

EFFECTIVENESS OF A SCHOOL-BASED NUTRITION EDUCATION ON WEIGHT MANAGEMENT AMONG YOUNG ADOLESCENTS

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Abstract

Introduction: Obesity in adolescents is seen as one of the most important global health issues. among both industrialized and developing nations, the prevalence of overweight and obesity among children and adolescents has significantly increased. Adolescent obesity is associated with a higher chance of developing chronic illnesses and a worse standard of living as an adult. This study highlights school-based nutrition education as a sustainable strategy to combat adolescent obesity within the underexplored Pakistani context.

Methods: The study design for this interventional study was a Quasi-Experimental study design. Students fulfilling the inclusion criteria of grades 6th-10th were included in the study, and written permission was given after explaining to them in writing the purpose of the research and their desired cooperation in this regard. Anthropometric measurement was done at baseline and end line. The presentation on nutrition education & balanced diet, physical activity, overweight and obesity, diet modification, behaviour modification, and the importance of physical activity was given weekly for up to six weeks.

Result: The significance between different variables and the data's normality was checked, and then a parametric or non-parametric test was applied. A paired test was used for our data to see the difference in BMI before and after the training.

Conclusion: The essential role of such programs to combat obesity and promote health is highlighted by the successful reduction of teenage BMI that may be achieved through school-based nutrition education and physical activity.

INTRODUCTION

School-Based nutrition education is most important ways to address the growing concerns about bad eating habits and increasing incidence of overweight in young teenagers is through

nutrition instruction in schools. Rapid changes in the body, mind, and emotions characterize this developmental stage, which necessitates healthy eating for healthy growth and academic success.

This demographic has unfortunately experienced weight-related issues and nutritional inadequacies as a result of bad eating habits, a lack of knowledge about balanced diets, and the growing availability of processed foods. Since schools reach a lot of students throughout their formative years, they are an excellent place to provide nutrition education. In addition to helping control body weight, these therapies lower the chance of developing chronic illnesses in later life. In the end, nutrition instruction in schools helps students' general wellbeing and encourages healthy habits for the rest of their lives. The World Health Organization claims that, adolescence is viewed as a second decade of life spanning ages 12 through 16 years [1] and is recognized globally as a vital developmental period along the pathway from childhood well-being into successful adult function. A time of significant physical growth, hormonal change and lifestyle alteration that has a profound effect on their future health prospects. In the past few years, there has been an increase in childhood and adolescent obesity as a global public health problem, so rates have nearly increased in kids and quadrupled in teenagers in many regions during the last decades [2,6]. Obesity is a chronic multifactorial disease that has drastic health and economic impacts through such comorbidities as type 2 diabetes, cardiovascular diseases, cancers, and hypertension [3,4]. High rates are being achieved, apart from the high-income nations, in low-and middle-income countries; for instance, school-aged children and adolescents are increasingly getting obese [5,28]. Most of the studies have reported alarming obesity prevalence in countries such as India, China, Mexico, and Lebanon, indicating a truly global epidemic [8,10].

In Pakistan, the factors causing the growing adolescent population to be overweight and obese are morbidity factors. Urbanization, unhealthy dietary practices and sedentary lifestyles. Overweight and obese children and adolescents suffer from orthopedic problems, psychosocial issues, and are most likely to remain obese adults. The two critical periods that mostly influence the risk are during the early years of childhood growth (4-6 years) and adolescence; therefore, interventions have to focus on these periods. Available evidence

has indicated that overweight adolescents are 1.5 to 2 significantly more likely to remain obese as an adult, hence sustaining the prevalence of obesity as a disease [22,23]. Schools are strategic venues for the implementation of nutrition and lifestyle interventions because they can involve great numbers of children in healthy behaviour through lessons, structured exercise, and behaviour modification components [24,13]. Several studies and meta-analyses affirmed positive impacts on dietary behaviour, waist circumference, and BMI by school-based nutrition education among adolescents [1,2,6]. However, the intervention to be effective must be culturally adapted, include parents' participation, and be sustained [14,25]. Overweight adolescents will fall between the 85th and 95th percentile for age and sex using BMI measurements; obese adolescents will be those whose BMI is above the 95th percentile.

