Pesquisa Brasileira em Odontopediatria e Clínica Integrada 2023; 23:e210093
https://doi.org/10.1590/pboci.2023.080
ISSN 1519-0501 / eISSN 1983-4632

ORIGINAL ARTICLE

Relationship between Quality of Life and Oral Health Status of Patients with Chronic Liver Disease

Fatemeh Moslemi[1], Sanaz Jahanshahi[2], Maryam Alsadat Hashemipour[3,4]

[1]Department of Pediatric Dentistry, Dental School, Kerman of University of Medical Sciences, Kerman, Iran.
[2]Private Practice, Kerman, Iran.
[3]Social Determinants on Oral Health Research Center, Kerman University of Medical Sciences, Kerman, Iran.
[4]Department of Oral Medicine, Dental School, Kerman University of Medical Science, Kerman, Iran.

Correspondence: Maryam Alsadat Hashemipour, Department of Oral Medicine, Dental School, Kerman University of Medical Science, Kerman, Iran. **E-mail:** m.s.hashemipour@gmail.com

Academic Editor: Wilton Wilney Nascimento Padilha

Received: 18 May 2022 / **Review:** 09 February 2023 / **Accepted:** 22 March 2023

How to cite: Moslemi F, Jahanshahi S, Hashemipour MA. Relationship between quality of life and oral health status of patients with chronic liver disease. Pesqui Bras Odontopediatria Clín Integr. 2023; 23:e210093. https://doi.org/10.1590/pboci.2023.080

ABSTRACT

Objective: To investigate the relationship between the quality of life and work ability related to the oral health status of patients with chronic liver diseases. **Material and Methods:** The sample size contains all patients referred to the internal ward of Afzalipour and Bahonar hospitals due to chronic liver disease from 2019 to 2020. Patient selection was based on a simple census and a questionnaire that contained characteristics information of the patient, Work Ability Index questionnaire and SF-36 questionnaire were completed by the patients and some information was extracted from medical file. The SF-36 questionnaire assesses the quality of life in two general dimensions (physical health and mental health) with the physical function subscale. DMFT, Gingival index, and Periodontal disease index are used to evaluate the severity and extent of gingivitis and periodontitis. For data analysis, ANOVA, Spearman correlation coefficients were used and the significant level was $p<0.05$. **Results:** a total of 108 patients were examined. The mean age of participants was 41.2 ± 4.3 years. The DMFT index in patients was also reported as 22.6 ± 7.35. Also, 32.4% of people described their ability to do work as poor, 21.3% as good, and 7.4% as excellent. Patients with poor or moderate workability reported a higher index of DMFT. Among the participants, 61 and 21 patients had gingivitis and periodontitis, respectively. Mean results of total SF-36 indices were reported at a low level in patients with increased DMFT and gum diseases. Patients with poor or moderate workability had a higher index of DMFT. There was a significant relationship between these two variables ($p=0.001$). However, they were not significantly associated with periodontitis. **Conclusion:** There was a significant relationship between the SF-36 index, the ability to work and the type of liver disease.

Keywords: Digestive System Diseases; Psychological Well-Being; Oral Health.

Introduction

Liver disease is not a single condition but could be considered a health problem related to reduced functional capacity of the liver. Serious liver disease usually leads to functional limitations and reduced inability to perform normal tasks, which can be related to work or at home. Liver disease Symptoms have a wide appearance, including swelling in the brain, internal bleeding, fluid accumulation in the abdomen and chest cavity, fainting, vomiting, sweating profusely, pale skin, and a rapid pulse. Any combination of symptoms experienced due to severe or chronic liver disease may mean that remaining at work or carry out normal daily tasks is impossible [1].

Some liver diseases are genetic, and others are caused by viruses or toxins (such as drugs or alcohol). People exposed to blood or secretions of patients with viral liver disease, diabetic people with high triglycerides and obese people are more prone to liver disease. Using shared syringes, unhygienic tattoos, and unprotected sex can also lead to liver disease [2].

Liver diseases have been increasing worldwide during the past decades, becoming one of the most common causes of morbidity and mortality. There is an increasing trend in Iran as well [3,4]. The Global Burden of Disease (GBD) project showed that almost 5400 deaths due to cirrhosis and other chronic liver diseases occurred in Iran in 2017 [5].

