

An Evaluation of Usage of Effective Recommendations in School-Based Nutrition Interventions Conducted in India Between 2010-2021: A Review Paper

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ABSTRACT

Objective: India is currently in early phases of using School-based Nutrition Interventions (SNIs) as a strategy to address Childhood Obesity. Therefore, this study aims to evaluate the effectiveness of SNIs conducted in India, analyse the use of established recommendations for successful SNIs, and identify the minimally used recommendations which may have more impactful results.

Material and Methods: Extensive literature search for SNIs was done using pre-established inclusion criteria through online databases. Eleven recommendations for effective SNIs were also compiled by literature search. The effectiveness of the included SNIs was evaluated as per their significant results. The application of recommendations was then analysed and minimally used recommendations were identified.

Results: None of the SNIs had a significant effect on Body Mass Index. Other outcomes like waist circumference and physical activity were improved. Only four of the eleven recommendations were highly employed by more than 70% of interventions. Rest was minimally used (avg.<35%).

Conclusion: There are currently very few recommendations being used to influence the

health behaviors of Indian children. More interventions need to be planned, using these underutilized efficient strategies.

Keywords: Childhood, Obesity, Overweight, School, Nutrition, Intervention.

INTRODUCTION

In the present world, children and adolescents are facing several health problems due to unhealthy lifestyles and eating habits. Childhood Obesity (CO) is one such consequence of these faulty behaviors. It has reached a level of epidemic all over the world. Globally, the combined prevalence of overweight and obesity has increased from 4% in 1975 to 18% in 2016 in the age group of 5-19 years.^[1] These trends have plateaued in developed countries but are still on a steep rise in developing countries.^[2] In India, 19% of girls & 21% of boys were overweight, and 6.5% of girls & 9% of boys were obese in 2019.^[3]

CO has several health implications like insulin resistance,^[4] hypertension,^[5] cardiovascular diseases, malignancies, obstructive sleep apnea, and orthopedic problems.^[6] It also has psychosocial effects like social discrimination, lower self-esteem,^[7] body image disturbance, and rejection by peers. Many studies have concluded that CO may also track into adulthood^[8] exposing them to a broad

spectrum of metabolic disorders like type 2 diabetes, hypertension, polycystic ovarian syndrome, dyslipidemia, coronary heart disease, etc,^[9] which prevents them from reaching their full potential in life. Also, obesity management in adulthood is complex and often unsuccessful due to already established lifestyle and eating behaviors, which are difficult to modify at this age. Therefore, it is essential to intervene and help at an early stage of life to establish healthy lifestyles and eating behaviors that may persist lifelong.

School-Based Nutrition Interventions (SNIs) are significantly effective in bringing positive behavior changes in children,^[10] primarily when they are based on the recommendations identified for successful interventions like goal setting, positive reinforcement of target behaviors,^[11] use of behavior change techniques,^[12] etc. In India, efforts to combat CO are still in their early stages. Adapting the established recommendations to carry out further interventions to achieve positive behavioral changes in children would be beneficial. Therefore, this study aims to (1) evaluate the effectiveness of SNIs implemented in India between 2010 and 2021, (2) analyze the use of established recommendations for an effective SNI, and (3) discern the recommendations which are minimally used in Indian interventions and must be incorporated in future interventions for more effective and long-lasting results.

MATERIALS & METHODS

Search Strategy for SNIs

An extensive literature search for SNIs conducted in India was done using online databases like Google Scholar, Cochrane, Web-of-Science, CINAHL, Scopus, and PubMed. Any publications that did not populate during the original search were discovered using cross-references from identified papers. Keywords used for the search were: school; nutrition; education; intervention; program; childhood obesity; overweight; children; adolescents; and pediatric.

Inclusion Criteria

Interventions were included in the study based on the following inclusion criteria- (1) primary research (2) interventions conducted in India only; (3) published between 2010 – 2021; (4) intervention implementation in a school setting; (5) subjects must be school students enrolled in kindergarten to XII standard; (6) quantitative study; and (7) publication in English only.

