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Relationships between screen time, internet addiction and other lifestyle behaviors with obesity among secondary school students in the Turkish Republic of Northern Cyprus

Özen Aşut, Gulifeiya Abuduxike, Songül Acar-Vaizoğlu, Sanda Cali

Department of Public Health, Faculty of Medicine, Near East University. E-mail: gulifeiya.abuduxike@neu.edu.tr or gulpiya1@gmail.com

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Obesity among children and adolescents is one of the critical public health problems worldwide, and the prevalence of obesity has been increasing rapidly over decades. We examined the associations between screen time, internet addiction and other life style behaviors with obesity among high school students in Near East College in Northern Cyprus. A cross-sectional study was conducted among 469 secondary school students with mean age 11.95 ±0.81 years. A self-administrated questionnaire was applied to assess screen time and life style behaviors. The Turkish adapted version of the short-form of internet addiction test was used to assess internet addiction problems. Height and weight were measured objectively to calculate body mass Index (BMI) and classify based on the BMI percentiles for sex and age. Descriptive analysis, Chi-Square test and multivariate regression analysis were performed, and the p- value <0.05 was accepted as significant.

Of all participants, 17.2% were overweight and obese, and 18.1% had internet addiction, while 40.7% of them reported to have screen time of more than two hours a day. After adjusting the analysis for age and sex, eating snacks while watching TV (OR,3.04; 95% CI, 1.28-7.21), self- perceived body weight (OR, 24.9; 95% CI, 9.64-64.25) and having a play station in the room (OR,4.6; 95% CI, 1.85 - 11.42) were significantly associated with obesity. Screen time (OR,4.68; 95% CI, 2.61-8.38; p=0.000) and having a computer in the bedroom (OR,1.7;95% CI, 1.01- 2.87; p=0.046) were significantly associated with internet addiction, whereas parent's complaint about lengthy technology use (OR,0.23; 95% CI, 0.11-0.46; p=0.000) was found to be a protective factor against internet addiction. The findings highlighted the significance of a family - school based integrated approach, which should be implemented to tackle obesity problem to improve the quality of life of children and adolescents.

Key words: screen time, internet addiction, obesity, children and adolescents, Northern Cyprus.

Obesity among children and adolescents is one of the critical public health problems worldwide as the prevalence of obesity has been increasing rapidly over decades both in developing and developed countries.[1-9] According to the World Health Organization, about one in 10 children aged 5-17 years are obese or overweight globally.[1] A meta-analysis done by Alper et al.[8] reviewed 58 studies which were conducted between 1990 and 2015 on school children aged 5-19 years in Turkey. It was concluded that the prevalence of obesity has increased from 0.6% to 7.3% with an 11.6-fold increase between the periods 1990-1995 to 2011-2015 for all; however, the prevalence among boys were significantly higher than

girls. A similar trend was seen in a study conducted among children and adolescents from Cyprus by Savva et al.[5], which found that the prevalence of obesity increased from 5.9% to 8.1% in a decade, from 2000- 2010.

It has been well documented that childhood obesity will lead to obesity in adulthood,[1,3,4] which is one of the main risk factors for various health conditions such as type 2 diabetes, hypertension, cardiovascular diseases and many other psychosocial disorders.[1,2,10-13] Obesity or being overweight also can affect adolescents' educational achievements, self-esteem and overall quality of life.[1,3,4] Along with the rapid development of technologies and improvements in economics, many children and adolescents are growing up in an obesogenic environment where most physical and outdoor activities are replaced by screen oriented and sedentary activities which encourage excessive weight gain leading to obesity.[1,3,10,14-17] Factors such as physical inactivity, unhealthy eating habits, sedentary behaviors, and inadequate sleeping hours are identified as the main causes of overweight and obesity among children and adolescents.[1,3,4,7,9,10,14,18-21]

