

Health Related Quality of Life Among Hepatitis C Infected Patients On Hemodialysis and Its Associated Factors in Saudi Arabia 2018-2019

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Abstract

Background: Chronic diseases such as hepatitis C viral infection affect the quality of life, especially for patients on hemodialysis. Usually, this effect is associated with many factors. Assessment of health-related quality of life is of great importance for clinicians and policy makers.

Objectives: To assess the health-related quality of life among hepatitis C infected patients in hemodialysis units and to determine factors associated with improved quality of life.

Methods: The study was conducted among Hepatitis C infected patients on hemodialysis who were registered in the ministry of health for receiving the Direct-Acting Antiviral (DAA) treatment from different regions of Saudi Arabia from (January 2018 to September 2019). Health-related quality of life was assessed by SF-12 health questionnaire. Depression as an independent variable was assessed by a Patient Health Questionnaire (PH-Q 9). Additional data includes sociodemographic variables, as well as clinical and laboratory variables, were collected from the ministry of health records.

Results: 386 hepatitis C patients were included in this study with a Mean age of participants (51.3 ± 15.13), males were (236) 61%, most patients were genotype 4 (152) 39.4%, the most patient had severe liver cirrhosis (132) 34.2%. The mean score of the Physical Component Summary (PCS) was (38.44 ± 10.30) and the Mental Component Summary (MCS) (40.83 ± 11.87). Male gender, younger patients (50 years or younger), higher level of education, employed patients, Body Mass Index less than 25, patients with non or mild depression, patients with no comorbidities had significantly higher value of both PCS and MCS. The multiple linear regression model shows that age, BMI, educational level, employment status, and depression significantly affect the value of PCS. The multiple regression model of MCS shows that age, employment status, depression, and degree of liver cirrhosis are significant predictors of MCS.

Conclusion: Hepatitis C infected patients on Hemodialysis (HD) had poor quality of life. The current study shows that age, BMI, educational level, employment status, and depression significantly affect the value of PCS. Age, employment status, depression, and degree of liver cirrhosis are significant predictors of MCS among hepatitis C on HD in Saudi Arabia 2018-2019.

Keywords: Hepatitis C; Viral hepatitis; Quality of life; CKD; Chronic kidney disease; Saudi Arabia

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Introduction

Hepatitis C Virus (HCV) infection is a global public health burden, causing an increasing level of liver-related morbidity and mortality due to the disease progression [1]. The World Health Organization

(WHO) estimated that >185 million people worldwide, or 2.8% of the human population, have been infected with Hepatitis C Virus (HCV); of these (130-170) million were chronically infected and 350,000 deaths occur each year due to HCV-related cirrhosis and liver cancer [2]. In 2016, estimates suggested that anti-HCV

antibody prevalence in Saudi Arabia among Saudi nationals was approximately 0.7%, and approximately 70% of these individuals had an active infection [3]. HCV infection is common among patients on Hemodialysis (HD) worldwide [4]. The prevalence of HCV infection in the HD population varies worldwide from 1% to more than 70% [5]. The reported prevalence of hepatitis C infection among patients on hemodialysis in a different region of Saudi Arabia is between 30% and 80% [6]. HCV infection among patients on HD is associated with a higher risk of death, hospitalization, and anemic complications, and worse quality of life scores [7]. Increasing evidence on the relationship between anti-HCV positive serologic status and survival in patients on long-term dialysis has been accumulated [8]. A meta-analysis demonstrated that anti-HCV positive serological status was an independent and significant risk factor for death in patients on maintenance dialysis [8]. It has been recently suggested that one of the mechanisms of increased mortality in HCV-positive patients is related to an impairment of quality of life [8]. Numerous investigators have noted that the Quality of Life (QoL) is lowered in the dialysis population; also, HCV-infected individuals with intact kidney function have an impairment of QoL scores [8]. Health-Related Quality Of Life (HRQoL) is a multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning [9]. WHO defines Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and about their goals, expectations, standards, and concerns. It is a broad-ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships, and their relationship to salient features of their environment [10]. The increasing prevalence of chronic disease in developed countries has led to an increased focus on the emotional and social well-being of patients as well as their physical well-being, referred to as Health-Related Quality of Life (HRQoL) [11]. There is a lack of published studies in Saudi Arabia that assess the health-related quality of life among chronically infected hepatitis C patients in hemodialysis units, more studies needed to be conducted in Saudi Arabia to evaluate this issue and to determine all factors affecting the quality of life of those patients in hemodialysis units. The current study aims to evaluate the burden of the disease in terms of HRQoL among hepatitis C patients on HD in Saudi Arabia 2018-2019 and to study the factors associated with improved quality of life.

