DOI: https://doi.org/10.54393/pjhs.v5i05.1599

PAKISTAN JOURNAL OF HEALTH SCIENCES
https://thejas.com.pk/index.php/pjhs
ISSN (P): 2790-9352, (E): 2790-9344
Volume 5, Issue 5 (May 2024)

Original Article

Risk Factors and Prevalence of Hepatitis B and C in Badin City, Pakistan

Yasir Akbar Jamali[1*], Rukia Farzana[2], Jawad Ahmad Khan[3], Amjad Ali Mughal[4], Hira Saeed Khan[5] and Sadia Kazi[6]

[1]Department of Physiology, University of Sindh, Jamshoro, Pakistan
[2]Khairpur Medical College, Khairpur, Pakistan
[3]Department of Pharmacy, Shah Abdul Latif University, Khairpur, Pakistan
[4]Institute of Microbiology, Shah Abdul Latif University, Khairpur, Pakistan
[5]Department of Physiology, Suleman Roshan Medical College, Tando Adam, Pakistan
[6]Department of Pharmacology, Isra University, Hyderabad, Pakistan

ARTICLE INFO

Keywords:
Hepatitis B, Viral Infection, Blood Transfusion, Polymerase Chain Reaction

How to Cite:
Akbar Jamali, Y., Farzana, R., Khan, J. A., Mughal, A. A., Khan, H.S., & Kazi, S. (2024). Risk Factors and Prevalence of Hepatitis B and C in Badin City, Pakistan: Prevalence and Risk Factors of Hepatitis . Pakistan Journal of Health Sciences, 5(05). https://doi.org/10.54393/pjhs.v5i05.1599

***Corresponding Author:**
Yasir Akbar Jamali
Department of Physiology, University of Sindh, Jamshoro, Pakistan
yasirakbar021@gmail.com

Received Date: 16th April, 2024
Acceptance Date: 27th May, 2024
Published Date: 31st May, 2024

ABSTRACT

Hepatitis is a global health concern, and its ever increasing prevalence in Pakistan has highlighted the need to study its epidemiology and develop preventative strategies. **Objective:** To determine the frequency and identify the risk factors associated with hepatitis virus infections B and C among the population of Badin city. **Methods:** Seven hundred sixty-seven people were tested for Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) using immunochromatographic methods. Additional testing was performed on blood samples from individuals who tested positive for hepatitis, and quantitative Polymerase Chain Reaction (PCR) was used to determine the viral load. **Results:** A total of 767 individuals had hepatitis. Among these, the research found that HCV was more common than HBV. However, men were more affected than women. Data on the exposure to risk factors for hepatitis B and C among the patients in our study are presented in Table 2 Of the 767 respondents, 473 (61.7%) were shaved from a barber/beauty parlour. Approximately 358 (46.7%) patients with hepatitis reused syringes. Drug addiction was observed in 66 (8.6%) patients. A history of blood transfusion was observed in 73 patients (9.5 %). Obstetrical procedures, ear pricks, and nose piercings were reported in 195 (68.1%), 245 (85.7%) and 240 (83.9%) female patients with hepatitis, respectively. **Conclusions:** Barbers, blood transfusions, and intravenous drug use are the most common risk factors for the spread of HBV and HCV are barbers, blood transfusions, and Intravenous Drug Use (IDUs), although newer variables, including piercings of the nose and ears and IDPs, also contribute.

INTRODUCTION

Liver diseases caused by hepatitis B and C viruses are a major financial and medical burden worldwide; however, they are particularly severe in underdeveloped nations such as Pakistan [1]. Approximately 296 million people have chronic HBV, and 1.4 million people die each year. More than two billion people are exposed to the virus [2]. It is the sixth most common killer in the world, with East Asia and sub-Saharan Africa having the highest rates [3, 4]. With a carrier incidence of 3-5%, Pakistan is home to an estimated 7-9 million HBV carriers. Zahoor *et al.*, found that by 2030, 3.25 percent of Pakistani patients tested positive for HBV, and 6.36 percent tested positive for HCV [5]. Having a mother infected with HCV, having intercourse with a man, using intravenous drugs, being hospitalised, dental treatment, using contaminated surgical equipment, being circumcised by a barber, blood transfusions, thalassaemia, and haemophilia are the main risk factors of HCV infection in Pakistan [6]. The primary risk factors for herpes simplex virus (HBV) infection include being born into an infected family, having the virus cut out of the body by a barber or other unsanitary means, reusing syringes, undergoing surgery with contaminated instruments, receiving blood transfusions, therapeutic injections, use of non-sterile invasive medical devices, hospitalisation, and sexual

