Cureus
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Open Access Original Article

Effect and Impact of School Snacking Policy on Snacking Behaviour and Dental Caries Among Children in Chennai City: A Cross-Sectional Study

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Review began 09/06/2026
Review ended 10/27/2026
Published 10/28/2026

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DOI: 10.7759/cureus.118743

Abstract

Aim: The study was planned to assess the effect and impact of snacking policies on snacking behaviour and caries experience among school-going children in Chennai city.

Material and methods: An exploratory cross-sectional survey was conducted to assess the existence of snacking policies among schools in Chennai city. Following the results of the survey, the schools were categorized into schools with and without a snacking policy. The effect and impact of the policy were assessed cross-sectionally among the upper kindergarten and fourth-grade children, respectively. The effect of the snacking policy was assessed by inspecting the snack boxes of the upper kindergarten children (N=207) and (N=80). The impact of the snacking policy was assessed among fourth graders through the child's food preference, snacking behaviour in the home environment, and caries experience, along with snack box inspection (N=136) and (N=70). The data was collected and statistically assessed using the chi-square and Mann-Whitney tests.

Results: A statistically significant difference ($p \leqslant 0.01$) was found between the snack boxes of fourth-grade children enrolled in schools with policy. Children studying in schools with policy had healthier food choices. The number needed to be exposed to a protective factor (NNE_p) in relation to the effect and impact of the policy after six years was 10 and 6, respectively. Statistically, no significant difference was noted in caries experience.

Conclusions: The implementation of a snacking policy in schools can positively influence the snacking behaviour and food preference of the school children, and more actions should be taken by the stakeholders to improve the oral health of school children.

Categories: Public Health, Pediatrics, Dentistry
Keywords: dental caries, school children, school snacking policy, snacking behaviour, the common risk factor approach

Introduction

Dental caries is one of the most prevalent non-communicable conditions affecting children worldwide [1]. According to WHO, the global prevalence of caries affecting deciduous and permanent teeth was 42.71% and 28.70%, respectively [2]. In India, various state-level surveys have estimated that the prevalence of dental caries among children was between 50-80% [3-5]. The negative impact of dental caries on the affected children as well as the family has been documented. While the affected children suffer majorly from pain, compromised esthetics, functional disability and social dysfunction, their parents undergo emotional and financial stress owing to their child's condition [6,7].

The common risk factor approach proposes that controlling a small number of risk factors that affect general health may have a major impact on the control of specific oral diseases at lower cost [8]. One such common risk factor which has a profound influence on general health as well as oral health is diet. Non-communicable diseases of health and oral health have unhealthy dietary behaviour as a common link [9-12]. The dietary habit of consuming food and drinks between main meals is known as "snacking". Despite being a means of meeting the daily nutritional recommendations among children and adolescents, snacking also increases the calorie intake between meals and is often associated with adverse oral health outcomes [13,14]. There exists a dose-response relationship between exposure to sugar and progression of dental caries [15]. Cross-sectional studies have substantiated the association of snacking on sticky foods or food rich in sugars as a risk indicator for the development of dental caries [14-16]. Consumption of these snacks between meals is thus associated with high caries levels among school children.

School is an important setting where unchanging beliefs, attitudes and skills of children are developed; hence it is wise to inculcate and reinforce healthy dietary and snacking behaviour to school children. A

systematic review concluded that children studying in schools which have adopted food environment policies have higher servings of fruits and vegetables and reduced servings of sweetened beverages and unhealthy snacks. However, they concluded that the impact of such policies on metabolic risks of non-communicable diseases such as coronary heart disease and obesity needs further investigation [17].

Literature search exhibits dietary behaviour change among school children following a dietary intervention. For instance, with respect to oral health, dietary intervention of reduced consumption of sugary snacks coupled with oral hygiene intervention positively influenced dietary behaviour with an absolute risk reduction of early childhood caries by 20% when compared to oral hygiene intervention alone among three-to-five-year-old underprivileged school children in India [18]. Similarly, a Finnish study reported that dietary intervention at school improved the consumption of warm meals and water among school children along with remineralization of incipient lesions [19]. However, literature on the influence of healthy dietary policy at the school level on oral health is sparse and warrants further exploration. The lone study that has documented the preventive effect of "Low sugar nutrition policy" in a school setting was conducted in Auckland for a period of seven years, which reported preventing the occurrence of 20 caries lesions per year with a preventive fraction of 0.37 [20].

Indicative findings show a growing trend of implementing school snacking policy (SSP) as a midstream approach in Indian schools in the past decade. Although it is implemented in schools with the objective of improving general health, according to the common risk factor approach, such a policy is likely to have oral health benefits in the long term and improved parental adherence to the policy as a short-term effect which has not been inquired so far. Hence this cross-sectional exploratory study was planned to assess the effect and impact of SSP on snacking behaviour and prevalence of dental caries, respectively, among school-going children in Chennai city, India.

