J. Bio-Sci. 30(1): 49-59, 2022 (June) **ISSN 1023-8654**
http://www.banglajol.info/index.php/JBS/index
DOI: https://doi.org/10.3329/jbs.v30i1.63100

ORAL COMPLICATIONS AND THEIR MANAGEMENT IN PATIENTS WITH CANCER DURING CHEMO OR RADIOTHERAPY IN BANGLADESH

M M Alamgir Siddique Abbasi[1,2], Mir Nowazesh Ali[2] and S. M. Shahinul Islam[1*]

[1]Institute of Biological Sciences, University of Rajshahi, Rajshahi-6205, Bangladesh

[2]Department of Oral and Maxillofacial Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbagh, Dhaka, Bangladesh

Abstract

Cancer is a very alarming disease that affects many people in every year all over the world and also in Bangladesh. Under this study a descriptive cross-sectional study was conducted to assess the knowledge on oral health status and its care before, during and after therapy. Total 145 cancer patients were selected and interviewed through a semi-structured questionnaire. Out of them 82 female and male 63 where 56 patients were treated by radiotherapy (38.62%), 72 patients were treated only by chemotherapy (49.66%) and 17 patients received both radio and chemotherapy. Here 80.69% of patients having pain during therapy while 28.96% and 11.03% before therapy. On the other hand, 61.38% patients had a change of taste after therapy whereas 8.96% had a change of taste during therapy. It was observed that the both physical and psychological well-being of oral health on quality of life which had a high effect on physical pain where 30.34% was very high, 46.21% was moderate, 20.69% a little and 2.76% not at all. In the psychological well-being study 62.76% patients felt very depressed where 37.24% fear moderate type of functional disability and 34.48% feel very lonely of remote from other people. Most patients developed sensitivity, altered taste, oral thrush, mucositis, trismus and xerostemia during and after palliative treatment. Poor knowledge (70.6%) was observed among patients in recommended quality of tooth brush, frequency of tooth brushing, duration, motion and recommended diet. Most of the patients (29.4%) were found with low quality of life. The study also concluded that patients should be provided with adequate knowledge about oral care before taking chemotherapy or radiotherapy.

Key words: Cancer, oral status, health-related quality of life, oral care, chemotherapy, radiotherapy

Introduction

The World Health Organization (WHO) refers to oral health as an essential part of public health during life; it report that poor oral health and untreated oral diseases can have a profound effect on quality of life. Inattention to functions related to oral health affects our nutrition, speech, voice and speech quality. Therefore, addressing this issue is one of the WHO's programs to prevent chronic oral disease and improve public health (World Health Organization 2022, Blackadar 2016). It was mentioned that the United Nations (UN) recognizes that non-communicable diseases (NCDs) are a major challenge to the sustainable development goals. So the WHO has developed a global coordination mechanism for the prevention and control of non-communicable diseases aimed at reducing non-communicable disease premature deaths by one-third by 2030. Oral diseases are the most common NCDs worldwide, affecting people of all genders, races, age groups and socio-economic levels (Riad et al. 2022). Despite their high social and economic

*Author for correspondence: shahinul68@gmail.com

burden, oral diseases receive little attention in many countries and remain a neglected area of international health (Einhorn 2008). It was explained that oral health is versatile and includes the ability to speak, smile, smell, taste, touch, chew, swallow and express various emotions with confidence and without pain, discomfort and craniofacial complex disease (Khader et al. 2021).

Radiation therapy/radiotherapy is a cancer treatment that uses high levels of radiation to kill cancer cells and shrink tumors. It can be used as the only treatment in the initial setting or as adjuvant therapy after surgery. It can be given on its own or with chemotherapy. Radiation therapy is usually given once a day, five days a week (Boeckman 2005, Polyak 2007). Thus, Radiotherapy often complex and frequently associated with significant short-and long-term complications including mucositis, dysgeusia, dysphagia, weight loss, malnutrition, hypo-salivation, increased risk of dental caries, increased risk of progression of periodontal disease, dental hypersensitivity, infections, mucosal atrophy, trismus, neuropathic pain and osteo-radio-necrosis (Lee et al. 2021).

