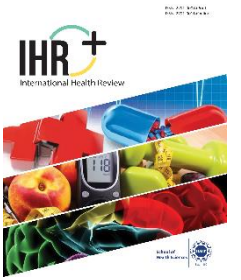
International Health Review (IHR)
Volume 3 Issue 2, 2023
ISSN$_{(P)}$: 2791-0008, ISSN$_{(E)}$: 2791-0016
Homepage: https://journals.umt.edu.pk/index.php/ihr

Article QR



Title: **Assessment of the Nutritional Status of Adolescents in Orphanage from Lahore, Pakistan**

Author (s): Hamala Khan[1], Zoha Sohail[2], Noohela Khan[3], Shazia Zahra[2], Rameen Khan Niazi[4], Usama Anwar[5], Aisha Zaheer[6], Mnahil Moazzam[7], Dua Arshad[7]

Affiliation (s):
[1]CCL Pharmaceuticals, Lahore, Pakistan
[2]Fatima Memorial Hospital, Lahore, Pakistan
[3]Riphah International University, Lahore, Pakistan
[4]Rashid Latif Medical Complex, Lahore, Pakistan
[5]Arif Memorial Teaching Hospital, Lahore, Pakistan
[6]NUR International University, Lahore, Pakistan
[7]University of Veterinary & Animal Sciences, Lahore, Pakistan

DOI: http://doi.org/10.32350/ihr.32.04

History: Received: June 8, 2023, Revised: September 11, 2023, Accepted: September 12, 2023, Published: December 15, 2023

Citation: Khan H, Sohail Z, Khan N, et al. Assessment of the nutritional status of adolescents in orphanage from Lahore, Pakistan. *Int Health Rev.* 2023;3(2):43–59. http://doi.org/10.32350/ihr.32.04

Copyright: © The Authors

Licensing: This article is open access and is distributed under the terms of Creative Commons Attribution 4.0 International License

Conflict of Interest: Author(s) declared no conflict of interest

A publication of
The School of Health Science
University of Management and Technology, Lahore, Pakistan

Assessment of the Nutritional Status of Adolescents in Orphanage from Lahore, Pakistan

Hamala Khan[1*], Zoha Sohail[2], Noohela Khan[3], Shazia Zahra[2], Rameen Khan Niazi[4], Usama Anwar[5], Aisha Zaheer[6], Mnahil Moazzam[7], and Dua Arshad[7]

[1]CCL Pharmaceuticals, Lahore, Pakistan
[2]Fatima Memorial Hospital, Lahore, Pakistan
[3]Riphah International University, Lahore, Pakistan
[4]Rashid Latif Medical Complex, Lahore, Pakistan
[5]Arif Memorial Teaching Hospital, Lahore, Pakistan
[6]NUR International University, Lahore, Pakistan
[7]University of Veterinary & Animal Sciences, Lahore, Pakistan

ABSTRACT

Orphans are one of the most vulnerable groups to nutritional deficiency, which require more nutritional care for proper growth and development. Assessment of nutritional status has cornerstone importance in orphans because growth retardation is mainly caused by undernutrition**.** As United Nations indicated in a recent report, there are more than 4.3 million orphan children in Pakistan and many of them are under age nearly of 17. The study aims to assess adolescent's nutritional status and the relationship between BMI and their dietary habits. The current study is a cross-sectional study conducted on 80 orphan children aged (10-19 years). The sample of orphan children was taken from three orphanages in Lahore via non-probability convenient sampling. The data was collected using a questionnaire that included questions related to anthropometric measurements, clinical assessment, and food frequency tables. Data were analyzed by using SPSS software version 25. The frequency of orphans with normal BMI was 51.2% among the study sample. Indicatively, majority of children were suffering from paleness and dryness of skin, white spots in nails, redness in eyes, dry and brittle hair, and discolored or spongy gums. Dietary history showed that consumption of bread and cereals, starchy vegetables, junk food, and carbonated beverages was more common among orphanages. Orphan children in diverse orphanages had sub-clinical nutritional deficiencies due to poor dietary habits; emphasizing the need for detailed assessment of nutritional status in orphanages for the applications of related interventions to prevent nutritional deficiencies.

