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DIFFERENCES IN BODY MASS INDEX DISTRIBUTION BETWEEN PUBLIC AND PRIVATE PRIMARY SCHOOLS

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ABSTRACT

Background: Malnutrition, including underweight, overweight, and obesity, poses significant health challenges for children, particularly in crisis-affected regions like Syria, where 60% face food insecurity. This study aimed to compare the Body Mass Index (BMI) distribution among primary school students in public and private schools in Latakia Governorate and link these findings to family socioeconomic status. **Objective:** To compare BMI levels across three groups: private schools, public schools in the city center, and public schools on the outskirts, while analyzing differences by gender and class grade. **Methods:** A comparative observational study was conducted involving 818 children aged 6.1 to 10.5 years from six schools using stratified cluster sampling. Weight, height, and BMI were measured according to World Health Organization (WHO) standards. Data were analyzed using chi-square and ANOVA tests. **Results:** The sample included 818 children, with females at 414 (50.6%) and males at 404 (49.4%). The average age was 8.22 ± 1.1 years. Participants were distributed as follows: 30% in private schools, 39.1% in public schools in the city center, and 30.9% in the outskirts. BMI classifications revealed 12% underweight, 69.9% normal weight, 10% overweight, and 8.1% obese. No significant differences were found between genders (P=0.8) or class grades (P=0.7) regarding BMI distribution. **Conclusion:** A correlation exists between socioeconomic status and children's nutritional health in schools. Public health interventions should consider regional economic characteristics, along with systematic growth chart follow-up and periodic BMI assessments for all students, particularly those with unsuitable BMI.

KEYWORD:- Body Mass Index (BMI), Primary Schools, Malnutrition, Socioeconomic Status, Private Schools, Public Schools.

INTRODUCTION

Body mass index (BMI) is a numerical value derived from an individual's weight and height, used as a screening tool to categorize individuals into different nutritional statuses, typically: underweight, normal weight, overweight, and obesity. Although BMI is a useful screening measure for assessing body weight relative to height, it does not directly measure body fat or overall health.[1,2] The American Academy of Pediatrics (AAP) recommends calculating BMI annually for all adolescents as part of health supervision.[3] Schools are considered an optimal environment for implementing BMI measurement programs because they reach a wide range of children and adolescents, including those who do not receive adequate healthcare or do not visit healthcare providers.[4] Therefore, periodic measurements of weight, height, and BMI are vital tools for monitoring the nutritional status of children and reflect the adequacy of caloric and protein intake.

Crises and disasters significantly affect the health status of communities, particularly among children from low socioeconomic backgrounds, as they decrease both the quantity and quality of food intake. This may be reflected in the disparities in BMI values among children in private and public schools. This study aimed to compare BMI values among children in primary schools and determine the correlation between the economic status of children's families and the BMI classification groups to inform appropriate health interventions for each group.

MATERIALS AND METHODS

Study Design and Population

A comparative observational study was conducted involving three groups across six schools: two private schools, two public schools in the city center, and two public schools in the outskirts of the city. The schools were randomly selected from Latakia city. The study included classes from the first to the fourth grade in

mixed-gender primary schools. The sample was chosen based on the principle of stratified cluster sampling, with classrooms selected randomly.

Data collection

After obtaining administrative approvals from Latakia University, the Directorate of Education in Latakia Governorate, and the school directors where the study was conducted, informed consent was received from the students' guardians in the presence of the school health supervisor. The following information was collected: Age was determined by reviewing the children's records, with school administrators present. Height was measured while the child stood in an upright position without shoes, looking straight ahead, ensuring that the heels, buttocks, and shoulders touched the wall during measurement with a tape measure. Each height measurement was taken twice to ensure accuracy, allowing for a margin of error of 0.5 cm. Weight was measured in light clothing in kilograms, rounded to the nearest 0.5 kg using a standard weighing scale. BMI was calculated and plotted on percentage charts according to age and gender.

Statistical analysis

Statistics were computed for all variables, presenting means ± standard deviation for continuous variables and counts/percentages for categorical variables. We utilized the One-Way ANOVA test to assess the difference between the means of three different groups. The Chi-square test was employed to evaluate the relationship between the categorical variables. All analyses were performed using SPSS statistical software (version 25), with a significance level set at $p < 0.05$.

Ethical considerations

The study protocol was reviewed and approved by the ethics committee at the Faculty of Medicine – Latakia University, ensuring compliance with ethical standards for research involving human subjects. Informed consent was obtained from all participants prior to data collection, with assurances provided regarding confidentiality and the voluntary nature of participation.