The goal of chemotherapy is to eliminate the rapidly growing tumor cells. Unfortunately, chemotherapy is often toxic to other cells that divide rapidly. These include the mucosa of the entire gastrointestinal tract, including the bone marrow, hair, and oral cavity (Kelly el at. 2007). Oral complications are related to integration with other cancer therapies such as radiation site, total radiation dose, fractional schedule and chemotherapy. Cancer patients have a higher risk of oral complications. Oral care goals differ before, during, and after cancer treatment. Before treating cancer, the goal is to prepare for the treatment of cancer by treating existing oral problems (Delaney et al. 2005, Koistinen 2020). During the treatment of cancer, the goals are to prevent oral complications and to manage the problems that occur. After cancer treatment, the goals are to keep teeth and gums healthy and to manage the long-term side effects of cancer and its treatment (Luo et al. 2021).

It was narrated that nurses are the primary caregiver and the first line of communication for patients. Also reported nurses lack the necessary knowledge and skills in oral care of cancer patients. Therefore, nurses can play an important role in screening for oral problems and implementing evidence-based oral care interventions to solve oral problems (Pai et al. 2019). Multidimensional team collaboration is needed to develop oral care for oral health during cancer treatment (Kotronia et al. 2021). Nurses have expressed interest in updating knowledge in oral care for cancer patients. Patients are reported by nurses as an effective strategy to help patients is treated more efficiently thereby improving their quality of life (Shejila et al. 2015).

Methodology

Study design, area of this research

Data on cancer patients were collected from National Institute of Cancer Research and Hospital, Mohakhali, Dhaka, Bangladesh and Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbagh, Dhaka, Bangladesh. A total of 145 respondents who's met the eligibility criteria. Before collecting the information it had been taken a written consent agreement from all individual patients. The patients who were suffered with cancer and advised with radio or chemotherapy, those patients were included in the study.

Data recording

Data was collected by maintaining three steps (before therapy, during therapy & after therapy). Patients were included in the study whose gave their full information in all three steps and excluded in the study whose could not give information in all three steps. Data were collected from a pre-planned interview (by questionnaire) schedule of all individual patients through personal interviews, investigations and examinations. The data were analyzed according to the purpose of the study.

Statistical analysis

The data collected was reviewed daily for completeness and accuracy. The data edited in the Statistical Package for Social Science Software (SPSS) version 16.0 for statistical analysis using descriptive statistics is inserted. Significance considered by DMRT, chi-square and t-test where p-value is <0.05.

Results

It ranges in age from 31-70 and >70 and is divided into five age groups such as 31-40, 41-50, 51-60, 61-70 and >70. A total of 145 cancer patients in this study 63 are male and 82 are female. Maximum 64 number of patients which aged in 61-70 years. The percentage of patients was recorded for 43.45% males while 56.55% were found for females. Among the research patients, a maximum of 52 rural patients had completed their secondary education. And at least 4 urban patients had completed their graduate studies. The survey found that 15.86% of patients are illiterate while 47.59% had completed secondary, 26.21% passed HSC and 10.34% had completed their graduation degree.

In this study found that the patients are under different occupations such as service, businessman, labor/housewife and student/unemployed. Most of the patients (53.41%) are businessman while 33.10% service holders, 10.34% labour/housewife and 4.13% student/unemployed. The study also assesses the level of income of patients and reveals that most urban patients (5.26%) have high income BDT 180000< and 68.42% less than BDT 60,000 per year. It further reveals that most patients are low-income patients. The value followed by different letter in a column is significantly different at $p<0.05$ according to Duncan's multiple range test (DMRT). Considering the cost of cancer treatment, 76.64% of rural patients and 60.53% of urban patients spend only 15000 BDT. On the other hand, 1.87% of rural patients spend a maximum 30001-45000 BDT. The difference was statistically significant.

P-value reached from chi-square test. The difference was significant ($p<0.05$). The study found that 97.24% of cancer patients experience a medical illness where only 2.76% did not and it was significant. Data shows 74.60% male patients reported smoking but only 1.22% female patients smoked. Data showed that the number of patients receiving betel leaf before cancer treatment. Here 63.49% male patients and 81.71% female patients received betel leaf regularly.