Materials And Methods

An exploratory cross-sectional study was conducted to assess the existence of SSP among schools in Chennai city, India. The effect and impact of the SSP policy on snacking behaviour and dental caries, respectively, were assessed. The list of schools in Chennai city was obtained from the office of the Deputy Director of Public Instruction (DDP). For administrative reasons, schools in Chennai city are segregated into five zones (north and south, east, and west, central) by the DDP. From the sample frame 20 schools (only private and government-aided schools) were randomly selected using a computer-generated sequence from each zone obtaining a total of N=100. After obtaining prior appointment from a total of 100 schools, an interview was conducted by the principal investigator (MB) with the head of the selected schools. Details pertaining to the existence of SSP, method of its implementation, monitoring, reinforcement, and challenges in implementation were collected during the interview using a closed-ended questionnaire (Appendix 1). The questionnaire was subjected to content validation. Based on the above survey, the schools satisfying the operation benchmarks such as Existence of SSP: the existence of a snacking policy in school for more than a year; Communication and Reinforcement Channels: The policy must be explicitly communicated with parents through any one of the school's communication platforms such as student diary or handbook, official website or online circulars; Actions suggested: to limit processed, packaged and unhealthy snacks on campus were categorized as schools having a snacking policy. Following the assessment of SSP, a multistage random sampling technique was employed to assess the effect and impact of the policy; four schools having a snacking policy for more than six years and one school without a snacking policy were each randomly selected. From each school four upper kindergarten sections and four sections from fourth grade were randomly selected and all eligible children were identified and included in the study (Figure *1*). This study was conducted from September 2021 to August 2022.

