Original Article

Predictive factors for acquiring HCV infection in the population residing in high endemic, resource-limited settings

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Abstract

Background: In a country like Pakistan, a high prevalence of HCV persists due to a lack of awareness among the masses and the absence of adequate medical facilities in less privileged areas. Therefore, this study aimed to develop a risk-based screening tool based on the identification of predictive factors for HCV in the adult population in Karachi, Pakistan, which can later be validated for implementation. **Methodology:** A case-control study design was adopted and data was collected through an interview-based questionnaire from among 284 patients visiting the Family Medicine Department at The Indus Hospital, Karachi on whom the anti-HCV antibody test was conducted. Received data was then entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0. **Result:** Analysis indicated that in the entire cohort, marital status, employment status, history of being operated on in the past, family history of HCV infection, and body piercing were the factors significantly associated with positive HCV antibody. Results thus achieved show that the anti-HCV-positive rate was higher in ever married, employed, having had surgery, and family history of HCV infection (aOR: 2.42, 3.5, 2.04 and 2.5, $P = 0.043$, 0.002, 0.011 and 0.005, respectively). **Conclusions:** It is concluded that future research may be conducted enrolling the heterogeneous population to further probe the HCV burden and incidence in our society to initiate educational purposes. This goal can be achieved through commercial advertisements and free public lectures for disease prevention and better health awareness among the masses and the curers.

Keywords: Anti-HCV, HCV, a risk factor

Introduction

World Health Organization (WHO) estimates that worldwide approximately 70 million people are infected with chronic hepatitis C virus (HCV).[1] The prevalence of chronic HCV is estimated to be 1.1% with high variation in different regions of the world.[2,3] The prevalence in general population varies between 0.5 to 6.5% with 0.5–15% variation in western countries. In southeast Asia and Mediterranean regions, the prevalence reaches up to 2.3% while in Europe it is around 1.5.[4]

It is pertinent to mention that a high percentage of disease exists in low- and middle-income countries, which includes Pakistan. A systematic review of data published between 2010 and 2015 showed that HCV seroprevalence among the general adult Pakistani population is 6.8%, while active HCV infection was found in approximately 6% of the population.[5]

Due to the asymptomatic nature of the disease, the later consequences have increased the risk of cirrhosis, hepatocellular

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carcinoma, and fibrosis. These circumstances have led to the global deaths of about 1.4 million untreated persons per year.[4]

Common risk factors contributing to the spread of infection differ in developed and developing countries. In developed countries, injection drug users (IDUs) are considered major risk factors for HCV transmission. Other important risk factors include blood transfusions (17%), no known risk factor (10%), body piercing (9%), sex with IDUs (6), prisons (3%), needle stick injuries (2%), and immunoglobulin treatment (1%).[6] However, in Pakistan major burden is due to the reuse of syringes or needles for injection amongst the general population (61.45%), surgeries and dental procedures (10.62%), blood transfusion or blood product (4.26%), and razor sharing and circumcision by barbers (3.9%).[7]

Local evidence suggests a lack of knowledge regarding HCV transmission and prevention in the general population. Only 37% of the general population considers HCV as a major health problem. Similarly, 60% were having a misconception that HCV is preventable through vaccination.[8] This is an obvious fact that a lack of disease awareness causes delayed presentation and hence delayed treatment.

Early diagnosis of HCV and necessary treatment is critical for prevention, delaying liver diseases, and prevention of transmission. Due to lack of awareness amongst healthcare providers, patients, and masses coupled with nonavailability of testing sites, resource concerns, unavailability of testing sites, limited technical human resources, discrimination concerns, and high medical costs, a poor diagnosis process exist in Pakistan.

The reason of the conduct of study is since HCV is a silent epidemic and knowledge gaps exists, national guidelines, and WHO guidelines,[9] lack of awareness at various levels in Pakistan. Moreover, current clinical practice lacks uniformity and standardization, which leads to an incidental diagnosis of HCV when screened preoperatively or random testing based on knowledge and practices of individual clinicians based on the "diagnosis of exclusion." In this way, we are touching only the tip of the iceberg and the remaining bulk is missing.

