



## RESEARCH ARTICLE

### EFFECT OF SCHOOL-BASED LIFESTYLE INTERVENTION PACKAGE ON HEALTH BEHAVIOR ON ANTHROPOMETRIC MEASUREMENTS OF SCHOOL CHILDREN

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#### ABSTRACT

**Objectives:** To evaluate the effectiveness of “lifestyle intervention package on health behavior” on anthropometric measurements. **Methods:** The study was an interventional trial with 3 months follow up. Multi stage sampling was used. In this technique, first stage of sampling was purposive and two schools were selected and randomized by lottery method in experimental and control group. Second stage of sampling, class sections by purposive and third stage, selection of students by total enumeration technique in experimental (150) and control (150). Both the groups were assessed for dietary behavior, physical activity, screen time and anthropometric measurements. “Lifestyle interventional package on health behavior” was developed and delivered to experimental group. This package included importance of healthy foods, structured physical exercises, and benefits of watching screen less than 2h/d. **Results:** Three months of intervention shows significant improvement in knowledge on health behavior in experimental group. Significant difference was observed in anthropometric measurements between experimental and control group in terms of BMI (mean difference -0.47 kg/m<sup>2</sup>) and Waist hip ratio (mean difference -0.006cm). Significant number of school children started using screen (television, mobile, video games and computer) for less than 2h. **Conclusion:** Lifestyle intervention package on health behavior was effective in improving health behavior and anthropometric measurements. Package can be used by health professionals for improving healthy lifestyle of school children and prevent of NCDs in future.

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## INTRODUCTION

Globalization, industrialization, urbanization, socio- economic development and changing lifestyle placed India at a position where it is facing a challenge of burden of non communicable diseases.<sup>i</sup> Globally 70% of all deaths occur due to non communicable diseases which mean 40 million people dying of NCDs in each year. Approximately 1.2 million deaths all over the world annually in the age group under 20 years are due to NCDs.<sup>ii</sup> Prevalence of physical inactivity, unhealthy diet and increased screen time among adolescents is higher and these are the major risk factors of non communicable diseases which are modifiable. More than two-thirds of the adolescent (11-17 years) are physically inactive.<sup>iii-iv</sup> Insufficient physical activity attributed approximately 3.2 million deaths in a year.<sup>3</sup> A survey among children (3-11years) revealed that only 17% were meeting recommended physical activity guidelines. All risk of cardiovascular (hypertension, diabetes, breast and colon cancer, and depression) can be reduced by doing regular physical activities.<sup>v</sup> Food consumption patterns of adolescents (14-16 years) showed poor dietary intakes.<sup>vi</sup> Children are more attractive towards screen media usage.

Majority (68.4%) of the children were using screen for more than two hours exceeded the recommendations.<sup>vii</sup> In adolescent major cause of mortality and morbidity is health damaging behaviours not diseases. Promoting healthy practice like eating healthy diet, doing regular exercises and reducing screen time during early adolescent period helps in reducing health risk in future. Based on the review of literature and personal experience researcher felt that although there are written guidelines for physical activity, diet and screen time but no comprehensive lifestyle intervention package for the school children exists.<sup>6-viii</sup> So need was felt to develop and implement lifestyle intervention package for the school children.

## MATERIALS AND METHODS

An interventional trial was conducted in 300 school children of selected schools of Chandigarh. Multi Stage sampling was used in this study. In this technique, first stage of sampling was purposive and two schools were selected and these were randomized by lottery method in experimental and control

group. In Second stage of sampling, class sections were selected by purposive sampling and third stage of sampling, selection of students was total enumeration technique to draw the sample for present study. Total accessible sample was 305. In experimental group 155 school children were accessible. Out of which 05 didn't met inclusion criteria so remaining 150 students were enrolled in the study. In control group 150 subjects were enrolled. Permission from Institute's Ethics Committee, respective schools and informed consent was taken from the parents/guardians of all school students. This trial was also registered under the Clinical Trials Registry-India with the CTRI/2018/01/011351. Global school based student health survey-core expanded questionnaire is a standardized tool developed by WHO in 2013 was used for the collection of data before and after intervention period. It consists of ten modules, out of which two modules were used i.e. dietary behaviour and physical activity module. Screen time questionnaire was developed with the help of expert opinion and review of literature as no standardized tool was available. WHO BMI z-score was used to assess the nutritional status of school children.

