A CAMBRA Model For High Caries Risk Indian Children: A Pragmatic Comprehensive Tailored Intervention

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Objective: *To evaluate a CAMBRA based therapeutic and preventive model for high caries risk children in a pediatric dentistry clinic set-up.* ***Study design:*** *A total of 100 systemically healthy children aged 4-8 years with dmft/DMFT ≥5 and/or ≤20% magnitude of cariogram sector 'chance to avoid new cavities' were enrolled. The program comprised of following components i.e. caries risk assessment, customized preventive interventions (Motivational interviewing and counseling, oral prophylaxis, fluoride varnish, fissure sealants) and restorative procedures. The recall intervals were scheduled on the basis of caries risk i.e. every 1 month (≤40% chance to avoid new cavities) and 3 months (≥41% chance to avoid new cavities). The primary outcome measure was 'new carious lesions' at 12 months following achievement of 'termination levels' i.e. ≥41% magnitude of 'chance to avoid new cavities.' The secondary outcome measures were changes in cariogram parameters at termination and duration needed to achieve termination levels.* ***Results:*** *The program showed 97% success rate as 3/100 subjects developed new carious lesions at 12 months follow up. Highly significant ($p<0.001$) favorable shift was achieved in cariogram parameters at termination. Termination levels were achieved in 2.71±4.854 months.* ***Conclusions:*** *The present CAMBRA based program with customized intervention and recall schedules showed favorable results.*

Key words: *CAMBRA, Caries prevention, Cariogram, High caries risk.*

INTRODUCTION

Despite the phenomenal decline in dental caries prevalence in the past decades, it still remains one of the most common chronic diseases in the children.[1] It represents a significant problem for the children belonging to all socio-economic classes in the developing countries like India[2-4] and low income minority populations in the developed countries.[5,6] Dental caries in the children not only interferes with efficient mastication, but, it also leads to significant pain,[7] malnutrition,[8] missed school days[9] and overall quality of life.[7] Further, caries in the primary dentition leads to greater risk of developing caries in the permanent dentition.[10]

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The caries process is ongoing and dynamic and can be arrested/intervened at multiple stages from pathogenic bio-film establishment to the development of frank cavitations.[11] The dynamicity of caries risk is determined by modifiable biologic, behavioral, social and economic determinants.[12] The existing literature is a rich mass of a plethora of preventive approaches e.g. fluoride, motivational interviewing, reducing microbial burden by oral prophylaxis, etc. There is an encouraging evidence to support the positive outcomes associated with application of fluoride varnishes and regular use of fluoride dentifrices.[13] Further, there is also a growing body of evidence to support the efficacy of motivational interviewing (MI) to alter the behavioral determinants of caries process to the benefit.[14] The restorative rehabilitation of carious teeth is a known approach to not only restore the function but also affect the oral microbial ecology in a favorable way.[15] But, unfortunately there is a shortage of reasonably realistic approaches for administering these preventive therapies to alter the caries risk.

Recently, an increasing interest has been laid on caries management by risk assessment (CAMBRA).[16-18] This approach enables the dental health care providers to deliver preventive and curative services in a systematic customized format based upon the caries risk of the child.

First of all, caries risk is identified and quantified for the purpose of caries prediction. Following risk assessment, a tailored care-path/action-plan (comprising of preventive and curative arms) is developed to help out all the associates of dental health care i.e. the

dentist as well as care-giver to reduce the caries risk. An ongoing appraisal plan to ensure adequate compliance with the 'care-path/ action-plan' is an integral part of the CAMBRA program. The customized follow up schedules help appraising the compliance and adequacy of preventive and curative management. The heart of the CAMBRA model is the delivery of comprehensive preventive and curative services via a 'tailored' approach with an integrated ongoing appraisal plan.

