

Oral-Health Related Quality of Life of Patients on Chemotherapy

Sheela Pavithran*, M. V. Sreelekshmi and R. Sreelekshmi

Amrita College of Nursing, AMRITA Vishwa Vidyapeetham,
Amrita Institute of Medical Sciences, Kochi, India.

*Corresponding Author E-mail: sheelapavithran@aims.amrita.edu

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Chemotherapy is a systemic treatment to combat primarily the disease sites, metastatic areas and possibly microscopic spread of disease. Along with the cancer cells, many actively dividing normal cells of the body are also destroyed. The current study, oral health related quality of life of patients on chemotherapy, a survey design was conducted with the aim to determine the impact of chemotherapy on oral-health and compare the OHRQoL of life at baseline, at Cycle III and V of chemotherapy. The study subjects included 60 patients receiving chemotherapy from the chemotherapy unit selected by total enumeration sampling. Oral-health status was assessed using Oral Health Impact Questionnaire. Study reported a gradual decline in the OHRQoL as the cycle of chemotherapy advanced (mean – 21.78 + 23.38, 28.02 + 21.24 and 34.33 + 21.45 at baseline, cycle III and V respectively). Statistically significant difference was noted in all the seven domains of OHRQoL between baseline, cycle III and V ($p < 0.01$). Factors like co-morbidity, oral hygiene, presence of decayed, missing and sensitive teeth were significantly associated with OHRQoL ($p < 0.05$). Hence, it is evident that chemotherapy pause a serious impact on the oral health. Keeping in view impact of chemotherapy on the oral health, assessment of the oral cavity must be part of the routine assessment of all the patients receiving chemotherapy and if necessary, consultation of a dentist must be done.

Keywords: Chemotherapy; Cancer; Oral-Health; Oral Health Impact; Risk Factors; Quality of Life.

Background of the problem

Chemotherapy is one of the most widely used treatments for cancer. It is used to prevent cancer cells from multiplying, invading or metastasizing. Cancer spreads primarily by direct extension through lymph nodes or the blood stream. Chemotherapy is a systemic treatment that enables the therapy to combat primarily disease sites, metastatic areas and possibly microscopic spread of disease. The goal of chemotherapy is targeted at three areas as cure, control or palliation.¹⁻² Cure is the desired outcome of all patients but the likelihood depends on factors like extent of the disease at the time of diagnosis, functional

status of the patients, physiological presentation at diagnosis, and other socioeconomic influences. Control is the goal of most of the therapy when a cure is unrealistic. Control focus on maintaining or improving functional status in the presence of unknown disease without complete elimination of the disease. Chemotherapy for palliation is used when cure or control is not possible because of the extent of the disease. Quality of life (QoL), disease symptom management and end of life issues/hospice are a primary focus of control as a goal.¹⁻⁴ Chemotherapy may be used as a single agent, combination chemotherapy, adjuvant or neoadjuvant.³

The advances in chemotherapy as a treatment of choice for cancer has greatly reduced the mortality rates and improved the survival of patients with cancer. Chemotherapy acts on the active cells. Along with the cancer cells, many actively dividing normal cells of the body like blood, mouth, digestive system and the hair follicles also get destroyed.⁴⁻⁶ Most of the people are aware of the common side effects of chemotherapy such as nausea and hair loss. But most people do not know that one third of the patients on chemotherapy for cancer treatments develop complications that affect mouth. Cancer patients are at high risk for oral complications. Oral complications occur in nearly 40% of the patients who receive chemotherapy. It affects the dental and oral health of the individual. Dental and oral health refers to the well-being of the entire mouth, including the teeth, gums, lining of the mouth (mucosa), and salivary glands. Oral complications caused by chemotherapy include mouth sores (oral mucositis), bleeding in the mouth, dry mouth, tooth decay and gum diseases, infection (bacterial, viral and fungal), pain, difficulty in swallowing (dysphagia), change in taste, neurotoxicity causing constant aching, burning pain similar to tooth ache, change in dental growth and development in children, malnutrition or dehydration.⁷