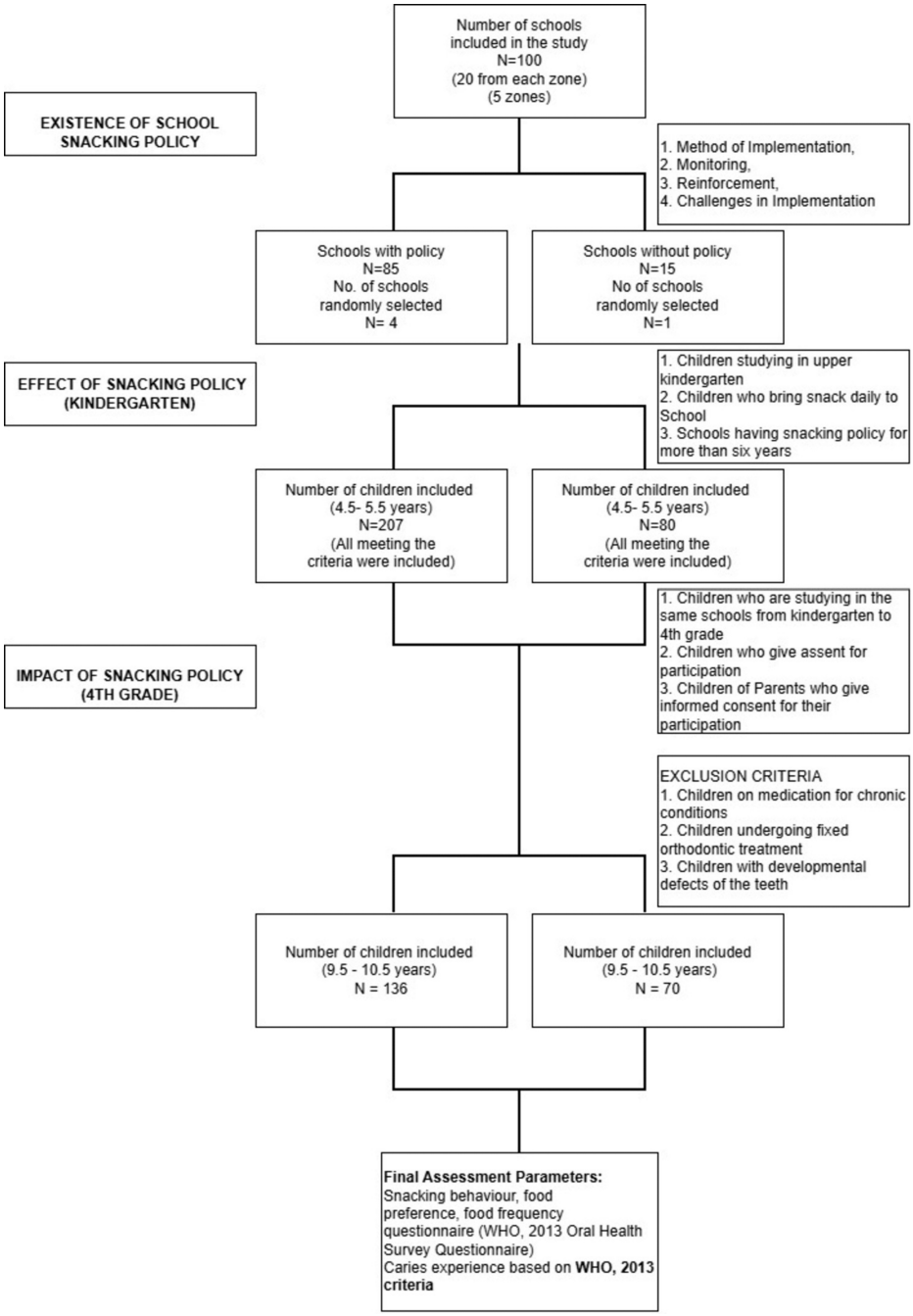


FIGURE 1: Flow chart

WHO 2013 [21]

Methodology for assessing the effect of snacking policy

Effect of SSP on snacking behaviour was assessed in a cross-sectional manner among children studying in upper kindergarten (4.5- 5.5 years old), i.e., comparison group based on the compliance of the parents to SSP. Schools having a snacking policy for more than or equal to six years, children studied in the same school from pre-kindergarten and who have the habit of bringing snacks to school and whose parents gave informed consent were deemed eligible for the study. Parental consent and child's assent to participate in the study were obtained at least one week prior to the inspection of the snack box. Secrecy on the actual day of inspecting the snack box was maintained to record the compliance of the parents with the SSP. The examiner was blinded to the SSP of the school.

A total of 207 children from schools with SSP and 80 children from schools without SSP were included. Prior to the morning recess, the snack box of the selected children was opened, and snacks brought were recorded with sufficient description. The snacks were categorized as healthy and unhealthy based on "snacking

recommendation worldwide" [22], modified to Indian snacking (Table *1*) based on the operational definition adopted for snacking. If mixed snacks were brought based on the quantity, type of food, and its nutritive value, they were categorized as healthy or unhealthy.

Snacks to Promote	Snacks to Limit
Fresh fruits and vegetables	Dried fruits and vegetables (with added sugar or salt)
Nuts- plain, and dates	Nuts- salted
Fresh juices without added sugar	Biscuits, cake, buns, pastries
Boiled sundal and channa varieties	Fresh juices with added sugar and packaged fresh juices
Starchy foods (e.g., flat wheat bread stuffed with vegetables, paneer, plain popcorn), millet-based noodles, makhana	Potato chips, bread with jam and butter, makhana with added sugar
Jaggery- Peanut chikki, kozukattai (steamed rice balls stuffed with peanut, sesame seeds or shredded coconut mixed with jaggery)	Chocolate/candies/sweets, oil-fried: thattai, murukku, mixture, samosa.

TABLE 1: Classification of healthy and unhealthy snack

A snack box item is defined as any solid, semi-solid, or liquid food packed by the parents for their children to consume at mid-morning recess apart from their breakfast and lunch. A healthy snack is operationally defined as wholesome foods that are nutrient-dense (fruits, vegetables, nuts, fruit juices, etc.), having low fat, zero added refined sugar, and low salt, providing essential dietary fiber, protein, and micronutrients.

Methodology for assessing the impact of snacking policy

The impact of the SSP on snacking behaviour and prevalence of dental caries was assessed among children studying in fourth grade (9.5 - 10.5 years), i.e., the comparison group. Only schools that implemented SSP for a minimum duration of the past six years were selected. In these schools, children were included if they had studied in the same school from lower kindergarten to fourth grade (and hence were exposed to SSP for six years), had parental consent and gave assent for undergoing oral examination. Children under orthodontic treatment and having developmental defects on their teeth were excluded.

A total of 136 children from schools with SSP and 70 children from schools without SSP were included. Apart from recording the type of snacks brought to school (healthy or unhealthy), the impact of SSP on food preference was assessed pictorially. A pictorial representation of healthy and unhealthy food choices was given to report their preference. Scores of +1 and -1 were given for healthy and unhealthy options, respectively. Hence, the maximum possible score was +5 and the least possible score was -5. A higher score represented more favourable snacking preferences. This questionnaire was developed and implemented in the present study based on the existing literature (Appendix 2) [23]. Further, the snacking behaviour of the child at home was assessed using the Food Frequency Questionnaire (WHO, 2013 Oral health survey questionnaire) [21], which was customized to South Indian and completed by the parents of the included children (Appendix 3). The questionnaire used in this study was subjected to content validation. The content validity index (CVI) and intra-class correlation (ICC) were used to check the reliability. Dental caries was diagnosed based on WHO 2013 criteria using a mouth mirror and ball-ended probe. The examination was carried out in daylight, and children were made to sit in the ordinary chair with a headrest and the examination was carried out under natural lighting conditions in their respective classrooms.

