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ORIGINAL RESEARCH

Dietary Habits, Physical Activity and Sleep Pattern Among In-School Adolescents in Lagos, Nigeria

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Abstract

Background: Overnutrition has been documented at epidemic levels in children and adults. The associated risk factors may include poor dietary habits, sedentary behaviour, inadequate sleep and low parental education.
Objective: To describe dietary habits, physical activity and sleep patterns among secondary school adolescents.
Methods: A cross-sectional study of 1,120 adolescents recruited from public and private secondary schools in Lagos, Nigeria, was carried out to study the dietary habits, sleep patterns and physical activity in relation to nutritional status.
Results: Ten per cent of the adolescents skipped breakfast, while 28% had fruits on up to five days of the week. Eleven per cent had a sweetened drink every day, while 20 % had a sweetened drink on most days of the week. One out of four (26%) adolescents had more than two hours of screen time daily, and only 5% engaged in sporting activities up to five times weekly. One-third of the students slept for less than six hours daily and experienced sleeping difficulties. Multivariate analysis showed that females were twice as likely not to participate in sports (OR = 2.38, CI = 1.3-4.37, p = 0.002 and to have a higher intake of confectionaries (OR = 1.47, CI = 1.07-2.04, p = 0.01.
Conclusion: Poor dietary habits, inadequate physical activity and insufficient sleep were observed among secondary school adolescents. A multi-pronged approach to improve these behaviours is recommended.

Keywords: **Adolescence, Diet, Obesity, Screen Time, Sleep pattern, Sporting activities, Sweetened drink.**

Introduction

Over-nutrition (overweight and obesity) has been documented to be on the rise in recent times. Children and adolescents are not spared from this epidemic. [1] Globally, an increase in the prevalence rates of childhood and adolescent overweight and obesity from 4% to 18% was reported between 1975 to 2016, [1] with a rate of increase 30% higher in developed countries than in poorer resource-constrained settings. [1] In the developing world, which has been known to

have high rates of undernutrition, [2] and almost non-existent over-nutrition, it is becoming apparent that overweight/obesity is an increasing health concern. In Nigeria, documented prevalence rates for overweight increased from 3.7% in 2007 [3] to 11% [2] in 2021. Childhood and adolescent obesity are likely to track into adulthood, become chronic and have adverse effects on health, resulting in premature morbidity and mortality. [4,5] Obesity has been associated with risk factors: high parental body mass index, high income, low parental education, poor dietary habits, inadequate sleep, sedentary behaviour, and increased time spent viewing screens such as television and video games. [5–10]

It is known that increased food intake in general, and fat-rich diets and high-calorie intake in particular, raise the risk of overweight and obesity. [5,6] Even though the effect of fruits and vegetables on overweight and obesity in children and adolescents has not been sufficiently studied, there are reports that inadequate intake of fresh fruits and vegetables are associated with weight gain and the development of obesity. [11] Moderate levels of physical activity for a minimum of thirty minutes almost every day is a recommendation of the World Health Organisation for healthy living in people across all age groups. [5] The American Academy of Pediatrics recommends fewer than two hours of screen time per day in children. [12] Among other benefits, this allows the child to be entertained and stimulated and leaves adequate time to engage in physical activity. While some studies show little relationship between screen time and obesity, [13, 14] others show that longer screen time increases the risk of overweight and obesity. [15–17] According to the sleep guidelines suggested by the National Sleep Foundation, insufficient sleep is defined as less than eight hours for teenagers and less than seven hours for adults on a weeknight. [18,19] While some studies have shown prolonged sleep duration to be associated with an increased likelihood of obesity, [20,21] others have revealed that insufficient sleep posed a risk in predisposing children, including adolescents, to obesity. [22] Lack of sleep may result in weight gain by increasing the time available for other daily activities such as eating, making maintaining a healthy lifestyle more challenging.

While the prevalence of over-nutrition has been relatively well-reported, there are few studies on the risk factors associated with it, particularly among adolescents. The present study aimed to determine the risk factors of overweight and obesity in terms of dietary habits, physical activity and sleep patterns among in-school adolescents.

Methods

Study design and setting

This was a descriptive, cross-sectional study carried out in Onigbongbo Local Council Development Area (LCDA), an urban area and one of the 37 LCDAs in Lagos State - a rapidly developing city with the representation of different tribes across all socio-economic groups. The LCDA was purposively selected due to its centrality in the state.

Sampling technique

The schools in the LCDA were first stratified into public and private schools. Four public and two private secondary schools (a total of six schools) were selected by simple random sampling from a list of registered secondary schools in the LCDA.