[*]Corresponding Author: Khan.hamala14@gmail.com

Keywords: adolescents, body mass index, convenient sampling, nutritional status, orphanages

1. INTRODUCTION

Nutritional evaluation is an organized technique for gathering and interpreting information related to nutritional status to make decisions concerning nutrition-related health disorders. ABCDE method is most commonly used to determine nutritional status. This normally stands for Anthropometry, B for biochemical technique, C for clinical assessment, D for dietary habits, and E for environmental factors. These techniques will help to assess the nutritional status; allowing for correct planning and execution of interventions to minimize morbidity and death related to undernutrition.

Regarding orphan children's nutritional status; undernutrition is mainly responsible for dietary deficiencies. Monthly or annual screening of nutritional status should be done for proper diagnosis of the underlying nutrition-related problem. Anthropometric measurements remain the most practically effective means for the assessment of the nutritional status of a population [1]. Body mass index (BMI) is the most common method for nutritional status assessment [2]. A population's nutritional status can also be ascertained through physical indicators, symptoms, and dietary recall.

An estimated 153 million children in the world are orphans [3]. Orphaned children, in contrast to non-orphan children, exhibit a higher susceptibility to inadequate nutrition due to factors like insufficient care, inadequate hygiene, and limited awareness. Another contributing factor to undernutrition in orphaned children is the variability in maternal and paternal involvement [4]. The lives of numerous individuals who were once healthy and productive have been adversely impacted by environmental factors, such as conflicts, natural disasters, poverty, war, endemic diseases, and maternal mortality, consequently contributing to the growing population of orphans [5]. Extensive evidence supports the significance of economic factors, specifically income and consumption, in influencing the overall well-being of a population [6]. Widespread childhood malnutrition, high infant mortality rates, and low literacy levels represent the foremost social challenges in numerous developing countries, including Pakistan [7].

A study titled “Nutrition Status and Associated Morbidity Risk Factors among Orphanage and Non-Orphanage Children in Selected Public Primary Schools within Dagoretti, Nairobi, Kenya” analyzed the nutrition status and associated risk factors of primary school children living in orphanages and those not living in orphanages. The orphanage children were found to have a much greater rate of stunting and underweight than non-orphanage youngsters. Morbidity was also considerably greater among orphanage children than among non-orphanage children. When compared to non-orphanage children, orphanage children were more than three times more likely to consume insufficient calories. Key factors related to a greater prevalence of malnutrition among orphanage children included high morbidity rate, insufficient quantity and variety of foods served, low rates of vaccination, and poor basic cleanliness [8].

Another study conducted in Lahore assessed the nutritional quality, energy, and macronutrient intake among male and female orphan children from orphanages. Anthropometric measurements such as height, weight, and BMI were used to determine nutritional status. The study's findings indicated that orphan males and females aged 14 were at high risk of malnutrition. Their average calorie consumption was 71% and 68% of their RDAs, respectively Out of the entire population, 88% of individuals had normal weight-for-height, while 5% exhibited moderate malnutrition and 6% showed severe malnutrition among orphans. Additionally, only 1% had severe malnutrition [9].

A study titled "Nutritional status assessment of orphanage children in Rawalpindi" determined the frequency of nutritional deficiencies through physical examination and dietary intake after data collection, results were then compared to the recommendations. The findings revealed that 34 (17%) of children and adolescents were underweight, 99 (49.5%) were stunted, 21 (10.5%) were thin, and 9 (4.5%) were overweight. Protein calorie insufficiency, iron inadequacy, and vitamin A and B 12 deficiency were the most frequent nutrient deficiencies. Because of financial limits and carer ignorance; orphanage children and adolescents were in danger of malnutrition, which led to child health problems and increased death rate [9].

Childhood is the most important and formative time of a person's life. A healthy childhood is critical for future development and growth. It is heavily influenced by parents, family, society, and the environment, all of

which shape one's attitude, behavior, manner, and emotions [3]. There is a great need for organizations to support and help these children to maintain their successful adult life. The most common problems faced by orphan children include loss of home, poor performance in school, problems with immunization and health, child labor, drug abuse, poor self-esteem, poor social network, lack of self-confidence, and lack of healthy physical activities [8]. Orphans are a susceptible section of our society and there is a great need for proper systems that will take charge of it [9].

