Impact of School Based Self Care Model in Assessment of Obesity and Its Risk Factor Knowledge among Urban School Children: Non Randomized Controlled Trial

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ABSTRACT

Background: A phenomenal rise [10% to 30%] has been observed in the prevalence of obesity among adolescents. Imparting health knowledge and skills in school children can bring a huge change in healthy practices and provides an ability to take care of their health. The objectives of the study was to evaluate the impact of school based self care model in assessment of obesity and its risk factors knowledge among school children.

Methodology: A Non Randomized Controlled Community trial was conducted among 480 urban school children of Belagavi. The students from intervention group [240] received school based self care model intervention over 4 weeks period.

Results: In study group 80% children became aware about obesity; 60.8 % to 92.5 % gained knowledge about specific dietary factors associated with obesity and knowledge improved regarding physical activities, Using motorcycle [68.3% to 85.4%], Watching TV [62.9% to 80.4%] and Using mobiles [66.7% to 87.1%]. The proportion of students having adequate skill score increased from 27.1% to 85.9% for weight (p<0.001), 21.5% to 89.6 % for height (p <0.001) and 10% to 76.7% (p<0.001) for waist circumference after intervention.

Conclusion: The school based self care model was effective as the knowledge increased by 30% and gross [50%] improvement was observed in obesity assessment skill at the end of intervention.

Keywords: Childhood obesity, School Based Approach, Self Care Model, Risk Factors, unhealthy diet, physical inactivity

INTRODUCTION

Obesity is one of the common health problem and a complex condition with serious medical, social and psychological implications affecting virtually all ages and socioeconomic groups. One fourth of premature global deaths are attributed to obesity and 2.1 billion (30%) of the world's population is either overweight or obese. A phenomenal rise has been observed in the prevalence of overweight and obesity [10% to 30%] among adolescents and has tripled in the past two decades in Asian countries including India. India is the third most obese country in the world. [1, 2]

The large attributes for overweight and obesity comes from changing lifestyles due to industrialization, technology and globalization. The promotion of food market has influenced the food habits of youngsters. The competition in currier, entertainments like television, mobile games etc, have increased the scope for sedentary activities and less time devotion to physical education and sports at school as well at households. This transformation in life styles have increased obesity related problems like dyslipidaemia, impaired glucose metabolism, type 2 diabetes mellitus, polycystic ovarian disease and depression among urban children.[3,4]

This increasing trend of obesity related problems are cause of grave concern among health care professionals and parents. The knowledge about obesity and its risk factors, importance of healthy lifestyle, adult health issues of childhood obesity are lacking among school children and overlooked by parents. Another concern is that poor focus on monitoring of overweight and obesity among school children. The lack of resources, limited public health capacity to deal the obesity issues and poor inter- sector approaches have left the obesity problem unaddressed. There is a need to develop cost effective, long term strategy to assess the obesity among school children and measures to prevent it. The school settings provide an effective means to promote child's health and to take preventive measures.[5, 6] Programmes like child-to-child programme[7] and healthy buddy programme have proved that, school child can play an important role in health promotion and prevention of the diseases. Imparting health knowledge and empowering child with health skills can bring a change in lifestyle and healthy practices of children. With this context the present study was conducted to evaluate the school based self-care model intervention for assessment and prevention of obesity.

METHODOLOGY

The present study was conducted in Belagavi which is one of the economically growing cities in India. It is an educational hub with many industries, attracting young population for education or work purposes and this migrant population is at risk of life style changes. A Non Randomized Controlled trial was planned and conducted in school setting to evaluate the impact of school based self-care model. The ethical committee approval was obtained from institutional ethical committee and permission was taken from school authorities. A required sample (480) was calculated considering minimum 15% effect of intervention and 240 students in each study and control group were included in the study. Nine schools were selected randomly and allocated into study group [5 schools] and control groups [4 schools]. Students from 8th and 9th standard were included in study. The study was carried out for two school academic years [2016 -17 and 2017-18].

A written informed consent was obtained from school children. Students who did not give consent were not included in the study. The baseline survey was carried out to collect socio demographic information and to assess the knowledge of school children regarding the obesity problem, its risk factors, risk groups, hazards and preventive measures of obesity. The basic skill for anthropometric measurements specifically Weight, Height and Waist Circumference was assessed by direct observation method.

