

Technological and electronic communication device addiction and its associated physical and psychosocial comorbidity among obese and overweight children aged 10 to 14 years, who attend the nutrition clinic at Colombo North Teaching Hospital

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Abstract

Background: Addiction to technological and electronic communication devices is the emerging trend among adolescents. Studies reveal a relationship between such addiction and obesity leading to physical and psychosocial morbidity.

Objectives: To assess the addiction to technological and electronic communication device and its associated physical and psychosocial comorbidity among 10 to 14 year old obese and overweight children attending the nutrition clinic at Colombo North Teaching Hospital.

Method: A clinic based cross sectional descriptive study was conducted among 406 overweight and obese children who attended the nutrition clinic at Colombo North Teaching Hospital, using an interviewer administered questionnaire.

Results: Prevalence of technological and electronic communication device addiction among the overweight and obese adolescent population in 10-14 years was 41.4%. Cartoon was the highest addicted programme among television (TV) addicted group at 65.6%, whereas games were the most interested programme in non-TV addicted group which was 73.3%. Education of the carer, employment status of the carer, place of device usage and number of hours spent in outdoor activities had affected the screen time and

technology addiction significantly ($p < 0.05$). Several physical and psychosocial morbidities were identified in a significant association to the technology addiction in obese and overweight adolescents ($p < 0.05$).

Conclusions: Technological and electronic communication device addiction has adversely affected the behavioural and physical health of obese and overweight adolescents in addition to metabolic derangements, augmented by many other factors.

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(Key words: Obesity and overweight, technology, addiction, morbidity)

Introduction

Addiction to technological and electronic communication devices is an emerging trend seen in adolescents. Technology addiction is defined as compulsive/ impulsive online and /or offline computer / mobile device usage despite negative consequences to the user of the technology¹. It refers to the compulsive, uncontrollable dependence to such a degree that cessation causes severe emotional, mental and psychological reactions^{2,3}. Young has made eight criteria for the diagnosis of technology addiction based on four main components of addiction according to Diagnostic and Statistical Manual of mental disorders -V (DSM V)¹. The above criteria were categorized and modified by Beard⁴. According to him, all of the first five criteria and one of the last three criteria made by Young are required for the diagnosis of technology addiction. The first five criteria could account for numerous behaviours that would not necessarily classify as an addiction and the last three criteria are separated from the others as these criteria impact the pathological technology user's ability to cope and function and also impact interactions with other people in his or her life⁴.

Handling of technological devices for nonacademic purposes is rising. It affects academic performances, real life experiences and social engagement. Therefore, not only the social network sites, but also the technological dependency can

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contribute to a behavioural change thus leading to addiction to these devices. Common hedonic mechanisms may explain a relationship between obesity and addiction⁵. The prevalence of overweight among adolescents has increased over the recent decades and its harmful effects are more evident with time as it progresses to adult obesity leading to development of non-communicable diseases⁶⁻⁸. According to the estimates of the World Health Organization (WHO), by the year 2020, non-communicable diseases will account for approximately three quarters of deaths in the developing world⁹. Sri Lanka is in a state of accelerated demographic, nutritional and epidemiological transition, in parallel to the socioeconomic development and urbanization. As a result, the unhealthy dietary practices and life style changes make the adolescent population overweight and obese. Research has been done on the addiction of technology among different groups of young adults and adolescents and related to body mass index (BMI)¹⁰⁻¹². Furthermore, there were some studies looking at screen time and obesity¹³.

Studies have identified some physical and psychosocial consequences of dependency of technology and its addiction in youngsters¹⁴. Behavioural symptoms were considered as appearing on a high while using electronic devices, avoiding friends and family, not getting enough sleep as compared to normal bed time, denying actual usage time spent on technological devices, avoiding activities that were once enjoyable to them. Physical morbidity patterns were considered as headache (non-sinister) with a frequency of at least once a week, whereas, vision problems were accounted to either new changes in visual acuity, eye strain or tearing. Furthermore, non-inflammatory type aches and stiffness, numbness and pain in the palms and fingers were considered as physical ailments with technology usage. This study was conducted to assess the technology addiction in obesity and overweight and its associated factors.