Efficient delivery of the CAMBRA model is dependent upon accurate caries risk assessment. Latter can be achieved via a simple user friendly caries risk assessment tool i.e. cariogram.[19] Latter is a software program to calculate the chance for development of new carious lesions within next 12 months on the basis of interaction of ten different caries risk factors. It presents the results in an easy to understand graphical pie-chart with various caries risk factors as five quantifiable segments. Every segment is represented by a specific color. The dark blue sector represents diet contents and frequency, the red sector is based upon the plaque and Mutans Streptococci, the light blue sector depends upon the available fluoride, saliva secretion and saliva buffer capacity, whereas the yellow sector describes the circumstances i.e. combinations of past caries experience and related systemic diseases. These all sectors are summed up and the magnitude of the remaining sector (green sector) depicts 'chance to avoid new carious lesions'. Cariogram enables the computation of caries risk class which is vital to patient selection and integrated ongoing appraisal plan of CAMBRA model.

As stated above, the research supporting the practical approaches to deliver the above stated preventive therapies with the CAMBRA concept is yet deficient. Thus, we conducted the present study to develop a CAMBRA based pragmatic, comprehensive, tailored intervention for high caries risk children. This approach involved an integrated tailored approach to reduce caries risk by utilizing following modes of prevention and intervention: MI, fluoride varnish application, oral prophylaxis and restorations.

Out study hypothesis was that the present program would alter the cariogram parameters in a favorable way to increase the magnitude of sector 'chance to avoid new cavities' and this would ultimately manifest in significantly fewer new carious lesions than at baseline.

The primary outcome of this prospective trial was the prevalence of new carious lesions after a follow up period of 12 months follow up. Secondary outcomes were variations in cariogram parameters post restorative phase at a follow up of 12 months.

MATERIAL AND METHOD

The present trial was approved by Institutional ethical committee and review board at PGIMER (Post Graduate Institute of Medical Education and Research), Chandigarh, India. Informed consent was obtained from parent/legal guardian.

A total of 100 systemically healthy new patients were enrolled. The inclusion criteria were 4-8 years of age, dmft/DMFT ≥5, a minimum of 16 teeth, ability to understand Hindi/English, planning to stay in the current city for ≥24 months, willingness to comply with the necessary recalls and written informed consent. The exclusion criteria were significant current or past medical history or use of medications that may affect oral flora or salivary flow (e.g. antibiotic use within past 3 months, chemotherapy or any heart condition requiring antibiotic prophylaxis) or any other factor that may affect the likelihood of adhering to study protocol.

The principal caregivers of recruited children were also enrolled. The principal caregiver in this setting was defined as the individual responsible for routine care of child including sanitation, hygiene, diet, nutrition and overall health including dental visits.

The present study was conducted in Chandigarh located in northern India and spread in an area of 114 km^2, with community water supply fluoridated at 0.3 ppm. The total population of the city is 900,635.[20]

The program comprised of six components viz. caries risk assessment, motivational interviewing, altering the plaque ecology, fluoride therapy, fissure sealants, restoration and rehabilitation, follow-up and maintenance.

1. ***Caries risk assessment:*** It included the assessment interview of principal caregiver, clinical examination, salivary and microbial tests.

   a. Assessment interview: The principal caregivers were interviewed by pediatric dentistry residents to collect information regarding dietary intake, oral hygiene habits and home-use of fluoride in a pre-specified manner. The caregivers were instructed to record diet diaries for 5 days including one school holiday and the demonstration was provided by recording 24 hour diet diary by pediatric dentistry resident. Mean number of sugar exposures/day, number of sugar exposures in between meals/day were calculated from 5 day diet diaries.

   b. Clinical examination included recording of caries scores and treatment needs using Möllers caries index,[21] plaque scores (Visual Plaque Index)[22] and gingivitis (Modified Gingival Bleeding Index).[22] The clinical examinations were performed by trained and calibrated pediatric dentistry residents. The training is a part of the pediatric residency curriculum and is conducted during teaching sessions using Microsoft PowerPoint slides and during patient evaluation in preventive clinics held once every week. The calibration was performed for this trial. Inter-examiner agreement of ≥0.6 (using kappa statistics) among gold standard examiners (AG and KG) and residents was a prerequisite to start with the recordings.[23] The intra-examiner reliability was not calculated as data were verified by gold standard examiners (AG or KG) prior to documentation in case sheets.

