

ASSOCIATION OF SCREEN TIME AND BODY MASS INDEX

Thiri Joseph¹, Nyein Aye Wint²

¹Department of Paediatric, Yangon Children Hospital

²Department of Paediatric, University of Medicine 1

The global prevalence of obesity is increasing in adults as well as in children. Prevention of overweight and obesity in children is necessary because childhood obesity is associated with a wide range of serious complications such as type 2 diabetes, cardiovascular diseases and psychological problems. Several lifestyle factors have been implicated as determinants of childhood obesity. One potential contributor to childhood obesity is time spent with screen media. In recent decades, screen time occupies a prominent place in children's environment. There are several studies in association of screen time and childhood obesity in developed countries. However, there is limited data in our country, Myanmar. This study may support appropriate intervention for life style changes regarding to screen time. In this study, total 329 middle school children from B.E.H.S (3), (4) and (6) from Ahlone Township were enrolled. Among 329 children, males were 43% and females were 57%. It was found that 2.1% of males were obese and 4.9% were overweight. Similarly 2.2% of females were obese and 7.5% were overweight. According to average screen time, most children (91.5%) had screen time more than 4 hours. Among them, TV was the most used screen media and phone/tablet was the 2nd most used screen media. It was also noted that higher BMI was associated with higher screen time.

Keywords: childhood obesity; overweight; screen time; BMI

INTRODUCTION

Obesity during childhood is a strong predictor for obesity in adolescent and adulthood.¹ Overweight is caused by a lower energy expenditure than energy intake, resulting in excessive weight gain.² Screen time (TV viewing and computer use) has been described as an important risk factor for overweight affecting both sides of the energy balance.³ Television (TV) viewing obstructs energy expenditure; although suggestions have been made that sedentary behavior should not be confused with lower level of physical activity. Several studies showed that children can have high levels of both screen time and physical activity.⁴ Nowadays, screen time occupies a prominent place in children environment. Reducing children's screen time seems, indeed, a promising approach for the prevention of childhood overweight.⁵ Therefore, it is important to gain more insight into the association between TV viewing, computer use and overweight and the related determinants. In Myanmar, there was increasing prevalence of overweight and obesity among children. In 2007, one study enrolled 199 school children from International Language and Business Center, Yangon, aged between ten to fourteen years. It was found that the proportion of overweight and obese children were 13.6% and 11.6 respectively.⁶ In 2008, the prevalence of overweight and obesity in middle school children No.1 Basic Education Middle School

Dagon, Yangon Division was 13.7% & 9.3% respectively.⁷ The purpose of this study is to determine the screen time in children and to find out the association of screen time and childhood obesity.

MATERIALS AND METHODS

This is a community based cross sectional descriptive study conducted at No. (3), No. (4) and No. (6) Basic Education High Schools, Ahlone Township, Yangon during January 2018 to December 2018. Grade (6), Grade (7) and Grade (8) students were selected according to inclusion criteria.

At the time of initiating the study, permission of principles of selected middle school, the informed consent from the lawful guardian was taken. Subject's weight, without shoes and with light clothes on was measured to the nearest 0.1 kg using bathroom scales. All measurements were done twice and average value was taken. The measuring apparatus were standardized before each measurement. The measurements were taken by investigator.

The height of each child was measured in centimeters by using the Portable Stadiometer. The child was asked to stand without shoes on the flat surface on front of the height scale with feet parallel and with heels, buttocks, shoulders and back of the heel touching the wall on upright position.

The head was held comfortably erect with the eyes looking in the horizontal plane. The hands were hanging loosely at the sides. A fiber bar was gently lowered, crushing the hair and making contact with the top of the head. The reading was taken to the nearest 0.1 centimeter.

BMI was calculated. The cutoff values of BMI, at each age and for each gender were classified as normal, overweight and obese by using WHO staging children. Prevalence and proportion of overweight and obesity were assessed. Children were interviewed by using questionnaires' about screen time in hours per week.