Recently, the WHO globally targeted to eliminate HCV as a public health issue by 2030,[10] which is an indicator of the concern the international body is paying to this disease.

Aim of the study is to develop a risk based screening tool for identifying suspects at increased risk of having HCV infection, which can later be validated for implementation.

Objectives during the study were to hypothesize that implementing the practice of a systematic risk based assessment for HCV infection can lead to early case detection, an increase in the number of cases, early treatment initiation, higher cure rate culminating in a reduction of HCV related morbidity and mortality.

Subjects and Methods

This case-control study was conducted in the Family Medicine Department at The Indus Hospital, Karachi. It is a tertiary care hospital in a densely populated area of Korangi with a population of 24,57,019 people as per the 2017 census (reference). The Indus Hospital provides free of cost treatment to the patients. After approval from the Institutional Review Board, the data collection was done from March to October 2018 using convenience sampling.

The sample size calculated using Open EPI software was 284 out of which 139 were cases while 145 controlled. All patients who were able to communicate in the Urdu language, aged ≥16 years, checked for anti-HCV (positive or negative) visiting family medicine outpatient department were included. Patients with HIV coinfection – reported positive by any of three tests (enzyme-linked immunosorbent assay [ELISA] or rapid test or Western blot), history of intravenous drug abuse, on regular hemodialysis, and healthcare staff workers were excluded. Our sample size was divided into two groups. Cases were defined as all those with anti-HCV positive and controls were anti-HCV negative on chemiluminescence immunoassay (CLIA) testing technique. Data was collected using a predefined structured questionnaire on baseline demographic, which included age, gender, marital status, religion, mother language, employment status, and ethnicity, etc., Risk factor assessment questionnaire focused on various known risk factors of HCV included the use of intravenous injection, surgeries, deliveries with their mode, family history of hepatitis, mother status at the time of delivery, circumcision, use of razors and blade, body piercing, and premarriage sexual relations or with people other than spouses (references from literature).

After taking consent and ensuring privacy, patients were interviewed in a separate room and were explained about nondisclosure of their information regarding HCV result status. The questionnaire was designed to include questions and images to ask about the presence of exposure to HCV-related risk factors. The questionnaire administration took approximately 15–20 min per individual. Some missing data of few questioners were collected over the phone. Confidentiality of the same was maintained through the identification of a person by asking a few particulars of persons and their participation in the study. Data was entered on Red Cap and analyzed using Statistical Package for the Social Sciences (SPSS) version 24.0. Mean ± SD/median interquartile range (IQR) were computed as appropriate for all the quantitative variables like age, education, and several pregnancies. Frequency and percentage were computed for all the categorical variables. Independent sample *t*-test/Mann-Whitney U test was applied as appropriate to assess differences in quantitative variables between anti-HCV antibody status. Chi-square/Fisher's exact test was applied as appropriate to assess the association between various categorical variables and anti-HCV antibody status. Both univariate and multivariable logistic regression was applied to assess factors associated with HCV. All the variables

with *P* value < 0.25 were included in the multivariable analysis. To facilitate the removal of insignificant variables to the backward likelihood ratio elimination method was applied to build the final model. *P* value < 0.05 was considered statistically significant.

Results

A total of 284 participants were enrolled in the study. Among all the participants 62.3% (*n* = 177) were females and 37.7% (*n* = 107) were males. Of the total, 48.9% (*n* = 139) were anti-HCV positive and 51.1% (*n* = 145) were negative. The median age of the study population was 40 years, with nearly 96% (*n* = 272) participants being Muslims. Majority of the participants were married (79.2%, *n* = 225), and more than half (58.8%, *n* = 167) were unemployed [Table 1].

