Original Article

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Dentistry Section

Dental Awareness among Parents and Oral Health of Paediatric Cancer Patients Receiving Chemotherapy

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ABSTRACT

Introduction: Dental care is often overlooked by the parents of children receiving treatment for cancer including chemotherapy who are in a phase of severe immunosuppression.

Aim: (i) To study dental attitudes of parents of children receiving chemotherapy towards importance of dental care. (ii) To evaluate oral hygiene status and compare it with healthy controls.

Materials and Methods: A questionnaire assessing the awareness towards dental care was given to the parents of 47 paediatric patients suffering from cancer receiving chemotherapy and to parents of 47 paediatric patients reporting to outpatient Department of Pedodontics at SGT Dental College. Oral examination was also carried out for both the groups and DMFT/dmft, plaque and gingival index were noted.

Results: Parents had a varying opinion regarding dental health of their child. The caries status of children in the control group was greater than children in the study group. The mean plaque index of children in the control group (1.40) was greater than children in the study group (1.34) which was statistically significant according to Mann-Whitney U test. The gingival health of children in the study group was better than children in the control group which was also not statistically significant.

Conclusion: This study highlights need for a periodic referral of the child cancer patients to the paediatric dental clinic in hospitals for the timely dental care.

Keywords: DMFT/dmft index, Gingival index, Plaque index, Questionnaire

INTRODUCTION

About 160000 new cases of childhood cancer and 90000 deaths due to the same are being reported each year globally in children less than 15 years of age [1]. In India cancer is the 9th common cause of deaths among children between 5 to 14 years of age [2]. Leukaemia is the most commonly occurring cancer in children in India with a mean incidence of 48.5% in boys and 21.2% in girls (accounting for around a third of all cases) followed by lymphoma, central nervous system tumour, retinoblastoma, renal tumour, hepatic tumour, bone tumour, soft tissue sarcoma and germ cell tumour [3].

Chemotherapy and/or radiotherapy for the treatment of cancer may cause many acute and long-term side effects in the oral cavity [4]. Prevention and treatment of pre-existing or concomitant oral disease is necessary to reduce complications in this population [5]. The key to success in maintaining a healthy oral cavity during cancer therapy is patient compliance. Faced with the diagnosis of a malignancy, a patient and/or their parents may not see dental care as a high priority [6]. The parental attitudes and preferences have a great influence on the oral care of their child. Hence, this study aims to assess the parental attitudes of children receiving chemotherapy towards the importance of dental care.

MATERIALS AND METHODS

This cross-sectional study was conducted in SGT Dental College, Gurgaon and the Paediatric Oncology Department of a hospital in New Delhi, India from July to September 2014 after obtaining the ethical approval from ethical committee of SGT Dental College and Sir Gangaram Hospital. The research was conducted in full accordance with the World Medical Association Declaration of Helsinki. The study group included all children (n = 47) in age group of six months-17 years who were suffering from cancer and receiving chemotherapy on a day-care basis in the hospital during the study period. Out of these, 35 children were suffering from Acute Lymphoblastic Leukaemia (ALL), six children were suffering from acute myeloblastic leukaemia, one child from chronic myeloid leukaemia, two children from neuroblastoma, one child from malignant germ cell tumour, one child from sarcoma of petrous temporal and one child from Wilm's tumour. All children were receiving chemotherapy; of which 17 children were on induction chemotherapy while 30 children were on consolidation chemotherapy. An equal number of children (47) with comparable age distribution and having insignificant medical history were randomly selected from children reporting to the outpatient Department of Paedodontics and Preventive Dentistry, SGT Dental College as control group.

A questionnaire was prepared consisting of open and closed ended questions and administered to the parents of children after obtaining a written informed consent and approval by the ethical committee of Sir Gangaram Hospital and SGT University. The questionnaire assessed oral hygiene practices; toothbrushing frequency, type of toothpaste used (brand and whether fluoridated/nonfluoridated), whether any other oral hygiene measures are used. Dietary habits were also assessed in the questionnaire; type of diet, sweetened beverages/snacks and their frequency and history of syrup based medications. Parental attitudes were also assessed by the questionnaire; regularity of dental attendance or any previous prophylactic dental treatment was asked.