Exclusion Criteria

Interventions focused solely on promoting physical activities without any nutrition intervention were excluded. Studies having clinical components like adolescent hypertension or cardio-metabolic risk were also eliminated. Figure 1 represents the flow diagram of study selection.

Recommendations Search

A literature search was also done for recommendations on successful strategies for effective SNIs using similar online databases. Based on the recommendations, given by Roseman et al and other experts,^[13–18] the authors compiled the following eleven recommendations: (1) targeting specific behavior; (2) behavior change theory-based (3) multicomponent; (4) healthful changes in school's food environment; (5) family involvement; (6) self-assessment; (7) quantitative evaluation measures; (8) community involvement; (9) inclusion of cultural groups; (10) innovative multimedia tools; and (11) sufficient duration and intensity.

Data Extraction

The data extracted from included studies are as follows – author, year of publication, study design, target age group, type of school, sample size, duration of intervention, theories used, follow-up period, outcomes, and location. A summary table was prepared for data extracted from all the studies. To evaluate the effectiveness of the included interventions, the significance of the results was evaluated for each study. A similar study

by Lambrinou et al^[19] guided the scoring procedure.

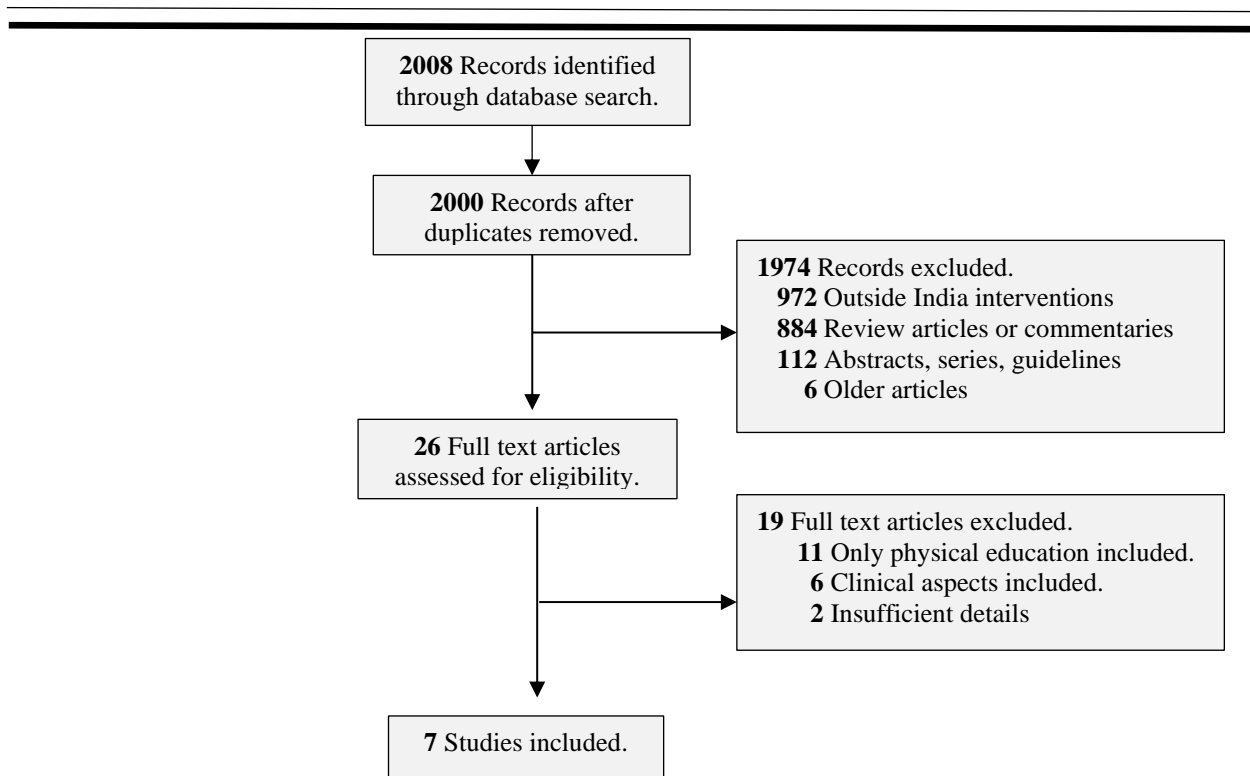
- (+++) significant effect on weight status and/or overweight/obesity or clinical indices.
- (++) significant improvement in the most important target behavior.
- (+) significant improvement in some/few secondary target behaviors
- (-) no effect

