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Quality of life in Iranian patients with head-and-neck cancer

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Abstract:

BACKGROUND: The goal of treating cancer patients is to cure the patients and improve their quality of life (QoL) during their illness. The aim of this research was to assess the QoL in Iranian patients with head-and-neck cancer by European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Head and Neck 35 (EORTC QLQ-H&N35) and University of Washington Quality of Life Questionnaire (UW-QoL).

MATERIALS AND METHODS: In this cross-sectional study, Iranian variation of EORTC QLQ-H&N35 and UW-QoL questionnaires was administered to 210 patients with head-and-neck cancer. Patients who visited the Department of Oncology at Omid Hospital in Isfahan, Shafa Hospital in Kerman, and Emam Khomeini Hospital in Tehran were selected. Kruskal–Wallis test, general linear model multivariate of variance, multiple regression models, and SPSS version 21 were used for statistical analysis.

RESULTS: In the present research work, 210 patients with cancer in head and neck were under investigation, such that 128 patients (61%) were male and 82 patients (39%) were female. Only the patients with laryngeal cancer scored worse for dyspnea according to the scores from UW-QoL questionnaires. There were statistically significant differences for pain, swallowing, social eating, social contact, speech, taste/smell, and trismus based on the QLQ-H&N35. Lower QoL was observed in patients with advanced (Stage III + IV) tumors and treated with radiotherapy plus surgical method.

CONCLUSION: The study showed that quality of life differs due to location of tumor, stage of cancer, and treatment type.

Keywords:

Cancer, head, life, quality

Introduction

Every year, millions of people experience cancer worldwide. This disease is the second leading cause of death in developed countries; almost 20% of the total deaths are attributed to this disease, and if do not consider the age of death, this disease causes more deaths than cardiovascular diseases.^[1] Head-and-neck cancer includes 4% of these malignancies, among which the worldwide prevalence of oral cavity cancer, pharyngeal cancer, and laryngeal cancer is about 500,000 cases/year, with an average mortality of 270,000 cases annually. These

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cases include 5% of mortalities caused by all types of cancer except for skin cancer, in which three-quarters of them are caused by oral cavity cancer and pharyngeal cancer, and others are caused by laryngeal cancer.^[2]

Cancer is a very unpleasant and unbelievable experience for everyone, and it affects patients' economic and social status, family life, and sexual performance. It is both emotionally and mentally challenging.^[3] Studies conducted on cancer patients show that the severity of symptoms and emotional distress affects the quality of life (QoL).^[4] In the past two decades, the QoL in cancer treatments has been seriously discussed and

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quickly developed. After completing the head-and-neck cancer therapy, negative effects on the QoL and physical functions continue for months or years.^[5,6]

The goal of treating cancer patients is to cure them and improve their QoL during their illness. These treatments have different side effects including pain, mucositis, mouth dryness, loss of taste, and smell, which have negative effects on the QoL of patients.^[3,4] Studies have shown that QoL is affected particularly with disorders in eating, breathing, and speaking functions in patients with head-and-neck cancers.^[3-6] Nowadays, the assessment of health-related QoL is an inseparable component of cancer treatments. Cancer treatment centers in many European countries, USA, and in some Asian countries try to assess and evaluate cancer patients' quality life even in clinical trials using valid assessment tools, and follow the decisions and further actions regarding the treatment protocols.

All of the factors that affect the life quality are equally important. Many studies examined the reliability and validity of the questionnaire in different languages. Life questionnaires are developed because of the importance of quality of cancer patients. Among these, the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Head and Neck35 (EORTC QLQ-H&N35) is the most reliable questionnaire to evaluate the oral complications of cancer treatments and its impact on patients' QoL.^[7-9]

The review of literature indicated that study on the QoL in patients with head-and-neck cancer has not been done in Iran. Therefore, the aim of this research is to assess the QoL in Iranian patients with head-and-neck cancer by EORTC QLQ-H&N35 and University of Washington Quality of Life Questionnaire (UW-QoL) questionnaires.