Sample size

The minimum sample size was calculated at 1092 with the obesity prevalence rate of 18% in an earlier Nigerian study, [23] using the standard formula for proportions. [24] However, 1,200 questionnaires were distributed. A proportionate sample of respondents was recruited from each school relative to their population sizes (80% from public schools and 20% from private

schools). Adolescents aged 10 to 19 years who gave assent and those whose parents consented to their participation were recruited into the study.

Ethical considerations

The study was approved by the Health Research and Ethics Committee of the Lagos State University Teaching Hospital with approval number LREC/10/06/269. Parental written informed consent and child assent were also obtained. Permission to carry out the study in the schools was obtained from the Lagos State Ministry of Education/Secondary School Education Board and individual school authorities and principals. The data were collected between May and July 2013.

Definition of variables

Healthy dietary habits were assessed with an adapted form of a previously used food frequency questionnaire; [25] using fruit and vegetable consumption, confectionaries (sweet pastries and other sweets including chocolates), and high sugar content drinks eating fruits and vegetables. Eating fruits and vegetables on less than five days of the week were classified as inadequate. Intake of confectionaries or sweetened beverages on more than three days of the week was classified as unhealthy. Physical activity was assessed using participation in sports. Participation in sports on five or more days of the week was deemed adequate, while less than that was inadequate. [5] Screen time was used as a measure of sedentary behaviour. An average daily computer screen time of more than two hours was classified as sedentary, while a screen time of fewer than two hours was not sedentary. [12] Sleep duration of a minimum of eight hours daily was classified as adequate, while duration less than eight hours was inadequate. [19]

Data analysis

The data was initially entered into Microsoft® Excel and then exported to SPSS version 20 software. Frequencies and percentages were computed for independent variables, and the Chi-Square test was used to determine associations between categorical variables. Critical variables for which significant associations were found at the bivariate stage were dichotomised and then fitted into a multivariable logistic regression model to identify independent predictors of obesity. The level of statistical significance was set at $p<0.05$.

Results

One thousand one hundred and twenty questionnaires that were accurately completed were included in the analysis. There were more males (52.9%) than females (47.1%). The cohort's mean age was 14.3±2.1 years, with a range of 10-19 years. Almost half (47.2%) of the subjects were in the age bracket of 13 to 15 years. The parents were well educated, with 60% of fathers and 48% of mothers having been educated to tertiary level (Table I).

About 10% of respondents skipped breakfast, while only 28.2% had fruits on up to five days of the week. Almost 90% had at least one portion of vegetables every day (Table II). Nearly two-thirds of the students had up to two pieces of confectionery snacks daily. The consumption of sugary drinks was high as 11.1% had a sweetened beverage every day, and 20.1% had one on most days of the week (Table II). Only five per cent engaged in sporting activities up to five times a week (Table III).

Table I: Socio-demographic characteristics

Variable	*Frequency*	*Percentage*
Age (Years)		
10 – 12	318	28.4
13 – 15	529	47.2
16 – 19	273	24.4
Sex		
Male	527	52.9
Female	593	47.1
Mother's level of education		
Primary	73	6.6
Secondary	500	44.6
Tertiary	547	48.8
Father's level of education		
Primary	134	11.9
Secondary	310	27.7
Tertiary	676	60.4

One out of four (26.3%) respondents had more than two hours of screen time daily. Thirty-five% of the students slept for less than 6 hours daily. Similarly, about a third of them experienced sleeping difficulties, with almost 10% stating this occurred on most days of the week (Table IV).

Bivariate analysis (Table V) showed that participation in sports (p = 0.001) and consumption of confectionaries (p = 0.03) was higher among females. While a higher proportion of males had longer screen time (p<0.05) and consumed sweetened drinks on more than three days a week (p = 0.02). Multivariate analysis (Tables VI and VII) showed that females were twice as likely not to participate in sports (OR = 2.38, CI = 1.3-4.37) and to have a higher intake of confectionaries (OR = 1.47, CI = 1.07-2.04). However, they had a lower screen time and were more likely to use motorised transport than their male counterparts. Controlling for other variables such as daily screen time, sleep duration, fruit and sweetened drink consumption, those in the younger age groups were more likely to participate in sports and eat confectionaries daily (Tables VI and VII). However, the younger age groups had less use of motorised transport for their daily commute to school. Parental level of education was significantly associated with screen time, with students in the younger age group being two to three times more likely to have more than two hours of screen time daily.

