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Original Article

Dietary Diversity and Nutritional Status of School Children in Pyin Oo Lwin township, Mandalay Region, Myanmar

Keanekaragaman Pola Makan dan Status Gizi Anak Sekolah di Kotapraja Pyin Oo Lwin, Wilayah Mandalay, Myanmar

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Abstract: *The nutritional status of school children is important for their growth, development, and overall well-being. Poor nutritional status of the school children can have a huge impact not only in the short term but also for their long lives. This study aimed to investigate the nutritional status and its associated factors among adolescent school children in Pyin Oo Lwin Township, Mandalay Region. A cross-sectional study was conducted from August to December 2023 among 202 school children in public schools of Pyin Oo Lwin Township by simple random sampling method using face-to-face interviews with pretested structured questionnaires. Anthropometric measures were taken, and nutritional indicators were calculated using the WHO Anthro Plus software. Data analysis was conducted using SPSS version 16. Bivariate and multivariable regression analyses were performed to find the associated factors of nutritional status. Among 202 students, aged between 14 and 18 years, 83.7% had normal nutritional status while the prevalence of thinness, overweight, and obesity were 12.4%, 3%, and 1%. Most of the school adolescents had a high knowledge level (80.7%), and 77.2% had adequate dietary diversity. According to multivariable analysis, dietary diversity was the major influencing factor on malnutrition of the school children. The students with an adequate dietary diversity score were 70% less likely to be malnourished compared to those with an inadequate diversity score (AOR= 0.30, 95%CI = (0.13, 0.67), p-value=0.003). Therefore, the study would like to recommend promoting nutrition education specifically on diverse food consumption to achieve a balanced diet and prevent malnutrition among the students.*

Key word: Dietary Diversity, Myanmar, Nutritional status, School children

1. INTRODUCTION

School children are the future leaders of society, and their health status is the foundation of the future health of the entire nation and has a crucial impact on the level of health in a country. The growth deceleration in school children impairs their learning, intelligence, and academic progress. The scientific consensus considers child growth as an important indicator of nutritional status and health (1).The nutritional status of school children is important for their growth, development, and overall well-being. Adolescence is a phase of rapid physical and cognitive development stated as the second window of opportunity to improve nutritional status and prevent consequences of malnutrition. Adolescents aged 10 to 19 find themselves in a transitional phase, moving from childhood towards young adulthood. This period coincides with the entry into high school, signifying a shift in the social dynamic. At an age where they can understand the importance of nutrition and make informed choices.

Adolescents accomplish more than 20% of their adult height and up to 50% of their adult weight and skeletons during the rapid physical growth that occurs during adolescence. This is a time of significant psychosocial development and establish lifelong dietary and lifestyle habits. Proper nutrition during this time is essential to support the body's increased energy and nutrient requirements (2). In Myanmar, a total of 5,609,676 students enrolled at basic education schools, private schools, and monastic schools in respective regions and states for the 2022- 2023 academic years (3). The second Global School-based Student Health Survey in Myanmar, conducted nationally with a representative sample of 45 schools and 2838 students, showed 18% of the students were underweight and 7.6% and 1.9% of students were measured to be overweight and obese, respectively (4).

However, the COVID-19 health crisis was a profound disruption for various many sectors and had the severe impact on public health and well-being, notably in education. The COVID-19 pandemic has led to an increased prevalence of obesity and nutritional deficiencies among children and adolescents. Because of the financial struggles related to COVID-19, a large number of families made cheaper and unhealthy food choices (5). Poor nutritional outcomes in developing countries are influenced by social and income inequalities, which represent a major determinant. In low-income countries where underweight and overweight could coexist, the balance has moved towards undernutrition. Malnutrition amplifies both the incidence of illness and death during infections, imposing a substantial economic burden on healthcare systems. Malnutrition has various forms, including undernutrition (wasting, stunting, and being underweight), vitamin or mineral deficiency, overweight, obesity, and diet-related non-communicable diseases.