Research Methodology

Research design

The study was conducted following the observational analytic cross-sectional approach.

Research variables

The independent variables include the sociodemographic and clinical variables, while the dependent variables include the HRQoL scores.

Research setting

The study was conducted in all hemodialysis units in the Kingdom of Saudi Arabia during the period (January 2018-September

2019).

Research population and sample

The population of the study included all patients with hepatitis C infection in hemodialysis units. The research sample included 449 patients who were registered in MOH for receiving Direct Antiviral Therapy (DAA).

Inclusion and exclusion criteria

The research sample was limited to patients aged 18 years and older, who were diagnosed with HCV infection and receiving medical care at the dialysis unit. The diagnosis was done *via* a special test (positive anti-HCV antibody confirmed by Polymerase Chain Reaction (PCR)). The sample, also, targeted those who received medications in the period between 1st January 2018 and 30 September 2019.

Methods

A total number of 449 patients were recruited for the study all cases were hepatitis C patients on hemodialysis. Of the 449 patients, 53 patients were excluded, (20 of them were dead and 33 with incorrect contact numbers). The remaining, total of 396 who responded was included in this study. SF 12 questionnaire and PHQ9 questionnaire were collected through the interview (phone calls). Before starting data collection, a pilot study was carried out among 10 cases to ensure that the questionnaire is clear and understandable, and timely sufficient for each call. After that, the data collection was carried out among 386 patients and Additional data was retrieved from the Saudi Ministry of Health (i.e. sociodemographic, clinical, and laboratory data). Employment status and educational level were obtained from participants before starting the questionnaire.

Data collection tool

To assess the quality of life among patients participating in the study, the SF-12 health questionnaire was used. SF-12v2 Health Survey is a reliable and valid shorter version of the SF-36v2 Health Survey, which includes 12 questions to measure functional health and well-being from the patient's point of view [12]. It is used to evaluate eight components: physical function, role physical, bodily pain, general health, vitality (energy/fatigue), role-emotional, mental health (psychological distress and psychological well-being), and social functioning. The results of the questionnaire could be summarized in two major components-Physical Component Score (PCS), Mental Component Score (MCS). For this study, the validated Arabic version of the SF-12 questionnaire was used [13]. The Arabic version of the patient health questionnaire PHQ-9 was used to assess the depression amongst the research participants. The Patient Health Questionnaire depression module (PHQ-9), which includes 9 items describing 9 symptoms corresponding to one of the 9 DSM-IV diagnostic criteria for major depressive disorder, was also used. The depression severity was measured using continuous data in the form of the PHQ-9 summary score (0-27 points); higher scores indicate higher severity.

Ethical consideration

After explaining the research objectives, procedures, and

implications, oral consents were obtained from all research participants as they were assured about confidentiality. The Ethical approval of the Institutional Review Board at King Fahad medical city in Riyadh city was obtained before starting data collection.

Statistical analysis

Data analysis was done using SPSS (IBM program version 20). Demographic, clinical characteristics and laboratory data were subjected to descriptive statistics, Numerical variables were expressed as the mean, Standard Deviation (SD), Categorical variables were expressed as percentages, Student's T-test, and ANOVA was used for comparison between groups as appropriate with a p-value <0.05 considered significant. A weighted number was given for each physical and mental item of the SF 12 questionnaire. the physical aspect of HRQoL was measured by the mean (PCS) and the mental aspect of the HRQoL questionnaire was measured by (MCS). Multiple linear regression was used to identify determinants of quality of life (the independent Factors associated with PCS and MCS). Statistical significance was set at <0.05.

