Original Article

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Dentistry Section

Is Socio-economic Status Associated with Oral Healthcare Utilisation and Dental Health among Female Cancer Survivors? A Cross-sectional Study from Southern Iran

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ABSTRACT

Introduction: Cancer patients are more prone to dental caries. Exposure to chemotherapy and/or radiation therapy, leads to hypofunction of salivary glands and consequently increases dental caries. A considerable number of cancer survivors are exposed to a heavy economic burden imposed by the disease.

Aim: To study the effects of Socio-economic Status (SES) on oral health and the utilisation of Oral Healthcare (OHC) services among female cancer survivors in Iran.

Materials and Methods: A cross-sectional study was conducted from June 2019 to October 2019 on 200 female cancer patients. Proportion of dental caries, OHC services utilisation, and SES were assessed in participants older than 18 years, who visited Shiraz cancer clinics at Shiraz, Iran. The data on OHC utilisation and SES among individuals were collected using the questionnaires by face to face interviews and oral examinations. Pearson's Chi-squared test, the independent samples t-test, and binary logistic regression were used for statistical analyses.

Results: Total of 200 female cancer patients were included and the median age was 49 years. Filled Teeth (FT) and Decayed, Missing and Filled Teeth (DMFT) (Poisson Regression (PR): 1.64, p-value <0.001; and PR: 1.11, p-value 0.04 in respect) were significantly higher; while, Decayed Teeth (DT) (PR: 0.80, p-value 0.03) and Missing Teeth (MT) (PR: 0.69, p-value <0.001) were significantly lower, in higher levels of SES. Hundred and fourteen participants had at least one dental visit during the previous year. SES did not affected having a dental visit in the previous year (p-value 0.6).

Conclusion: Among female cancer survivors, SES was associated with oral health and was not a determinant for the rate of utilised OHC services. Treatment in comparison with prevention/regular dental check-ups was the most prevalent reason for the last dental visit.

Keywords: Dental care, Dental caries, Health status disparities

INTRODUCTION

Cancer is one of the most common chronic non communicable diseases with an overall incidence of 17 per 100,000 female individuals in Iran [1]. Due to higher awareness about cancer, systematic screening programs, and new treatments strategies, the survival of cancer patients increased and more than 58% of female patients with breast cancer survive 10 years after diagnosis [2]. Exposure to chemotherapy and/or radiation therapy leads to mucositis, hypofunction of salivary glands which consequently increase dental caries [3]. Besides, a considerable number of cancer survivors are exposed to a heavy economic burden imposed by the disease [4].

Recent evidence highlights cancer survivors' crucial need for accessible and affordable preventive OHC services. The situation grows even worse in less developed and developing countries where OHC utilisation is significantly low even among the normal population. Research conducted on OHC utilisation among Iranian adults shows that factors, such as being covered by an insurance policy, job status, level of education, SES, and psychologic health affect utilisation of OHC services [5-9].

According to the literature, there could be an association between oral health and SES among adults [10-12]. A systematic review evaluating the effects of socio-economic factors on dental caries among adults reported that a higher proportion of people of low SES experienced more severe dental caries in a population [10]. Another systematic review indicated the same results and, reported that the recent association could be stronger in developed countries [11].

To the best of the authors' knowledge, there is no study conducted on oral health and utilisation of OHC services in female cancer survivors in Iran. Thus, the current study aims to evaluate the effects of SES on OHC utilisation and dental health among female cancer survivors in southern Iran.

MATERIALS AND METHODS

This cross-sectional study was conducted on female cancer survivors having attended Shiraz cancer clinics at Shiraz, Iran, from June 2019 to October 2019, after approval by the Ethics Committee (approval number: IR.SUMS.MED.REC.1399.160) of Shiraz University of Medical Sciences. Written informed consent forms were obtained from all participants in this study.

Inclusion criteria: Female cancer survivors older than 18 years, who were able to consciously participate in the study, were included.

Exclusion criteria: Those patients with less than six months and/or over 60 months of cancer diagnosis as well as edentulous patients were excluded.

Sample size calculation: Stratified cluster sampling was employed at different public and private cancer care centres. The study sample size was calculated using Cochran's sample size formula [13]:

$$n_0 = \frac{Z^2pq}{e^2}$$

where e: Desired level of precision; p: Estimated proportion of the population; q: 1-p.

By assuming the prevalence of OHC utilisation at 4.67%, with the hypothesis of a 10% decrease in OHC utilisation among cancer survivors, and with the precision value of 0.05, the total sample size was estimated 200 [9].

Data collection was conducted in a single face-to-face interview and an oral examination. The interviews were conducted in a private room for each participant. Three interviewers were selected among senior dental students, who were trained in an educational meeting managed by a highly competent dentist. Next, all of them participated in a role-play interview.

The data on OHC utilisation were collected using the Iranian National Healthcare Utilisation Questionnaire (version 2015) which was designed, standardised, and used by the National Institute of Health Research (NIHR) [14] [Annexure-1]. Data on SES among individuals were gathered through a Persian questionnaire on socio-economic determinants [15] [Annexure-2]. Variables assessed in the current study included SES, education level, age, job status, place of residence (urban/rural), number of months passed from initial diagnosis of cancer, history of head and/or neck radiation therapy, multiple co-morbidities, polypharmacy, anxiety, depression, oral hygiene behaviours (oral hygiene frequency, use of a toothbrush, toothpaste, dental floss, mouth wash, and sugar consumption), cancer treatments (surgery, chemotherapy, and radiation therapy), and the history of smoking. Anxiety and depression was assessed through Hospital Anxiety and Depression Scale (HADS) questionnaire. SES was categorised into four quartiles including low, low-middle, middle-high, and high. The cut-offs were selected according to the Interquartile Range (IQR) of the studied sample (n=200) [16]. Therefore, each group of the SES, included twenty-five percent (n=50) of the participants.