The intervention package was prepared with the help of the experts and literature. The intervention was provided for the school children in experimental group. The package was developed in the form of booklet and flash cards. Students were taught about benefits of eating healthy food, number of serving of food, food pyramid, benefits of structured physical exercises, screen time with the help of flash cards. Demonstration of physical exercises was given to them. Positive motivation was given while students were doing exercises. In experimental group, follow-ups were done daily for 1 week, twice a week for 2 week then weekly for next 2 months. Whereas control group received routine practices. All the study subjects were re-assessed for dietary behaviour, physical activity, screen time and anthropometric measurements.

**Data Analysis:** SPSS 20 software was used analyze the data. For categorical variable, chi-square test was used. To compare control and experimental groups, with respect to the quantitative variables independent-t test was used. To compare the means within the groups the paired t-test was used.

## RESULTS

A total 300 students were evaluated in the study (150 from experimental and 150 control). The socio-demographic profile of the study participants is given in Table 1. Age of the students ranged from 11- 16 years in both the groups with mean age of  $12.73 \pm 0.91$  years in experimental and  $12.60 \pm 0.79$  years in control group. As per the gender, approx half of the school children in experimental (50.7%) and control (54%) group were males. In regard to the type of the house, 64.7% and 66.7% of the school children in experimental and control group respectively lived in rented house. Hence, both the groups were found to be homogeneous and comparable in terms of age, gender ( $p > 0.05$  as per  $\chi^2$ ). Health behaviour of school children related to diet, physical activity and screen time of the groups shown in table 2. The health behaviour of school children regarding diet has shown a significant rise in the proportion of children who always eating their breakfast from 74% to 87.3% ( $p < 0.05$ ) contrary to no change in control group ( $p = 0.2$ ).

Frequency of drinking milk was increased from 68.7% to 81.4% in experimental group against reduction among school children of control group. About 57.3% of the students in the experimental group restricted their frequency of intake of salty foods once a month ( $p < 0.05$ ). There was a significant increase in the physical exercises of students for muscle strengthening (16%) and stretching (17%) from the baseline 7.7% and 4.3% respectively ( $p < 0.001$ ). this is in contrast to the control group where there was a reduction in number of children opting to exercises. Regarding screen usage, At baseline, only 7.3% of the school children in experimental were using screen (television, mobile, video games and computer) for less than two hours but after three month follow up significant improvement was observed in experimental group ( $p < 0.001$ ) whereas in control group no significant change was observed ( $p > 0.05$ ). The anthropometric measurements of the study children were compared before and after study (Table 3). In experimental group, significant mean and standard difference of BMI, waist hip ratio (cm) was observed during post interventional assessment. In experimental group, a rise in mean height from 148.02 to 149.84 (in cm) with mean difference 1.82 (in cm) whereas in control group 144.90 to 146.2 with mean difference 1.32 although this increases was significant in both the groups as per paired t-test ( $p < 0.05$ ). The weight was significantly increased from 35.13 to 36.74 kg in experimental and 32.48 to 33.9 kg. BMI showed improvement in experimental group 15.87 to 16.33  $\text{kg/m}^2$  whereas in control group no significant change was observed as per paired t-test. The waist hip ratio of the intervention significant rise 0.79 to 0.82, while it remained nearly same 0.81 in control group, before and after intervention. This difference was statistically significant ( $p$  value =  $< 0.01$  as per paired t test). There was a significant difference in mean and standard deviation of height(cm), weight(kg) and waist circumference(cm) of both the groups during post interventional assessment ( $p$  value =  $< 0.01$  as per unpaired test). Nutritional status of school children compared during pre and post interventional assessment of experimental and control group shown in table 4. As per the WHO z-score classification in experimental group and control only 56% school children had normal body mass index before intervention. After intervention 71.3% attained their normal body mass index in experimental group whereas in control group only 56.7% had it. Hence, there was a statistically significant difference in nutritional status in experimental group as compared to control group ( $p$  value  $< 0.05$ ).