The interventions were analysed in-depth to determine whether they are only knowledge-based, only behavior-based, or both. The use of knowledge dissemination only through various modes was considered to be knowledge-based only. The use of behavior-changing components like targeting

environment, involvement of parents or family, interventions based on behavior change theories, and execution of self-improving behavior techniques were considered to be behavior-based. And the use of both components was categorized as Knowledge + Behavior. Family involvement only for imparting knowledge was categorized as knowledge only.

All the included interventions were then examined for the usage of eleven recommendations to assess their quality using frequency method. Interventions were numbered according to the year of publication, the latest being the first and the oldest being the last.

Figure 1. Flow Diagram of Study Selection



RESULT

A total of seven interventions met the inclusion criteria out of the 2008 articles examined. A detailed description of included interventions ^[20-26] is presented in Table 1. Findings are explained below.

Age group. 85.7% of interventions ^[20,21,23-26] focused on adolescents, (10-16 years) studying in grades VI to XI. Only 10.7% ^[22,26]

included children (7-10 years) studying in grades III to V, and none targeted students of kindergarten to II grade.

Type of school. Although two (28.57%) interventions ^[24,25] did not mention the type of schools selected, five (71.4%) ^[20-23,26] included private schools representing middle- and high-income groups, and only three (42.85%) ^[20,21,26] included public

schools representing lower-income groups. But only one intervention [26] represented the results separately for public and private schools.

Evaluation measures. All the interventions used diet, physical activity, and lifestyle pre-post knowledge, attitude, & practice scores as one of the evaluation measures. Anthropometry was the second highest used measure (71.4%). [21-25] Other measures included biochemical analysis (28.6%), [21,25] self-esteem (28.6%), [23,25] and body composition (14.3%). [25]

Knowledge or behavior approach. 75.1% of interventions [20,21,23,25] used a combined approach of knowledge and behavior. Two interventions [24,26] (14.3%) were entirely knowledge-based. Although an intervention [22] planned knowledge dissemination along with a behavior change approach, the classes were discontinued due to academic pressure.

Effectiveness Assessment. Only one intervention [23] showed a significant reduction in body mass index. 71.4% of interventions [20-22,25,26] had significant improvement in the most important target behaviors like knowledge, attitude & practice scores, mid-upper arm circumference, waist circumference, and waist-hip ratio. One intervention [24] presented its results only in percentage.

Recommendations Usage. Figure 2 represents the analysis of the use of eleven recommendations for school-based nutrition interventions. Four recommendations were highly used by more than 70% of interventions namely the quantitative evaluation measures (100%), sufficient duration and intensity (85.7%), multi-component (71.4%), and family involvement (71.4%). Healthful changes in school's food environment were employed by 42.9% of interventions. None of the interventions used community involvement and the inclusion of cultural groups as a component. The least used recommendations were targeting specific behaviors and the use of behavior change theories (14.3%). Table 2 shows the employment of multiple components by various interventions.

DISCUSSION

This review aimed to evaluate the effectiveness of SNIs conducted in India between 2010 to 2021, analyze the application of established recommendations for successful interventions in those SNIs, and narrow down the minimally used recommendations which must be integrated into future interventions for more effective results.

