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Impact of screen use on nutritional status

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Abstract: *Background:* Media use has become increasingly common among young people, in both developed and developing countries. Screen media are particularly popular as they provide a wide variety of information and entertainment. Excess use of these has been associated with several negative impacts, among which is the potential risk of inducing or promoting overweight and obesity, through various mechanisms including promotion of a sedentary lifestyle.

Objectives: To establish a relationship between prolonged and excessive use of media and the body mass index of students in secondary schools

Methods: A cross-sectional descriptive study was carried out among 630 secondary school students within Ilorin metropolis. Subjects were selected using a multi-staged, stratified sampling technique. Semi-structured questionnaire were used to obtain

socio-demographic data and use of media. The weight and height of the subjects were obtained and body mass index was calculated as the ratio of weight to height squared.

Results: A total of 630 students participated in the study, 300 (47.6%) were male and 330 (52.4%) were female. Television was the commonest medium used by 94.9% students, followed by mobile phones (69.2%). Seven point three percent of the students were overweight and 5.2% were obese. Overweight and obese students spent a longer total time on screen media than others ($p=0.002$).

Conclusion: Media use is common in Nigerian children and there was significant association between prolonged use of screen media and being overweight and obese in the students

Keywords: Media, Screen, Overweight, Students

Introduction

'Media use' describes the time spent using the different means of entertainment and information broadcast such as televisions (TV), computers, cell phones and print media.¹ Screen time refers to the use of any device with a screen, such as video games, TV, computers.² The use of screen media has become highly prevalent in our society, particularly among adolescents and young children.^{3,4} Use of print media on the other hand, is on a progressive decline among young people all over the world, due to increased access to electronic screen media.⁵ This can be adduced to the fact that electronic screen media provide a wider variety of information and entertainment while at the same time serving as means of communication on various platforms.^{1,5}

Several researchers have described an increase, not only in the amount of media accessible to young people, but also in the amount of time they spend using them.^{5,6}

According to the Kaiser Family Foundation study of 2010, the total amount of time spent using the media per

day among 8-18 year olds increased progressively between 1999-2009.⁵ Media use has also been found to increase with increasing age, as older children and adolescents use a greater variety of media, and for longer periods than the younger ones.^{6,7}

Some of the positive effects of screen media include; early cognitive development as well as improved knowledge and social interactions.^{8,9} The negative effects of excessive media use on the other hand, are more numerous and include; poor school performance, violence and vices, nutritional disorders like overweight and obesity amongst others.³

In recent years, there has been an upsurge in the prevalence of overweight and obesity among young children and adolescents.^{10,11} According to a review by Bibiloni et al,¹² 30% of adolescents in America are overweight or obese, while the prevalence in Africa, though less than 20%, is on a progressive increase.¹³ Adeomi et al¹⁴, also reported a steady rise in over-nutrition in developing countries, in addition to the pre-existing under-nutrition,

giving rise to a double-burden of nutritional disorders in low income countries.

Excessive media use is believed to be an important risk factor for overweight/obesity.¹⁵ This association has been attributed to increase in caloric intake as well as the promotion of a sedentary lifestyle during media use.¹⁶ The proposed mechanisms by which this could occur include:

- (1) The replacement of physical activity with sedentary use of leisure-time on media
- (2) The influence of media on food choices and dietary habits and
- (3) Reduction in children's sleep through nighttime use of (bedroom) media.^{15,16}

Several studies in developed countries have reported a significant association between high rates of media exposure and overweight and obesity among children and adolescents.^{3,17} In developing countries however, an association between rising rates of media use and the concurrent increase in overweight and obesity among adolescents has not been strongly established. Afolabi et al,⁴ in Ile-Ife found that a high rate of media exposure (television) was associated with excess weight; the study was however carried out in pre-adolescent children in primary schools. More so, many of the studies on media use in association with overweight/obesity have looked at the impact of only one type of media, commonly, television use.^{18,19} There is however a variety of new media available today, causing the use of multiple media types to gain more ground in the society.^{5,17} This study therefore seeks to determine the association between use of different screen media and the body mass index of students in secondary schools.

Materials and methods

The study was a cross-sectional descriptive study carried out among secondary school students within Ilorin metropolis. Ilorin is the capital city of Kwara state, with an estimated population of 776,667.²¹ The predominant tribes in Ilorin include Yoruba, Hausa, Fulani, Nupe and Kanuri. The city comprises mostly urban and semi-urban areas and a smaller rural population. There are 3 local government areas (LGA); namely Ilorin East, Ilorin West and Ilorin South and a total of 145 registered secondary schools, consisting of 71 private schools and 74 public schools. These schools comprise both junior and senior secondary classes with a total student population of 42,195.²²

The minimum sample size for the study was calculated using the Fisher formular.²² The prevalence of malnutrition among adolescents of 28.8% reported by Abdulkarim et al,²³ in Abuja, Nigeria (2014) was used. The standard normal deviate, set at 1.96, which corresponds to the 95 percent confidence level, giving a minimum sample size of 315 students. In order to better represent the study population and for ease of recruitment, six hundred and thirty (630) students aged between 10-19 years were recruited for the study. Students with

known chronic illnesses such as diabetes mellitus, chronic kidney disease and sickle cell disease were excluded (as these conditions can affect the nutritional status). These students were identified through their history and health profile from the school records. Children attending schools for the physically or intellectually disabled were also excluded from the study.