Internet addiction (IA) has become one of the serious sedentary behaviors, particularly in school aged children and adolescents worldwide due to the excessive, prolonged sitting time in front of a screen.[14,16,18,20,22-26] IA is defined as the loss of control over the use of the internet that leads to negative consequences in daily life.[16,20,22,23,27] For instance, in an epidemiological study examining the prevalence of IA among 5,366 adolescents from six Asian countries using the Internet addiction test, IA was prevalent among all the Asian countries. The prevalence of addictive user ranged from 1% in South Korea to 5% in Philippines whereas problematic internet use ranged from 13% in South Korea to 46% in the Philippines.[18] There are many studies that examined the effects of internet addiction and other life style habits with relation to obesity and being overweight among school aged children in many countries.[14,16,21-23,28-33] However, there is no information available in this arena in Northern Cyprus and it is crucial to fill the gap in knowledge and to provide evidence for the various stakeholders to make an informed-decision on suitable public health interventions. Thus, in this study we attempted to examine the relationship between internet addiction and other life style behaviors with obesity among secondary school students in Nicosia.

Material and Methods

Study design

This was a cross-sectional study conducted among secondary school students in Near East College in Nicosia, Northern Cyprus from September to October in 2017. The study was conducted in classroom settings using the convenient sampling method. A written informed consent was taken from the participants prior to the data collection and the ethical approval was obtained in 2017 from the ethical committee of Near East University for the study protocol with a project number of YDU/2017/50-455. An official permission was taken from the Near East College management to conduct the research.

A total of 469 students completed the questionnaires out of 524 students with the response rate of 89.5%. Participants were from sixth grade (n=172), seventh grade (n=183), and eighth grade (n=114).

Study tools and measurements

A self- administrated questionnaire was developed by the researchers, which consisted of 39 questions with three sections. First section included information on socio-demographics of the students such as age, sex, class, both parents' education and working status, medical history of the participants, history of diabetes mellitus in nuclear family, number of siblings, possession of technologic devices (cellular phone, computer, television (TV), etc.), and having a private room. Second section consisted of questions on participants' lifestyle habits including the frequency and types of physical activities per week, consistency in eating daily meals alone and eating daily meals with the family (always, sometimes, never), eating food or snacks in front of the screen, screen time (defined as hours spent on electronic devices per day viewing TV, computer, phone, tablet, and video

games),[14] reasons to use the electronic devices, hours of sleep per day. Reported hours of sleep per day by the respondents were evaluated according to the recommended hours by the American Academy of Sleep Medicine (AASM) guidelines for children and adolescents.[34] Thus, in this study, 9 - 12 hours per day was considered normal for the respondents who were 12 years and below, and 8 - 10 hours was considered normal for the students above 12 years old. At the end of the second section, there were questions asked about participants' self-perceived weight and height.

The third section of the questionnaire was the short version of the Internet Addiction Test (s-IAT) to assess the level of internet use among study participants. The original IAT is comprised of 20 items and was developed by Young[27] in 1998. We applied the Turkish adapted version of the s-IAT,[35] which was modified and validated to s-IAT with 12 items by Mirko Pawlikowski et al. in 2013.[36] The s-IAT has demonstrated to have good psychometric properties and validity. The s-IAT consisted of 12 items which are rated on a 5 - point - Likert scale ranging from 1 ("= never") to 5 ("= very often") resulting in total scores range between 12 to 60.[36,37] Three levels of internet addiction were determined based on the cut-off points, where smaller than 30 indicates "normal", scores between 30 to 37 indicates "problematic internet user" and greater than 37 is considered a "pathologic internet user" (PIU).[36] In this study, we have classified both of the latter two groups as having internet addiction problems.

Outcome measurement - Body mass index (BMI)

Objective measurements of height and weight were performed by the researchers using the standard measurements to calculate the BMI. Height was measured to the nearest 0.1 cm with a wall-mounted stadio-meter. Weight was measured to the nearest 0.1 kg using a portable electronic scale. BMI calculated as weight in kilograms/height in meters squared (kg/m^2). To classify BMI percentiles according to age and sex, the cut-off values for healthy Turkish children and adolescents were used.[38] Participants' BMI percentiles were classified into four categories: <5% was considered underweight, between 5% to 85% was normal, between ≥85% to < 95% was overweight, and ≥ 95% were considered as obese.[38-40] As being overweight and obese both pose significantly higher risk for children and adolescents' healthy development and quality of life, we have classified participants with BMI percentile equal and higher than 85% as "higher BMI group", while participants with BMI percentile smaller than 85% as "lower BMI group".

