Original Paper

Nutrition assessment of school-going children in the rural area of District Swabi, Pakistan

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Abstract— Anemia and malnutrition are global health problem among all nutritional disorder with high morbidity and mortality in school aged children. Therefore the aims of the study assist the prevalence and risk factors of anemia, and malnutrition among school-going children of District Swabi Pakistan. A total of 600 school aged children of aged 4-15 years were included in the study in 2023. Hematocrit level was obtained using a centrifuge microhematocrit, and converted to hemoglobin using standard conversion. Nutritional status was determined by the anthropometric measurements, and demographic characteristics were obtained by questionnaire. Anemia and malnutrition were defined according to the World Health Organization standards. In current research work 600 children were selected for the assessment of nutritional status in which 105(17.5%) were found malnutrated. Moderate frequency of assessment were found among anemia 25(23.80%), stunting 22(21%) and underweight 18(17%) respectively. High frequency was found in malnutrition 40(38%) while very low frequency was seen in wasting 2(1.90%). Gender wise assessment of the students shows that the nutritional deficiencies were slightly high in male as compare to female students in comparison of Anemia, Malnutrition, Stunting, and Underweight and in wasting respectively. Aged group wised assessment of the students shows that the nutritional deficiencies were slightly high in low aged student (4-7 years) as compare to 8-11 years and 12-15 years in both gender. Among them Malnutrition were very high leading by Anemia while Underweight and wasting of very low frequency respectively.

Keywords—bacteria, climate, microbe, mycorrhizae, temperature

I. INTRODUCTION

Rate of malaria infection declined from 22% (146 million individuals) in 2005 to 13% (114 million individuals) in 2015 in sub-Saharan Africa [1]. In Cameroon, malaria burden and transmission intensity are heterogeneous with spatial and temporal variations between altitudes and geographical areas, with varied prevalence rates from one area to another [2]. Like many sub-Saharan countries, prevalence of malaria has dropped in Cameroon by using insecticide-treated nets (ITN) in 2007 [3-6]. According to the follow-up study of Sumbele et al. [3], prevalence of malaria parasitemia dropped from 85.4% in 2006 to 36.6% in 2013 with a relative risk reduction of 57.2% in the Mount Cameroon area. Nevertheless, malaria still remains a major killer of children in this country and is estimated to take the life of a child every two minutes [1].

Malaria, anemia, and undernutrition are associated with morbidity and mortality, with higher rates among children, particularly in sub-Saharan Africa [7-9]. Anemia is defined as a condition in which the oxygen-carrying capacity of red blood cells is insufficient to meet the body's physiologic needs due to low blood hemoglobin concentration [7]. This condition affects individuals and has significant adverse health consequences, as well as adverse impacts on social and economic development [10].

Childhood anemia is considered a severe public health problem in Sub-Saharan Africa (62.5%) and in particular Cameroon, where a prevalence of 63.2% was reported in 2011 [1]. Malaria causes a substantial proportion of anemia in malaria-endemic settings [11-13]. Notwithstanding, updating the role of malaria parasitemia in anemia prevalence when coverage of insecticide-treated nets is above 75% in Cameroon [14], will help the National Malaria Control Programs to plan proper management strategies by considering the heterogeneities in different localities. However, association of anemia burden with malaria, relative to other causes such as malnutrition, and its variation across different altitudes of Cameroon has not been established. On the other hand,

nutritional status is closely associated with immune response to the infections, is an important determinant of risk and prognosis of infectious diseases, and is directly influenced by the infections [15]. Nonetheless, association of malnutrition with malaria has been contradictory. Sumbele et al. [16] reported that malnutrition is associated with a higher risk of Plasmodium infection, and infectious episodes contribute to deterioration of nutritional status. In contrast, some studies found no association between nutrition and subsequent mortality from malaria [9,17]. In agreement, malnutrition and Plasmodium falciparum malaria frequently co-exist in Sahelian countries, and are accounted for a large part of under-five morbidity and mortality during their concomitant peak seasons [18]. Based on the report of the United Nations Children's Fund in 2013, 38% of children below the age of 5 years suffer from chronic malnutrition or stunting in sub-Saharan Africa. Unfortunately, malaria and undernutrition are two major causes of childhood mortality in the region [19]. Anemia has also been reported as a significant determinant of stunting [20], which is the main type of malnutrition in young children [21]. Stunting is associated with impaired cognitive development, reduced academic achievement, and decreased physical work capacity in adulthood, with a financial burden on societies [22]. While the global stunting prevalence fell from 39.6 to 23.8% between 1990 and 2014, scenario is quite different in Africa, where an increasing trend is observed [23]. Nevertheless, prevalence of stunting fell from 49.9% [24] to 17.1% [21] in some localities in the Mount Cameroon area.