The distribution of risk factors of HCV among study participants was as follows: Of all the patients enrolled in the study, only 8.5% (*n* = 24) had a history of receiving a blood transfusion. Nearly 70% (*n* = 197) of the participants ever received any type of injection or drip in the past 1 year, whereas 41.5% (*n* = 118) had a positive past surgical history, and almost half of the patients (47.5%, *n* = 135) reported a history of dental treatment. Approximately 32% of the participants voiced the use of razors from outside their home to shave. Out of 100 Muslim men, 78 reported that they knew how their circumcision happened. Of these 78 men, 57 (73.1%) reported that their circumcision was done by a barber, whereas 18 (23.1%) had their circumcision done by a doctor. The majority of the female participants i.e., 91% had a history of pregnancy (*n* = 161), with a median (IQR) number of pregnancies 6,[4-8], and median (IQR) number of parity 5.[3-7] When asked whether their mother got tested for HCV during pregnancy, most participants (59.9%, *n* = 170) were unaware of it, whereas 36.6% (104) reported that their mother did not get tested. However, only 3.2% (*n* = 9) responded in the affirmative; of these nine patients, only 22.2% (*n* = 2) reported that the result was positive. Of all the patients enrolled, 22.2% had a positive family history of HCV. (*n* = 63). Of those, 42.9% (*n* = 27) reported that they shared their items of personal use with their family members. Of the total participants, 75.4% (*n* = 214) stated that they shared their items of personal use with other than a family member and the most shared item was a nail cutter (*n* = 205, 95.8%). When asked about body tattooing, only 6.3% (*n* = 18) reported getting it done, whereas 63% (*n* = 179) participants confirmed body piercing done when enquired. The majority of those who got the piercing done had it done at home (67.6%, *n* = 121) with a needle (87.7%, *n* = 157). Approximately 10% (*n* = 28) reported having a sexual relationship with any man or a woman other than a spouse.

Table 1: Characteristics of the study participants

Variable	*n* (%)
Gender	
Male	107 (37.7)
Female	177 (62.3)
Anti-HCV antibody	
Positive	139 (48.9)
Negative	145 (51.1)
Age	
Median (IQR)	40 (31-50.8)
Min-Max	17-86
Education	
Median (IQR)	3 (0-8)
Min-Max	016
Religion	
Islam	272 (95.8)
Hinduism	1 (0.4)
Christianity	11 (3.9)
Marital Status	
Unmarried	35 (12.3)
Married	225 (79.2)
Widow/Widower	17 (6)
Divorced	3 (1.1)
Separated	3 (1.1)
Not reported	1 (0.4)
Employment Status	
Employed	117 (41.2)
Unemployed	167 (58.8)

No significant difference was found in median age (41 versus 40 years, *P* = 0.235) and median year of education (2 versus 5 years, *P* = 0.145) between HCV positive and HCV negative patients. There was also no significant difference observed in the mean number of pregnancies between HCV positive and HCV negative participants (6.02 ± 2.82 versus 6.75 ± 3.22; *P* = 0.130) [Table 2].

No significant difference was observed in gender (*P* = 0.463), religion (*P* = 0.881), history of blood transfusion in past 1 year (*P* = 0.833), history of receiving any injection or intravenous drip in past 1 year (*P* = 0.960), ever had dental treatment (*P* = 0.122), circumcision (*P* = 0.332), positive

Table 2: Comparison of mean scores of age, education, and number of pregnancies by participant's HCV status

	Hep C status						*P*
	Positive n=139			Negative n=145			
	Mean±SD	Min-Max	Median (IQR)	Mean±SD	Min-Max	Median (IQR)	
Age in year	42.15±12.13	17-71	41 (33-53)	40.77±14.57	3.75±4.23	40 (29.5-50)	0.235[‡]
Education in years	3.75±4.23	0-15	2 (0-8)	4.49±4.33	0-15	5 (0-8)	0.145[‡]
	Positive, *n*=86			Negative, *n*=75			
Number of pregnancies	6.02±2.82	1-13	6 (4-8)	6.75±3.22	1-16	7 (5-8)	0.130[†]

*P<0.05, **P<0.0001, [‡]Mann-Whitney U test, [†]Independent *t*-test

anti-HCV in mother during pregnancy ($P = 0.381$), sharing of items of personal use with family ($P = 0.058$) and with anyone other than family member ($P = 0.240$), body piercing ($P = 0.499$), and sexual relationship with people other than spouse ($P = 0.278$), between patients who were HCV positive and those who were negative both in cases and controls. Univariable analysis showed significant association of marital status ($P = 0.014$), employment status ($P = 0.008$), ethnicity ($P = 0.001$) history of prior surgery ($P = 0.004$), history of ever being pregnant ($P = 0.037$), history of how the delivery was done ($P = 0.000$), family history of HCV ($P = 0.015$), and where the body piercing was done from ($P = 0.004$) with anti-HCV test results [Table 3].