Objectives

To describe the technological and electronic communication device addiction and its associated physical and psychosocial comorbidity among obese & overweight children aged 10-14 years, who attend the nutrition clinic at Colombo North Teaching hospital.

Method

This cross sectional descriptive study was carried out in Colombo North Teaching Hospital during a period of six months in 2017/2018. The study sample included obese and overweight patients in the age group of 10-14 years who got registered randomly, out of the wide age range of registered

children at the nutrition clinic. Sampling frame was the daily clinic attendance register, including both new and already being followed up patients without repetition. Consecutive patients who met the inclusion criteria were recruited into the study. Calculated sample size was 384 as per formula by Lwanga and Lameshow. 412 patients were recruited into study, but only 406 patients responded. Children below 10 years or above 14 years were not recruited to study. Furthermore, children attending the clinic without a parent/guardian, children with previously diagnosed developmental disorders, children with severe visual or hearing impairment which cannot be corrected and children with obesity due to congenital, heritable, neurological or endocrinology disorders were excluded from the study. Further, all children who attended the clinic were assumed to have access to at least one of the electronic device during the past 3 months. The electronic devices considered were, mobile phones, laptop, tablet computer, desktop computer, and TV.

The questionnaire was developed in consultation with an expert panel and reviewing of literature. It included socio-demographic details, information about technological device usage, physical/psychosocial morbidity and addiction to screen device. Sex and age specific BMI criteria had been defined according to the WHO standards¹⁵. Overweight had been based on BMI for age $>+1$ standard deviations (SD) from the median and $\leq +2SD$, whereas obese children had a BMI for age $> +2SD$ of the median¹⁵. Questionnaire was made according to Beard to assess technology addiction within the local setting, by modifying the Young's internet addiction screening criteria that has been outlined in published literature^{4,16}. Beard modification consisted of eight criteria which include behavioral, psychological and social factors with a one mark for each positive criterion. Score ≥ 6 including initial five consecutive criteria plus, one or more in the final three criteria, were taken as addiction and unable to score as above is considered non-addiction⁴.

A pilot study was conducted using the pretested questionnaire, in the patients who attended the same nutrition clinic, to assess feasibility of applying it in the study. An interviewer administered questionnaire was used by the main investigator to obtain the data from parents/guardians of the index children following informed written consent. Ethical clearance was obtained from the ethics review committee, Post Graduate Institute of Medicine, University of Colombo, while the administrative approval was taken from the hospital authorities.

The data analysis was conducted according to the Statistical Package for the Social Sciences (SPSS, version 23) for Windows. The pattern of device usage was described in terms of the type of device, duration of use and purpose of the device use. All variables were described in terms of frequency and proportion. Factors associated with addiction to technological devices were analysed using Chi square test. Statistically significant difference was calculated at $p < 0.05$ at the confidence level of 95%.

Results

There were 412 eligible patients recruited for the study and only 406 responded with a response rate of 98.5%. Their sociodemographic data and their medical characteristics are illustrated in Table 1. Males comprised the majority of the sample with 221 (54.4%), while females comprised 185 (45.6%). Average age of males was 12 years and 3 months and females 12 years and 1 month. Majority (57.4%) of patients were overweight.

Table 1: Distribution of study population according to sociodemographic and medical characteristics

Characteristics	Male n	Female n	Total n (%)
<i>School</i>			
Government – National	110	71	181 (44.6)
Government – Non National	97	109	206 (50.7)
Private	14	05	19 (04.7)
<i>Ethnicity</i>			
Sinhala	187	164	351 (86.4)
Tamil	03	02	05 (01.2)
Muslim	31	17	48 (11.8)
Other	0	02	02 (0.5)
<i>Area of residence</i>			
Urban	96	88	184 (45.3)
Sub Urban	95	63	158 (38.9)
Rural	30	34	64 (15.8)
<i>Number of children in the family</i>			
1	95	97	192 (47.3)
2-4	124	87	211 (52)
>4	02	01	03 (0.7)
<i>Body mass index of the child</i>			
>+2 SD	100	73	173 (42.6)
> +1 SD to ≤ + 2SD	121	112	233 (57.4)

Table 2 shows the prevalence of addiction and the pattern of addiction to technological devices among the study group. Technology addiction was analysed according to the responses from parents / guardians. The proportion of addiction among the study group was 168 (41.4%). Out of the addicted group, 93 (55.4%) of adolescents were addicted to TV. Cartoon was the most addicted TV programme (65.6%), while the non-TV addicted group was most attracted to games (73.3 %).