Sample size and statistical power analysis

An a priori sample size evaluation was done using G*Power software version 3.1 with a statistical alpha value of 0.05 and a statistical power (1-β) of 0.80. For assessing the effect of snacking policy involving categorical cross-tabulations via a chi-square test of independence, the final sample size of 287, Group (n=207) and Comparison Group (n=80) with allocation ratio (2.59) possesses sufficient statistical utility to reliably detect a small-to-medium operational effect size (w=0.165). For assessing the impact of SSP on dental caries involving a two-tailed chi-square test of significance, the final sample size of 206, the group (n=136) and the comparison group (n=70) with an allocation ratio (1.94), is found to be reliable between small and medium effect size (Cohen's w = 0.195).

Data management and statistical analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS version 19; IBM, Armonk,

NY, USA). Following descriptive analysis, Chi square test was used to assess the difference in snacking behaviour and prevalence of dental caries between children studying in schools with and without SSP. Mann-Whitney test was used to compare food preferences. A binary logistic regression model was constructed to control for potential confounding variables for dental caries. A p-value <0.05 was set as the significance level. The practical significance of the findings was tested in terms of the number needed to be exposed to a protective factor (NNE_p).

Results

Validation of the questionnaire

Following the validation of the questionnaire assessing the existence of SSP, food preference and food frequency questionnaire the CVI-S scores obtained were 0.90, 0.88 and 0.95, respectively. The questionnaires related to the existence of SSP and food frequency were checked for theirreliability. ICC scores of 0.92 (CI: 0.80-0.92 P≤0.001) and 0.99 (CI: 0.97-0.99, P≤0.001) were obtained.

Status of school snacking policy in Chennai city, India

Of the total 100 schools selected in Chennai city, 85 schools (85%) had SSP with an average implementation period of 7.6±7.7 years. Information on the methods of implementation of the snacking policy, its monitoring, reinforcement, and challenges in implementation is given in Table *2*.

Characteristics	N (%) Mean ± SD
Snacking Policy	-
with policy	100(85%)
without policy	100(15%)
Nature of policy	-
Group 1	28(32.9%)
Group 2	39(45.9%)
Group 3	18(21.2%)
Levels of Implementation	-
Only to Kindergarten	12(14.1%)
Up to primary class	58(68.2%)
Up to secondary class	15(17.7%)
Reinforcement	-
Sending remainders (yes)	76 (89.4%)
Sending remainders (No)	9(10.6%)
School dairy	5(6.6%)
Direct communication	40(52.6%)
Digital platform	4(5.3%)
Multiple modes of communication	27(35.5%)
Intervals for reinforcement	-
Once a month	15(19.7%)
Once in three months	19(25%)
Once every six months	6(7.9%)
Once in a year	36(47.4%)
Monitoring	-
Yes	83(97.6%)
No	2(2.4%)

TABLE 2: Descriptive table on the existence of snacking policy among schools in Chennai

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Effect of SSP among upper kindergarten children

Although the prevalence of children bringing healthy snacks was 11% higher in schools with SSP compared to those without, this difference was not statistically significant (Table *3*). The control event rate (CER) was 0.49 while that of experiment event rate (EER) was 0.38, with an absolute risk reduction (ARR) of 0.11. The NNE_p is given as the reciprocal of ARR and hence was found to be 10. Thus, 10 children should be exposed to SSP for one child to bring healthy snacks to school.

Variable	with policy	without policy	P-value	Test statistics
[+]Snacking behaviour among children 9.5-10.5 years old.	-	-	-	χ^2 Value
Healthy N (%)	82(60.3%)	30(42.9%)	0.01*	5.664[a]
Unhealthy N (%)	54(39.7%)	40(57.1%)		
[+]Caries experience	-	-	-	χ^2 Value
Caries free	85(62.5%)	47(67.1%)	0.51	0.433[a]
With caries	51(37.5%)	23(32.9%)		
[++]Food preference	-	-	-	Z Value
Healthy food preference (Median ± IQR (q1- q3))	3.0±2 (1-3)	1.0±2.5 (0.5-3)	0.19	-1.293
[+]Snacking frequency at home ([+]Never consumed food items)	-	-	-	χ^2 Value
Fresh fruits and vegetables	0.8%	1.6%	0.04*	11.359[a]
Bread with jam and butter	31.1%	21.9%	0.03*	12.408[a]
Cooked peas	13.1%	23.4%	0.03*	11.809[a]
[+]Snacking behaviour among children 4.5-5.5 years old.	-	-	-	χ^2 Value
Healthy N (%)	129(62.3%)	41(51.2%)	0.08	2.928[a]
Unhealthy N (%)	78(37.7%)	39(48.8%)		