In this study, dental caries was assessed in female cancer survivors using decayed teeth (DT), missing teeth (MT), filled teeth (FT), and decayed mobile filled teeth (DMFT) indices [17]. All dental examinations were conducted by a general dentist based on the World Health Organisation (WHO) method of measurement [18], i.e., the examination of all permanent teeth, including wisdom teeth for dental caries using a metallic periodontal probe {Community Periodontal Index (CPI) probe} as well as a plane mouth mirror.

STATISTICAL ANALYSIS

Pearson's Chi-squared test, the independent samples t-test, binary logistic regression, and Poisson regression were used for statistical analyses. Furthermore, p-values <0.05 was considered statistically significant, and all analyses were performed using International Business Management (IBM) SPSS Statistics 24.0 (Armonk, NY: IBM Corp.). To investigate the associated variables to the dental visits within the previous year, First the independent variables like education, age, number of months passed from initial diagnosis, multimorbidity, polypharmacy, SES, place of residence, job status, type of cancer, history of surgery, chemotherapy, radiation therapy, smoking, oral hygiene, anxiety, depression, and self-report health state, were put in the model and then backward elimination technique was used to fit logistic regression and calculate adjusted Odds Ratio (OR). The associated variables of dental indices i.e. DMFT, DT, MT, and FT were examined through the Poisson regression modelling by application of robust technique for estimation of standard errors for regression coefficients; and the Prevalence Ratio (PR) with 95% confidence interval was measured.

RESULTS

Two hundred female cancer survivors were included, among whom 146 (73%) were breast cancer survivors. The other most frequent types of cancers in patients involved 15 (7.5%) endometrial cancers, 8 (4%) cervical cancers, 8 (4%) colon cancers, and 7 (3.5%) brain tumours and 16 (8%) other cancers. The median (IQR) age was 49 (41, 55) years. Out of 200, 135 (68%) were educated up to a high school diploma and 169 (85%) were housewives (had no job). A number of 75 (38%) suffered from depression and 92 (46%) suffered from anxiety [Table/Fig-1].

Factors	n (%)	Median (IQR)								Seek for dental services	
		DMFT	p-value*	Decayed Teeth (DT)	p-value*	Missing Teeth (MT)	p-value*	Filled Teeth (FT)	p-value*	n (%)	p-value^
SES											
Low	50 (25)	15 (9, 18)	0.9	3 (1, 5)	0.6	6 (2, 10)	**0.01**	2 (0, 5)	**0.001**	22 (11)	0.2
Low-Middle	50 (25)	13 (8, 19)		3 (1, 5)		3 (1, 8)		3 (0, 9)		33 (16.5)	
Middle-High	50 (25)	14 (10, 17)		3 (2, 5)		3 (2, 6)		5 (2, 8)		30 (15)	
High	50 (25)	13 (10, 16)		2.5 (1, 4)		1 (0, 6)		7 (3, 11)		29 (14.5)	
Education											
Illiterate	16 (8)	17 (12, 19)	0.1	4 (1, 6)	0.7	10(5, 16)	**<0.001**	0 (0, 5)	**0.001**	6 (3)	0.2
Up to Diploma	135 (67.5)	13 (9, 18)		3 (1, 5)		4 (1, 8)		4 (1, 8)		81 (40.5)	
Diploma and more	49 (24.5)	12 (9, 16)		3 (1, 5)		1 (0, 5)		6 (3, 10)		27 (13.5)	
Age (year)											
18-34	13 (6.5)	11 (10, 16)	<0.001	5 (2, 8)	0.06	0 (0, 2)	**<0.001**	6 (2, 11)	0.4	8 (4)	0.3
35-44	55 (27.5)	11 (7, 14)		2 (1, 5)		2 (1, 6)		4 (0, 8)		32 (16)	
45-54	74 (37)	14 (10, 18)		3 (2, 5)		4 (1, 9)		4 (0, 9)		38 (19)	
55 and more	58 (29)	16 (11, 19)		3 (0.7, 5)		5 (3, 10)		5 (2, 8)		36 (18)	
Job											
Yes	31 (15.5)	12 (8, 15)	**0.05**	3 (1, 4)	0.4	2 (0, 3)	**0.004**	6 (3, 9)	0.2	6 (3, 9)	1.0
No	169 (84.5)	14 (9, 18)		3 (1, 5)		4 (1, 9)		4 (1, 8)		4 (1, 8)	
Inhabitancy											
Metropolitan	100 (50)	13 (9, 18)	0.6	2.5 (1, 4)	0.07	3 (1, 7)	0.9	5 (2, 9)	0.7	64 (32)	0.6
Other	100 (50)	13 (9, 17)		3 (2, 6)		3 (1, 9)		3 (0, 8)		50 (25)	
Duration of cancer (month)											
Up to 6	29 (14.5)	11 (9, 14)	**0.05**	3 (1, 4)	0.06	2 (0, 6)	0.09	3 (1, 9)	0.8	14 (7)	0.4
7-12	48 (24)	14 (9, 17)		3 (2, 6)		3 (1, 7)		4 (1, 8)		24 (12)	
13-36	58 (29)	13 (8, 17)		2 (1, 4)		3 (1, 9)		3 (1, 8)		37 (18.5)	
37 and more	65 (32.5)	15 (11, 19)		2 (1, 5)		5 (1, 9)		5 (1, 9)		39 (19.5)	

