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Effect of a Preventive Regime on Oral Hygiene Practices of Children with Type-1 Diabetes Mellitus

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Abstract

Aim: To evaluate the effect of an oral health preventive protocol on oral hygiene practices and gingival status of type 1 diabetes mellitus patients over a period of 6 months.

Material and methods: 50 type 1 diabetes mellitus children, aged 6-12 years, were divided into two groups and received similar oral hygiene instructions at baseline. Children in group I (Intervention group) additionally received a comprehensive oral health preventive protocol.

Results: Group I showed favorable improvements in the percentage of participants practicing the oral hygiene maintenance method taught. All participants in the test group adopted the recommended brushing frequency at the end of 6 months as compared to 72% in control group (p=0.003). The brushing method taught (Modified Bass method) was taken up by all children in the test group whereas only 40% children in control group adopted it (p=0.001). All participants in the test group started using fluoridated toothpaste by 6 months as compared to 68% participants in control group (p=0.002). As a result of the above, the plaque index of the test group at 6 months was 0.36±0.21 as compared to 0.90±0.19 in the control group (p=0.01). Gingival index also decreased considerably in Group 1 being 0.20±0.23 at 6 months as compared to 0.85±0.25 in Group 2 (p=0.001).

Conclusion: The preventive protocol used in the present study showed a significant improvement in the oral hygiene practices and gingival status of children with type 1 diabetes mellitus.

Keywords: Oral health, Preventive, Type 1 diabetes, Practice, Gingival health

Introduction

Diabetes is a metabolic disorder characterized by chronic hyperglycemia.[1] India has been lately referred to as the diabetic capital of the world with 8.8% of its population suffering from one or the other forms of diabetes.[2] A possible link between diabetes and oral health has been studied at length. It is seen that children with diabetes have an increased rate of dental caries, gingivitis and higher dental plaque scores. They also have greater

gingival inflammation than children without diabetes in spite of similar plaque scores.[3]

Several researchers have shown that preventive instructions and procedures can mitigate dental caries, plaque and gingivitis in healthy children. They even recommend the routine implementation of these in healthy children for optimum oral health.[4,5,6,7] It is also known that diabetic children have limited knowledge about oral health and display poor oral health behavior.[8-13] However, no oral health preventive protocol exists for catering to the oral health of children with type-1 diabetes.

A preventive program is being currently run for healthy children at the Post Graduate Institute of Medical Education and Research, Chandigarh and has shown considerable improvement in the oral health status of healthy children.[14] With the above considerations in mind the present study was conducted expecting the preventive program to work for children with type 1 diabetes as well. The objectives of the study were:

1) To evaluate the changes, if any, brought about by an oral health preventive protocol on oral hygiene practices of children with type 1 diabetes mellitus.
2) To evaluate the changes in gingival health of these children.

Material and Methods

Ethical clearance was obtained from the Institute Ethics Committee at the Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh prior to beginning the study. Sample size required was calculated using Cochran formula.

50 newly diagnosed patients of type 1 diabetes mellitus who attended the diabetic clinic at PGIMER, Chandigarh were selected. Block randomization was used to divide them into two groups- Group I (intervention group) and Group II. The glycated hemoglobin levels of the participants were obtained from hospital records.

Inclusion criteria

- Newly diagnosed children with type 1 diabetes mellitus
- Age range of 6-12 years.
- Children who gave written assent and whose parents provided a written informed consent for participation in the study.

Exclusion criteria

- Known systemic problems other than diabetes mellitus,
- History of antibiotic intake in the last 1 month and
- Use of medications like anti- psychotics, anti cholinergics, anti secretagogues etc.

Group I had 25 children who received a comprehensive oral health preventive protocol (details given in Table 1). This preventive program was carried out when the patients showed up for their first dental visits within a span of two months. The 3- and 6- month follow ups were used to motivate and reinforce the instructions.

Group II had children who received the usual treatment for diabetes without any preventive protocol. They were, however, provided baseline oral hygiene instructions and the required dental treatment.

A pre-validated questionnaire was used to assess changes in oral hygiene practices- oral hygiene maintenance method used, correct brushing method and frequency and the use of fluoridated dentifrice. These practices were initially assessed at baseline and the changes were observed at 3- and 6- months follow up. A single examiner carried out oral examination for dental plaque (Silness and Loe index)[15] and gingivitis (Loe and Silness index)[16] scores.

These parameters were recorded for the patients at baseline, 3- and 6- months intervals. A flow chart depicting a summary of the methodology has been shown in Figure 1.

Statistical analysis

Statistical analysis was carried out using IBM SPSS software (version 22.0). Normally distributed data was compared using One- way ANOVA and Post Hoc Multiples comparisons and groups were compared using Student t- test. Skewed data comparisons were carried out using Mann-Whitney test.

Results

Group I had 13 males and 12 females while Group II had 14 males and 11 female participants (p=0.7). The mean age of the patients in Group I was 8.92±2.040 years and that in Group II was 9.68±2.036 years (p=0.19). Thus, the participants were age and sex matched at baseline.

