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RESEARCH ARTICLE

SCHOOL INTERVENTION PROGRAM TO PROMOTE HEALTHY LIFESTYLE AMONG MALE ADOLESCENT STUDENTS IN KING FAISAL RESIDENTIAL CITY, JEDDAH, WESTERN REGION, 2014-15.

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Abstract

Background: Unhealthy behaviors, physical inactivity, consumption of unhealthy diet and sedentary life style are well known to be associated with overweight and obesity among adults as well as adolescents. These behaviors were subjected to modifications in several interventions with controversial outcomes. In Saudi Arabia, although the prevalence of obesity is remarkably high, few interventions were made to modify its related factors among adolescents.

Methods: Through a cluster randomized control trial, 148 male adolescents' students were randomly assigned into either intervention group who received an educational program for two months (n=79), or control groups (n=69) who didn't attend the program. The principle outcomes were the changes in physical activities, consumption of healthy diet, sedentary life habits and anthropometric measurements. The outcomes of the intervention group were compared with their own baseline readings, as well as with the readings of the control group.

Results: Among intervention group, there was increase in the percentage of students who met the recommended daily activity by 7%, those who used to intake vegetables daily by 1.4%, and fruit by 7%, meanwhile there was decrease in the percentages of students who consume fast food by 3 % and French fries by 10%. By the end of the study, there was no statistically significant difference between the intervention and control groups regarding regular performance of physical activity, reduction of unhealthy behaviors and the anthropometric measurements.

Conclusion: The provided intervention had no significant effects on the anthropometric, physical activity and unhealthy behaviors of the adolescents 'students.

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Introduction:-

In 2014, there were approximately 1.2 billion adolescents in the world, forming 18% of the world's total population.⁽¹⁾ Adolescence is a critical stage of human life,⁽²⁾ a period in which individuals are neither stable nor

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mature in their thoughts and behavior.⁽³⁾ During this stage, their personalities and behavior are in a developmental phase⁽⁴⁾ and the behavioral traits that they acquire may endure throughout their lifetime.⁽⁵⁾ Therefore, these traits not only affect the adolescent stage but also extend to adulthood. According to the World Health Organization (WHO), the (DALY) is a measure of the overall disease burden, expressed as the number of years lost due to ill-health, disability, or early death. In 2004, approximately 2.6 million youths died with a combined Disability Adjusted Life Year (DALY) of 236 million years, which constitutes 15% of the total DALY for all age groups. Most of these deaths are closely related to modifiable behavioral choices,⁽⁶⁾ such as smoking, physical inactivity, unhealthy diet, and the harmful use of alcohol.⁽⁷⁾ Physical inactivity alone is responsible for about 3.2 million mortalities worldwide every year.⁽⁷⁾ While approximately 1.7 million dies due to low fruit and vegetable consumption which constitute about 16 million DALY.⁽⁸⁾ Changes in dietary and physical activity patterns often result from societal and environmental changes.^(9;10) Obesity which results from energy imbalance due to unhealthy dieting and physical inactivity,⁽¹¹⁾ has increased in recent years. In 2013, it was estimated that there were 42 million adolescents who were either overweight or obese.⁽¹²⁾ The highest rates of physical inactivity had been recorded in Middle East, where 50% of the women and one third of the men are not sufficiently active; therefore, the prevalence of obesity and overweight records above 70% in the Gulf countries.⁽¹³⁾ In Saudi Arabia, adolescents comprised 19% of the population in 2013. Amounting to approximately 5 million individuals. The prevalence of overweight in Saudi adolescents in 2005 was 26.6% and obesity was 10.5%.⁽¹⁴⁾ Saudi Arabian adolescents are not an exception in practicing unhealthy behaviors. Approximately one half of adolescent males and less than a quarter of females met the recommendations of a daily physical activity, and the majority (ranging from 66.8% to 80.4%) did not consume breakfast, fruit, vegetables, or milk every day, while a considerable proportion frequently exhibited unhealthy dietary habits.⁽¹⁵⁾ The findings related to the health behaviors of adolescents are not different from those reported worldwide, implying that Saudi adolescents are in need for more attention and intervention to promote their health in the future. Therefore, this study aims at testing the effectiveness of promotional intervention program targeting adolescents.