Discussion

The known risk factors of overweight and obesity included parental level of education, level of physical activity, sedentary behaviour, unhealthy dietary habits and sleep duration. The parents of these adolescents were well educated, with about half of them having the tertiary level of education. This is not surprising as the study was conducted in the metropolitan city of Lagos, where there is a good mix of people at all levels of education. Participation of adolescents in sporting activities was poor in this study; in fact, females were less likely to participate in sports. In addition, a quarter of respondents were exposed to more than two hours of screen time daily. While one report indicated that physical inactivity is increasing among youths, [26] another study reported a universal decline in leisurely

sports activity among adolescent girls in the higher age groups. [27]

Table II: Dietary habits of in-school adolescents

Dietary Habits	*Frequency*	*Percentage*
Eating breakfast		
Never	107	9.6
1-2 days a week	240	21.4
3-5 days a week	772	68.9
Everyday	1	0.1
Fruit consumption		
None	100	9.0
1-2 days a week	389	34.7
3-5 days a week	316	28.2
>5 days a week	315	28.1
Vegetable consumption		
Never	132	11.8
1 portion a day	372	33.2
2-3 portions a day	616	55.0
Confectionery		
Never	192	17.1
1 portion a day	212	19.0
2 portions a day	716	63.9
Consumption of sugary(sweetened) drinks		
Never	201	18.3
1-2 days a week	565	50.5
3-5 days a week	225	20.1
More than five days a week	124	11.1
Consumption of fruit juices		
Never	158	14.2
1-2 days a week	463	41.3
3-5 days a week	293	26.2
>5 days a week	206	18.3

Perhaps the higher demands of academic work in the higher classes combined with the observation that girls are not as physically competitive as boys may explain these findings. While the findings in the present study agree with both reports, this is a worrisome trend and may be due in part to the availability of video games and serial movies, which encourage sedentary behaviour. Another reason for this observation may be increasing safety concerns that force adolescents to stay more indoors than outdoors. The dearth of public sports facilities is also likely to contribute to this.

Poor dietary habits were noted in the present study; one out of every ten respondents skipped breakfast. It is not clear why this was so; possible reasons include parents' unavailability to supervise or prepare meals for their children early in the morning before school or their choice to go to school without having breakfast. There was also a high intake of sweetened drinks and confectionery.

Table III: Physical activity of in-school adolescents

Variable	*Frequency*	*Percentage*
Sporting activities		
Never	485	43.3
1-2 days a week	378	33.8
3-4 days a week	201	17.9
5 or more times a week	56	5.0
Mode of transport		
Walk	363	32.4
Cycle	14	1.2
Public bus	421	37.6
Motorbike/Car	322	28.8
Parents' involvement in sports		
None	389	34.7
One	371	33.1
Both	360	32.2
Siblings' involvement in sport		
Yes	901	80.4
No	219	19.6
Computer Screen time		
None	281	25.1
1-2 hours	545	48.6
2 or more hours	294	26.3
Home chores time		
None	107	9.5
1-2 hours a day	841	75.1
2 or more hours a day	172	15.4

This may reflect poor knowledge of what constitutes a healthy diet. It is also possible that these options are easily accessible for consumption. Despite the abundance of seasonal fruits, most study subjects had inadequate fruit intake. This may be related to local pricing as fruits are relatively more expensive in urban areas than in rural areas. Earlier studies have established that skipping breakfast, consuming high calorie-diet and sugary drinks, and poor fruit intake are factors that increase the risk of overweight and obesity. [5,6,11,28,29]

Conclusion

The present study shows a high prevalence of poor dietary habits, insufficient sleep, sedentary habits and physical inactivity in adolescents attending secondary schools. Therefore, we recommend that adolescents be educated on the risk factors of obesity and overweight, emphasising what constitutes healthy meals. Parents should also be educated on their role in closely monitoring their wards' food intake and activities. The importance of breakfast should be emphasised at all levels, especially in the community. Secondary school policies should be adjusted to incorporate measures that increase physical activity in both boys and girls while reducing sedentary behaviour at the same time.

Table IV: Sleep patterns of in-school adolescents

Variable	Frequency	Percentage
Hours of sleep		
Below 6 hours	392	35.0
Hours	502	44.8
>8 hours	226	20.2
Having sleep difficulties		
Often > 3 days/week	99	8.5
Sometimes	285	25.4
No	739	66.0
Having strict bedtimes		
Yes	530	47.3
No	590	52.7
Keeping late nights		
Yes	894	79.8
No	226	20.2