Materials and Methods

Patients

In this cross-sectional study, the Iranian version of EORTC QLQ-H&N35 and UW-QoL questionnaires was administered to 210 patients. The samples were selected from the patients who visited the Department of Oncology at Omid Hospital in Isfahan, Shafa Hospital in Kerman, and Emam Khomeini Hospital in Tehran. The questionnaire was randomly administered to 210 patients ($P = 0.05$, $d = 0.05$, $z = 1.96$, $d = 0.07$, $n = 200$) who were diagnosed with head-and-neck cancer in each department. Patients were census method assigned to study. Thus, each patient with head-and-neck cancer entered the study if he or she wished to participate (140 patients from Omid Hospital, 40 patients from Emam Khomeini Hospital, and 30 patients from Shafa Hospital). Inclusion criteria used

were: age up to 18; those with duration of radiotherapy and chemotherapy; those diagnosed with head-and-neck cancer; and those with Stage I-IV oral cavity, larynx, and pharynx cancers. Patients with recurrent or second cancers, those with distant metastases, and inability to understand the questionnaire due to cognitive and/or mental impairment were excluded from the study. The demographic information, including age, sex, education, employment, side of tumor, stage of tumor, and treatment type was collected.

During a regular follow-up visit and face-to-face interview, the patients completed the UW-QoL and EORTC QLQ-H&N35 questionnaire. These questionnaires were provided by Hashemipour and Pouyafard in Iran. UW-QoL is a widely used questionnaire incorporating extensive QoL issues relevant to a broad range of cancer patients.^[10] This questionnaire has emerged as a simple yet clinically relevant measure suitable for routine clinical practice. In an original description, the advantages of the UW-QoL head-and-neck questionnaire are recalled and distinguished by Hassan and Weymuller^[3] as: (1) it is brief and self-administered; (2) it is multifactorial, allowing sufficient detail to identify subtle change; (3) it provides questions specific to head-and-neck cancer; and (4) it allows no input from the health provider, thus reflecting the QoL as indicated by the patient. The current version 4 of the UW-QoL questionnaire^[11] consists of 12 single-question domains; these have between 3 and 6 response options that are scaled evenly from 0 (worst) to 100 (best) according to the hierarchy of response. In this study, the domains are pain, appearance, activity, recreation, swallowing, chewing, speech, shoulder, taste, saliva, mood, and anxiety. During another question, the patients were asked to choose up to three of these domains that have been the most important to them. There are also three global questions: one about patients' feel before developed their cancer, one about their health-related QoL, and one about their overall QoL. With regard to their overall QoL, the patients are asked to consider not only physical and mental health but also many other factors, such as family, friends, spirituality, or personal leisure activities that were important to their enjoyment of life. The whole questionnaire focuses on current patient health and QoL from a week ago.

Seven subscales containing, pain, swollen, taste/smell, speech, social eating, social contacts, and sexuality, exist in the EORTC QLQ-H&N35, such that there are ten single items relating to problems with teeth, dry mouth, cough, opening the mouth wide, sticky saliva, weight loss, weight gain, use of nutritional supplements, feeding tubes, and pain killers.^[9,12] Items 1 to 30 are scored on a 4-point Likert-type categorical scales ("not at all,"

“a little,” “quite a bit,” and “very much”) and finally the items 31 to 35 have a “no/yes” response format.^[9,13]

Ethical considerations

Ethical considerations were taken into account throughout the study, and the patients’ names and medical information remained completely confidential. The patients’ medical history was used solely for the purposes of the current study. The research proposal was approved by the Ethics Committee of Kerman University of Medical Sciences with Reg. IR.KMU.REC.1398.449.

Statistical analysis

For data analysis, Kruskal–Wallis variance analysis, general linear model multivariate of variance, and multiple regression models were used to determine the effects of socio-demographic factors on the QoL. In this study, the statistical significance level was considered at $P < 0.05$, and SPSS 21(IBM Corp., Armonk, N.Y., USA) was used for statistical analysis.

Results

In the present research work, 210 patients with cancer in head and neck were under investigation, such that 128 patients (61%) were male and 82 patients (39%) were female. Their age ranged from 23 to 63 years, with an average of 39.4 ± 5.5 years. The number of patients with oral cavity tumors, laryngeal cancer, and pharyngeal tumors was 82, 43, and 85 persons, respectively. In treating the patients under study, 30 patients (14.28%) have been under radiotherapy, 30 patients (14.28%) have been treated with chemotherapy, and 24 patients (11.42%) have been cured with surgery [Table 1].