Multivariable logistic regression analysis showed that in the overall cohort, anti-HCV-positive rate was higher in ever married (aOR: 2.42, $P = 0.043$), employed (aOR: 3.5, $P = 0.002$), whoever had surgery (aOR: 2.04, $P = 0.011$) and had a family history of HCV (aOR: 2.5, $P = 0.005$) [Table 4]. Interestingly, the patients who had body piercing had a lower rate of anti-HCV-positive in comparison to those who never got any of their body parts pierced adjusting for other variables (aOR = 0.33, $P = 0.005$) [Table 4].

In males, the employment status was found to be significantly associated with positive anti-HCV antibody (aOR: 4.6, $P = 0.032$) adjusting for marital status, ever operated, and family history of HCV. However, it can be inferred from the result that male patients who ever married, (aOR: 3, $P = 0.069$), had a family history of HCV (aOR: 2.4; $P = 0.073$), and ever operated (aOR: 2.6; $P = 0.073$) had higher odds of positive anti-HCV, but the results were not statistically significant. On the other hand, in the female cohort, patients who were employed (aOR = 3.63, $P = 0.018$) and ever had surgery (aOR 1.97, $P = 0.041$) were found to have higher chances of positive anti-HCV adjusting for family history of HCV [Table 4]. Moreover, data showed that female patients who had a positive HCV in their family had two times higher chances of having positive anti-HCV, though the result was not statistically significant ($P = 0.057$) [Table 4].

In the employed cohort, patients who ever got body piercing done (aOR = 0.281, $P = 0.024$), who were ever operated (aOR = 2.9, $P = 0.029$), and who ever had dental treatment done (aOR = 1.9, $P = 0.019$) were found to have higher chances of positive anti-HCV adjusting for marital status and family history of HCV. However, those employees who were married had three times increased risk of being anti-HCV positive but were not statistically significant ($P = 0.096$) [Table 4]. In the unemployed cohort, participants with history of prior surgery (aOR = 2.01, $P = 0.039$) and family history (aOR = 2.5, $P = 0.024$) were found to have higher chances of positive anti-HCV adjusting for gender [Table 4].

Discussion

Worldwide, viral hepatitis is considered a major infectious illness having unfavorable outcomes for society.[11,12] Along with the cure and treatment of the disease, it is essential to understand the

Table 3: Study Characteristics in Comparison with Anti-HCV Status

	Anti-HCV antibody			
	Positive, *n* (%)	Negative, *n* (%)	Total, *n* (%)	*P*
Gender				
Male	49 (45.8)	58 (54.2)	107 (100)	0.463†
Female	90 (50.8)	87 (49.2)	177 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Marital status				
Unmarried	10 (28.6)	25 (71.4)	35 (100)	0.014*‡
Married	120 (53.3)	105 (46.7)	225 (100)	
Widow/Widower	5 (29.4)	12 (70.6)	17 (100)	
Divorced	1 (33.3)	2 (66.7)	3 (100)	
Separated	2 (66.7)	1 (33.3)	3 (100)	
Total	138 (48.8)	145 (51.2)	283 (100)	
Employment Status				
Employed	46 (39.3)	71 (60.7)	117 (100)	0.008**†
Unemployed	93 (55.7)	74 (44.3)	167 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Religion				
Islam	133 (48.9)	139 (51.1)	272 (100)	0.881‡
Hinduism	1 (100)	0 (0)	1 (100)	
Christianity	5 (45.5)	6 (54.5)	11 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Spoken Language (Ethnicity)				
Muhajir	32 (34.4)	61 (65.6)	93 (100)	0.001**†
Punjabi	32 (68.1)	15 (31.9)	47 (100)	
Pakhtun	17 (48.6)	18 (51.4)	35 (100)	
Sindhi	29 (63)	17 (37)	46 (100)	
Seraiki	10 (47.6)	11 (52.4)	21 (100)	
Balochi	7 (70)	3 (30)	10 (100)	
Hindko	9 (52.9)	8 (47.1)	17 (100)	
Bengali	0 (0)	2 (100)	2 (100)	
Other	3 (23.1)	10 (76.9)	13 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Transfused blood in past 1 year?				
Yes	11 (45.8)	13 (54.2)	24 (100)	0.833†
No	128 (49.2)	132 (50.8)	260 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Do not know	0 (0)	1 (100)	1 (100)	
Total	139 (49.1)	144 (50.9)	283 (100)	
Any type of injection or drip in past 1 year				
Yes	96 (48.7)	101 (51.3)	197 (100)	0.960‡
No	42 (50)	42 (50)	84 (100)	
Do not know	1 (33.3)	2 (66.7)	3 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Ever been Operated				
Yes	70 (59.3)	48 (40.7)	118 (100)	0.004**†
No	69 (41.6)	97 (58.4)	166 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
(Only for females) Has patient ever been pregnant, *n*=177				
Yes	86 (53.4)	75 (46.6)	161 (100)	0.037*†
No	4 (25)	12 (75)	16 (100)	
Total	90 (50.8)	87 (49.2)	177 (100)	
How delivery was done				
C-section	34 (40.5)	11 (15.3)		0.000**†
Normal	69 (82.1)	70 (97.2)		