TABLE 3: Effect and impact of the SSP

SSP: school snacking policy

+Chi square test

++Mann-Whitney Test

p<0.05 is considered to be statistically significant

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Impact of SSP on fourth-grade children

The prevalence of bringing healthy snacks was higher among children enrolled in schools having SSP when compared to children enrolled in schools without SSP and the difference was statistically significant. The CER was 0.57 while EER was 0.4 with an ARR of 0.17 and NNE_p of 6. Thus, six children should be exposed to SSP for duration of six years for one child to bring healthy snacks to school.

More frequent consumption of healthy snacks like fruits and cooked peas and less frequent consumption of unhealthy snacks like bread, butter, and jam at home were noted among children studying in school with SSP when compared to children studying in school without SSP and this difference was found to be statistically significant (Table *3*). However, no difference was noted in the frequency of consuming other snacks such as Indian savouries, biscuits, chocolates, and ice creams at home. No difference was found in the snacking preference or prevalence of dental caries among children studying in schools with and without SSP. After adjusting for potential confounders such as oral hygiene, diet, and dental attendance, no statistically significant association was noted between SSP and dental caries (adjusted odds ratio (AOR) = 1.012, 95% CI (0.529, 1.937), p = .971).

Discussion

Since diet is a common connector for health and oral health, health policies are the best practice by which oral health promotion can be achieved for a wider population in an efficient manner. In a country like India, which is rapidly adopting Western culture, the dietary and snacking patterns of children and adolescents have also changed drastically. Policies implemented to improve consumption of fruits, vegetables and water

at various settings have been found to be effective in achieving the targeted goals. In the wake of such change, a formal enquiry on the oral health benefits of SSP in terms of snacking behaviour as well as dental caries needs to be explored.

In order to encourage children from disadvantaged backgrounds to attend school regularly, help them attain formal education and to provide nutrition to the underfed and undernourished children in Tamil Nadu, India, the government of Tamil Nadu has implemented a nutrition-based scheme called “Puratchi Thalaivar MGR - Nutritious Meal Programme” among state-run schools and aided schools in Tamil Nadu. The children were provided with a breakfast and lunch meal in schools based on the dietary chart created to meet the nutritional benchmark [24]. Historically, schools run by the government usually cater to families belonging to a low socio-economic class or living below the poverty line. Consequently, the possibility of children in these schools bringing snacks regularly to school is very thin. Hence, government schools were not included in the study. While 85% of the schools claim to have a snacking policy, and though these policies have been implemented in schools for a minimum of one year to a maximum of 15 years, the methods of implementation, monitoring, and reinforcement remain a matter of concern. This study, being exploratory in nature, had the scope to identify drastic differences in the manner in which the SSP was implemented in the school setting. While some schools clearly mention the type of food that needs to be packed as snacks for the children during the school recess, most schools are vague in their SSP. The method of reinforcement also varied, with some schools giving yearly reminders and some in a more periodic manner. Further, the class teachers felt burdened with the duty of monitoring whether parents adhered to the SSP. All these factors might have retarded the actual influence of the SSP on snacking behaviour as well as dental caries experience of the study subjects.

According to WHO, designing and implementing a school food policy should include a well-planned strategy [25]. In the present study, the interview with the head of the selected institutions revealed that none of the schools had a clear-cut strategy for developing, implementing and evaluating the healthy snacking policy. Perhaps the introduction of SSP at the school level appears more like a marketing strategy to sustain competition from other schools that portray themselves as working on the overall growth and development of children, without an actual focus on the health promotion of the students.

According to the Ecological model of eating behaviour, eating or snacking behaviour of a person is influenced by the individual environment, social environment and the global environment [26]. Though SSP is implemented at a school level, it basically aims to change the individual lifestyle without any scope for change in the social environment. A study conducted in Eastern India clearly highlights the discrepancy in the schools’ stance with propagation of healthy eating messages on one hand and availability of unhealthy snacks within school premises on the other hand [27]. This might be the situation even in selected schools in Chennai city. Hence, mere implementation of SSP will not be sufficient to bring about a favourable outcome.