Statistical analysis

Statistical analysis was carried out using SPSS version 23.0 for Windows. Descriptive analysis was performed to analyze the characteristics of the participants and all variables by frequency, percentage, mean, and standard deviation. Chi- square test was used to test for significant differences between groups. A multivariate logistic regression was performed to assess the independent effect of the variables such as doing any kind of sports, screen time, internet addiction, hours of sleep, having a TV or a play station in the room, eating snacks while watching TV, family history of diabetes mellitus, and self-perception of body weight on obesity. The regression model was adjusted for age and sex and for all the analyses; a level of significance was set at $p< 0.05$.

Results

A total of 469 students comprised of 50.3% males and 49.7% females with a mean age of 11.95 ± 0.81 years (range, 10-15 years) participated in the study.

Table I illustrates the distribution of socio-demographic characteristics of participants by BMI classifications. Out of the total, 5.2% of the students were obese and 12.0% of them were overweight while 14.8% of them were underweight. There was a significant difference between younger adolescents (≤12 years) and older adolescents (>12 years) in terms of all BMI classifications ($p= 0.022$). Boys had a significantly higher prevalence of being overweight and obese compared to girls (10.7% vs 1.3% and 5.0% vs 0.3%, respectively, $p=0.000$).

Participants with a family history of diabetes mellitus were more likely to be overweight and

Table I. Distribution of Socio-Demographic Characteristics of Participants by BMI Percentile Classifications.

	Underweight		Normal		Overweight		Obese		Total			
	n	%	n	%	n	%	n	%	n	%	X^2 value	p-value
Total	68	14.8	312	68.0	55	12.0	24	5.2	459	100		
Age group (years)												
≤12 years	56	12.2	234	51.0	36	7.8	13	2.8	339	73.9	9.58	0.022
>12years	12	2.6	78	17.0	19	4.1	11	2.4	120	26.1		
Gender												
Female	64	13.9	158	34.4	6	1.3	1	0.2	229	49.9	106.78	0.000*
Male	4	0.9	154	33.6	49	10.7	23	5.0	230	50.1		
Class												
6th	30	6.5	115	25.1	14	3.1	6	1.3	165	35.9		
7th	25	5.4	122	26.6	26	5.7	9	2.0	182	39.7	7.49	0.278
8th	13	2.8	75	16.3	15	3.3	9	2.0	112	24.4		
History of diabetes Mellitus in nuclear family												
Yes	8	20.5	20	51.3	5	12.8	6	15.4	39	8.7	10.67	0.020*
No	59	14.4	284	69.3	18	4.4	49	12.0	410	91.3		
Having a private room												
Yes	66	14.6	289	63.9	52	11.5	21	4.6	428	94.7	1.32	0.724*
No	2	0.4	17	3.8	3	0.7	2	0.4	24	5.3		
Having technology devices in bedroom												
Computer												
Yes	35	7.7	176	38.5	36	7.9	14	3.1	261	57.1	2.26	0.520
No	32	7.0	135	29.5	19	4.2	10	2.2	196	42.9		
TV												
Yes	27	5.9	151	33.0	38	8.3	12	2.6	228	49.9	10.80	0.013
No	40	8.8	169	35.0	17	3.7	12	2.6	229	50.1		
Play station												
Yes	13	2.8	120	26.3	37	8.1	16	3.5	186	40.7	35.96	0.000
No	54	11.8	191	41.8	18	3.9	8	1.8	271	59.3		
Cellphone												
Yes	63	13.8	265	58.1	49	10.7	2	0.4	398	87.3	4.45	0.217*
No	4	0.9	46	10.1	6	1.3	21	4.6	58	12.7		
Self-reported weight perception												
Underweight	29	49.2	30	50.8	-	0.0	-	0.0	59	13.7		
Normal	35	13.7	197	77.3	22	8.6	1	0.4	255	59.2	151.83	0.000*
Overweight	-	0.0	66	56.4	30	25.6	21	17.9	117	27.1		

