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Overweight and Obesity among School-Age Children Rural area: Exploring Prevalence and Association with physical Activity

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ABSTRACT

Background: Childhood overweight and obesity are rising globally, yet evidence from rural Bangladesh is scarce. Understanding prevalence and associated factors such as physical activity is essential for prevention. **Objectives:** To determine the prevalence of overweight and obesity and examine their association with physical activity among rural school children in Narsingdi district, Bangladesh. **Methods:** A descriptive cross-sectional study was conducted from January to December 2024 among 1,800 students aged 12–17 years in six randomly selected secondary schools from three Upazilas of Narsingdi District. Cluster sampling was applied. Sociodemographic, dietary, and lifestyle data were collected using a semi-structured questionnaire. Anthropometric measurements were taken, and BMI-for-age percentiles were classified using CDC standards. Data were analyzed with SPSS version 26; $p<0.05$ was considered significant. **Results:** Among 1,750 analyzed participants, 5.0% were underweight, 80.0% normal weight, 9.9% overweight, and 5.0% obese, giving a combined overweight/obesity prevalence of 14.9%. Overall, 85.4% reported engaging in physical activity, but participation declined with increasing BMI (underweight: 92.0%, obese: 78.4%; $p=0.030$). Main barriers to physical activity included lack of school playgrounds (40.6%), insufficient teacher encouragement (29.6%), and private coaching commitments (28.2%). **Conclusion:** Overweight and obesity affect nearly one in seven rural adolescents in Narsingdi district, with lower physical activity among those with higher BMI. Addressing structural and academic barriers through school- and community-based interventions is crucial to prevent the double burden of malnutrition in rural Bangladesh.

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INTRODUCTION:

Childhood overweight and obesity have become major public health challenges worldwide, affecting both developed and developing nations [1]. It is estimated that obesity affects over 107 million children worldwide, with the prevalence of childhood obesity exceeding 20% in high-income countries [2]. Obese adolescents are five times more likely to remain obese in adulthood and face a higher risk of developing major chronic diseases [3]. Immediate and long-term psychosocial consequences, such as reduced self-esteem and depression, are also prevalent among children with obesity and overweight [4,5].

Therefore, the prevention of childhood obesity is a critical priority. Identifying the factors that influence adolescent obesity is essential for promoting healthier lifestyles and preventing overweight and obesity, with the ultimate aim of reducing both the short-term and long-term health burdens associated with these conditions [6]. Importantly, physical inactivity is one of the major modifiable risk factors contributing to childhood obesity. Globally, physical activity levels among children are declining, and studies have shown a strong inverse relationship between physical activity and body mass index (BMI) in school-aged populations [7].

Although several studies have examined the factors influencing obesity among school-aged adolescents, limited research has focused on overweight and obesity in Bangladeshi adolescents, particularly in rural areas. Most existing studies have been conducted in urban settings. A recent study highlighted various factors contributing to the prevalence of obesity in urban adolescents in Bangladesh[8]. However, there is a paucity of studies on the factors influencing obesity among rural adolescents. A study conducted in Bangladesh, examined dietary and exercise behaviors but did not analyze the underlying factors contributing to obesity in rural adolescents [9]. Understanding the prevalence of overweight and obesity and its association with physical activity in rural school children is essential for early intervention and policy planning. This study aims to determine the prevalence of overweight and obesity among school children in rural areas of Narsingdi district and to assess the association between physical activity levels and nutritional status.

METHODS:

Study Design and Setting:

This descriptive cross-sectional study was conducted from January to December 2024 in rural areas of Narsingdi district, Bangladesh. Data were collected from six randomly selected secondary schools or 12-17 years (both boys and girls Grades VI–X) across three Upazilas.

Study Population and Sample Size:

Participants were rural school children aged 12–17 years or from grade VI- GradeX. The sample size was calculated using the formula for prevalence studies with an estimated prevalence of overweight/obesity of 18% (Amin et al., 2018), 95% confidence level, and 10% allowable error, yielding 1,750 students; 1,800 were enrolled.

Sampling Technique:

A cluster sampling approach was applied: three Upazilas were randomly selected, one union from each, and two schools from each union. From each school, 300 students (60 per grade) were randomly chosen.

Data Collection:

After obtaining ethical approval from the ERC of BIRDEM and consent from school authorities, data were collected via face-to-face interviews using a semi-structured questionnaire. Anthropometric measurements were taken (height with stadiometer, weight with calibrated scale), and BMI was calculated and categorized according to CDC growth charts. Information on dietary habits, physical activity, screen time, and socioeconomic status was recorded. Physical inactivity was defined as <5 days/week of outdoor games or structured exercise (≤30 minutes/session).

Data Analysis:

Data were analyzed using SPSS Version 26. Descriptive statistics summarized participant characteristics, and inferential statistics assessed the association between overweight/obesity and physical activity.

RESULTS:

This observational cross-sectional study was conducted from January to December 2024 in rural areas of Narsingdi district, Bangladesh., after fulfilling the exclusion and inclusion criteria by claster sampling method. A total of 1750 apparent Participants were included in the study.