## DISCUSSION

Non communicable diseases are a leading global health problem. It cause up to 80% of mortality-tobacco consumption, harmful use of alcohol, inappropriate diet, and physical inactivity.<sup>ix</sup> These risk factors can be prevented and controlled by intervention, thereby reducing the probability of diseases. An interventional trial was used in present study to assess effectiveness of lifestyle intervention package on health behaviour on anthropometric measurements on school children because it is evident that for the evaluation of certain types of interventions such as health promotion and educational interventions, this design is virtually the only valid approach. School children of 7<sup>th</sup> and 8<sup>th</sup> standard were chosen in this study because as per WHO report of India, more than two-thirds of the adolescent (11-17 years) are physically inactive<sup>x</sup> and According to GATS Report of India,

**Table 1. Socio-demographic profile of school children in experimental and control group N=300**

Variables	Experimental n <sub>1</sub> =150	Control n <sub>2</sub> = 150	χ <sup>2</sup> (df) p value
	n <sub>1</sub> (%)	n <sub>2</sub> (%)	
<b>Age (years)*</b>			
1. 11 – 12	54(36.0)	63(42.0)	4.34 <sup>#</sup>
2. 13 – 14	<b>88(58.7)</b>	<b>85(56.7)</b>	(2)
3. 15– 16	8(5.3)	2(1.3)	0.11
<b>Gender</b>			
• Male	<b>76(50.7)</b>	<b>81(54.0)</b>	0.33(1)
• Female	74(49.3)	69(46.0)	0.56
<b>Type of house</b>			
• Rent	<b>97(64.7)</b>	<b>100(66.7)</b>	0.14 (1)
• Own	53(35.3)	50(33.3)	0.72
<b>Religion</b>			
• Hindu	<b>126(84.0)</b>	<b>100(66.7)</b>	<b>12.13 (1)</b>
• Others (Sikh, Muslim, Christian)	24(16.0)	50(33.3)	<b>&lt;0.001</b>
<b>Type of family</b>			
• Nuclear	<b>120(80.0)</b>	<b>118(78.7)</b>	0.081(1)
• Joint	30(20.0)	32(21.3)	0.78
<b>Total number of family members</b>			
• <4	31(20.7)	65(43.3)	<b>17.98 (2)</b>
• 5-8	<b>109(72.7)</b>	<b>76(50.7)</b>	<b>0.001</b>
• >8	10(6.7)	9(6.0)	
<b>Socioeconomic status *</b> <b>(As per modified B.G. Prasad scale 2017)</b>			
• Lower class (<938)	38(25.3)	10(6.7)	
• Lower middle class (938– 1875)	<b>73(48.7)</b>	<b>61(40.7)</b>	<b>30.98<sup>#</sup></b>
• Middle class (1876 – 3126)	28(18.7)	56(37.3)	<b>(4)</b>
• Upper middle class (3127-6253)	10(6.7)	21(14.0)	<b>&lt;0.001</b>
• Upper class (>6254)	1(0.7)	2(1.3)	

**Table 2. Health behaviour of school children related to diet, physical activity and screen time of experimental and control group**

Themes	Health behaviour	Experiment Group n <sub>1</sub> =150 n <sub>1</sub> %		P value	Control Group n <sub>2</sub> = 150 n <sub>2</sub> %		P value
		Baseline	End line		Baseline	End line	
		<b>Dietary behaviour</b>	Always eating breakfast		111(74.0)	131(87.3)	
	Frequency of drinking milk	103(68.7)	122 (81.4)	<0.001	91(60.6)	68(45.3%)	0.12
	Salty food intake	98(62.7)	86(57.3)	0.04	82(54.7)	97(64.6)	0.02
	Food high in fats	88(58.7)	85(56.7)	0.004	79(52.7)	88(58.7)	0.04
	Carbonated fruit juices	52(34.6)	30(20.0)	0.06	30 (20.0)	54 (36.1)	0.001
<b>Physical activity for ≥5 days a week</b>	Exercises done for muscle strengthen	23(7.7)	48(16.0)	<0.001	22(7.3)	8(2.6)	0.01
	Exercises done for stretching	13(4.3)	81(17.0)	<0.001	29(19.3)	06(1.0)	0.01
<b>Screen time</b>	<2 hours/day	11(7.3)	108(72.3)	<0.001	8(5.3)	6(4.0)	0.79

