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Evaluation and Comparison of Oral Hygiene Status and Periodontal Health among Head and Neck Cancer Patients during Radio and Chemotherapy

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Abstract

Background: Dental disease following chemotherapy and radiotherapy is a common and important problem in many head and neck cancer patients

Aim: To compare the complications and oral health status of patients who received radiotherapy with those who received chemotherapy.

Methods: A cross-sectional study was conducted in the Oncology Department of SMS Medical College and Hospital among 242 patients. The patients were divided into two groups' i.e. One group of patients who were undergoing chemotherapy and other group were undergoing radiotherapy treatment. The questionnaire included variables like age, gender, cancer site, type of treatment, completion of treatment (yes or no) and associated complications (altered taste, pain, mucositis, trismus and xerostomia). Oral mucositis was assessed according to the EORTC/ RTOG criteria. Salivary secretion was assessed by collection of resting whole saliva as well as stimulated saliva. OHI-S and CPI indices were also recorded. The statistical significance was determined by Chi-square test with the help of SPSS version 20.

Results: There was a highly statistically significant difference between chemotherapy and radiotherapy modalities when tested in relation to complications (altered taste, pain, mucositis, trismus and xerostomia). All the indices including OHI-S (The Simplified Oral Hygiene Index), CPI (Community Periodontal Index) and LOA (Loss of attachment) showed statistically significant difference when tested with the treatment modality.

Conclusion: It can be appreciated from the results that patients receiving radiotherapy experienced higher intensity of oral complications and poor oral health status. Different strategies should be planned to prevent oral complications and maintain oral hygiene status according to the type of cancer treatment.

Keywords: Health professionals; Oral health status; Cancer; CPI; OHI-S

Introduction

Dental disease following chemotherapy and radiotherapy is a common and important problem in many head and neck cancer patients. Diet consumption, vital for existence, depends on a well-functioning oral cavity. Aesthetic appearance of a person is also dependent on the anatomy of the oral cavity.

Oral cancer (OC) accounts for 7% of all new cancer cases worldwide, around 270,000 cases annually [1]. OC is the fifth and seventh most common cancer among male and female respectively in developing countries [1]. Dr. Geoff Craig stated that "people are dying of oral cancer because of ignorance" [2]. In India every year 3,00,000 cases of cancer are tobacco related [2]. Head and neck cancer (HNC) is described as cancer of tonsil, pharynx, nasal cavity, salivary gland, hypopharynx, larynx and other. Oral cancer refers to cancer of lip, tongue, gingivae, floor of the mouth, palate (hard and soft), maxilla and cheek [3,4].

Surgery, radiotherapy and chemotherapy are the various approaches to treat malignant neoplasms. It is a harsh reality that during cancer treatment, collateral damage to the head and neck structures is frequently encountered as an unwanted consequence. The ionizing radiation released during radiotherapy lead to damage in normal tissues located in the radiation field [5]. Chemotherapy is generally given in cycles with varying intensity depending on the disease [6,7].

In this study null hypothesis was formulated that treatment modalities like radiotherapy and chemotherapy effect periodontal status of patients, but it is not clear whether both therapies have same or different impact. It is of interest to compare the complications and oral health status of cancer patients receiving radiotherapy and chemotherapy. This study concerns oral health status and oral complications among cancer patients, treated with radiotherapy and chemotherapy.

Materials and Methods

This cross-sectional study was conducted at the Oncology and Radiology Department of SMS Medical College and Hospital, Rajasthan, India, during the month of February-December 2014. All the cancer patients who were registered and undergoing head and neck and oral cancer treatment during 1 February to December 2014 were considered for the study. Convenience sampling was considered for the present study. 279 patients were recruited during this time period. WHO type III [8] examination was carried out with the help of plane mouth mirror, explorer and CPITN (WHO) probe. Out of 279 patients recruited, 242 were considered eligible according to the inclusion criteria i.e. histopathological confirmation of head and neck and oral cancer, mouth opening of at least 25 mm, patients with completion of treatment i.e. complete radiotherapy and chemotherapy cycles during the time period and minimum of two teeth present per sextant for recording the Simplified Oral Hygiene Index and Community Periodontal Index. Those patients who had undergone previous treatment for Head and Neck and Oral Cancer, Head and Neck and Oral Cancer of unknown region and patients who had tumour at primary sites other than those established in the study were excluded from the present study.

