014) showed that promotion of nutritional interventions thus causes decline of malnutrition in developing countries. This divergence in conclusion may be because of promoting breast feeding practices, effective preventive strategies, proficient healthcare facilities and immunization coverage in certain areas than rural areas that are still deprived of all these health care services.

Mother's nutritional knowledge plays an integral role in child's development as well as promotes nutritional

interventions that improve health status of them. In this study, out of 100 children, 49(49.0%) had malnutrition. In developing countries it is observed that one of the leading cause of malnutrition is poverty and food insecurity whereas, in developed countries abundance of food is the main driver for obesity (Black et al. 2013).

Nevertheless, recent studies also specified dual burden of malnutrition in both under and over nutrition children of developing countries (Mengistu et al. 2013) as well as the burden of obesity is escalating in poor as well as in low income communities (Pal et al. 2017).In a study, it was concluded that, the pervasiveness of malnutrition among children was 48.5% (Endris et al. 2017).In another study, 54% prevalence of malnutrition was reported (Ole Tankoi et al. 2016).

A common but potentially serious infection that affects children younger than 5 years of age throughout the world is pneumonia with annual incidence of 34 to 40 cases per 1000 in Europe and North America. In developing countries, pneumonia is not only common but also severe and fatal than it is in Europe and North America. Earlier researches have anticipated the effect of malnutrition and infections on genetic damage (Rodriguez, Cervantes and Ortiz 2011; McIntosh et al. 2002).

In this study, mean hemoglobin was 7.41±1.25 g/dl with malnutrition and 8.36±1.33 g/dl among children without malnutrition. Mean platelet count was 225.35±45.44 109/L with malnutrition and 266.37±31.23 109/L among children without malnutrition. It has been reported that there was significant difference ($p<0.001$) observed for laboratory parameters of pneumonia in children with and without malnutrition i.e. hemoglobin (7.1±2.08 vs. 8.71±1.31) and platelet count (140.27±54.89 vs. 284.55±145.26) (Elsayh et al. 2013).

CONCLUSION

The study concluded that malnutrition being a global challenge affecting children to a greater extent i.e. 49%. Therefore there is an imperative need to arrange educational programs and mass media campaigns that improve nutritional knowledge of mothers as well as give awareness about healthy eating's that benefits both the mother and their children; as it has shown definite association with child's nutritional status under 5 years of age.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

Dr. MARYAM SHAHID: Proposed Topic, Literature Review, Methodology, Data collection, Data Analysis, Interpretation of Results.
RUKIYA TARIQ: Literature Review, Interpretation of Results and Manuscript writing
DR. KHOLA BINET MANSOOR: Formal Analysis and Reviewed the Manuscript
All authors read and approved the final version..

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