Undergraduate Students, Population, Health & wellness

# Association Between Sleep Duration, Food Consumption Patterns and Obesity Among Adolescents in Qatar


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## ABSTRACT


**Background:** Recent research suggests that sleep duration contributes towards developing unhealthy dietary habits which can lead to obesity. Further study in this field can provide a new direction in addressing this epidemic.

**Objective:** To examine the association between sleep duration, food consumption pattern, and obesity in adolescents in Qatar.

**Hypothesis:** Sleep duration and unhealthy dietary pattern may be positively correlated to obesity.

**Methods:** This is a cross-sectional, descriptive and analytical study including 1161 adolescents aged 14-19 years from a representative sample of independent secondary schools in the state of Qatar. Validated questionnaire was used to collect data on sleep duration and frequency of intake of foods. Sleep duration was classified as short (≤ 6 hrs), sufficient (7-8 hrs) and long (≥ 9 hrs). Anthropometric indicators included body weight, height and waist circumference (WC) that were measured using standardized procedures. General obesity was defined according to International Obesity Task Force (IOTF) age- and gender-specific body mass index (BMI) reference values. Age-specific cutoff values for WC were used to define abdominal obesity. Factor loading matrix was used to categorize healthy and unhealthy foods. The association between the study variables was assessed using multiple regression analysis.

**Results:** The mean frequency of food consumption was lower for students of shorter sleep duration regardless of the day of the week. Students who reported long sleep duration had higher mean frequency of consumption of unhealthy food (fast food, French fries, cakes/donuts, candy/chocolates, sugar-sweetened beverages). Females showed an unhealthier eating pattern as compared to males. Multiple regression analysis revealed that as the WC and BMI increased, consumption of healthy eating pattern decreased by 25% and 10 % respectively ($p<0.001$)

**Conclusion:** Lack of sufficient sleep and decreased consumption of healthy foods have an association with increased risk of being obese among adolescents.


## INTRODUCTION

Obesity rates have been remarkably increased over the past decades, with more than 124 million children and adolescents being obese in 2016 alone. Diet quality and excessive food intake has been considered in many studies as a primary factor contributing towards childhood obesity.[1] Another factor less commonly studied, contributing towards obesity, is sleep duration. Studies show that longer sleep duration was associated with a higher consumption of fresh fruits, vegetables, whole fat milk, water and lower consumption of Western fast foods and sweets among obese individuals.[2,3] Habitual short sleepers ate more than 3 meals a day consuming more sweets and desserts predisposing them to obesity.[4] This shows that sleep duration contributes towards developing unhealthy dietary habits which leads to obesity. Hence, this study is expected to be the first to highlight the crucial role of sleep duration in developing childhood obesity in Qatar.

## RESULTS

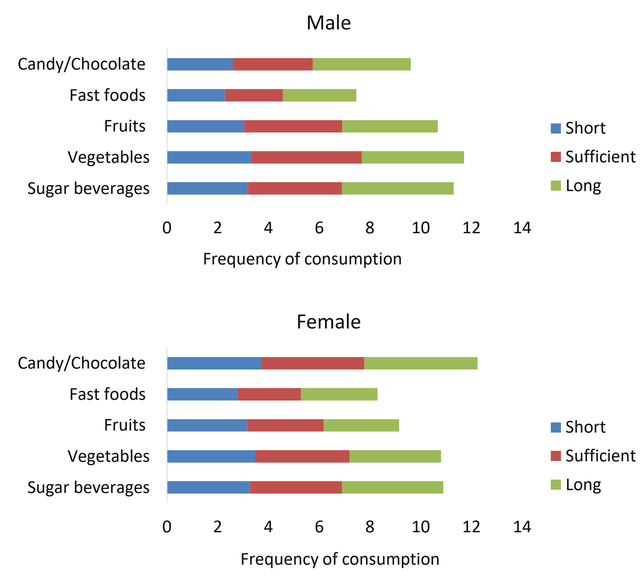
**Table 1: Prevalence of general and abdominal obesity according to sleep categories.**

| Sleep Duration | | WC Normal (%) | WC Abdominal Obesity (%) | WC P-value | BMI Normal (%) | BMI Overweight (%) | BMI Obese (%) | BMI P-value |
|---|---|---|---|---|---|---|---|---|
| Weekday | Short | 18.0 | 32.0 | | 48.7 | 53.6 | 50.6 | |
| | Sufficient | 10.9 | 20.0 | 0.344 | 31.9 | 30.5 | 28.5 | 0.510 |
| | Long | 7.8 | 11.2 | | 19.4 | 15.9 | 20.9 | |
| Weekend | Short | 9.8 | 16.9 | | 26.2 | 27.6 | 27.2 | |
| | Sufficient | 9.2 | 19.0 | 0.155 | 27.8 | 29.3 | 28.0 | 0.961 |
| | Long | 17.6 | 27.5 | | 45.9 | 43.1 | 44.8 | |