Head and Neck radiation therapy										
Yes	46 (23)	15 (8,18)	0.7	3 (2, 6)	**0.006**	3 (1, 9)	0.9	4 (0, 7)	0.2	28 (14)	0.6
No	154 (77)	13 (9, 17)		3 (1, 5)		3 (1, 7)		4 (1, 8)		86 (43)	
Co-morbidities											
Zero	100 (50)	13 (9, 16)	**0.006**	3 (2, 5)	0.5	3 (1, 6)	**0.001**	5 (1, 8)	0.6	58 (29)	0.6
One	64 (32)	12 (9, 17)		2 (1, 5)		3 (1, 7)		4 (1, 8)		38 (19)	
Two and more	36 (18)	17 (11, 21)		3(1, 6)		7 (3, 14)		3 (0, 8)		18 (9)	
Depression											
Yes	75 (37.5)	14 (11, 19)	**0.003**	3 (2, 6)	**0.004**	5 (2, 10)	**0.006**	3 (0, 8)	0.2	51 (25.5)	**0.01**
No	125 (62.5)	12 (8, 16)		2 (1, 4)		3 (1, 6)		4 (2, 8)		63 (31.5)	
Anxiety											
Yes	92 (46)	14 (9, 18)	0.5	3 (1, 5)	0.2	4 (1, 8)	0.8	4 (0, 9)	0.7	58 (29)	0.1
No	108 (54)	13 (9, 16)		2 (1, 5)		3 (1, 7)		4 (1, 8)		56 (28)	

[Table/Fig-1]: Dental health and oral healthcare utilisation according to participants' characteristics.
Independent sample t-test; ^: Pearson's chi-squared test; bold p-values are significant; DMFT: Decayed missing filled teeth

The median (IQR) of the MT among four groups of SES from Low to High was 6 (2, 10), 3 (1, 8), 3 (2, 6) and 1 (0, 6) respectively (p=0.01); and also, for FT, it was 2 (0, 5), 3 (0, 9), 5 (2, 8) and 7 (3, 11) in respect (p=0.001) [Table/Fig-1].

A number of 179 (90%) participants reported a history of chemotherapy, and 150 (75%) went under radiation therapy. Twenty-three (11.5%) patients had a history of smoking [Table/Fig-2]. The median (IQR) of MT among patients with and without a history of polypharmacy were 6 (3, 19) and 3 (1, 7) in respect (p=0.02). More details on participants' medical history are available in [Table/Fig-2].

Of those who participated in this study, 168 (84%) reported cleaning their teeth at least once a day and 162 (81%) stated to use sugar contained foods/drinks, several times a day. The median (IQR) of DT among patients who used toothbrushes and those who did not were 3 (1, 5) and 5 (2, 7) respectively (p=0.006). Detailed information about patients' oral hygiene habits is depicted in [Table/Fig-3].

A hundred and seventy-three (86.5%) of the participants, reported at least one oral healthcare need, and 114 (57%) of them had at least one dental visit during the previous year [Table/Fig-4]. Also, among those who reported at least one oral healthcare need during the previous year (n=173), 107 received dental services. In addition, the reason for the last dental visit in 72% of the patients was the dental treatment; while, 28% of them had preventive reasons or visited a dentist for the regular dental check-ups.

Among the participants categorised in low SES (n=50), 40 (80%, 95% CI: 66-90) reported at least one case of OHC need within the previous year, 22 (44%, 95% CI: 30-59) had at least one dental visit, and 21 (42%, 95% CI: 28-57) received the OHC services. While, in the high SES group, 46 reported at least one case of OHC need, 29 had at least one dental visit during the previous year, and all the 29 received OHC services. Details about all the four groups of SES are illustrated in [Table/Fig-4].

According to the multivariable logistic regression model, the chance of occurrence of higher SES with OHC visits within the previous year was not significant (OR: 1.20, 95% CI: 0.9-1.6; p: 0.6) [Table/Fig-5]. Besides, FT and DMFT (PR: 1.55, 95% CI: 1.4-1.8, p<0.001; and PR: 1.11, 95% CI: 1.0-1.2, p=0.04 in respect) were significantly higher; while, DT (PR: 0.80 (0.7-1.0), p: 0.03) and MT (PR: 0.69 (0.6-0.8), p: <0.001) were significantly lower, in higher levels of SES [Table/Fig-5].

DISCUSSION

Recent study aimed to investigate the status of OHC utilisation and the effects of SES on OHC utilisation and dental health status among female cancer survivors in southern Iran. A 61.8% of the participants who needed OHC services within the previous year received the services. SES was associated with oral health status, but it was not significant for OHC utilisation.