Mucositis is one of the most common and dose limiting complications of chemotherapy,⁴⁻⁹ which begins 5-10 days after the initiation of chemotherapy and lasts 7-14 days. The combination of mucus, excess saliva and pain can make it difficult or even impossible to eat. Younger patients tend to develop oral mucositis (OM) more often than older patients being treated for the same malignancy with the same regimen. This appears to be due to the more rapid rate of basal cell turnover noted in children. However, the healing of OM is also more rapid in the younger age group. Mucositis is further complicated by nausea and vomiting that often occurs with treatment. Patients with damaged oral mucosa and reduced immunity are also prone to mouth infections.¹⁰⁻¹¹ Oral complications make it difficult to eat, talk, chew or swallow. These complications can affect the patients' quality of life.^{7,12} In some cases, the oral complications becomes so severe and can significantly affect the cancer treatment like the need to lower the treatment dose, change in the

schedule, delay in the treatment, and may even have to stop the treatment.^{7,13}

Oral health is essential to general health and well-being at every stage of life. A healthy mouth enables not only nutrition of the physical body, but also enhances social interaction and promotes self-esteem and feelings of well-being. WHO defines oral health as a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing.¹⁴

The malignancy, effect of chemotherapy on the body, and OM affect both the OHRQoL as well as the general QoL of the individuals. In addition to chemotherapy there are many other factors that contribute to the quality of the oral health like the presence of dental appliances, history of oral lesions, or smoking, oral hygiene/care practices,⁶ poor dental health, particularly periodontal disease, has been identified as an environmental factor that may increase the severity of OM. Treatment variables like the type, dose and schedule of systemic cytotoxic drugs delivered, radiation dose and field, and concomitant use of chemotherapy and radiation also contribute to OM. Studies report that the risk of OM increases as the intensity of therapy increases. In addition, patient-related risk factors like age, malnutrition, gender, pre-existing medical conditions, alterations in salivary production and composition, poor oral health and mucosal trauma have been reported to influence the risk of OM.¹⁵ Chemotherapy induced mucositis pose a serious implication on the patients' QoL.¹⁶⁻¹⁸ Strategies need to be developed to suit the individual patient considering the contributing factors for the prevention and appropriate management of mucositis and enhancement of the oral-health and general wellbeing. The global burden of disease study 2016 estimated that oral diseases affected half of the world's population and reported that oral health is a neglected area of global health that could make a contribution to achieving universal health coverage.¹⁹ In addition to this, most of the people are unaware about the oral impact of chemotherapy leading to neglect of oral discomfort as a complication.²⁰ So, careful assessment and

attention to the existing oral health issues can be done even before starting chemotherapy to help reducing the worsening of the oral problems during chemotherapy.

Aim of the study

The study is primarily aimed to determine the impact of chemotherapy on the oral-health related quality of life cancer patients receiving chemotherapy. The study further attempted to compare the oral-health related quality at different cycles with the baseline oral-health status.

MATERIALS AND METHODS

The present study was a descriptive survey to assess the impact of chemotherapy on the OHRQoL of patient receiving chemotherapy. The study was conducted among 60 patients scheduled to receive chemotherapy who were selected by total enumeration sampling. The data regarding socio-demographic and clinical variables were collected using a self-developed questionnaire and OHRQoL using Oral Health Impact Questionnaire (OHIQ) which has seven domains and 49 items. Data on oral health impact was assessed before starting the chemotherapy (baseline) and at third and fifth

cycle. Ethical Clearance from the Institutional Review Board and informed consent from each of subjects were obtained before starting the data collection. Data on socio-demographic and clinical variables were analyzed using descriptive statistics – frequency and percentage. Comparison of the OHRQoL at baseline, cycle III and V were assessed using Wilcoxon Signed Rank test and correlation by Mann Whitney U test. The statistical package SPSS 21 was used for the data analysis.

RESULTS AND DISCUSSION

Sample Characteristics

Table 1 showed that majority (27, 45%) of the subjects were between 61-70 years with 44 (73.3%) constituting age between 51-70 years. Females outnumbered males (36, 60% females vs 24, 40% males). Half (30, 50%) of the subjects had an income of Rs. 20,000 and above. More than 3/4th of the subjects never smoked while 11(18.3%) were ex-smokers and 11 (18.3%) had the habit of alcohol consumption.