There is a growing concern about biological, psychological, social, clinical, and therapeutic issues and factors that might influence the quality of life-related health of patients with chronic liver disease [2]. Low quality of life in these patients may be associated with depression and complications of cirrhosis, such as hepatic encephalopathy, ascites, peritonitis, and bleeding from ovarian varices [6]. Also, low quality of life can affect oral health. Studies have shown that several factors are associated with poor oral health (age, low level of education, low income, smoking, alcohol consumption, systemic diseases and medications) [3]. Oral manifestations have been well described in patients with chronic liver disease. These patients often suffer reduced salivary flow, which predisposes them to the onset of periodontal disease and caries. Also, oral indicators are higher in patients with liver cirrhosis or in patients with hepatitis B or C [7-10].

A literature review shows that chronic diseases such as heart, pulmonary, and liver diseases have some effects on the ability to work in patients. There are many research works worldwide on the relation between chronic diseases, oral health and the ability to work. These studies, in particular, dealt with the heart and lung diseases [11-13].

There are many tools to check health status survey. The study by Pequeno et al. [14] showed that the most commonly used instruments were the Medical Outcomes Study Short-Form 36 (MOS SF-36), EuroQol EQ-5D, 12-Item Short-Form Health Survey (SF-12), and Visual Analogue Scale EQ-VAS. The 36-item short-form (SF-36) was designed for use in clinical practice and research, health policy evaluations, and general population surveys. The SF-36 has eight health concepts [14].

Some literature reviews [8-10,15-17] demonstrate that few studies have been conducted in the area of oral health, quality of life, and chronic liver disease in the world, and no study has been conducted in Iran so far. Since the evaluation of oral health and ability to work in patients with liver disease can lead to significant improvement in the situation of patients, the present work took place.

So, the present work focuses on the evaluation of oral hygiene and association with SF-36 indicators and the ability to work. Also, the relationship between quality of life and work ability related to the oral health status of patients with chronic liver disease was certified in this research (2019-2020).

Material and Methods

Study Design and Ethical Clearance

The present research work is a descriptive-analytical and cross-sectional study. This project was approved by the Ethical Committee of Kerman University of Medical Sciences of the university with the code IR.KMU.REC.1399.488. Oral consent was obtained from all patients.

Participants and Data Collection

The sample size contains all patients referred to the internal ward of Afzalipour and Bahonar hospitals due to chronic liver disease diagnosed by a physician from 2019 to 2020 (120 patients). The patient was over 18 years old and had the ability to read and write.

A questionnaire that contains characteristics demographics, Work Ability Index questionnaire [18], and an SF-36 questionnaire [19] was completed by the patients, and some information was extracted from a medical file by a last year student. The patient examination was performed by a last year student using the dental unit available in the dental unit of the hospital.

Health-Related Quality of Life (HRQOL) was assessed by the SF-36 questionnaire [10]. This questionnaire has been adapted for the Iranian population [19]. The SF-36 questionnaire consists of 36 questions and assesses quality of life in two general dimensions: physical health and mental health. In this questionnaire, 36 questions are summarized in the following subscales:

- Physical function subscale: This subscale includes ten questions assessing the ability to perform life activities such as paying attention to individual needs, walking, and exercising.
- Physical role subscale: It assesses the role of restrictions caused by physical problems. This subscale includes four questions related to activities that restrict physical ability.
- Physical pain subscale: This subscale includes four questions, assessing the level of pain felt over the past 4 weeks and its interference with an individual's daily activities.
- General health subscale: It includes four questions, assessing the general health based on an individual's perception.
- Vitality subscale: This subscale has four questions, assessing the feeling of agility, energy and fatigue.
- Social function subscale: This subscale includes two questions, assessing the effect of physical and mental problems on social activities and communication with family, friends and other people in the community.
- Emotion role subscale: This subscale, related to the role of restrictions caused by emotional problems, includes three questions assessing emotional factors interfering with work and other activities.
- Mental health subscale: This subscale includes five questions assessing the feelings of depression and anxiety.

The first four subscales include physical function, physical role, physical pain and general health in the "physical health" dimension and the last four subscales of mental health include vitality, social function, emotional role and mental health. The questionnaire also has one question about the assessed subjects' health in the past month. In this questionnaire, a low score indicates a low quality of life and vice versa.

To assess the ability to do work, the Work Ability Index questionnaire was used. In this questionnaire, workability was assessed using seven dimensions. The validity and reliability of the work ability index (WAI) questionnaire for Persian people was investigated by Adel et al. [18]. Intraclass correlation coefficients for its seven dimensions were estimated to be higher than 0.7. The questionnaire showed a good internal consistency,

Cronbach α = 0.78. Factor analysis showed a three factors structure model for the Persian translation of WAI, including mental resources, self-perceived work ability, presence of disease, and health-related limitations.