According to the sites of tumor, stage of cancer, and treatment method, the scales and single items of both questionnaires were compared to each other.

Only the laryngeal cancer patients scored worse for dyspnea ($P = 0.001$), when the scores from UW-QoL questionnaire were compared among the cancer sites [Table 2].

Statistically significant differences were observed for pain, swallowing, social eating, social contact, speech, taste/smell, and trismus for the QLQ-H&N35. The worst values for pain, social eating, social contact, taste loss, and trismus were found in patients with oral cavity cancer ($P = 0.255$ for pain; $P = 0.001$ for social eating; $P = 0.011$ for social contact; $P = 0.001$ for taste loss; and $P = 0.002$ for trismus). Worst for swallowing was considered in pharyngeal cancer ($P = 0.001$), whereas patients with laryngeal cancer had worse score for speech and cough ($P = 0.002$ and 0.042 , respectively) [Table 2].

Table 1: Demographic characteristics of the participants in the study (n=210)

Characteristics	Male, n (%)	Female, n (%)	Total, n (%)
Gender	128 (61)	82 (39)	210 (100)
Yes	106 (83)	61 (74)	167 (79.5)
No	22 (17)	21 (23)	43 (20.5)
Education years			
≤6	3 (2.5)	2 (2.5)	5 (2)
6- 12	83 (65)	53 (64.5)	136 (65)
>12	42 (32.5)	27 (33)	69 (33)
Site of tumors			
Oral cavity	53 (41.5)	29 (35)	82 (39)
Pharynx	50 (39)	35 (43)	85 (40.5)
Larynx	25 (19.5)	18 (22)	43 (20.5)
Cancer stage			
I and II	75 (58.5)	42 (51)	117 (55.5)
III and IV	53 (41.5)	40 (49)	93 (45.5)
Treatment methods			
Surgery	14 (11)	10 (12)	24 (11.5)
RT	20 (16)	10 (12)	30 (14)
Chemotherapy	20 (16)	10 (12)	30 (14)
Combination	74 (57)	52 (64)	126 (60.5)

RT=Radiotherapy

The stages of the disease have different significance both in the UW-QoL and QLQ-H&N35. From this point of view, the patients with tumors Stage I + II, scored better than the ones with tumors Stage III + IV. Patients with large tumors (Stage III + IV) scored higher on swallowing difficulties and many other disabilities. Besides, the patients with small tumors also scored better for physical functioning [Table 3].

On evaluating the treatment methods, it seemed that the patients who underwent surgery or surgery was a part of their treatment, had higher scores for pain, swallowing, social eating, speech, cough, and pain killer [Table 4].

This study showed that women and the elderly had a lower QoL compared to men and young people.

Multiple regression models showed that patients’ education and occupation had no effect on their QoL, and no significant relationship was observed in this regard [Table 5].

A total of 185 patients (85%) stated that their QoL was much better before the disease. In addition, 25 patients (15%) stated that their QoL was sometimes better than before their disease. The patients believed that their QoL was better before their disease.

Figure 1 shows the patients’ response to the question “How do you describe your health-related QoL in general?” As stated in the figure, women’s QoL was lower than men; there was no significant relationship between patients’ age, education, occupation, type of treatment, and their stated QoL.

Table 2: Differences of scales and single items of the University of Washington Quality of Life scores and the Quality of Life Questionnaire Head and Neck 3 by the site of tumor