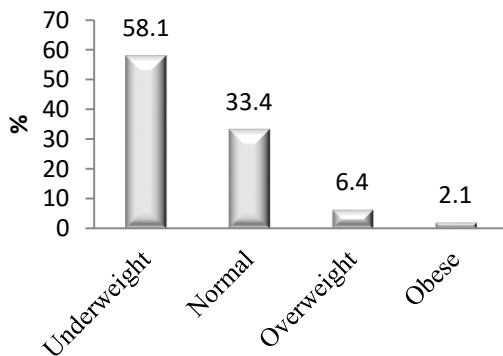


Figure (1) Proportion of childhood obesity

Total screen time of children was recorded by using questionnaires according to proforma. These results were shown in Figure – 2. Among 329 children, most children (91.5%) had screen time more than 4 hours. Twenty - five children (7.6%) had >3 to 4 hours duration and none of children had 1 to 2 hours duration. For those < 1 hour duration had only (0.3%).

RESULTS

This study was a community based cross sectional descriptive study of association of screen time and BMI. Total three hundred and twenty nine middle school children from B.E.H.S (3), (4) and (6) Ahlone Township were enrolled in the study. Figure - 1 showed proportion of childhood obesity. According to WHO classification of BMI, 6.4% of children were overweight and 2.1% were obese. Underweight was 58.1% and normal BMI was 33.4%.

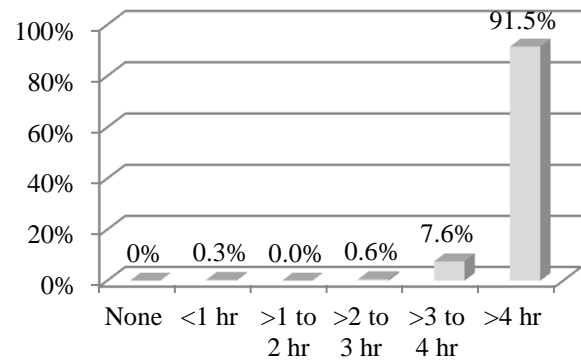


Figure (2) Prevalence of screen time in children

Figure - 3 showed prevalence of computer screen time in children. Among 329 children, most children (52.3%) had no computer screen time and no one used computer more than 4 hours and only (35.9%) used computer for > 1 to 2 hours.

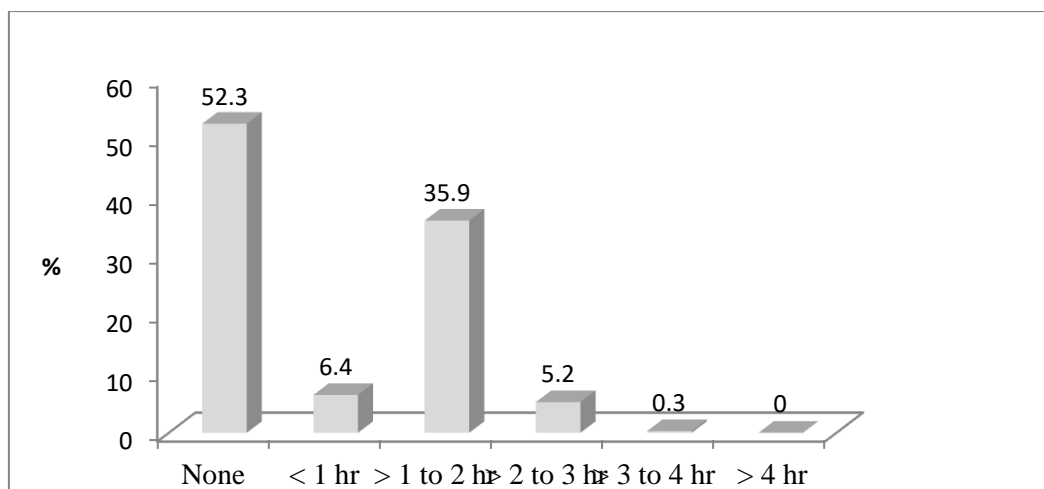


Figure (3) Prevalence of computer screen time

As shown in Figure - 4, (41.3%) of children had 1 to 2 hours duration of phone/tablets screen time. It was followed by (39.2%) of children who had phone/tablets screen time > 2 to 3

hours and (15.5%) had > 3 to 4 hours duration. Only (1.5%) of children had > 4 hours duration of phone/tablets screen time.