While dietary interventions have found favourable results on oral health status, the same has not been produced by studies where dietary policies have been implemented. This might be because most of the experimental studies are conducted in a controlled environment with strict eligibility criteria, along with provision of healthy snacks/diet as part of the intervention which might have swung the behaviour in favour of the intervention. On the other hand, policies are guiding statements based on which decisions are made and course of action is planned in an organization. An individual who understands the importance of the formulated policy will adhere to it while others might not. The behaviour change which occurs due to a health policy might be more due to the inner/internal motivation of the person involved.

With regards to the effect of snacking policy in this study, no difference was noted in parental adherence and packing of healthy snacks to the school. This is probably because parents of younger children might not have adequately understood the importance of the healthy snacking policy and hence might have not adhered to it completely. On the other hand, on assessing the impact of SSP, adherence to the healthy snacking policy was better among children studying in schools with a snacking policy implemented for the past six years than those studying in schools without a snacking policy, with significantly more frequent consumption of healthy snacks and lesser frequency of consumption of unhealthy snacks even in the home environment. This finding is in line with the studies reported in the Western world, where regular supply of fruits and vegetables for snacks in the school environment was found to alter the snacking preference even at home in a healthier direction [28]. These results of the present study show that implementation of SSP has good clinical significance. While the NNE_p for healthy snacking is 10 among upper kindergarten children, it reduces to 6 among children in fourth grade, clearly showing that as the duration of exposure to school snacking policy increases, the NNE_p decreases. In an over-populous country like India, this finding is of significance. Implementation of a healthy snacking policy in all schools across India will have a positive influence on dietary behaviour along with favourable health outcomes in the long run without incurring any additional cost to the State.

Despite children studying in schools with a snacking policy being reported to have healthier snacking behaviour both at school and at home, it did not transform into a visible oral health benefit in terms of caries experience even after adjusting to potential confounders such as oral hygiene, diet, and dental attendance. Furthermore, the clustering at the school level for shared variance falls below the statistical threshold, as the

difference in caries was not found to be significant and the data was nested around a total of five schools, performing which would have widened the standard error and p-value. The findings of the present study were not similar to the longitudinal study of low sugar nutrition policy in Auckland [20]. The reason for this is manifold: in none of the selected schools was the healthy snacking policy framed with oral health in mind, nor was the policy designed to be a 'zero-sugar policy'. The healthy snacking policies were more of a verbal kind than a written policy, thereby affecting compliance as reported by the study in Kolkata, India [27]. The present cross-sectional study design was not favourable in documenting the impact of the policy. A systematic review conducted on the beneficial effect of healthy eating policy concluded that such policies bring about a positive change in eating behaviour without substantial change in health outcomes such as diet-related anthropometric measurements [29].

Limitations

The study lacks generalisability as children from state-run schools were not included, even though the majority of these children belong to a low socio-economic status and automatically fall under the state-run programme. The study was exploratory in nature with respect to SSP. Another key limitation of this study is the reliance on natural lighting conditions within school classrooms for dental caries examinations. Because examinations occurred across different schools and times of day, the ambient illumination was inherently variable. This lack of standardization introduces an environmental confounding variable leading to observer bias. Social desirability bias in responses also cannot be ruled out, as parents commonly know about the detrimental effects of unhealthy snacks on their children's health. Lastly, dental caries is a multifactorial disease that has multiple determinants, all of which were not controlled or adjusted in the present study except brushing frequency, diet, and dental attendance.

Recommendation

Longitudinal studies with SSP confined to oral health and structured policy implementation and evaluation were warranted to assess the impact on oral health outcomes after adjusting for multiple potential determinants.

Conclusions

The exploratory study revealed that the majority of schools in Chennai had implemented a snacking policy in school settings. More frequent consumption of healthy snacks such as cooked peas and fruits and vegetables and less frequent consumption of unhealthy snacks such as bread, butter, and jam at home were noted among children studying in schools with a snacking policy when compared to children studying in schools without a snacking policy. Though the caries experience among children studying in schools with SSP is low and the association between SSP and dental caries was not significant, it can be concluded that the implementation of a snacking policy in schools can positively influence the healthy food preference and healthy snacking behaviour of the school children. More actions should be taken by the stakeholders to structure the policy in schools to improve children's oral health.

Appendices

Appendix 1: Program implementation strategies

Please tick the appropriate answer.

1. Do you know that some schools have a healthy snacking policy by which they advise the parents to send certain food items like fruit, vegetables, nuts, and salads as snacks to their children?

a. Yes b. No

2. Do you think schools should have a healthy snacking policy?

a. Yes b. No

3. Does your school have a healthy snacking policy?

a. Yes b. No

If not, go to question number 12.

If yes, answer the following question.