		Median (IQR)								Seek for dental services	
Factors	n (%)	DMFT	p-value*	Decayed Teeth (DT)	p-value*	Missing Teeth (MT)	p-value*	Filled Teeth (FT)	p-value*	n (%)	p-value^
Surgery											
Yes	187 (93.5)	13 (9, 17)	0.1	3 (1, 5)	0.1	3 (1, 7)	0.4	4 (1, 8)	1.0	107 (53.5)	1.0
No	13 (6.5)	14 (12, 22)		5 (2, 7)		6 (2, 11)		5 (2, 9)		3.5 (7)	
Chemotherapy											
Yes	179 (89.5)	13 (9, 18)	0.7	3 (2, 5)	0.4	3 (1, 8)	**0.05**	4 (1, 8)	**0.03**	98 (49)	0.06
No	21 (11.5)	12 (8, 17)		2 (0, 5)		2 (0, 4)		7 (2, 12)		16 (8)	
Radiation therapy											
Yes	150 (75)	13 (9, 18)	0.4	3 (1, 5)	1.0	3 (1, 9)	0.2	4 (1, 8)	0.6	45 (90)	0.1
No	50 (25)	13 (10, 15)		3 (1, 5)		3 (0, 7)		6 (0, 8)		12 (24)	
History of smoking											
Yes	23 (11.5)	11 (7, 16)	0.05	2 (0, 5)	0.1	4 (1, 9)	0.8	2 (0, 5)	0.07	13 (6.5)	1.000
No	177 (88.5)	13 (9, 18)		3 (2, 5)		3 (1, 8)		5 (1, 9)		101 (50.5)	
Polypharmacy											
Yes	8 (4)	18 (17, 23)	**0.003**	2.5 (1, 4)	0.6	6 (3, 19)	**0.02**	9.5 (0, 17)	0.2	108 (54)	0.5
No	192 (96)	13 (9, 17)		3 (1, 5)		3 (1, 7)		4 (1, 8)		6 (3)	

[Table/Fig-2]: Dental health and oral healthcare utilisation according to the medical history of the study participants.
*: Independent sample t-test; ^: Pearson's chi-squared test; bold p-values are significant; DMFT: Decayed missing filled teeth

Factors	n (%)	Median (IQR) DMFT	p-value*	Decayed Teeth (DT)	p-value*	Missing Teeth (MT)	p-value*	Filled Teeth (FT)	p-value*	Seek for dental services n (%)	p-value^
Oral hygiene											
Less than once a day	32 (16)	17 (11, 21)	**0.02**	4 (1, 7)	**0.02**	7 (2, 11)	**0.02**	1 (0, 7)	0.2	18 (9)	0.9
Once a day	92 (46)	12 (8, 16)		3 (1, 5)		3 (1, 7)		5 (2, 8)		54 (27)	
Twice/more a day	76 (38)	14 (9, 18)		3 (2, 5)		3 (1, 7)		5 (2, 10)		42 (21)	
Toothbrush											
Yes	180 (90)	13 (9, 17)	**0.02**	3 (1, 5)	**0.006**	3 (1, 7)	**0.003**	5 (1, 8)	**0.05**	104 (52)	0.6
No	20 (10)	18 (11, 22)		5 (2, 7)		8 (3, 12)		0 (0, 5)		10 (5)	
Toothpaste											
Yes	174 (87)	13 (9, 17)	**0.03**	3 (1, 5)	0.2	3 (1, 7)	**0.05**	4 (1, 8)	0.7	100 (50)	0.8
No	26 (1 3)	16 (11, 21)		3 (1, 6)		5 (2, 10)		1 (0, 11)		14 (7)	
Dental floss											
Yes	48 (24)	14 (11, 18)	0.2	3 (1, 5)	0.7	3 (0, 6)	**0.05**	8 (4, 11)	**<0.001**	36 (18)	**0.004**
No	152 (76)	13 (9, 17)		3 (1, 5)		4 (1, 9)		3 (0, 7)		78 (39)	
Mouth wash											
Yes	22 (11)	13 (11, 16)	0.6	3 (1, 5)	0.9	2 (0, 4)	0.08	6 (2, 10)	0.3	16 (8)	0.2
No	178 (89)	13 (19, 18)		3 (1, 5)		3 (1, 8)		4 (1, 8)		98 (49)	
Sugar consumption											
Several times a day	162 (81)	13 (9, 18)	0.9	3 (1, 5)	0.2	3 (1, 7)	0.2	5 (1, 9)	**0.02**	93 (46.5)	0.9
Less	38 (19)	13 (9, 17)		3 (1, 6)		6 (2, 9)		3 (0, 6)		21 (10.5)	

[Table/Fig-3]: Dental health and oral healthcare utilisation according to oral health behaviours of the study participants.
*: Independent sample t-test; ^: Pearson's chi-squared test.

SES group (N)	OHC utilisation: Reported at least one oral healthcare need n (%, 95% CI)	Had at least one dental visit n (%, 95% CI)	Received dental services n (%, 95% CI)
Low (n=50)	40 (80, 66-90)	22 (44, 30-59)	21 (42, 28-57)
Low-middle (n=50)	42 (84, 71-93)	33 (66, 51-79)	30 (60, 45-74)
Middle-high (n=50)	45 (90, 78-97)	30 (60, 45-74)	27 (54, 39-68)
High (n=50)	46 (92, 81-98)	29 (58, 43-72)	29 (58, 43-72)
Total (N=200)	173 (87, 81-91)	114 (57, 50-64)	107 (54, 46-61)

[Table/Fig-4]: Oral healthcare utilisation among female cancer survivors in southern Iran, 2019 within the previous year.
OHC: Oral healthcare; SES: Socio-economic status