2. MATERIALS AND METHODS

A cross-sectional study was conducted. Sample size (n) of 80 participants was included in the study by using 90% confidence interval (1-α/2), 4% margin of error, and by taking expected percentage (p) of underweight as 23% [10] with the help of following formula;

$$N = \frac{Z^2\ 1-\alpha/2 * p * (1-p)}{d^2}$$

The sampling technique was convenient sampling, and the sample was collected from three orphanages in Lahore, Pakistan. The inclusion criteria was orphans aged 10-19years [11, 12]. Exclusion criteria included children under the age of 10 and above the age of 19, and those with any comorbidities.

Orphanage was visited after written approval from the respective authority. Data was collected through interviews and filling a validated questionnaire that included questions related to anthropometric assessment, clinical assessment, and food frequency. Anthropometric measurements were taken by the researcher which included weight, height, and BMI calculations. Clinical assessment included physical signs and symptoms, and dietary history was taken from the food frequency questionnaire [13, 14].

Moreover, the data was analyzed by using SPSS software version 25. Chi-square was used with a level of significance of 0.05 *(p-value <0.05)*

3. RESULTS

Table 1. Demographic Data and Anthropometric Measurements of the Study Population

Characteristics	Frequency (*n*) *N* = 80	Percentage (%)
Age		
10-12years	24	30%
13-15 years	28	35%
16-19years	28	35%
Gender		
Male	50	62.5%
Female	30	37.5%
Body Mass Index		
Underweight (<18 kg/m^2)	35	43.8%
Normal (≥18.5-24.9 kg/m^2)	41	51.2%
Overweight (≥25-29.9 kg/m^2)	3	3.8%
Obese (≥30 kg/m^2) [15]	1	1.3%

Table 1 represents the demographic characteristics and body mass index of the study population. According to the data, 24 (30%) children belonged to the age group of 10-12 years, 28 (35%) were in the age range of 13-15 years, and 28 (35%) were from the age group of 16-19 years. Most of the participants were males (n=50), accounting for 62.5% of the total, while females accounted for 37.5% (n=30). Among the 80 participants, 35 (43.8%) were classified as underweight, 41 (51.2%) fell into the normal weight category based on their body mass index, 3 (3.8%) were classified as overweight, and only one (1.3%) participant was categorized as obese.

Table 2. Clinical Assessment of the Study Population

Clinical Assessment		Underweight	Normal	Overweight	Obese	Total	*p-value*
Skin changes	Pale	14 (17.5%)	15 (18.75%)	0 (0%)	0 (0%)	29 (36.25%)	0.03
	Dry	16 (20%)	18 (22.5%)	0 (0%)	1 (1.25%)	35 (43.75%)	
	Pink, Uniform	5 (6.25%)	8 (10%)	3 (3.75%)	0 (0%)	16 (20%)	
	Total	35 (43.75%)	41 (51.2%)	3 (3.75%)	1 (1.25%)	80 (100%)	
Eyes	Pale	16 (20%)	21 (26.25%)	1 (1.25%)	1 (1.25%)	39 (48.75%)	0.1
	Redness	13 (16.25%)	18 (22.5%)	0 (0%)	0 (0%)	31 (38.75%)	
	Bright, Clear	6 (7.5%)	2 (2.5%)	2 (2.5%)	0 (0%)	10 (12.5%)	
	Total	35 (43.75%)	41 (51.2%)	3 (3.75%)	1 (1.25%)	80 (100%)	
Hair	Firm	6 (7.5%)	2 (2.5%)	1 (1.25%)	1 (1.25%)	10 (12.5%)	0.07
	Dry	16 (20%)	18 (22.5%)	1 (1.25%)	0 (0%)	35 (43.75%)	
	Loose	13 (16.25%)	21 (26.25%)	1 (1.25%)	0 (0%)	35 (43.75%)	
	Total	35 (43.75%)	41 (51.2)	3(3.75%)	1 (1.25%)	80 (100%)	
Teeth	Discolored	13 (16.25%)	10 (12.5%)	0 (0%)	1 (1.25%)	24 (30%)	0.17
	Spongy gums	15 (18.75%)	29 (36.25%)	2 (2.5%)	0 (0%)	46 (57.5%)	
	Healthy	7 (8.75%)	2 (2.5%)	1 (1.25%)	0 (0%)	10 (12.5%)	
	Total	35 (43.75)	41 (51.2%)	3 (3.75%)	1 (1.25%)	80 (100%)	
Nails	White spot	19 (23.75%)	23 (28.75%)	0 (0%)	1 (1.25%)	43 (53.75%)	0.01
	Spoon shaped	8 (10%)	14 (17.5%)	0 (0%)	0 (0%)	22 (27.5%)	
	Healthy	8 (10%)	4 (5%)	3 (3.75%)	0 (0%)	15 (18.75%)	
	Total	35 (43.75%)	41(51.2%)	3(3.75%)	1(1.25%)	80 (100%)	
Lips	Cracked	11 (13.75%)	26 (32.5%)	2 (2.5%)	1 (1.25%)	40 (50%)	0.03
	Cheilosis	13 (16.25%)	13 (16.25%)	0 (0%)	0 (0%)	26 (32.5%)	
	Pink, Normal	11 (13.75%)	2 (2.5%)	0 (0%)	0 (0%)	13 (17.5%)	
	Total	35(43.75%)	41(51.2%)	3(3.75%)	1(1.25%)	80(100%)	