*Fisher's Exact test

obese compared to those who did not (12.8% vs 4.4% and 15.4% vs 12.0%, respectively, p=0.020). There were no significant differences between different classes (p=0.278), those that had a private room (p=0.724), a computer (p=0.520), and a cellphone in their room (p=0.217) compared to those who did not. However, participants who had

a TV in their room were more likely to be overweight compared to their counterparts (8.3% vs 3.7% respectively, p= 0.013), whilst having a play station in the room showed a significant difference between groups (obese: 3.5% vs 1.8% and overweight: 8.1% vs 3.9%, respectively, p=0.000).

There was a significant difference between self-perception of body weight and BMI classifications. Of all participants, 8.6% thought they had a normal weight while their BMI classified into overweight and 17.9% of participants thought they were overweight, despite categorizing as obese (p=0.000). Table II presents an overview of the Internet usage patterns among high school students who participated in our study. Each of the items listed are the questions based on the validated shortened version of the original Internet Addiction Test (mean score, 23.61±8.21). Of 419 respondents, 12.1% students were classified to the category of "problematic internet use", while 6.0 % of them fell in to the category of "pathologic internet user". We have classified both groups as having internet addiction problems (18.1%).

Table III provides an overview of the distribution of lifestyle behaviors by BMI status of the participants. Among all examined behaviors, only eating snacks while watching TV was significantly associated with having higher BMI (OR,1.78;95% CI, 1.09-2.90, p=0.020). Out of all, 41% of them described potato chip as the No. 1 choice among snacks followed by chocolates (15.7%), fruits (14.4%), biscuits & crackers (9.2%), ice-cream (2.6%) and others (17.1%). However, doing any kind of sports activities in a week, length of screen time, having internet addiction, and hours of sleep were not significantly associated with having higher BMI among participants.

Table IV reveals the associations between participant's characteristics with an internet addiction problem. The comparisons of age groups, gender and hours of sleep showed no significant differences between groups in terms of internet addiction problems. However, those who had a computer at home were 1.7 times more likely to have internet addiction problems compared to their counterparts (95% CI, 1.01- 2.87; p=0.046). Participants who spent more than two hours in front of the screen were shown to be 4.68 times more likely to have an internet problem compared to those who had less than two hours' screen time per day (95% CI, 2.61-8.38; p=0.000). Participants whose parents always complained about lengthy technology use tended to reduce the risks of having internet addiction by 67% compared to their counterparts (95% CI, 0.11-0.46; p=0.000).

Table V summarizes the results of the multivariate logistic regression used to assess the factors that are associated with obesity among participants. Among all the factors in the model which was adjusted for age and gender, self- perceived body weight as normal was positively associated with being obese (OR, 24.9; 95% CI, 9.64-64.25). Moreover, eating snacks while watching TV (OR,3.04; 95% CI, 1.28-7.21) and having a play station in the room (OR,4.6; 95% CI, 1.85 - 11.42) were positively associated with being obese among participants.

Discussion

To our knowledge, this is the first study to examine the relationships between screen time, internet addiction and other life style behaviors with obesity among secondary school students in Northern Cyprus. In the current study, of all the participants, 12% of them were overweight, while 5.2 % of them were obese as classified based on the BMI percentiles by age and gender. The proportion of obesity among participants from our study is in line with the result of a meta-analysis conducted by Alper et al.[8] among 58 publications on Turkish children aged 5-19 years. However, there are differences in proportions of being overweight and obesity compared to some other studies which might be due to the differences in the BMI classifications and target age groups.[1,5,7,19,21,40-43]

In the present study, younger school children had significantly higher proportion of being overweight and obesity compared to their older counterparts and this finding is consistent with several studies conducted in different countries.[1,5,7,44] It was also found that boys had significantly higher tendency to be overweight or obese compared to girls and this trend is

Table II. Internet Use Among Respondents.