Contd...

Table 3: Contd...

	Anti-HCV antibody			
	Positive, *n* (%)	**Negative, *n* (%)**	**Total, *n* (%)**	***P***
Where delivery was done				
Hospital	66 (77.6)	50 (68.5)		0.280†
Home	51 (60)	49 (67.1)		
Ever had dental treatment				
Yes	73 (54.1)	62 (45.9)	135 (100)	0.122†
No	66 (44.3)	83 (55.7)	149 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
(Only for Muslim Men) Have your parents ever told you how your circumcision happened, *n*=100				
Yes	39 (50)	39 (50)	78 (100)	0.332‡
No	3 (33.3)	6 (66.7)	9 (100)	
Do not know	4 (30.8)	9 (69.2)	13 (100)	
Total	46 (46)	54 (54)	100 (100)	
Mother have a test for HCV during pregnancy				
Yes	4 (44.4)	5 (55.6)	9 (100)	0.975‡
No	52 (50)	52 (50)	104 (100)	
Do not know	83 (48.8)	87 (51.2)	170 (100)	
Total	139 (49.1)	144 (50.9)	283 (100)	
Result of Mother's HCV test, *n*=9				
Positive	2 (100)	0 (0)	2 (100)	0.381‡
Negative	1 (25)	3 (75)	4 (100)	
Do not know	1 (33.3)	2 (66.7)	3 (100)	
Total	4 (44.4)	5 (55.6)	9 (100)	
Anyone in your home have HCV				
Yes	41 (65.1)	22 (34.9)	63 (100)	0.015*‡
No	94 (44.5)	117 (55.5)	211 (100)	
Do not know	4 (44.4)	5 (55.6)	9 (100)	
Total	139 (49.1)	144 (50.9)	283 (100)	
HCV in family members *n*=63				
Spouse	10 (100)	0 (0)	10 (100)	0.043*†
Parent	10 (47.6)	11 (52.4)	21 (100)	
Child	7 (77.8)	2 (22.2)	9 (100)	
Siblings	11 (68.8)	5 (31.3)	16 (100)	
Relative	7 (63.6)	4 (36.4)	11 (100)	
Do you share any of the items of personal use with family, *n*=63				
Yes	21 (77.8)	6 (22.2)	27 (100)	0.058‡
No	19 (55.9)	15 (44.1)	34 (100)	
Do not know	0 (0)	1 (100)	1 (100)	
Total	40 (64.5)	22 (35.5)	62 (100)	
Do you share items of personal use with anyone other than your family member?				
Yes	100 (46.7)	114 (53.3)	214 (100)	0.240‡
No	38 (55.1)	31 (44.9)	69 (100)	
Do not know	1 (100)	0 (0)	1 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Have you ever get any type of Tattoos on your body?				
Yes	9 (50)	9 (50)	18 (100)	1.000†
No	130 (48.9)	136 (51.1)	266 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	
Have ever gotten any piercings on any part of the body? i.e., ear and nose				
Yes	90 (50.3)	89 (49.7)	179 (100)	0.499‡
No	48 (46.2)	56 (53.8)	104 (100)	
Do not know	1 (100)	0 (0)	1 (100)	
Total	139 (48.9)	145 (51.1)	284 (100)	

Contd...