Variables related to oral health presented in table 2 indicated that 26(43.3%) had only average oral hygiene and another 1(1.7%) had

Table 1. Sample characteristics based on socio demographic data n=60

Sl. No	Variables	Frequency (f)	Percentage (%)	Total
1	Age (yrs)			60
	21- 30	3	5.0	
	31- 40	4	6.7	
	41-50	9	15.0	
	51-60	17	28.3	
2	61-70	27	45.0	60
	Gender			
3	Male	24	40.0	60
	Female	36	60.0	
	Income (₹)			
	< 5000	5	8.3	
4	5000 - 9999	11	18.3	60
	10,000 - 19,999	14	23.3	
	20,000 and above	30	50.0	
5	Smoking status			60
	Never	46	76.7	
	Present smoker	3	5.0	
6	Ex-smoker	11	18.3	60
	Alcohol intake			
	Yes	11	18.3	
	No	49	81.7	

poor oral hygiene. More than half (36, 60%) used to brush the teeth twice daily and, paste and brush were the main items (55, 91.7%) used to clean the teeth. Majority (50, 83.3%) availed dental service only when there was an indication. Decayed teeth was reported by 14(23.3%), missing teeth by 26(43.3 %), filled teeth by 12(20%) and sensitive teeth by 6(10%). A few (9, 15%) used prosthesis out of which five were using fully removable and three using fixed prosthesis.

Oral Health Related Quality of Life of Patients Receiving Chemotherapy

The data regarding clinical variables (table 3) indicated that among the study subjects, over half (35, 58.4%) had normal BMI, whereas 21(35%) were overweight. Majority (42, 70%) had lymph node metastasis and 14(23.3%) had

distant metastasis. A variety of chemotherapeutic agents were used with maximum receiving the single agent oxaliplatin (6, 10%) followed by doxorubicin (4, 6.7%). Paclitaxel and carboplatin were the most commonly used (7, 11.7%) combination chemotherapy. A good number (28, 46.7%) were scheduled to receive six (6) cycles of chemotherapy. The laboratory investigation indicated that 36(60%) had normal Hb count, 25(41.7%) had normal WBC count and almost an equal number (23, 38.3%) had below normal WBC count (46, 76.7%), more than three quarter had normal neutrophil count (46, 76.7%) and 54(90%) had a normal platelet count. Hypertension was the major co-morbidity (11, 18%) reported by the subjects while almost half of the subjects did not report any co-morbidities (29, 48.3%). Previous

Table 2. Sample characteristics based on oral health related factors n=60

Sl. No	Variables	Frequency (f)	Percentage (%)	Total
1	Oral hygiene			60
	Good	33	55.0	
	Average	26	43.3	
2	Tooth brushing practice			60
	Once daily	23	38.3	
	Twice daily	36	60.0	
3	Brushing with			60
	Paste and brush	55	91.7	
	Tooth powder (commercial)	5	8.3	
4	Availing dental service			60
	Regularly	10	16.7	
	Only with indication	50	83.3	
5	Use of			60
	Betel leaves	3	5.0	
	Tobacco chewing	1	1.7	
6	Conditions of oral health			60
	No. of decayed tooth	14	23.3	
	No. of missing tooth	26	43.3	
7	Use of prosthesis			60
	No	51	85.0	
	Fixed prosthesis	3	5.0	
	Partially removable	1	1.7	
	Fully removable	5	8.3	