Subjects and methods:-

This Trial was registered in ClinicalTrials.gov with the following I.D: NCT03885700 Through cluster randomized control trial, participants were enrolled by the eligibility criteria: male school students at 5th grade or higher, aged between 10-15 years from schools at King Faisal residential city. The sample size was calculated based on the results of previous study of adolescent lifestyle, where the mean weekly moderate activity METs score of male adolescent school students in Jeddah was 1020.4 METs-min/week,⁽¹⁵⁾ with targeted detectable difference of 579.500 between the two groups, when the standard deviation is 1028.500 and the intracluster correlation is 0.02500 using a One-Sided T-test with a significance level of 0.05, it gives a sample size of 8 clusters per group with 9 individuals per cluster to achieves power of 90%. Taking 10% for the dropout value gives approximately 80 subjects in each study group. Since the study is cluster-based, eight clusters were considered for each of the intervention and control group. The eight clusters for each group consisted of two classes from the primary schools; one from the 5th grade and one from the 6th grade, three from the intermediate level (one class from each level); and three classes from high school (one class from each level). Since there were four elementary schools, two schools were selected using random sampling one was chosen for the intervention group and one for the control group. Of the two intermediate schools, one was assigned by random sampling for the intervention and one for the control group. Since there were only one high school, the intervention and control groups were selected by random sampling from the same school (King Saud High School). The random sampling technique was done by the investigation team by drawing one piece of paper for the intervention and one for the control group from the pile of papers at each stage of randomization. At the end of the intervention (two months), the number of students who completed the intervention was 70 out of 80 (dropout rate of 11.3%) and the number of control group accessed was 56 out 80 (dropout rate 18.8%).

Tools of the study:

Self-administered questionnaire: Adopted from the Arab Teens Lifestyle Study Questionnaire which is a valid tool. that was designed to collect information on the frequency, duration, and intensity of physical activities during a typical week, which are used to estimate the metabolic equivalent (MET) values based on the compendium of these activities,⁽¹⁶⁾ upon which, the participants' levels of physical activity are determined.⁽¹⁷⁾

My plate:

My Plate is a nutrition guide published by the United States Department of Agriculture, depicting a plate containing five food groups which are part of an ideal diet and a glass.⁽¹⁸⁾ It is a new tool, that has been proven to be appropriate

for any age. Through its simplicity, it serves as a guide to help consumers choose nutritionally balanced meals with the right portion size and make healthy choices.⁽¹⁹⁾

Body composition analyser:

Tanita BC 418 segmental body composition analyzer was used as it had been shown to be valid in 2009 by Harounet al. in their study.⁽²⁰⁾

Intervention:

The intervention was suggested based on the updated recommendations for adolescents' healthy diet and physical activity, the recommendations derived from the 2008 Physical Activity Guidelines for Americans and **Dietary Guidelines for Americans, 2010** by the U.S. Department of Health and Human Services,⁽²¹⁾ 'Healthy active living: Physical activity guidelines for children and adolescents by Canadian Paediatric Society 2012,⁽²²⁾ 'Healthy Lifestyle Guide Pyramid' for children and adolescents by González-Gross M et al. 2008,⁽²³⁾ 'The Food Guide Pyramid by the USDA, Nutrition and Healthy Eating by Mayo clinic,⁽²⁴⁾ and the CDC website.⁽²⁵⁾ The program was delivered in a period of two months and was modified according to the age of the child. This plan was typically pursued in a School-based Intervention to Promote Healthy Lifestyles in Sousse, Tunisia, by ImedHarrabi et al⁽²⁶⁾. Generally, the 1st month covered the healthy diet while the 2nd month covered the physical activity as follow:

1. First and fifth week: A 60-minutesession in health education.
2. Second and sixth week: Group counselling.
3. Third and seventh week: Students were divided into eight groups (6-8 students in each group), and each group was asked to make a 5-10 min presentation about a task related to healthy diet.
4. Fourth and eighth week: Discussing the presentation prepared by the students.