Students were selected from 15 schools using a multi-staged stratified sampling technique, based on the proportion of schools in each local government area. Public and private school students were selected in proportional allocation to the ratio of public to private schools in each LGA. The ratio of public to private schools in each LGA as provided by the Ministry of Education was 1:2 for Ilorin South LGA, 1:1 for Ilorin East and 1:1.5 for Ilorin West. Four private and two public schools were selected from Ilorin South, two private and three public schools from Ilorin West, two private and two public schools from Ilorin East LGA; using a table of random numbers based on their serial numbers in the school register. A total of 42 students were recruited from each school, which were stratified into 6 classes from the first Junior year to the third Senior year. Seven students were recruited from each of the six classes. In schools with multiple arms of a class, the arm to be used as the sampling frame was selected by balloting. Classes were stratified into male and female using the class register and proportional allocation was used to select the number of boys to girls among the subjects, using different sampling intervals for either sex. In situations where the selected schools had students that were less than expected for recruitment, the next school on the school list provided, was selected.

Ethical approval was obtained from the Ethical Review Committee of the University of Ilorin Teaching hospital. A written approval was obtained from Kwara state Ministry of Education and permission was also obtained from the school principals. Information about the study was given to the students, interpreted letters of information about the study were sent to the parents and informed consent obtained from the parents and the students, while assent was obtained from the younger students. Students who did not return with parental consent (including those who were boarding students in mixed schools) were excluded from the study.

A pre-tested semi-structured questionnaire was administered by the researcher and 2 trained research assistants. It comprised three sections ; socio-demographic characteristics of the students (The social class of the subjects was assigned using the Oyedeji's classification)²⁴ and media use evaluation, which was put together by the researchers using excerpts from the Kaiser Family Foundation survey.²⁵ It covered questions on the different media types used by the students, circumstances surrounding their use; and the meal-time habits of the students. The Body Mass Index was determined using ratio of the weight and height (weight/height²) in kilogrammes per meter squared (Kg/m²). Body weight was measured in kilogramme using a digi-

tal portable scale (Seca model 213 USA). Participants wore only their school uniform and the pockets were emptied of any contents. Weight was read off to the last 0.1kg.²⁶ Height was measured to the nearest 0.1cm using a stadiometer (Seca Model 213 USA) with a fixed vertical backboard and an adjustable head piece. The subjects stood up straight against the backboard with both feet flat on the platform and the head, shoulder blades, buttocks and heels making contact with the backboard. The head was aligned in the Frankfurt horizontal plane.

Subjects were categorized into underweight, normal weight, overweight and obese using WHO BMI Growth Reference for 5-19 year olds.²⁷ Underweight, when the BMI was less than the 5th percentile, normal weight when the BMI was between the 5th and 84th percentile, overweight when the BMI was between the 85th and 95th percentile and obese when the BMI percentile was greater than the 95th percentile. The data was analysed using a Statistical Package for the Social Sciences (SPSS Statistics) version 20.0. Student t-test was used to compare means of normally distributed continuous variables and Kruskal-Wallis test was used to compare more than two sets of median. Cross tabulation of media use and nutritional status against the characteristics of the population was done. Differences between proportions of categorical variables were evaluated using the Chi-square test or the Yates continuity corrected Chi square. The confidence level was set at 95% and a *p*-value less than 0.05 was considered statistically significant.

Results

A total of 630 secondary school students participated in the study, 336 (53.3%) were from private schools and 294 (46.7%) from public schools. Three hundred

(47.6%) were male and 330 (52.4%) were female, with a male to female ratio of 1:1.1. The mean age \pm SD was 14.0 ± 1.2 years. Four hundred and sixty (73.0%) of the students belonged to the upper social class with 53.4% of them in public schools and 90.2% in private schools $p = 0.001$. (Table 1)

There was no statistically significant difference in the age and gender distribution for both public and private schools ($p=0.512$ and $p=0.424$ respectively).