4. When was the snacking policy implemented in your school? _____ (Please mention the year)

5. When has the school first communicated the healthy snacking policy to the parents?

a. At the time of admission

b. one week after the date of joining

c. one month after the date of joining

d. At the first PTA meeting

e. Three months after the date of joining

6. How has the school communicated the healthy snacking policy to the parents?

a. Through the school website

b. Through the child's diary

c. Directly to parents when they come to pick up or drop off the child or at the time of admission or PTA meeting

d. Digitally through SMS/WhatsApp group/students portal for communication

e. Circulars

7. Does your school send remainders to parents regarding the healthy snacking policy?

a. Yes b. No

8. If yes, how does the school send reminders to parents regarding the school's healthy snacking policy?

a. Through the child's diary

b. Directly to parents when they come to pick up or drop the child

c. PTA meet

d. Digitally through SMS/WhatsApp group/students portal for communication

9. How often are remainders sent to parents to follow the weekly snacks chart drafted by the school in line with the healthy snacking policy?

a. Once a month

b. Once in 3 months

c. Once in 6 months

10. Do school teachers monitor the adherence of parents to the healthy snacking policy?

a. Yes b. No

11. Do you get adequate support from teachers in implementing a healthy snacking policy?

a. Yes b. No

12. Do you get adequate support from parents in implementing a healthy snacking policy?

a. Yes b. No

If no, answer the following questions.

13. Do you think that it is the responsibility of the school to provide a healthy environment for children?

a. Yes b. No

14. Do you wish to implement a healthy snacking policy in your school?

a. Yes b. No

15. If yes, do you think you need any help from the health professionals for implementing a policy in school?

a. Yes b. No

Appendix 2: Food preference questionnaire

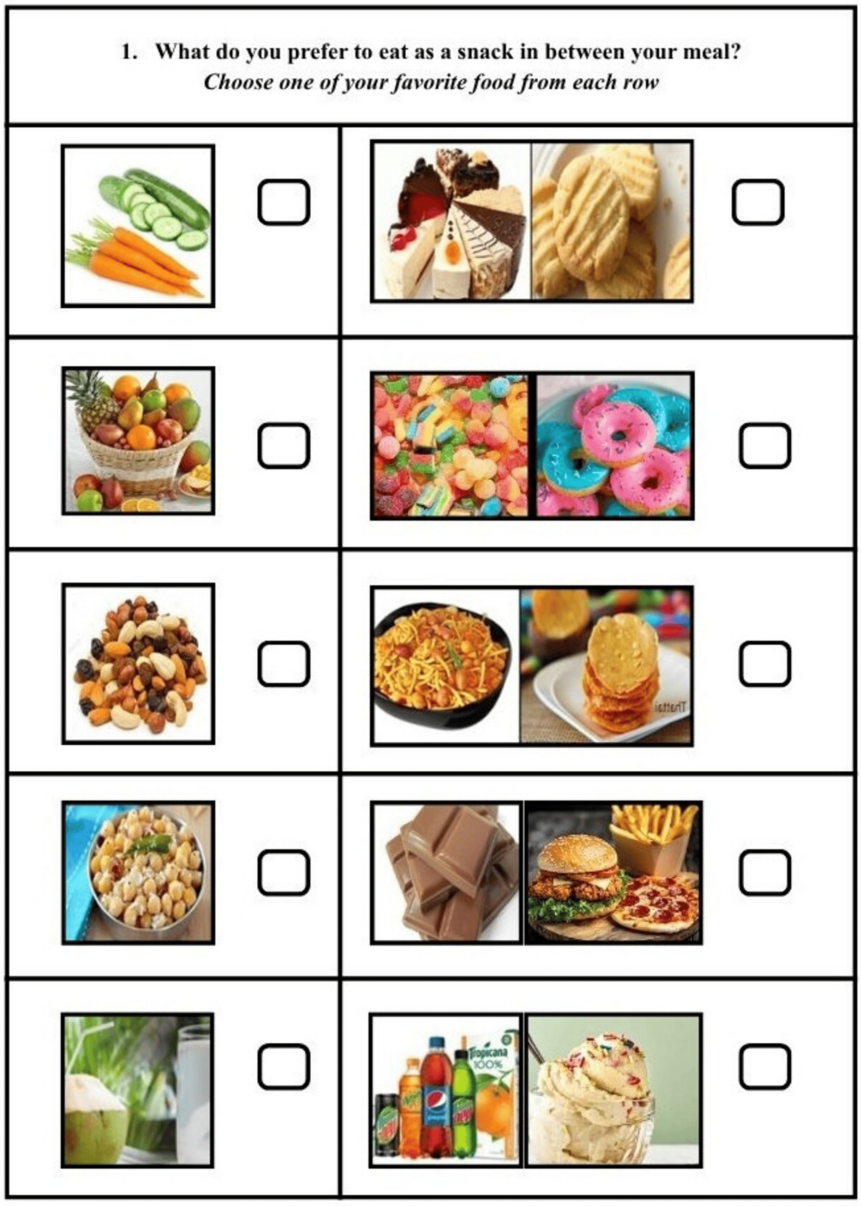
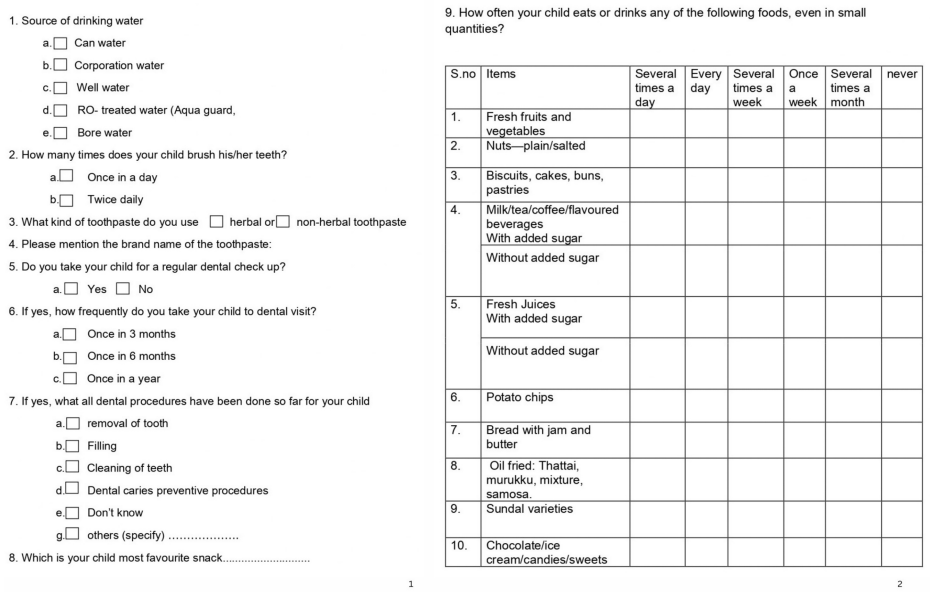