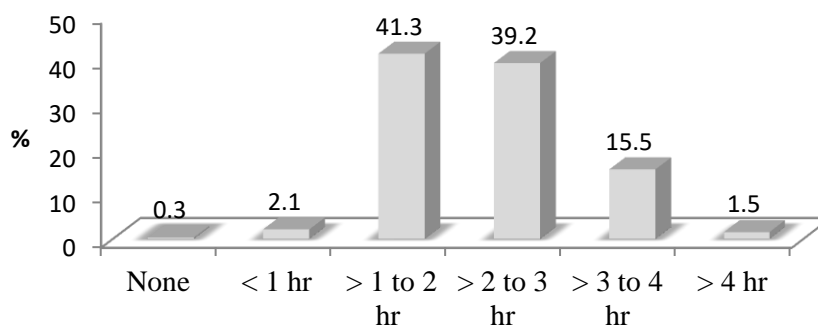


Figure (4) Prevalence of Phone/ tablets screen time

BMI distributions in middle school children by sex were shown in Figure - 5. Approximately half of the children were females (60.2%). Among 60.2% of females, 7.5% were

overweight and 2.2% were obese. Compared to females, 4.9% of males were overweight and only 2.1% were obese.

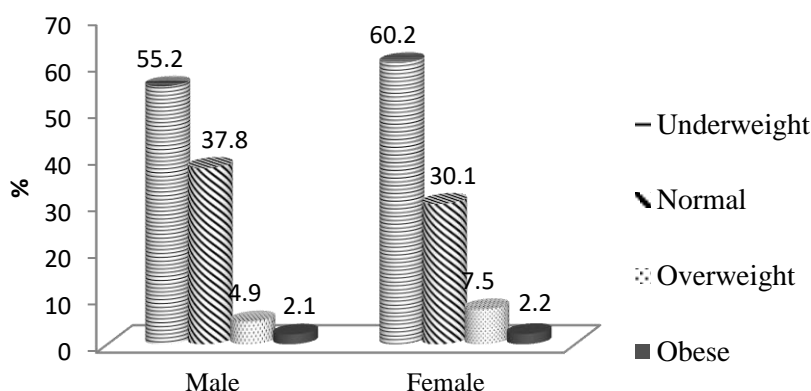


Figure (5) BMI distributions in middle school children by sex

According to Table - 1 and Figure - 6, the significant Pearson correlation coefficient value of 0.56 revealed the positive correlation between the screen time and BMI. R square linear value

of 0.31 meant that 31% of BMI is determined by higher screen time. Therefore, there was a positive correlation between screen time and BMI ($r=0.56$, $p<0.001$).

Table (1) Correlation between screen time and BMI in children

Pearson correlation (r)	P value
0.56	<0.001

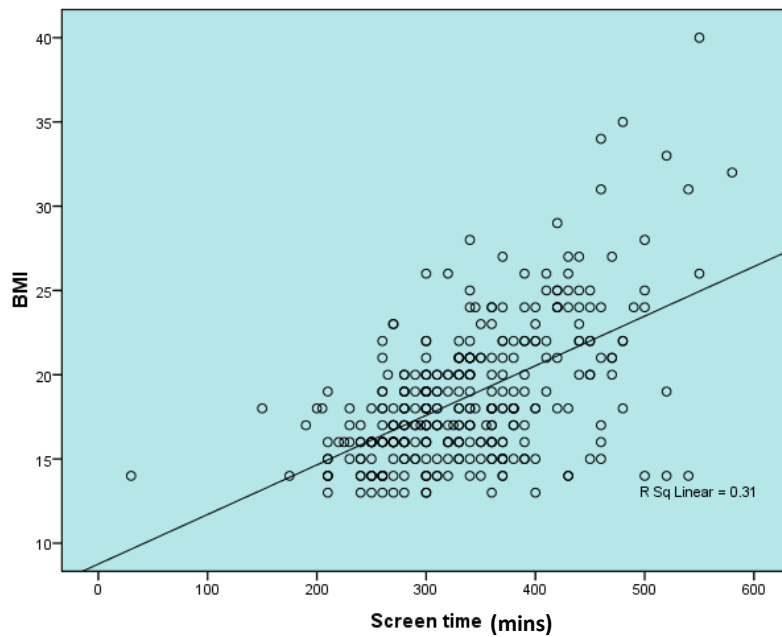


Figure (6) Correlation between screen time and BMI in children

Correlation between TV screen time and BMI in children was shown in Table - 2 and Figure-7. The significant positive correlation between TV

and BMI is 0.37. According to Pearson correlation, 13% of BMI is determined by TV screen time (R sq linear=0.127).