Data manipulation and statistical analysis

We used the growth chart recommended by the Saudi Ministry of Health and which was developed by El Mouzan et al. in 2007⁽²⁷⁾ to plot the weight of the adolescents, then calculated the BMI and the BMI categories for adolescents according to the international definition of children's overweight and obesity developed by Cole et al. in 2000.⁽²⁸⁾ For the reference values of assigned metabolic equivalent (MET) to the different activities, we reverted to the compendium of physical activity 2011.⁽²⁹⁾ For every activity we applied the MET equation, which is METs-min per week = 60 min per day × 7 days per week × METs of the activity, which gave us the total METs per week. According to Al-Hazzaa, the minimal recommended daily physical activity per week in the form of METs per week is equal to the METs of one hour of daily moderate intensity activity, which is equal to 1680. This figure was found using 4 METs as the equivalent and multiplying it by 60 minutes in seven days.⁽¹⁵⁾ We then calculated the percentages of students who had a total of 1680 METs per week or higher to obtain the percentage of students who met the recommended daily activity level. For the cut-off values the physical activity and sedentary behaviors, we used the Canadian physical activity and Sedentary Behavior Guidelines.⁽²²⁾ Regarding the dietary habits, for breakfast, fruit, vegetables, and milk we used daily consumption as recommended by healthy food pyramids.⁽²⁴⁾ For fast food, we used the measure of three times and more as an indication of consuming fast food more than twice per week;⁽³⁰⁾ for soft drinks, we used the cut off of more than three times per week.⁽³¹⁾ For the remaining factors of unhealthy diet, we used the cut off value of three times per week or more as this is considered high and is necessary for the purpose of facilitation and comparison with other studies, particularly those conducted in the Middle East region in which they used the cut off of more than three times per week.⁽¹⁵⁾

The analysis was conducted using the SPSS18 program. Quantitative comparisons between the two groups was conducted in relation to anthropometric measures, physical activity, sedentary behaviors, and dietary habits. Pre- and post-outcome measures for the primary and secondary objectives were compared using paired t-tests for continuous data, and the Wilcoxon signed rank test for non-normally distributed quantitative variables. Further, pre- and post- intervention quantitative comparison was conducted between the two groups using independent sample t tests. A p-value < .05 was considered an indication for statistical significance. Informed consent from the child' guardian was considered an essential prerequisite for inclusion in the study.

Results:-

The total number of students enrolled in the study was 148, out of them, 38 (25%) were selected from primary schools, 62(41.9%) from intermediate schools and 49 (33.1%) from secondary schools. The overall mean age of the students was 14.45±2.32 years, it ranged between 11 to 19years. According to the study design, 79 students were assigned as intervention group, and 69 as controls. The mean age of the intervention group (n=79) was 14.70±2.30