Table 2 depicts the clinical examination of the study population, which included 80 individuals. Clinical assessment of skin changes, eyes, hair, teeth, nails, and lips in individuals of various weight categories (underweight, normal, overweight, and obese) are shown in Table 2. Dry skin was the most prevalent skin alteration observed, affecting 43.75% of the population. Pale skin changes were more common in the underweight (17.5%) and the normal weight (18.75%) categories. However, only 20% of the total population had pink and uniform skin. The *p-value* of 0.03 indicated a statistically significant difference in the prevalence of skin changes among the weight categories.

Regarding eye changes, most participants (48.75%) showed pale eyes, which was more prevalent in normal-weight individuals (26.25%) as compared to underweight individuals (20%), respectively. Redness in eyes was observed in both underweight and normal-weight categories, with 38.75% of participants displaying this symptom. Notably, underweight individuals had the highest proportion (7.5%) of bright and clear eyes among the studied population. Furthermore, the *p-value* of 0.1 represented that there was no significant difference between the weight status and the eye changes among the study participants.

Among the study participants, both dry hair and loose hair were the most reported issues, each affecting 43.7% of the individuals. Notably, within the normal weight category, 26.25% of participants encountered the problem of loose hair, while 22.5% of subjects experienced the concern of dry hair, which may point towards potential underlying deficiencies. However, the participants having body weight in the overweight and obese categories did not encounter any kind of changes in hair. The *p-value* of 0.69 represented the insignificant relationship between hair characteristics and body weight status among the study population.

The findings suggest that variations in participants' teeth conditions might not be attributed to their weight status, as supported by the insignificant p-value of 0.17 indicating a lack of association. Spongy gums emerged as the most prominent issue, affecting 57.5% of the individuals. This condition was most prevalent in the normal weight category as 36.25% of participants experienced it. Discolored teeth were reported by 30% of the participants, with 16.25% of the underweight group and 12.5% of the normal group being affected. Additionally, healthy teeth were observed in

12.5% of participants, with a slightly higher occurrence among the underweight individuals (8.75%).

White spots on nails were the most common issue, affecting 53.75% of participants, notably prevalent in the normal weight category (28.75%). Spoon-shaped nails were found in 27.5% of participants, mainly among the normal weight group (17.5%). Healthy nails were observed in 18.75% of participants across weight categories. The calculated *p-value* of 0.01 signifies a significant relationship between nail characteristics and weight status, suggesting potential underlying factors.

Lastly, the table presents an overview of lip conditions among the participants. Among the total of 80 participants, cracked lips were observed in 50% of the individuals, with the highest occurrence in the normal weight category (32.5%). Cheilosis was reported by 32.5% of participants, with an equal prevalence in both the underweight and normal weight categories (16.25% each), respectively. Additionally, pink/normal lips were noted in 17.5% of the participants, with the majority observed in the underweight category (13.75%). The calculated *p-value* of 0.03 suggests a statistically significant relationship between lip characteristics and weight status within the study population.