This study is unique since it concentrates on young teenagers, a demographic that is frequently disregarded in studies on weight management. It is carried out in a particular dietary and cultural setting with little data on school-based nutrition programs. Unlike traditional lecture-based approaches, the program incorporates parental involvement with interactive teaching. Additionally, it assesses behavioral outcomes (knowledge, attitudes, and dietary choices) as well as physiological ones (weight, BMI), providing a comprehensive viewpoint.

Material and Methods

A pre-test/post-test quasi-experimental study was conducted at a naval school in Karachi, selected through stratified sampling from five qualifying institutions. BMI screening was conducted on students aged 12 to 16 years (grades 6 to 10), and those identified as overweight or obese were selected using purposive sampling. The size of the sample of 109 was determined using the WHO Open Epi software, based on a presumed 50% prevalence within a total population of 202 pupils. A modified, structured questionnaire was used to gather data both before and after the intervention. Before data collection, informed parental consent, student assent, and ethical approval were obtained.

Interventional Strategy

A module for education on diet, physical activity, and behaviour modification components was developed for the students. Nutrition education in the form of a lecture for 20 minutes a week was given for six weeks. In the first week, the presentation was given on nutrition education & balanced diet; in a lecture on physical activity was delivered, in 3rd the lecture on over-weight and obesity; in the fourth-week lecture on diet modification; in the fifth-week lecture was delivered on behavior modification & in the sixth-week presentation was given on the importance of Physical activity. Along with these lectures, all students of the interventional group received a timetable of physical activity six days a week for 60 minutes for six weeks, which consisted of (Warm & stretching exercises for 05 minutes, Running/walking/jogging for 40 minutes, sits up for 2 minutes, hip-hop for 03 minutes and rope jumping for 10 minutes up to six weeks and saw the student's response by filling up the physical activity chart weekly in terms of weight reduction after six weeks (Post assessment).

Nutrition Education

It included a module to educate the students on the constituents of a balanced diet and obesity reasons. The module explained the methods of decreasing calories from meals, taught the students about food labels, and told them about low-calorie diets.

Physical Activity

The exercise program consisted of (Warm & stretching exercises for 05 min, running/walking/jogging for 40 minutes, sitting up for 2 minutes, hip-hop for 03 minutes, and rope jumping for 10 minutes) for up to 6 days a week. The students showed videos on physical activity to motivate them towards it.

Behavioral Modification

Behaviour modification strategies were provided, including recording food intake, limiting eating situations, eating slowly, reducing sedentary behaviour, and limiting screen time. Additionally, the practice of early rising for prayers was

recommended, as it fosters a sense of spiritual connection and peace, contributing to overall wellness.

Study Variable

The study includes dependent variables such as BMI and adolescent weight. In contrast, explanatory variables such as maternal education, occupation, ethnicity, usual family income, size of the family, monthly income, sports frequency, spending of free time, sleeping time in the afternoon and at night, food choices and favourite foods, meal timings, physical activity, and modification of behaviour are also included.

Analysis of Data Variable

The collected data were entered and analysed by using SPSS version 23. Mean and SD were reported for continuous variables. Quantitative data were shown as frequencies and percentages. To see the significance between different variables, the normality of data was checked, and then a parametric or non-parametric test was applied. A paired test was used for our data to see the difference in BMI before and after the training. P-value ≤ 0.05 is considered to be statistically significant.

Results

A study was carried out at the Naval School, and the age range was from 12 to 16 years. The total number of students who were involved in research at baseline and at the end line of the survey was 55. The mean age of the respondent was 13.2 ± 2.0 years, with the age range from 12 to 16 years. Results of the dietary habits of children aged 12-16 years. Data was collected two times at baseline, and after the awareness session, data was collected at the end line to assess the progress. The result shows that there is a significant difference between the access to soft drinks at home after the session, which was 94.5%, and the access to soft drinks at home at baseline and after the awareness session decreased to 64.5%. The use of soft drinks also showed a significant difference in the end line was 63.6%, and students consumed zero bottles per day after the session. At baseline, 41.8% take > two bottles per day; in the same way, 45.5% of students

use less than two bottles per day. There is a significant difference in knowledge of "glass of fruit juice/week, take tea/coffee /day with sugar, glass of sweetener/day" at baseline and end line. The behaviour of eating vegetables every day and eating breakfast among students shows a marginal change in the students, as shown in the table after training; however, it indicates that training and awareness have increased the rate of eating vegetables and breakfast every day among students. Furthermore, the assessment of the way of eating asked the following question: "Ways of getting

lunch, Watching Television or mobile while eating" result shows that there is improvement in students after the training. Similarly, the study investigated fast food consumption, meal skipping, and milk intake before and after the intervention. The results showed a slight improvement in these areas. However, the most significant finding was the positive influence of the intervention on students' attitudes towards nutrition and health. This encouraging result suggests that the intervention could have a lasting impact on the students' dietary habits and overall health.