Most of the critically ill patients from all over the Rajasthan state are referred to SMS Medical College and Hospital. This hospital is situated in the capital city of Rajasthan. The preliminary selection of the patients was done according to the site which was further classified according to the prescribed mode of treatment. The patients were divided into two groups according to their treatment regimen, one group of patients who were undergoing chemotherapy treatment and other group were undergoing radiotherapy treatment. Patients prescribed with a combination therapy were not considered for the study. Ethical guidelines of Helsinki Declaration (2000) were followed for the present study.

The ethical clearance was obtained from the ethical committee of SMS Medical College and Hospital, Rajasthan, before commencing the study. An informed consent was signed by the patients who agreed to participate in the study. The dental clinical examination was conducted by a single calibrated examiner for whom kappa statistics was tested 82% two days prior to study. Data was collected through face-to-face interviews using a standardized questionnaire applied to all cases. The questionnaire included sociodemographic variables such as age, gender, cancer site, type of treatment, patients with completion of treatment i.e. complete radiotherapy and chemotherapy cycles during the time period and complications associated with the therapy. The questionnaire was pretested on a group of 20 patients to check the feasibility of the study. The reliability of the questionnaire was evaluated by: (1) Cronbach's coefficient alpha to measure the internal consistency; (2) testretest method to examine the stability of the questionnaire. The alpha coefficient of 0.82 was considered adequate. Testretest reliability was measured by having the same set of respondents to complete a questionnaire at two different points of time within which there was no change of the constructs of interest. Intraclass correlation coefficient (ICC) with 95% confidence interval (CI) was used for assessing this reliability. The value of the ICC was 0.82.

The complications were recorded in the patients, during the last phase of their chemotherapy or radiotherapy session. Among the complications in the present study oral mucositis was assessed according to the Radiation Therapy Oncology Group (RTOG) and the European Organization for Research and Treatment of Cancer (EORTC) criteria [9], as follows: Grade 0 (normal), 1 (soreness with/without erythema), 2 (ulceration and erythema), 3 (ulceration and extensive erythema, patient cannot swallow solid food), 4 (mucositis of such severity that feeding is not possible). Salivary secretion assessment was done in the morning by gathering of resting whole saliva as well as stimulated saliva. Resting whole saliva was gathered by having the subjects drivel in a graduated glass during 5 minutes. Saliva was stimulated by chewing on 1 g of paraffin and collected in a graduated glass during 5 minutes. The secretion rate was determined as ml per minute. Normal flow rate of resting whole saliva is ≥ 0.3 ml/min and normal flow rate of stimulated saliva is ≥ 1 ml/min. A resting flow rate of <0.1 ml/min and a stimulated flow of <0.7 ml/min are generally indicative of hypo salivation [10]. Rest of the complications such as altered taste and pain was assessed with subjective input from the patient.

Evaluation of oral hygiene (debris and calculus) was done by Simplified Oral Hygiene Index [11] on buccal/labial and lingual/palatal surfaces of the selected index teeth while community periodontal index (CPI) [12] was used to record the gingival and periodontal status. Before the start of treatment, oral prophylaxis of all the selected patients was done. After the completion of oral prophylaxis patients were instructed regarding brushing technique and use of mouth wash. These procedures were done to neutralize the impact of confounding factors like oral hygiene practices so that the influence of chemotherapy and radiotherapy could be assessed on oral hygiene and periodontal status.

SPSS version 20 was used for the statistical analysis. The statistical significance was determined by the Chi-square test, and level of significance was set at $P<0.05$.

Results

In the present study, male and female patients constitute 88.43% and 11.57% respectively. HN and OC constitute 35.95% and 64.05% cases respectively. Both HN and OC patients were reported maximum in the age group 50-59 years. The prevalence of HN and OC was found to be least in the ≥ 70 years participants with 2.5% and 3.7% cases, respectively. There was a statistically significant difference between HN and OC with age. The demographic characteristics are shown in Table 1.