Students from intervention groups received school based self-care model intervention. School based self-care model intervention is a new approach, in which school children are imparted with the knowledge about obesity, its risk factors, risk groups, hazards and were trained to assess, interpret and classify the nutritional status. The study group received intervention in10 divided batches of 25 students in each whereas control group did not receive any intervention. The intervention was given in 4 sessions over a period of four to six weeks. Each session was carried out for 2 hours. Theory and practical sessions included health education, interactions on nutrition /obesity, group discussions on obesity issues, hazards of obesity, quiz on risk groups, problem-solving, role-playing, demonstration on assessment methods, games & fun activities to change the eating habits and healthy cooking techniques. Data was collected using pre-designed & pre-tested structured self-administered questionnaire and pre-structured observation sheets (5 step for each parameter) at the beginning of the study and as well as at the end of the intervention. The post test data was collected at the end of 8 weeks of pretest and 4 weeks after intervention.

Statistics:

Data was coded, entered in excel sheet for statistical analysis and was analyzed using SPSS version 22. The proportion of correct knowledge of each variable and proportion of each skill was analyzed and compared within groups and between the groups (Study and control). The proportion of overweight, obesity and central obesity was calculated. A descriptive analysis of variable was done using scoring system. Each item was given score 2 for correct answer, score 1 if did not answer or don't know answer and incorrect answer was scored as 0.Scores were also given for assessment methods (anthropometric measurements) of obesity and each correct step was scored 1; incorrect step was scored 0 and each candidate was scored out of five (5 steps method) for skill assessment. Mean scores each item and average mean scores were derived for qualitative data of both groups. Descriptive (means and standard deviations) and interferential statistics was used to test significant difference before and after intervention (Wilcox or Signed Rank Test) and between study and control groups (Mann Whitney U test). Similarly means score of each variable and mean skill scores were calculated before and after intervention and were compared with control group (z test).

RESULTS

A non-randomized controlled trial was conducted to evaluate an impact of school based self-care model for assessment of obesity. The study group and control group comprised 240 students in each group. Majority of students [Study 88.4%; Control 76.6%] belonged to 13 years to 14 years age group. In the study group 142 (59.2%) were males and in the control group 102 (42.5%) were females. Among the study group 105 (43.8%) students belonged to upper class, 58 (24%) belonged to lower socioeconomic class whereas, in control group 29 (11.9%) belonged to upper class and 112 (46.8%) belonged to lower class. Among the participants 66% parents from study group and 73% from control group were literates. On enquiry of health conditions of parents, 14.2% students from study group and 3% from control group revealed that their parents were having the obesity related health problems.

Knowledge: The knowledge of obesity was assessed among study group before and after the intervention. The knowledge improved from 75.4% to 92.2% about obesity and 97% of study group and 96% of control group, knew at least one Non communicable diseases related to obesity at the end of study. The impact of self-care intervention model on knowledge of factors associated with obesity is depicted in Table.1.

The proportion of correct knowledge regarding specific dietary factors associated with obesity among study group varied from 50.0% to 89.6% at the beginning of study. The knowledge improved by 10 to 30% among study group except skipping breakfast and obesity. Definitive improvement was observed in the knowledge among intervention group specifically, Eating large portion of food (80.0% to 91.3%; p<0.001) eating while watching TV (567% to 85.0%; p<0.001), Alcohol consumption (59.2% to 69.2%; p<0.05), importance of traditional diet (15.4% to 68.3%; p<0.01) and eating outside food (81.7% to 91.7%; p<0.01) as shown in table No.2. The proportion of correct knowledge differed among control group at the end of the study without any intervention; the knowledge improved with respect to eating large portion (72.1% to 77.9%), eating while watching TV (45.4% to 53.8%), Snacking in between meals (59.6% to 67.5%) and drinking alcohol (49.6% to 55.8%) but none of them were statistically significant (>0.05).

The mean score of each knowledge item was calculated as shown in Table 2. The average of mean score of all dietary factors associated with obesity was compared with and without intervention among study and control groups. The mean difference among the study group (p<0.05) was statistically significant whereas in control group (p >0.05) it was not significant.