Outcome/correlate	Unadjusted OR	95% CI	p-value*	Adjusted OR	95% CI	p-value
Higher SES	1.15	0.9-1.5	0.9	1.20	0.9-1.6	0.6
Metropolitan/other	1.77	1.0-3.1	0.05	2.04	1.1-3.8	0.02
Depression	0.47	0.0-2.1	0.02	2.47	1.3-4.7	0.006
Number of DT	**PR**	**95% CI**	**p-value^**	**PR**	**95% CI**	**p-value**
Having dental visit (during the previous year)	0.89	0.8-1.0	0.04	0.87	0.8-1.0	0.01
Anxiety	1.19	1.0-1.4	0.02	1.21	1.0-1.4	0.01
Higher SES	0.84	0.7-1.0	0.07	0.80	0.7-1.0	0.03
Age category	0.90	0.8-1.0	0.02	0.89	0.8-1.0	0.01
History of smoking	0.71	0.5-0.9	0.02	0.68	0.5-0.9	0.006
Number of MT						
Depression	1.49	1.3-1.7	<0.001	1.41	1.3-1.6	<0.001
Age category	1.47	1.4-1.6	<0.001	1.37	1.3-1.5	<0.001
Duration of initial diagnosis	1.19	1.1-1.3	<0.001	1.14	1.0-1.2	<0.001
Multimorbidity	1.36	1.3-1.5	<0.001	1.12	1.0-1.2	0.005
Higher SES	0.59	0.5-0.7	<0.001	0.69	0.6-0.8	<0.001
Number of FT						
Receiving dental services	1.56	1.4-1.8	<0.001	1.30	1.05-1.60	0.013
Dental visit (within previous year)	1.27	1.2-1.4	<0.001	1.16	1.01-1.33	0.031
Higher SES	1.64	1.4-1.9	<0.001	1.55	1.4-1.8	<0.001
Depression	0.84	0.7-1.0	0.010	0.85	0.7-1.0	0.018
History of smoking	0.65	0.5-0.8	<0.001	0.68	0.5-0.9	0.001
DMFT						
Job	0.83	0.8-0.9	0.002	0.83	0.7-0.9	0.004
History of Smoking	0.81	0.7-0.9	0.002	0.81	0.7-0.9	0.003
Higher SES	1.00	0.9-1.1	0.9	1.11	1.0-1.2	0.04
Toothpaste	0.82	0.7-0.9	<0.001	0.86	0.8-1.0	0.009
Dental floss	1.09	1.0-1.2	0.04	1.19	1.1-1.3	<0.001
Age category	1.13	1.1-1.2	<0.001	1.14	1.1-1.2	<0.001
Duration of initial diagnosis	1.07	1.-1.1	<0.001	1.04	1.0-1.2	0.01
Depression	1.20	1.1-1.3	<0.001	1.23	1.1-1.4	<0.001

[Table/Fig-5]: Factors associated with the dental health and oral healthcare utilisation among female cancer patients in southern Iran.
*: Binary logistic regression; ^: Poisson regression; OR: Odds ratio; CI: Confidence interval; SES: Socio-economic status; DT: Decayed teeth; MT: Mobile teeth; FT: Filled teet

Fifty-seven percent of the participants had at least one dental visit during the previous year. This finding is consistent with the results of studies conducted on adult population [6,19,20]. For instance, Bahramian H et al., showed that 56% of the participants visited a dentist at least once during the previous year [6]; and also, a systematic review reported that regular and preventive utilisation of dental services occurred in 54% of the individuals [19]. However, in another study on adult population in China, 21.4% of the participants between 35-44 years of utilised oral health services within the previous year [21]. This difference might be as a result of long working hours [22] or the age limitation (35-44-year-old) of the participants [20]. A brief expression of similar studies is shown in [Table/Fig-6] [6,19-29].

A total of about 38% of those who needed a dentist during the previous year did not receive dental services. The literature review showed a variety of results (10.8-80%) for unfulfilled dental needs among normal adults [20,22,25-29]. The differences could have arisen from the availability and accessibility of dental services, treatment expenses,