Results

Among the sample population, 178 (46.1%) were 50 years or younger, while 208 (53.9%) were older than 50 years. The number of females was 150 (38.9%), while the number of males was 236 (61.1%). Saudi nationals were 240 (62.2%) of the research sample, while 146 (37.8%) were non-Saudi. More details are shown in (Table 1) the demographic characteristics of the participants.

Clinical characteristics of the participants at the (Tables 2 and 3) showed that the BMI of the Hepatitis C patients is 18<25 in 176

(45.6%) of the patients. The GT4 HCV Genotype was the most prevalent in the sample of the current study (39.4%). Besides, it is noted that liver Cirrhosis was severe in most of the patients (34.2%). Most of the patients were at the "F1" Fibrosis Stage and most of them are without Decompensation (369). In addition, the results showed that most of the study sample have no depression, while 112 (29%) of them have mild depression. 153 (39.6%) of patients with comorbid illnesses, most of them 125 (81.7%) have Hypertension. Furthermore, the great majority of the participants had no prior HCV treatments (91.5%). A (Table 4) which is showing the mean PCS, MCS between different groups of Socio-demographic characteristics, younger patients (50 years or younger) have significantly higher values of both PCS and MCS when compared to older patients (p-value<0.001). Males have significantly higher values of both PCS and MCS when compared to females (p-value<0.05). The non-Saudi have significantly higher values of both PCS and MCS when compared to Saudi (p-value<0.05). Regarding marital status, singles have significantly higher values of both PCS and MCS when compared to both married and widowed. Also, married patients have significantly higher values of both PCS and MCS when compared to widowed patients (p-value<0.001). The results also showed that illiterate patients and primary school patients have the lowest values of both PCS and MCS, and that difference was statistically significant when compared to higher educational levels, at the same time, there was no significant difference in PCS and MCS values between the university and middle/high school patients (p-value<0.001). In respect to the employment status, retired patients have the lowest values of both PCS and MCS, and that difference was statistically significant when compared to another status. Disabled and unemployed patients have significantly lower values of both PCS and MCS when compared to employed

Table 1: Socio-demographic characteristics of Hepatitis C patients.

Characteristics	Category	Count	Percentage
Age	50 years or Younger	178	46.10%
	Older than 50 years	208	53.90%
Gender	Female	150	38.90%
	Male	236	61.10%
Nationality	Non-Saudi	146	37.80%
	Saudi	240	62.20%
Residency	East	47	12.20%
	South	51	13.20%
	North	61	15.80%
	Central	87	22.50%
	West	140	36.30%
Marital Status	Divorced	2	0.50%
	Widowed	15	3.90%
	Single	88	22.80%
	Married	281	72.80%
Educational Level	Illiterate	36	9.30%
	Middle/High school	163	42.20%
	Primary School	134	34.70%
	University	53	13.70%
Employment Status	Disabled	31	8%
	Retired	60	15.50%
	Employed	145	37.60%
	Unemployed	150	38.90%

Table 2: Clinical characteristics of Hepatitis C patients.

Characteristics	Category	Count	Percentage
BMI	Less than 18	5	1.30%
	18 to less than 25	176	45.60%
	25 to less than 30	136	35.20%
	30 to less than 35	57	14.80%
	35 to less than 40	11	2.80%
	More than 40	1	0.30%
HCV Genotype	No GT	1	0.30%
	GT5	1	0.30%
	GT6	1	0.30%
	GT2	15	3.90%
	GT3	47	12.20%
	GT1B	34	8.80%
	GT1A	131	33.90%
	GT4	152	39.40%
Liver Cirrhosis	None	49	12.70%
	Mild	121	31.30%
	Moderate	84	21.80%
	Sever	132	34.20%
Fibrosis Stage	F0	49	12.70%
	F1	121	31.30%
	F2	84	21.80%
	F3	64	16.60%
	F4	68	17.60%
Decompensation	No	369	91.20%
	Yes	3	0.80%
Depression	None	209	54.10%
	Mild	112	29.00%
	Moderate	43	11.10%
	Moderately Severe	18	4.70%
	Sever	4	1.00%
Comorbidities	No	233	60.40%
	Yes	153	39.60%
Type of Comorbidities	Non-Hepatic Cancer	1	0.70%
	HBV	3	2.00%
	Liver/Kidney Transplantation	4	2.60%
	Coronary Heart Disease	10	6.50%
	Anemia	11	7.20%
	DM	65	42.50%
	Hypertension	125	81.70%
Prior HCV Treatments	No	353	91.50%
	Yes	33	8.50%
Treatment Status	Before Treatment	27	7.00%
	Ongoing Treatment	37	9.60%
	After Treatment	322	83.40%
Duration of Treatment	8 weeks	32	8.30%
	12 weeks	330	85.50%
	16 weeks	8	2.10%
	24 weeks	16	4.10%