Gingival Index

This index is used to evaluate the severity and extent of gingivitis. In this method, each of the four dental areas of the facial, mesial, distal, and lingual are examined regarding the presence of gingivitis and receive a score from zero to 3. The GI score is obtained by summing the teeth score and dividing them by the number of examined teeth. Zero scores indicate moderate inflammation and 3 (2.1 to 3) denote gingivitis [10].

Periodontal Disease Index

Gingival scores for teeth varied from G0 in the absence of inflammation to G3 in severe gingivitis. PDI score for each tooth is based on the evaluation of gingivitis and the depth of the gingival groove related to CEJ. If the gingival sulcus extends by 3 mm or less relative to CEJ (in each area), the PDI score will be four. Teeth with a sulcus of 3-6 mm receive a score of 5 and teeth with a sulcus of more than 6 mm receive a score of 6 [20]. All patients were examined using the dental unit available in the dental unit of the hospital.

Data Analysis

For statistical analysis, the ANOVA, Spearman correlation coefficients and SPSS 21 program (IBM Corp., Armonk, NY, USA) were employed.

Results

In the present study, 120 questionnaires were distributed, of which 108 participants were examined (90%). A total of 72.2% of males and 27.3% of females were recruited. The most common type of liver disease was cirrhosis (37%), followed by hepatitis (27.8%). A small number of patients consumed alcohol (6.5%) (Table 1).

Table 1. Demographic and health characteristics of participants.

Variables	N	%
Gender		
Male	78	72.2
Female	30	27.8
Age (Mean Age)		
Male	46.1±6.5	
Female	36.3±2.1	
Total	41.2±4.3	
Job Status		
Student	2	1.9
Collegian	8	7.4
Employee	36	33.3
Self-employed	20	18.5
Retired	21	19.4
Housewives	13	12.0
Unemployed	8	7.4
Education Level		
High school	8	7.4
Diploma	46	42.6
Associate	24	22.2
Bachelor	23	21.3
Master and Higher	7	6.5

Type of Liver Disease		
Cirrhosis of the liver	40	37.0
Hepatitis	30	27.8
Cancer	12	11.1
Gallstones	14	13.0
Fatty liver	12	11.1
History of Disease		
Diabetes	25	23.1
Heart attack	8	7.4
Hypertension	20	18.5
Kidney failure	8	7.4
Stroke	4	3.7
Asthma	5	4.6
Thyroid cancer	11	10.2
Gastric ulcers	9	8.3
No disease	18	16.7
Number of Annual Visits to Dentist		
Once	59	54.6
Twice	29	26.9
Three times	12	11.1
>Three times	8	7.4
Use Mouthwash		
Yes	2	1.9
No	106	98.1
Teeth Brushing		
Yes	96	88.9
No	12	11.1
Smoking		
Yes	27	25.0
No	81	75.0
Consumption of Alcohol		
Yes	7	6.5
No	101	93.5
Drug Use		
Yes	2	1.9
No	106	98.1

Regarding periodontal status, most of the population had gingivitis or periodontitis. Specifically, 66.7% of the participants with periodontitis had mild periodontitis (Table 2). Regarding the history of caries, the value of mean DMFT was 22.6 ± 7.35. Also, 32.4% of people described their ability to do work as poor, 21.3% as good, and 7.4% as excellent (Table 2).

Table 2. Oral health indices and mean score and standard deviation of scores of ability to work and SF-36.

Variables	Male		Female		Total	
	N	%	N	%	N	%
Periodontal Diseases						
Gingivitis	40	65.6	21	34.4	61	56.5
Periodontitis	14	66.7	7	33.3	21	19.4
No Disease	24	92.3	2	7.7	26	24.1
DMFT Index (Mean and SD)	25.05 ± 10.49		20.15 ± 4.21		22.6 ± 7.35	
Ability to do Work						
Poor	30	85.7	5	14.3	35	32.4
Moderate	32	76.2	10	23.8	42	38.9
Good	11	47.8	12	52.2	23	21.3
Excellent	5	62.5	3	37.5	8	7.4
SF-36 (Mean and SD)						
Physical Function	42.1 ± 8.11		40.3 ± 12.5		41.2 ± 10.8	