Authors name Year and Reference no.	Place of study	Number of subjects	Variables compared	Conclusion
Bahramian H et al., 2019 [6]	Tehran, Iran	20320	**Main outcomes:** Dental service utilisation, Barriers of dental visit, Self-perceived oral health. **Predisposing factors:** Mental health, Age, Gender, Education, Wealth status	• Only 56% of the participants visited a dentist at least once during the last year. • Dental service utilisation was influenced by socio-economic factors and the mental health status of the adult population.
Reda SM et al., 2018 [19]	Global	7,395,697	**Main outcomes:** Proportion of individuals regularly/preventively utilising dental services. **Predisposing factors:** Human Developmental Status (HDS), Age, General health, Oral health, Edentulous individuals, Supportive family structures, Health literacy	• The global mean proportion of individuals regularly/preventively utilising dental services was 54%. • Regular/preventive utilisation varied widely between and within countries. The observed differences within populations did not significantly change with time and were universally present.
Alade OT et al. 2016 [25]	Ibadan, Nigeria	342	Cost per participant	• More than 80% of the participants examined had an unmet oral health need. • Outreach dental services provided similar dental treatment to services in a primary oral health clinic at a reduced cost.
Gupta A et al. 2019 [20]	Boston, USA	52,493,940	**Main outcomes:** time since last dental visit, Unmet dental care need, Reasons for unmet dental care need. **Predisposing factors:** Age, Race, Education status, Income status, Marital status, Health insurance status, General health condition.	• Of the women, 60.1% reported that it was one year or less since they last visited a dentist, and 1.2% reported never having visited a dentist. • Age, race/ethnicity, education, poverty income ratio, general health status, and health insurance were significantly associated with "time since last dental visit".
Kim N et al., 2017 [26]	South Korea	17,141	**Main outcomes:** experience of unmet dental care needs **Predisposing factors:** Demographic factors, Socio-economic factors, Need factors, Oral health-related factors	• Perceived unmet dental needs were among 43.9% of the participants, with the most common reason being financial difficulties. • The disparities in unmet dental care needs were strongly associated with income level, normative treatment needs, and self-perceived oral health status.
Kim Y et al., 2019 [22]	South Korea	4203	**Main outcome:** Unmet dental needs. **Predisposing factors:** Working hours, Demographic variables, Region of residence, Socio-economic variables, Occupation type, Household income, Health-related variables, Health insurance, Self-reported oral health status, Dental care indicators	• Unmet dental needs were experienced among 39.5% of the individuals. • Among adults who have experienced dental pain, unmet dental needs had higher odds of occurring in males who worked longer, and this relationship appears to be influenced by consumption of alcohol, region of residence, tooth-brushing frequency, and access to and perception of dental care.
Malecki K et al., 2015 [27]	Wisconsin, USA	1453	**Main outcomes:** Oral health status and unmet oral healthcare needs. **Predisposing factors:** Socio-demographic predictors, Preventive oral health behaviours, Psychosocial correlates, Community-level correlates	• More than 15% of participants had untreated cavities, and 20% did not receive needed oral healthcare. • Individuals who self-reported unmet need for dental care were four times as likely to have untreated cavities as were those who did not report such a need.
Pradeep Y et al., 2016 [28]	India	3102	**Main outcomes:** Perceived need for dental care, actual dental service utilisation, reason for not seeking for dental care, normative need of an individual participant. **Predisposing factors:** Age, Gender, Social class, Residence.	• Of the participants, 40% perceived a need for dental care. • Among the people who perceived need for care, only 21.4% utilised dental care and 78.6% of them had unmet dental needs. • The two main reasons for not seeking dental care was lack of money, i.e., unaffordable dental treatment (48%) and having the perception that they do not have any dental problem (19.4%).
Wiener RC et al., 2018 [29]	USA	4,845	**Main outcome:** presence of unmet dental care needs. **Predisposing variables:** Age, Gender, Race, Personal health conditions, BMI, Alcohol use, Dental visits.	• Among participants, 47% had unmet dental care need. • A significant association between low food security and unmet dental care need was identified among adults in the United States.
Eslamipour F et al., 2018 [23]	Isfahan, Iran	1360	**Main outcomes:** Access to oral healthcare services, satisfaction with the services. **Predisposing variables:** Demographic variables, Oral health status, Oral healthcare behaviours, Barriers to accessing dental health-care services	• Among the referrals to dentists, 69% were for treatment reasons. • Most participants were satisfied with access to dental healthcare, but they were dissatisfied with the costs and inadequate insurance coverage. • About half of the participants were satisfied with the services provided to them, and the highest level of satisfaction was reported for easy access to health-care centres.
Rezaie S et al., 2018 [24]	Krmanshah, Iran	1067	**Main outcome:** Whether a household's head had visited a dentist for dental treatment in the past 12 months. **Predisposing variables:** Socio-demographic characteristics and Economic status.	• Among household heads, 60.3% were reported to have visited a dentist for dental treatments. • Dental health-care utilisation among households in the study area was influenced by being socio-economically disadvantaged, self-rated poor oral health and not regularly brushing own teeth.
Xu M et al., 2020 [21]	China	7206	**Main outcome:** Oral health service utilisation in the 12 months prior to data collection. **Predisposing factors:** Gender, Education, Health beliefs.	• Among adults aged 35-44, 21.4% and among older adults (65-74-year-old), 20.7% utilised oral health services in the past 12 months. • Nearly, 80% of adults and more than 90% of older visited a dentist for treatment.
Assar S et al., [Present study]	Shiraz, Iran	200	**Main outcome:** Dental visits within the previous year. **Predisposing variables:** Demographic variables, Socio-economic status, Oral healthcare, Health status, Type of received cancer treatments	• Among participants, 86% reported at least one dental need within the previous year; which 62% of them received dental services. Treatment reasons for dental visits were 2.5 times higher than preventive reasons or regular dental check-ups

[Table/Fig-6]: Comparison between findings of similar studies and the present study [6,19-29].

insurance coverage, individuals' income, long working hours, oral health unawareness, and psychological disorders [20,22,25-29].

In the current study, treatment reasons for the last dental visit were about 2.5 times more prevalent than preventive reasons or regular dental check-ups. In accordance with this result, a number of studies showed a larger proportion for treatment reasons than preventive reasons for dental visits [23,24]. As an example, Eslamipour F et al., reported that 69% of the referrals to the dentists were for treatment reasons [23]; and also, a total of 60.3% of household heads who participated in the study of Rezaei S et al., were reported to have visited a dentist for dental treatments in the previous year [24]. It is essential to consider that concentration on preventive OHC plans and services rather than treatments could decrease OHC expenses which especially is crucial for cancer survivors and should be regarded in future policies.