patients (p-value<0.001). The mean PCS, MCS between groups of different clinical characteristics at the (Table 5) shows that patients with BMI "18 to less than 25" tend to have significantly higher values of PCS when compared with patients with BMI "25 to less than 30" or "35 to less than 40". In addition, patients with BMI "18 to less than 25" tend to have significantly higher values

of MCS when compared with patients with the higher categories of BMI (p<0.05). Patients with BMI "35 to less than 40" have the lowest value of MCS within BMI categories. Analyzing the HCV Genotype showed that patients with genotype GT2 have the lowest score of both PCS and MCS. No significant differences in PCS and MCS values were found between genotypes GT1A, GT1B,

Table 3: The average score of different items of the SF 12 questionnaire.

Health Aspects	Mean	SD
Physical Functioning (PF)	38.53	12.48
Role Physical (RP)	39.66	18.16
Bodily Pain (BP)	35.11	10.89
General Health (GH)	39.09	12.79
Vitality (VT)	42.35	9.22
Social Functioning (SF)	36.56	12.76
Role Emotional (RE)	36.26	22.19
Mental Health (MH)	39.08	11.77
Physical Health (PCS)	38.44	10.3
Mental Health (MCS)	40.83	11.87

and GT3. Furthermore, the analysis of liver cirrhosis showed that no significant differences in PCS and MCS values were found between the categories of liver cirrhosis. Patients with none or mild depression have significantly higher values of both PCS and MCS when compared with other patients ($p < 0.001$). Patients with no comorbidities have significantly higher values of both PCS and MCS when compared to patients with comorbidities ($p < 0.001$). The multiple linear regression model of PCS at (Table 6) shows that only age ($B = -0.38$, p value < 0.001), BMI ($B = 0.17$, p value $= 0.042$), educational level ($B = 6.39$, p -value < 0.001), employment status ($B = 4.28$, p -value < 0.001) and depression ($B = -1.53$, p -value $= 0.048$) are significantly affecting the value of PCS. The value of R^2 of the model was 0.701 which means that the

Table 4: PCS, MCS between different socio-demographic characteristics.

	Category	Physical Health (PCS)			Mental Health (MCS)		
		Mean	SD	p-value	Mean	SD	p-value
Age	50 years or Younger	45.76	5.94	< 0.001	48.87	6.13	< 0.001
	Older than 50 years	32.19	9.04		33.95	11.27	
Gender	Male	39.43	9.74	0.022	41.96	11.49	0.019
	Female	36.9	10.97		39.06	12.28	
Nationality	Non-Saudi	39.9	9.3	0.025	43.04	11.66	0.004
	Saudi	37.56	10.78		39.49	11.83	
Residency	East	32.62	9.19	0.001	34.23	11.38	0.001
	South	37.71	11.23		40.21	12.9	
	North	40.41	11.27		41.17	10.93	
	Central	38.84	10.14		41.26	11.87	
	West	39.57	9.34		42.87	11.4	
Marital Status	Divorced	47.37	1.85	< 0.001	53.64	4.22	< 0.001
	Widowed	27.98	7.39		32.18	11.22	
	Single	42.87	9.58		44.92	10.06	
	Married	37.55	10.06		39.92	12.03	
Educational Level	Illiterate	24.62	3.53	< 0.001	25.88	4.53	< 0.001
	Primary School	33	9.33		35.82	12.75	
	Middle/High school	43.95	7		46.24	8.3	
	University	44.65	7.61		47.03	7.07	
Employment Status	Retired	27.97	6.65	< 0.001	27.78	8.58	< 0.001
	Disabled	35.1	9.68		37.77	11.21	
	Unemployed	37.41	10.6		40.26	12.22	
	Employed	44.56	6.52		47.48	6.96	