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Sociodemographic Characteristics:
The majority of participants were aged 13–15 years (56.5%), and more than half were female (59.4%). Most students were enrolled in Class 6 (36.4%) and Class 7 (23.4%). In terms of socioeconomic status, the vast majority (88.9%) belonged to the lower-middle-income group, with very few from upper-middle-income (0.2%) and none from the high-income group.

Table 1: Sociodemographic Characteristics of the Study Participants (n = 1750)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	10–12	516	29.5%
	13–15	989	56.5%
	16–18	245	14.0%
Gender	Male	710	40.6%
	Female	1040	59.4%
Grade Level	Class 6	637	36.4%
	Class 7	409	23.4%
	Class 8	208	11.9%
	Class 9	230	14.8%
	Class 10	237	13.5%
Socioeconomic Status	Low Income (<10,500 BDT)	192	11.0%
	Lower Middle (10,501–42,000)	1555	88.9%
	Upper Middle (42,001–130,000)	03	0.2%
	High Income (>130,000 BDT)	0	0.0%

Nutritional Status:
Table-2 presents the nutritional status of 1,750 respondents based on BMI percentile for age and sex, which is a standard method for assessing body weight categories in children and adolescents. 88 respondents (5.0%) fall below the 5th percentile for BMI, indicating underweight status. 1,400 respondents (80.0%) fall within the normal range (5th to <85th percentile). This indicates that the majority of the sample are within a healthy BMI range. The prevalence of overweight and obesity combined is 14.9%, which may be a concern for public health. Among them 9.9% are classified as overweight and 5.0% are classified as obese. The presence of both underweight (5%) and obesity (5%) highlights a double burden of malnutrition—undernutrition and overnutrition—among the population.

Table-2: Nutritional status of the respondents based on BMI percentile for age and sex (n=1750)

BMI Percentile	Frequency	Percent
<5th percentile (Underweight)	88	5.0
5th to < 85th percentile (Normal)	1400	80.0
85th to <95th percentile (Overweight)	174	9.9
≥95th percentile (Obese)	88	5.0
Total	**1750**	**100.0**

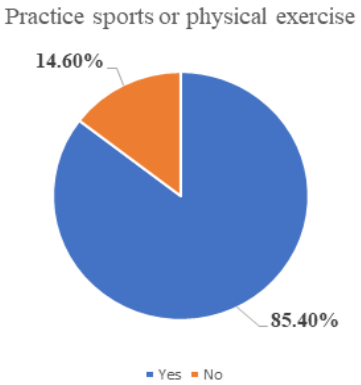

Figure-I: Distribution of the Study Population According to Participation in Sports and Physical Exercise

Participation in Sports and Physical Exercise:
Figure-I illustrates how many participants engage in sports or physical exercise: 85.4% of participants reported engaging in regular physical activity, while 14.6% did not engage in such physical activities.

Daily Activity Engagement:
Table-3 shows that a majority of the participants engaged in various sedentary and leisure activities on a daily basis. Notably, 99.1% of participants reported reading books, spending an average of 167.28 ± 123.80 minutes per day, which was the highest average duration among all activities. Screen-based activities were also highly prevalent: 66.8% watched TV and 66.9% played games or used mobile devices, with mean durations of 36.49 ± 21.68 minutes and 39.44 ± 27.49 minutes, respectively. Using computers was less common, with only 15.8% engaging in this activity, although they spent a comparable amount of time (36.38 ± 23.34 minutes) to TV watching. Among non-screen leisure activities, 75.4% of participants listened to music, averaging 20.40 ± 15.34 minutes daily.

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Shopping (55.1%) and gardening (50.2%) were also practiced by over half of the participants, with average durations of 41.19 ± 26.17 minutes and 13.91 ± 13.91 minutes, respectively.

Table 3: Mean SD with Distribution of Daily Activity Engagement Among Participants (n=1409)

Activities	Number of Participants	Percentage	Mean±SD
Watching TV	941	66.8	36.49±21.68
Playing game Other Activities Mobile	943	66.9	39.44±27.49
Using Computer	223	15.8	36.38±23.34
Listening Music	1063	75.4	20.40±15.34
Reading Book	1397	99.1	167.28±123.79
Shopping	776	55.1	41.19±26.17
Gardening	708	50.2	13.91±13.91

Barriers to Physical Activity:
Table-4 outlines several lifestyle constraints. The biggest barrier to physical activity is the lack of a playing field at school, reported by 40.6% of participants. Lack of encouragement from school teachers (29.6%) and attending coaching or private tutoring (28.9%) are also notable barriers to play or free time. Lack of leisure time (24.1%), parental discouragement of play (23.9%), and no playing field near the home (22.9%) further limit opportunities for recreation.