Table 3. Dietary Assessment of the Study Population

Dietary Assessment	Daily	1-2 days/week	2-4 days/week	Rarely	Total	*p-value*
Whole milk and yogurt						
Under-weight	2 (2.5%)	29(36.25%)	3 (3.75%)	1 (1.25%)	35(43.75%)	
Normal	8 (10%)	26 (32.5%)	5 (6.25%)	2 (2.5%)	41 (51.2%)	
Overweight	2 (2.5%)	0 (0%)	1 (1.25%)	0 (0%)	3 (3.75%)	0.04
Obese	1 (1.25%)	0 (0%)	0 (0%)	0(0%)	1 (1.25%)	
Total	13 (16.25%)	55 (68.75%)	9 (11.25%)	3(3.75%)	80 (100%)	
Bread and cereals						
Underweight	28 (35%)	1 (1.25%)	6 (7.5%)	0 (0%)	35 (43.75%)	
Normal	27 (33.75%)	1 (1.25%)	13 (16.25%)	0 (0%)	41 (51.2%)	
Overweight	1 (1.25%)	0 (0%)	2 (2.5%)	0 (0%)	3 (3.75%)	0.2
Obese	0 (0%)	0 (0%)	1 (1.25%)	0 (0%)	1 (1.25%)	
Total	56 (70%)	2 (2.50)	22(27.5)	0(0%)	80(100%)	
Chicken and Eggs						
Underweight	1 (1.25%)	25 (31.25%)	2 (2.5%)	7 (8.75%)	35 (43.75%)	
Normal	1 (1.25%)	32 (40%)	3 (3.75%)	5 (6.25%)	41 (51.25%)	
Overweight	1 (1.25%)	1 (1.25%)	1 (1.25%)	0 (0%)	3 (3.75%)	0.02
Obese	1 (1.25%)	0 (0%)	0 (0%)	0(0%)	1 (1.25%)	
Total	4 (5%)	58 (72.5%)	6(7.5%)	12(15%)	80(100%)	
Fruits and Fruit Juices						
Underweight	0 (0%)	28 (35%)	(0%)	7 (8.75%)	35 (43.75%)	
Normal	3 (3.75%)	28 (35%)	3 (3.75%)	0 (0%)	41 (51.2%)	
Overweight	2 (2.5%)	1 (1.25%)	0 (0%)	0 (0%)	3 (3.75%)	0.003
Obese	0 (0%)	1 (1.25%)	0 (0%)	0 (0%)	1 (1.25%)	
Total	5(6.25%)	58 (72.5%)	3(3.75%)	7(8.75%)	80(100%)	
Starchy and Non–starchy Vegetables						
Underweight	2 (2.5%)	19 (23.75%)	8 (10%)	6 (7.5%)	35 (43.75%)	0.02
Normal	2 (2.5%)	21 (26.25%)	15 (18.75%)	3 (3.75%)	41(51.2%)	

Dietary Assessment	Daily	1-2 days/week	2-4 days/week	Rarely	Total	*p-value*
Overweight	0 (0%)	1 (1.25%)	1 (1.25%)	1 (1.25%)	3 (3.75%)	
Obese	1 (1.25%)	0 (0%)	0(0%)	0 (0%)	1 (1.25%)	
Total	3(6.25%)	41 (51.2%)	24(30%)	10 (12.5%)	80(100%)	
Carbonated drinks						
Underweight	24 (30%)	3 (3.75)	8 (10%)	0 (0%)	35 (43.75%)	
Normal	26 (32.5%)	4 (5%)	11 (13.75%)	0 (0%)	41 (51.2%)	
Overweight	3 (3.75%)	0 (0%)	0 (0%)	0 (0%)	3 (3.75%)	0.8
Obese	1 (1.25%)	0 (0%)	0 (0%)	(0%)	1 (1.25%)	
Total	54 (67.5%)	7(7.75%)	19 (23.75%)	0(0%)	80(100%)	
Junk food						
Underweight	28 (35%)	0 (0%)	7 (8.75%)	0 (0%)	35 (43.75%)	
Normal	28 (35%)	4 (5%)	9 (11.25%)	0 (0%)	41 (51.2%)	
Overweight	1 (1.25%)	1 (1.25%)	1 (1.25%)	0 (0%)	3 (3.75%)	0.003
Obese	0 (0%)	1 (1.25%)	0 (0%)	0 (0%)	1 (1.25%)	
Total	57 (71.25%)	6(7.50%)	17(21.25%)	0(0%)	80(100%)	
Almonds and Nuts						
Underweight	0 (0%)	2 (2.5%)	0 (0%)	33 (41.25%)	35 (43.25%)	
Normal	0 (0%)	5 (6.25%)	0 (0%)	36 (45%)	41 (51.2%)	
Overweight	0 (0%)	0 (0%)	0 (0%)	3 (3.75%)	3 (3.75%)	0.02
Obese	0 (0%)	0 (0%)	0 (0%)	1 (1.25%)	1 (1.25%)	
Total	0(0%)	7(8.75%)	0(0%)	73(91.25%)	80(100%)	