years and for the control group (n=69) it was 14.16 ± 2.33 years which is not statistically significant. At the start of the study, almost one-third of the students were overweight (23.6%) in addition to 14.9% who were obese [Figure 1], with no statistically significant differences between the two groups regarding weight, height, fat percentage and fat mass $p > 0.05$ [Table 1]. The majority of the students (70.9%) were performing intense activities in average of two days weekly (median=2; IQR 0-4) for an average of half an hour each time (median=30; IQR 0-60), followed by walking (62.2%) almost once weekly for one quarter of an hour (median=15; IQR 0-30) with no statistically significant differences between the intervention and the control group [Table 2]. Therefore, there was no statistically significant difference in the total METs between the intervention (mean \pm SD; 2098.41 ± 1922.67) and control group (mean \pm SD; 2216.46 ± 1816.03). In this respect, only one-half of the students (49.3%) met the daily recommended physical activity (1 hour of moderate-intensity physical activity) equivalent to 1680 METs or more per week. One-third of the students (33%) exceeded the recommended daily watching time of TV (<two hours daily) and computer (33.3%) with an overall percentage of 66% who exceeded the allowed exposure time to screen daily. As they used to spend (2.27 ± 2.00 hours) daily watching TV and almost equal time spent in computer use (2.33 ± 2.10 hours) making a total of four hours spent in front of screens (4.60 ± 3.33), while they sleep for an average of 5.41 ± 1.67 hours, with no statistically difference between the intervention and control group [Table 3]. Only 18.9% of the students used to have their breakfast daily at home and 22.9% of them used to including vegetables in their meals with much lesser percentage (13.6%) who eat fruits daily [Table 4]. After intervention, although the intervention group showed increase in the average total METs from 2098.41 ± 1922.67 up to 2497.95 ± 2291.13 , there was no statistically significant difference in total METs between intervention group and control group (2556.27 ± 2048.71). There was increase in the proportion of students who used to eat vegetables (from 22.9% to 24.3%) and fruits daily (from 8.7% to 15.7%) and decreased daily intake of milk (from 37.7% to 27.1%), however these differences are not statistically significant either with comparison to baseline or with the control group. Regarding physical activity, the students in the intervention group who met the recommended >1680 METs-min/week increased from 47.1% up to 54.3%, however, this increase is not statistically significant. Also, there was a minimal decrease in the average time for exposure to TV and computer after the intervention, however, this difference is not statistically significant. On the same line, there was no any change in the average sleeping time. There was statistically significant increase in all anthropometric measurements of the students where the average increase in weight was 1.4 ± 2.5 kg and increase in fat% by 1.2 ± 2.07 and fat mass by 1.2 ± 1.66 $p < 0.001$. Subsequently there was an increase in BMI by 0.6 ± 0.55 .

Discussion:-

The prevalence of overweight and obesity in our study group was 23.8% and 15.1% respectively, which is almost the same reported by Elmouzan et al. in 2010.⁽¹⁴⁾ where the percentage of overweight in Saudi male adolescents was 24.8% and the obesity rate was 13.8%. These are alarming rates, as one in every four adolescents being overweight and one in every seven adolescents being obese. The same had been observed in the neighbouring Gulf countries, with the highest prevalence of overweight for male adolescents reported by Kuwait⁽³²⁾, Oman,⁽³³⁾ United Arab Emirates,⁽³⁴⁾ and Bahrain,⁽³⁵⁾ while the lowest was found in Oman⁽³³⁾. However, the prevalence is still lower than that in USA.⁽³⁶⁾

In this respect, several school based trials had been tested to reduce obesity among adolescents, however, its results were controversial.⁽³⁷⁻³⁹⁾ In our study, the applied intervention failed to induce significant BMI reduction of the adolescents. The same was found in previous interventions, although their interventions were delivered by nutrition specialists and dieticians.⁽⁴⁰⁾ Even more, David Thive et al. reported significant increase in the weight and BMI of the intervention and control groups at the end of their study,⁽⁴¹⁾ that was also revealed by Waling et al.⁽⁴²⁾ These findings could be explained by the fact that the adolescent are in the age of physiological growth and development, with natural increase in the anthropometric measures of the students.⁽⁴³⁾