Table 1: Impact of School Based Self Care Model on Knowledge of Factors associated with Obesity

Factors associated with Obesity	Study Group (n=240)		P value	Control Group (n=240)		p value
	Pre Test (%)	Post Test (%)		Pre Test (%)	Post Test (%)	
Unhealthy diet	76(31.7)	86(35.8)	>0.05	52(21.7)	62(25.8)	>0.05
Decreased physical activity	30(12.5)	39(16.3)	>0.05	22(9.2)	18(7.5)	>0.05
Mental stress	69(28.8)	80(33.3)	>0.05	70(29.2)	62(25.8)	>0.05
Family history	39(16.3)	60(25.0)	<0.05	34(14.2)	48(20.0)	>0.05
Other health problems	48(20.0)	44(18.3)	>0.05	80(33.3)	58(24.2)	<0.05

Table 2: Impact of School Based Self Care Model on Mean Knowledge score of students regarding Dietary factors associated with Obesity

Dietary factors	Study group (n=240)		Control group (n=240)	
	Pre test Mean(SD)	Post test Mean(SD)	Pre test Mean(SD)	Post test Mean(SD)
Eating large portion of food	1.7 (0.7)	1.8 (0.5)	1.5 (0.8)	1.7 (0.7)
Eating while watching TV	1.2 (1.0)	1.7 (0.7)	0.9 (1.0)	1.2 (1.0)
Eating fruits & vegetables	1.8 (0.6)	1.8 (0.6)	1.6 (0.8)	1.6 (0.8)
Eating fried food	1.8 (0.6)	1.9 (0.5)	1.7 (0.7)	1.7 (0.7)
Snacking in between meals	1.4 (0.9)	1.7 (0.7)	1.2 (1.0)	1.4 (0.9)
Non Vegetarian food	1.1 (1.0)	1.2 (1.0)	1.1 (1.0)	1.1 (1.0)
Drinking alcohol	1.2 (1.0)	1.4 (0.9)	1.0 (1.0)	1.0 (1.0)
Drinking more fluids	1.5 (0.9)	0.5 (0.8)	1.5 (0.9)	1.1 (1.0)
Having whole milk	0.6 (0.9)	1.5 (0.9)	1.3 (0.9)	1.2 (1.0)
Having junk foods	1.7 (0.7)	1.8 (0.7)	1.5 (0.8)	1.6 (0.8)
Traditional diet	1.3 (0.9)	1.4 (0.9)	1.4 (0.9)	1.2 (1.0)
Eating outside food	1.6 (0.8)	1.8 (0.5)	1.6 (0.8)	1.5 (0.9)
Skipping breakfast	1.4 (0.9)	0.7 (0.9)	1.0 (1.0)	1.0 (1.0)
Average of Means	**1.41(0.34)**	**1.48(0.44)**	**1.33(0.27)**	**1.33(0.26)**
p value	<0.05		>0.05	

Table 3: Impact of School Based Self Care Model on Mean Knowledge score of students regarding Physical Activity factors associated with Obesity

Physical activity factors	Study group (n=240)		Control group (n=240)	
	Pre test Mean (SD)	Post test Mean (SD)	Pre test Mean (SD)	Post test Mean (SD)
Playing out door in leisure time	1.6(0.8)	1.7(0.7)	1.6(0.8)	1.5(0.9)
Playing in home	1.0(1.0)	1.5(0.8)	1.0(1.0)	1.0(1.0)
Using motorcycle short distance	1.4(0.9)	1.3(0.7)	0.9(1.0)	0.5(0.8)
Using Bicycle for short distance	1.5(0.9)	1.5(0.9)	1.3(1.0)	1.4(0.9)
Doing regular exercises	1.6(0.8)	1.7(0.7)	1.4(0.9)	1.5(0.9)
Spending more time with screens	1.5(0.8)	1.8(0.6)	1.3(0.9)	1.4(0.9)
Walking reduce the risk of obesity	1.2(1.0)	1.0(1.0)	1.2(1.0)	1.1(1.0)
Excessive watching of TV/videos	1.3(1.0)	1.6(0.8)	1.3(1.0)	1.3(0.9)
Using stairs	1.3(0.9)	1.6(0.8)	1.2(1.0)	1.3(1.0)
Using lifts	1.590.8)	1.8(0.6)	1.4(0.9)	1.3(0.9)
Doing yoga	1.8(0.6)	1.6(0.8)	1.7(0.7)	1.4(0.9)
Spending more time with mobiles	1.4(0.9)	1.7(0.7)	1.4(0.9)	1.4(0.9)
Average of Means	1.43(0.21)	1.59(0.22)	1.31(0.22)	1.26(0.28)
p value	>0.05		<0.05	