The study found that the majority 92.41% of patients had never drank alcohol and only 2.7% had been in the habit of consuming alcohol regularly and remaining 4.83% of patients had drank alcohol occasionally. The distribution of the patients according to the restorations (restorations means filling/cap/artificial teeth inside the patients mouth), among them 79.31% had present restorations and only 20.69% were absent. Moreover a few (14.48%) used prosthesis and 85.52% did not use prosthesis. Table 1 showed that 56 cancer patients received radiotherapy, 72 patients received chemotherapy and 17 patients received both radiotherapy and chemotherapy (out of n = 145). The results of radiotherapy were 38.62% and chemotherapy 49.66%.

Table 1: Distribution of the study patients by type of therapy (n = 145).

Therapy	No. of patients	% of patients	P-value
Radiotherapy	56	38.62	
Chemotherapy	72	49.66	0.23
Both	17	11.72	

P-value reached from chi-square test. The difference was non-significant ($p<0.05$).

It calculated that 34.48% of patients had a maximum/32 and 65.52% had below 32 teeth before therapy. During therapy it was 31.72% maximum/32 teeth and 68.28% below 32 followed by 22.76% maximum/32 and 77.24% below 32 after therapy (Fig. 1).

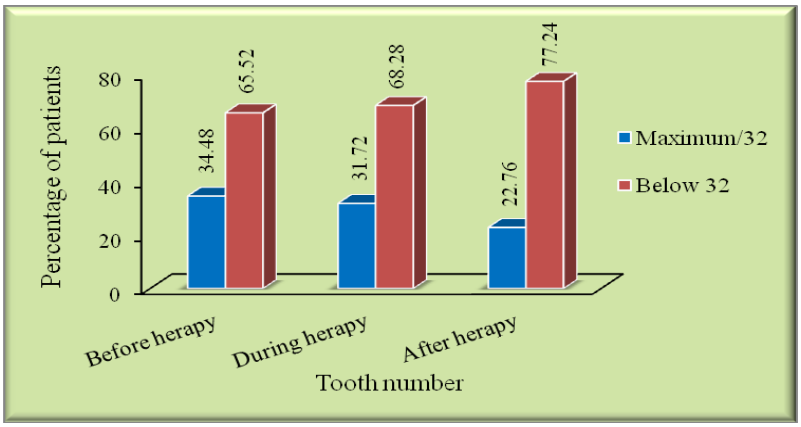

Fig. 1: Statistics of tooth number of the study patients (n = 145).

Table 2 shows the indicators of oral health and the percentage of single items. Based on the calculated indicators, the main factors affecting oral health indicators were pain/tenderness, sensitivity, swelling, altered taste, caries, gingivitis, oral thrush, mucositis, trismus and xerostemia. Oral health indicators were compared before, during and after therapy. After analyzing the results, statistically significant differences were found for pain/tenderness, sensitivity, swelling, altered taste, caries, gingivitis, oral thrush, mucositis, trismus, and xerostemia. Patients' pain/tenderness decreased significantly after therapy, with 80.69% (n = 117) cancer patients experiencing pain during therapy while 28. 96% (n = 42) patients experienced pain after therapy and 11.03% (n = 16) before therapy. On the other hand, 61.38% (n = 89) patients had a change of taste after therapy whereas 8.96% (n = 13) had a change of taste during therapy. On the other hand, 61.38% (n = 89) patients had a change of taste after therapy whereas 8.96% (n = 13) had a change of taste during therapy.

Table 2: Oral health status of the patient of the study patients (n = 145).

Oral health indicators	Before therapy	During therapy	After therapy	P-value
	No. of patients (%)	No. of patients (%)	No. of patients (%)	
Pain/Tenderness	11.03	80.69	28. 96	0.002*
Sensitivity	8.966	31.03	16.55	0.036*
Swelling	42.07	33.10	22.76	0.721
Altered taste	8.96	49.65	61.38	0.016*
Caries	24.14	31.03	57.23	0.027*
Gingivitis	14.48	71.03	33.79	0.001*
Oral thrush	8.96	31.72	17.24	0.001*
Mucositis	7.58	44.14	52.41	0.019*
Trismus	6.90	54.48	21.38	0.021*
Xerostemia	4.14	43.45	46.89	0.011*

S = Significant; NS = Non-significant. P-value reached from unpaired t-test.