**Table 3. Comparison of anthropometric measurements during pre and post interventional assessment of experimental and control group**

N=300

	Baseline Mean±SD (Range)	End line Mean±SD (Range)	Mean change± SD	Paired t-test
Height (cm)	148.02 ± 8.45 (130.0-172.0)	149.84 ± 8.67(132.0-179.0)	1.82 ± 3.57	6.25 (149)<0.001
Experimental	144.90 ± 7.98 (114.0-165.0)	146.2± 7.7(128.0-166.0)	1.32 ± 2.71	5.95(149)<0.001
Control	-3.11	-3.62		
Mean difference Unpaired t-test	-3.36 (298) 0.001	-3.80 (298)<0.001		
Weight (kg)	35.13 ± 8.31 (21-67.0)	36.74 ± 8.51 (26.50-67.0)	1.61 ± 5.5	3.53(149) 0.001
Experimental	32.48 ± 6.94 (20-54)	33.99± 7.3 (20.0-56.0)	1.51 ± 3.42	5.42 (149)<0.001
Control	-2.65	-2.74		
Mean difference Unpaired t-test	-2.99 (298) 0.003	-2.99 (298) 0.003		
Body mass index (kg/m <sup>2</sup> )	15.87 ± 2.82 (10.4-26.8)	16.33± 2.78 (11.6-26.8)	0.46 ± 2.06	2.73(149) 0.007
Experimental	15.57 ± 3.07 (10.7-26.6)	15.85± 2.98 (10.8-26.6)	0.28 ± 1.91	1.84 (149) 0.06
Control	-0.30	-0.47		
Mean difference Unpaired t-test	-0.89 (298) 0.37	-1.42 (298) 0.15		
Waist circumference(cm)	61.10 ± 7.49 (50-90)	63.40± 8.16 (50.0-91.5)	2.3 ± 5.80	4.86(149) <0.001
Experimental	60.82 ± 6.97 (50-86)	61.46± 6.8 (48.50-91.0)	0.64 ± 3.97	1.98 (149) 0.04
Control	-0.28	-1.94		
Mean difference Unpaired t-test	-0.34 (298) 0.74	-2.23 (298) 0.02		
Hip circumference(cm)	76.29 ± 7.73 (61-107)	76.07± 9.3 (70.50-107.0)	-0.21 ± 7.22	-0.36 (149) 0.71
Experimental	74.90 ± 7.00 (60-91)	74.65 ± 7.01 (62.0-96.0)	-0.25 ± 4.44	-0.68 (149) 0.49
Control	-1.39	-1.42		
Mean difference Unpaired t-test	-1.63 (298) 0.10	-1.49 (298) 0.13		
Waist -hip ratio(cm)	0.79 ± 0.052 (0.62-0.97)	0.82 ± 0.05 (0.64-1.0)	0.02 ± 0.05	6.12 (149)<0.001
Experimental	0.80 ± 0.05 (0.66-1.00)	0.81± 0.05 (0.62-0.97)	0.007 ± 0.05	1.62 (149) 0.10
Control	0.01	-0.006		
Mean difference Unpaired t-test	2.01 (298) 0.04	-1.08 (298) 0.27		

**Table 4. Comparison of nutritional status of school children of experimental and control group at baseline and end line assessment**

Variables	Experiment group n <sub>1</sub> =150 n <sub>1</sub> %		Mc Nemar test	Control group n <sub>2</sub> = 150 n <sub>2</sub> %		Mc Nemar test
	N=300					
	Baseline	End line		Baseline	End line	
<b>As per WHO Z-Score classification</b>						
Normal	84(56.0)	107(71.3)	0.002	70(46.7)	85(56.7)	0.04
Moderate undernutrition	33(22.0)	26(17.3)		35(23.3)	33(22.0)	
Severe undernutrition	26(17.3)	13(8.7)		37(24.7)	25(16.7)	
Overweight	7(4.7)	4(2.7)		8(5.3)	7(4.7)	