Pyin Oo Lwin Township is located in the central of Myanmar which has diverse ethnics and lifestyles, mixing upper and lower socioeconomic classes. It is a city of attraction for both foreigners and local travelers as well as a center of flower and vegetable production of Myanmar. Pyin Oo Lwin Township accommodates a total of 20 basic education high schools (public schools), and approximately four thousand students attend these institutions. The impact of COVID-19 is also felt among school-age adolescents. In the last three years, the government has strongly responded to the COVID-19 pandemic condition. Educational institutions have been temporarily shuttered during that time. Therefore, there are health services program interruptions in Myanmar, including school health services, during the pandemic. In addition to that, the current scarcity of nutritional data on school going children in Myanmar, their nutritional status needs increased attention. In order to support this, the current study aimed to investigate the nutritional status and its associated factors of adolescent's school children in Pyin Oo Lwin Township, Mandalay Region of Myanmar. Based on the findings of this study, more effective and focused nutrition intervention plans could be formulated to improve the nutritional status of the school children in Myanmar.

2. METHODS

The study was a cross-sectional descriptive study from August to December (2023) conducted among school children aged 14 to 18 years at selected basic education high

schools in Pyin Oo Lwin Township, Mandalay region of Myanmar. The school children were regarded as eligible only if their parents or guardians gave permission to participate in the study. The school children with known chronic illnesses or conditions affecting dietary intake, the school children who felt ill on the day of data collection and those who do not want to participate were excluded from the study.

Sampling and sample size

The total required sample size was calculated by single proportion population formula (6) whereas p represents proportion of obese school children (13.7%) (7). The total required sample size was 202 school children with 10% non-response rate at 95% confidence intervals and margin of error (0.05). To recruit the required sample size, three basic education high schools were selected randomly from 20 basic education high schools in Pyin Oo Lwin Township and the required number of school children were selected randomly and proportionately from each three schools.

Data collection methods and tools

Data collection was done by face-to-face structured questionnaire which included socio-demographic characteristics, nutritional knowledge, and dietary diversity. Nutritional knowledge questionnaires were adopted from the local literature (8). A qualitative 24-hour dietary recall method was used to assess dietary diversity. The schoolchildren were asked to recall what they had eaten in the previous 24 hours. DDS was calculated based on the nine food groups by FAO; (i) starchy staples; (ii) dark green leafy vegetables; (iii) other vitamin A-rich fruits and vegetables; (iv) other fruits and vegetables; (v) organ meat; (vi) meat and fish; (vii) eggs; (viii) legumes, nuts, and seeds; and (ix) milk and milk products. Five enumerators were trained by the researchers for two days before data collection. Pre- testing was done among 20 school children in another township and the questionnaires were revised accordingly.

Anthropometric measurements (height and weight) were conducted using standard procedures (9). The weight was measured by a seca digital weighting scale. Before weighing, the participants were requested to remove bulky outer clothing, shoes, and any objects (such as wallets or heavy jewelry) and to stand with their weight evenly distributed. The weight was recorded to the nearest 100 g (0.1 kg). The height was measured by using seca stadiometer and it was measured to the nearest 1 mm (0.1 cm). The heads of the students were placed in the Frankfort position with the shoulders, buttocks, and heels touching the vertical stand when measuring height. The measurements were taken twice, and the average was used for analysis. Ethical clearance was obtained from the Institutional Review Board, University of Public Health, Ministry of Health, Myanmar (UPH-IRB, December 5/2022)

Data analysis

Descriptive and inferential analyses were performed using SPSS version 16. The descriptive analysis was conducted using frequencies and percentages for categorical variables. Bivariate and multivariable logistic regression analysis was performed to examine the factors associated with malnutrition (undernutrition, overweight and obesity). All independent variables that had an association with the outcome variable at a p-value of less than 0.25 were chosen for multivariable analysis. The results were presented in tabular form, showing the crude odds ratios (CORs) and adjusted odds ratios (AORs) with their 95% confidence intervals (CIs). A p-value <0.05 was considered statistically significant.