Table 4: Mean Skill Scores of Students in Anthropometric Measurements for Nutritional Assessment

Skill Parameters	Study group (n=240)			Control group (n=240)		
	Pre test Mean (SD)	Post test Mean (SD)	p value*	Pre test Mean (SD)	Post test Mean (SD)	p value*
Weight	2.4(1.4)	4.4(0.7)	<0.001	1.8(1.0)	2.6(0.8)	<0.05
Height	2.3(1.5)	4.6(0.8)	<0.001	2.5(1.2)	2.9(1.4)	< 0.05
Waist	1.5(1.2)	4.1(1.1)	<0.001	1.5(1.2)	1.9(1.3)	< 0.05

*p value (z test) at 0.05 level both groups showed significant difference

The knowledge on how many times risk of junk foods [1.4(0.7); 1.7(0.6)] (p<0.001) and risk of unhealthy snacking [1.3 (0.8); 1.5(0.7)] (p=0.03) associated with obesity was improved among study group and was statistically significant whereas it was not significant in control group (p=0.24; p=0.39).

The proportion of correct knowledge regarding physical activity factors associated with obesity, showed an improvement among study group especially towards playing at home [47.9% to 75.4%;p<0.01], using lift [74.6%; to 89.6%;p<0.01], excessive watching of TV [62.9% to 80.4%;p<0.01] and using mobiles [66.7% to 87.1%; p<0.01]. The proportions varied haphazardly among control group and none of them were statistically significant (p>0.05). The mean score of knowledge about the physical activities associated with obesity were calculated among both groups. The average of mean score of all items were calculated and compared with and without intervention Table 3. The mean knowledge score improved after the intervention among the intervention group but not significant (>0.05) whereas in control group the mean score reduced significantly (<0.05). Study also found that, the mean knowledge score improved with respect to risk factors like sedentary activity and less activity in children among study group and negative changes were observed among the control group. The mean knowledge score of preventive measures like adequate duration of brisk walk [1.3(0.8); 1.3 (0.7)] [p=0.23], cycling [1.3(0.7); 1.3(0.7)] [p=0.23], jogging [1.4(0.7); 1.3(0.7)] [p=0.24] and limiting screen time [0.7(0.7); 0.8(0.8)][p=0.08] were compared before and after intervention and the difference was not significant. It was significant only for the limiting screen time among control group (p=0.03).

The knowledge about the high risk groups for obesity was assessed and the proportion of students perceived following as risk groups for obesity among study and control group respectively, Sports person [16.7%; 23.8%], Inactive school children [78.3%;46.7%], Managers / officials [63.8%;35.0%], Children having obese parents [63.8%; 32.5%], Alcoholics [65%; 46.3%], Software engineers [55.6%;17.9%], Teachers [44.2%; 15.4%], Actors [47.5%;31.7%] and House wives with maid [48.8%; 31.3%] at the end of study. The knowledge about the hazards of obesity showed more impact towards Irregular cycles [26.7%; 42.3%], Gall stones [20.8%; 43.8%], Joint disease [39.6%; 48.3%], Heart disease [51.7%; 65.4%], and Low back ache [37.9%; 52.1%] compared to Diabetes, Joint pains, heart disease, hypertension etc, among study group whereas, control group showed haphazard results.

Skill: Skill score wise proportions were derived and the proportion for attaining adequate skill [score ≥ 4] for all the parameters was compared with and without intervention. The proportion of students having adequate skill score [score ≥ 4] in-

creased from 27.1% to 85.9% for weight (p<0.001), from 21.5% to 89.6 % for height (p<0.001), from 10% to 76.7% (p<0.001) for waist circumference after the intervention and improvement was highly significant. There was minimal improvement observed in skill score among the control group for all three parameters and it was statistically significant (p<0.01).

The mean skill scores were calculated for all the three anthropometric parameters for nutritional assessment with and without intervention. A highly significant difference (p<0.001) was observed in intervention group for all the anthropometric parameters (weight, height, waist) compared to control group. The improvement among the control group was also significant (<0.05) but could not attain adequate mean score [score ≥4]

The knowledge about BMI improved among the study group after the intervention [83.8% to 86.7%] compared to control group [25.4% to 21.3%] at the end of the study. The mean knowledge scores with respect to Monitoring and nutritional assessment like BMI, its calculation and monitoring of height improved significantly (<0.01) among study group except for monitoring of weight (0.09), whereas in the control group the difference was not statistically significant (> 0.05).