Table 3 shows the identified morbidity patterns in relation to the technology addiction. The available data showed an increasing trend of physical and behavioural morbidity with technology addiction. While 47.6% of children with technological addiction had behavioural morbidity, only 36.1% of adolescents without technology addiction had identified behavioural morbidity, which is statistically significant ($p < 0.05$). Furthermore, 48.2% of addicted adolescents had physical

morbidity, whereas 62.6% of adolescents in the study group without the technology and telecommunication device addiction did not have the physical morbidity, which is statistically significant ($p < 0.05$).

Furthermore, there were statistically significant relationships between the technological device addiction and behavioural morbidities of appearing on high while using the device, avoiding family and friends, denial of actual state of using the device and avoiding activities which were earlier enjoyable to them ($p < 0.05$). Similarly, the data in this study showed significant relationship between the addiction to technological device and the presences of physical morbidities of headache and vision problems ($p < 0.05$). There were no statistically significant relationships between the addiction and the lack of sleep, aches and stiffness and numbness of hand ($p > 0.05$).

Table 2: Prevalence of addiction and other identified patterns of technology addiction

Characteristic	Number (%)
<i>Addiction</i>	
No	238 (58.6)
Yes	168 (41.4)
<i>Screen time</i>	
<1 hour	84 (20.7)
1-3 hours	177 (43.6)
>3 hours	145 (35.7)
<i>Commonest used device in children with technology addiction</i>	
Personal computers	10 (05.9)
Laptop computers	05 (03.0)
Tablet (Android)	14 (08.3)
Mobile phones	39 (23.2)
Game devices	07 (04.2)
Television	93 (55.4)
<i>Addicted programme (except television)</i>	
Academic purposes	00 (0)
Communication with relatives and friends	06 (08.0)
Entertainment	10 (13.3)
News reading	00 (0)
Games	55 (73.3)
Social media	04 (05.3)
<i>Addicted programme in television</i>	
Tele drama	15 (16.1)
Movie	05 (05.4)
Educational/ Documentary	02 (02.1)
Cartoons	61 (65.6)
Sports	10 (10.7)

Table 3: Morbidity patterns with technology addiction

Pattern of morbidity		Addiction				p*		
		Present		Absent				
		n	%	n	%			
<i>Behavioural morbidity</i>	Yes	80	47.6	86	36.1	0.020		
	No	88	52.4	152	63.9			
<i>Physical morbidity</i>	Yes	81	48.2	89	37.4	0.030		
	No	87	51.8	149	62.6			
<i>Behavioural morbidity</i>	Appearing on a high while using the devices	Yes	50	29.8	46	19.3	0.015	
		No	118	70.2	192	80.7		
	Avoid friends & family	Yes	31	18.5	23	09.7	0.010	
		No	137	81.5	215	90.3		
	Not enough sleep	Yes	40	23.8	40	16.8	0.081	
		No	128	76.2	198	83.2		
	Denial of actual status of usage of devices	Yes	48	28.6	46	19.3	0.030	
		No	120	71.4	192	80.7		
	Avoid activities which were previously enjoyable	Yes	56	33.3	55	23.1	0.023	
		No	112	66.7	183	76.9		
	<i>Physical morbidity</i>	Headache	Yes	53	31.5	52	21.8	0.028
			No	115	68.5	186	78.2	
Vision problems		Yes	41	24.4	37	15.5	0.026	
		No	127	75.6	201	84.5		
Aches & stiffness		Yes	17	10.1	13	05.5	0.077	
		No	151	89.9	225	94.5		
Numbness & pain in palms & fingers		Yes	13	07.8	09	03.8	0.083	
		No	155	92.3	229	96.2		

*From Chi square test

Table 4 shows the relationship between the variables, which could have an involvement with the presence of technology addiction. There was a statistically significant relationship between the technological device addiction and the education of the carer, employment status of the carer and place of using the device ($p < 0.05$). Similarly, the screen time also showed a statistically significant

relationship with the above variables ($p < 0.05$). Furthermore, the number of hours involved in outdoor activities was significantly related to the technology addiction and screen time ($p < 0.05$).