DOI: https://doi.org/10.54393/pjhs.v5i05.1599

contact [6, 7]. Following Egypt, the prevalence of HCV infection is highest in Pakistan [8]. A viral infection has been detected in one out of every 20 people in the nation [9, 10]. Exposures that occur in the course of medical treatment are believed to be the primary vector for the spread of HCV in Pakistan [9]. Factors contributing to the spread of this iatrogenic infection include insufficient screening of blood products and transfusions with tainted blood, inadequate cleaning of medical equipment, and reuse of both syringes and needles for therapeutic injections [9]. Additionally, it is believed that community-level exposures such as barbering, tattooing, and piercing play a significant role [11, 12]. A major factor in the spread of the herpes simplex virus (HCV) is the increasing prevalence of intravenous drug use in Pakistan [13]. According to a recent meta-analysis, injecting drug users (PWID) in Pakistan had a seroprevalence of 54% [14].

METHODS

From 1st January 2024 until 31st March 2024 researchers at the Civil Hospital in Badin collected the data. From individuals clinically suspected of having Hepatitis B or C, 845 blood samples were obtained. Patients were interviewed to gather personal details such as their medical history, sex, age, and pregnancy status. Following the manufacturer's instructions, the patients were tested for Hepatitis B surface Ag (HBs-Ag) and Anti-HCV antibodies using ELISA Kits (The Bio-kit ELISA system, BEST 2000). The data were analysed using the statistical program SPSS 26.0. We used the chi-square test to determine whether the link was statistically significant between two or more variables. To assess the relationship between the outcome and each independent variable, we used simple logistic regression analysis. We determined the Odds Ratios (OR) and 95% Confidence Intervals (CI) for each risk factor. Participants ranged from outpatients to inpatients at a Civil Hospital in Badin, Pakistan. Hepatitis B or C was confirmed by ICT/ELISA, and the participants had to be at least 18 years old to participate. Anyone not currently enrolled at the Civil Hospital Badin was automatically disqualified. This study was approved by the ethical review board of Shah Abdul Latif University in Khairpur (Dated 28-12-2023, Ref. No# IRB-C689). Patients at Civil Hospital Badin completed a questionnaire over the course of three months (1 January 2024–31 March 2024). Interviews were conducted in person using a standardised questionnaire after verbal agreement. Only multiple-choice questions were included in this survey. After translation into the respondent's native language, it was retranslated into English with the necessary adjustments already made.

RESULTS

Overall, 767 subjects tested positive for hepatitis C and C viral infections. Of, these481 (62.7%) were male and 286 (37.3 %) were female. 345 (44.9%) patients had hepatitis B and 422 (55%) patients had Hepatitis C. Majority 412 (53.7%) had primary school education. A total of 418 patients (54.5 %) were married. The highest frequency of 640 (83.4 %) hepatitis-positive patients belonged to the low-income class, and 115 (15%) of hepatitis-positive employees belonged to the middle-income class. Only 12 (1.5%) patients with hepatitis belonged to the high-income class table 1.

Table 1: Demographic Characteristics of the Study Population

Variables	Total N (%)	Male N (%)	Female N (%)	p-Value
	Total = 767	481 (62.7%)	286 (37.3%)	
Age				
18 – 30	145 (18.9%)	103 (21.4%)	42 (14.7%)	0.005
31 – 45	158 (20.6%)	61 (12.7%)	97 (33.9%)	
45 >	464 (60.5%)	317 (65.9%)	147 (51.4%)	
Hepatitis B	345 (44.9%)	231 (48%)	114 (39.9%)	0.027
Hepatitis C	422 (55%)	250 (52%)	172 (60.1%)	
Marital Status				
Single	339 (52.0%)	290 (60.3%)	49 (17.1%)	0.000
Married	418 (54.5%)	191 (39.7%)	227 (79.4%)	
Divorced/Separated/Widow	10 (1.3%)	0	10 (3.5%)	
Education				
Primary School	412 (53.7%)	270 (56.1%)	142 (49.7%)	0.000
Secondary School	138 (18%)	78 (16.2%)	60 (21%)	
Intermediate	40 (5.2%)	63 (13.1%)	27 (9.4%)	
Bachelor	40 (5.2%)	33 (6.9%)	7 (2.4%)	
Illiterate	87 (11.3%)	37 (7.7%)	50 (17.5%)	
Socio-Economic Status				
Lower Class	640 (83.4%)	431 (89.6%)	209 (73.1%)	0.000
Middle Class	115 (15%)	41 (8.5%)	74 (25%)	
Upper Class	12 (1.5%)	9 (1.9%)	3 (1.0%)	