Presently, very limited studies are available which describe the aforementioned aspects of SNIs in India. Firstly, the potential of SNIs has not been fully explored in India as the number of SNIs conducted here is very low, and secondly, the ones which are conducted do not have very promising results. All of the included interventions had an effect on a few outcomes but were unable to reduce weight and BMI levels which are the actual parameters of overweight and obesity. Nonetheless, Waist circumference was improved in several interventions, demonstrating the potential promising effects of these SNIs if the duration and intensity [27] of these interventions are increased. The content of classroom nutrition education must also include the ways to deal with the cravings of eating unhealthily. Also, The SNIs will have a greater impact, if they are started at primary ages rather than adolescent age as behaviors are learned, reinforced, and solidified during childhood [28] and it is very taxing to change lifestyle habits once they are fully established. [29]

Perhaps from the perspective that obesity is more prevalent in high-socioeconomic-status (SES) families with children attending private schools, more interventions have included high-SES schools. However, low-SES children are nearly twice as likely as high-SES children to be obese [30] because their financial hardships make it difficult for them to purchase healthy diets. So, to gain a complete view of the current situation and help them develop healthy behaviors, SNIs are advised to include public sector schools as well and curate the content as per their resources.

Table 1-1. Study Components of School-based Nutrition Interventions conducted in India between 2010 to 2021

Author	Code	Year	Study Design	Target Age Group (yrs.) & Grade	Type of School		Sample Size	Duration		Follow up	Theory Based	Approach (K/B)	Location
					Public School	Private School		Total	Classroom NE				
Moitra et al. ²⁰	1	2021	Cluster-Randomized Controlled Trial	10-12 yrs. Grade – VI & VII	Yes	Yes	428 students Four schools	12 weeks	55 min per week	2 months	Yes Health Belief Model	K+B	Mumbai
Thakur et al. ²¹	2	2016	Cluster-Randomized Controlled trial	Age group - NM Grade- VIII - IX	Yes	Yes	462 students Four schools	20 weeks	One session every 15 days	12 months	No	K+B	Chandigarh
Bhave et al. ²²	3	2016	Cohort Non-Randomized Controlled trial	7.7-9.6 yrs. Grade- III-IV 12.1-15yrs. VIII-IX	No	Yes	865 students Two schools	5yrs.	60 min per week (Not sustained due to academic pressure)	NM	No	B	Pune, Nasik
Nayak & Bhat ²³	4	2016	Randomized Controlled Trial	10-16 yrs. Grade – NM Obese Children	No	Yes	194 students Obese students Ten schools	Six months	NM	NM	No	K+B	Karnataka
Mani ²⁴	5	2011	Non-Randomized Controlled trial	Age group - NM Grade - VI-XII	NM	NM	224 students Two schools	Six months	NM	NM	No	K	Vadodara
Singhal et al. ²⁵	6	2010	Randomized Controlled trial	15-17 yrs. Grade - XI	NM	NM	192 students Two schools	Six months	First 10 weeks - 30 min lectures per week in batches of 30 next 8 weeks – 30 min activities for 5 days per week.	6 months	No	K+B	North India
Shah et al. ²⁶	7	2010	Randomized uncontrolled trial	8-18yrs. Grade – III- XII	Yes	Yes	3128 students 30 schools	Six months	60 min per week	NM	No	K	New Delhi, Agra, Jaipur

Abbreviation: NM, not mentioned; K, knowledge; B, behavior

Table 1-2. Results, Conclusions, and Quality Assessment of School-based Nutrition Interventions conducted in India between 2010 to 2021