   c. Salivary flow estimation: Salivary samples were collected past noon, post lunch; subjects were refrained from eating or drinking an hour prior to sample collection. Subjects were seated in upright, relaxed position. Subjects were provided with a paraffin pellet to chew for 30 seconds and instructed to spit out the accumulated saliva or swallow it. The chewing was then continued for next five minutes and saliva was collected continuously in a measuring cup. Salivary flow per minute was calculated as 'amount of saliva collected in mL/5 minutes'.

   d. Snyder's test: Modified Snyder's test[24] was used to assess caries activity and salivary lactobacillus levels at various time points of observation. The preparation of Snyder medium was done using commercially available B-C-G dextrose agar (Snyder Test Agar: HiMedia Laboratories Pvt Ltd, Mumbai). A total of 65 grams of the snyder test agar

was suspended in 1 liter of distilled water. The mixture was boiled to dissolve the powder completely. Each snyder test-tube was dispensed with 10 mL of media and autoclaved at 121^{0}C at 15 lbs for 15 minutes. The contents of the tube were allowed to solidify before storage in the refrigerator. Prior to saliva collection, snyder tubes were rolled between hands to bring the temperature close to body temperature. Following this the tube was uncapped and the open end was momentarily exposed to flame to sterilize the tube opening and prevent any untoward sample contamination. Unstimulated saliva was collected by making the subject to drool directly into the tube in sufficient amount to just cover the superior surface of the medium. Samples were collected around 2.00 pm on all successive days.

Evaluation of caries activity employing snyder's test was done on the basis of length of color change following incubation at 35-37 ºC (95-99 ºF) every 24, 48, 72 and 96 hrs. The caries activity was divided into 6 categories (Table 1) based on the color changes obtained in the snyder tubes after 96 hours.

e. Estimation of *Mutans streptococci* in saliva: It was done using the Dentocult SM strip® (Orion Diagnostica, Helsinki, Finland) following manufacturer's instructions. The bacitracin disc provided in the kit was placed in the culture broth vial using sterile forceps. It was allowed to stand for a minimum of 15 minutes. One strip mutans test strip was taken, picking it from square end using sterile forceps. Approximately 2/3rd length of this strip was placed into the patient's mouth and was rotated over surface of tongue for approximately 10 times. Due care was taken not to rub the strip over tongue surface, it was only wetted. While removing from patient's mouth, it was pulled between lips to remove any excess saliva. Following this the strip was transferred to vial and cap of vial was kept 1/4th open. The vial was placed upright in an incubator at 35-37 ºC (95-99 ºF) for 48 hours. The number of mutans streptococci per ml saliva was obtained by comparing the test strip with evaluation chart and classified as per manufacturer's instructions.

Cariograms were constructed at baseline and post completion of restorative treatment by NM using the cariogram software.[19,25] The modifications for few scores were applied [Table 2]. Salivary buffer capacity was not measured and hence no input could be provided for this variable. Dietary contents were calculated on the basis of snyder's test scores [Table 2]. Scores 1 & 2 were graded as very low carbohydrate intake, 3 as low, 4 as moderate, 5 & 6 as high carbohydrate intake. Caries experience for all subjects was scored as 3 as only high caries risk subjects were enrolled. The input for related diseases was kept as zero for all recruits as only systemically healthy subjects were enrolled. No attempts were made to alter the preset input for variable clinical judgement.

Table 1: Caries activity scores on the basis of Snyder's test

Score	Caries
1.	No caries activity
2.	Very mild caries activity
3.	Mild caries activity
4.	Moderate caries activity
5.	High caries activity
6.	Very high caries activity

2. ***Motivational interviewing (MI):*** MI sessions were conducted by trained pediatric dentistry residents. The training is a part of routine residency training and is conducted using seminars with KG and AG as moderators. In addition, all residents spend an observation period of approximately 6 months prior to starting with MI sessions in preventive dentistry clinics. The MI sessions covered the concepts of "importance of good oral health, importance of regular dental visits, oral hygiene and regular use of fluorides, healthy eating pattern and behavior." The duration of each session was approximately 40-45 min and it involved the principal care-giver. The delivery of MI was based on 5 key principals i.e. establishing rapport, empathetic attitude, non-confrontational approach, resolving ambivalence and supporting self-efficacy. The MI session were supervised by an experienced pediatric dentist (either KG or AG) to ensure that MI is being conducted keeping in mind the 'MI spirit'. However, 'MI fidelity' was not evaluated formally.