Variable	Head and neck	Oral cancer	Total	χ2	p value
Gender	N (%)	N (%)	N (%)	0.204	0.718
Male	78 (32.23)	136 (56.20)	214 (88.43)		
Female	9 (3.72)	19 (7.85)	28 (11.57)		
Total	87 (35.95)	155 (64.05)	242 (100)		
Age groups (Years)	**N (%)**	**N (%)**	**N (%)**	**χ2**	**p value**
<40	16 (6.6)	47 (19.4)	63 (26.03)	12.128	0.01
40-49	19 (7.9)	39 (16.1)	58 (23.96)		
50-59	32 (13.2)	53 (21.9)	85 (35.1)		
60-69	14 (5.8)	7 (2.9)	21 (8.7)		

≥ 70	6 (2.5)	9 (3.7)	15 (6.2)		
Total	87 (35.95)	155 (64.05)	242 (100)		

Table 1: Head and neck and oral cancer distribution according to age group and gender (χ2: Chi square test).

Pain was the most common complications observed in both chemotherapy (71.9%) and radiotherapy patients (96.7%). Trismus was the least common complications observed among chemotherapy and radiotherapy cases i.e., 11.6% and 52.9% respectively (Table 2).

Variables	Treatment modality			
	Chemotherapy N (%)	Radiotherapy N (%)	χ2	p value
HNC	45 (18.6)	42 (17.4)		
Oral cancer	76 (31.4)	79 (32.6)		
Symptoms				
Altered taste	72 (59.5)	113 (93.4)	21.521	<0.0001
Pain	87 (71.9)	117 (96.7)		
Mucositis	37 (30.6)	101 (83.5)		
Trismus	14 (11.6)	64 (52.9)		
Xerostomia	43 (35.5)	96 (79.3)		

Table 2: Treatment modalities and its symptoms (χ2: Chi square test).

There was a highly statistically significant difference between chemotherapy and radiotherapy modalities when tested in relation to complications ($p<0.05$).

Tongue was the most common cancer site in OC cases. Among the tongue cancer cases chemotherapy and radiotherapy treatment was given 34 and 33 patients respectively. Treatment modality is presented according to the site in (Table 3).

Site	Treatment		N%
	Chemotherapy	Radiotherapy	
Lip	6	4	10 (4.1)
Tongue	34	33	67 (27.7)
Gingiva	2	2	4 (1.7)
Floor of mouth	4	4	8 (3.3)
Palate	7	1	8 (3.3)
Maxilla	4	1	5 (2.1)
Mandible	2	1	3 (1.2)
Cheek	14	29	43 (17.8)
Nasal cavity	3	4	7 (2.9)
Tonsil	7	13	20 (8.3)
Oropharynx	8	6	14 (5.8)
Hypopharynx	17	11	28 (11.6)
Larynx	13	12	25 (10.3)

Table 3: Site wise treatment of HNC and oral cancer

	Treatment				
Oral hygiene status	Chemotherapy	Radiotherapy	Total	X^2	p value
	N (%)	N (%)	N (%)		
Good	19 (15.70)	8 (6.61)	27 (11.16)		
Fair	49 (40.50)	31 (25.62)	80 (33.06)		
Poor	53 (43.80)	82 (67.77)	135 (55.79)	14.874	0.0006
CPI Codes					
CPI Code 0	26 (21.49)	8 (6.61)	34 (14.05)		
CPI Code 1	31 (25.62)	36 (29.75)	67 (27.69)		
CPI Code 2	43 (35.54)	49 (40.50)	92 (38.02)	11.536	0.021
CPI Code 3	17 (14.05)	21 (17.36)	38 (15.70)		
CPI Code 4	4 (3.31)	7 (5.79)	11 (4.55)		
LOA Codes					
LOA code 0	109 (90.08)	93 (76.86)	202 (83.47)		
LOA code 1	4 (3.31)	14 (11.57)	18 (7.44)		
LOA code 2	6 (4.96)	8 (6.61)	14 (5.79)	9.818	0.041
LOA code 3	1 (0.83)	5 (4.13)	6 (2.48)		
LOA code 4	1 (0.83)	1 (0.83)	2 (0.83)		

Table 4: Oral health status according to treatment modalities (X^2: Chi square test).