Physical Role	37.2 ± 10.12	39.2 ± 8.15	38.2 ± 9.12
Body Pain	40.1 ± 14.31	42.9 ± 10.3	41.3 ± 12.1
General Health	35.1 ± 16.21	45.2 ± 10.3	40.2 ± 13.2
Vitality	36.1 ± 2.11	47.9 ± 6.5	41.4 ± 4.1
Social Function	35.1 ± 13.11	46.5 ± 11.2	40.1 ± 12.3
Emotion Role	30.2 ± 16.21	38.2 ± 11.7	34.2 ± 14.2
Mental Health	48.6 ± 10.6	42.7 ± 10.7	45.6 ± 10.5
Physical Health Subscale	36.2 ± 11.8	46.5 ± 12.2	41.4 ± 10.5
Mental Health Subscale	37.8 ± 10.12	45.2 ± 10.2	41.5 ± 10.7

The general SF-36 scores were low. Moreover, there was an association between liver disease and another disease, with SF-36. Mean results of total SF-36 indices were reported at low level in patients with increased DMFT (p=0.001) and gingivitis and periodontitis (p=0.002). Patients with poor or moderate work ability reported a higher index of DMFT (p=0.02, p=0.001). There was a significant relationship between these two variables. However, they were not significantly associated with periodontitis (p=0.14) (Table 3).

Table 3. Spearman correlation coefficients between SF-36 domains, ability to do work, DMFT index components, and the presence of gingival disease.

SF-36 Domains		Spearman Correlation Coefficient			
		DMFT	p-value	Gingival Disease	p-value
Physical Function		-0.25	0.001*	-0.27	0.001*
Physical Role		-0.25	0.001*	-0.21	0.001*
Body Pain		-0.08	0.08	0.12	0.09
General Health		-0.11	0.12	0.15	0.14
Vitality		0.04	0.25	0.11	0.1
Social Function		-0.08	0.14	0.15	0.06
Emotion Role		-0.12	0.9	-0.26	0.001*
Mental Health		-0.18	*0.02	-0.21	0.001*
Physical Health Subscale		-0.25	0.001*	-0.22	0.001*
Mental Health Subscale		-0.06	0.18	0.08	0.24
Ability to do Work	Poor	0.18	0.02*	0.06	0.21
	Moderate	0.21	0.001*	0.04	0.25
	Good	0.23	0.001*	0.15	0.014*
	Excellent	0.04	0.24	0.09	0.023*

*Statistically Significant.

The present study revealed no significant relationship between SF-36 domains with age, gender and job (p=0.08, p=0.021, p=0.014, respectively). However, there was a significant relationship between the SF-36 index, the ability to work and the type of liver disease (p=0.001). The patients with hepatitis and liver cancer reported a lower SF-36 index (Table 4).

Table 4. Relationship between demographic characteristics and physical and mental health subscales of SF-36 questionnaire.

Demographic Characteristics	Physical Health Subscale		Mental Health Subscale	
	r	p-value	r	p-value
Age (equal to and less than 35 *vs.* more than 35)	0.06	0.14	0.04	0.05
Gender (male *vs.* female)	0.11	0.21	0.15	0.24
Type of disease (cancer and hepatitis *vs.* other liver diseases	-0.21	0.001	-0.25	0.001*
Job (having a job versus not having a job)	0.04	0.08	0.04	0.08

*Statistically Significant.

Discussion

Oral health is a key indicator of overall health, well-being and quality of life. It encompasses a range of diseases and conditions that include dental caries, periodontal disease, tooth loss, oral cancer, oro-dental trauma, noma and birth defects such as cleft lip and palate. The Global Burden of Disease Study 2019 estimated that oral diseases affect close to 3.5 billion people worldwide. Most oral diseases and conditions share modifiable risk factors with the leading noncommunicable diseases (cardiovascular diseases, cancer, chronic respiratory diseases and diabetes) [21].

The present study evaluated the quality of life and functional ability of patients with liver disease. The liver is the most vital organ and the only organ in the body to repair itself. Its dysfunction will affect the health of other organs [22].

The study conducted by Helenius-Helenius-Hietala et al. [15] showed that liver disease is generally associated with oral health status and there are many differences between different groups of liver patients in this regard. Patients with biliary cirrhosis and alcoholic cirrhosis have worse oral health than those with other liver diseases. Also, patients with a higher grade of end stage liver disease have worse oral health than those with a lower grade.