Oral examination was carried out for all the patients in both the groups independently by the first author. During the examination, the following methods were used. For caries prevalence the dentition was visually examined using a dental mirror under natural light. If there was doubt about the existence of a carious lesion a blunt dental probe was used. From the results, the 'DMFT' score for permanent teeth and 'dmft' score for deciduous teeth, were derived [7]. 'DMFT' represents the total number of Decayed (D),

Missing (M), or Filled (F) permanent Teeth (T) while 'dmft' represents total number of decayed (d), missing (m) or filled (f) primary teeth (t). Gingival health and oral hygiene were assessed by the gingival index and plaque index [8]. The gingival index reflects the amount of inflammation of the gingiva. Oral hygiene was assessed by the plaque index.

The results of this study were statistically analysed using Mann-Whitney U test and significance level was set at <0.05.

RESULTS

[Table/Fig-1] depicts the total number, age and sex of children included in each group. Twenty three children were less than five years of age, 15 children were less than 10 years of age, five children were between 11-15 years of age and four children were from 16-17 years of age.

[Table/Fig-2] shows the responses of the parents on the questionnaire administered in the study and in the control group. With regards to their tooth brushing frequency; in the study group, 40% children brushed only once a day, 34% brushed twice a day while 26% of the children didn't brush whereas in the control group, Fifty-seven percent children brushed once a day, 13% children brushed twice a day while 30% children didn't brush. Majority of the parents had not taken their child to a dentist previously; 87% in study group while 79% in control group. Most of the parents were interested in dental care of their child; 72% in study group while 74% in control group. Only three children complained of pain in their oral cavity and only one patient gave a history of spontaneous bleeding in his teeth in the study group while in the control group, 19 patients complained of pain in their oral cavity and 10 patients gave history of spontaneous bleeding in their teeth. In the study group, 30% of the patients regularly consumed sweetened/ beverages snacks between meals while 23% consumed them sometimes whereas in the control group, 68% children regularly consumed sweetened beverages/snacks between meals while 23% consumed sometimes. All the patients in the study group reported that they were being given dietary counselling by the paediatrician who included avoiding raw fruits and vegetables. None of them had been referred to any dental surgeon for check-ups/follow-ups. However, all the patients reported that they were being given guidelines for dental/oral care which included Listerine mouthwash and candid mouth paint thrice a day daily. Majority of the patients (70%) followed the instructions while 30% of patients did not follow. All of the patients in the study group reported that they were on syrup based medications compared to 20 in control group. However, none of the patients complained of dry mouth.

At the start of the treatment in study group; one patient complained of oral ulcerations; one patient complained of blackish and yellowish discoloration of tongue and one patient complained of gingival bleeding. Also, one patient reported repeated oral ulcerations during the course of the treatment while one patient complained of delayed eruption of teeth.

Oral Examination: The 'DMFT/dmft', plaque index and gingival index of children in both study and control group are presented in [Table/Fig-3], the data was statistically analysed using Mann-Whitney U Test and are illustrated in [Table/Fig-3].

Organ	Group	N	No. of boys	No. of girls
<5 years of age	Control	23	17	6
	Study	23	21	2
6-10 years of age	Control	15	8	7
	Study	15	9	6
11-15 years of age	Control	5	3	2
	Study	5	4	1
16-17 years of age	Control	4	2	2
	Study	4	2	2

[Table/Fig-1]: Distribution of sample in both the study and control groups by age-group and sex.

S.No.	Question	Yes		No		Sometimes	
		Study group	Control group	Study group	Control group	Study group	Control group
1.	How many times does child brush a day?	Brush once-19 (40%) Brush twice-16 (34%)	Brush once-27 (57%) Brush twice-6 (13%)	12 (26%)	14 (30%)		
2.	History of any fluoride application?	-		47 (100%)	47 (100%)		
3.	Whether taken child to a dentist previously?	6 (13%)	10 (21%)	41 (87%)	37 (79%)		
4.	Interested in dental care for their child?	34 (72%)	35 (74%)	13 (28%)	12 (26%)		
5.	Has child ever complained of pain in oral cavity?	3 (6%)	19(40%)	44 (94%)	28 (60%)		
6.	History of spontaneous bleeding in child's oral cavity?	1 (2%)	10 (21%)	46 (98%)	37 (79%)		
7.	Whether consumes sweetened beverages /snacks between meals?	14 (30%)	32 (68%)	22 (47%)	4 (9%)	11 (23%)	11 (23%)
8.	Whether given dietary counselling by the paediatrician?	47 (100%)	10 (21%)	-	37 (79%)		
9.	Whether referred them to dental surgeon for check-ups/ follow-ups?	-	2 (4%)	47 (100%)	45 (96%)		
10.	Given any guidelines for dental/oral care during and after therapy?	47 (100%)		-	47 (100%)		
11.	Whether followed dental preventive advice given by hospital staff?	33 (70%)					
12.	History of long term use of syrup based medications	47 (100%)	20 (43%)	14 (30%)	27 (57%)		
13.	Whether complains of dry mouth which forces to drink water?	-	47 (100%)	-	47 (100%)		

[Table/Fig-2]: Responses of parents to questionnaire in study and control group.