Table-4: Barriers to Physical Activity (n=1750)

Causes of no physical Activity	Number of Participants	Percentage
No leisure Time	421	24.1
Go Coaching Private Tutor	493	28.2
No Playing Field School	711	40.6
No playing Field Vicinity our Home	400	22.9
School Teacher Does not Encourage Playing	518	29.6
Parents Do Not Encourage Playing	419	23.9

Association Between BMI Category and Participation in Physical Activity (Sports/Exercise):
Out of the total respondents, 1,494 individuals (85.4%) reported participating in physical activity (Sports/Exercise). Physical activity is more common in individuals with lower or normal BMI. Participation declines with increasing BMI, with obese individuals being the least active group. Despite this, a majority across all BMI groups still report some level of physical activity. The p-value is 0.030, indicating a significant association between BMI category and physical activity practice.

Table 5: Association Between BMI Category and Participation in Physical Activity (n=1750)

BMI Category	Practice Sports/Physical Exercise	P-value
Underweight	81(92.0)	(p=.030)
Normal	1202(85.9)	
Overweight	142(81.6)	
Obese	69(78.4)	
Total	**1494(85.4)**	

p= probability value; p< 0.001- highly significant, p< 0.01 – very significant, p< .05 – significant, p> 0.05- not significant.

DISCUSSION:

The results showed that the prevalence of overweight and obesity was 9.9% and 5.0% respectively, accounting for a combined 14.9% of the study population. This finding is consistent with several recent studies conducted in rural and peri-urban regions of South Asia. This aligns with findings from Islam et al. (2024), who reported significantly lower rates of overweight (2.6%) and obesity (1.5%) among rural children compared to their urban counterparts (17.6% and 21.8%, respectively) in Bangladesh. This study highlights the impact of urbanization on childhood obesity and serves as a useful comparison for understanding the relatively lower obesity rates in rural areas like Narsingdi District, where my study is focused [10]. A study in rural India reported a combined overweight and obesity prevalence of around 13% among school-aged children [11]. In Bangladesh, previous urban-focused research has reported even higher prevalence rates, indicating a growing trend of childhood obesity in both urban and rural settings[12].

The low obesity rate among rural children may be due to limited access to processed, high-calorie foods and more active lifestyles. However, as rural areas develop, obesity rates may increase, as noted by Adegun et al. (2013) [13]. The 5.0% underweight prevalence highlights the coexistence of undernutrition and overnutrition—typical of nutritional transition in developing countries. Similar to findings by Gür et al. (2006) in Turkey[14], undernutrition remains a key concern, reflecting limited access to diverse, nutrient-rich foods. Over half of the participants were aged 13–15 years, with females comprising 59.4% of the sample. Gender differences, influenced by cultural norms, may affect physical activity and nutritional status—girls may have less opportunity for exercise, increasing their risk of overweight. Most children (88.9%) were from lower-middle-income households. While obesity is often linked to higher income in urban

areas, this study shows it is also emerging in lower-income rural settings. Similar trends in rural South Africa, Latin America [15], and Egypt [16] suggest changing food environments and lifestyles are reshaping traditional socioeconomic-obesity patterns.

Encouragingly, a high proportion of children (85.4%) reported regular participation in physical activity, and daily physical activity duration (mean: 32.39 minutes) aligns fairly well with WHO recommendations of at least 60 minutes of moderate to vigorous activity for school-aged children. However, multiple barriers to physical activity were reported, including lack of school playgrounds (40.6%), lack of teacher encouragement (29.6%), and time constraints due to private coaching (28.2%). These findings are consistent with studies in both urban and rural contexts showing that environmental and academic pressures increasingly limit children's opportunity for physical activity [17]. In terms of screen time and sedentary behavior, a considerable amount of time was spent on activities such as watching television or using mobile/computers, with an average of over 60 minutes per day spent on screen-based entertainment. This behavior has been strongly associated with weight gain in children globally and poses a risk even when physical activity levels are adequate [18].

Physical activity decreased significantly with increasing BMI ($p = 0.030$). Over 92% of underweight participants engaged in sports or physical exercise, compared to only 78% of obese participants. This trend echoes global findings demonstrating inverse relationships between BMI and physical activity levels among children [17,18]. In rural Bangladesh, Amin et al. previously highlighted the low engagement in structured physical exercise among adolescents, particularly those with higher BMI [19].

CONCLUSION:

This study demonstrates that overweight and obesity are emerging public health concerns among rural school children in Narsingdi district, affecting nearly 15% of the population studied. Although the majority of students reported engaging in regular physical activity, participation declined significantly with increasing BMI, with obese adolescents being the least active group. Structural barriers such as lack of playgrounds, inadequate encouragement from teachers, and academic pressures from private coaching were major constraints to physical activity. The coexistence of underweight and obesity reflects a double burden of malnutrition, indicating that rural communities in Bangladesh are experiencing a nutritional transition. Targeted interventions—including the promotion of active lifestyles in schools, provision of adequate recreational spaces, and community-based awareness programs—are essential to prevent both undernutrition and overnutrition, improve adolescent health, and reduce the long-term risk of chronic diseases.

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