Impact of nutritional status on malaria may differ due to the heterogeneity of populations, species of the parasite, and other factors involved in the host and parasite relationship. This study aimed at determining the prevalence and intensity of malaria parasitemia, anemia, and malnutrition as well as identifying the risk factors for these public health concerns among children living in Charsadda (a city of Khyber, Pakistan). Anemia and malnutrition were defined according to the World Health Organization standards. Logistic regression analysis was used to determine associations between the predictor variables and primary outcomes.

II. Subjects and methods

This observational cross-sectional study was conducted in rural area of District Swabi from April to September 2023. It was approved by ethical committee of the Takht Bhai Institute of Health and Management Sciences and the Takht Bhai THQ Hospital (Pakistan). Informed consent was obtained from the teachers and participants. Verbal consent was obtained from the parent/caregivers after explaining the purpose, risks, and benefits of the study. Sample size was determined by a single population formula. Accordingly, 600 students of aged 4-15 years were selected from the Govt schools. Demographic information together with weight and height of the children were obtained by a questionnaire (Table 1), and plotted to gender specific, growth charts. School Health Program was carried out on a systematic basis in the Rural Block. Ages of the children were determined using school records. For nutritional status assessment, weight was measured by a floor type weighing scale, height was taken using a measuring tape applied to the wall from their back of heels to the head touching the wall. Malaria infection was confirmed by rapid diagnostic tests. The hematocrit level was obtained using a centrifuge microhematocrit and converted to hemoglobin using standard conversion. Nutritional status was determined from the anthropometric measurements collected. Anemia and malnutrition were defined according to the World Health Organization standards.

Demographic information	General information	Dietary Habits
Name: Age: Gender: Grade/Class: School Name: **Anthropometric Measurements** Height (cm): Weight (kg): BMI (Body Mass Index):	Do you have breakfast every day before going to school? (Yes/No) How many meals do you typically eat a day? Do you eat fruits and vegetables daily? (Yes/No) How often do you consume fast food? (Yes/No)	What is your favorite healthy food? How often do you drink water a day? ○ Less than 3 glasses ○ 3-5 glasses ○ 6-8 glasses ○ More than 8 glasses Are you aware of the importance of a balanced diet? (Yes/No) Do you receive any nutrition education at school? (Yes/No)

III. Results

In current research work 600 children were selected for the assessment of nutritional status in which 105(17.5%) were found malnutrated. Moderate frequency of assessment were found among anemia 25(23.80%), stunting 22(21%) and underweight 18(17%) respectively. High frequency was found in malnutrition 40(38%) while very low frequency was seen in wasting 2(1.90%). (Fig. 1).
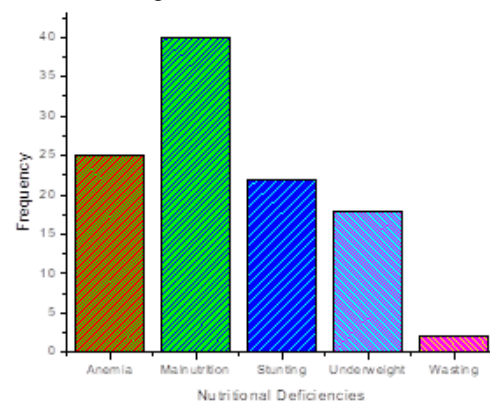

Fig. 1. Overall frequency of nutritional assessment in the school aged children

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Gender wise assessment of the students shows that the nutritional deficiencies were slightly high in male as compare to female students in comparison of Anemia, Malnutrition, Stunting, and Underweight and in wasting respectively which are shown in the (Fig. 2)
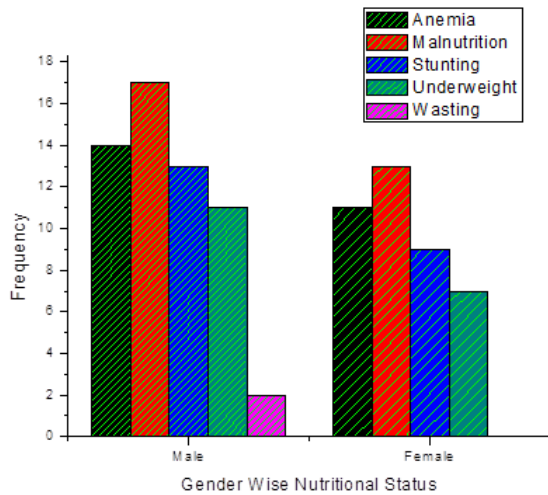