RESULTS

The research sample comprised 818 children, with females accounting for 414 (50.6%) and males for 404 (49.4%). The ages of the children ranged from 6.1 to 10.5 years, with an average age of 8.22 ± 1.1 years. Among the participants, 30% were enrolled in private schools, 39.1% in public schools located in the city center, and 30.9% in public schools on the outskirts of the city. In terms of grade distribution, 24.3% of the participants were in the first class, 25.2% in the second class, 24.1% in the third class, and 26.4% in the fourth class. Regarding weight status, 12% of the studied cases were classified as underweight, 69.9% were within the normal range, 10% were overweight, and 8.1% were classified as obese. The percentile values indicated a distribution of 37%. We found no significant statistical differences between males and females in the distribution of BMI categories, with a P-value of 0.8. Additionally, there was no statistically significant relationship between grade level and the distribution of BMI classifications, with a P-value of 0.7.

Table 1: Distribution of body mass index (BMI) categories across school types.

BMI Category	Private Schools	Public Schools (City Center)	Public Schools (Outskirts)	P-Value
Underweight	12 (4.9%)	30 (9.4%)	56 (22.1%)	0.0001
Normal	160 (65.3%)	235 (73.4%)	177 (70%)	
Overweight	40 (16.3%)	30 (9.4%)	12 (4.7%)	
Obesity	33 (13.5%)	25 (7.8%)	8 (3.2%)	
Mean ± SD	54.93 ± 32.9	44.37 ± 31.7	32.63 ± 29.6	0.0001

One-Way ANOVA revealed significant differences in BMI categories and mean BMI across school types ($p<0.001$). Private and city center public schools exhibited higher overweight/obesity prevalence, while underweight cases were more frequent in outskirts public schools. Mean BMI values decreased progressively from private to outskirts schools.

DISCUSSION

In this study, we focus on an important health issue by investigating the nutritional conditions in children through the measurement of Body Mass Index (BMI), which reflects children's growth and health. According to the World Health Organization (WHO), BMI is classified into four groups: the underweight group (BMI $\leq$ 18.5), the normal weight group (BMI between 18.5 and 24.9), the overweight group (BMI between 25 and 29.9), and the obese group (BMI $\geq$ 30).[2]

The paper revealed significant statistical differences between the type of school and BMI classifications. Cases of overweight and obesity were more prevalent in private schools and public schools located in the city center, while an increase in underweight cases was observed in public schools situated on the outskirts of the city. This may be explained by the effects of economic and social situations, dietary patterns, and daily lifestyles. In high-income areas and private schools, there may be increased consumption of high-calorie foods and reduced physical activity, whereas low-income areas face challenges such as limited access to nutritious food and lower health awareness.

Malnutrition refers to both extremes: undernutrition on one side and overnutrition on the other. Undernutrition in childhood is associated with serious health problems,

including recurrent diarrhea, anemia, decreased ability to resist infections, and difficulty healing wounds. Health problems resulting from poor nutritional status in primary schools are among the most common causes of slowed cognitive development, increased absenteeism, early school dropout, and unsatisfactory performance in the classroom.[5]

Research by Sadoh in Nigeria, Bouali in Morocco, and Ashok in India found that the prevalence of obesity and overweight is higher in private schools, while public schools recorded a higher prevalence of underweight.[5-7] Villa-Caballero observed a bimodal curve between obesity and income level, noting that children in very poor or very rich neighborhoods had more opportunities to become obese, which can be attributed to a nutritional shift toward foods rich in fats and carbohydrates, with less consumption of fruits and vegetables.[8]

Obesity is caused by a combination of environmental, genetic, physiological, and behavioral factors.[9] Among obese children, approximately one in four deaths during childhood can be attributed to obesity as a primary or contributing cause.[10] Approximately 30% of childhood obesity cases begin during childhood, and 50-80% of these children will become obese adults.[11]

In our study, we found no significant statistical differences between males and females in the distribution of BMI categories, with a P-value of 0.8. This may indicate that biological or behavioral factors related to gender do not have a significant effect on BMI in these age groups among children. Additionally, there was no statistically significant relationship between the grade level and the distribution of BMI classifications, with a P-value of 0.7. This may be explained by the close age range among the children, as well as the stability in dietary patterns and physical activity during this developmental period.

Bouali found a higher prevalence of underweight among male students in private schools, while obesity was more common among females due to the overconsumption of unhealthy foods and a lack of physical activity.[12] These findings differ from Sharma's study, which reported that underweight prevalence was higher among female students in public schools due to social habits that may lead girls to eat less in order to maintain their fitness, while boys were less concerned about appearance.[13] Bouali's study also observed an increase in obesity among children aged 6 to 9 years, attributing this trend to decreased parental awareness of the risks associated with obesity, which may result in neglecting healthy dietary habits and early exposure to unhealthy foods. Conversely, Sharma's study indicated that the highest rates of overweight were observed among children aged 9 to 14 years, likely due to physiological changes associated with rapid growth during this period and increased independence in choosing fast foods, coupled with a lack of physical activity.[14]

Limitations of this study

1. Factors such as physical activity, dietary habits, and family health history were not included due to the difficulty of collecting this data (Such as the lack of parental participation).
2. The study based on the assumption of a direct correlation between the type of school and the socio-economic status of families, without considering individual differences within these groups.
3. The sample was limited to a specific geographic area, making it a challenge to generalize the findings across the entire country.