The students amongst study group were trained to calculate BMI using their own parameter, exercises and also to classify the nutritional status. The study found that 203 (84.6%) students among intervention group could calculate and interpret the BMI and were able to grade the nutritional status of children as well as adults; whereas, control group students could not do the same as they were not aware of BMI, its calculation and interpretation.

The nutritional status was assessed using the BMI among both groups, 72(15.0%) were overweight, 32 (6.7%) were obese and 124 (25.8%) students were having central obesity as per the waist circumference.

DISCUSSION

The childhood obesity poses a long-term health risks and psycho-social changes which affects the academic performance. Most of the lifestyle changes are adopted by school children in school settings. It is one of the platform where knowledge, attitude and practices regarding food choices, physical activities are inculcated and can be reasonably controlled and programmed. Interventions targeting the school environment or curriculum can be considered as key strategy to address childhood obesity and prevention of the same.[8,9] Similar

attempt was made in our study where we tested school based self care strategy by changing school learning environment. In the present study knowledge about the obesity [92.2%] and NCDs [96%] improved at the end of health education. The knowledge improved regarding following factors like healthy diet [31.5% to 35.8%], mental stress [28.8% to 33.3%], decreased physical activity [12.5% to 16.3%], family history of obesity [16.3% to 25%] etc at the end of intervention. Surprisingly many students could not identify decreased physical activity and family history as risk factor of obesity but the knowledge improved for family history compared to physical activity at the end of intervention. The average mean score of the specific dietary factors associated with obesity improved significantly among the study group (p<0.05) whereas it was not significant in control group (p>0.05). Much improvement was observed with respect to eating while watching TV, Alcohol consumption, importance of traditional diet and risk of eating outside food.

Similar School-based education programme by P. Shah et al, educated school children about health, nutrition, physical activity, non-communicable diseases etc in cities of North India. The knowledge scores improved in all children; more improvement was observed among younger children, females and among government school children (p=0˙001) compared to private schools. The study demonstrated a significant impact of education intervention on knowledge and behaviour of urban school children. It recommended initiation of an early health education programme for school children which helps to adopt healthy lifestyles.[8] Our study also demonstrated significant impact on knowledge of dietary factors, physical activity, NCDs and factors associated with obesity and highlights the need of such education in school curriculum to acquire healthy lifestyles.

Shah V et al studied an impact of educational intervention regarding hazards of obesity and its preventive measures among students of Ahmadabad city. An education intervention significantly improved the knowledge by 60 to 70% about hazards of obesity like hypertension, cancer, heart attack and diabetes mellitus[9]. Similarly baseline knowledge of preventive measures of obesity improved by 70% with respect to avoiding junk food/ unhealthy diet, exercise and meditation. In our study also a significant improvement (20%) was observed in the knowledge regarding hazards of obesity especially with respect to Irregular cycles, Heart disease, Gall stones and Low back ache. In our study the intervention did not show much impact on knowledge regarding preventive measures like adequate duration of brisk walking, jogging etc., except for the cycling, probably be-

cause the base line knowledge was good among our students. The study by Goel S, etal reported that 65.3% students had knowledge about hypertension and 58.3% knew about diabetes as hazards of obesity. Another school based study by Taha AZ et al in Saudi Arabia reported that, less than 50% students knew about the beneficial effects of physical activity in the prevention of heart disease, hypertension and diabetes mellitus.[9] However, in our study students lacked the knowledge regarding role of sedentary activities in obesity, adequate duration of exercise and importance of limiting screen time for prevention of obesity.