Table 3. Sample characteristics based on clinical variables n = 60

Sl. No	Variables	Frequency	Percentage
1	BMI		
	Under weight	2	3.3
	Normal weight	35	58.4
	Overweight	21	35.0
	Obese Class I	2	3.3
2	TNM Staging		
	T staging	4	6.7
	MN staging	42	70.0
	Metastasis	14	23.3
3	Chemotherapeutic agent used*		
	Doxitaxel	4	6.7
	Oxaliplatin	6	10.0
	Carboplatin	2	3.3
	Paclitaxel	3	5.0
	5-Fluorouracil	1	1.7
	Cisplatin	3	5.0
	Doxorubicin, Cyclophosphamide	3	5.0
	Paclitaxel, Carboplatin	7	11.7
	“Paclitaxel, Oxaliplatin”	3	5.0
	“Adreamicin, Cyclophosphamide”	3	5.0
4	Length of chemotherapy		
	4 weeks	13	21.7
	6 weeks	28	46.7
	7 weeks	2	3.3
	>7 weeks	17	28.3
5	Laboratory data		
a	Haemoglobin (Hb)		
	Below normal	21	35.0
	Normal	36	60.0
	Above normal	3	5.0
b	WBC		
	Below Normal	23	38.3
	Normal	25	41.7
	Above Normal	12	20.0
c	Neutrophil		
	Below normal	11	18.3
	normal	46	76.7
	Above normal	3	5.0
d	Platelet		
	Below normal	5	8.3
	Normal	54	90.0
	Above normal	1	1.7
6	Co-morbidity		
	Nil	29	48.33
	Hypertension	11	18.3
	Anaemia	3	5.0
	Kidney disease	1	1.7
	Others	16	26.7
7	Previous malignancy		
	Yes	6	10
	No	54	90
8	Oral risk factors		
	Previous oral ulcers	16	27
	Presence of dental caries	7	12
	Dental procedures	5	8
	Use of dentures	1	2
	None	30	50
	Total	60	100

*n more than 60

malignancy was reported by 6(10%), presence of oral risk factors by 30(50%). Previous oral ulcer (16, 27%) was the major oral risk factor reported.

Data presented in table 4 showed that the mean overall oral health of patients who received chemotherapy had significantly reduced from the baseline to third and fifth cycle with a mean

difference of 6.23 between baseline and Cycle III, 12.55 between baseline and Cycle V and 6.32 between cycle III and V ($p < 0.001$).

Comparison of the OHRQoL of patients at baseline, Cycle III and V using Wilcoxon Signed Rank test presented in table 5 indicated that there was a significant difference between the overall

Table 4. Mean and Standard deviation of Overall Oral Health Related Quality of Life at baseline and 3rd and 5th cycle of chemotherapy

	Measurement	Mean	Mean Difference	Std. Deviation	p- values
I	Baseline	21.7833	6.2334	23.43407	<0.001
	Cycle III	28.0167		21.23915	
II	Baseline	21.7833	12.5500	23.43407	<0.001
	Cycle V	34.3333		21.45446	
III	Cycle III	28.0167	6.3166	21.23915	<0.001
	Cycle V	34.3333		21.45446	

*Wilcoxon Signed Rank Test

Table 5. Comparison of the Oral health Related Quality of Life at Baseline, Cycle III and V n=60

S. No.	Domains	Measurements	Mean \pm SD	Paired Comparison	p Value	
I	Overall OHRQoL	Baseline	21.78 \pm 23.43	Baseline & Cycle III	0.001	
		Cycle III	28.02 \pm 21.4	Baseline & Cycle V	0.001	
		Cycle V	34.33 \pm 21.45	Cycle III & Cycle V	0.001	
II	Domain wise Oral Health Related Quality of Life	1 Functional Limitation	Baseline	3.57 \pm 4.92	Baseline & Cycle III	0.001
			Cycle III	4.45 \pm 4.78	Baseline & Cycle V	0.001
			Cycle V	5.35 \pm 5.43	Cycle III & Cycle V	0.001
		2 Physical Pain	Baseline	2.23 \pm 3.06	Baseline & Cycle III	0.01**
			Cycle III	2.72 \pm 2.61	Baseline & Cycle V	0.001
			Cycle V	2.63 \pm 2.85	Cycle III & Cycle V	0.001
		3 Psychological Discomfort	Baseline	3.02 \pm 3.32	Baseline & Cycle III	0.001
			Cycle III	3.47 \pm 3.27	Baseline & Cycle V	0.001
			Cycle V	3.93 \pm 3.35	Cycle III & Cycle V	0.001
		4 Physical Discomfort	Baseline	2.33 \pm 4.73	Baseline & Cycle III	0.001
			Cycle III	3.43 \pm 4.59	Baseline & Cycle V	0.001
			Cycle V	4.18 \pm 4.71	Cycle III & Cycle V	0.001
		5 Psychological Disability	Baseline	3.68 \pm 4.37	Baseline & Cycle III	0.001
			Cycle III	4.85 \pm 4.33	Baseline & Cycle V	0.001
			Cycle V	5.87 \pm 4.27	Cycle III & Cycle V	0.001
		6 Social Disability	Baseline	2.00 \pm 2.42	Baseline & Cycle III	0.001
			Cycle III	3.02 \pm 1.94	Baseline & Cycle V	0.001
			Cycle V	4.07 \pm 1.74	Cycle III & Cycle V	0.001
		7 Handicap	Baseline	4.95 \pm 4.81	Baseline & Cycle III	0.001
			Cycle III	6.08 \pm 4.27	Baseline & Cycle V	0.001
			Cycle V	7.30 \pm 3.83	Cycle III & Cycle V	0.001