Television was the most popular screen, used by 598 (94.9%) of the students. Four hundred and thirty-six (69.2%) of them used mobile phones. A higher proportion of female students 320 (97.0%), viewed television compared with the males 278 (92.7%); $p = 0.011$. More male than female students however played video games $p= 0.001$. Video games, computers, mobile phones and internet were used more commonly by the private school students, all $p=0.001$ (Table 2)

Table 1: Socio-demographic characteristics of the subjects

Variables	Type of School			p value
	Public (N=294)	Private (N=336)	Total	
<i>Age (years)</i>				
10-13	118 (40.1)	126(37.5)	244(38.7)	0.512
14-16	155 (52.7)	178(53.0)	333(52.9)	
17-19	21 (7.2)	32(9.5)	53(8.4)	
<i>Sex</i>				
Male	135 (45.9)	165(49.1)	300(47.6)	0.424
Female	159 (54.1)	171(50.9)	330(52.4)	
<i>*Social class</i>				
Upper Class	157 (53.4)	303(90.2)	460(73.0)	0.001
Middle Class	108 (36.7)	31(9.2)	139(22.1)	
<i>Class</i>				
Lower Class	29 (9.9)	2(0.6)	31 (4.9)	

**Upper class (Social classes I and II); Middle Class (Social class III);*

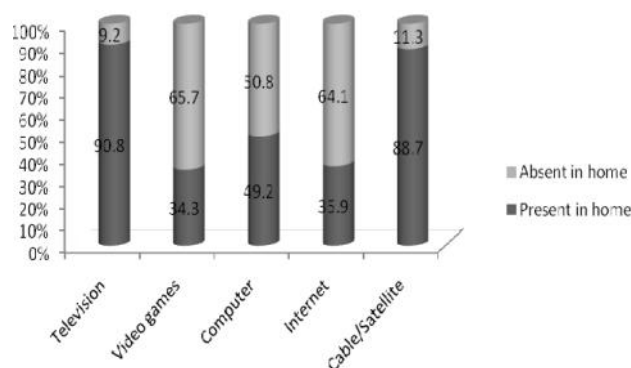
Lower Class (Social classes IV and V)

Table 2: Distribution of media used by the participants

Media	Sex		<i>p</i> value	School Type		<i>p</i> value
	Male n (%)	Female n(%)		Public	Private	
Television	278(92.7)	320 (97.0)	0.011	281(95.6)	317(94.3)	0.482
Video games	177(59.0)	135(40.9)	0.001	103(35.0)	206(62.2)	0.001
Internet	159(53.0)	155 (47.0)	0.076	100(34.0)	214(63.7)	0.001
Computer	197(65.7)	197(59.7)	0.072	139(47.3)	255(75.9)	0.001
Mobile phone	210 (70.0)	226 (68.5)	0.681	167(56.8)	269(80.1)	0.001

Five hundred and seventy-two (90.8%) of the students had at least a television in their homes and 559 (88.7%) had cable/satellite devices. Internet and video games were not so readily available in the homes (35.9% and 34.3% respectively).(Figure 1)Majority of the students 508 (80.5%) used two or more types of media daily while only 122 (19.5%) used a single medium daily.

Fig 1: Types of media available in the homes of the students



The students spent about 1.45 ± 0.7 hours viewing television on weekdays and 2.15 ± 0.8 hours on weekends. The longest time was spent on computers on weekdays (2.19 ± 0.9 hours), while internet use took the longest time on weekends (2.27 ± 0.8 hours). More time was spent using each of the media types on weekends than on weekdays. Table 3

The median (IQR) total time spent by the students on media daily was 6.0 (3.0-9.5) hours. Male students and students from the private schools spent longer periods using media daily than females and public school students ($U=42867.50$, $p=0.019$) and ($U=32622.00$, $p=0.001$) respectively. Table 4

Table 3: Mean \pm SD Duration spent using Media Daily

Media Type	Hours/day (Mean \pm SD)	
	Weekdays	Weekend
Television	1.45 ± 0.7	2.15 ± 0.8
Video Games	2.12 ± 0.9	2.21 ± 0.9
Internet	2.14 ± 0.8	2.27 ± 0.8
Computer	2.19 ± 0.9	2.21 ± 0.9

Table 4: Total Time Spent Using All Media Types on Weekdays

	Total Media Time		
	Median (IQR)*	U [†]	p value
<i>Sex</i>			
Male	6.0 (3.5-10.0)	42867.50	0.019
Female	6.0 (3.5-9.5)		
<i>School Type</i>			
Private	7.5 (4.5-10.5)	32622.00	0.001
Public	4.5 (1.5-8.0)		

*IQR: Interquartile range, †U: Kruskal Wallis

The mean \pm SD weight of the female students was 48.5 ± 9.6 kg which was higher than that of the males 45.9 ± 11.5 kg ($p=0.002$). There was no significant difference between the mean height of male and female students ($p=0.058$). The mean \pm SDBMI of the study population was 18.8 ± 3.1 kg/m². Sixty-five (10.3%) were categorized as underweight, 46 (7.3%) were overweight and 33 (5.2%) were obese. More male students were underweight, 48 (16.0%) when compared to the females 17 (5.1%) $p=0.001$. (Table 5)