Table 3: Contd...

	Anti-HCV antibody			
	Positive, *n* (%)	**Negative, *n* (%)**	**Total, *n* (%)**	***P***
If yes so, where did you get it done from, *n*=179				
Shop	7 (25)	21 (75)	28 (100)	0.004**†
Doctor	1 (100)	0 (0)	1 (100)	
Home	66 (54.5)	55 (45.5)	121 (100)	
Street person	4 (57.1)	3 (42.9)	7 (100)	
Other	7 (87.5)	1 (12.5)	8 (100)	
Do not know	4 (30.8)	9 (69.2)	13 (100)	
Total	89 (50)	89 (50)	178 (100)	
Do you have sexual relationship with any man or woman?(other than your husband/wife)				
Yes	11 (39.3)	17 (60.7)	28 (100)	0.278‡
No	125 (49.6)	127 (50.4)	252 (100)	
No answer	1 (100)	0 (0)	1 (100)	
Total	137 (48.8)	144 (51.2)	281 (100)	

*P<0.05, **P<0.0001, †Pearson's Chi-square test, ‡Fisher's exact test

possible associated risk factors that play important role in disease development. Therefore, the current study was conducted with the purpose to develop a risk-based screening tool to identify suspects at increased risk of HCV infection in a high endemic population.

The highest percentage of HCV 27.3% was observed in the age group 31–40 years whereas the median age of study participants was 31–50.8 years. The results when compared with a similar study[13] conducted in the general population of Pakistan almost correlated with young patients of up to 40 years. However, when comparing with a second study published in 2019 at an outreach center for screening and treatment in Pakistan,[14] it was found that most older age people (>61 years) were positive. It may be due to the inability of patients to seek medical attention after appearing of symptoms due to various reasons like finances, etc., eventually seeking medical help at a later stage. However, enhanced screening at an early age can help detect more positive cases earlier on and linking them to treatment thus preventing complications. Moreover, gender trends similar to our study were observed in another study that indicated women being infected more at a ratio of 1:3.[14]

In our study, the multivariable analysis found marital status to be associated with HCV infection; this association was also evident in various international studies.[11,15] An interesting observation was that employment is also a significant risk factor of the disease, which is not much evaluated in our setting but it is found to be insignificant in western settings during a study.[16] Another risk factor that was identified in our study was the history of surgery which is also in agreement with other studies conducted in Pakistan.[17] Family history with HCV is one of the significant factors on our side which is similar to another study which concludes that there are 2.5 times greater chances of being positive if you have a positive family history as compared to the general population.[18] Considering this, it is recommended that active screening of the families of HCV infected patients be done routinely. Body piercing was also

Table 4: Multi Variable Logistic Analysis

Variables	Multivariable analysis	
	aOR (95% CI)	*P*
Overall cohort		
Marital status		
Never married	Ref	
Ever married	2.42 (1.03-5.7)	0.043*
Employment Status		
Unemployed	3.5 (1.6-7.6)	0.002*
Employed	Ref	
Ever operated		
Yes	2.04 (1.2-3.5)	0.011*
No	Ref	
Does anyone in your home have HCV		
Yes	2.5 (1.3-4.6)	0.005*
No	Ref	
Have you ever gotten any piercings on any part of the body? i.e., ear and nose		
Yes	0.33 (0.15-0.75)	0.005*
No	Ref	
Male cohort only		
Marital status		
Never married	Ref	
Ever married	2.98 (0.92-9.7)	0.069
Use of razor outside the home		
Yes	Ref	
No	0.44 (0.159-1.22)	0.114
Employment Status		
Unemployed	4.6 (1.14-18.71)	0.032*
Employed	Ref	
Ever operated		
Yes	2.4 (0.92-6.5)	0.073
No	Ref	
Does anyone in your home have HCV		
Yes	2.6 (0.9-7.3)	0.08
No	Ref	
Female cohort only		
Employment Status		
Unemployed	3.63 (1.2-10.6)	0.018*
Employed	Ref	
Ever operated		
Yes	1.97 (1.03-3.8)	0.041*
No	Ref	
Does anyone in your home have HCV		
Yes	2.14 (0.98-4.7)	0.057
No	Ref	
Employed cohort only		
Marital status		
Never married	Ref	
Ever married	3.2 (0.81-12.57)	0.096
Have you ever gotten any piercings on any part of the body? i.e., ear and nose		
Yes	0.281 (0.09-0.85)	0.024*
No	Ref	
Ever operated		
Yes	2.9 (1.1-7.96)	0.029*
No	ref	
Does anyone in your home have HCV		
Yes	1.910 (0.64-5.7)	0.245
No	ref	
Have you ever had dental treatment		
Yes	1.9 (0.64-5.7)	0.019*
No	ref	
Unemployed cohort only		
Gender		
Male	0.39 (0.113-1.33)	0.132
Female	ref	
Ever operated		
Yes	2.01 (1.03-3.92)	0.039*
No	ref	
Does anyone in your home have HCV		
Yes	2.5 (1.13-5.59)	0.024*
No	Ref	