Data on the exposure to risk factors for hepatitis B and C among the patients in our study are presented in Table 2. Of the 767 respondents, 473 (61.7%) were shaved from the barber/beauty parlour, and 315 (65.4%) male hepatitis patients were significantly higher than 158 (55.2%) female patients ($p = 0.004777$). Approximately 358 (46.7%) hepatitis patients reused syringes, although a significantly higher number of 190 (39.5%) male patients than 168 (58.7%) female hepatitis patients. Drug addiction was seen in 66 (8.6%) patients; among them, 56 (11.6%) were significantly higher than 10 (3.5%) female patients. A history of blood transfusion was found in 73 (9.5%) patients with hepatitis, with no gender significance Table 2. A total of 151 (19.7%) respondents reported sharing various items (Tooth-Brush, Hukkah, Miswak, Blades, Vax, and towel). Obstetrical procedures, ear pricks, and nose piercings were reported in 195 (68.1%), 245 (85.7%), and 240 (83.9%)

DOI: https://doi.org/10.54393/pjhs.v5i05.1599

female patients with hepatitis, respectively. Almost 74 (25.9%) of the 114 (14.9 %) female patients were significantly higher than 40 (8.3 %) male patients with a history of family hepatitis (p <0.00001). On the other hand, patients asked about Knowledge about the spread of hepatitis and 283 (36.9%) of patients responded with no gender difference. The use of tattooing was also observed in 34 respondents (4.4 %). A total of 108 (14.1%) patients were vaccinated against hepatitis B virus infection. A dental treatment history was reported in 48 patients (6.3%) (Table 2).

Table 2: Risk Factors of the Study Population According to Sex

Variables	Total N (%)	Male N (%)	Female N (%)	p-Value
	Total = 767	481 (62.7%)	286 (37.3%)	
Blood Transfusion				
Yes	73 (9.5%)	45 (9.4%)	28 (9.8%)	0.842
No	694 (90.5%)	436 (90.6%)	258 (90.2%)	
Surgery				
Yes	224 (29.2%)	24 (5%)	200 (69.9%)	0.000
No	543 (70.8%)	457 (95%)	86 (30.1%)	
History of Hepatitis				
Yes	114 (14.9%)	40 (8.3%)	74 (25.9%)	0.000
No	653 (85.1%)	441 (91.7%)	212 (74.1%)	
Ever Admitted to a Hospital				
Yes	237 (30.9%)	113 (23.5%)	124 (43.4%)	0.000
No	530 (69.1%)	368 (76.5%)	162 (56.6%)	
Obstetrical Procedure				
Yes	195 (25.4%)	0	195 (68.1%)	0.000
No	537 (70.0%)	481 (100%)	56 (19.6%)	
Ear Prick				
Yes	248 (32.3%)	3 (0.6%)	245 (85.7%)	0.000
No	519 (67.7%)	478 (99.4%)	41 (14.3%)	
Nose Piercing				
Yes	245 (31.9%)	5 (1%)	240 (83.9%)	0.005
No	522 (68.1%)	476 (99%)	46 (16.1%)	
Dental Treatment				
Yes	48 (6.3%)	30 (6.2%)	18 (6.3%)	0.974
No	719 (93.7%)	451 (93.8%)	268 (93.7%)	
Use of Syringes				
Yes	731 (95.3%)	460 (95.6%)	271 (94.8%)	0.577
No	36 (4.7%)	21 (4.4%)	15 (5.2%)	
Drug Addiction				
Yes	66 (8.6%)	56 (11.6%)	10 (3.5%)	0.000
No	701 (91.4%)	425 (88.4%)	276 (95.5%)	
Sharing of Various Items (Tooth Brush, Hukaah, Miswak, Blades, Wax Towel)				
Yes	151 (19.7%)	95 (19.8%)	56 (19.6%)	0.954
No	616 (80.3%)	386 (80.2%)	230 (80.4%)	
Use of Reuse Syringes				
Yes	358 (46.7%)	190 (39.5%)	168 (58.7%)	0.000
No	349 (45.5%)	231 (48.0%)	118 (41.3%)	
Shave from Barber/Beauty Parlor				
Yes	473 (61.7%)	315 (65.4%)	158 (55.2%)	0.005
No	294 (38.3%)	166 (34.5%)	128 (44.8%)	
Hepatitis B Vaccination				
Yes	108 (14.1%)	75 (15.6%)	33 (11.5%)	0.118
No	659 (85.9%)	406 (84.4%)	253 (88.5%)	
Family History of Hepatitis				
Yes	157 (20.5%)	45 (9.4%)	112 (39.2%)	0.000
No	610 (79.5%)	436 (90.6%)	174 (60.8%)	
Knowledge about Spread of Hepatitis				
Yes	283 (36.9%)	170 (35.3%)	113 (46.5%)	0.247
No	484 (63.1%)	311 (64.6%)	173 (60.4%)	
Ever had Tattooing				
Yes	34 (4.4%)	25 (5.2%)	9 (3.1%)	0.182
No	733 (95.6%)	456 (94.8%)	277 (96.9%)	