T-test was used with variables with only two categories, and ANOVA was used for variables with three or more categories. It is a part of the table so include this in the table

Table 5: Mean of PCS, MCS between different groups clinical characteristics.

Characteristics	Category	Physical Health (PCS)			Mental Health (MCS)		
		Mean	SD	p-value	Mean	SD	p-value
BMI	Less than 18	33.48	13.32	0.017	45.38	13.18	0.009
	18 to less than 25	40.06	10.3		42.66	11.53	
	25 to less than 30	37.42	9.9		39.72	11.75	
	30 to less than 35	37.63	10.56		38.95	11.87	
	35 to less than 40	31.64	8.84		32.21	13.52	
HCV Genotype	GT1A	40.36	9.86	0.002	42.84	11.57	< 0.001
	GT1B	36.55	10.82		41.02	11.52	
	GT2	30.26	8.22		29.17	10.17	
	GT3	39.11	9.98		41.41	11.96	
	GT4	37.4	10.46		39.37	11.73	

Liver Cirrhosis	None	40.12	9.35	0.053	42.98	12.32	0.054
	Mild	39.64	9.96		41.99	11.69	
	Moderate	38.77	10.84		41.42	11.34	
	Sever	36.52	10.39		38.6	12	
Decompensation	No	38.56	10.32	0.678	40.95	11.84	0.963
	Yes	36.07	14.21		41.27	19.5	
Depression	None	40.64	9.42	<0.001	43.29	10.84	<0.001
	Mild	40.99	9.47		43.98	9.95	
	Moderate	27.74	6.49		28.65	10.01	
	Moderately Severe	25.19	4.15		25.67	5.46	
	Severe	27.26	2.55		23.37	3.33	
Comorbidities	No	40.69	9.57	<0.001	43.2	11.09	<0.001
	Yes	35.03	10.45		37.22	12.16	
Treatment Status	Before Treatment	34.46	11.03	0.068	36.31	12.76	0.119
	Ongoing Treatment	40.36	11.25		40.79	11.24	
	After Treatment	38.56	10.07		41.22	11.83	

T-test was used with variables with only two categories, and ANOVA was used for variables with three or more categories. It is a part of the table so include this in the table

Table 6: Multiple linear regression model to predict associated variables with (PCS) Physical Component Summary score for hepatitis c patients.

Variable	Regression Coefficient (B)	SE(B)	Sig.
(Constant)	44.33	4.55	<0.001
Age	-0.38	0.03	<0.001
Gender	0.79	0.84	0.344
Marital Status			
Married	1.26	1.75	0.473
Single	1.25	1.88	0.506
Widowed	Reference		
Educational Level			
Middle /High school	6.39	1.43	<0.001
Primary School	2.21	1.26	0.08
University	6.05	1.67	<0.001
Illiterate	Reference		
Employment Status			
Unemployed	3.61	1.18	0.002
Employed	4.28	1.19	<0.001
Disabled	4.22	1.52	0.006
Retired	Reference		
BMI	0.17	0.08	0.042
Comorbidities	0.82	0.74	0.263
HCV Genotype			
GT1B	0.2	1.92	0.917
GT4	1.53	1.7	0.37
GT3	1.77	1.86	0.344
GT1A	2.08	1.72	0.226
GT2	Reference		
MELD Score	0.01	0.04	0.909
Depression			
Mild	-1.53	0.77	0.048
Moderate	-1.6	1.23	0.195
Moderately Severe	-2.32	1.63	0.155
Sever	1.89	3.2	0.554
None	Reference		
Prior HCV Treatments	0.42	1.13	0.709
Degree in Liver Cirrhosis			
Mild	-1.87	1.09	0.088
Moderate	-1.91	1.24	0.124

Sever	-1.84	1.4	0.191
None	Reference		
Fibro Scan Score	0.06	0.05	0.236
Treatment Status			
Ongoing	0.68	1.68	0.687
After	-0.76	1.28	0.553
Before	Reference		

Table 7: Multiple linear regression model to predict associated variables with (MCS) Mental Component Summary score for hepatitis c patients.