Table (2) Correlation between TV screen time and BMI in children

Pearson correlation (r)	P value
0.37	<0.001

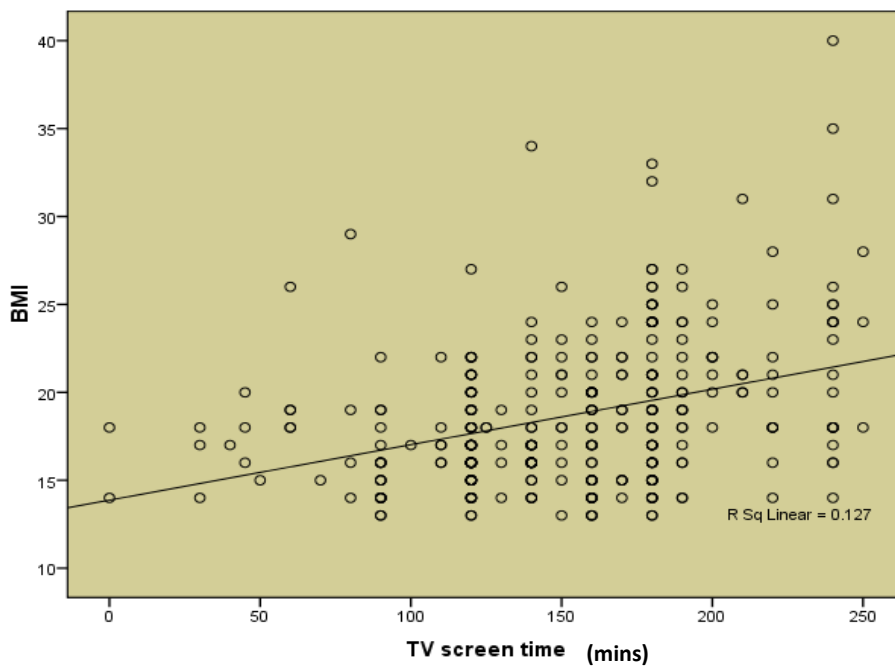


Figure (7) Correlation between TV screen time and BMI in children

Correlations between phone/tablets screen time and BMI were shown in Table - 3 and Figure - 8. According to Pearson correlation, correlation coefficient value of

0.14% revealed a positive association between computer screen time and BMI ($r=0.14$, $p < 0.01$). Only 2% of BMI is determined by computer screen time ($R^2_{\text{linear}}=0.02$).

Table (3) Correlation between computer screen time and BMI in children

Pearson correlation (r)	P value
0.14	0.01

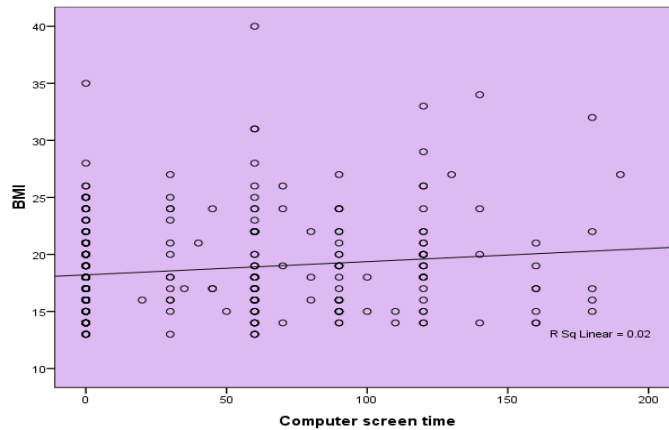


Figure (8) Correlation between computer screen time and BMI in children

Table (4) and Figure (9) showed correlation between phone/tablets screen time and BMI. It was found that Pearson correlation coefficient value of 0.42 revealed the positive correlation between phone/tablets screen time

and BMI ($r=0.42$, $p < 0.001$). According to Pearson correlation, 18% of BMI is determined by phone/tablets screen time ($R^2_{\text{linear}} = 0.178$).