Dietary Habits	Baseline	End line
Access to soft drinks at home		
Yes	52(94.5)	36(65.4)
No	3(5.5)	19(34.5)
Soft drinks		
Zero bottles the previous day	7(12.7)	35(63.6)
≥ 2 bottles the previous day	23(41.8)	2(3.6)
≤ 2 bottles the previous day	25(45.5)	18(32.7)
How many glasses of fruit juices/wk.		
0 glass	2(3.6)	35(63.6)
1 glass	2(3.6)	14(25.5)
2 glasses	20(36.3)	5(9.1)
3 glasses	2(3.6)	1(1.8)
4 glasses	12(21.8)	0(0.0)
5 glasses	11(20.0)	0(0.0)
> 6 glasses	6(10.6)	0(0.0)
How often do you take tea or coffee /day with sugar?		
0 cup	4(7.3)	20(36.4)
1 cup	1(1.8)	32(58.2)
2 cups	20(36.4)	1(1.8)
3 cups	5(9.1)	1(1.8)
4 cups	8(7.3)	0(0.0)
> 4 cups	17(30.9)	1(1.8)
How many glasses of sweetened drinks/wk.		
0 glass	7(12.7)	45(81.8)
1 glass	1(1.8)	7(12.7)
2 glasses	11(20.0)	1(1.8)
3 glasses	15(27.3)	1(1.8)
4 glasses	7(12.7)	0(0.0)
5 glasses	12(21.8)	1(1.8)
> 6 glasses	2(3.6)	0(0.0)
Have breakfast_times /wk.		
0 time	1(1.8)	2(3.6)
1 time	0(0.0)	2(3.6)



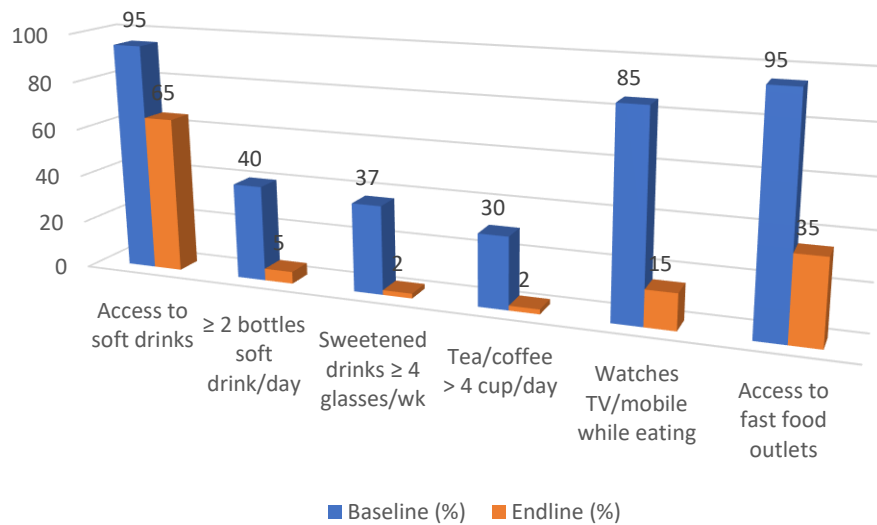
2 time	3(5.5)	2(3.6)
3 time	6(10.6)	1(1.8)
4 time	0(0.0)	4(7.3)
5 time	5(9.1)	25(45.5)
> 6 times	40(72.7)	19(34.5)
Have fried foods_____times /wk.		
0 time	0(0.0)	41(74.5)
1 time	1(1.8)	12(21.8)
2 time	5(9.1)	1(1.8)
3 time	1(1.8)	0(0.0)
4 time	5(9.1)	0(0.0)
5 time	15(27.3)	1(1.8)
> 6 times	28(50.9)	0(0.0)
Have Cake, pines, and doughnuts times /wk.		
0 time	3(5.5)	38(69.9)
1 time	0(0.0)	17(30.9)
2 time	5(9.1)	0(0.0)
3 time	8(14.5)	0(0.0)
4 time	7(12.7)	0(0.0)
5 time	10(18.1)	0(0.0)
> 6 times	22(40.0)	0(0.0)
Eat fruits times /week.		
0-5 times	36(65.5)	15(27.3)
6-10 times	16(29.1)	31(56.4)
11-15 times	3(5.4)	9(16.4)
> 15 times	0(0.0)	0(0.0)
Eat vegetables times /week.		
0-5 times	44(80.0)	32(58.2)
6-10 times	9(16.4)	19(34.5)
11-15 times	2(3.6)	4(7.3)
> 15 times	0(0.0)	0(0.0)
What do you eat for breakfast?		
Paratha with a fried egg	36(65.5)	3(5.5)
Paratha with boiled egg	10(18.2)	4(7.3)
Bread with Jam	2(3.6)	14(25.5)
Boiled egg only	2(3.6)	17(30.9)
Bread with butter	2(3.6)	11(20.0)
Other	1(1.8)	6(10.9)
No breakfast	2(3.6)	0(0.0)
Have Meat/chicken/ fish times /wk.		
0 time	1(1.8)	1(1.8)
1 time	1(1.8)	4(7.3)
2 time	8(14.5)	8(14.5)
3 time	10(18.2)	10(18.2)
4 time	10(18.2)	18(32.7)
5 time	11(20.0)	13(23.6)
> 6 times	14(25.5)	1(1.8)
No snacks/day		
0 time	0(0.0)	42(76.4)