A comparison of radiotherapy and chemotherapy with saliva-related oral symptoms is shown in Fig. 2 showed there was a significant difference among ability to perform oral hygiene, pain, gingival condition, dysphagia and feeling of a clean mouth symptoms. Here, it has been observed that radiotherapy produces more oral symptoms than chemotherapy. Similar oral symptoms have been reported in oral symptoms related to mucosa. Significant differences were observed among mouth dryness, salivary viscosity, lip dryness, taste alteration and ability to talk (Fig. 2).

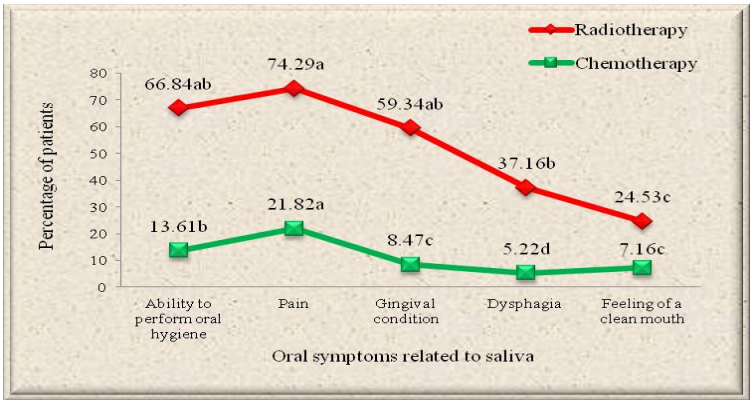

Fig. 2: Comparative study of oral symptoms related to saliva after therapy.

Based on patients oral care information, about one third (71.03%) are used to brush their teeth once a day and 23.45% are used twice whereas only 5.52% are used to brush their teeth three times daily. The majority (64.83%) of patients said they needed dental care and 35.175% said they did not. Only 26.21% of the patients visited to the dentist whereas 73.79% did not go to the dentist (Fig. 3).

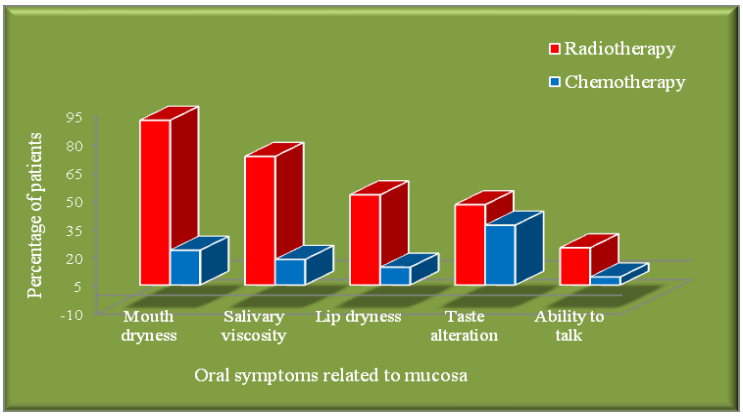

Fig. 3: Comparative study of oral symptoms related to mucosa after therapy.

Outcomes of the impact of oral health on quality of life according to each dimension are described in Table 3. 60.69% had a little overall quality of life while 6.90% had very much among cancer patients. Here 35.17% cancer patients reported that they experienced moderate physical performance. Only 4.14% patients get very much support from their friends and relatives.

Table 3: The impact of oral health on quality of life during the past week of the patients (n = 145).

General well- being	Patients number				P-value
	Very much (%)	Moderate (%)	A little (%)	Not at all (%)	
Overall quality of life	6.90	24.83	60.69	7.59	0.001
Overall physical condition	10.34	31.03	52.41	6.21	0.001
Physically performing	4.83	9.65	50.34	35.17	0.012
Confident level to manage financial need at any situation	15.17	46.90	32.41	5.52	0.018
Support from friends and relatives	4.14	27.59	48.97	19.31	0.011

Table 4 shows the physical well-being of oral health on quality of life which had a high effect on physical pain where 30.34% was very high, 46.21% moderate, 20.69% a little and 2.76% not at all.

Table 4: Physical well-being of oral health on quality of life of the patients (n = 145).