@ Wilcoxon Signed Rank test; * $p < 0.01$

OHRQoL of patients receiving chemotherapy between the baseline and Cycle III, baseline and Cycle V and Cycle III and Cycle V ($p < 0.001$). Such a difference existed in all the domains [$p < 0.001$ for all the seven domains except in the domain 'physical pain' between baseline and

Table 6. Association of Related factors with OHRQoL n = 60

Sl. No	Parameter	Mean \pm SD	Mean \pm SD	p value
1	Age	≤ 50 (n = 16)	> 50 (n = 44)	
	Baseline	30.88 \pm 36.47	41.43 \pm 45.45	0.316
	Cycle 3	40.44 \pm 30.35	53.41 \pm 41.66	0.189
	Cycle 5	52.19 \pm 27.59	64.70 \pm 43.43	0.336
2	Gender	Male (n = 24)	Female (n = 36)	
	Baseline	24.21 \pm 19.09	48.22 \pm 51.66	0.089
	Cycle 3	36.88 \pm 15.21	58.67 \pm 47.28	0.139
	Cycle 5	49.63 \pm 20.90	69.19 \pm 47.45	0.163
3	Smoking history	Never smokers (n = 46)	Smokers (n = 14)	
	Baseline	42.04 \pm 47.88	27.36 \pm 18.81	0.727
	Cycle 3	53.93 \pm 43.20	36.86 \pm 15.94	0.271
	Cycle 5	64.65 \pm 43.68	50.57 \pm 22.16	0.392
4	Use of alcohol	Yes (n = 11)	No (n = 49)	
	Baseline	38.00 \pm 20.60	38.76 \pm 46.96	0.184
	Cycle 3	47.45 \pm 18.37	50.51 \pm 42.56	0.497
	Cycle 5	63.64 \pm 22.96	60.86 \pm 43.06	0.316
5	Oral Hygiene	Good (n=33)	Average (n=27)	
	Baseline	35.48 \pm 46.24	42.44 \pm 39.68	0.262
	Cycle 3	44.82 \pm 42.38	56.22 \pm 34.52	0.043
	Cycle 5	56.24 \pm 43.83	67.63 \pm 34.50	0.037*
6	Tooth brushing practice	Once daily (n = 23)	Twice daily (n = 27)	
	Baseline	36.52 \pm 37.6	39.92 \pm 46.79	0.988
	Cycle 3	47.57 \pm 32.18	51.43 \pm 43.27	0.988
	Cycle 5	59.09 \pm 32.05	62.78 \pm 44.59	0.976
7	Availing dental service	Regularly (n = 10)	Only when indicated (n = 50)	
	Baseline	60.90 \pm 72.98	34.16 \pm 33.86	0.377
	Cycle 3	64.70 \pm 67.70	47.00 \pm 30.82	0.945
	Cycle 5	73.4 \pm 70.71	58.96 \pm 31.18	0.819
8	Decayed teeth	≤ 1 (n = 46)	> 1 (n = 14)	
	Baseline	27.76 \pm 27.54	74.29 \pm 63.68	0.003**
	Cycle 3	38.63 \pm 23.78	87.14 \pm 55.26	0.001**
	Cycle 5	50.20 \pm 25.51	98.07 \pm 55.79	0.001**
9	Missing teeth	≤ 1 (n = 34)	> 1 (n = 26)	
	Baseline	31.35 \pm 45.13	48.12 \pm 39.37	0.017*
	Cycle 3	44.88 \pm 41.13	56.58 \pm 36.09	0.073
	Cycle 5	58.03 \pm 43.35	65.73 \pm 35.48	0.165
10	Filled teeth	≤ 1 (n = 48)	> 1 (n = 12)	
	Baseline	40.73 \pm 46.67	30.17 \pm 24.61	0.732
	Cycle 3	51.48 \pm 41.9	43.83 \pm 25.74	0.767
	Cycle 5	63.75 \pm 42.53	51.83 \pm 26.96	0.494
11	Sensitive teeth	≤ 1 (n = 54)	> 1 (n = 6)	
	Baseline	34.07 \pm 40.20	79.50 \pm 51.55	0.018*
	Cycle 3	46.19 \pm 37.11	83.83 \pm 18.05	0.014*
	Cycle 5	58.37 \pm 39.21	88.33 \pm 40.08	0.043*