Code	Aim of Intervention	Outcomes	Intervention	Results	Effectiveness Assessment	Conclusion of Intervention
1.	Evaluation of changes in KAP related to eating habits and activity levels.	Knowledge Attitude Dietary Practices Activity Practices	Development of theory-driven workbook, weekly classroom-based NE with audio-visual aids, games, and role-plays; parents' education; physical activity sessions; self-record activity diaries; food monitors in class; health promotion material display.	Overall improved KAP ($p < 0.001$). Greater improvement in aided schools than in private schools. Higher improvement in girls than boys.	(++)	Adding 50 min per week of NE into the academic timetable can have positive effects on the knowledge, attitudes, and health behaviors of adolescents.
2.	Examining the impact of a 20-week multicomponent lifestyle intervention on anthropometric, biochemical, and behavioral parameters.	Anthropometry Biochemical Dietary parameters Physical Activities	Fortnight classroom-based NE with audio-visual aids; self-record diaries; daily physical activity; school canteen menu change; reduced TV viewing; involvement of teachers and parents; health promotion material display; physical activity measurement using pedometers.	Anthropometry: Sig. decrease in weight ($p=0.048$) MUAC ($p=0.002$), WC ($p=0.01$) & SFT ($p<0.001$) but not in BMI. Biochemical: No sig. change Dietary: Sig. reduction in energy ($p=0.02$) and fat ($p=0.01$) intake. Physical activities: No sig. change in total METs but sig. increase in transport-related METs ($p=0.001$).	(++)	Multiple stakeholders should be included in decision-making. Long-term interventions are needed. Follow-ups are recommended. Multicomponent interventions are needed
3.	Evaluation of program targeting increased in-school physical activity, Improve diet at school, introduction of health education program.	Anthropometry Physical fitness Diet Lifestyle indicators	Increased in-school PE sessions; making PE scoring subject; teachers training to engage children in yoga; attractive physical activity sessions on holidays (Bollywood dancing); changes in school kitchen menu- increasing fruit and vegetable content of lunches; banning fast food hawkers; classroom-based NE; newsletters; fun activities.	Anthropometry: No sig. reduction in BMI but sig. reduction in WC ($p=0.05$) in one group. Physical fitness: Sig. improvement in some fitness tests, not all (sit-ups, long jump & sprint). Diet: Sig. improvement in fruit intake ($p=0.005$). Lifestyle indicators: Sig. reduction in television viewing hours ($p=0.03$), and sig. improvement in active play ($p<0.001$)	(++)	Intervene in childhood to increase physical activity and improve dietary behavior. Interventions need to be tailored to individual contexts. Intervention must be attractive to children. There is a need for standardized physical tests. Teachers should involve all children and make activities interactive.
4.	Development and evaluation of multicomponent intervention with the aim of	Anthropometry Lifestyle Practices Self Esteem	Information booklets for children and parents; physical activity by aerobic sessions;	Anthropometry: Sig. reduction in BMI ($p=0.34$, and SFT ($p<0.001$) Lifestyle practices: & Self-esteem	(+++)	Long-term aerobic exercise with the education of parents and children is important to

	reducing body fat, improving lifestyle practices & improving self-esteem of obese children.		classroom-based NE in the sequence of a quiz, snake and ladder game, and group discussions.	Sig. improved lifestyle practices (p=0.009) Self-esteem: Sig. improvement in self-esteem (p<0.001).		control obesity in children. Diet control and vigorous exercise for 20 min per day are necessary to reduce excess fat and maintain body fat.
5.	Evaluation of the effect of health promotion program to manage childhood obesity.	Anthropometry KAP Diet Activity (Only percentages were calculated)	Classroom-based NE with audio-visual aids; health promotion material display; skits, and discussions. Games like a maze, grid, crossword puzzle, and jumbled words for retention evaluation.	Anthropometry: No sig. changes in BMI, and WC. KAP: A slight improvement in knowledge Diet & Activity: No sig. change in Energy intake and expenditure	(-)	Longer duration interventions are required. More extensive and exhaustive interventions are required with frequent reinforcement sessions. These interventions need to be a part of the curriculum. Physical training must be made compulsory and should be evaluated as part of academic performance.
6.	Assessing the effectiveness of low-cost nutrition and lifestyle education intervention on behavior modification and risk profile	Anthropometry Body Composition KAP Biochemical Body image Self esteem	Classroom-based NE through lectures & FGD; Physical Activity promotion by providing ways to increase physical activity. Health activities such as quizzes, extempore, daily diet planning for themselves; individual counseling; school canteen menu change; health camp for teachers and parents, and training of student volunteers to sustain the program.	Anthropometry: No sig. change in BMI, but sig. reduction in WC (p=0.02), SAD (p<0.001) and WHR (p=0.02). Body Composition: No sig. change in BCA. Biochemical: Sig. improvement in FBG (p<0.001), triglyceride (p<0.001). Knowledge: Sig. increase in knowledge about few aspects. Diet: Non sig. improvement in dietary intake. Lifestyle practices: Sig. improvement in various lifestyle practices. Attitude: Sig. improvement in attitude about fatty food consumption. Body image & Self-esteem: Non sig. improvement.	(++)	Intervention programs can motivate adolescents to a positive behavioral change. Appropriate policy changes, and involvement of parents and teachers are necessary. Government should implement such interventions countrywide
7.	assess the impact of an education intervention on health and nutrition-related knowledge and behaviour	Knowledge and behaviour	Age-appropriate classroom-based NE for three different age groups using audio-visual aids, creative activities;	Sig. improvement in knowledge and behavior (p<0.05) in the order – teachers > parents > 15-18 years	(++)	Education intervention has a significant impact on knowledge and behavior. It is important to start early.