Nutritional indicator of BMI-for-age z score (BAZ) of the participants were calculated using WHO Anthro Plus software, which has the Growth Reference Standard for children and adolescents (5-19 years) (10). The growth reference classification of the nutritional indicators consists of thinness (BAZ < - 2 SD), overweight (BAZ > 1 SD to < 2 SD), and obesity (BAZ > 2 SD).

The independent variables were socio-demographic characteristics, dietary diversity and nutritional knowledge. The dependent variable was the nutrition status of the school children. The knowledge question has a total of 17 items and the total score was given 19 marks. Knowledge scores were categorized into two groups; school children who scored ≥80% of the total scores (≥15points out of 19) were considered to have "high knowledge", and those who scored <80% (<15points out of 19) were considered to have "low knowledge" (11). DDS was categorized into two groups, the school children who consumed at least four different food groups were categorized into adequate dietary diversity (DDS ≥4) and who consumed less than four different food groups as inadequate dietary diversity (12).

The classification of the status categories of the types and frequencies of consumption of vegetables and fruits is based on the median values obtained from the total quantity of how many types and the frequency of consume of fruits and vegetables. Univariate analysis is used to find out the frequency distribution of each variable studied. Bivariate analysis is also used to see the relationship between free variables, i.e. vegetable and fruit preferences, with bound variables such as vegetables and fruit consumption, and the test used is a chi-square test with SPSS.

3. RESULTS

This study aimed to find the nutritional status and associated factors of the basic education high school students in Myanmar. The minimum age was 14 years, and the maximum age was 18 years within the range of Grade 8 to Grade 10. Almost all the respondents were Buddhist (89.6%) and Myanmar ethnic (92.1%) which is not surprising because of the geographic context of the study area.

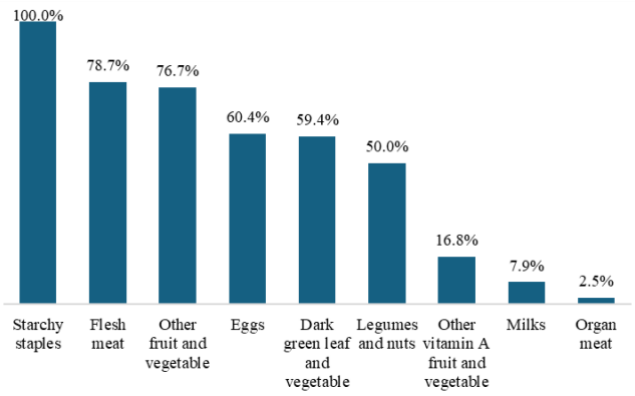
Table 1. Background characteristics of high school students

Variables	Frequency	Percent
Age in years		
14-15	96	47.5
16-18	106	52.5
Gender		
Male	84	41.6
Female	118	58.4
Religion		
Buddhist	181	89.6
Christian	15	7.4
Muslim	6	3
Ethnic		
Myanmar	186	92.1
Indian	14	6.9
Chinese	2	1
Main Guardian		
Mother	184	91.1
Father	7	3.5
Grandfather	3	1.5

Variables	Frequency	Percent
Grandmother	3	1.5
Others	5	2.5
Main Guardian's Education		
Illiterate	12	5.9
Read and write	22	10.9
Primary school level	40	19.8
Middle school level	60	29.7
High school level	49	24.3
University	3	1.5
Graduate	16	7.9
Main Guardian's Occupation		
Dependent	73	36.1
Manual workers	36	17.8
Private employee	34	16.8
Government employee	5	2.5
Famer	49	24.3
Others	5	2.5
Number of family members		
≤5	148	73.3
>5	54	26.7
Family per capita income (MMKs)		
≤100,000	110	54.5
>100,000	92	45.5
Nutritional knowledge		
High	163	80.7
Low	39	19.3
Dietary Diversity		
Adequate	156	77.2
Inadequate	46	22.8