s-IAT Questions	Never		Rare		Sometimes		Often		Very often		Scoring	
	n	%	n	%	n	%	n	%	n	%	Mean	SD
Stay online longer than you intended	68	14.7	128	27.6	168	36.3	57	12.3	42	9.1	2.73	1.13
Find yourself saying "just a few more minutes" when online?	240	51.7	147	31.7	48	10.3	17	3.7	12	2.6	1.74	0.97
Neglect household chores to spend more time online	214	45.8	149	31.9	69	14.8	27	5.8	8	1.7	1.86	0.99
Try to cut down the amount of time you spend online and fail	292	63.3	88	19.1	40	8.7	15	3.3	26	5.6	1.69	1.12
Grades or school work suffers because of the amount of time you spend online?	164	35.4	136	29.4	88	19.0	35	7.6	40	8.6	2.25	1.23
Lose sleep due to late-night log-ins	254	55.0	103	22.3	63	13.6	28	6.1	14	3.0	1.8	1.08
Choose to spend more time online over going out with others	283	61.1	78	16.8	44	9.5	25	5.4	33	7.1	1.81	1.24
Try to hide how long you've been online?	123	27.2	121	26.7	100	22.1	52	11.5	57	13.0	2.56	1.33
Snap, yell, or act annoyed if someone bothers you while you are online?	206	45.2	102	22.4	93	20.4	29	6.4	26	5.7	2.05	1.2
Feel preoccupied with the Internet when offline, or fantasize about being online	288	62.9	88	19.2	53	11.6	17	3.7	12	2.6	1.64	1.0
Block out disturbing thoughts about your life with soothing thoughts of the Internet	281	60.6	104	22.4	43	9.3	19	4.1	17	3.7	1.68	1.05
Become defensive or secretive when anyone asks you what you do online	240	51.8	88	19.0	58	12.5	32	6.9	45	9.7	2.04	1.34
Internet addiction												
No (score ≤30)	343	81.9										
Yes (score >30)	76	18.1										

also complemented by some studies conducted among children and adolescents.[5,7,20] The reason behind this might be that girls tend to be more cautious about their weight compared to boys at this age as seen in a study conducted by Rachmi et al.[7] in Indonesia. Eating habits of our participants did not show any significant differences on obesity status, despite the habit of eating snacks while watching TV was found to be one of the strong predictors for obesity among participants. This supports the findings in another study conducted in Brazil by Ferrari et al.[6] among children aged 9-11 years old and reported that having healthy eating policies or practices in schools was significantly associated with BMI in children. In our study, participants reported that they preferred to eat high calorized sweet snacks such as potato chips, chocolates, biscuits and ice-cream. At the same time, this was complemented by lengthy hours sitting in front of a screen, which encouraged children to have more sedentary behaviors and reduced physical activities. However, the majority

Table III. Distributions of Lifestyle Behaviors of Participants by Obesity Status.

	Higher BMI group		Lowe BMI group		Total		OR	95% CI		P-value
	n	%	n	%	n	%				
Sports activities? (No vs Yes)										
Yes	62	17.6	290	82.4	352	76.7	0.88	0.49	1.59	0.679
No	17	15.9	90	84.1	107	23.3				
Screen time (≤2 vs >2)										
>2 hours	37	19.6	152	80.4	189	44.6	0.73	0.45	1.23	0.248
≤2 hours	36	15.3	199	84.7	235	55.4				
Internet addiction (≤30 vs >30)										
Yes (score >30)	13	17.3	62	82.7	75	18.3	0.92	0.47	1.78	0.797
No (score ≤30)	54	16.1	281	81.9	335	81.7				
Sleeping hours (normal vs less than normal)										
Normal	32	20.0	128	80.0	160	41.5	1.2	0.71	2.01	0.493
Less than normal	39	17.3	187	82.7	226	58.5				
Eat snacks while watching TV (No vs Yes)										
Yes	40	14.1	244	85.9	284	62.1	1.78	1.09	2.90	**0.020**
No	39	22.5	134	77.5	173	37.9				

* Pearson Chi-Square test, P-value < 0.05; OR: odd ratios; CI: confidence interval

of the participants in our study reported to have eaten three meals per day regularly and there were no differences between age and sex. This finding is different from the result of a study conducted Koca et al.[21] among Turkish adolescents which showed that obese/overweight children skipped breakfast more frequently compared to children with normal weight.