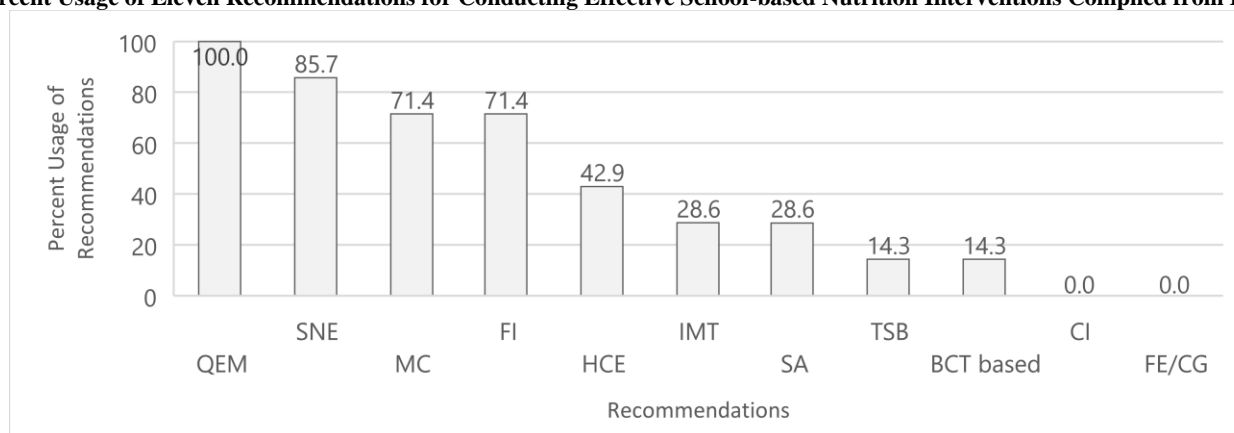
			interactive discussions; education modules for parents & teachers; take-home booklets	children > 12-14 years children > 8-11 years		Parents' and teachers' participation must be there. Emphasizing fun ways to achieve a healthy lifestyle.
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Abbreviation: KAP, knowledge, attitude & practice; NE, nutrition education; PE, physical education; BMI, body mass index; WC, waist circumference; HC, hip circumference; WHR, waist-hip ratio; WTR, waist thigh ratio; MUAC, mid-upper arm circumference; WHtR, waist height ratio; SFT, skin fold thickness; METs, metabolic equivalents; HDL, high-density lipoprotein; LDL, low-density lipoprotein; FBG, fasting blood sugar; HDL-c, high-density lipoprotein cholesterol; FFQ, food frequency questionnaire; BCA, body composition analysis; FFT, fitness & flexibility test; PE, physical education; sig, significant; FGD, focus group discussions; SAD, sagittal abdominal diameter.