During 3rd MI session, caregivers were presented with a menu of 10 self-management goals [Table 3].

3. ***Fluoride therapy:*** It employed fluoride varnish application with a concentration of 22,600 ppm (Fluoritop-SR® ICPA, Gujarat, India) every 3 months and promoting regular use of fluoride dentifrice at home.

4. ***Altering the plaque ecology:*** The plaque microflora was altered by oral prophylaxis, restoration of decayed teeth and removal of non-restorable teeth, promoting oral hygiene and fluoride varnish application.

5. ***Restoration and rehabilitation:*** This phase involved restorative, prosthodontic, exodontic and space maintenance and management interventions. A comprehensive dental treatment depending on subjects treatment needs was delivered. Fissure sealants were applied on non-carious occlusal surfaces and occlusal surfaces with incipient lesions.

6. ***Follow-up and maintenance:*** A pre-specified criteria was used to decide the follow-up intervals. The follow-up interval was one month until termination levels were not achieved and 3 months when termination levels were achieved. The termination levels were defined as 10% of baseline plaque index, 15% of baseline gingival index, caries activity scores 1/2 on snyder's test, scores 0/1 on Dentocult SM and/or score ≥41% of cariogram parameter 'chance to avoid new cavities.'

Entire set of interventions were offered to participant child-caregiver pairs in a pragmatic pre-specified phased sequential manner. (Figure 1).

The primary outcome for this trial was new carious lesions at 12 months follow up post termination. Secondary outcomes were

Table 2: The modified cariogram

Cariogram variable	Data source	Scores
Caries experience	Clinical examination	3*: Caries (above the average for the age group)
Related diseases	Caregiver's interview	0*: Healthy
Diet, Frequency	5 day diet diary (Total number of meals+snacks including candies, sweets, ice-creams, etc.)	0: 3-5/day 1: 5-7/day 2: 7-9/day 3: ≥9/day
Diet, contents	Snyder tests scores for caries activity	0: Very low fermentable carbohydrate content (Snyder test score 1/2: No/Very mild caries activity) 1: Low fermentable carbohydrate content (Snyder test score 3: Mild caries activity) 2: Moderate fermentable carbohydrate content (Snyder test score 4: Moderate caries activity) 3: High fermentable carbohydrate content (Snyder test score 5/6: High/very high caries activity)
Oral hygiene (Plaque amount)	Clinical examination	0: VPI <5% 1: VPI : 5-20% 2: VPI: 21-50% 3. VPI: >50%
Mutans streptococci	Dentocult strip mutans test	0: Strip mutans class 0 1: Strip mutans class 1 2: Strip mutans class 2 3: Strip mutans class 3
Fluoride programme	Caregiver's interview	0: Fluoride toothpaste + additional fluoride regularly 1: Fluoride toothpaste + additional fluoride irregularly 2: Fluoride toothpaste 3: No fluoride toothpaste
Salivary flow	Collection of paraffin stimulated saliva over 5 min	0: Normal saliva secretion (≥1.1 mL/min) 1: Low, 0.9 - 1.1 ml stimulated saliva/min 2: Low, 0.5- 0.9 ml saliva/min 3: Very low, Xerostomia, <0.5 ml saliva/min
Clinical judgement	-	1*: Normal setting. Risk according to the other values entered

*No attempts were made to alter these values; reasons stated in text.

Table 3: Menu for self management goals presented to care-givers

1.	Provision of complete dental care as recommended by your dentist
2.	Regular dental visits even when you don't see any cavity or child doesn't have any pain and/or swelling
3.	Brushing twice/daily
4.	Brushing at night before bed-time; No eating or drinking after bed-time brushing
5.	Rinsing after every meal
6.	Use of fluoride toothpaste
7.	Healthy snacking
8.	Less soft-drinks/sweetened drinks/juices
9.	Intelligent use of sugars i.e. not > than 3/day and not >1 in b/w meals; no sticky candies/jams/chocolates/biscuits
10.	Inspecting your child's oral cavity regularly for new caries and/or any dislodged/fractured/damaged restoration/crown.