Contd...

Table 4: Contd...

a significant HCV risk factor in our study but with inverse relation in contradiction to various other studies. However, others show no definitive evidence of an increased risk of acquiring HCV from receiving piercing in a professional parlor.[19]

While comparing results based on ethnicity, our study revealed that participants from Punjab and Sindh showed a higher percentage of HCV; this is correlating with the study showing prevalence in different provinces of Pakistan indicating higher percentages in these provinces.[6] It is assessed that effects on ethnicity remain the same and people hailing from a particular region while living in other areas of Pakistan are prone to the disease as per the ratio of their primary regions.

The factor of ever being pregnant is a significant risk factor that coincides with the high prevalence of HCV in pregnant women as correlated with other studies.[20]

In males ever married, the family history of HCV and ever operated have higher chances of positive anti-HCV which was significant in a previous study conducted on men.[21] On the other hand in females ever had surgery and positive family history are linked with positive anti-HCV and we obtained the same results in one of the local studies during screening healthy females for antenatal.[20]

In our study, the employed cohort showed an association of higher risk of anti-HCV with regards to body piercing, ever operated, and dental treatment. However, any other study comparing such cohort with risk factors was not available. These factors are thus considered significant while focusing on the general population.[19] The current study analyzed the association of many risk factors with HCV but did not find any significant difference in education, religion, pregnancies, history of blood transfusions and injection, dental treatment, circumcision, sharing of personal items, and sexual relationship other than a spouse in univariable analysis.[7,19] The possible reasons for the abovementioned results include

people only undertaking anti-HCV and not the polymerase chain reaction (PCR) recall biases and exclusion of high-risk populations such as healthcare workers, patients with hemodialysis and HIV, and intravenous (IV) drug abusers. Further research is recommended that includes these study populations for more generalizable results.

This study is aimed at developing a risk-based screening checklist, which can be validated in the future and administered among the general population for HCV screening. The strength of this study is that all possible risk factors were assessed among study participants in the questionnaire designed for the study. The limitation of the study is that we relied only on the anti-HCV result, which may have been positive or negative. Another limitation is that this study is a single centric study. A multicenter study is recommended by enrolling the heterogeneous population to further probe the HCV burden and incidence in our society with the intent to create awareness regarding hepatitis C, which may be achieved through commercial advertisement and free public lectures for disease prevention and better health of our society.

Conclusion

In light of the above study, it is concluded that we must screen people having risk factors for hepatitis C to decrease the burden of this communicable disease and its late consequences which cause irreversible changes and increase mortality

Final Recommendation

Using these risk factors, a multicenter study must be conducted so that this checklist validates for the screening of hepatitis C and we can make an early diagnosis and high cure rate.

Key Finding

People ever married, employed, had surgery or family history of HCV have high rate of anti-HCV infection, must undergo hepatitis C screening.

Ethical Statement

Interactive Research Development- Institute Review Board (IRD-IRB) reviewed the protocol for human subjects and issued approval to the study ID # IRD_IRB_2017_08_005

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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