Table (4) Correlation between phone/tablet time and BMI in children

Pearson correlation (r)	P value
0.42	<0.001

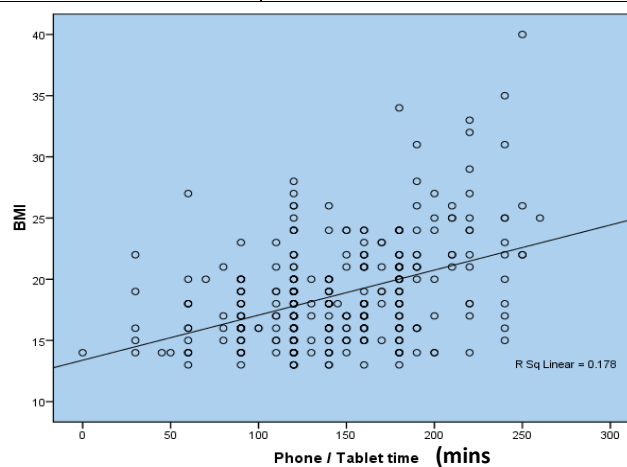


Figure (9) Correlation between computer screen time and BMI in children

DISCUSSION

This study provides the association of screen time and BMI of middle school children. In this study, out of 329 children, 6.4% are overweight and 2.1% are obese. In the study of Min-Kyaw-Htet, it was found that proportion of overweight and obese children were 13.6% and 11.6% respectively.⁶ In that study, 199 middle school children from International Language and Business Center, Yangon, were enrolled. In contrast to it, socioeconomic status of study group might be the one contributing factor for overweight and obesity.

Bickham et al investigated the associations between characteristics of screen media use and BMI of young adolescents. In that study, 126 students were enrolled and 25.5% of them were most attention to TV screen time. Only 8.7% had attention to computer screen time. Duration of screen media use was calculated by using 24 hours' time-use diary per week. It was found that higher proportions of primary attention to TV were positively associated with higher BMI.⁸

In this study, the average screen time per week of middle school children was determined by using questionnaires. It was found that most children (91.5%) had total screen time more than 4 hours duration. On average, most children (47.1%) had TV screen time for > 2 to 3 hours and (41.3%) of children had 1 to 2 hours duration of phone/ tablets screen time. Regarding computer screen time, only (35.9%) of children had 1 to 2 hours. After analyzing the collected data, it was noted that largest portion of middle school children had higher TV screen time.

A study from suburban Philadelphia provided the evidence of differential associations between that amount of screen time and changes in BMI of high school students. Total of 1336 children from four high schools were enrolled and their baseline surveys were followed-up every 6 months over four year period. In that study, screen time, weight and height were self-reported by the participants. Gender, race and maternal education (markers for socioeconomic status) were also included. And then their time-spent in moderate to vigorous physical activity and hours of sleep were also adjusted to determine the any association between screen time and changes in BMI. The sample was approximately split in term of gender, the majority of the sample was white (> 75%) and most participants had

mothers with and education level beyond high school (> 70%). And it was found that screen time was positively associated with changes in BMI at the 50th, 75th and 90th BMI percentiles.⁹

According to the findings in the present study, higher BMI was associated with higher screen time. In this study, other contributory factors for higher BMI were not recorded. Self-reported screen time of children were only included. Total screen time more than 4 hours was positively associated with higher BMI (p value=0.001).

Doherty et al also revealed the association between screen time and weight status in Hispanic children. Study participants were middle school Hispanic children and their parents. In that study, questionnaires were used to assess children's screen time, sleeping time, physical activity and to ask parents on the home environment and parental limiting. It was found that total time spent watching TV was associated with higher BMI of children (p= 0.02). Sleeping time was inversely associated with BMI score (p= 0.02). These findings might inform obesity prevention efforts to intervene at the family level in improving sleeping patterns and increasing physical activity at home.¹⁰

Research on the association between screen time and overweight/obesity in children mostly used total screen time. Nowadays, the media such as computer games and the internet substantially occupies children's pastime. An investigation of the independent effect of this electronic media use on overweight/obesity in children will have public health importance. Like studies of physical activity, research assessing the effect of video/computer game use on the weight status of children showed mixed results.¹¹ A meta-analysis by Marshall et al. found no association, while a positive relationship between electronic game use and weight status were found to be curvilinear with a difference in ages in a study of US children using 24-hour time-use diaries to record the amount of video game use.¹²

Fulton et al revealed the prevalence of TV viewing, computer use, and their combination and associations with demographic characteristics and BMI among U.S youth. In that study, prevalence of meeting the U.S objective for TV viewing (< or = 2 hours/day) ranged from 65% to 71%. Prevalence of no computer use (0 hours/ day) ranged from 23% to 45%.¹³

In this study, prevalence of no computer use was 52.3% and no one used computer more than 4 hours and only 35.9% of children used computer for > 1 to 2 hours.