Lee et al evaluated the effectiveness of a multicomponent school-based weight management program and study showed improvement in healthy eating habits, controlling unhealthy habits, performing exercise and other physical activities. The study concluded that Health Promotion School approach enhances the knowledge on healthy lifestyles and healthy practices.[10] Another school based study done by Lee et al, used different behavioral modification strategies as intervention (225 minutes education sessions on diet, physical activities, healthy meal plan and printed tips/advices to change knowledge, attitudes and behaviors) similar to our study.[10] The study observed an improvement in dietary habits, positive attitudes towards exercise, a significant reduction in BMI (p = 0.003) and body fat (p = 0.033) among the intervention group compared to control group. The study concluded School based program in supporting individual skills of obese students, is helpful for prevention and control of obesity and will bring positive outcomes. A non-randomized controlled trial was conducted to investigate the effectiveness of a school-based intervention for physical activity among school children, showed a significant reduction in BMI, skin fold thickness and fasting glucose.[11] Another systematic review reported that lifestyle interventions incorporating dietary and exercise components with or without behaviour therapy lead an improvement in weight and cardio-metabolic outcomes among children.[12] Similar attempt was made in our study to know the effectiveness of School based intervention to improve the knowledge regarding lifestyle factors and skills to assess childhood obesity. Our study enhanced the knowledge, skill towards assessment and prevention of obesity and brought positive outcomes in behavior.

Robert et al developed a potential model for primary care and conducted a randomized control trial to compare two models i.e Group lifestyle modification programme [LMP] with Self-Guided LMP (using remainders letters, printed material, etc). Both models were observed and both were effective in reducing the BMI [Group LMP reduction by 1.31%; Self-guided LMP by 1.17%; p (0.92)]. Thus the study demonstrated that, the self-guided LMP offers an innovative, cost effective and potential model for prevention of obesity at primary care level.[13]Our study also used similar self-care model at primary level which was proved to be most effective model and has potential for prevention and control of obesity by empowering school children with the knowledge and skills.

Shabibi et al evaluated the effect of Health Belief based education intervention Model (HBM) to promote the self-care behavior of type II Diabetes Mellitus and he found that, the mean scores of outcomes like perceived benefits, Self-efficacy and self-care behavior increased significantly [12 to 20; (<0.001)] compared to mean scores before the intervention.[14] The study concluded that, health education through HBM promotes the self-care behaviors of patients with type 2 diabetes. Chen etal conducted one of largest national school based multi component intervention study to prevent childhood obesity in Mainland China and similar studies in china have showed change in knowledge, beliefs & attitudes, healthy practices and outcome of metabolic risk factors of obesity and BMI.[15] Similar concept of self-care model intervention was used in our study which demonstrated that school-based lifestyle education with skill modification was more effective and brought huge improvement in behavior. Integration of self-care model as part of health promotion program and modification of school learning environment is one of new strategies which improves the outcome of risk factors of overweight and obesity. The lesson learned from such studies will guide in future, a nationwide school-based program to prevent childhood obesity. Such multi-component self-care model is cost effective and sustainable strategy for management of obesity.

Our study results showed great improvement in knowledge about Risk factors, BMI and self-monitoring skills which significantly differed from control group. The proportion of children having adequate skill score for anthropometric measurements improved from 25% to 98% among study group and mean score improved to 4.6 (0.8) which was highly significant (p<0.01). The students amongst study group attained higher cognitive domains for nutritional/obesity assessment. Among study group (84.6%) majority of students could calculate and interpret the BMI and were able to grade the nutritional status of children and as well as adults. The present school based self-care model is unique of its kind which demonstrated that it empowers school children with the basic health skills and it has long term impact on obesity problem if becomes a part of school curriculum.

Limitations

The study had few limitations. The study could not focus and consider quantitative data on attitude and practices towards the risk factors of obesity because of time constrains. The study could not assess long term effect or sustainability of intervention of a model due to difficulty in adjusting the school schedules for the project. Due to practical reasons we planned a nonrandomized controlled trial and it included heterogeneous base line data from both groups which is another limitation of the study. Hence, the study results cannot be applicable to whole population.

CONCLUSION

One fifth of our study population was overweight and obese. School based self-care intervention model improved the knowledge about the risk factors of obesity among the study group and great improvement was observed with health skill in anthropometric measurement and its interpretation. Thus the study concludes that, School based self-care intervention model is an effective model to promote health and self-care regarding nutritional status and prevention of childhood obesity.

RECOMMENDATIONS

Further the study recommends large scale, systematic randomized controlled study including the attitude and practice components. And study also recommends a pilot study to incorporate the health promotion or self-care model in school curriculum for prevention and control of childhood obesity. The self-care model empowers the children with knowledge & skills which help to assess risk factors among family members and community members; an extended study can be conducted at family and community level.

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