The prevalence of students who did not meet the recommended daily activity at the base line in the current study was almost the same as that documented by Al-Hazzaa for Saudi male adolescents in 2011.⁽¹⁵⁾ the intervention succeeded in having a positive effect in this regard as the percentage of students in the intervention group that met the recommendation increased after the intervention. Furthermore, the frequency and duration of some activities increased. These improvements indicate that the educational approach has a promising response with regard to changing the behavior of adolescent students, but this change alone will not produce significant and sustainable results if it is not accompanied with providing the students with the opportunity to practice and apply what they have learned. In this respect, the school can help by making modifications to its policy such as: adding extra physical activity classes to the curriculum,⁽⁴⁴⁾ providing a short physical activity break,⁽⁴⁵⁾ organizing after school

physical activity sessions.⁽⁴⁶⁾ Another hurdle for the students is the climate of the country as it is sunny and hot and there are no suitable public facilities. A very high percentage of the study adolescents reported having more than two hours of screen time per day, with nearly two thirds of students exceeding the recommendation. However, this percentage is lower than the percentage of Saudi adolescents that exceeded the daily recommendation.⁽¹⁵⁾ The difference can be explained by the fact that our sample was from a closed compound. so the boys spend their time inside the compound area. Our percentage is almost equal to that of Bahraini⁽⁴⁷⁾ adolescents, but lower than Kuwaiti⁽³²⁾ and higher than Omani⁽³³⁾ and Emirati⁽⁴⁸⁾ adolescents. With regard to Middle Eastern countries, the percentage of Saudi adolescents that spend more than two hours per day in front of a screen is lower than Iraq,⁽⁴⁹⁾ Jordan⁽⁵⁰⁾ and Tunisia⁽⁵¹⁾ but higher than Morocco.⁽⁵²⁾ The percentage of our study is slightly lower than the U.S. rate.⁽⁵³⁾

This study did not have a significant effect on the total screen time for the intervention adolescents intervention programs have succeeded in reducing the sedentary behaviors in children.^(38;45;54;55) Their intervention was on an individual, school, and family level,^(38;45) of longer duration^(38;45;54;55) and amongst a younger age group.^(38;45)

In conclusion, our study did not have positive effect on the sedentary behaviors of the adolescents, The percentage of students that skip breakfast in our study was high, When we compare the percentage of Saudi adolescents⁽¹⁵⁾ that eat breakfast daily with other Gulf countries, we find that Saudi adolescents have the same rates as Kuwaiti⁽³²⁾ adolescents but lower rates than Bahrain,⁽⁴⁷⁾ the United Arab Emirates,⁽⁵⁶⁾ and Oman⁽³³⁾. Compared to the Middle East, we find that Saudi adolescents have their breakfast less often than most Middle Eastern countries. Even U.S.⁽⁵⁷⁾ adolescents have breakfast more often than Saudi adolescents. The prevalence of skipping breakfast in our study was high. This may be because the students do not go to sleep early. The mean amount of sleep time for participants in our study was 5.5 hours per day, which is not sufficient. This may lead to them having insufficient time to eat breakfast, which they then skip. Another reason is that students usually do not have any appetite for breakfast when they wake up.⁽⁵⁸⁾

No significant change has been observed after the intervention. Thus, improving the daily intake of students can be tackled by different approaches; the education that we used, if accompanied by actions by the school such as modifying the school environment, policy changes, and involving the family will have a more profound influence on the intake of breakfast by students.⁽⁵⁹⁾ Providing students with breakfast is another option that has demonstrated significant improvement in the breakfast and school performance of students.⁽⁶⁰⁾

A lower prevalence of daily fruit and vegetable consumption is a major problem This rate can be considered low as it demonstrated that only one in five adolescents consume vegetables daily and one in seven adolescents consume fruit daily. Our results are considered lower than most Gulf countries, Middle Eastern countries,^(32;33;47;49-52;57) and even lower than for U.S. adolescents.⁽⁶¹⁾ Saudi traditional cuisine depends mainly on rice and meat, with a considerably low share of vegetables. Fruit is usually served at the end of the meal as a desert. The majority of them prefer sweets and chocolate over fruit. For these reasons, Saudi adolescents consume less fruit and vegetables.