DMFT index in this study was reported in the region 22.6 ± 7.35. In the study conducted by Khoshnevisan et al. [23] on 44200 people in Iranian population, this index was reported to be equal to 13.98 for the age group of 35-44 years and 25.27 for the age group of 65-74 years. Since both age groups were considered in the present study, it seems that this index is higher than that in the general population of Iran, which is consistent with the findings by Helenius-Hietala et al. [15]. In the of Zahed et al. [24], the DMFT index and bone level were not significantly different between the two groups (patients with chronic liver failure *versus* healthy individuals).

Several reasons can cause an increase in caries in patients with liver diseases. Reduced salivary flow in patients with liver disorders may cause rapid tooth decay. Also, with the increasing prevalence of tooth decay, patients suffer from saliva deficiency and gum infections and fungal infections increase in the oral mucosa [24]. In a dry mouth, eating, swallowing, talking, and using oral prostheses become more difficult [15].

The present study revealed that older people have more annual visits to dentists, which is not in line with the study by Helenius-Hietala et al. [15] in Finland, in which younger patients showed more regular dental visits. This difference can be due to the fact that young people usually pay less attention to oral health than the middle-aged and elderly groups in Iran. Also, the government pays the cost of dental treatment for young people in Finland, while Iran's government does not pay such costs, and usually, young people are less covered by supplementary insurance or other insurance such as social security.

Helenius-Hietala et al. [15] showed that age and duration of chronic liver disease have unfavorable effects on oral health. Age is the most important factor related to the need for tooth extraction, which agrees with the result of the present work.

Studies suggest that alcohol consumption worsens oral health [16,17]. In the study conducted by Chen et al. [25], patients in the alcoholic cirrhosis group had the lowest number of teeth compared to non-alcoholic cirrhosis. One reason for poor oral health in these patients is inadequate dental care.

In the present study, patients with liver cancer and hepatitis had a worse quality of life and a weaker ability to work. Among chronic diseases, hepatitis is one of the most important diseases in the world, especially in developing countries. It is one of the most important diseases worldwide, especially in developing countries, with more than 300 million chronic carriers and more than five hundred thousand deaths per year. In studies conducted on patients with chronic hepatitis, results revealed its negative effects on quality of life, which can

affect treatment choices in patients whose disease is not even advanced [26]. Knowing that this disease has serious effects on the patient can change his or her quality of life. Some studies have indicated that hepatitis can cause fatigue and reduced feeling. Mallolas et al. [27] revealed that the life quality of patients with hepatitis C is worse than that in the healthy control group, which agrees with other studies [28,29].

Interestingly, SF-36 physical and mental domains were reported to be lower. Hence, we can state that, for example, in the case of fatigue symptoms, physiological mechanisms, and not just psychological mechanisms, can be influential factors. However, no significant difference was reported between hepatitis C patients who were unaware of their diagnosis and the control group who were not infected with the virus [30]. In the study by Gupta et al. [31] to compare patients with hepatitis B and C, the most important change in the hepatitis B group was shown in the mental component of SF-36. In the hepatitis C group, both physical and mental components were affected. A research by Younossi et al. [32] revealed that quality of life is reduced in patients with hepatitis C and HCV infection, negatively affecting overall physical and mental health.

In the present study, no significant relationship was reported between alcohol, smoking and drug use and quality of life, similar to the results of other studies [33,34]. Takahashi et al. [35] showed a relationship between alcohol consumption and reduced quality of life in patients with hepatitis C. Patients in that study not only suffered chronic alcoholism but also experienced social problems such as unemployment and family breakdown. The lack of significant difference might be due to the fact that most patients in these studies had previously stopped taking drugs for a long time. However, it is possible that alcohol and drug use prevents a decline in quality of life, but there is a need for comprehensive and definitive studies to assess improving the quality of life of patients concerning the hepatitis C disease.

The present study found no difference between males and females regarding quality of life. The difference between males and females in terms of quality of life is still the subject of many research works. The study conducted by Younossi et al. [32] showed that the quality of life in patients with chronic liver disease is much lower than that in healthy people, comparable to patients with chronic obstructive pulmonary disease and congestive heart failure. This finding is in agreement with the result of the research carried out by Pradhan et al. [36].

The study by Aguiar et al. [10] revealed that the mean scores of SF-36 for patients with chronic liver disease decrease below 50% and are very low, especially for the emotional domain. In this study, mean SF-36 indices were reported at low levels in patients with increased DMFT, gingivitis, and periodontitis.

A review shows that studies are limited in this field. Brasil-Oliveira et al. [37] showed that SF-36v2 domain scores are consistently lower among the individuals in the severe asthma group, and there were statistically significant differences among the groups (mild, moderate and severe asthma) for the SF-36v2, although the DMFT index did not differ significantly among groups.