Site of tumor	Oral cavity	Larynx	Pharynx	P
EORTC QLQ-C35				
Pain	65.23	45.12	50.22	0.025*
Swallowing	45.12	48.22	72.12	0.001*
Social eating	68.20	45.12	41.21	0.001*
Social contact	45.15	32.21	30.45	0.011*
Speech	42.62	54.12	42.45	0.002*
Taste/smell	64.23	45.23	54.71	0.001*
Sexuality	70.70	61.45	61.32	0.121
Teeth	45.25	39.25	42.25	0.091
Trismus	75.12	40.22	45.75	0.002*
Dry mouth	58.02	51.12	52.45	0.082
Sticky saliva	35.12	50.00	61.52	0.021*
Cough	32.26	55.12	45.16	0.042*
Felt ill	56.71	53.14	45.56	0.132
Painkiller	55.54	58.16	51.25	0.812
Nutritional supplement	60.23	55.65	62.12	0.050
Feeding tube	45.32	44.25	44.12	0.201
Weight gain	25.12	32.02	27.01	0.095
UW-QoL scores				
Pain	62.13	52.12	49.25	0.040*
Appearance	45.13	41.45	72.12	0.001*
Activity	62.25	45.15	41.02	0.001*
Recreation	45.12	33.25	31.17	0.011*
Swallowing	42.25	50.85	45.12	0.001*
Chewing	62.84	47.24	55.64	0.002*
Speech	62.25	61.45	59.12	0.211
Shoulder	46.11	37.64	41.53	0.127
Taste	71.15	38.12	48.54	0.001*
Saliva	60.12	52.17	56.15	0.102
Mood	46.25	55.11	59.25	0.125
Anxiety	59.12	55.24	45.75	1.010

*P<0.05 is significant. EORTC-QLQ=European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, UW-QoL=University of Washington Quality of Life

Figure 2 shows the patients’ response to the question “Which issues have been the most important to you during the past 7 day?”. Furthermore, there was no significant relationship between patients’ age, education, occupation, type of treatment, and response to this question.

Discussion

This study showed that cancer patients believed that their swallowing and speech were most affected. The most common problems were changes in taste, xerostomia, speech problem, chewing problem, and swallowing difficulty. Literatures showed that dental problems, pain, sensorial problems in oral cavity cancer, mouth dryness, throat pain, swallowing difficulty, sticky saliva in pharynx cancer, speech problem, and dyspnea in larynx cancer have high symptom points.^[14-17]

Table 3: Differences of scales and single items of the University of Washington Quality of Life and the Quality of Life Questionnaire Head and Neck 35 by the stage of tumor

Stage	Stage I	Stage II	Stage III	Stage IV	P
EORTC QLQ-C35					
Pain	32.12	35.22	37.16	38.12	0.112
Swallowing	35.25	59.18	62.17	71.25	0.001*
Social eating	31.02	34.02	36.12	39.25	0.007
Social contact	41.25	59.17	53.16	68.27	0.001*
Speech	45.25	45.12	61.17	62.21	0.050
Taste/smell	32.19	48.12	55.19	63.45	0.012*
Sexuality	52.17	52.25	54.48	52.15	0.095
Teeth	52.13	55.45	59.22	58.12	0.212
Trismus	42.16	45.85	42.46	62.17	0.010*
Dry mouth	52.14	36.12	46.52	48.12	0.050
Sticky saliva	51.03	51.84	51.25	51.21	0.812
Cough	53.25	56.16	46.22	52.28	0.090
Felt ill	31.12	35.17	36.16	37.25	0.124
Painkiller	32.15	49.12	58.16	69.81	0.001*
Nutritional supplement	31.23	33.12	28.12	34.16	0.050
Feeding tube	31.26	34.16	56.15	67.12	0.001*
Weight gain	45.23	51.16	57.15	65.18	0.004
UW-QoL scores					
Pain	42.25	50.16	58.23	56.16	0.050
Appearance	43.54	42.56	62.02	68.05	0.001*
Activity	42.25	42.16	41.23	40.15	0.008
Recreation	48.52	31.17	33.15	30.15	0.010*
Swallowing	42.25	50.85	45.12	62.21	0.001*
Chewing	45.19	46.22	53.15	65.74	0.001*
Speech	54.12	55.23	61.17	75.16	0.001
Shoulder	53.12	42.25	45.12	46.22	0.117
Taste	45.13	46.55	58.54	68.23	0.001*
Saliva	32.17	35.25	48.16	62.18	0.002*
Mood	46.12	47.21	59.65	62.78	0.003*
Anxiety	32.89	38.14	49.12	59.17	0.001*

*P<0.05 is significant. EORTC-QLQ=European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, UW-QoL=University of Washington Quality of Life

Leung *et al.* showed that the most common problems were dry mouth, sticky saliva, and tooth problems.^[15] The study by Epstein *et al.*^[5] showed that the most common complaints include mucositis; infection; salivary and neurosensory changes; taste, oral, and dental infection; risk of dental diseases; and necrosis of the jaw. These complications impact the QoL.