In our study, although there was some improvement in fruit consumption, there was no effect at all on vegetable consumption. Increasing the fruit and vegetable consumption of students is a behavioral issue and most of the studies tried to change this behavior. The difference lies in the approaches that were used. Education is one of the approaches that had a good influence but the school can also help in the process by changing the environment, such as providing free fruit and vegetables to the primary school students to make them adopt the idea of daily fruit and vegetable consumption,^(62;63) changing school policy to provide fruit and vegetables in the school canteens, enabling students to make healthier choices,^(64;65) involving the family in the intervention as the students depend on their parents for the food provided for them,^(38;58) and long duration of intervention, all of which help to make students adopt the behavior.^(38;64;65)

The percentage of adolescents who eat fast food more than three times per week in our study was high, and it was almost the same percentage as for Saudi adolescents. In Gulf countries, the highest percentage of adolescents that eat fast food more than three times per week was in the United Arab Emirates,⁽⁴⁸⁾ followed by Bahrain⁽⁴⁷⁾ and Oman⁽³³⁾ and the lowest was in Saudi Arabia⁽¹⁵⁾ and Kuwait⁽³²⁾. However, when we compare our percentage with Middle Eastern countries, we find the percentage in Gulf countries is higher than the Middle Eastern countries Morocco,⁽⁵²⁾ Tunisia⁽⁵¹⁾ and Jordan. The difference can be explained by the higher income per capita in oil producing countries. Due to the lack of places to spend leisure time, dining at restaurants has become a favourite

pastime during weekends and holidays for many families in Gulf countries.⁽⁶⁶⁾ The study involved the parents in some of the tasks and this program showed an increase in the physical activity and vegetable intake and reduced unhealthy food consumption in children.⁽⁶⁷⁾ The percentage of adolescents in our study that consume junk food more than three times per week was high, ranging from 41% for cakes and doughnuts to 68% for soft drinks. Our study did not decrease the consumption of junk food. The educational approach can result in a positive effect⁽⁶⁸⁾ but only when it is combined with other modalities such as including the parents of students because they are the ones who supervise the adolescents outside the school, and they have a major influence over their children.⁽⁶⁹⁾

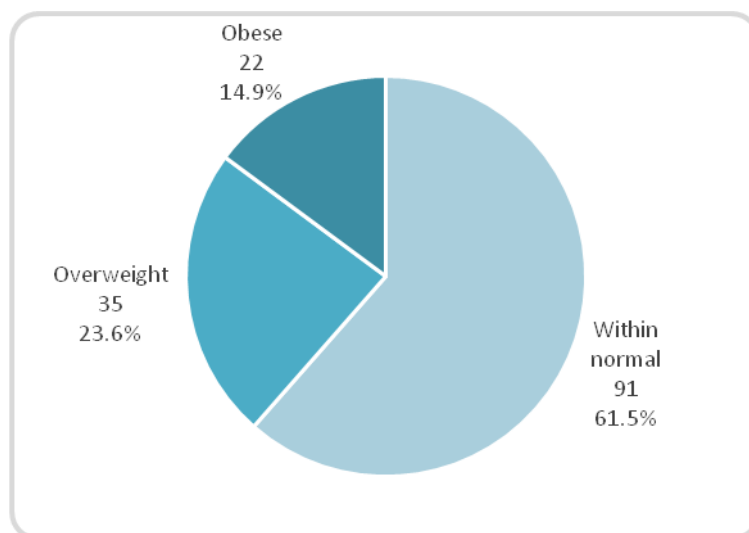


Figure 1:-Prevalence of overweight and obesity among the study group

Table 1:- Anthropometric characteristics of the study group (n=148).