Physical well-being	Patients number				P-value
	Very much (%)	Moderate (%)	A little (%)	Not at all	
Pain at present	30.34	46.21	20.69	2.76	0.015
Pain interfere day-to-day activity	24.14	49.65	17.93	8.28	0.002
Normal appetite	11.03	22.76	53.79	12.41	0.035
Problem in sleep	24.83	46.90	21.38	6.90	0.026
Feeling more rest	55.86	32.41	11.72	0.0	0.001
Feeling fatigued	50.34	37.93	9.66	2.07	0.001
Idle to move around (physical) as usual	44.83	27.59	24.14	3.45	0.029
Problems in passing urine	8.28	27.59	39.31	24.83	0.724
Problems in passing motion	48.97	24.83	18.62	7.59	0.001
Satisfaction with working capacity	2.76	14.48	23.45	58.62	0.001

Information on the psychological well-being of oral health on the quality of life of cancer patients is shown in Table 5. Among the subjects in the study, more than half and 76% felt very depressed. Where 37.24% fear moderate type of functional disability and 34.48% feel very lonely of remote from other people.

Table 5: Psychological well-being of oral health on quality of life of the patients (n = 145).

Psychological well-being	Patients number				P-value
	Very much (%)	Moderate (%)	A little (%)	Not at all (%)	
Feeling depressed	62.76	21.38	11.03	4.83	0.001
Feeling of sadness/depression interfere with everyday functioning	53.79	28.28	13.79	4.14	0.014
Comfortable attending social functions as usual	4.83	19.31	33.79	42.07	0.001
Fearing of recurrence	33.10	42.76	19.31	4.83	0.027
Fearing of functional disability	17.24	37.24	26.90	18.62	0.856
Fearing of rejection and losing social status	45.52	27.59	17.24	9.66	0.022
Feeling very lonely of remote from other people	26.21	34.48	17.93	21.38	0.947

Discussion

The purpose of this study was to assess of several aspects of the oral condition, oral health, quality of life and to study several aspects of oral care in patients treated with radiotherapy or chemotherapy. The most striking result in a possible study of patients receiving radio- or chemotherapy is that oral symptoms are related to health quality of life (HQL). In this case a study sampling plan involves collecting data from a sample of 145 patients receiving cancer treatment. The demographic characteristics of the selected cancer patients show that the maximum 64 in patients aged 61-70 years, mainly female (n = 82), male (n = 63) and their percentage was 43.45% males while 56.55% females. Similar types of observations found by Aswini et al. (2021). They found that 71% of the participants were women (n = 53). In this study patient a maximum of 52 rural patients had completed their secondary education. And at least 4 urban patients had completed their graduate studies. The survey found that 15.86% of patients are illiterate while 47.59% had completed secondary, 26.21% passed HSC and 10.34% had completed their graduation degree. Such observations are consistent with other studies (Aswini et al. 2021). They found 32% high school or equivalency, 13% did not complete high school, and 55% completed varying stages of college. On the other hand they demonstrated that 36.2% were illiterates. It was recorded that all illiterates and less educated patients had negligence with oral care and also had poor knowledge of oral care. The current study found that 56 cancer patients received radiotherapy, 72 patients received chemotherapy and 17 patients received both radiotherapy and chemotherapy (n = 145). The results of radiotherapy were 38.62% and chemotherapy 49.66%.

Based on the calculated indicators, the main factors affecting oral health indicators were pain/tenderness, sensitivity, swelling, altered taste, caries, gingivitis, oral thrush, mucositis, trismus and xerostemia (He et al. 2019). Oral health indicators were compared before, during and after therapy. After analyzing the results, statistically significant differences were found for pain/tenderness, sensitivity, swelling, altered taste, caries,

gingivitis, oral thrush, mucositis, trismus, and xerostemia. Patients' pain/tenderness decreased significantly after therapy, with 80.69% (n = 117) cancer patients experiencing pain during therapy while 28. 96% (n = 42) patients experienced pain after therapy and 11.03% (n = 16) before therapy. On the other hand, 61.38% (n = 89) patients had a change of taste after therapy whereas 8.96% (n = 13) had a change of taste during therapy.