The survey also showed a weaker state of overall health, fatigue, loss of appetite, difficulty swallowing, sensory problems, social eating difficulties, dental problems, trismus, sticky saliva, dry mouth, coughing, and feeling ill in patients with head-and-neck cancer.

A systematic review by Ryzek *et al.*^[18] showed that limitations in social activities, nausea, pain, financial problems, speech, social eating, trismus, sticky saliva, swallowing, and dry mouth were the most common

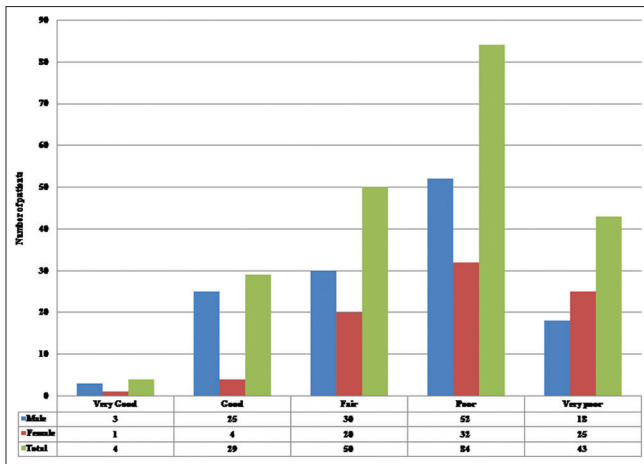


Figure 1: The patients' response to the question "would you say your health-related quality of life during the past 7 days has been"

complaints. In the studies conducted by Allal *et al.*,^[19] Pow *et al.*,^[20] Cengiz *et al.*,^[21] and Wijers *et al.*^[22] regarding assessing the QoL in patients who underwent radiation therapy, the most common complaint among patients was lack of saliva and dry mouth, which contrasts with the results of the present study. This difference can be the result of different received dosages of radiotherapy during treatment and differences in the types of cancer under study.

The results of this study showed that the location of the tumor can affect the QoL in patients. Patients with laryngeal tumors had speech difficulties and cough; patients with oral cavity tumors had pain, social eating, social contact, taste loss, and trismus; and patients with pharyngeal tumors had swallowing problems. The study conducted by de Oliveira *et al.*^[23] showed that mood and anxiety domains were the most affected at the time of diagnosis. Chewing and speech domains were the most affected in the reevaluation of the questionnaire, after 3 months.

Alicikus *et al.*^[24] studied the effects of tumor types and treatment methods in patients with head-and-neck cancer on their QoL, and showed that the location of tumor and the treatment method are the most important factors affecting the head-and-neck cancer patients' QoL.

This study shows a lower QoL for women and the elderly compared to men and young people. Gender comparisons in the study carried out by Epstein *et al.*^[5] show that women with head-and-neck cancer generally have better grades in EORTC QLQ-H&N35 questionnaire, whereas men with head-and-neck cancer have lower grades. The patients who were aged 65 years or older had lower grades compared to patients under 65 years old.

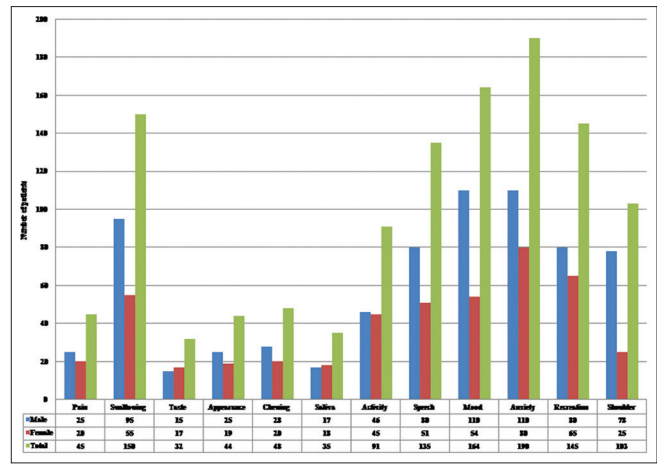


Figure 2: The patients' response to the question "Which issues have been the most important to you during the past 7 days?"