The overall number of decayed, missing or filled teeth were greater in the control group (Mean DMFT/dmft= 5.3) compared to study group (Mean DMFT/dmft= 3). The caries status of children in the control group was greater than children in the study group which was statistically significant ($p<0.001$). The mean plaque index of children in the control group (1.40 ± 0.36) was greater than children in the study group (1.34 ± 1.04) which was statistically significant (p-value = 0.013).

Organ	Mean ± Standard Deviation (Study group)	Mean ± Standard Deviation (Control group)	U-value	p-value
DMFT/ dmft Index	2±3.05	5.3±4.7	523.5	<0.001 (HS)
Plaque Index	1.34±1.04	1.40±0.36	766.5	0.013 (S)
Gingival Index	1.34±0.54	1.25±0.30	1021	0.624 (NS)

[Table/Fig-3]: The mean DMFT/dmft, plaque and gingival index of children.
Mann-Whitney U Test; HS- highly significant, S- Significant; NS- Non significant

The gingival health of children in the study group was also poorer compared to children in the control group. The mean gingival index of children in the study group (1.34±0.54) was greater than children in the control group (1.25±0.30) but was not statistically significant (p value = 0.624).

Four patients who were suffering from ALL had pale gingiva and tongue while one patient had yellowish pigmentation on tongue and teeth. One patient also showed blackish discoloration of tongue and gingiva and one patient showed spotted tongue. Gingival enlargement was found in three patients. One patient had enamel hypoplasia while delayed eruption of teeth was found in two patients. One patient also showed the presence of candidiasis.

DISCUSSION

In this study, we assessed the dental attitudes of the parents of children who were receiving chemotherapy and oral hygiene habits of children in the study group using the administered questionnaire. We found that 12 out of 47 children didn't brush their teeth. The main reason that was cited by their parents was that their children were less in age because of which they were unable to brush. Also, only six out of 47 parents had taken their child to a dentist previously. This indicates a lack of awareness among the parents of most children towards the dental health of their child. Out of the six who had visited, five had visited only a general dental practitioner. Many parents had not taken their child for any dental check-ups because they did not perceive their child to have any dental problems because they believed they had milk teeth which were dispensable. In the study group, parents of most children (72%) placed a high level of importance on the dental care of their child. However, parents of 13 children were not concerned about any dental treatment for their child and their response towards the preventive advice was poor. The children undergoing treatment were being advised Listerine mouthwash and Candid mouth paint by the paediatrician. In our study, we found that approximately 70% of the parents followed these instructions; however, 14 parents didn't follow. The main reason given by these parents were that they feared that their child was small and they might swallow the mouthwash or the mouthpaint. Also, the parents were more concerned about the concomitant illness rather than the oral care of their child as they seemed worried faced with the diagnosis of a malignancy as they asked what effect the oral hygiene would have on treatment of cancer while administering the questionnairre. All the patients receiving chemotherapy were on sugar based syrups/ medications and were advised to avoid raw fruits and vegetables. This might lead to high caries risk in these children.

On oral examination, we found pale gingiva and tongue in four patients, oral ulcerations in one patient, delayed eruption of teeth in two patients; and gingival enlargement in three patients. Also, one patient complained of repeated oral ulcerations and one patient complained of gingival bleeding. All these patients were suffering from ALL; thus these findings may be oral manifestations of ALL. We also found yellowish pigmentation of teeth in one patient, blackish discoloration of tongue and teeth in two patients, enamel hypoplasia in one patient and candidiasis in one patient. These might be the side-effects of chemotherapy in these patients because all these findings were reported after the start of chemotherapy.