Good oral hygiene status was reported in 15.70% and 6.61% of the chemotherapy and radiotherapy cases respectively. 67.77% of the radiotherapy patients had poor oral hygiene status while in contrary only 43.80% chemotherapy cohort had poor oral hygiene (Table 4). CPI code 0 was observed in 21.49% of the chemotherapy cases whereas only 6.61% of the radiotherapy cases had CPI code 0. Radiotherapy

and chemotherapy patients reported with a total of CPI code 3 and 4 were 23.15% and 17.36% respectively. LOA code of 1, 2, 3 and 4 were reported in 9.93% and 23.14% among chemotherapy and radiotherapy cohort respectively. All the indices including OHI-S, CPI and LOA reported with a statistically significant difference when tested with the treatment modality.

Discussion

The purpose of the study was to provide information on oral health status in the patients undergoing Head and Neck and Oral cancer treatment. In the present study oral hygiene and periodontal status were measured separately among chemotherapy and radiotherapy patients. This would help to educate the patients and the concerning doctors to take measures towards improvement in oral hygiene and can be used as a supportive therapy according to the treatment (chemotherapy or radiotherapy) given.

Patient opinions regarding oral complications are valid independently of the outcomes evaluated by the doctors. Various studies [13-15] found that patients are always not able to express their oral complications and the same was reported by Persson et al. [16]. Patients felt these oral complications reported by staff as part of treatment which are unavoidable and that's why they rarely talk about it and the same was reported by Wells [15] in his research.

Patients receiving radiotherapy were suffering from severe oral complications. These complications were less severe among patients receiving chemotherapy. Significant differences in complications burden were found between patients who received radiotherapy alone as opposed to patients who received chemotherapy but the same was not reported by Galitis et al. [17]. So, patients receiving radiotherapy need considerable support from dental as well as nursing staff. After treatment termination, when symptoms are at their peak, it is of great importance that the dental staff, who has sufficient knowledge to treat the oral symptoms, continues to see these patients. Mouth dryness and salivary viscosity remained elevated in the present patients. This represents an important threat to the oral health since saliva is an important protector [10,18-20].

Severe oral complications reported among chemotherapy patients were not as frequent as it were in radiotherapy patients. In the current study, some of the patients receiving chemotherapy reported severe oral complications. But as of now no dependable prognosticator is available which lets us know that who will suffer from complications, which lead to the importance of referring all patients to dentist before the initiation of the treatment. In the current research signs of mucositis were approximately shown by all the chemotherapy patients, although lower when compared to radiotherapy patients [16,21]. Patients reported taste alterations and difficulties in eating. The observation that patients receiving radiotherapy are more affected by oral complications than are chemotherapy patients is in agreement with earlier findings [22-24]. Tumour location is most commonly found in or near the oral cavity in most of the cases with head and neck cancer, which may produce an extra effect on their experience of oral complications.

In the present research oral hygiene status as well as periodontal status of chemotherapy cases was better than radiotherapy cases. This difference may be related to the oral complications as it can be well appreciated from the results that conditions like trismus and sore were more severe in radiotherapy patients. Patients having complications like trismus and sore found it difficult to perform the routine oral hygiene procedures. In this study, periodontal status fluctuates depending on the treatment modalities. The null hypothesis generated by the authors that treatment modalities have no effect on periodontal status of patients was thus rejected.

Therefore to provide evidence-based oral care, it is vital to achieve scientific evidence in relation to the effects of oral programs for patients receiving cancer treatment. Existing protocols are employed in clinical practice to a varying extent and there is a lack of research within this field. The strength of the present study is that authors have taken the maximum sample of chemotherapy and radiotherapy cases to examine the oral health status and oral complications till date. This is the first kind of study in which oral health status was compared among chemotherapy and radiotherapy cases. The limitation of present study is that due to cross sectional design; it did not allow assessment or tracking changes in oral health assessment and symptoms after the treatment. So, further longitudinal studies are recommended in this direction.

Conclusion

It can be clearly appreciated from the results that patients receiving radiotherapy experienced higher intensity of oral complications and poor oral health status irrespective of the oral care provided while in comparison patients receiving chemotherapy experienced low to moderate intensity of oral symptoms and better oral health status. So, different strategies should be planned to prevent oral complications and maintain oral hygiene status according to the type of cancer treatment i.e. chemotherapy or radiotherapy and multi-disciplinary approach to oral care should be adopted including the medical, dental and para medical staff.

