Multivariable Predictors of Overweight and Obesity among Children Aged 6–17 Years in Tirana, Albania (2025)

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Abstract*: Overweight/obesity is a global public health challenge. This was a cross-sectional study that aimed to identify multivariable predictors of overweight and obesity in children aged 6-17 years in Tirana. Anthropometric measurements were collected to calculate Body Mass Index (BMI), classified according to international cut-offs. Socio-demographic characteristics, dietary habits, breakfast consumption, physical activity and screen time were assessed through a structured questionnaire, based on self-report by participants. In a total of 600 participants, the prevalence of overweight and obesity was 10% (n=60) and underweight/normal weight 90% (n=540) increased with age. Chi-squared analyses showed that male gender, adolescence, high screen time, low physical activity, and low fruit consumption were significantly associated with overweight and obesity, whereas breakfast and fast food consumption were not. Binary logistic regression identified male gender (OR=2.50, 95% CI 1.38-4.53, p=0.002), older age (OR=1.71, 95% CI 1.11-2.65, p=0.015), and participation in sports ≥60 min/day (OR=1.84, 95% CI 1.04-3.26, p=0.038) as independent predictors. These findings highlight the multifactorial nature of childhood obesity and underscore the need for policymaking, interventions based on school, family, and socio-cultural environments, where children are part of these environments.*

Keywords: childhood obesity, BMI, nutritional habits, screen time, physical activity, Albania

INTRODUCTION

Childhood represents a critical period of growth, and behaviors established during this stage of life often persist into adulthood and can strongly influence health outcomes, including overweight and obesity (Hiba Jebeile et al., 2022; Lobstein et al., 2015). Overweight and obesity are major public health challenges worldwide, with prevalence increasing over the past decade (World Health Organization [WHO], 2022a; Ng et al., 2014).
While this increasing prevalence has long been a challenge in developed countries, developing countries, including Albania, are experiencing similar trends due to rapid urbanization, technological advances, and lifestyle changes that affect dietary habits and physical activity levels (UNICEF Albania, 2023; WHO, 2024).

In Albania, especially in urban areas like Tirana, there is limited research on the determinants of childhood overweight and obesity. The Childhood Obesity Surveillance Initiative (COSI) provides some national data, but detailed analyses of sociodemographic, dietary, and lifestyle predictors remain scarce (WHO, 2024; UNICEF Albania, 2023). This study therefore aims to identify key predictors of overweight and obesity among children aged 6–17 years in Tirana, providing evidence to inform effective public health prevention strategies.

LITERATURE/ THEORETICAL UNDERPINNING

Childhood obesity is widely recognized as a multifactorial condition influenced by behavioral, environmental, and socio-demographic factors (Boyd A. Swinburn et al., 2011; Hiba Jebeile et al., 2022). Ecological and behavioral epidemiology models suggest that obesity arises from complex interactions between individual behaviors, such as dietary intake and physical activity, and broader environmental determinants, including family, school, and community settings (Story et al., 2008; Birch & Davison, 2001).

Several international studies have identified breakfast skipping as a significant risk factor for increased body mass index (BMI) in children and adolescents (Ahrens et al., 2014; Hiba Jebeile et al., 2022). Sedentary behaviors, particularly excessive screen time (television, computer, phone), are associated with an increased risk of overweight and obesity. This is explained by lower energy expenditure due to lack of movement and greater exposure to food advertisements, which often promote high-calorie products (Hancox et al., 2004; Mitchell et al., 2013). Insufficient levels of moderate to vigorous intensity physical activity also reduce energy expenditure. When energy intake from food is greater than energy expenditure, a positive energy balance is created, which over time leads to weight gain and an increased risk of overweight or obesity (Janssen & LeBlanc, 2010; Tremblay et al., 2016).