@Mann Whitney U test; * $p < 0.05$; ** $p < 0.01$

cycle III ($p < 0.01$)]. So this data suggested that the OHRQoL significantly differ between the baseline and different cycles as well as in the overall QoL in patients receiving chemotherapy.

In addition to the overall and domain wise analysis, an item wise ($n=49$) comparison of the OHRQoL was done between the baseline and cycle III and V of chemotherapy. In the domain functional limitation, the items 'taste worse' and 'food catchy' were the most affected. The number of subjects whose taste affected had increased from 18(30%) at baseline to 33(55%) at cycle V. The subjects who felt 'food catchy' during the course of chemotherapy increased from 15(25%) at baseline to 27(45%) at cycle V. Other items which were affected in functional limitation was 'breathe sale' which increased from 20(33.3%) at baseline to 30(50%) at cycle V. In the domain of physical pain, the item sensitivity of the tooth was the most affected where the number has increased from 10(16.7%) at baseline to 43(71.7%) at cycle V. Number of subjects with painful aching had increased from 20(33.3%) at baseline to 24(56.7%) at cycle V. The subjects who felt uncomfortable to eat had increased from 13(21.7%) to 21(35%). Data in the domain psychological discomfort showed that majority (35, 58.3%) were self conscious right from the baseline itself and it had increased to 48(80%)

at cycle V. A good proportion of subjects (27, 45%) expressed that they felt tensed at baseline which increased to 40(66.7%) at cycle V. Among the items in the domain 'physical discomfort', 'avoid eating' was very often reported where the number of subjects who avoided eating had increased from 20(33.3%) at baseline to 38(63.3%) at cycle V. Diet was felt unsatisfactory by 13(21.7%) and this had increased to 24(40%) at cycle V. The meals were interrupted for 7(11.7%) at baseline and 13(21.7%) at cycle V. Data concerning the psychological domain indicated that depression was the most serious issue present among the subjects where 35(58.3%) felt depressed at the baseline and 51(85%) at cycle V. Sleep was interrupted for 15(41.7%) at baseline and 46(76.7%) at cycle V. As many as 27(45%) were upset at the baseline which increased to 48(80%) at cycle V. Difficulty to relax was expressed by 24(40%) at baseline and 34(56.7%) at cycle V. In the domain of social disability, majority of the subjects avoided going out during the chemotherapy. At the baseline itself, 31(51.7%) reported that they avoided going out which increased to 53(88.7%) at cycle III and 57(95%) at cycle V. Difficulty doing job was reported by 27(45%) at baseline and 47(79.3%) at cycle V. The general health was reported to be worsened at baseline for 36(60%) which increased

Table 7. Correlation between Oral Health Related Quality of Life and Selected factors $n = 60$