Table 3 depicts the dietary assessment of 80 individuals. Dietary changes of milk, chicken, eggs, fruits, vegetables, junk food, breads, cereals, almonds, and nuts in individuals of underweight, overweight, obese, and normal children. Whole milk and yogurt consumption were more prevalent in normal-weight individuals, 41 (51.2%). However, 29 (36.25%) underweight children consumed milk 1-2 days/week. Only 2 (2.5%) overweight children consume milk daily. The *p-value* of 0.04 indicates a statistically significant difference in the consumption of whole milk and yogurt among weight categories.

Regarding daily consumption of bread and cereals, 28 (35%) underweight, and 27 (33.5%) normal weight children were found. With respect to the *p-value*, there is no statistically significant difference between bread and cereal consumption among weight of individuals. However, 1-2 days /week chicken and egg consumption were highest in underweight 25 (31.25%), and normal 32 (40%) individuals. 1 (1.25%) obese individual consumed chicken and eggs daily. The *p-value* of 0.02 indicates a statistically significant difference in the consumption of chicken and eggs among weight categories.

In terms of fruit and juice consumption, the intake of fruits was observed different among various bodyweight categories: 28 individuals (35%) were underweighted, another 28 individuals (35%) had normal weight, 1 individual (1.25%) fell into the obese category, and similarly, 1 individual (1.25%) was classified as overweight. This consumption pattern occurred over a span of 1-2 days per week. The *p-value* 0.002 is statistically significant in the consumption of fruit and fruit juices among different weight categories.

In the case of starchy and non-starchy vegetables, the highest consumption was seen in normal individuals, 21 (26.25%) of individuals. The calculated *p-value* of 0.02 indicates a

statistically significant difference in the consumption of starchy vegetables among weight categories. However, the consumption of carbonated drinks may not be related to their weight categories, as the *p-value* of 0.8 indicates a lack of association.

Junk food consumption is most common among individuals, indicating the highest number of underweight 28 (35%), normal 28 (35%), and overweight 1 (1.25%) consumption of junk food on daily basis. The P-value

of 0.003 indicates a statistically significant difference between consumption of junk food and weight categories. Almond and nut consumption is found to be very rare among normal weight 36 (45%), overweight 33 (41.25%), obese 3 (3.25%), and 1 (1.25%) individual. The findings suggest a *p-value* of 0.02 that indicates a statistically significant difference among individuals of almond and nut consumption and weight categories.

4. DISCUSSION

The overall wellbeing of children might be influenced by orphanhood. The current study assessed the nutritional status of 80 children living in three different orphanages in Lahore, Pakistan. Another study conducted in Rawalpindi with a sample size of 276 adolescents aged 5-18 was conducted considering four orphanages. The BMI of orphans was significantly influenced by the dietary habits of people and adolescent's food consumption patterns [16]. The 2021 edition of the UNICEF-WHO-World Bank Group Joint Malnutrition Estimates revealed, while the incidence of stunting has decreased since 2000, more than one in five people, or 149.2 million people, still they suffered from the condition. There will be 38.9 million overweight children under the age of five in 2020, up from 33.3 million in 2000 [17].

In the current study, 43.8% of participants were underweight. While 51.2% were of normal weight, 1.3% were obese, and 3.8% were overweight. The study revealed that several of the orphaned adolescents had subclinical deficiencies, while having normal BMIs. This study also showed that 36.25% of the orphans had pale skin and 43.75% had dry skin, which indicates zinc and iron dietary insufficiency. Additionally, 26.25% of children with normal weight had pale eyes and 22.5% had eye redness, suggesting possible riboflavin and iron deficiencies. A related study found even more concerning results, with 95% of participants showing evidence of nutritional inadequacy and 68% exhibiting symptoms of anemia. These findings highlighted the critical need for tailored interventions [10].