Similarly, there were no differences among participants in terms of parent's education and employment status in our study, whereas some studies have found that mother's employment status and family income were negatively associated with obesity prevalence among subjects.[7,21] Interestingly, a study conducted by Savva et al.[5] in Cyprus has reported that mother's educational status was associated with lower risk of obesity. However, a meta-analysis done by Rachmi et al.[7] evaluated the prevalence of obesity and summarized that mother's working status, higher income and higher educational level were associated with higher prevalence of obesity among children in Indonesia. In the present study, we found a strong association between self-perception of body weight with obesity, even after adjusting the analysis for age and sex. This finding is consistent with the study conducted by Suchert et al.[42] among German adolescents. Several studies have reported that sleeping disorders and physical inactivity are important factors associated with being overweight and obesity among children.[1,6,7,16,45] However, we did not find any statistically significant associations of these factors with obesity in our current study. This might be due to the respondent bias in the self-reported sleeping hours and physical activities by the participants.

In our present study, 40.7% of the participants reported spending more than two hours in front of the screen during the day and a significantly positive relationship with internet addiction was shown and this is in line with previous studies.[20,46] Furthermore, 18.1% of participants were diagnosed as having internet addiction using the short form of internet addiction test. In our current study, there was no statistically significant association between screen time and internet addiction with obesity status of the participants. This is different from some studies that examined the effects of screen

Table IV. Association Between Participants' Characteristics with Internet Addiction problem.

	Internet addiction problem									
	Yes		No		Total		OR	95% CI		P-value
	n	%	n	%	n	%				
Total	76	18.1	343	81.9	419	100				
Age group (≤12 vs >12)										
≤12 years	56	18.4	248	81.6	304	73.6	0.94	0.53	1.66	0.818
>12years	19	17.4	90	82.6	109	26.4				
Gender (Male vs Female)										
Female	35	16.9	172	83.1	207	49.8	0.83	0.51	1.37	0.475
Male	41	19.6	168	80.4	209	50.2				
Having a computer in the room (No vs Yes)										
Yes	51	21.5	186	78.5	237	56.8	1.70	1.01	2.87	**0.046**
No	25	13.9	155	86.1	180	43.2				
Screen time (≤2h vs >2h)										
≤2h	18	8.3	198	91.7	216	55.8	4.68	2.61	8.38	**0.000**
>2h	51	29.8	120	37.7	171	44.2				
Hours of Sleep per day (Normal vs Less than normal)										
Normal	28	19.9	113	80.1	141	40.8	0.61	0.34	1.09	0.095
Less than normal	27	13.2	178	86.8	205	59.2				
Parents' complaint about lengthy technology use at home (Yes vs No)										
Yes	64	24.3	199	75.7	263	64.1	0.23	0.11	0.46	**0.000**
No	10	6.8	137	93.2	147	35.9				

*Pearson Chi-Square test. P-value <0.05; OR: odd ratios; CI: confidence interval.

Table V. Factors Associated with Obesity Status among Participants (n=469).

Factors	Obesity		
	OR	P	95% CI
Do any sports (Yes/No)	2.17	0.166	0.73 - 6.52
Hours of sleep (Normal/less than normal)	0.96	0.916	0.42 - 2.17
Eating while watching TV (Yes/No)	0.64	0.332	0.26 - 1.59
Internet addiction (Yes/No)	0.99	0.971	0.29 - 3.27
Screen time (≤2h />2h)	1.09	0.850	0.47 - 2.53
Self-perception of body weight (Normal /obese)	24.9	0.000	9.64 - 64.25
Eating snacks while watching TV (Yes/No)	3.04	0.012	1.28 - 7.21
Having Diabetes Mellitus in nuclear family (Yes/No)	2.87	0.117	0.77 - 10.72
Having a Play Station in the room (Yes/No)	4.6	0.001	1.85 - 11.42
Having a TV in the room (Yes/No)	1.78	0.262	0.65 - 4.85