The theoretical foundation of this study is based on behavioral epidemiology, emphasizing modifiable lifestyle factors - such as diet quality, physical activity and sedentary behavior - as major determinants of BMI. Understanding these factors is essential for designing effective interventions to prevent overweight and obesity in children in the city of Tirana and beyond, as Tirana is the capital of Albania.

METHODOLOGY

This was a cross-sectional analytical study among children aged 6-17 years enrolled in public schools in Tirana, Albania. With a 5% margin of error and a 95% confidence level, the sample size was estimated to be approximately 384 participants, but to be more representative, a sample of 600 participants was selected. Multi-stage sampling was used, in a probabilistic manner, first the administrative units were selected as cluster samples, from each group or unit the public schools were randomly selected, from each school the classes from grades 1 to 12 (9-year schools and high schools) were additionally selected, and from each class 20 students in each class were systematically selected. Anthropometric measurements (weight and height) were obtained using standard procedures. BMI was calculated as weight (kg)/height (m²) and classified according to international standards. The data collection instrument was a structured questionnaire, which contained the following variables: demographic characteristics, breakfast consumption habits, meal frequency, screen time, physical activity level. Data were analyzed using SPSS software (IBM Corp.) version 17. Descriptive statistics were calculated for all variables. Chi-square tests assessed associations between categorical variables. Logistic regression analysis was performed to identify independent predictors of overweight and obesity. Statistical significance was set at $p < 0.05$. The data of this study were collected during the period January-May 2025, in accordance with the ethical principles of scientific research. Subsequently, the study instrument and its use were included in the dissertation on the topic "Assessment of nutritional habits by age and BMI in children 6-17 years old in the city of Tirana, 2025-2027", by the same author. The instrument was reviewed and approved by the Ethics Council for Third Cycle Students / Doctoral Program (approval given on September 17, 2025; Protocol No. 2002).

RESULTS/FINDINGS

In a total of 600 participants the prevalence of overweight and obesity was 10% (n=60) and underweight/ normal weight 90% (n= 540) increased with age. Among the 6–9-year-olds, 4.2% were overweight or obese, while in the 10–13-year-old group this prevalence rose to 10.4%, and among 14–17-year-olds it reached 13.7%, indicating a significant association between age and weight status (p=0.007).

Boys were more likely to be overweight or obese than girls, with 14.6% of boys affected compared to 6.0% of girls (p<0.001).

Lifestyle behaviors also showed notable associations. Children who spent more than 2 hours per day in front of screens had a higher prevalence of overweight/obesity (16.6%) compared to those who spent ≤2 hours per day (7.7%) (p=0.002). Participation in sports: children engaging in at least 60 minutes of daily sports had a lower prevalence of overweight/obesity (7.6%) than those with insufficient activity (12.6%) (p=0.045).

Daily fruit consumption was associated with lower overweight/obesity prevalence (7.1%) compared to children who did not consume fruit daily (13.8%) (p=0.006). In contrast, breakfast consumption and daily fast-food intake were not significantly associated with weight status (p=0.085 and p=0.073, respectively).

Table 1: Association Between Socio-Demographic and Lifestyle Factors and Weight Status (n=600)

Variabla	Category	Underweight/ Normal weight n (%)	Overweight/ Obese n (%)	p-value
Gender	Girls Boys	300 (94) 240 (85.4)	19 (6.0) 41 (14.6)	<0.001**
Age group (years)	6-9 10-13 14-17	159 (95.8) 173 (89.6) 208 (86.3)	7 (4.2) 20 (10.4) 33 (13.7)	0.007*
Breakfast consumption	≥5 days/ week 5 days/ week	208 (87.4) 332 (91.7)	30 (12.6) 30 (8.3)	0.085
Screen time	≤2 hours/ day >2 hours/ day	407 (92.30) 131 (83.4)	34 (7.7) 26 (16.6)	0.002*
Physical activity	Insufficient physical activity in sports teams (<60 min/ day) Sufficient physical activity in sports teams (≥60 min/ day)	278 (92.4) 257 (87.4)	23 (7.6) 37 (12.6)	0.045*
Fruit consumption	No daily fruit consumption Daily fruit consumption	224 (86.2) 316 (92.9)	36 (13.8) 24 (7.1)	0.006*
Fast-food consumption	No daily fast-food consumption Daily fast-food consumption	515 (90.5) 25 (80.6)	54 (9.5) 6 (19.4)	0.073