Table 4: Baseline caries scores

Parameter	Mean ± SD
dmft	14.23±3.768
dmfs	43.73±17.907
DMFT	0.25±0.866
DMFS	0.41±1.566
Surfaces with white spot lesions + enamel breakdown	5.47±2.238

cariogram parameters at termination, time period needed to achieve termination levels and distribution of children in various risk profiles at baseline versus termination. Caries risk profiles were calculated on the basis of magnitude of sector 'chance to avoid new carious lesions' i.e. very high caries risk (0-20% chance), high caries risk (21-40% chance), moderate caries risk (41-60% chance), low caries risk (61-80% chance), very low caries risk (81-100% chance).

The entire data were recorded on pre-printed case sheets containing provision to record demographics, details of clinical examination, salivary tests and diet diaries. The photographic records of patient's pre- and post-treatment clinical findings, serial snyder test results and Dentocult SM were also attached to these case files.

The collected data were analysed using the SPSS package version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive data were presented as mean± SD and number; %age. Comparative statistics for quantitative parameters at baseline versus termination levels were calculated using student t-test and for qualitative parameters Chi square test was employed.

RESULTS

The mean age of subjects was 5.43±**1.34** years. Baseline caries scores are depicted in table 4. Highly significant improvements in all sectors of cariogram were observed ($p < 0.001$) [Table 5]. Termination levels were achieved in duration of 2.71±4.854 months. Significant difference ($p < 0.05$) in the distribution of children belonging to various risk profiles was observed at termination when compared to baseline (Table 6). After a follow up period of 12 months post-termination, only 3 subjects developed new carious lesions (enamel demineralization/white spot lesions).

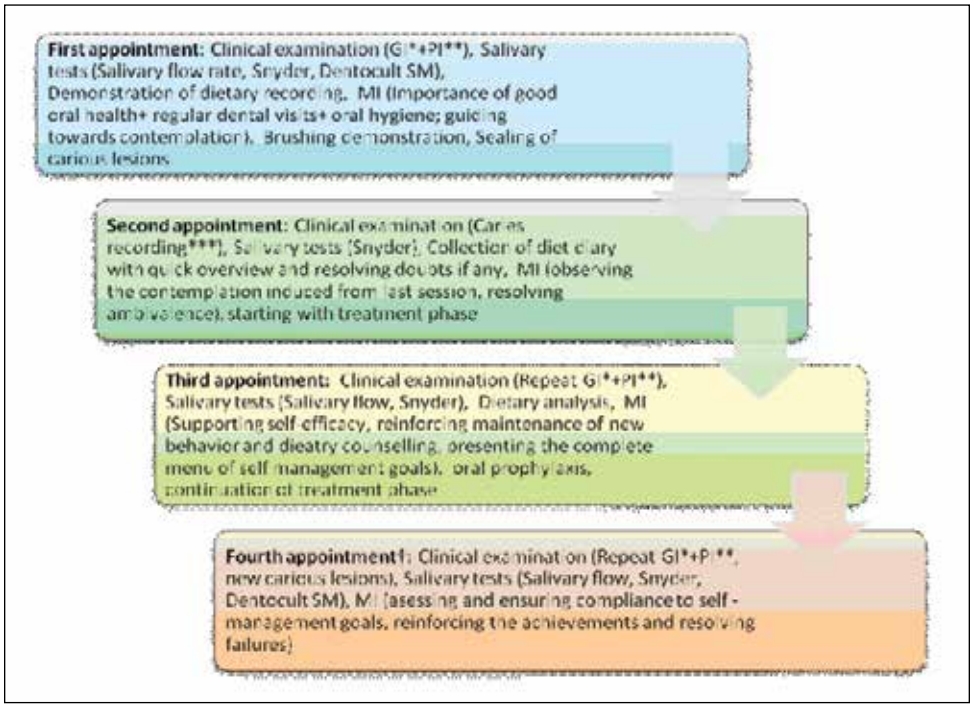
DISCUSSION

Beneficially altering the risk profile of young school aged children is one of the most demanding errands faced by contemporary pediatric dentists. Previous research has indicated that the oral health educational programs do not effectively modify the health related behaviors and in case they do, the desirable end points such as clinical improvements are not seen.[14,26] One possible explanation could be that caries is a multifactorial disease and to intervene it a multimodal oral health promotional model is needed.