1 time	5(9.1)	11(20.0)
2 time	5(9.1)	2(3.6)
3 time	7(12.7)	0(0.0)
4 time	12(21.8)	0(0.0)
5 time	14(25.5)	0(0.0)
> 6 times	12(21.8)	0(0.0)
No meals/day		
≥ 3 meals/day	35(63.6)	3(5.5)
≤ 3 meals/day	20(36.4)	52(94.5)
Ways of getting lunch		
Taking from home	5(9.1)	49(89.1)
Cafeteria	17(30.9)	1(1.8)
School lounge	33(60.0)	5(9.1)
Watching Television or mobile while eating		
Yes	47(85.5)	6(10.9)
No	8(14.5)	49(89.1)
Reading while eating		
Yes	21(38.2)	5(9.1)
No	34(61.8)	50(90.9)
Missing meals		
Yes	2(3.7)	4(7.3)
No	24(43.6)	23(41.8)
Sometimes	29(52.7)	28(50.9)
Access to restaurants/shops for fast food.		
Yes	51(92.7)	21(38.2)
No	4(7.3)	34(61.8)
No of glasses of milk/week.		
0-1	7(12.7)	1(1.8)
2-3	32(58.2)	8(14.5)
4-5	7(12.7)	33(60.0)
5-6	9(16.4)	4(7.3)
> 6 glasses	8(14.5)	9(16.4)



Reduction in Unhealthy Dietary Behavior

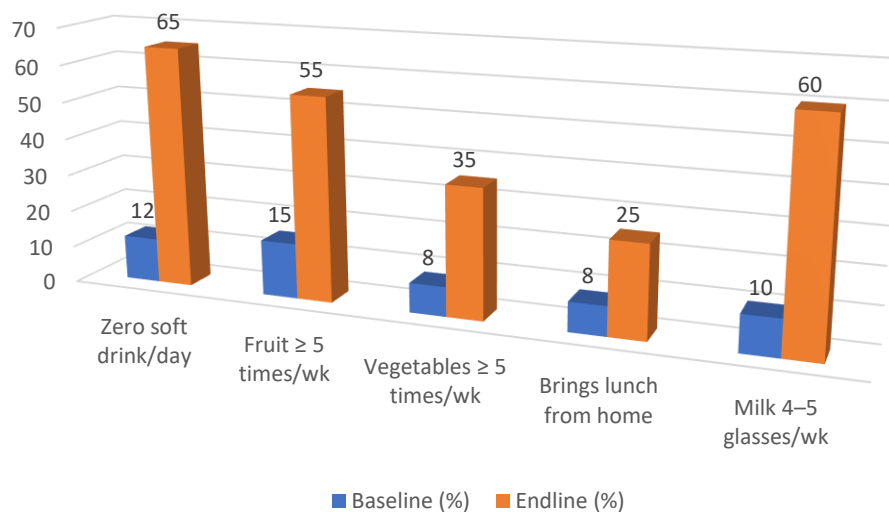


This graph shows that after the intervention, there was a noticeable decline in harmful eating habits. Frequent consumption of sweetened beverages decreased from 37% to 2%, while access to soft drinks decreased from 95% to 65%. The percentage of people who watch TV or use their phones while eating dropped from 85% to 15%,