OR: odd ratios; CI: confidence interval;

time and internet addiction on overweight/obesity among school aged children in different counties and have reported that prolonged sitting time in front of a screen and internet addiction were associated with eating disorders, reduced physical activities, sleep

disorders and some psychological problems in children.[6,10,20,41,47-50]

Among the types of technological devices in the bedroom, having a TV and a play station were significantly associated with the BMI percentile of the participants in our study. Having a TV in the bedroom was positively related to being overweight, while having a play station was strongly associated with being overweight and obese. After adjusting the regression analysis for age and sex, it was found that those who have a play station in their bedroom were 4.6 times more likely to be obese compared to those who did not. Even though having a TV in the bedroom was not statistically associated with the obesity status and screen time, however, a significant association of snacking in front of the TV with obesity can be linked to the sufficient time they spent in front of the TV and might be more common among girls. This assumption was supplemented by the results of a population - based study conducted by Sisson et al.[51] which examined the association between the television viewing and energy intake among all age groups, and an association was reported among girls aged 12-18 who had the longest hours of TV viewing (≥4h/d) and tended to consume more energy daily. Further studies need to be conducted to understand the associations and reasons behind these differences.

We also examined the relationship between socio-demographics and lifestyle behaviors with internet addiction among participants. It was found that those who spent more than two hours in front of a screen had more than four times the risk of having internet addiction when compared to those who spent less than 2 hours in front of a screen. Similarly, those who had a computer in their room were almost twice as likely to have internet addiction compared to those who did not. These finding are consistent with the findings from other studies.[50,52,53] However, in our present study we did not find any significant relationship between age groups, gender, hours of sleep, and eating behaviors with internet addiction. These findings are inconsistent with some studies focused on internet addiction.[10,16,46] For instance, a study conducted by Tao[48] among college students from China reported that both males and females with internet addiction problems have shown close association with frequent binge eating and bulimia. Correspondingly, another study conducted by Alpaslan et al.[41] among high school student in Turkey found that those who have internet addiction tend to consume more alcohol and tobacco, at the same time having higher BMI compared to their other counterparts.

Nevertheless, our findings are similar to a study by Simcharoen et al.[20], which found no difference between internet addiction scores in terms of age and gender among medical students. It was also reported by Continente et al.[54] that excessive use of media and having a computer in the bedroom were associated with short sleep duration among adolescents in Barcelona, Spain. One of the important factors that plays a protective role in having internet addiction problems is parental control, by limiting the usage of technology devices and screen time at home.[55] In our study, parents' complaints and limitations on lengthy technology use at home was significantly inversely associated with internet addiction problems among participants and similar findings were reported in a study by Ding et al.[15], among Chinese middle school students. It was reported that poor parental monitoring increases the risk of adolescents exposed to or engaged with some adverse problem behaviors such as having prolonged screen time and internet addiction.[15]

The present study has several limitations that must be acknowledged. First, with the cross-sectional study design, we could only assess the relationships not the causality between variables. Second, the convenient sampling from one school's students has limited our study results to be generalized or representative of children and adolescents in the Turkish Republic of Northern Cyprus. However, in consideration of the small population and the study site (Near East colleague) as one of the popular high schools in Northern Cyprus, we believe that our study has added values in the local context to fill the knowledge gap in this field. The study results can lay the foundation for the further in-depth research in obesity among adolescents in Northern Cyprus.

Prolonged screen time is strongly associated with internet addiction among children and

adolescents and subsequently might lead to sedentary life styles and reduced physical and social activities, which would result in being overweight or obese among children. Parental control is one of the most important protective factors in reducing screen time and use of technology at home. Parents should be role models for their children in terms of adequately using internet, limiting the duration of watching TV and improving the dietary habits. School based intervention programs should be implemented to encourage students to participate in more frequent outdoor sports and social activities. Most importantly, students should be educated in the contexts of pros and cons of screen time, internet addiction and obesity. Self-perception of body image is one of the essential factors to be focused on in order to promote healthy body image, which would result in better quality of life among children and adolescents.

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