Another study reported associations between reduced salivary flow, periodontal disease, caries, and oral mucosal lesions and low SF-36v2 domain scores [19]. The low SF-36 in patients with caries, periodontitis and gingivitis can be due to the fact that oral diseases can affect the quality of life and mental and physical health. The studies conducted by Bernabé and Marcenes [38] and Aguiar et al. [10] showed a significant relationship between reduced salivary flow and periodontal disease, decays and lesions of the oral mucosa. The mean DMFT index in patients in the study by Aguiar et al. [10] was much higher than that in the general population. The researchers concluded that this condition can affect the function component, physical role and some basic functions such as the ability to eat, talk, and socialize, resulting in low health-related quality of life. In the study carried out by Aguiar et al. [10], low oral health status was associated with lower quality of life. However, no

association was reported between periodontal disease and health-related quality. However, previous studies have revealed a significant relationship between periodontal disease and low quality of life [38-40].

It should be noted that the present work is the first study in Iran. Also, a relatively sufficient number of patients is considered and a detailed oral examination has been done in terms of caries and periodontal diseases. The limitations of this study were the severity of the liver disease (which isn´t always associated with the time of diagnosis) and the presence of any other disease. In the present investigation, a very small percentage of patients used cigarettes, drugs, and alcohol and no relationship was found between their use and DMFT. A very small number of participants in this study had consumed alcohol, cigarettes or drugs; and therefore, this issue is one of the limitations of the study and it cannot be easily mentioned that there is no correlation in this field. Therefore, due to the small number of alcohol consumption, cigarettes or drugs, comparison with other studies is not possible.

Conclusion

Patients with liver diseases had poor oral health or a high DMFT index with low health-related quality of life and poor workability. These findings show that these patients must be examined by a dentist during their illness.

Authors' Contributions

FM	https://orcid.org/0000-0001-7211-1242	Formal Analysis, Investigation and Writing - Review and Editing.
SJ	https://orcid.org/0009-0001-6416-5950	Methodology, Investigation, Resources, Data Curation and Writing - Review and Editing.
MAH	https://orcid.org/0000-0002-4515-8974	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft and Writing - Review and Editing.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

References

[1] Pimpin L, Cortez-Pinto H, Negro F, Corbould E, Lazarus JV, Webber L, et al. Burden of liver disease in Europe: Epidemiology and analysis of risk factors to identify prevention policies. J Hepatol 2018; 69(3):718-35. https://doi.org/10.1016/j.jhep.2018.05.011

[2] Vilstrup H, Amodio P, Bajaj J, Cordoba J, Ferenci P, Mullen KD, et al. Hepatic encephalopathy in chronic liver disease: 2014 practice guideline by the American association for the study of liver diseases and the European association for the study of the liver. Hepatology 2014; 60(2):715-35. https://doi.org/10.1002/hep.27210

[3] Sepanlou SG, Malekzadeh F, Naghavi M, Forouzanfar MH, Shahraz S, Moradi-Lakeh M, et al. Trend of gastrointestinal and liver diseases in Iran: Results of the global burden of disease study, 2010. Middle East J Dig Dis 2015; 7:121-37.

[4] Institute for Health Metrics and Evaluation. GBD Compare. Seattle, WA: IHME, University of Washington; 2015. Available from: https://vizhub.healthdata.org/gbd-compare. [Accessed on September 13, 2019].

[5] Anushiravani A, Ghajarieh Sepanlou S. Burden of liver diseases: a review from Iran. Middle East J Dig Dis 2019; 11(4):189-91. https://doi.org/10.15171/mejdd.2019.147

[6] Tsuchida T, Friedman SL. Mechanisms of hepatic stellate cell activation. Nat Rev Gastroenterol Hepatol 2017; 14(7):397-411. https://doi.org/10.1038/nrgastro.2017.38

[7] Spanemberg JC, Cardoso JA, Slob EMGB, López-López J. Quality of life related to oral health and its impact in adults. J Stomatol Oral Maxillofac Surg 2019; 120(3):234-9. https://doi.org/10.1016/j.jormas.2019.02.004

[8] Lins L, Bittencourt PL, Evangelista MA, Lins R, Codes L, Cavalcanti AR, et al. Oral health profile of cirrhotic patients awaiting liver transplantation in the Brazilian Northeast. Transplant Proc 2011; 43(4):1319-21. https://doi.org/10.1016/j.transproceed.2011.03.063