The results of the present study showed that SES was not associated with the prevalence of having a dental visit during the previous year among female cancer survivors. However, in studies conducted on adult population, costs of dental treatments, individuals' income, dental insurance, the level of education, health literacy, and the number of family members were the factors affecting the utilisation of OHC services [5,6,19,24,30-32]. For instance, a study on 37,860 households from the 2017 Households Income and Expenditure Survey (HIES) in Iran showed that the utilisation of OHC was more common among households with higher SES [9]. Accordant with this, Bahadori M et al., reported that high costs of dental care caused limitations for patients referring to dental clinics in Tehran (Iran capital) [5]. Comparing to the result of the present study, one should consider that cancer treatment expenses are still globally high [4,33,34], and dental treatments are expensive and limit the patients' opportunities to have access to OHC services [5]; and also, oral health unawareness and/or ignorance among all levels of SES in cancer survivors [35,36] might all explain the difference between the current result and the studies conducted on the normal adult population.

Based on the present study, FT and DMFT were significantly higher; while, DT and MT were significantly lower, in higher levels of SES. Literally, results of MT and FT showed the different destiny of carious teeth among different levels of SES. DMFT did not indicate preventive or treatment needs of individuals as it gave equal weight to untreated dental caries as well as missing or well-restored teeth [37]. In addition, the negative effect of SES on DT in this study was consistent with the past researches [38,39]. This is the first study that planned to investigate the OHC utilisation among female cancer survivors in southern Iran. The results of the present study provided crucial information about the utilisation of OHC services which contributes to increasing awareness about the oral health of cancer survivors. Also, present finings prepared useful evidence for future policy makings regarding this group.

Limitation(s)

The small sample size and cross-sectional design were among the limitations of the current study. Moreover, the examination of other oral health-related indices, such as periodontal indices, was not possible due to the lack of cooperation on the part of the participants.

CONCLUSION(S)

The socio-economic status was found to be associated with oral health; and was not a determinant for the rate of utilised OHC services. Treatment in comparison with prevention/regular dental check-ups was the most prevalent reason for the last dental visit. Further studies are required to investigate the patterns and correlates of OHC status and utilisation among cancer survivors in developing countries.

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[ANNEXURE-1]: IRANIAN NATIONAL HEALTHCARE UTILISATION QUESTIONNAIRE (VERSION 2015)

Q1. Date of last dental visit:

□ 6 months or less □ 6-12 months ago □ more than 12 months □ never

Q2. Reason for visit:

□ just regular checkup □ Prevention (fluoride therapy, scaling, etc…) □ Treatment (dental restoration, RCT, crown …) □ None

LIST OF DENTAL NEEDS IN THE PAST YEAR

Dental needs and oral health	Q3. Dental need	Q4. Seeking for services	Q5. Receiving services
	When has this need risen?	Have you taken services?	Answer these only if you have answered yes to the previous column
	(1) started from 6 months ago		Have you succeeded in receiving oral healthcare services after seeking for them?
	(2) started from a year ago		
A. Needs pertaining to oral lesions	□ 1	□ Yes	□ Yes, I have been examined
	□ 2	□ No	□ Yes, I have received treatment
			□ No
B. Needs pertaining to tooth decay	□ 1	□ Yes	□ Yes, I have been examined
	□ 2	□ No	□ Yes, I have received treatment
			□ No
C. Needs pertaining to removing teeth	□ 1	□ Yes	□ Yes, I have been examined
	□ 2	□ No	□ Yes, I have received treatment
			□ No
D. Needs pertaining to replacing teeth	□ 1	□ Yes	□ Yes, I have been examined
	□ 2	□ No	□ Yes, I have received treatment
			□ No
E. Needs pertaining to gums and periodontal problems	□ 1	□ Yes	□ Yes, I have been examined
	□ 2	□ No	□ Yes, I have received treatment
			□ No
F. Needs pertaining to esthetics, orthodontics, and jaw deformities	□ 1	□ Yes	□ Yes, I have been examined
	□ 2	□ No	□ Yes, I have received treatment
			□ No

EVALUATION OF RECEIVED DENTAL SERVICES

Healthcare services you have received the last time you succeeded receive the services

Please, name the last need you have received services for: ……

Q6. Have you received the following healthcare services?		Q7. Who did you refer to?
A. Checkup	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
B. Imaging (radiology)	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
C. Pathological evaluation	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
D. Diagnostic examines (biopsy, sampling, …)	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
E. Receiving a prescription or medication	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
F. Dental scaling	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
G. Fluoride therapy	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
H. Fissure sealant	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
I. Removing decay and tooth restoration	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
J. Root canal therapy	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
K. Tooth extraction	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
L. Dental crown or bridge	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
M. Removable dentures	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
N. Gum surgery	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
O. Tooth removal surgery	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
P. Implant	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
Q. Lesion removal surgery	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
R. Jaw correction surgery	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
S. Teeth lamination	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
T. Composite veneers	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
U. Orthodontics	Yes □ No □	1-general dentist □ 2-specialist dentist □ 3-dental hygienist □ 4-experimental dentist □ 5-general practitioner □
Were have you been referred to higher levels? If yes, go to question V, If no, go to Q8.	Yes □ No □ ↓ go to Q8	
V. What was the reason for referring to higher levels?	1-Following a specialist advice □ 2-Following my dentist (or other healthcare personnel) advice □ 3-I insisted □ 4-They did not offer the service I needed □	
Q8. How long did it take to receive services from taking action to being treated?		
A. Booking an appointment (less than a day=0)	……. days □ I don't know	
B. Dental visit	……. minutes □ I don't know	
C. Time spent in commute	……. minutes □ I don't know	
D. Waiting room	……. minutes □ I don't know	
E. Number of sessions needed for giving services	……. sessions	
F. Session 1 receiving service	……. minutes □ I don't know	
G. Session 2 receiving service	……. minutes □ I don't know □ Does not apply	
H. Session 3 receiving service	……. minutes □ I don't know □ Does not apply	
I. Total sessions receiving service	……. minutes □ I don't know	
J. Receiving diagnosis (for diagnostic services) (less than a day=0)	……. days □ I don't know	