Ojo *et al.*^[10] showed that the parameters which increase the general health condition are gender (men showed better general health conditions than women) and the primary stages of the disease.

Individuals who had Grade III and IV tumors had lower QoL compared to patients with small tumors (Stages I and II). Studies showed that disease stage and QoL had a high negative correlation.^[5,14]

In a study by Akkas *et al.*,^[3] it was found that patients in Stage I and II have better scores, compared to those in Stage III and IV. While in patients with Stage III and IV, the scores were higher for fatigue, dyspnea, insomnia, loss of consciousness, swallowing difficulties, social communication, and loss of taste/smell. Besides, in patients with Stage I and II tumors, the scores were better for physical function.

Epstein *et al.*^[5] reported that dental problems, sticky saliva, taste loss, and swallowing difficulty are significantly high in Stage III and IV head-and-neck cancers in comparison with Stage I and II. Similar results were also found by Tahani *et al.*^[11] Based on these investigations, it can be found that symptom scale points are high and QoL is low in patients with advanced stages. Some other studies found that many serious complications can be omitted by therapy methods which have many modalities.^[5,14-17]

In the present study, it was revealed that only in radiotherapy group, physical functions, functions of role, emotional functions, global health status, and QoL points were significantly high. Fatigue, pain, insomnia, weakness, speech and swallowing problems, dyspnea, and social communication difficulty subscale points were significantly high in the surgery group.

Table 4: Differences of scales and single items of the University of Washington Quality of Life and the Quality of Life Questionnaire Head and Neck 35 by treatment type

Treatment type	RT	Chemotherapy	Surgery	P
EORTC QLQ-C35				
Pain	38.12	25.15	51.21	0.002*
Swallowing	27.85	29.12	42.51	0.003*
Social eating	43.15	32.26	51.05	0.010*
Social contact	26.56	32.17	34.12	0.013*
Speech	31.12	25.12	45.14	0.001*
Taste/smell	40.67	53.12	55.67	0.076
Sexuality	44.16	61.22	56.67	0.121
Teeth	49.34	45.78	55.32	0.653
Trismus	56.12	33.56	50.78	0.231
Dry mouth	50.12	67.12	44.34	0.045*
Sticky saliva	53.33	56.12	50.15	1.241
Cough	45.14	35.12	56.25	0.021*
Felt ill	44.34	53.12	55.15	0.764
Painkiller	55.12	45.15	61.17	0.004*
Nutritional supplement	48.56	47.23	47.43	0.653
Feeding tube	45.25	46.45	45.87	1.000
Weight gain	43.34	45.09	46.78	0.890
UW-QoL scores				
Pain	32.34	27.34	55.54	0.001*
Appearance	34.12	36.26	48.12	0.001*
Activity	46.56	30.67	55.65	0.001*
Recreation	32.45	45.16	29.17	0.004*
Swallowing	45.74	23.15	48.42	0.001*
Chewing	42.45	50.16	58.74	0.061
Speech	45.34	67.13	58.67	0.098
Shoulder	51.23	47.13	57.13	0.765
Taste	49.56	37.14	53.56	0.047*
Saliva	54.23	72.03	46.15	0.009*
Mood	57.21	60.16	59.56	1.009
Anxiety	54.32	38.16	59.34	0.001*

*P<0.05 is significant. EORTC-QLQ=European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, UW-QoL=University of Washington Quality of Life, RT=Radiotherapy

The study by Singer *et al.*^[7] showed that patients who had surgery had better grades regarding swallowing solid foods, dry mouth, and dental problems; however, this had no effect on their QoL responses. The patients who underwent radiotherapy mostly complained about dry mouth and its related problems.

Ryzek *et al.*^[25] studied 111 head-and-neck cancer patients under treatment and found out that the group who only had surgery had a better QoL compared to the group that underwent surgery and radiotherapy simultaneously, or the patients who had surgery accompanied by any other method of treatment had better QoL.