Footnote: Percentages represent row percentages; p-values are based on Chi-square tests; * $p<0.05$, ** $p<0.001$ indicates statistical significance; totals may differ slightly due to missing data for some variables. Source: Authors research.

Multivariable logistic regression was conducted to identify independent predictors of overweight and obesity among children, controlling for all socio-demographic and lifestyle factors. The results are summarized below, table 2:

Table 2: Multivariable Logistic Regression of Factors Predicting Overweight and Obesity

Variable	OR (Exp (B))	95% CI	p-value
Gender	2.50	1.38-4.53	0.002 *
Age group	1.71	1.11-2.65	0.015 *
Breakfast consumption	1.16	0.62-2.18	0.646
Screen time	1.49	0.80-2.77	0.208
Sports team membership	1.84	1.04-3.26	0.038 *
Fruit consumption	0.59	0.33-1.04	0.067
Fast food consumption	1.58	0.58-4.31	0.371

Footnote: OR=odds ratio; CI= 95% confidence interval; *p<0.05 indicates statistical significance; all values are adjusted for other variables in the model. Source: Authors research.

Gender: Boys had significantly higher odds of being overweight or obese compared to girls, with an odds ratio of 2.50 (95% CI: 1.38-4.53, p=0.002). This indicates that male gender is an independent risk factor for excess weight.

Age group: Older children were more likely to be overweight or obese, with an OR of 1.71 (95% CI: 1.11-2.65, p=0.015), showing a significant increase in risk with age.

Breakfast consumption: Skipping breakfast was not significantly associated with overweight/obesity in the adjusted model (OR=1.16, 95% CI: 0.62-2.18, p=0.646).

Screen time: Spending more than 2 hours per day on screens was associated with higher odds of overweight/obesity, but this association did not reach statistical significance after adjustment (OR=1.49, 95% CI: 0.80-2.77, p=0.208).

Sports participation: Children participating in sports for at least 60 minutes per day had significantly higher odds of overweight/obesity (OR=1.84, 95% CI: 1.04-3.26, p=0.038), suggesting that structured sports activity may interact with other factors affecting weight.

Fruit consumption: Daily fruit intake tended to be protective (OR=0.59, 95% CI: 0.33-1.04, p=0.067), although this did not reach statistical significance.

Fast-food consumption: Frequent fast-food intake was not significantly associated with overweight/obesity in the multivariable model (OR=1.58, 95% CI: 0.58-4.31, p=0.371).

DISCUSSION

The findings of this study indicate that childhood overweight and obesity both globally and in Tirana are influenced by a combination of socio-demographic and lifestyle factors. Consistent with data from international studies, boys and girls exhibited higher odds of being overweight. According to the WHO European Childhood Obesity Surveillance Initiative, recent rounds of data collection have shown an

increase in the prevalence of overweight and obesity in school-aged children across Europe, including countries in the Balkan region. In Albania, the most recent round of COSI (2022–2023) reported that 30.2% of children aged 8-9 years were overweight (including obese), while 14.2% were classified as obese. However, the prevalence observed in the current study is lower than these national estimates, which may be explained by the fact that this research was conducted only in the city of Tirana, while COSI uses a nationally representative sample that includes both urban and rural areas (World Health Organization, 2025).

The significant association between gender and overweight/obesity is also consistent with other previous epidemiological studies that boys are often at greater risk for high BMI during childhood and adolescence (Ahrens et al., 2014; Hiba Jebeile et al., 2022). The age-related increase in overweight may reflect developmental and lifestyle changes that occur during the transition from childhood to adolescence, including reduced physical activity and changes in energy balance (Lobstein et al., 2015; Hiba Jebeile et al., 2022).