FIGURE 2: Food preference questionnaire

scored +1 for the healthy option and -1 for the unhealthy option

Maximum Score +5, Minimum Score -5

Appendix 3: Food frequency questionnaire



1. Source of drinking water
   a. ☐ Can water
   b. ☐ Corporation water
   c. ☐ Well water
   d. ☐ RO- treated water (Aqua guard,
   e. ☐ Bore water
2. How many times does your child brush his/her teeth?
   a. ☐ Once in a day
   b. ☐ Twice daily
3. What kind of toothpaste do you use ☐ herbal or ☐ non-herbal toothpaste
4. Please mention the brand name of the toothpaste:
5. Do you take your child for a regular dental check up?
   a. ☐ Yes ☐ No
6. If yes, how frequently do you take your child to dental visit?
   a. ☐ Once in 3 months
   b. ☐ Once in 6 months
   c. ☐ Once in a year
7. If yes, what all dental procedures have been done so far for your child
   a. ☐ removal of tooth
   b. ☐ Filling
   c. ☐ Cleaning of teeth
   d. ☐ Dental caries preventive procedures
   e. ☐ Don't know
   g. ☐ others (specify) .....
8. Which is your child most favourite snack.....

1

9. How often your child eats or drinks any of the following foods, even in small quantities?

S.no	Items	Several times a day	Every day	Several times a week	Once a week	Several times a month	never
1.	Fresh fruits and vegetables						
2.	Nuts—plain/salted						
3.	Biscuits, cakes, buns, pastries						
4.	Milk/tea/coffee/flavoured beverages With added sugar						
	Without added sugar						
5.	Fresh Juices With added sugar						
	Without added sugar						
6.	Potato chips						
7.	Bread with jam and butter						
8.	Oil fried: Thattai, murukku, mixture, samosa.						
9.	Sundal varieties						
10.	Chocolate/ice cream/candies/sweets						

2

FIGURE 3: Food Frequency Questionnaire

Question 1: Source of drinking water

Question 2-4: Oral hygiene behaviour

Question 5-7: Dental attendance and type of treatment

Question 8: Child's favourite snack

Question 9: Food frequency table (Modified WHO, 2013 oral health survey questionnaire) [21]

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Review Board of Meenakshi Ammal Dental College issued approval MADC/IRB-XXIX/2019/458. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have

declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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