Sl. No	Parameter	Mean \pm SD	Mean \pm SD	p value
1	Platelet count	Normal (n = 54)	Not normal (n = 6)	
	Baseline	41.59 \pm 44.53	11.83 \pm 6.74	0.043*
	Cycle 3	51.72 \pm 40.64	34.00 \pm 15.35	0.306
	Cycle 5	62.37 \pm 41.51	52.33 \pm 22.24	0.758
2	WBC Count	Normal (n = 35)	Not normal (n = 25)	
	Baseline	29.64 \pm 25.17	45.03 \pm 51.87	0.422
	Cycle 3	39.32 \pm 23.43	57.54 \pm 46.14	0.152
	Cycle 5	47.24 \pm 23.14	71.46 \pm 46.32	0.033*
3	Co-morbidity	No (n = 29)	Yes (n = 31)	
	Baseline	29.41 \pm 30.61	47.23 \pm 51.34	0.127
	Cycle 3	40.83 \pm 26.41	58.48 \pm 46.97	0.107
	Cycle 5	50.34 \pm 27.61	71.68 \pm 46.97	0.034*
4	Oral risk factors	No (n = 30)	Yes (n = 30)	
	Baseline	23.53 \pm 28.78	53.70 \pm 50.31	0.002**
	Cycle 3	37.23 \pm 24.7	62.67 \pm 46.61	0.005**
	Cycle 5	48.40 \pm 26.54	74.33 \pm 46.92	0.006**

@Mann Whitney U test; * $p < 0.05$; ** $p < 0.01$

to 43(71.7%) at cycle V; 37(61.7%) felt it unable to work at baseline, which increased to 56(93.3%) at cycle V; 23(38.3%) of the subjects reported that they were unable to function at baseline and 35(58.3%) at cycle V. So, among all the 49 items distributed among seven domains, all the items in the domain handicap was rated low by the subjects at the baseline itself. This had decreased in subsequent cycles of chemotherapy too. Hence it is evident that chemotherapy had resulted in significant difference in the OHRQoL of patients in all the seven domains.

Table 6 depicted that there was a significant difference in the OHRQoL between those who had good and average oral hygiene. Presence/number of decayed teeth (<1 and >1) showed a significant difference in the OHRQoL of patients at the baseline ($p<0.003$) and at cycle III and V ($p<0.001$). Presence/number of missing teeth had a significant impact at the baseline ($p<0.05$). There was also a significant difference in the OHRQoL of patients who had more than and less than one sensitive tooth ($p<0.05$). Other factors like age, gender, smoking history, alcohol consumption, tooth brushing practice, availing dental service and presence of filled teeth did not show any statistically significant difference in the OHRQoL of patients on chemotherapy.

Data in table 7 indicated that OHRQoL of patients receiving chemotherapy had a significant correlation with the platelet count at baseline, WBC count and presence of co-morbidity at cycle V of chemotherapy and presence of oral risk factors at baseline, cycle III and Cycle V of chemotherapy ($p<0.05$).

Factors like BMI, TNM staging, length of chemotherapy, haemoglobin level, neutrophil count, presence of previous malignancies were not correlated with OHRQoL of patient on chemotherapy ($p>0.05$).

DISCUSSIONS

Health-related quality of life (HRQoL) is a multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning. It goes beyond direct measures of population health, life expectancy, causes of death and focuses on the impact health status has on