The non-significant associations of breakfast skipping and screen time in the adjusted model are inconsistent with some literature that identifies these behaviors as risk factors. Previous studies have linked prolonged screen time to increased risk of obesity through mechanisms such as sedentary behavior and exposure to food advertising (Hancox et al., 2004; Mitchell et al., 2013). However, when controlling for other lifestyle factors, screen time may act indirectly or interact with diet and activity patterns, which may explain its lack of significance in the logistic regression analysis of this study.

Participation in sports was unexpectedly associated with higher odds of overweight and obesity. This finding may reflect complexities in measuring physical activity, where participation alone does not capture overall intensity or levels of daily activity. Evidence suggests that while structured participation in sport contributes to health benefits, total daily movement and energy expenditure remain the main determinants of weight status (Janssen & LeBlanc, 2010; Tremblay et al., 2016). It is also possible that children who participate in sports teams are the ones who are most likely to be overweight/obese.

Daily fruit consumption showed a trend towards protective effects, consistent with dietary guidelines that promote fruit intake to improve diet quality and reduce the risk of obesity (Story et al., 2008; World Health Organization, 2018). Although not statistically significant in the adjusted model, this trend highlights the importance of healthy eating.

The multifactorial nature of childhood obesity is well documented. Genetic, environmental, and behavioral factors interact to shape risk (Boyd A. Swinburn et al., 2011; Sahoo et al., 2015). Family and community influences, including food availability, parenting habits, and socioeconomic conditions, play critical roles (Birch & Davison, 2001). Therefore, prevention strategies should be comprehensive, targeting schools, families, socio-cultural environments, policy-making institutions, etc. Findings from systematic reviews suggest that multifactorial interventions that combine diet, physical activity, and behavior change are most effective in preventing obesity in children (Brown et al., 2019).

Limitations of this study include the cross-sectional nature of the study, which does not infer causal relationships, and its reliance on self-reported findings from participants, which may be subject to bias, and recall bias.

Implication to Research and Practice

The findings of this study have implications for scientific research in the field of overweight/obesity prevention in schoolchildren. Based on the interrelationship between many factors of overweight/obesity in children, there should be a collaboration between the Ministries of Education and Health to build structured education programs to promote healthy eating. Public health authorities are encouraged to develop initiatives that promote regular physical activity, ensuring that children meet the recommended levels of activity. Parental awareness campaigns are needed to address behaviors such as skipping breakfast and excessive screen time, which contribute to the increased risk of overweight and obesity. Policymakers should also draft strict regulations to prohibit the marketing of energy-dense and nutrient-poor foods to children, promoting healthy environments. Finally, future research should be prospective or longitudinal to better understand the causal relationships between lifestyle behaviors and overweight/obesity in children.

CONCLUSION

Childhood overweight and obesity in the city of Tirana are influenced by multiple socio-demographic and lifestyle factors, with boys, older children, and sports participation emerging as independent predictors. Although behaviors such as skipping breakfast, screen time, and fruit consumption were not statistically significant in the adjusted model, they may interact with other lifestyle and environmental factors. These findings highlight the multifactorial etiology of childhood obesity and the need for comprehensive prevention strategies targeting schools, families, and the broader socio-cultural environments of the community. Future interventions should combine instruction on healthy eating habits, promotion of regular physical activity, and healthy behaviors for the Albanian schoolchildren population to effectively address the growing burden of childhood overweight and obesity.

Future Research

Future studies should be cohort studies to find causal associations between lifestyle factors and childhood overweight/obesity. Furthermore, the relationship between sports participation and weight status deserves further investigation. Studies where the role of the researcher is active, rather than just reporting from children, are needed to evaluate the effectiveness of school programs for preventing obesity in children.

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