Variable	Regression Coefficient (B)	SE(B)	Sig.
(Constant)	55.89	5.76	<0.001
Age	-0.41	0.04	<0.001
Gender	1.69	1.06	0.112
Marital Status			
Married	-2.48	2.21	0.263
Single	-3.42	2.37	0.15
Widowed	Reference		
Educational Level			
Middle /High school	3.55	1.81	0.053
Primary School	1.56	1.59	0.328
University	3.77	2.11	0.074
Illiterate	Reference		
Employment Status			
Unemployed	6.69	1.5	<0.001
Employed	7.4	1.5	<0.001
Disabled	7.35	1.93	<0.001
Retired	Reference		
BMI	-0.11	0.1	0.298
Comorbidities	0.79	0.93	0.399
HCV Genotype			
GT1B	4.3	2.43	0.077
GT4	3.92	2.15	0.069
GT3	3.74	2.36	0.114
GT1A	4.02	2.17	0.065
GT2	Reference		
MELD Score	0.1	0.05	0.054
Depression			
Mild	-0.21	0.98	0.833
Moderate	-3.68	1.56	0.019
Moderately Severe	-2.72	2.06	0.187
Sever	-4.95	4.05	0.222
None	Reference		
Prior HCV Treatments	0.81	1.43	0.574
Degree in Liver Cirrhosis			
Mild	-2.86	1.38	0.039
Moderate	-2.71	1.56	0.085
Sever	-1.93	1.77	0.277
None	Reference		
Fibro Scan Score	-0.04	0.06	0.551
Treatment Status			
Ongoing	-0.49	2.13	0.817
After	-1.24	1.63	0.447
Before	Reference		

regression model explains 70.1% of the variance in the data. The multiple linear regression model of MCS at (Table 7) shows that only age (B=-0.41, p-value<0.001), employment status (B=7.40,

p-value<0.001), depression (B=-3.68, p-value=0.019) and degree of liver cirrhosis (B=-2.86, p-value=0.039) are significantly affecting the value of MCS. The value of R² of the model was

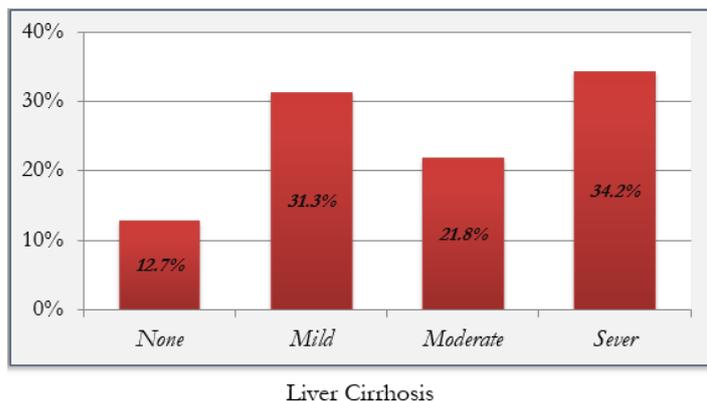


Figure 1: Stages of liver cirrhosis among hepatitis C patients on hemodialysis.

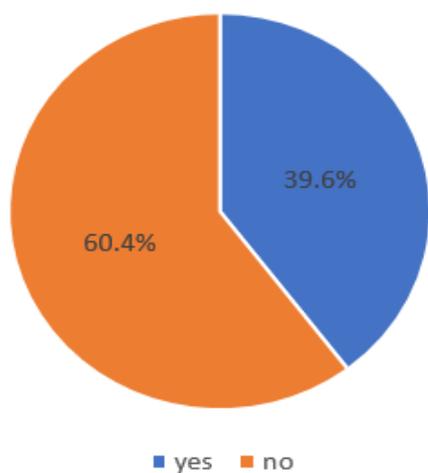


Figure 2: Comorbidity among Hepatitis C patients on hemodialysis.