Similar findings were found in other studies. It was discovered that 49% of the individuals were anemic, while others had angular stomatitis (8.4%), cheilosis (29.1%), and glossitis (58.3%). Furthermore, the findings of another research showed that many participants had pale skin (60%), nail issues (31%), and angular stomatitis (34%). Whereas 16.25% of children

with normal weight had cheilosis, 28.75% had white patches in their nails, and 17.5% had spoon-shaped nails [18].

There was a higher prevalence of bread and cereal consumption among the study's participants. The primary sources of protein for orphaned children in our research were chicken and eggs, yet the consumption rate is only 40% as compared to children with normal weight. Another study stated that the most frequently consumed food was bread and white rice. Beans were the only source of protein among orphan children. The findings indicated a low intake of both macro and micronutrients with the exception of protein [19].

Daily milk and yogurt consumption in underweight children was 2.5% and 10% in normal weight children, which was extremely low and necessitated dietary modifications. According to a study which was conducted among Lebanese school-aged children living in orphanages in North Lebanon showed that physical signs suggesting nutritional deficiencies were detected in about 25% of the sample. Dietary intake evaluation showed that about half of the participants had inadequate dietary intakes of proteins, fruits, and vegetables. Whereas 92% had inadequate milk and dairy intakes recommended for their age specific needs [20].

The results of a recent study revealed that 15.7% of girls and 18.6% of boys were underweight, 3.7% of girls and 4.1% of boys were stunted, and 16.5% of boys and 23.1% of girls were overweight/obese. The most eaten foods among adolescents were cereals and the least eaten food option were dairy products. Vegetables, fruits, and milk consumption rates were very low in orphanage children. The average intake of energy, protein, and total fats was inadequate for orphanage children, which were nearly between 14 to 18 years [21].

4.1. Conclusion

This study showed that the BMI status of orphan children among different orphanages was normal; however, they had sub clinical deficiencies due to improper dietary habits. Indicatively, majority of orphan children were suffering from paleness of skin, redness of eyes, discoloration of teeth or spongy gums, dry or thin hair, and white or spoon shaped nails. Children are more likely to consume bread and cereals and fewer number of fruits, milk, and proteins. Additionally, it was observed that excessive consumption of carbonated beverages or junk food was also seen as a

prevailing reason for causing nutritional deficiency in adolescents. Moreover, this study also identified that nuts and dry fruits consumption, such as almonds and nuts very rare in children living in orphanage.

4.2. Recommendations

The dietary trends that have been found highlighted the critical need for focused interventions. For the general health and wellbeing of adolescents who were from orphanage, it is imperative to address these nutritional abnormalities. Therefore, this study suggested the following thorough intervention techniques to bridge these gaps:

- Develop targeted and useful educational programmes to increase public understanding of a balanced diet. Work together with medical experts to make sure that carers and orphaned children receive accurate and useful information.
- Encourage community collaboration to establish a nurturing atmosphere for adolescent orphans. Take part in community-based interventions that address nutritional inadequacies and encourage the population to adopt healthy eating habits.
- Examine how socioeconomic factors affect the eating habits of teenagers who are orphaned. Targeted therapies that address the underlying causes of dietary deficits and encourage long-lasting adjustments will be informed by an understanding of all the aforementioned aspects.

This study also indicated that further studies should be conducted:

- To determine the nutritional status of orphan children in other age groups, for instance, less than 10 years or more than 19 years of age.
- To do surveillance based nutritional screening to assess nutritional deficiencies at the earliest.

4.3. Limitations

Biochemical tests of selected samples were not measured due to the lack of funds though it should be done to determine certain biochemical markers and their relationship with body mass index. Future research should address these for more comprehensive findings and effective interventions.