The mean plaque index of children in the control group (1.40) is greater than children in the study group (1.34) which was statistically significant. This means that the oral hygiene status in children of study group was only better than control group. This might be because the patients in study group were being given advice on oral care as they were being advised Listerine and Candid mouthwash as assessed by the administered questionnaire. The mean gingival index of children in the study group (1.34) is greater than children in the control group (1.25) but was not statistically significant. This may be due to the side-effects of chemotherapeutic drugs on the gingiva of the patients in the study group as gingival bleeding and gingival enlargement was noted at the time of oral examination. The caries status of children in the control group is greater than children in the study group. This might be because they were recruited from the outpatient Department of Pedodontics who came with chief complaints of decayed or discoloured teeth and also might be due to the poorer socio-economic status of the parents of children in the control group compared to study group which was assessed by occupation of parents in the questionnaire. Moreover, the children in the control group consumed more sugar containing snacks/beverages in their diet than the study group (assessed by the questionnaire).

Welbury et al., Fleming et al., Maguire et al., have reported a similar level of decay in long term survivors of malignant disease or children in remission from acute lymphoblastic leukaemia compared to healthy children or to that of siblings (aged 3 to 22 years) [9-11]. Fleming et al., also reported that there was no significant difference in dmft values of children 6 to 19 years of age in remission from leukaemia than their matched controls as the patients in study group were being given preventive dental advice by their physician similarly as in our study [12].

However, many authors have reported an increased level of caries in children in remission of chemotherapy. Pajari et al., reported an increased level of caries in children with ALL compared to matched controls, but the children with ALL had a higher level of caries before being diagnosed with leukaemia [13]. Dens et al., examined 52 children ranging being treated with chemotherapy and reported a higher caries prevalence but no significant differences in gingival index, plaque index or toothbrushing frequency compared with a control group [14]. Cubucku C and Sevinir B also reported significantly more carious lesions (more dmft index) in long term survivors of cancer (disease free for five years), ranging from 6 to 19 years of age; however no significant differences in the DMFT values were found between them and the control group [15].

The first period of treatment (approximately one month) is concerned with the chemotherapeutic induction of remission. During this time, the bone marrow is cleared of visible leukaemic cells and repopulated with normal ones. Induction is followed by consolidation, usually accomplished by the administration of several blocks of high dose chemotherapy over 6-9 months following diagnosis. Finally, there is a period of maintenance treatment during which anti-metabolite treatment is continued on a daily basis. This usually lasts for 18 months and three years, depending on the protocol employed [16].

Acute oral sequelae as a result of cancer therapies are common in children [17]. Oral and associated systemic complications may include pain, mucositis, oral ulcerations, bleeding, taste dysfunction, secondary infections (e.g., candidiasis, herpes simplex virus), dental caries, salivary gland dysfunction (e.g. xerostomia), neurotoxicity, mucosal fibrosis, post-radiation osteonecrosis, soft tissue necrosis, temporomandibular dysfunction (e.g. trismus), craniofacial and dental developmental anomalies [6].

As the patients are immunocompromised, any existing or potential sources of oral/dental infections and/or soft tissue trauma can compromise the medical treatment which may lead to morbidity, mortality, and higher hospitalization costs. It is imperative for

the paediatric dentist to be familiar with the medical history as well as oral manifestations of the patient's underlying condition and the treatment differences that exist for patients undergoing chemotherapy or radiotherapy [6].

Only age and gender were used to match the children, but it might have been of value to match socioeconomic status also because it may also influence dental health [18]. Further long term studies are required to analyse effect of chemotherapy on the primary dentition.

High occurrence of ALL (40 per million), occurs predominantly in the white populations of North America, Western Europe and Oceania, and also in the Chinese of Hong Kong and Singapore. Somewhat lower rates, around 20–30 per million, have tended to be found in the former socialist countries of Eastern Europe, and in Japan, much of Latin America, and parts of the Middle East. Incidence is still lower, 15–20 per million among US Blacks and in India, and lowest of all in much of sub-Saharan Africa [19].

All patients with cancer should have an oral examination prior to initiation of the oncology therapy. Oral prophylaxis and timely caries treatment are strongly recommended to maintain normal status as far as possible [20]. The prime focus should be on caries prevention and must include dietary counselling, oral hygiene practices and fluoride applications if necessary. There should be periodic dental check-ups during the treatment to register any specific dental problem and treatment be instituted at the right time so as to control any oral infection.

LIMITATION

The limitation of this study was that children of same socio-economic status and similar oral hygiene practices were not compared. Further studies should be conducted using a larger sample size and having similar oral hygiene practices.