[9] Lins-Kusterer L, Bastos J. Oral health protocol for liver transplant patients. Transplant Technol 2014; 2(2):1-8. https://doi.org/10.7243/2053-6623-2-2

[10] Aguiar I, Lins-Kusterer L, Lins LS, Paraná R, Bastos J, Carvalho FM. Quality of life, work ability and oral health among patients with chronic liver diseases. Med Oral Patol Oral Cir Bucal 2019; 24(3):e392-e397. https://doi.org/10.4317/medoral.22918

[11] Westerdahl E, Jonsson M, Emtner M. Pulmonary function and health-related quality of life 1-year follow up after cardiac surgery. J Cardiothorac Surg 2016; 11(1):99. https://doi.org/10.1186/s13019-016-0491-2

[12] Price AE. Heart disease and work. Heart 2004; 90(9):1077-84. https://doi.org/10.1136/hrt.2003.029298

[13] Samuel BP, Marckini DN, Parker JL, Kay WA, Cook SC. Complex determinants of work ability in adults with congenital heart disease and implications for clinical practice. Can J Cardiol 2020; 36(7):1098-1103. https://doi.org/10.1016/j.cjca.2019.11.003

[14] Pequeno NPF, Cabral NLA, Marchioni DM, Lima SCVC, Lyra CO. Quality of life assessment instruments for adults: a systematic review of population-based studies. Health Qual Life Outcomes 2020; 18(1):208. https://doi.org/10.1186/s12955-020-01347-7

[15] Helenius-Hietala J, Meurman JH, Höckerstedt K, Lindqvist C, Isoniemi H. Effect of the aetiology and severity of liver disease on oral health and dental treatment prior to transplantation. Transpl Int 2012; 25(2):158-65. https://doi.org/10.1111/j.1432-2277.2011.01381.x

[16] Miller PM, Ravenel MC, Mauldin MP, Sulkowski S, Lowndes A, Thomas SE. An online alcohol and oral health curriculum for dental students. J Dent Educ 2014; 78(1):16-23. https://doi.org/10.1002/j.0022-0337.2014.78.1.tb05652.x

[17] Çetinkaya H, Romaniuk P. Relationship between consumption of soft and alcoholic drinks and oral health problems. Cent Eur J Public Health 2020; 28(2):94-102. https://doi.org/10.21101/cejph.a5745

[18] Adel M, Akbar R, Ehsan G. Validity and reliability of work ability index (WAI) questionnaire among Iranian workers; a study in petrochemical and car manufacturing industries. J Occup Health 2019; 61(2):165-74. https://doi.org/10.1002/1348-9585.12028

[19] Montazeri A, Goshtasebi A, Vahdaninia MS. The Short Form Health Survey (SF-36): translation and validation study of the Iranian version. Payesh 2006; 5(1):12-9. [In Persian].

[20] Arvaniti V, D'Amico G, Fede G, Manousou P, Tsochatzis E, Pleguezuelo M, et al. Infections in patients with cirrhosis increase mortality four-fold and should be used in determining prognosis. Gastroenterol 2010; 139(4):1246-56, 1256.e1-5. https://doi.org/10.1053/j.gastro.2010.06.019

[21] World Health Organization. Oral Health. Available from: https://www.who.int/health-topics/oral-health#tab=tab_1. [Accessed on November 19, 2022].

[22] Bharadwaj M, Roy G, Dutta K, Misbah M, Husain M, Hussain S. Tackling hepatitis B virus-associated hepatocellular carcinoma--the future is now. Cancer Metastasis Rev 2013; 32(1-2):229-68. https://doi.org/10.1007/s10555-012-9412-6

[23] Khoshnevisan MH, Ghasemianpour M, Samadzadeh H, Baez RJ. Oral health status and healthcare system in I.R. Iran. J Contemporary Med Sci 2018; 4(3):45-54. https://doi.org/10.22317/jcms.09201801

[24] Zahed M, Ranjbar MA, Azad A. Oral health-related quality of life in chronic liver failure patients measured by OHIP-14 and GOHAI. Biomed Res Int 2020; 2020:8835824. https://doi.org/10.1155/ 2020/ 8835824

[25] Chen Y, Yang YC, Zhu BL, Wu CC, Lin RF, Zhang X. Association between periodontal disease, tooth loss and liver diseases risk. J ClinPeriodontol 2020; 47(9):1053-63. https://doi.org/10.1111/jcpe.13341