Table 5: Cariogram parameters at baseline versus termination

Study characteristic (in %age)	Baseline (Mean ± SD)	Termination (Mean ± SD)	P value
Chance to avoid new cavities	12.51±13.529	72.74±14.376	0.000
Diet	8.47±5.179	2.37±2.227	0.000
Bacteria	20.73±6.342	5.74±3.793	0.000
Circumstances	51.24±19.947	13.66±13.254	0.000
Susceptibility	7.43±2.255	5.38±1.108	0.000

Figure 1: Intervention phases and contents



*GI: Gingival index (Ainamo and Bay, 1975) **PI: Plaque index (Ainamo and Bay, 1975) ***Caries: Möller and Poulsen caries recording index (1973), †This appointment was conducted after completion of dental treatment. In case the termination levels were not achieved, next appointment was scheduled after 1 month and repeat measurements and MI sessions were conducted.

Currently, greater emphasis is being laid on customized caries management by risk assessment (CAMBRA).[16,17] CAMBRA action plan delivers 'made to order' restorative and prevention interventions with individualized recall intervals based on caries risk rather than delivering the 'same recipe' of interventions to every patient.[16-18] With this background thought, we developed and tested our multimodal integrated oral health promotional model based on CAMBRA approach.

The main aim of this study was not to evaluate any individual preventive intervention or a combination of these, but to evaluate a risk based individualized approach. This model is based on a pragmatic (interventions being delivered in a planned way), comprehensive (preventive+ interceptive+ curative approach), tailored (interventions based on individual risk profile targeting every possible risk factor) approach. The objectives of this trial were whether the positive shift in cariogram parameters could be achieved with this tailored integrated model and if yes, then, whether it would result in desirable outcome i.e. 'No new carious lesions'? The results were blissfully encouraging. This integrated approach exhibited a success rate of 97% at 12 months follow-up i.e. 3/100 subjects developed new carious lesions. All of the cariogram parameters were altered significantly to shift the caries balance towards health.

Target for achieving positive changes in the behavior was sought by employing motivational interviewing. Motivational interviewing is an evidence based, client-centred, tailored, empathetic, open-ended, non-confrontational counselling technique that explores and resolves client's ambivalence about health related behavioural change.[27] At most of the times, the care-givers were in stage of contemplation. In case, they were in pre-contemplation phase, reflective listening was used to induce contemplation. An empathetic open-ended talk ensured exploration of care-giver's heath beliefs. Reflective advices were presented in a non-confrontational manner to help caregivers with their lack of confidence about inducing and maintaining necessary health behaviors. This mode of counselling is based on Transtheoretical Model for behavior change.[28] MI reduces the resistance in behavior change by non-confrontational listening to the problems faced by caregivers and reflective provision of solutions. It is a non-authoritative approach that simply guides the clients towards behavior change and supports the maintenance of behavior change.

We used fairly objective measures to evaluate compliance to acquisition of positive oral health related behaviors. Repeat snyder test assays after sealing of cavitated lesions were employed to evaluate adherence to dietary instructions. In addition to evaluation of compliance, snyder test assays also served as a motivational tool. Since role of self reported oral health behavior remains debatable, we used clinical examination of subjects to evaluate improvements in oral hygiene. To mask irregular brushing habits, subjects have a tendency to clean immediately prior to appointments while they may not be performing oral hygiene tasks regularly. To account for this we supplemented plaque index with gingival index. In case the improvements were not seen, repeat MI sessions and counselling sessions were scheduled.