and the percentage of people who drink more than four cups of tea or coffee per day dropped from 30% to 2%. The percentage of those who drank at least two bottles of soft drinks each day also dropped significantly, from 40% to 5%. Even with improvements, fast-food restaurants were still reasonably accessible (95% to 85%), suggesting that more robust measures are required.

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Increase in Healthy Dietary Behavior



Following the intervention, the chart shows a notable increase in healthy eating habits. Milk intake significantly increased while soft drink consumption

significantly decreased. Additionally, consumption of fruits and vegetables increased significantly, indicating healthier dietary choices. Modest success was made in

bringing lunch from home, suggesting some behavioral change. All things considered; the intervention was successful in encouraging long-term, healthful eating patterns.

Discussion

This study showed that a school health program on food habits helped teens aged 12-16 years back to the Naval School. It made a big cut in soft drink availability at home (from 95% to 65%) and daily intake, with 63.6% of the students saying they had no intake after the intervention. These findings match those from other studies that show that direct nutrition education can help cut sugar-sweetened beverages and support better food choices (Medeiros et al., 2022; Juara Siha, 2021). Students' knowledge of healthy eating such as how much fruit juice, tea/coffee with sugar, and sweetened drinks to consume also grew. While the daily vegetable intake and regular breakfast intake increased, the trend toward mindful eating also grew smaller on the use of phones at mealtimes, showing it is spreading (South India RCT, 2022). This fits with studies that show school programs help bring better nutritional outcomes. For example, programs carried out in Puducherry, India, saw the waist circumference of overweight teens shrink from 78 cm to 75.9 cm, calories and the intake of fats go down, and the amount of protein goes up. Similar programs in Kenya, Iran and Pakistan saw improvements in BMI, healthier eating patterns and the frequency of fruit and vegetable intake, while the frequency of overweighting went down (Medeiros et al., 2022; SCT intervention, Iran; Pakistani adolescent studies).

This work also showed that attitudes on nutrition and health changed for the students, which shows that with age-appropriate and fun education that behavioural change can take place and last. However, differences in feeding status like BMI (more out of the norm of the private school students), and higher intake of fast food (or among obese teens) suggest that context should drive the way forward (Karachi study; North India; Taif, KSA). There were good signs in the results showing that school-based education approaches can help improve the knowledge and attitudes toward food as well as change adolescent behaviours. However, to keep this going and further improve, a refresher program, multi-contact techniques, and engaging families are recommended, especially occurs with areas with not

much change, such as eating more vegetables, breakfast, and a reduction (School-based multicomponent interventions; Puducherry study; Karachi adolescent data).

Conclusion

Nutrition education in schools intervention effectively improved dietary habits, and adolescents' physical activity significantly reduced their BMI. This study shows the importance of incorporating nutrition education in schools to combat adolescent obesity and promote health. Nutrition education and regular physical activity should be included in the curriculum to increase sensitization to school-based nutrition education programs on weight management among young adolescents. We are establishing and providing professional development for teachers and collaborating with healthcare professionals. Promoting a healthy diet and physical activity within schools will reinforce these initiatives, fostering a supportive environment for healthy behaviour adoption and obesity prevention.

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Conflict of Interests

The study's authors affirm that they have no conflicts of interest.

Data Availability Statement

The accompanying author can provide the study's results upon reasonable request.

Ethical Approval

This study was authorized on April 16, 2021 by the Dow University of Health Sciences Ethics Committee (Ref. No. DIONAM/MSN/2021/18/-321). All participants were given clear explanations of the goals of the study, the fact that participation is voluntary, and their choice to withdraw at any time, as well as guarantees about the confidentiality of their personal information, before they began. After that, informed consent was sought in writing.

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