Boscolo-Rizzo *et al.*^[26] used the EORTC QLQ-C30 and H&N35 questionnaires for studying 57 patients with T3-4 oropharyngeal cancer. In that work, 31 patients

receiving concurrent chemo-radiotherapy after surgery were compared with 26 patients receiving radiotherapy. The chemo-radiotherapy technique showed better scores in fatigue, pain, swallowing problems, eating problems in social environment, and inability to build social interaction, while disadvantages were found in terms of dental problems, the problem of opening the mouth, dry mouth, and sticky saliva.

The QoL was verified by Tschudi *et al.*^[27] after three different treatment modalities in 99 patients. Among them, there were 31 patients with only surgery, 19 patients with radiotherapy alone, and 49 patients with radiotherapy after surgery. Fewer complaints were found in the group of patients without radiotherapy. They had fewer swallowing difficulties, eating problems in a social environment, lack of social interaction, dry mouth, sticky saliva, and difficulties with opening the mouth.

Symptom scales were compared by Akkas *et al.*^[3] in patients receiving only radiotherapy, concurrent chemo-radiotherapy, and radiotherapy after surgery. The better scores distinguished for physical and emotional function and QoL in the group with only radiotherapy. In the group with radiotherapy after surgery, the scores for fatigue, pain, insomnia, weight loss, speech and swallowing problems, dyspnea, and lack of social interaction were found to be significantly higher. It was also revealed that surgery increases the survival, but the performance level and the QoL were affected negatively by the permanent functional and physical changes. Besides, high scores were found in the radical surgery group, for the swallowing and the speech problems, dyspnea, insomnia, and also in sensory and social communication problems.

Surgical methods are applied for removing the cancer completely and preventing the breathing, swallowing, and voice functions.^[28] Similar studies showed that surgery increases the survival, but permanent functional and physical changes negatively affect the QoL and performance level.^[29,30]

This study showed that social and psychological issues are affected by cancer, for instance, many of the cancer patients who are employed lose their jobs, and many of them become dissociable and depressed.

Conclusion

The study showed that QoL differs due to location of tumor, stage of cancer, and treatment type.

Suggestion

The review of literature indicated that studies on QoL in

Table 5: The overall effect of the sociodemographic and clinical variables on the University of Washington Quality of Life and European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-C35

Sociodemographic characteristic	UW-QoL				EORTC QLQ-C35			
	One-factor model*		Multifactor model**		One-factor model*		Multifactor model**	
	Wilk's λ	P	Wilk's λ	P	Wilk's λ	P	Wilk's λ	P
Age: <40 versus 40-60 versus \geq 60 years	0.887	0.026 ^e	0.954	0.01 ^e	0.924	0.017 ^e	0.835	0.01 ^e
Gender: Female versus male	0.932	0.01 ^e	0.825	0.01 ^e	0.875	0.021 ^e	0.954	0.01 ^e
Education years: \leq 6 versus 6-12 versus >12	0.987	0.06	0.985	0.05	0.854	0.05	0.941	0.06
Employment: Yes versus no	0.875	0.09	0.934	0.05	0.890	0.08	0.954	0.07
Tumor site: Oral cavity versus pharynx versus larynx	0.845	0.01 ^e	0.956	0.01 ^e	0.745	0.01 ^e	0.624	0.01 ^e
AJCC stage: Stage I- II versus III- IV	0.954	0.01 ^e	0.675	0.01 ^e	0.875	0.01 ^e	0.968	0.01 ^e
Treatment methods: RT versus chemotherapy versus surgery	0.956	0.01 ^e	0.875	0.01 ^e	0.856	0.01 ^e	0.945	0.01 ^e

*The one-factor model: Only one independent variable was entered into the model, **The multifactor model: All the mentioned variables were entered as independent variables in the model, ^eP<0.05 is significant. ANOVA=General linear model multivariate of variance, EORTC-QLQ=European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, UW-QoL=University of Washington Quality of Life, AJCC= American Joint Committee on Cancer

patients with head-and-neck cancer have not been done in Iran. Therefore, it is recommended that more studies be done on this subject.

Limitation

The study limitation included lack of cooperation of a number of patients.

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Conflicts of interest

There are no conflicts of interest.

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