Q 9. Costs for recieving services	
A. Commute	.....IRR 1-I don't know □ 2-Free □ 3-Does not apply □
B. Dental visit	.....IRR 1-I don't know □ 2-Free □ 3-Does not apply □
C. Diagnostic procedures	.....IRR 1-I don't know □ 2-Free □ 3-Does not apply □
D. Therapeutic procedures	.....IRR 1-I don't know □ 2-Free □ 3-Does not apply □
E. Other costs	.....IRR 1-I don't know □ 2-Free □
F. Total	.....IRR 1-I don't know □ 2-Free □
G. Has the problem you booked an appointment for been solved?	1-Yes □ 2-No □ 3-Somewhat □ 4-treatment continues □ 5-only went for preventive measures (fluoride therapy, dental scaling) □ 6-only went for diagnostic measures □ 7-did not continue the treatment procedure □ 8-I have been referred to a higher level □

PATIENT SATISFACTION FROM LAST DENTAL SERVICES RECEIVED

According to the table below, mark your level of satisfaction for the services you've received.
(Choose one option for each question.)

Q10. What do you think about the different aspects of the service you have received in your last visit		Neutral (1)	Poor (2)	Average (3)	Good (4)	Very good (5)
Aspects						
A.	Waiting period for receiving services					
B.	Cleanliness of environment where service was offered					
C.	Dentist/practitioners attitude					
D.	The amount you have paid					
E.	Your overall opinion about the service					

Q11. Reasons for not seeking for dental services The first sense of need in the past 6 months which healthcare services have not been received for	
A. Do you think your condition was an emergency and required instant care?	Yes □ No □
For what reason(s) did you avoid seeking healthcare services?	Yes □ No □
B. My condition was resolved	Yes □ No □
C. It was too far from oral healthcare center/ the specialist I needed was not available in the area	Yes □ No □
D. Same-sex dentist (women for women/ men for men) was not available in the place where service was offered	Yes □ No □
E. The appointment was too late	Yes □ No □
F. My health insurance booklet had been expired	Yes □ No □
G. My insurance did not cover the expenses well	Yes □ No □
H. I took medicine at home	Yes □ No □
I. The services are of insufficient quality	Yes □ No □
J. I did not have time/ I will book an appointment soon	Yes □ No □
K. I could not financially afford the expenses	Yes □ No □
L. Other (please specify)	Yes □ No □
Q12. Reasons for not receiving oral healthcare services after seeking for The first appointment in 6 months that has not led to receiving services	
A. My appointment date has not arrived yet	Yes □ No □
B. I could not financially afford the expenses	Yes □ No □
C. Same-sex dentists (men for men/ women for women) were not present at the place in which service is offered	Yes □ No □
D. They did not have the right attitude with me/ I did not like the place the service was offered in, so I changed my mind.	Yes □ No □
E. The oral healthcare unit was closed	Yes □ No □
F. They did not accept me	Yes □ No □
G. The date of the appointment was too late, so I changed my mind	Yes □ No □
H. It was very crowded and I couldn't wait	Yes □ No □
I. My insurance did not cover the expenses well	Yes □ No □
J. Other (please specify):	

[ANNEXURE-2]: SOCIO-ECONOMIC QUESTIONNAIRE

[PERSIAN QUESTIONNAIRE]

A. Which of the following items does the family have access to?

1-Smart TV	1 -has	0 -does not have
2-Water purifier	1 -has	0 -does not have
3-Automatic washing machine	1 -has	0 -does not have

4-Dishwashing machine	1	-has	0	-does not have
5-Microwave oven	1	-has	0	-does not have
6-Laptop	1	-has	0	-does not have
7-Video camera	1	-has	0	-does not have
8-Automobile	1	-has	0	-does not have

a. number of automobiles?..... b. model?.....

B. How much living space does the family have access to? _____

(1) rather not say (0) I don't know

b. Address?_____

C. How many rooms do the family have access to in this residential unit?____ (Living room is counted as a room whereas the kitchen and storeroom are not)

Guide:

(0) Less than one room

(9) Residential unit is not made of hard building material (tent or shed)

D. Which of the following heating equipment do you use in your residential unit?

1-Underfloor heating

2-Radiator

3-Fan coil

4-Fireplace with chimney

5-Fireplace without chimney

6-The household does not use any heating equipment

9-Other Other heating equipment:_____

E. Which of the following cooling devices do you use in your household?

1-A/C

2-Fan coil

3-Water air cooler

4-Fan

5-The family does not use any cooling devices

9-Other

F. What type of stove is used for cooking at home?

1-Stove without oven built into the cabinets (fixed)

2-Stove with oven

3-Portable stove without oven

4-Single flame gas cooking stove

5- Camping stove

6-Open fire

9-Other……

G. a. How long has passed since your last vacation? .....

b. Travel destination?.....