Table 2: Usage of Multiple Components by School-based Nutrition Interventions Conducted in India between 2010 to 2021

Code	Foodservice	Classroom Nutrition Education	Physical activity	Parental involvement	Peer involvement	Incentives	School-level policy change	Barrier identification
1.	×	✓	✓	✓	✓	×	×	✓
2.	✓	✓	✓	✓	×	×	✓	×
3.	✓	×	✓	×	×	×	✓	×
4.	×	✓	✓	✓	×	×	×	×
5.	×	✓	×	×	×	×	×	×
6.	✓	✓	✓	✓	✓	×	✓	×
7.	×	✓	×	✓	×	×	×	×

Figure 2: Percent Usage of Eleven Recommendations for Conducting Effective School-based Nutrition Interventions Compiled from Literature Search



Abbreviation: QEM, quantitative evaluation measures; SNE, sufficient duration, and intensity (at least six months); MC, multi-component; FI, family involvement; HCE, healthful changes in school’s food environment; IMT, innovative multimedia technology; SA, self-assessment; TSB, target specific behavior; BCT, behavior change theory; CI, community involvement; FE/CG, focus on cultural group

Follow-up is an essential part of an intervention to determine whether it has accomplished its objectives and to evaluate why successful interventions have succeeded.^[31] In the present context, without follow-up, it would be impossible to determine whether an intervention had genuinely improved long-term health behaviors. Therefore, every intervention must follow up after a certain period.

The following recommendations are found to be used minimally after assessing the utilization of eleven recommendations.

1.Targeting Specific Behaviors. Several reviews conclude that nutrition intervention is more likely to have positive effects when it focuses on specific behavior rather than mere knowledge dissemination^[17,31,32] and broadly promotes healthy eating in general. For example, increasing fruit intake, reducing junk food intake, or reducing screen time, etc. The present analysis proves that this recommendation is minimally explored by Indian interventions. To identify specific behaviors, interventions must first survey the perceived barriers that prevent students from eating healthily. Taste, lack of time, screen addiction, non-availability of healthy foods in school canteens, and boredom eating^[33,34] are a few of the barriers perceived by students in Indian schools.

2.Behavior Change Theory. Based. According to a comprehensive review, nutrition education interventions are most effective if based on suitable behavior change theory.^[35] In the present study, only one intervention was based on Health Belief Model.^[20] None of the other interventions mentioned the use of any behavior change theory as a basis for building the intervention. This is an avenue that must be explicitly explored in Indian interventions, as theories provide a direction for effective behavior change^[36] rather than focusing on it naively without understanding underlying notions. Working with a specific age group with the most suitable BCT will have much more efficient results.

3.Healthful Changes in the School's Food Environment. Healthful changes in the

school food environment here refer to any permanent policy-level changes (for the whole duration of the intervention) implied in existing food-providing / eating systems of the school. In the current analysis, less than half of the interventions have incorporated this recommendation. Two interventions focused on menu change in the school canteen by replacing high-calorie foods with healthy Indian meals. One intervention was held at a meal-serving school, therefore, the school kitchen staff was trained to prepare more nutritious food options with increased amounts of fruits and vegetables. There is an evident positive association between a modified school food environment and student food behavior in and outside school.^[37] This recommendation is less commonly used because canteens in Indian schools are generally outsourced to caterers, who provide cheap items with the highest profit margins. Second, in-school lunch provision is not widely practiced in India. Parents still prefer to pack their children's lunch boxes. But Children who do not bring lunch boxes from their homes are dependent on the food available in the canteens. Therefore, making healthful changes in the school's food environment is an important step in creating an atmosphere that delivers healthy food. Another helpful alternative for feeding children healthy diets is to provide nutritionally calculated lunches at school.