CONCLUSIONS

As a conclusion, there appears to be a correlation between the socioeconomic status and the health, nutritional status of children in schools. Therefore, public health interventions should be conducted regarding the economic characteristics of each region. A systematic follow-up of growth charts and periodic BMI measurements for all children across schools is essential especially for children with un suitable BMI.

Declarations

Ethical approval and consent to participate: Ethical approval to study was obtained from the Scientific Research Ethics Committee at Latakia University in accordance with the Declaration of Helsinki.

Consent for publication: Not applicable.

Availability of Data and Materials: All the data generated or analyzed during this study are included in this published article. The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests: None.

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Author contribution: Ibrahim Melhem, collected the data, checked the quality of the data collection, analyzed and interpreted the data, designed and coordinated the study, undertook and checked the quality assessment, produced the first draft of the manuscript, wrote and edited the manuscript and approved the final manuscript before submission. and Ahmad Chreitah and Maha khoury were the supervisor of the project; undertook and checked to the quality assessment, checked the quality of the collected data; analyzed and interpreted the data; checked the quality assessment; edited the manuscript and approved the final manuscript before submission.

REFERENCES

1. World Obesity Federation [Internet]. [2025; 10]. Obesity Classification. Available from: https://www.worldobesity.org/about/about-obesity/obesity-classification

2. Weir CB, Jan A. BMI Classification Percentile And Cut Off Points. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing, 2025, [2025; 10]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK541070/
3. Krebs NF, Jacobson MS. Prevention of pediatric overweight and obesity. Pediatrics, 2003; 112(2): 424–30.
4. Nihiser AJ, Lee SM, Wechsler H, McKenna M, Odom E, Reinold C, et al. Body Mass Index Measurement in Schools. J Sch Health, 2007; 77(10): 651–71.
5. Sadoh WE, Israel-Aina YT, Sadoh AE, Uduebor JE, Shaibu M, Ogonor E, et al. Comparison of obesity, overweight and elevated blood pressure in children attending public and private primary schools in Benin City, Nigeria. Niger J Clin Pract, 2017; 20(7): 839–46.
6. Ashok N, Kavitha H, Kulkarni P. A comparative study of nutritional status between government and private primary school children of Mysore city. Int J Health Allied Sci, 2014; 3(3): 164–164.
7. Bouali H, Boujtat K, Ezzerrouqui A, Lazreg Y, Rouf S, Abda N, et al. Prevalence of childhood short stature, underweight, overweight, and obesity among primary school children. Cureus [Internet], 2021; [2025; 10], 13(11). Available from: https://www.cureus.com/articles/52881-prevalence-of-childhood-short-stature-underweight-overweight-and-obesity-among-primary-school-children.pdf
8. Villa-Caballero L, Caballero-Solano V, Chavarría-Gamboa M, Linares-Lomeli P, Torres-Valencia E, Medina-Santillán R, et al. Obesity and socioeconomic status in children of Tijuana. Am J Prev Med, 2006; 30(3): 197–203.
9. Hasan I. An assessment of nutritional status of the children of government urdu higher primary schools of Azad Nagar and its surrounding areas of Bangalore [Internet] [Master's Thesis]. Rajiv Gandhi University of Health Sciences (India), 2011; [2025: 10]. Available from: https://search.proquest.com/openview/a3fdc3fa4c30e690464278eb91e0a9bb/1?pq-origsite=gscholar&cbl=2026366&diss=y
10. Morley JE. Editorial: Defining Undernutrition (Malnutrition) in Older Persons. J Nutr Health Aging, 2018; 22(3): 308–10.
11. Srivastava A, Mahmood SE, Srivastava PM, Shrotriya VP, Kumar B. Nutritional status of school-age children - A scenario of urban slums in India. Arch Public Health, 2012; 70(1): 8.
12. Organization WH. Levels and trends in child malnutrition child malnutrition: UNICEF/WHO/World Bank Group Joint Child Malnutrition Estimates: Key findings of the 2023 edition [Internet]. World Health Organization, 2023; [2025: 10]. Available from: https://books.google.com/books?hl=en&lr=&id=UV_BEAAAQBAJ&oi=fnd&pg=PA6&dq=Levels+and+trends+in+child+malnutrition+2021+edition+,+UNICEF+/+WHO+/+World+Bank+Group&ots=7_QG3_qoxI&sig=snnah45YrpcKHVN2SPwRQbpxK_Y
13. Consultation WHO. Obesity: preventing and managing the global epidemic. World Health Organ Tech Rep Ser, 2000; 894: 1–253.
14. Lindberg L, Danielsson P, Persson M, Marcus C, Hagman E. Association of childhood obesity with risk of early all-cause and cause-specific mortality: A Swedish prospective cohort study. PLoS Med, 2020; 17(3): e1003078.