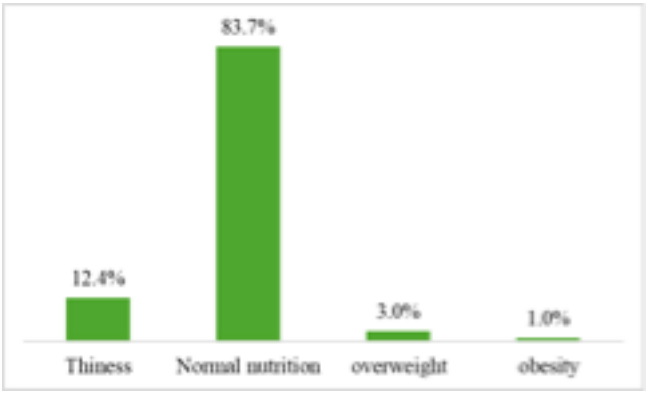
More than 90% of the respondents' mother existed as main guardian and around one third of main guardian attained middle (29.7%) and high school level (24.3%). Also, one third of the main guardian (36.1%) were unemployed or dependent, which contribute highest proportion among occupational status. The majority of the school children (73.3%) had less than 5 family members. The estimated monthly income of the family was found to be very low that more than half of the families had less than 100,000 in Myanmar kyats.

Figure 1. Dietary Diversity by foods group of the school children



A low consumption rate of other vitamin A-rich fruits and vegetables was observed, with only 16.8% of students reporting their consumption. Additionally, a mere 7.9% of students consumed milk, and a minimal 2.5% included organ meats in their diet.

Figure 2. Nutritional Status of the school children according to BMI-for-age z score



According to BMI-for-age z score (Figure-2), the majority of the school children (83.7%) were in normal nutritional status whereas 12.4% had thinness. Only 4% of the respondents were overweight and obese.

Table 2. Bivariate and multivariable regression analysis of factors associated with malnutrition

Variables	BMI-for-age		COR (95% CI)	AOR (95% CI)
	Malnutrition	Normal		
Age				
≤15	15(15.6%)	81(84.4%)	1	
>15	18(17.0%)	88(83.0%)	1.10(0.52,2.33)	
Gender				
Male	17(20.2%)	67(79.8%)	1	1
Female	16(13.6%)	102(86.4%)	0.62(0.29, 1.31)	0.58 (0.27,1.25)
Religion				
Buddhist	29(16.0%)	152(84.0%)	1	
Non-Buddhist	4(19.0%)	17(81.0%)	1.23(0.39,3.93)	
Ethnic				
Myanmar	29(15.6%)	157(84.4%)	1	
Others	4(25.0%)	12(75.0%)	1.81(0.54,5.98)	
Main Guardian				
Mother	23(12.5%)	161(87.5%)	1	
Others	2(11.1%)	16(88.9%)	0.62(0.14,2.82)	
Guardian's Education				
≤ Primary school	12(16.2%)	62(83.8%)	1	
>Primary school	19(14.8%)	109(85.2%)	0.75(0.35,1.60)	
Guardian's Occupation				
Non-employed	11(15.1%)	62(84.9%)	1	
employed	22(17.1%)	107(82.9%)	1.16(0.53,2.55)	
Number of family				

Variables	BMI-for-age		COR (95% CI)	AOR (95% CI)
	Malnutrition	Normal		
≤5	27(18.2%)	121(81.8%)	1	1
>5	6(11.1%)	48(88.9%)	0.56(0.22,1.44)	1.24(0.48,3.19)
Family per capita income (MMKs)				
≤100,000	19(17.3%)	91(82.7%)	1	
>100,000	14(15.2%)	78(84.8%)	0.86(0.41,1.82)	
Nutritional knowledge				
High knowledge	27(16.8%)	134(83.2%)	1	
Low knowledge	6(14.6%)	35(85.4%)	0.85(0.33,2.22)	
Dietary Diversity Score				
Inadequate	14(30.4%)	32(69.6%)	1	1
Adequate	19(12.2%)	137(87.8%)	0.32(0.14,0.70)*	0.30(0.13,0.67)*

4. DISCUSSION

Regarding the nutritional knowledge level of participants in this study, it is found that only one-fifth of the participants (19.3%) exhibited low knowledge, whereas the majority, (80.7%) demonstrated a high level of knowledge. The nutritional knowledge level of the current study was greater than the previous studies in Myanmar, which were conducted in the Naypyitaw region and Mandalay region. The Naypyitaw study showed that more than half of the students (58.9%) obtained high knowledge levels. Another study of nutritional status and dietary patterns among high school students in the Mandalay region showed that 54% of students attained high knowledge level (13). This could be explained that after COVID-19, health promotion programs were accelerated including nutrition promotion program.