**Notes:** WC= waist circumference; BMI= body mass index; Normal, overweight and obesity according to BMI were determined using IOTF reference values; Waist circumference cutoff according to Taylor *et al*, 2000.

**Figure 1: Frequency of consumption of different foods according to short, sufficient and long sleep duration among subjects during the weekdays.**


**Figure 2: Frequency of consumption of different foods according to short, sufficient and long sleep duration among subjects during the weekend.**




## METHODOLOGY

This is a cross-sectional, descriptive and analytic study, including adolescents from independent secondary schools in the State of Qatar during the academic year 2013-2014.

**Dimensions and Structure**

Selection was done through two sampling stages; first being random school selection and second random class selection.

**The Sample**

The final sample consisted of 1161 students, aged between 14 and 19 years. For data analysis, the subjects were divided into two groups based on their age; 14-16 years and 17-19 years. The sample selection was controlled and included only those who were free from any physical abnormalities. Written consent was obtained from all participants.

**Anthropometric measurements**

Weight, height, waist circumference (WC) and BMI were measured using standard methods and calibrated tools. Overweight and obesity among 14-17 year adolescents were defined using IOTF age- and gender-specific BMI reference values. WHO standards were used to define for adolescents aged 18-19 years i.e. BMI = 25 to 29.9 kg/m$^2$ and BMI > 30 kg/m$^2$ for overweight and obese respectively. The criteria used to define abdominal obesity were gender- and age-specific WC values associated with high trunk fat measured by DEXA.

**Lifestyle Measurements**

Data about lifestyle measurements were collected using Arab Teens Lifestyle Study (ATLS) questionnaire. It included 10 questions addressing the frequency of consuming healthy and unhealthy foods and two questions regarding sleep duration.

Sleeping hours were classified as short for less than 6 hours, sufficient as 7-8 hours and long as 9 hours and more based on the recommendations from National Sleep Foundation for the age group, 14-19 years. [5]

**Statistical analysis**

T-test, ANOVA and Pearson's square test tested the association between the three variables, independently of other confounding factors. P-value <0.05 was considered significant. Multiple linear regression analysis of variance detected the relationship between (i) obesity indicators (WC and BMI), (ii) eating patterns (healthy and unhealthy) and (iii) sleep duration (sufficient and long). Healthy and unhealthy pattern was defined using factor loading matrix. All statistical analysis was performed using STATA version 15.0 and SPSS version 25.0.

**Table 2: Multiple linear regression analysis between the indicators of obesity, Dietary pattern Sleep duration.**

| | WC[a] ß | WC[a] 95% CI | WC[a] P value | BMI[a] ß | BMI[a] 95% CI | BMI[a] P value |
|---|---|---|---|---|---|---|
| Healthy Pattern | -2.528 | (-3.417)-(-1.638) | **0.000** | -1.098 | (-1.489)-(-0.707) | **0.000** |
| Unhealthy Pattern | 0.039 | (-0.862)-(0.939) | 0.933 | -0.282 | (-0.678)-(0.114) | 0.162 |
| Sufficient Sleep Duration | -1.181 | (-3.201)-(0.838) | 0.251 | -0.245 | (-1.133)-(0.642) | 0.588 |
| Long Sleep Duration | 0.157 | (-2.219)-(2.534) | 0.897 | 0.364 | (-0.681)-(1.409) | 0.495 |

**Notes:** WC= waist circumference; BMI= body mass index; ß= beta coefficient; CI= confidence interval. [a] Obesity variables have been corrected for age, gender and physical activity

## CONCLUSION

The present study revealed an inverse relationship of obesity indicators with healthy eating pattern and sufficient sleep duration among adolescents.

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