[26] Nardelli S, Riggio O, Rosati D, Gioia S, Farcomeni A, Ridola L. Hepatitis C virus eradication with directly acting antivirals improves health-related quality of life and psychological symptoms. World J Gastroenterol 2019; 25(48):6928-38. https://doi.org/10.3748/wjg.v25.i48.6928

[27] Mallolas J, Ahumada A, Ampuero J, Blanco JR, Hidalgo Á, Londoño MC, et al. Quality of life in patients with hepatitis C. Importance of treatment. Gastroenterol Hepatol 2019; 42(Suppl 1):20-5. https://doi.org/10.1016/S0210-5705(20)30184-9

[28] Horváth G, Keleti T, Makara M, Ungvari GS, Gazdag G. Effect of hepatitis C infection on the quality of life. Perspect Psychiatr Care 2018; 54(3):386-90. https://doi.org/10.1111/ppc.12269

[29] Fábregas BC, de Ávila RE, Faria MN, Moura AS, Carmo RA, Teixeira AL. Health related quality of life among patients with chronic hepatitis C: a cross-sectional study of sociodemographic, psychopathological and psychiatric determinants. Braz J Infect Dis 2013; 17(6):633-9. https://doi.org/10.1016/j.bjid.2013.03.008

[30] Zoe T, Jane C, Rebecca H, Joe W, Guha IN, Morling JR. Health related quality of life in individuals at high risk of chronic liver disease: impact of a community diagnostic pathway. Public Health Pract 2020; 1:100033. https://doi.org/10.1016/j.puhip.2020.100033

[31] Gupta R, Avasthi A, Chawla YK, Grover S. Psychiatric morbidity, fatigue, stigma and quality of life of patients with hepatitis B infection. J Clin Exp Hepatol 2020; 10(5):429-41. https://doi.org/10.1016/j.jceh.2020.04.003

[32] Younossi Z, Park H, Henry L, Adeyemi A, Stepanova M. Extrahepatic manifestations of hepatitis C: a meta-analysis of prevalence, quality of life, and economic burden. Gastroenterol 2016; 150(7):1599-1608. https://doi.org/10.1053/j.gastro.2016.02.039

[33] Pizzo G, Guiglia R, Lo Russo L, Campisi G. Dentistry and internal medicine: from the focal infection theory to the periodontal medicine concept. Eur J Intern Med 2010; 21(6):496-502. https://doi.org/10.1016/j.ejim.2010.07.011

[34] Cossais S, Schwarzinger M, Pol S, Fontaine H, Larrey D, Pageaux GP, et al. Quality of life in patients with chronic hepatitis C infection: Severe comorbidities and disease perception matter more than liver-disease stage. PLoS One 2019; 14(5):e0215596. https://doi.org/10.1371/journal.pone.0215596

[35] Takahashi A, Abe M, Yasunaka T, Arinaga-Hino T, Abe K, Takaki A, et al. Quality of life among patients with autoimmune hepatitis in remission: a comparative study. Medicine 2020; 99(43):e22764. https://doi.org/10.1097/MD.0000000000022764

[36] Pradhan RR, Kafle Bhandari B, Pathak R, Poudyal S, Anees S, Sharma S, et al. The assessment of health-related quality of life in patients with chronic liver disease: a single-center study. Cureus 2020; 12(9):e10727. https://doi.org/10.7759/cureus.10727

[37] Brasil-Oliveira R, Cruz ÁA, Souza-Machado A, Pinheiro GP, Inácio DDS, Sarmento VA, et al. Oral health-related quality of life in individuals with severe asthma. J Bras Pneumol 2020; 47(1):e20200117. https://doi.org/10.36416/1806-3756/e20200117

[38] Bernabé E, Marcenes W. Periodontal disease and quality of life in British adults. J Clin Periodontol 2010 ;37(11):968-72. https://doi.org/10.1111/j.1600-051X.2010.01627.x

[39] Costa AA, Cota LOM, Mendes VS, Oliveira AMSD, Cyrino RM, Costa FO. Periodontitis and the impact of oral health on the quality of life of psoriatic individuals: a case-control study. Clin Oral Investig 2021; 25(5):2827-36. https://doi.org/10.1007/s00784-020-03600-1

[40] Theodoridis C, Violesti A, Nikiforidou M, Menexes GC, Vouros ID. Short-term impact of non-surgical and surgical periodontal therapy on oral health-related quality of life in a Greek population-a prospective cohort study. Dent J 2020; 8(2):54. https://doi.org/10.3390/dj8020054