Changes observed in the hygiene practices and gingival health of participants are shown in table 2. As can be seen a greater number of the participants adopted the recommended oral hygiene methods. Also, the plaque and gingival indices improved over the course of the study. The improvement was greater in participants of Group I as compared to Group II.

Discussion

The study was conducted keeping in mind the fact that children with diabetes exhibit poor oral health knowledge and behavior. This, to the best of our knowledge, is the first study of this kind involving children with type 1 diabetes mellitus.

The importance of preventive dentistry has been iterated time and again, yet no oral preventive protocol has been designed to specifically meet the oral health needs of children with type- 1 diabetes. A preventive program based on the oral health preventive protocol of the University of Milwaukee is being used at the Post Graduate Institute of Medical Education and Research for healthy children and has shown promising results.[14] It was expected to be effective for children with type 1 diabetes also. It has four appointments at specific time intervals as shown in table 1. A general discussion of the importance of preventive dentistry and oral diseases that children usually suffer from comprise the first appointment along with other steps. In the second appointment, which is kept at an interval of ten days, the child and the parent are explained about the specific oral disease process. A gap of ten days is kept in order to give sufficient time to the child to acquaint himself/herself with the proper use of a toothbrush. It also gave adequate time to seal all open carious lesions with IRM prior to the second appointment. The third appointment, scheduled fifteen days after the second appointment, involved dietary counseling. This was a superficial counseling only as the diet intake of diabetic children is usually dictated by their glycemic status. Moreover, they received comprehensive dietary guidance by a trained dietician at the Advanced Pediatric Centre, PGIMER, Chandigarh. A fifteen day duration was kept in order to effectively assess changes in gingival health of the participants. The fourth appointment was kept at one month interval from the third appointment. This time period gave ample time to complete the rehabilitative work including restorations, endodontic procedures, crowns etc. Also it is known that microbial lag phase usually takes four weeks to occur.

The oral health practices assessed in the study were the oral hygiene maintenance method used, correct brushing frequency and method and the use of a fluoridated dentifrice. The oral hygiene maintenance method recommended in the study was using a toothbrush and dental floss. All other methods like dattun, manjan, tooth powder, plain water, manual toothbrush alone, powered toothbrush, toothbrush and inter-dental brush together or any other method were considered incorrect. This was done as no significant differences in dental plaque removal has been observed between manual toothbrush and powered tooth brushes[18] and a manual toothbrush

dental floss are easily available and within reach of people from all socioeconomic status. Another consideration to this effect was the fact that powered toothbrushes are not as effective as manual toothbrush in removing dental plaque especially from the inter-proximal and lingual tooth surfaces.[17] The correct brushing method taught and recommended in the study was the Modified Bass Technique as it has proven to be better than other brushing methods in removing dental plaque.[19] The correct brushing frequency considered correct was twice or thrice (after every meal) daily tooth brushing. Though once daily brushing provides satisfactory removal of plaque if done properly, it is known that most individuals do not display the required diligence or dexterity in being able to remove plaque with once daily brushing. Hence, twice daily tooth brushing is recommended.[20] To this effect, participants brushing thrice daily were also considered to be practicing the correct brushing frequency. The use of fluoridated dentifrice has been recommended by various agencies[21] and is also in line with the guidelines of the American Academy of Pediatric Dentistry.[22] Hence, the participants were educated and motivated to use a fluoridated dentifrice in this study as well.

It was observed that post implementation of the preventive protocol in group I, favourable changes came about in the oral hygiene practices and gingival health of the participants as compared to children in group II. As no author, to the best of our knowledge, has worked with diabetic children using such a preventive protocol, a direct comparison of our work with others was not possible.

Ashkar et al,[13] used an educational preventive program in adult patients after assessing their oral health knowledge and oral hygiene practices via a questionnaire. They concluded that after delivering the 4 session preventive program there was a significant improvement in the oral health knowledge, hygiene practices and some oral health parameters. Although this study was carried out in adult patients and using a different preventive protocol, our results correspond with the observations of this study.

Different authors have assessed oral health knowledge and behaviors in children in children with diabetes and have reported that they possess limited knowledge and compromised oral health behaviors.[8-11] Poudel et al,[12] in a systematic review of oral health knowledge, attitudes and care practice of people with diabetes reported that they had poor oral health information and behaviors.

Our baseline observations are in agreement with the above mentioned authors[8-13] wherein the participants did not exhibit satisfactory oral hygiene practices. Post implementation of the oral health preventive protocol, the behavior of the subjects improved to a greater extent in Group I, demonstrating the effectiveness of the protocol.

The study was limited to due to exclusion of a healthy control group. However, this was done purposely as the efficacy of the protocol has already been proven in them.[14] Also, had a healthy control group been included, it would have diluted the results. The study could also benefit from a longer follow up in order to establish whether the changes brought about by the protocol are sustained after a period of 6 months. It is suggested that studies with the above mentioned protocol be conducted for longer periods of time in order to establish the veracity of the preventive program in children with type 1 diabetes mellitus.