0.644 which means that the regression model explains 64.4% of the variance in the data (Figures 1 and 2).

Discussion

The study was conducted to measure HRQoL among Hepatitis C patients on hemodialysis. The current study found that the mean PCS for the total hepatitis C patients included in this study were (38.45 ± 10.29), and the mean MCS were (40.83 ± 11.87), which is low compared to normal levels (using US norm-based methods-in which the mean is 50 (SD, 10) in the 1998 general US population) [14]. The current study findings were lower than previous studies as Svrtlih, et al. study evaluated HRQoL among hepatitis C patients using the Sf12 questionnaire the study reported the mean PCS (45.68 ± 9.43) and the mean MCS (43.02 ± 12.25) of hepatitis C infected patients [15]. Jang, et al. study found that the mean score of the SF-36 physical component summary score was (48.8 ± 8.3) and the mental component summary score was (46.2 ± 11.7) of the HCV-infected patients [16]. This may be explained due to that the current study included hepatitis C patients on dialysis, which has more burden on quality of life. The study found that younger patients (50 years or younger) have significantly higher values of both PCS and MCS when compared with older patients (older than 50 years). This could be explained by the fact that younger patients have less life stress in their lives, in addition to enjoying more physical health and fewer diseases and health problems, which contributed to increasing their

mental and physical health. similar results were found by Islam et al study [17]. Among hepatitis C patients included in this study Male patients were found to have significantly higher values of both PCS and MCS when compared to females. This may be explained by the fact that they usually have more active physical routine than females, their greater freedom of movement in Saudi society, which gave them continuous activity and contributed to protecting them from many diseases and coexistence with other diseases better, which contributed to increasing mental and physical health for them. Barreira, et al. found similar results in their study about hepatitis C pre-treatment profiles and gender differences [18]. Regarding marital status, this study found that Singles have significantly higher values of both PCS and MCS when compared to both married and widowed, and married patients have significantly higher values of both PCS and MCS when compared to widowed patients. This could be explained by the fact that single individuals have less life burden and have few responsibilities and less pressure on them, which raised their level of physical and mental health. The study of Kamal, et al. came up with similar findings in the Egyptian context [19]. For Educational Level Illiterate patients and Primary school patients have the lowest values of both PCS and MCS, and it has significant differences when compared to higher educational levels. This could be because the higher the level of education, the greater the individual's awareness of the factors that affect physical and mental health and this led to the adoption of daily and nutritional habits appropriate to coexistence with the disease and reducing its negative effects. this result was confirmed by Cho and Park [20]. Concerning the employment status, retired patients have the lowest values of both PCS and MCS, and it has significant differences when compared to another status. Disabled and unemployed have significantly lower values of both PCS and MCS when compared to employed patients. This could be because work helps the individual be busy in daily and work life, which makes him forget the effects of the disease and merges with colleagues and clients in the work environment, which raised his mental and physical health. These results are in line with the results of the Mhatre and Sansgiry study [21]. In general, the results indicated that being literate, in a comfortable relationship, and having a good job contribute positively to the health of patients with HCV. Regarding the clinical characteristics of hepatitis C patients, the study found Patients with BMI "18 to less than 25" tend to have significantly higher values of PCS and MCS when compared with patients with the higher categories of BMI. Patients with BMI "35 to less than 40" have the lowest value of MCS within BMI categories. Perhaps this could be because whenever the BMI moderates, this leads to the protection of a person from many physical diseases such as heart and joint' diseases, pressure, diabetes, mental illnesses such as depression, and the individual's enjoyment of vitality and activity, which contributed to improving mental and physical health. Similar results were found by Cossais, et al. [22]. Exploring Liver Cirrhosis showed that no significant differences in PCS and MCS values were found between the categories of liver cirrhosis. In contrast with the result of Juanbeltz, et al. study who found a connection between Liver Cirrhosis and overall physical health [23]. Concerning depression, the study found that patients with none or mild depression have significantly higher values of both PCS and MCS when compared with other patients. this result could be