Anthropometric characteristics	Groups		Total	P
	Intervention (n=79) Mean \pm SD	Control (n=69) Mean \pm SD		
Weight	56.68 \pm 20.29	53.37 \pm 19.38	55.1 \pm 19.9	0.90
Height	156.4 \pm 11.9	155.0 \pm 13.8	155.8 \pm 12.8	0.09
BMI	22.77 \pm 6.43	21.59 \pm 5.17	22.22 \pm 5.90	0.15
Fat%	24.59 \pm 10.03	23.78 \pm 8.01	24.22 \pm 9.13	0.16
Fat mass	15.45 \pm 12.20	13.64 \pm 9.13	14.61 \pm 10.88	0.19

Table 2:-Frequency of physical activity performance of the study group (n=148).

Physical activities and its frequencies	Group		Total n =148 Median(IQR)	P
	Intervention n=79 Median(IQR)	Control n=69 Median(IQR)		
Walking				
Days/week	1 (0-5)	1 (0-3)	1(0-0.75)	0.73
Minutes	15 (0-40)	10 (0-30)	15(0-30)	0.81
Running				
Days/week	0(0-2)	1 (0-2.5)	0(0-2)	0.07
Minutes	0(0-15)	5 (0-17.5)	0(0-15)	0.08
Cycling				
Days/week	0(0-0)	0(0-0)	0 (0-1)	0.08
Minutes	0 (0-2)	0 (0-10)	0 (0-5)	0.07
Swimming				
Days/week	0(0-0)	0 (0-0.5)	0(0-0)	0.30

Minutes	0(0-0)	0 (0-4)	0 (0-0)	0.33
Moderate intensity sport				
Days/week	0(0-1)	0(0-2)	0(0-1)	0.82
Minutes	0 (0-20)	0(0-12.5)	0(0-15)	0.89
Intense sport				
Days/week	1(0-4)	3(0.5-5)	2 (0-4)	0.02
Minutes	15 (0-45)	1.5(30-60)	30 (0-60)	0.01
Self-defence sport				
Days/week	0(0-0)	0(0-0)	0 (0-0)	0.40
Minutes	0 (0-0)	0(0-0)	0(0-0)	0.39
Weightlifting				
Days/week	0 (0-0)	0(0-1.5)	0(0-0.75)	0.14
Minutes	0(0-0)	0 (0-10)	0 (0-1.5)	0.16
Household work				
Days/week	0 (0-1)	2 (0-3)	0(0-3)	0.00
Minutes	0 (0-15)	10 (0-30)	0(0-15)	0.00

Table 3:- Time spent in sedentary behaviors as reported by the students (n=148)

Sedentary Behaviors	Group		Total Mean \pm SD	P
	Intervention Mean \pm SD	Control Mean \pm SD		
TV watching	2.41 \pm 2.17	2.10 \pm 1.88	2.27 \pm 2.00	0.58
Computer use	2.29 \pm 1.98	2.38 \pm 2.33	2.33 \pm 2.10	0.17
Total screen	4.75 \pm 3.16	4.44 \pm 3.53	4.60 \pm 3.33	0.44
Sleep time	5.58 \pm 1.49	5.23 \pm 1.847	5.41 \pm 1.67	0.69

Table 4:-The frequency of intake of certain foods(n=148)

variable	Intervention %	Control%	Total%
Daily breakfast intake	18.8	21.7	18.9
Daily vegetables intake	22.9	21.7	22.9
Daily fruits intake	8.7	20.3	13.6
Daily milk Intake	37.7	37.7	36.5
Sugar-sweetened drinks intake (> 3 day/week)	68.6	49.3	51.4
Fast food intake (> 3 day/week)	50.0	38.2	34.2
French fries/potato chips intake (> 3 day/week)	47.8	37.5	35.4
Cake/donut/biscuit intake (> 3 day/week)	41.2	23.2	21.2
Sweets/chocolates intake (> 3 day/week)	47.8	24.6	28.6
Energy drinks intake (> 3 day/week)	15.7	11.6	10.2

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