Table 5: Body Mass Index of the students

	Body Mass Index Classification				2*	p value
	Under-weight n (%)	Normal n (%)	Over-weight n (%)	Obese n (%)		
<i>Sex</i>						
Male	48 (16.0)	219 (73.0)	21 (7.0)	12 (4.0)	23.325	0.001
Female	17 (5.1)	267 (80.9)	25 (7.6)	21 (6.4)		
<i>School Type</i>						
Public	28 (9.5)	240 (81.6)	17 (5.8)	9 (3.1)	8.276	0.037
Private	37 (11.0)	246 (73.2)	29 (8.6)	24 (7.1)		

2*: Pearson's Chi-square

Two hundred and seventy-nine (44.9%) students spent more than 4 hours on media daily. Total duration spent on screens in a day was however not significantly related to the nutritional status ($p=0.168$). (Table 6)

Table 6: Relationship between the total time spent on screens daily and nutritional status

Total media (Hours)	Under-weight n(%)	Normal n(%)	Over-weight n(%)	Obese n(%)	Total N(%)	2	p value
1 - < 2	13(21.0)	111(23.1)	4(8.7)	5(15.2)	133(21.4)	12.89 ^y	0.168
2 - < 3	6(9.7)	52(10.8)	4(8.7)	3(9.1)	65(10.5)		
3 - < 4	21(33.8)	108(22.5)	11(23.9)	4(12.1)	144(23.2)		
>4	22(35.5)	209(43.5)	27(58.7)	21(63.6)	279(44.9)		

²: Pearson chi-square; TV: Television

Overweight and obese students spent a significantly longer period with media on weekdays, than students in other BMI categories, ($K=14.357$; $p=0.002$). (Table 7)

Table 7: Total daily media time and BMI

BMI Classification	Total weekday media time		
	Median (IQR)	K [†]	p value
Underweight	6.00(3.0-9.0)*	14.357	0.002
Normal	6.00(3.0-9.0)*		
Overweight	8.50(4.9-12.0) [‡]		
Obese	8.00(4.3-12.0) [‡]		

^{a,b}: Variables bearing the same superscript were not significantly different; †K: Kruskal wallis

Discussion

The prevalence of overweight and obesity in this study was higher than previous findings by Sabageh et al¹¹ and some other authors in this environment.^{10,11} Students with over nutrition were also more than those with under nutrition. Similar findings of higher prevalence of weight excess than weight deficit were obtained by

Chinedu et al²⁸ among school children and adolescents in South Western Nigeria. This further unveils the progressive decline in rates of under nutrition amongst adolescents and gradual rise in prevalence of over nutrition in developing countries. The average time the students spent on television on a typical weekday was 1 hour 45minutes and about 2 hours 15 minutes on weekends. Computers, video games and internet use took up about 2 hours of some of the students' time daily, which was comparable to the time reported by Igbokwe *et al*²⁹ in school children in South Eastern Nigeria. Total daily screen time among the study population was about six to eight hours and which though less than the duration reported in American children,^{5,6} was higher than the American Academy of Paediatrics recommendation of no more than 2 hours of entertainment media daily for children,³⁰ in order to prevent adverse health outcomes. While there was no significant relationship between the BMI status and the number of media used in a day, this study showed that the total amount of time spent using screen media was significantly higher in overweight and obese students than those who had a normal body weight or were undernourished.

Ninety-nine point four percent of the students made use of television, and 90.2% had at least one television in their homes; making it the most popular screen type among the study population. This was similar to a previous findings in Nigeria,⁴ and almost at par with television use among young people in advanced countries like America.⁵ Thus, further corroborating the report that televisions remains the predominant media used by young people all over the world.^{3,31} The study also showed that rates of television use did not differ significantly among public and private school students, further

underscoring the degree of television popularity across all socioeconomic classes.

Mobile phone was the next most commonly used screen type. It was used by 69.2% of the students, with no disparity between the public and private schools. High prevalence of mobile phone use in young people were also described by Madden et al³² and Rideout et al³ in American teenagers; and is likely due to the increasing popularity of mobile phones as means of communication, information and entertainment. Phones are also more portable compared to other screen media and provide ready access to the internet.

The study was limited by the inability to use time diaries for a more precise estimation of screen time.

Conclusion

This study reveals a high prevalence of media use among the study population as well as prolonged screen time, which was more among the overweight and obese adolescents. Our finding could be a pointer the presence of a more potent association between screen time and over nutrition in children and adolescents in this environment and would pave a way for further research into this emerging menace.

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