Fig. 2. Gender wise nutritional assessment in the school aged children

Aged group wised assessment of the students shows that the nutritional deficiencies were slightly high in low aged student (4-7 years) as compare to 8-11 years and 12-15 years in both gender. Among them Malnutrition were very high leading by Anemia while Underweight and wasting of very low frequency respectively which are shown in the (Fig. 3)
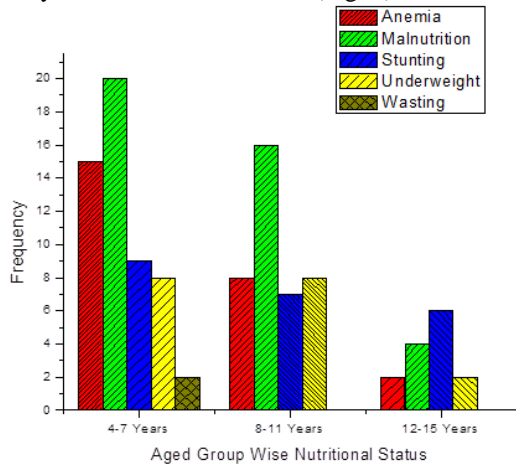

Fig. 3. Aged group wise nutritional assessment in the school aged children

Fig. 4 Demographic assessment

IV. DISCUSSION

In current research work 600 children were selected for the assessment of nutritional status in which 105(17.5%) were found malnutrated. Moderate frequency of assessment were found among anemia 25(23.80%), stunting 22(21%) and underweight 18(17%) respectively. High frequency was found in malnutrition 40(38%) while very low frequency was seen in wasting 2(1.90%). Same work also conducted by [15] for nutritional deficiencies among them anemia were recorded with high percentage of the children, respectively while malnutrition prevalence was 41.2% with wasting, underweight, and stunting occurring in 0.06%, 10%, and 37% respectively. Age was a significant risk factor for malaria with higher odds of having malaria infection in children 6–10 years of age were identified as significant risk factors for anemia while being in the age group of up to 5 years were the only high risk factor associated with malnutrition.

Gender wise assessment of the students shows that the nutritional deficiencies were slightly high in male as compare to female students in comparison of Anemia, Malnutrition, Stunting, and Underweight and in wasting respectively. Similar assessment were also conducted by [27] according to age group wise between 4 to 10 years 90(10%) female students were found stunting and 60(7%) were found underweight. While in the age of 11 to 15 years 48(5.3%) students were stunting and 42(4.7%) students were underweight. The difference in stunted and underweight showed more boys than the girls. In the Pre

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nursery group more boys were stunted than girls, the ratio being 70%:30%, on the contrary underweight was more in boys than in girls, with the ratio of 57%:43%. In the Primary section both stunting and underweightwere more in boys as compared to the girls. The ratios were54.8%:45.2% and 82.9%:17%, respectively.

Aged group wised assessment of the students shows that the nutritional deficiencies were slightly high in low aged student (4-7 years) as compare to 8-11 years and 12-15 years in both gender. Among them Malnutrition were very high leading by Anemia while Underweight and wasting of very low frequency respectively. Similarly [26] the nutritional deficiencies of the school going children among them anemia percentage was recorded high in lower socioeconomic family children, than middle class and upper class. The percentage of anemic children was also high in age group of 10 - 12 years. Pale skin was the most common symptom of anemia.

V. CONCLUSION

The available data show that malnutrition is a public health problem among the school-going children of the local area of District Swabi, Pakistan. The findings of the study revealed that slightly above one 4th (17.5%) school going children of the local area of Swabi were Anemic, underweight, stunting and malnutrated. Being male, were more effected than female students. Based on the finding; there must be collaboration among health sectors and education sectors of the city to address under nutrition problems of the City. This research work however provides data for further studies and advance on public health among school-aged children.

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