In this study, most of the students (77.2%) had adequate dietary diversity. Compared to other studies, the current study had more adequate dietary diversity than other previous studies. The previous finding, derived from a cross-sectional study conducted among the school-age population of Ghana, revealed that 33% of the participants exhibited adequate dietary diversity (14). In another Myanmar study in Pyinmana Township, 35.2% of individuals had an adequate dietary diversity score (15). This could be most probably due to the study area of the current study which is an economically developed township with high food availability and accessibility compared to other studies.

The proportion of the school children consuming from the food groups were illustrated in Figure-1. According to the 24-hour dietary recall, 100% of the students consumed starchy staples in the presence study, which is similar to the study in the Pyinmana township revealed that approximately 100% of the study population consumed starchy staples (15). This is due to the culture of Myanmar, where every day Myanmar people consume rice, mostly three times a day. The rural regions of Pyin Oo Lwin play a crucial role in food production, so they have no difficulty with food availability and accessibility. Therefore, most students (78.7%) ate flesh meats as well as other fruit and vegetables (76.7%). More than half of the students (60.4%) consumed eggs, and

(59.4%) ate dark green leaves and vegetables. Exactly half of all students ate legumes and nuts. Generally, most of the students can afford to eat a high-protein diet, which may be due to the economic development of Pyin Oo Lwin township.

Myanmar Household Welfare Survey found that adults are driven by lower consumption of milk and dairy products (16.4%) as well as Vitamin A rich fruits (16). The current findings suggest a necessity for educational efforts aimed at promoting milk and dairy product consumption among school adolescents. Likewise, there is a requirement to provide education to school adolescents regarding the importance of including vitamin A-rich fruits and vegetables, as well as organ meats, in their diet.

According to BMI-for-age z score (Figure-2), the majority of the school children (83.7%) were in normal nutritional status whereas 12.4% had thinness. Only 4% of the respondents were overweight and obese. The prevalence of malnutrition is similar to results obtained in Nigeria, where 18.1% had malnutrition (17). A study on nutritional status and dietary patterns among middle school students in Yangon Region shows that 45.2% of students were malnourished (8) which is quite higher than the current study. This discrepancy in findings may be due to different in consumption and lifestyle behavior between the study areas since Yangon region is the most economically developed area in Myanmar and so the school children adopt the sedentary lifestyle and their consumption pattern lean to fast foods than healthy food which could prone to malnutrition more likely.

In the present study, the prevalence of malnutrition was higher in boys (20.2%) than in girls (13.6%). These findings were consistent with a previous study conducted in Pyinmana Township of Myanmar where males were higher (23%) than females (18.6%) in malnutrition (15). In Poland, the prevalence of malnutrition was more common in males (33.5%) than in females (23.1%) (18). Male adolescents are more affected by malnutrition than female adolescents (19). It may be because boys often have higher muscle mass and metabolic rates compared to girls, resulting in potentially higher energy requirements and more susceptible to malnutrition.

The limitation of this study were there may be recall bias from 24-hour dietary recall which may result in both overestimation and underestimation of food intake from previous days.

5. CONCLUSION

The study found that most of the students had high nutritional knowledge and adequate dietary diversity as well as most of the students had normal nutritional status. Malnutrition was more prevalent among boys than girls in this study. Dietary diversity was found to be the influencing factor on the malnutrition of the school children. The students with adequate dietary diversity score were 70% less likely to be malnourished compared to those with an inadequate diversity score. Therefore, the study would like to recommend nutrition intervention that address dietary diversity such as school-based nutrition education and school feeding program should be considered to achieve a balanced diet and prevent malnutrition among the school children.

CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest in this study.

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