REFERENCES

1. Oninla SO, Owa JA, Onayade AA, Taiwo O. Comparative study of nutritional status of urban and rural Nigerian school children. *J Trop Pediatr*. 2007;53(1):39–43. https://doi.org/10.1093/tropej/fml051
2. Higashiyama Y, Kubota M, Oshima S, Mibu M, Yasui Y, Nagai A. Assessment of Japanese healthy children's nutritional status using waterlow classification. *Health*. 2012;4(11):e24444. https://doi.org/10.4236/health.2012.411158
3. Routray S, Meher BK, Tripathy R, Parida SN, Mahilary N, Pradhan DD. Growth and development among children living in orphanages of Odisha, an eastern Indian state. *Reason*. 2015;110:75–83.
4. De Onis M, Monteiro C, Akré J, Glugston G. The worldwide magnitude of protein-energy malnutrition: an overview from the WHO global database on child growth. *Bull World Health Org*. 1993;71(6):703–712.
5. Sarker M, Neckermann C, Müller O. Assessing the health status of young AIDS and other orphans in Kampala, Uganda. *Tropical Med Int Health*. 2005;10(3):210–215. https://doi.org/10.1111/j.1365-3156.2004.01377.x
6. Linnemayr S, Alderman H, Ka A, Biology H. Determinants of malnutrition in Senegal: individual, household, community variables, and their interaction. *Econom Human Biol*. 2008;6(2):252–263. https://doi.org/10.1016/j.ehb.2008.04.003
7. Cheah WL, Muda WA, Zamh ZH. A structural equation model of the determinants of malnutrition among children in rural Kelantan, Malaysia. *Rural Remote Health*. Jan-Mar 2010;10:e1248.
8. Sadowska J, Radziszewska M, Krzymuska A. Evaluation of nutrition manner and nutritional status of pre-school children. *Acta Sci Pol Technol Aliment*. 2010;9(1):105–115.
9. Bukht H, Qazi HJ, Islam Z, et al. Assessment of nutritional status and dietary patterns of orphans residing in different orphanages of Lahore, Pakistan. *Int J Biosci*. 2020;16(4):19–33.
10. Haleemath SKS, Bhat B, Anees S, Bangera S. Assessment of nutritional status in children of an orphanage. *Indian J Clinic Anatomy Physiol*. 2017;4(2):156–159.

11. Sunitha S, Gururaj G. Health behaviours & problems among young people in India: cause for concern & call for action. *Ind J Med Res*. 2014;140(2):185–208.
12. World Health Organization. Adoloscent health. https://www.who.int/health-topics/adolescent-health#tab=tab_1. Accessed December 31, 2023.
13. Moazzam M, Zahid M, Sohail Z, Khan N, Firdous AJ. Relationship between dietary patterns and central obesity in middle aged adults: Dietary patterns and central obesity in adults. *Healer*. 2023;3(3):423–434. https://doi.org/10.55735/hjprs.v3i3.135
14. Arshad D, Sohail Z, Khan N. Association of normal weight obesity with dietary habits among young adults in Pakistan. *Pak J Public Health*. 2022;12(3):137–142. https://doi.org/10.32413/pjph.v12i3.1064
15. Weir CB, Jan A. BMI classification percentile and cut off points. In: *StatePearls*. StatePearl Publishing; 2019.
16. Riaz M, Azam N, Mahmood H, Asif R, Khan N, Mughal FA. Nutritional status assessment of orphanage children in rawalpindi. *Pak Armed Forces Med J*. 2021;71(6):2139–2143. https://doi.org/10.51253/pafmj.v71i6.6496
17. World Health Organization. *Levels and trends in child malnutrition: UNICEF/WHO/The World Bank Group joint child malnutrition estimates: key findings of the 2021 edition*. https://www.who.int/publications/i/item/9789240025257. Publsihed May 5, 2021.
18. Hussain M, Hossain AM, Bhuyan AH. Nutritional status of resident female orphans of selected orphanages of Dhaka city. *J Bangladesh Soc Physiol*. 2010;5(2):66–70. http://dx.doi.org/10.3329/jbsp.v5i2.6779
19. Sadik A. Orphanage children in Ghana: are their dietary needs met? *Pak J Nutr*. 2010;9(9):844–852. https://doi.org/10.3923/pjn.2010.844.852
20. El-Kassas G, Ziade F. The dual burden of malnutrition and associated dietary and lifestyle habits among lebanese school age children living in orphanages in north Lebanon. *J Nutr Metabol*. 2017;2017:e4863431. https://doi.org/10.1155/2017/4863431
21. Singwa AA, Tanya A, Ngangmou TN, Navti LK, Tamfuh PA, Ejoh RA. Nutritional status and eating habits of children in orphanages in Bamenda (North West Cameroon). *Int J Nutr Food Sci*. 2022;11(2):30–37. https://doi.org/10.11648/j.ijnfs.20221102.13