Table V: Association between age and sex and physical activity

Variables	*Physical activities*		*Chi-Square*	*P-value*
	Sporting activities			
	Sports <5 days a week	*Sports > 5 days a week*		
Age				
10-12	301 (94.7)	17 (5.3)	0.69	0.71
13-15	506 (95.7)	23 (4.3)		
16-19	258 (94.5)	15 (5.5)		
Sex				
Male	576 (97.1)	17 (2.9)	11.28	0.001
Female	489 (92.8)	38 (7.2)		
	Type of Transport			
	Motorized	*Non-motorised*		
Age				
10-12	210 (66.0)	108 (34.0)	6.92	0.03
13-15	365 (69.0)	164 (31.0)		
16-19	163 (59.7)	110 (40.3)		
Sex				
Male	365 (69.3)	162 (30.7)	5.02	0.03
Female	373 (62.9)	220 (37.1)		
	Screen Time			
	Less than 2 hours	*Two hours or more*		
Age				
10-12	228 (71.7)	90 (28.3)	1.18	0.55
13-15	393 (74.3)	136 (25.7)		
16-19	206 (75.5)	67 (24.5)		
Sex				
Male	366 (69.4)	461 (77.7)	9.92	0.02
Female	161 (30.6)	132 (22.3)		

Table VI: Association between socio-demographic characteristics and dietary habits

Variable	*Daily vegetable consumption <5/ week*		*Sugary drinks >3/week*		*Daily consumption of confectionary*	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p -value**	**OR (95% CI)**	**p-value**
Age						
10-12	14.9 (8.9 - 24.8)	**0.00**	1.9 (1.4 – 2.5)	0.00	4.6 (3.2 – 6.7)	**0.00**
13-15	8.2 (5.6 - 12.1)	**0.00**	2.1 (1.6 – 2.7)	0.00	4.5 (3.3 – 6.2)	**0.00**
16-19	Ref		Ref		Ref	
Sex						
Female	9.6 (5.8 - 15.9)	0.99	0.9 (0.7 - 1.1)	0.22	1.5 (1.1 - 2.1)	**0.01**
Male	Ref		Ref		Ref	
Mother's education						
Primary	1.0 (0.4 - 2.4)	0.95	1.1 (0.6 - 2.1)	0.67	0.9 (0.4 - 2.0)	0.84
Secondary	0.9 (0.6 - 1.6)	0.81	1.1 (0.8 - 1.5)	0.56	1.1 (0.7 - 1.6)	0.74
Tertiary	Ref		Ref		Ref	
Father's education						
Primary	0.5 (0.2 – 1.3)	0.14	0.5 (0.2 - 1.2)	0.11	0.5 (0.2 - 1.3)	0.14
Secondary	0.9 (0.5 – 1.5)	0.63	1.0 (0.7 - 1.4)	0.93	1.0 (0.7 - 1.6)	0.88
Tertiary	Ref		Ref		Ref	

Table VII: Associations between socio-demographic factors and physical activity and sleep

Variables	*Sports <5 days/week*		*Screen time > 2 Hours/day*		*Use of motorised transport*		*Sleep < 8 Hours*	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
Age (Years)								
10-12	10.6 (6-18.8)	**0.00**	1.8 (1.3 – 2.4)	0.00	0.3 (0.3 – 0.5)	0.00	2.3 (1.7– 3.1)	**0.00**
13-15	12.9 (7.7 – 21.6)	**0.00**	2.0 (1.5 - 2.6)	0.00	0.3 (0.3 – 0.4)	0.00	3.7 (2.8–5.0)	**0.00**
16-19	Ref		Ref		Ref		Ref	
Sex								
Female	2.4 (1.3 – 4.4)	**0.002**	1.5 (1.2-2.0)	0.00	1.3 (1.0 - 1.7)	0.03	1.2 (0.9 - 1.6)	0.21
Male	Ref		Ref		Ref		Ref	
Mother's education								
Primary	1.6 (0.71 – 3.8)	0.07	1.7 (0.8 – 3.6)	0.18	1.5 (0.8 – 2.8)	0.16	1.6 (0.7 - 3.8)	0.25
Secondary	1.6 (0.75 - 3.3)	0.23	1.1 (0.8 - 1.6)	0.52	1.4 (1.0 – 1.9)	0.06	1.2 (0.8 - 1.8)	0.36
Tertiary	Ref		Ref		Ref		Ref	
Father's education								
Primary	0.18 (0.1 – 0.7)	0.02	1.6 (0.6 – 4.3)	0.37	0.6 (0.3 – 1.4)	0.23	1.2 (0.4 - 3.6)	0.71
Secondary	0.95 (0.4 – 2.1)	0.90	1.3 (0.9 - 1.9)	0.15	1.0 (0.7 - 1.4)	0.87	0.9 (0.6 - 1.4)	0.74
Tertiary	Ref		Ref		Ref		Ref	

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