References

1. Marques LA, Neto JE, Figueiredo RAO, Góis-Filho JF, Kowalski LP, et al. (2008) Oral health, hygiene practices and oral cancer. Rev Saude Publica 42: 471-479.
2. www.oralcancerawareness.org/mouth_cancer.html
3. MacCarthy D, Flint SR, Healy C, Stassen L (2011) Oral and neck examination for early detection of oral cancer - a practical guide. J Ir Dent Assoc 57: 195-199.
4. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin LH, et al. (2000) International classification of diseases for oncology (ICD-O). (3rd edtn.), Geneva: World Health Organization.
5. Rosales AC, Esteves SC, Jorge J, Almeida OP, Lopes MA (2009) Dental needs in Brazilian patients subjected to head and neck radiotherapy. Braz Dent J 20: 74-77.
6. Conklin KA (2004) Chemotherapy-associated oxidative stress: Impact on chemotherapeutic effectiveness. Integr Cancer Ther 3: 294-300.
7. Lee C, Longo VD (2011) Fasting vs dietary restriction in cellular protection and cancer treatment. Oncogene 30: 3305-3316.
8. American Dental Association (1954) A dental health program for schools. Chicago (IL): The American Dental Association.
9. Cox JD, Stetz J, Pajak TF (1995) Toxicity criteria of the Radiation Therapy Oncology Group (RTOG) and the European Organization for Research and Treatment of Cancer (EORTC). Int J Radiat Oncol Biol Phys 31: 1341-1346.
10. Tenovuo J, Lagerlöf F (1994) Saliva. In: Textbook of clinical cariology. Munksgaard, Copenhagen.
11. Greene JC, Vermillion JR (1964) The simplified oral hygiene index. J Amer Dent Assoc 68: 7-13.

12. Ainamo J (1989) Epidemiología de la enfermedad periodontal. In: Lindhe J (eds). Periodontología Clínica. Buenos Aires: Editorial Médica Panamericana.
13. Bjordal K, Freng A, Thorvik J, Kaasa S (1995) Patient self-reported and clinician-rated quality of life in head and neck cancer patients: a cross-sectional study. Eur J Cancer B Oral Oncol 31: 235 - 241.
14. Persson L (1998) Daily life problems from a nursing perspective in patients with acute leukaemia or highly malignant lymphoma (Dissertation) Centre of Caring Sciences. The Medical Faculty Lund University, Lund.
15. Wells M (1998) The hidden experience of radiotherapy to the head and neck: a qualitative study of patients after completion of treatment. J Adv Nursing 28: 840-848.
16. Persson L, Hallberg I.R, Ohlsson O (1995) Acute leukaemia and malignant lymphoma patients experiences of disease, treatment and nursing care during the active treatment phase: an explorative study. European J Cancer Care 4: 133-142.
17. Galitis NO, Kouloulias V, Lountou SA, Dardoufas K, Polychronopoulou A, et al. (2015) Oral mucositis, pain and xerostomia in 135 head and neck cancer patients receiving radiotherapy with or without chemotherapy. The Open Cancer Journal 4: 7-17.
18. Jansma J (1991) Oral sequelae resulting from head and neck radiotherapy, Course, prevention and management of radiation caries and other oral complications (Dissertation) Rijksuniversiteit Groningen, Groningen.
19. Ekström J (2000) Regulation of salivation. Tandläkartidningen 92: 36-43.
20. Epstein JB, Meij VD, Emerton EH, Le SM, Stevenson MP (1995) Compliance with fluoride gel use in irradiated patients. Spec Care Dentist 15: 218-222.
21. Zittoun R, Achard S, Ruszniewski M (1999) Assessment of quality of life during intensive chemotherapy or bone marrow transplantation. Psycho-Oncology 8: 64-73.
22. Lunn R (1998) Oral Management of the Cancer Patient. Probe 32: 58-68.
23. Sonis ST, Eilers JP, Epstein JB, LeVeque FG, Liggett W, et al. (1998) Validation of a New Scoring System for the Assessment of Clinical Trial Research of Oral Mucositis Induced by Radiation or Chemotherapy. Cancer 85: 2103-2113.
24. Spijkervet FK, Van Saene HK, Panders AK, Vermey A, Mehta DM (1989) Scoring irradiation mucositis in head and neck cancer patients. J Oral Pathol Med 18: 167-171.