According to Guidry et al. (1997) before cancer treatment, the most common symptoms were dry mouth, sore mouth, sore mouth and difficulty swallowing. These four symptoms were the most common during cancer treatment, only at high rates (Zugazagoitia et al. 2016). Both dry mouth and mouth pain increased from 2 participants before treatment to participants before treatment (Guidry et al. 1997). Mouth sores increased from 2 to 8 participants, while difficulty swallowing increased from 3 to 16. Among the 16 participants, the most common symptoms at all stages of radiation therapy include dry mouth, sore mouth, sore mouth, and difficulty swallowing. When comparing these early symptoms and others to the level of education given prior to treatment, those who have symptoms experience a lack of education (Tadin et al. 2022). These patients were already experiencing painful oral care symptoms that may worsen during and after treatment, they are not receiving the education necessary to correct their behavior (Zugazagoitia et al. 2016).

In the present study the result showed that about one third (71.03%) are used to brush their teeth once a day and 23.45% are used twice whereas only 5.52% are used to brush their teeth three times daily. The majority (64.83%) of patients said they needed dental care and 35.175% said they did not. Only 26.21% of the patients visited to the dentist whereas 73.79% did not go to the dentist. Oral symptom reports reflect the patient's opinion and are independently validated by the results of the evaluation by the dentist or staff/nurse. Patient reports are valuable for communication with patients and between nursing and dentist or staff. Previous studies have shown that patients do not always report their oral symptoms which may cause problems with oral care. Previous studies have reported that patients are less likely to have treatment-induced problems than those with cancer (Pai et al. 2019). Current results explain that patients experience a number of oral symptoms and there is a good agreement between patient reporting and recording by staff/nurse. There was a significant difference among ability to perform oral hygiene, pain, gingival condition, dysphagia and feeling of a clean mouth symptoms. Here, it has been observed that radiotherapy produces more oral symptoms than chemotherapy. Similar oral symptoms have been reported in oral symptoms related to mucosa. Significant differences were observed among mouth dryness, salivary viscosity, lip dryness, taste alteration and ability to talk. Among cancer patients receiving radiotherapy and chemotherapy, there is a significant correlation between saliva and all aspects of oral symptoms next to oral hygiene and dysphagia which is consistent with other studies (Walko et al. 2014). Dry mouth and salivary viscosity are significantly related to the rate of taste change. These relationships were more pronounced in patients receiving radiotherapy than in chemotherapy. Furthermore, there was a correlation between mucosa score and dryness of the lips and rate of taste change and ability to speak.

The symptoms studied represent different types of oral discomfort and all patients receiving radiotherapy, and a large proportion of those receiving chemotherapy experience such symptoms. Patients receiving radiotherapy are more affected by oral symptoms than chemotherapy patients who agree with previous results (Siegel 2013).Patients with head and neck cancer have tumors in or around the oral cavity, which can have an additional effect on their experience of oral symptoms. Ventola (2017) demonstrated all types of oral symptoms are increased regardless of whether the patients are examined orally by the dental staff and oral care. Since the presence of oral mucositis agrees with the reporting of oral symptoms, mucositis may be an important cause of such discomfort surface erythema was reported in 45% of patients receiving radiotherapy,

dysphagia 59% and pain 37% (Siegel 2013). It was observed that the physical well-being and psychological well-being of oral health on quality of life which had a high effect on physical pain where 30.34% was very high, 46.21% moderate, 20.69% a little and 2.76% not at all. In the psychological well-being study more than half 62.76% felt very depressed. Where 37.24% fear moderate type of functional disability and 34.48% feel very lonely of remote from other people. In this record it represent that patients had mostly low quality of life. Similarly, Ventola (2017) revealed that half of the participants were assessed as having poor oral hygiene, which made oral self-care even more challenging, possibly due to general illness as well as mental and physical disabilities. Harmful short- and long-term oral effects as a result of cancer therapy can affect a patient's physical and mental health and well-being (Ventola 2017).

Conclusion

Therapy induced oral side effects are frequent complications and may generate significant impact on cancer patients' long-term and overall quality of life. Patients receiving therapy have increased oral symptoms regardless of oral care. These symptoms persist for a long time after treatment. Overall, patients are receiving chemotherapy experience fewer and milder (38.62%) oral symptoms than patients receiving radiotherapy. Oral symptoms were significantly associated with patients' health-related lifestyles, especially among those receiving radiotherapy (49.66%). Information on oral complications and oral hygiene was inadequate (23.76%). Oral condition and oral care were inadequately documented, especially in nursing records.