due to that depression greatly affects the psychological state of individuals, which has many effects related to the physical aspect, where depression may be linked to constant fatigue, headache, abdominal, body, and back pain, digestive problems, loss of appetite, and chest pain. In addition, those who suffer from depression are usually reluctant from practicing any activity. Furthermore, depression increases the worries of patients, and thinking of the deteriorating situation of life also worsens the mental status. Similar results were found by Barboza, et al. and Huang, et al. [24-25]. The current study found that Patients with no comorbidities have significantly higher values of both PCS and MCS when compared with patients with comorbidities. This could be because individuals who do not have many diseases make it easier for them to adapt to the current disease and live with it better than those with various injuries and health problems, which contributed to improving their physical and mental health. In addition, they have fewer side effects and have more flexible medication plans as stated by Cossais, et al [22]. The majority of Hepatitis C patients (42%) in this study perceived their health as "good", followed by patients (19.4%) who perceived their health as "Fair". In a similar study Basseri, et al. reported on the patient's perception of their health where they found that most of the research sample feel good about their health followed by those who feel very good [26]. They identified "healthcare" and "lifestyle habits" as major factors contributing to the good health of patients with HCV. The multiple linear regression model of PCS shows that only Age ($B=-0.38$, $p\text{-value}<0.001$), BMI ($B=0.17$, $p\text{-value} 0.042$), educational level ($B=6.39$, $p\text{-value}<0.001$), employment status ($B=4.28$, $p\text{-value}<0.001$) and depression ($B=-1.53$, $p\text{-value}=0.048$) are significantly affecting the value of PCS. The multiple linear regression model of MCS shows that only age ($B=-0.41$, $p\text{-value}<0.001$), employment status ($B=7.40$, $p\text{-value}<0.001$), Depression ($B=-3.68$, $p\text{-value}=0.019$) and Degree of Liver Cirrhosis ($B=-2.86$, $p\text{-value}=0.039$) are significantly affecting the value of MCS. similar results were achieved by Youssef et al. who found that that BMI, education, and depression are key factors contributing to the quality of life of hepatitis C patients [27]. Also, Cossais, et al. study found that older age,

lower education, unemployed, severe comorbidities, being overweight significantly affect HRQoL [22], considering those factors when developing medication protocols for patients with HCV is of great importance. Any study has its limitation and strength, one of the strengths of this study that it includes relatively large sample and it include patients from different regions of Saudi Arabia. In addition, it was one of the few studies in Saudi Arabia to our knowledge evaluating the Health-related quality of life and its associated factors among hepatitis C patients, especially those who are on hemodialysis. Similarly, it's one of the few studies that evaluated the effect of biological and clinical parameters on HRQoL. In terms of the study limitations this study is a cross-sectional study that cannot approve causal relationship. In addition, one of the limitations is that the SF-12 scores were not compared to expected Saudi Arabian norms, because such data was not available. In addition, we could not assess the effect of achieving SVR (Sustainable Virologic Response) on Health-related quality of life due to the unavailability of (SVR) data after 12 weeks of treatment with Direct-acting antiviral therapy. Future studies are needed to address this issue using a prospective longitudinal design.

Conclusion

In conclusion, HRQoL among hepatitis C patients on hemodialysis was low. The HRQoL was affected by age, BMI, educational level, employment status, depression, and comorbidity. Therefore, these factors should be addressed through activating the role of social service to provide moral and psychological support to patients with hepatitis C viruses in dialysis units in Saudi Arabia, providing appropriate support and health care to patients and disabled people with hepatitis C. Considering these factors when developing medication protocols for patients with HCV is of great importance, as well as when developing health awareness, counseling and social services for the families of people with chronic hepatitis viruses. Future studies are needed in Saudi Arabia to evaluate the effect of achieving SVR on HRQoL after receiving new Direct-acting antiviral therapy.

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