One in 10 (10.6%) daily smokers aged 20-34 had started smoking before age 15 years, while 33.1 percent of all daily smokers have started smoking when they were younger than 18 years.<sup>xi</sup> Empowerment of the school children through effective health teaching, use of trained public health personnel along with provision of free health care would prove beneficial in effectively controlling the growing prevalence of non communicable diseases.<sup>xii</sup> In present study Lifestyle interventional package on health behaviour includes diet, physical exercises and screen time which helps school children in maintenance of healthy lifestyle and these are modifiable risk factors that's why they are included in this package. A Study done by Archer T. reported that exercise offers a non pharmacological, noninvasive intervention which, if introduced proactively, will provide marked elements of prevention from chronic diseases in future.<sup>xiii</sup>

Present study also showed that consumption of salty foods and carbonated beverages higher among school children. At baseline, 62.7% consumed salty food but after intervention reduced to 56.7%. Carbonated beverages were drunk by 34.6% in experimental group and 20% in control group after 3 months of intervention shows reduction in experimental group was 20% but control group rise to 36.1%. similar study on food consumption patterns of adolescents aged 14–16 years in Kolkata reported that adolescents had poor dietary intakes; over one quarter (30%) reported no consumption of vegetables and 70% reported eating three or more servings of energy-dense snacks. 45% didn't consume any servings of fruits and approximately half reported drinking three or more servings of energy-dense beverages.<sup>iv</sup> In the interventional group, implementation of the package showed significant increase in the behaviour of doing physical exercises for muscle strengthening for more than 5 days a week significantly increase from the baseline 7.7% to 16% in contrast to control group showed reduction from 7.3% to 2.6% ( $p < 0.05$ ). A similar study showed that the time spent in moderate physical activity in physical education classes increased from 40% to 50% after the intervention.<sup>xiv</sup> Screen time usage was categorized into television, computer, mobile, video games and parents control on media usage. Screen time usage on electronic devices shows significant changes in both the groups this may be due to pre testing awareness in control group. In experimental group "Lifestyle intervention package on health behavior" shows significant change in screen usage (television, mobile, video games and computer) as compared to control group. A study revealed that Overall, nearly two third of the children exceeded the recommendations of maximally two hours of screen time per day. More girls than boys, and more children from rural than urban areas, achieved screen time recommendations.<sup>xv</sup> Present study showed Significant number of children started watching screen for  $< 2$  hours ( $p < 0.001$ ).

Magnitude of the difference between the total screen hours was large (2.7) effect size. Adolescent is stage of rapid and robust growth and development there are maturation effect that may increase physical parameters. Present study also showed in both the groups there is change in anthropometric measurements. As per WHO z- score BMI classification 39.3% of school children in experimental group and nearly one fourth in control group were under nourished. The present study revealed that in experimental group, a rise in mean height from 148.02 to 149.84 (in cm) with mean difference  $1.82 \pm 3.57$  (in cm) whereas in control group 144.90 to 146.2 with mean difference  $1.32 \pm 2.71$  although this increases was significant in both the groups. The weight was significantly increased from 35.13 to 36.74 cm in experimental and 32.48 to 33.9cm. BMI showed significant difference in experimental group 15.87 to 16.33  $\text{kg/m}^2$  whereas in control group no significant change was observed. The waist hip ratio of the intervention significant rise 0.79 to 0.82, while it remained nearly same 0.81 in control group, before and after intervention. A longitudinal study results indicate that the intervention group maintained the improvements gained in BMI just immediately after the three months of intervention period.<sup>xvi</sup> Nutritional status of school children was assessed with the help of WHO z- score. Results showed there was significant change in nutritional status of school children. At baseline in experimental group (56%) and control (46.7%) group school children had normal body mass index. After intervention 71.3% attained their normal body mass index in experimental group whereas in control group no significant difference was found ( $p < 0.05$ ). The study concluded that lifestyle intervention package on health behavior was effective in promoting health behavior of school children and improvement in anthropometric measurements within normal range. It is also recommended that community health nurses and other health professionals working in a community can provide school health services through health teaching and actively involve the school children in a structured physical exercise, improve healthy dietary behaviour and reduce screen hours along with various health related modification on regular basis and creating awareness on health issues.

## CONCLUSION

The "lifestyle intervention package on health behaviour" was effective in increasing knowledge of school children regarding health behaviour i.e. modification in dietary pattern, reduced screen time, doing physical exercises. This package was also effective in improving the anthropometric measurement in terms of body mass index, waist hip ratio in among the groups after implementation of interventional package.

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