Conclusion

The comprehensive oral health preventive protocol used in the present study proved to be beneficial for children with type 1 diabetes mellitus. It helped improve their oral hygiene practices and gingival health. It is emphasized that as diabetes requires multidisciplinary management, interdisciplinary coordination and cooperation should be encouraged.

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Legends Figure and Tables

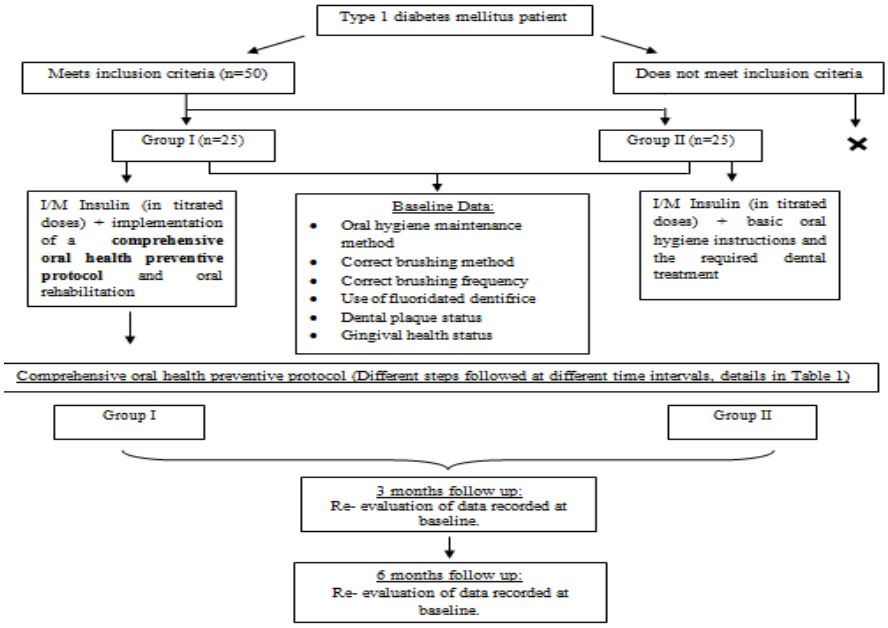

Table 1 Details of the oral health preventive protocol followed in present study

Appointment- 1 (of approximately 40 minute duration)	Appointment- 2 (10 days after the first appointment)(of approximately 45 minute duration)	Appointment- 3 (15 days after second appointment) (of about 40 minutes duration)	Appointment- 4 (1 month after third appointment)(of about 30 minutes duration)
1) Explanation of the dental problem and concept of prevention 2) Recording of Snyder's test 3) Recording of salivary	1) Explanation of the disease process to the child and parent. 2) Recording of Snyder's test 3) Estimation of *Strep. mutans* 4) Recording of dental caries 5) Application of 10% povidone	1) Dietary counseling based upon diet evaluation and analysis of the recorded diet diary. 2) Recording of gingival health status	1) Recording of Snyder's test 2) Recording of salivary flow rate 3) Estimation of *Strep. mutans* 4) Recording of gingival bleeding index

flow rate 4) Quantitative estimation of *Strep. mutans* 5) Recording of gingival health status 6) Recording of plaque scores followed by brushing demonstration. 7) Sealing of open carious lesions with IRM. 8) Recording of 24 hour diet diary (retrospective)	iodine and 2% topical sodium fluoride varnish on all erupted teeth. 6) Discussion of Snyder's test and gingival bleeding index and plaque index scores with the child and the parent.	3) Recording of plaque scores 4) Oral prophylaxis if required. 5) Continuation of endodontic and restorative procedures already initiated.	5)Recording of plaque index

Table 2 Changes in the tested parameters over the course of the study

Parameter Assessed	Group	Baseline ($\bar{X}$±S.D.)	p value	3 months ($\bar{X}$±S.D.)	p value	6 months ($\bar{X}$±S.D.)	p value
Oral hygiene maintenance method (% of participants)	Group I	0	-	66.7	0.01	86.7	0.09
	Group II	0		40		66.7	
Correct brushing frequency (% of participants)	Group I	26.7	0.35	100	0.001	100	0.003
	Group II	13.3		40		72	
Use of fluoridated dentifrice (% of participants)	Group I	46.7	0.25	100	0.001	100	0.002
	Group II	40		40		68	
Brushing method taught (% of participants)	Group I	0	-	93.3	0.002	100	0.001
	Group II	0		40		40	
Plaque index	Group I	1.41±0.33	0.80	1.04±0.53	0.01	0.36±0.21	0.01
	Group II	1.39±0.25		1.30±0.22		0.90±0.19	
Gingival index	Group I	1.07±0.35	0.40	0.74±0.46	0.01	0.20±0.23	0.001
	Group II	1.04±0.28		1.00±0.24		0.85±0.25	