References

Aswini S, Shavi CR, Shankar S, Sanga R, Lalithambigai G, Rahila C and Santhakumari S (2021). Assessment of oral health-related quality of life among head and neck Cancer patients attending cancer care center at Kanchipuram, Tamil Nadu – A cross-sectional study. Journal of Global Oral Health, 4(1): 20-26.

Blackadar CB (2016). Historical review of the cause of cancer. World J Clin Oncol; 7(1): 54-86.

Boeckman HJ (2005). Cisplatin sensitizes cancer cells to ionizing radiation via inhibition of homologous end joining. Mol Cancer Res., 3: 277-85.

Delaney G, Jacob S, Feathtstone C and Barton M (2005). The role of radiotherapy in cancer treatment. Cancer; 104(6): 1129-37.

Einhorn LH (2008). First-line chemotherapy for non–small-cell lung cancer: is there a superior regimen based on histology? J Clin Oncol., 26: 3485-86.

Guidry JJ, Aday LA and Zhang D (1997). Transportation as a barrier to cancer treatment. Can Pract., 5: 361-66.

He Q, Liu Z, Lai Y, Zhou X and Weng J (2019). TCR-like antibodies in cancer immunotherapy. J Hematol Oncol., 12(1): 99.

Kelly PN, Dakic A, Adams JM, Nutt SL and Strasser A (2007). Tumor growth need not be driven by rare cancer stem cells. Science; 317(5836): 337.

Khader DA and Peedikayil FC (2021). Oral health care programs for children: A literature review. Int J Community Dent., 9: 1-5.

Koistinen S (2020). Oral health, experiences of oral care, associated factors, a mortality among older people in short-term care. Doctoral Dissertations. Falun Dalarna University. ISBN 978-91-88679-05-5.

Kotronia E, Brown H, Papacosta AO, Lennon LT, WeyantRJ, Whincup PH, Wannamethee G and Ramsay SE (2021). Oral health and all-cause, cardiovascular disease, and respiratory mortality in older people in the UK and USA. Scientific Reports, 11(1): 16452.

Lee HJ, Han DH, Kim JH and Wu HG (2021). The effect of comprehensive oral care program on oral health and quality of life in patients undergoing radiotherapy for head and neck cancer: A quasi-experimental case-control study. Medicine, 100: 16 (e25540).

Luo H, Lu J, Bai Y, Mao T, Wang J, Fan Q, Zhang Y, Zhao K, Chen Z et al. (2021). Effect of Camrelizumab vs Placebo added to chemotherapy on survival and progression-free survival in patients with advanced or metastatic esophageal squamous cell carcinoma: The ESCORT-1st Randomized Clinical Trial. JAMA, 326(10): 916-925.

Pai RR, Ongole R and Banerjee S (2019). Oral care in cancer nursing: Practice and barriers. Indian J Dent Res., 30: 226

Polyak K (2007). Breast cancer stem cells: a case of mistaken identity? Stem Cell Rev., 3: 107-09.

Riad A, Al-Khanati NM, Issa J, Zenati M, Abdesslem NB, Attia S and Krsek M (2022). Oral health-related knowledge, attitudes and behaviors of Arab dental students: multi-national cross-sectional study and literature analysis 2000-2020. International Journal of Environmental Research and Public Health, 19(3): 1658.

Shejila CH, Pai M and Fernandes DJ (2015). Oncology nurse navigator programme – A narrative review. Nitte Univ J Health Sci., 5:103.

Siegel R, Naishadham D and Jemal A (2013).Cancer statistics. CA Cancer J Clin., 63: 11-30.

Tadin A, Guberina RP, Domazet J and Gavic L (2022).Oral hygiene practices and oral health knowledge among students in split, Croatia Healthcare, 10: 406. https://doi.org/10.3390/healthcare10020406.

Ventola CL (2017). Cancer immunotherapy, part1: current strategies and agents. Pharmacy and Therapeutics, 42(6): 375-385.

Walko CM and McLeod HL (2014). Personalizing medicine in geriatric oncology. J Clin Oncol., 32: 2581-8.

World Health Organization. Oral health fact sheet (2022). Available from: http://www.who.int.

Zugazagoitia J, Guedes C, Ponce S, Ferrer I, MolinaPinelo S and Paz-Ares L (2016). Current challenges in cancer treatments. Clinical Therapeutics, 7: 1551-66.

(Manuscript received on 17 March 2022; Revised on 28 April 2022)