Gender, school type or area of residence did not have a significant relationship with technological device addiction or the screen time ($p > 0.05$).

Table 4: Factors associated with technology addiction and screen time

Variable	Technology addiction		p*	Screen time (hours)			p*
	Present n (%)	Absent n (%)		< 1 n (%)	1-3 n (%)	>3 n (%)	
<i>Gender</i>							
Male	97 (57.7)	124 (52.1)	0.261	42 (50.0)	96 (54.2)	83 (57.2)	0.569
Female	71 (42.3)	114 (47.9)		42 (50.0)	81 (45.8)	62 (42.8)	
<i>School type</i>							
Government – national	68 (40.5)	113 (47.5)	0.368	38 (26.2)	86 (48.6)	57 (39.3)	0.351
Government – non national	92 (54.8)	114 (47.9)		40 (47.6)	84 (47.5)	82 (56.6)	
Private	08 (04.8)	11 (04.6)		06 (07.1)	07 (03.9)	06 (04.1)	
<i>Area of residence</i>							
Urban	76 (45.2)	108 (45.4)	0.077	41 (48.8)	87 (49.1)	56 (38.6)	0.296
Sub urban	73 (43.5)	85 (35.7)		33 (39.3)	62 (35.0)	63 (43.4)	
Rural	19 (11.3)	45 (18.9)		10 (11.9)	28 (15.8)	26 (17.9)	
<i>Education of the carer</i>							
Less than Grade 6	25 (14.9)	12 (05.0)	0.017	06 (07.1)	10 (05.6)	21 (14.5)	0.036
Grades 6-9	45 (26.8)	79 (33.2)		35 (41.7)	51 (28.8)	38 (26.2)	
Ordinary Level	74 (44.0)	109 (45.8)		32 (38.1)	83 (46.9)	68 (46.9)	
Advanced Level	14 (08.3)	22 (09.2)		07 (08.3)	17 (09.6)	12 (08.3)	
Higher Education	10 (06.0)	16 (06.7)		04 (04.8)	16 (09.0)	06 (04.1)	
<i>Employment of carer</i>							
No	59 (35.1)	111 (46.6)	0.020	47 (56.0)	74 (41.8)	49 (33.8)	0.005
Yes	109 (64.9)	127 (53.4)		37 (44.0)	103 (58.2)	96 (66.2)	
<i>Place of use</i>							
Home (Common Area)	79 (47.0)	107 (45.0)	0.000	27 (31.1)	106 (59.9)	53 (36.6)	0.000
Bed Room	63 (37.5)	61 (25.6)		19 (22.6)	47 (26.6)	58 (40.0)	
School	02 (01.2)	33 (13.9)		22 (26.2)	04 (02.3)	09 (06.2)	
Travel	04 (02.4)	20 (08.4)		12 (14.3)	06 (03.4)	06 (04.1)	
Other	20 (11.9)	17 (07.1)		04 (04.8)	14 (07.9)	19 (13.1)	
<i>Hours of outdoor activities</i>							
< 1	106 (63.1)	120 (50.4)	0.013	33 (39.3)	101 (57.0)	92 (63.5)	0.000
1-2	49 (29.2)	80 (33.6)		31 (36.9)	62 (35.0)	36 (24.8)	
>2	13 (07.7)	38 (16.0)		20 (23.8)	14 (07.9)	17 (11.7)	

*From Chi square test

Discussion

In this study 41.4% obese and overweight adolescents were addicted to technological devices; while 43.6% of study population had a screen time of 1-3 hours/ day, 35.7% had more than 3 hours/ day. In contrast, a non-experimental cross sectional study in 370 students attending 4 elementary schools in Korea showed a significant association of screen time with increased BMI. Meanwhile, 45.7% of children were reported to have a screen time of 1-2.9 hours/day and 8.9% 3 or more hours per day¹⁸. A study in USA showed that 8-18 year-old children spend about 4.5 hours per day on TV, videotapes and playing video games¹⁹.