CONCLUSION

In this study, we found that there is a lack of dental awareness among the parents of children receiving chemotherapy. The child and the parents should be educated regarding the possible acute side effects and the long-term sequelae of cancer therapies in the oral cavity. The worse caries experience of the control group might be because they were taken from the outpatient Department of Paediatric Dentistry.

There should be free of cost dental check-ups for such immunocompromised patients receiving chemotherapy and periodic referral to Paediatric Dental Clinics and timely oral care should be provided.

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REFERENCES

[1] Ferlay J, Bray F, Pisani P, Parkin DM. GLOBOCAN 2002: Cancer Incidence. Mortality and Prevalence Worldwide. IARC CancerBase No. 5, version 2.0., Lyon: IARC Press 2004.
[2] Summary- Report on Causes of Death: 2001-03 in India [Internet]. Available from: http://censusindia.gov.in/Vital_Statistics/Summary_Report_Death_01_03.pdf.
[3] Satyanarayana L, Asthana S, Labani P. Childhood Cancer Incidence in India: A Review of Population-Based Cancer Registries. *Indian Paediatrics*. 2014;51:218-20.
[4] National Cancer Institute. [Internet] Oral Complications of Chemotherapy and Head/Neck Radiation (PDQ®). Available from: http://www.cancer.gov/about-cancer/treatment/side-effects/mouth-throat/oral-complications-pdq
[5] Elad S, Thierer T, Bitan M, Shapira MY, Meyerowitz C. A decision analysis: The dental management of patients prior to hematology cytotoxic therapy or hematopoietic stem cell transplantation. *Oral Oncol.* 2008;44(1):37-42.
[6] Guideline on Dental Management of Paediatric Patients Receiving Chemotherapy, Hematopoietic Cell Transplantation, and/or Radiation Therapy. *AAPD Reference Manual.* 2013;37(6):15-16.
[7] Klein H, Palmer C. Studies on dental caries vs. familial resemblance in the caries experience of siblings. *Pub Hlth Rep*. 1938;53:1353-64.
[8] Loe H. The gingival index, the plaque index and the retention index system. *J Periodontal*. 1967;38:610-16.
[9] Welbury RR, Craft AW, Murray JJ, Kernahan J. Dental health of survivors of malignant disease. *Arch Dis Child*. 1984;59:1186-87.
[10] Fleming P, Kinirons MJ. Dental health of children suffering from Acute Lymphoblastic Leukaemia. *Paediatr Dent*. 1986;2:1-5.
[11] Maguire A, Craft AW, Evans RGB, Amineddine H, Kernahan J, Mcleod RI, et al. The long- term effects of treatment on the dental condition of children surviving malignant diseases. *Cancer*. 1987;60:2570-75.
[12] Fleming P, Kinirons MJ. Study of the dental health of children in remission from acute lymphoblastic leukaemia in Northern Ireland. *Comm Dent Oral Epidemiol*. 1993;21:309–12.
[13] Pajari V, Larmas M, Lanning M. Caries incidence and prevalence in children receiving antineoplastic therapy. *Caries Res*. 1988;22:318-20.
[14] Dens F, Boute P, Otten J, Vinckier F, Declerck D. Dental caries, gingival health, and oral hygiene of long term survivors of paediatric malignant diseases. *Arch Dis Child*. 1995;72:129-32.
[15] Cubucku CE, Sevinir B. Dental health indices of long-term childhood cancer survivors who had oral supervision during treatment: a case-control study. *Paediatr Hematol Oncol*. 2008;25(7):638-46.
[16] Atilla S. Oral and Dental Care in Acute Lymphoblastic Leukemia: Role of Paediatric Dentist. *Int J Hem Oncol.* 2009;19(1):58-62.
[17] Margolin JF, Poplack DG. Acute Lymphoblastic Leukaemia. In: Pizzo PA, Poplack DG (eds). Principles and Practice of Paediatric Oncology. Philadelphia. New York: Lipincott-Raven, 1997.
[18] Grindefjord M, Dahllöf G, Nilsson B, Modéer T. Stepwise prediction of dental caries in children up to 3.5 years of age. *Caries Res*. 1996;30:256–66.
[19] Stiller CA. Epidemiology and genetics of childhood cancer. *Oncogene*. 2004;23:6429-44.
[20] The Royal College of Surgeons of England/The British Society for Disability and Oral Health. The Oral Management of Oncology Patients Requiring Radiotherapy, Chemotherapy and / or Bone Marrow Transplantation. *Clinical Guidelines*. Updated 2012.

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