Inducing a positive health related behavior cannot always suffice for achievement of positive clinical outcomes[24] i.e. 'no new carious lesions'. Provision of support to overcome logistic barriers is an absolute requirement. In the present program, flexible appointments to overcome time constraints, free fluoride varnish applications and provision of dental treatment at a cost lesser than private practice helped to conquer the logistic barriers. This is important in a country where no insurance cover is provided for dental treatment and limited resources don't let the oral health receive needed priority.

In this trial, cariogram parameters were used as evaluation parameters. Cariogram was developed based on interpretation of data from adult population. The accuracy of predictive ability of cariogram has been validated across multiple age groups.[30,31] But, unfortunately reports of its predictive accuracy in young children are conflict-ridden.[32,33] But, in the present study, cariogram was not used as a sole assessment parameter. In fact, it was supplemented with other assessment parameter i.e. new carious lesions within a follow up period of 12 months. The combined validity of both of these tools is distinctly non-ambiguous and thus our evaluation parameters should remain reliable.

The clinical examinations were performed by trained and calibrated examiners and thus should remain reliable. As discussed above, cariogram is based on algorithms derived from adult population and thus its extrapolation in child population should involve suitable modifications. For this purpose, we used a modified scoring system for dietary parameters i.e. frequency of intake and content of carbohydrate [Table 2]. Salivary lactobacillus levels are better gauge for dietary carbohydrate intake.[19] Employing Snyder test as a tool to weigh salivary lactobacillus levels serves a dual motive to educate patient and children. We did not include salivary buffer capacity in the cariogram construction. Even though the role of salivary buffer capacity is not clearly labelled;[34] omitting this from the cariogram construction remains one limitation of our study. Anyhow, cariogram's lack of predictive accuracy should not be over criticized owing to inherent dynamicity of risk. One should not forget that cariogram or any other predictive tool predicts development of new caries on the condition that risk factors remain constant during observation period.[19] The results of our observation should remain trustworthy owing to reliable primary outcome measure i.e. 'new carious lesions.' Further, even though multiple regression models are more accurate,[35] they are not very user friendly.

Table 6: Distribution of children in risk categories on the basis of Cariogram profile

Time point of observation	Number of children in various risk categories				
	Very Low	Low	Moderate	High	Very High
Baseline	0	0	0	24	76
Termination	36	42	22	0	0

One major limitation of the present study is the absence of a control group. In our department, we are running a special preventive clinic for all high caries risk patients where CAMBRA approach is routinely employed. Recruiting the subjects for non-interventional control and not providing the recommended CAMBRA therapy for purpose of generating evidence is not ethically justified. Thus, we did not enrol any control subjects in the present trial.

The extrapolation of the results of this study to general dental practitioners should employ some caution as the providers were calibrated pediatric dentistry residents. The providers were tightly supervised to deliver the behavioral, preventive and restorative interventions to ensure quality services. This means if end-results of similar excellence are to be targeted, the providers (whether general dentists or specialist pediatric dentists) should receive needed training as well as reinforcements at regular intervals. Still, our results should remain generalizable as far as the study population is concerned as our centre caters to subjects with diverse backgrounds.

The crux of this program resides in repeated client centred MI sessions to induce behaviour change on the top of routine preventive measures i.e. oral prophylaxis, fluoride varnish, fluoride toothpaste and fissure sealants. Maintaining the spirit of risk reduction till achievement of predetermined termination levels with individualized frequency of recall intervals might have had a definite role in success of this program. We skipped flossing and chlorhexidine from this preventive program. As the subjects were young; obtaining compliance and dexterity for flossing could have been difficult (especially in younger age group <6 years). Further, the evidence for using chlorhexidine amongst high caries risk subjects is yet inconclusive.[36,37]

In a nutshell, our program modified the biologic sectors and behavioral sectors of caries process. The expected clinical improvements i.e. termination levels were achieved in 2.71±4.854 months and were sustained for next 12 months. Future studies with a longer follow up period and cost-effectiveness are of interest.

CONCLUSION

The present risk based caries management model with targeted preventive approaches effectively altered the caries balance towards health. This model may serve as a practical approach in high caries risk children.

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