In this study, the data indicates association between total screen time and BMI, independent of physical activity for middle school children. Mitchell et al., also indicate the similar associations independent of physical activity.

Fundamentally, a positive energy balance underlies the development of obesity. More screen time could contribute to a positive energy balance by decreasing energy expenditure.¹⁴

CONCLUSION

To conclude, screen time is an important adolescent obesity risk factor. In this study, the greater screen time was associated with increases in BMI of middle school children.

There are several limitations in the present study. Questionnaires about physical activity, sleeping time and snacking during screen time were not involved. Additional research using more direct measures of adipose tissue would also advance this study. A number of possible mechanisms are thought to explain the effects of screen media exposure on obesity. This study was limited by the sample size and short time period. Finally, this study is observational and causal interference between screen time and changes in BMI cannot be made. Therefore, longitudinal studies are needed, using objective and subjective measures to verify the association between sedentary behavior with nutritional status, eating habits and physical activity levels.

Although this study cannot show causality, it is reasonable for family obesity prevention to include recommendations for parents to monitor total daily screen time of children as part of daily healthier behaviors.

Targeting reductions in screen time, especially among overweight and obese children, could contribute to lowering the prevalence of adolescent obesity.

REFERENCES

1. Deshmukh-Taskar P, Nicklas TA, Morales M, Yang SJ, Zakeri I, Berenson GS. Tracking of overweight status from childhood to young adulthood: the Bogalusa

- Heart Study. *European journal of clinical nutrition*. 2006;60:48-51.
2. World Health Organization. Obesity: preventing and managing the global epidemic. World Health Organization; 1999.
 3. Adachi-Mejia AM, Longacre MR, Gibson JJ, Beach ML, Titus-Ernstoff LT, Dalton MA. Children with a TV in their bedroom at higher risk for being overweight. *International Journal of Obesity*. 2007 ;31: 644-8.
 4. Melkevik O, Torsheim T, Iannotti RJ, Wold B. Is spending time in screen –based sedentary behaviors associated with less physical activity: a cross national investigation. *International Journal of Behavioral Nutrition and Physical Activity*. 2010;7:46.
 5. Robison TN. Reducing children’s television viewing to prevent obesity: a randomized controlled trial. *Jama*. 1999;282:1561-7.
 6. Min Kyaw Htet. Factors associating overweight and obesity in primary five School children at international language and business center, Yangon. M.Med.Sc (Public Health) thesis, University of Medicine 2. 2007.
 7. Moe Myint. Prevalence and risk factors for overweight and obese middle school children in Dagon Township, Yangon division, M.Med.Sc. (Public Health) thesis, Defence Service Medical Academy. 2008.
 8. Bickham DS, Blood EA, Walls CE, Shrier LA, Rich M. Characteristics of screen media use associated with higher BMI in young adolescents. *Paediatrics*. 2013;131:935-41.
 9. Mitchell JA, Rodriguez D, Schmitz KH, Audrian-McGovern J. Greater screen time is associated with adolescent obesity: a longitudinal study of the BMI distribution from ages 14 to 18. *Obesity*. 2013;21:572-5.
 10. Doherty M, Santiago-Torres M, Cui Y, Schoeller D, LaRowe T, Adams A, et al. The association between screen time and weight status in Hispanic Children. *BAOJ obesity & weight loss management*. 2015;1(1).
 11. Marshall SJ, Biddle SJ, Gorely T, Cameron N, Murdey I. Relationships between media use, body fatness and physical activity in children and youth: a meta-analysis. *International journal of obesity*. 2004; 28:1238-40.

12. Vandewater EA, Shim MS, Caplovitz AG. Linking obesity and activity level with children's television and video game use. *Journal of adolescence*. 2004;27:71-85.
13. Fulton JE, Wang X, Yore MM, Carlson SA, Galuska DA, Caspersen CJ. Television viewing, computer use, and BMI among US children and adolescents. *Journal of physical activity and health*. 2009;6:S28-35.
14. Healy GN, Dunstan DW, Salmon J, Cerin E, Shaw JE, Zimmet PZ, Owen N. Breaks in sedentary time: beneficial associations with metabolic risk. *Diabetes care*. 2008; 31:661-666.