4.Self-Assessment. Student self-assessment is a great tool that improves motivation, engagement, and learning.^[38] The student monitors his development and seeks to outperform his own goals^[39,40] In the nutrition program context, these tools include food frequency questionnaires, logs, food diaries, activity diaries, etc. through which they can evaluate their own health behaviors. This review suggests a minimum usage of this recommendation. Self-recorded activity diaries and food diaries^[20,21] were the used forms of self-assessment strategy. Student self-assessment is an effective tool, mainly for adolescents, to influence self-decision-making and make healthy changes

in self-behavior, therefore it must be explored more.

5. Community Involvement. Community involvement is defined by Roseman et al^[17] as “public and private businesses, organizations, and individuals involved in a school-based program that did not have a common association or routine involvement with the school.” In the current study, none of the interventions incorporated any form of community participation. This promising approach must be used to cement the nutrition concept and grasp its real-world impact on one’s life.^[41] Interactions with doctors, athletes, cooks, gym trainers, health experts, and other professionals shall affect student health behavior.

6. Inclusion of Cultural Group. None of the interventions focused on specific cultural groups. Instead, the whole school population was considered together. Targeting cultural groups is the need in nutrition education for children.^[28] It may prove effective in framing culture-based strategies as culture plays a vital role in setting eating beliefs in one’s life. Though it is a difficult task to differentiate cultural groups in a school setup where all communities study together, community interventions may play a part here or various healthy and unhealthy foods may be discussed in classroom education sessions and individually in one-on-one sessions with parents.

7. Innovative Multimedia Technology. Although reducing screen time is essential for increasing active time pursuits for children. But in the present world, multimedia is an undeniable part of children’s life. Innovative multimedia technology enhances children’s engagement as they are very well-versed and quickly adapt to the technology.^[41] Among all, only two interventions used multimedia technology in the form of PowerPoint presentations.^[24,26] The rest of them were based on traditional ways of teaching. Our brain prefers vivid pictures over simple words.^[42] Consequently, traditional teaching approaches cause students to become quickly bored and unable to concentrate for extended

periods of time. The brain understands much more swiftly and easily with revolutionary multimedia technology.^[43] As a result, these new technologies must be employed to educate children. Innovative uses of multimedia technology may include videos, animated stories, health-tracking apps, children’s health status updates on parent-facing apps, and so on.

8. Family Involvement. Family has a direct influence in shaping the dietary and lifestyle behaviors of children.^[44] Several studies have concluded that involving parents/family can positively impact children’s health behaviors.^[45-51] In agreement with the results of other studies, this analysis also represents a high usage of this recommendation. However, parents were only involved in one or two sessions in all of the included Indian SNIs. None of the interventions involved them as active participants in the intervention. Family is the children’s first school, and they adopt most of their habits from them. Engaging families more actively, such as conducting physical activity sessions with families or accompanying families with children to grocery shopping to teach label reading, are a few promising avenues for targeting their child’s health behaviors.

CONCLUSION

The findings of this analysis imply that long-term SNIs should be more widely implemented in Indian schools for both public and private sectors, in order to enhance children’s health behaviors and, ultimately their health status. Rather, it would be more beneficial to state that every Indian school must have a policy of promoting healthy eating and lifestyle through the implementation of such SNIs throughout the session for all age groups.

Also, to have a greater impact, the following recommendations must be included in those SNIs which are barely used in Indian interventions to date.

- Behavior Change Theory-based
- Targeting specific behavior

- Healthful changes in the school's food environment
- Self-assessment
- Community Involvement
- Cultural Group
- Innovative multimedia technology

It is vital to concentrate on the escalating obesity epidemic that is raging across India. If action is not taken now, the country's upcoming workforce will grow ill and not attain their full potential, as many adult morbidities are sown in childhood.^[52] SNIs are a promising approach to combat CO. However, the number of robust randomized controlled trials on CO completed over a ten-year period is extremely low. Therefore, more and more good quality interventions are required in both private and public schools. Researchers, particularly in India, must use underutilized recommendations offered in this review to have a long-term impact on the health behaviors of children ultimately affecting their health status.

Declaration by Authors

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