QoL21 and includes both positive and negative aspects.²²

Though there was no statistically significant difference in the OHRQoL between patients below and above 50 years of age in this study, majority (53, 88.3%) of the subjects were above 50years of age. Studies²³⁻²⁴ reported that advancing age was significantly associated with the OHRQoL. Females outnumbered the males (60% females vs. 40% males), which was also reported to be negatively correlated with OHRQoL.²⁵ However, gender too did not have significant contribution to the OHRQoL in the present study. Clinical studies suggest that smokers have more than average risk for periodontal disease and poor oral health. Smoking status was independently associated with worse OHRQoL after adjusting with a range of social demographic predictors, clinical status and self-reported general health. In a study conducted among 33,777 subjects, 24% of respondents were current cigarette smokers, 43% were former smokers and 33% had never smoked. When age, sex, household income and dental insurance were controlled in a multivariate logistic regression model, current smokers and former smokers had higher Odds of reporting oral-facial pain than people who had never smoked. Prevention of smoking onset and support for cessation of smoking could contribute to improved oral health status.²⁶ There are various other reports indicating that the smoking status is significantly associated with the number of teeth, where ex-smokers had significantly fewer teeth than non-smoker and current smoker had significantly fewer number of teeth than ex-smokers.²⁶⁻²⁸ Studies reported that consumption of alcohol increase the risk for oral and other cancers, cardiovascular disease, liver cirrhosis and trauma. Alcohol increase the periodontal diseases, dental caries, plaques, mucosal lesions and lower salivary pH.²⁹⁻³⁰ Study findings support the association between clinically diagnosed periodontal diseases and OHRQoL with a dose-response relationship demonstrated. In summation, periodontal diseases play a significant role in oral health and impact on the QoL of affected individuals.³¹⁻³² In the current study, there were 14(23.3%) smokers and 11 (18.3%) who consumed alcohol.

The study reported that 27(45%) had only average oral hygiene, 23(38.3%) who brushed teeth only once daily and 1(1.7%) who brushed after each meal and 50(83.3% who availed dental service only on indication. Various oral risk factors like decayed teeth (14, 23.3%), missing teeth (26, 43.3%), filled teeth (12, 20%) and sensitive teeth (6, 10%) were reported by the subjects under study. Except 35(58.4%) of subjects, all others fell under the category of overweight/obesity (23, 38.3%) or underweight (2, 3.3%). Study results were consistent with various studies where behavioural risk factors for oral diseases such as an unhealthy diet high in free sugars, tobacco use and harmful use of alcohol, poor oral hygiene and inadequate exposure to fluoride had negative effects on oral health. Malnutrition was also reported to be an independent risk factor for poor oral health.³³⁻³⁴

The present study report showed that the OHRQoL of patients who were on chemotherapy was significantly different from the baseline to cycle III and V. The difference is obvious in the overall QoL and in all the seven domains of oral health such as functional limitation, physical pain, psychological discomfort, physical discomfort, psychological disability, social disability and handicap. The findings are consistent with reports of various other studies. Study conducted among head and neck cancer patients regarding the OHRQoL reported that about 45.57% felt that life in general was less satisfying because of problems with teeth, mouth or dentures.³⁵

The study observed that the OHRQoL of the patients who received chemotherapy had declined from the baseline to the subsequent cycles (Cycle III and Cycle V). The decline was observed both in the overall OHRQoL and in all the seven domains of oral health related quality of life.

Clinical application

Finding of this study has wide clinical application. It is a known fact that chemotherapy is an effective treatment for cancer. But chemotherapy is associated with many side effects including that of the dental and oral. Evidences from clinical studies state that oral and dental problem add to the risk for oral complications from chemotherapy. The oral health issues become so severe that at times there is a need to lower the dose of the chemotherapy, delay to start or even to discontinue the same. So, the nurses or the health professionals

should make it mandatory to include assessment of the oral cavity in the routine assessment of patients before starting the chemotherapy and also to refer the patients to dentist in case any of the oral or dental problems are exist. It is advisable to take treatment for the existing oral problems before chemotherapy so that the oral complications can be minimized or even can have an uninterrupted course of chemotherapy. So, the study suggests need for a comprehensive oral assessment using standard questionnaire.

CONCLUSION

Oral-health is very important for the general health of any individual. Chemotherapy affects the oral health of individual which has an impact on the overall/general health related quality of life. Patients may experience a variety of issues related to oral health as a consequence of chemotherapy. But it may not be given the required attention as the focus is mainly on the disease aspect and its treatment. Oral health of patients on chemotherapy must be identified early in the treatment itself so that appropriate individualized therapy can be planned. More researches on oral health issues and its intervention have to be planned in future for the patients on chemotherapy.

Limitations of the Study

The study assessed the oral health of the patients receiving any chemotherapeutic drug and combinations. It didn't study the effect of different combinations or single agent which limits the generalization. Future studies need to be undertaken using single agent or different combinations or a comparative study of different combinations.

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