Studies on technology addiction among obese adolescents have not been done in Sri Lanka. International studies show a significant relationship between screen time and prevalence of obesity, prevalence increasing by 2% for each additional hour of TV viewing^{20,21}. In adolescents, technology

use has been linked to high energy intake in the absence of hunger while using screen. Furthermore, advertisements of unhealthy foods through unrestricted internet, TV and mobile applications also promote the current eating habits²²⁻²⁴.

In this study, some identified behavioural and physical morbidities were significantly associated with technology addiction and screen time. Appearing high while using technological devices, avoiding friends and family, denial of actual status of device usage, avoiding activities previously enjoyable, headache and visual problems were significantly associated with technology addiction but there was no significant relationship with aches/ stiffness and sleep. A study in Norwegian teens showed that the combination of more TV, video and computer use lead to more back pain and headache²⁵. An American study showed more total ill-being, more attention problems and physical problems in children who used more technology²⁶.

Kraut *et al* revealed that social networks and TV viewing have an impact on physical inactivity as well as on social withdrawal and low psychological wellbeing²⁷. This general response pattern was partially confirmed by the study by Wastlund *et al*, which showed an increased tendency for less psychological wellbeing among people with internet addiction²⁸. Meanwhile a north Indian study by Meena *et al* showed that use of excess social network had higher rate of depression, anxiety and stress score²⁹. In contrast to our findings, a study by Foley *et al* showed worse sleep quality in children viewing TV during the last 90min before sleep³⁰. Unfortunately, due to lack of studies on technology addiction in adolescents, information on this topic is scanty.

In considering factors associated with technological device addiction, educational status of caregiver and employment status of carer were significantly associated with technological device addiction in obese and overweight adolescents. Similarly, a study by Furthner *et al* showed significant correlation between lower parental education and longer screen time³¹. Our study did not show any significant association between technological addiction and gender, school type or area of residence of obese and overweight adolescents.

There were statistically significant relationships between the place of using the device and the addiction as well as the screen time. A study done in USA by Dennison *et al* showed that almost 40% of children had a TV in their bedroom and they had more tendency to become overweight by spending more time (4.6 hours/ week) on viewing TV than children without a TV in their bedroom³².

Investigators have hypothesized that watching the TV is responsible for making a person obese by one or more of three possible ways such as displacement of physical activity, increased calorie intake while watching TV or due to the effects of advertising and reduced resting metabolism³³. Similarly, the results of our study among the obese and overweight adolescents revealed that the relationship between technological device addiction as well as the screen time is statistically significant with the number of hours spent on outdoor activities. TV, movies, video games, mobile phones and computer networks have assumed an important central role in children's lives which invariably influence the child health including social isolation, violence, substance abuse and sexual behaviours³⁴. Therefore, it's essential to take some steps to minimize this social catastrophe.

There were a few limitations to the study. The data were collected from a government hospital where the social status and the financial situation of the

family would not be fair representation of society. Therefore, generalisation of the results may be limited. However, since data from a relatively lower socioeconomic strata show that addiction of technological and communication devices is fairly high, it can be postulated that the condition would be worse in higher socioeconomic strata having more accessibility to such devices. Despite the limitations, findings in this study are significant for the care of obese and overweight adolescents with regard to the use of technological and electronic communication devices in Sri Lanka, and also to be taken into consideration in designing obesity programmes in the country. Technology addiction among children and adolescents is a new arena for clinical research. Local and international studies among adolescent group, especially in obese and overweight group are lacking. Further studies into this field and comparison with normal population can be used to analyse the situation and social impact in a wide range.

Conclusions

Addiction to use of electronic devices is a significant associated factor with overweight and obesity and it is related to several physical and psychosocial morbidities.

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