DISCUSSION

Various environmental and behavioural risk factors contribute to the development of hepatitis, a highly infectious viral illness [15]. The purpose of this research was to track the incidence of hepatitis and its correlations with potential risk factors among people living in Badin City. Among the individuals surveyed, 55% had HCV, and 44.9% had HBV. Compared to HBV, which was shown to be 8.4% more prevalent in Punjab, Pakistan, another study found that HCV was 42.7% more prevalent [16]. In the Taiwanese population, 9.9% of HBV cases have been reported compared to four percent of HCV cases [17]. In the current study, 473 (61.7%) patients with hepatitis were shaved from a barber/beauty parlour. Various studies have determined the specific prevalence rates associated with barbers. Ali *et al.*, in 2023 and Naqvi *et al.*, in 2019 reported frequencies of 21.4% and 59.2%, respectively, while Noreen *et al.*, in 2022 observed a rate of for HBV 22.3% and HCV 31% for HCV among barbers [18-20]. Blades and razors that have not been sterilised may spread the illness if they come into contact with blood borne viruses. Research from around Pakistan has shown that barbers are a major vector for the spread of viral hepatitis [21, 22]. Approximately 358 (46.7%) patients with hepatitis reused syringes in our study. A study conducted in hospitals, clinics, and healthcare personnel in poor nations showed that they are more likely to reuse used medical needles, particularly among low-income families and people. Recycling trash and medical waste is a common activity among children from low-income households, putting them at increased risk of infection [23]. A nationwide poll conducted from 2007 to 2008 anticipated that 86% of women would inject themselves using an unopened packet for their previous injection [24]. Therapeutic injection is the second option [21, 25]. In the present study, drug addiction was observed in 66 patients (8.6 %). Intravenous drug use has been identified as a significant risk factor for the spread of viral infections through human contact in Pakistan, as reported by Irshad *et al.*, in 2021, with HBV and HCV rates of 19 (10%) [26]. Additionally, Noreen *et al.*, in 2022 highlighted this risk

DOI: https://doi.org/10.54393/pjhs.v5i05.1599

factor in 17.8% of cases, and Bibi *et al.*, in 2013 found it to be a concern for pregnant women 2.46% [20, 27]. A history of blood transfusion was observed in 73 (9.5%) patients with hepatitis. The main ways in which bloodborne infections may spread are through blood donations and transfusions. The association of this factor with HCV infection has been extensively documented in the literature. Various studies have confirmed this finding, including Ali *et al.*, in 2016, with a prevalence of 2.15%; Akhtar *et al.*, in 2016, 8.9%, and Rana *et al.*, in 2020, 43.3%, and Saleem *et al.*, in 2020, 1.8% [18, 28-30]. In our study, ear prick and nose piercing were reported in 245 (85.7%) and 240 (83.9%) women, respectively. The spread of bloodborne diseases is related to anything that might inadvertently cause blood injuries or leakage. Historically, more Pakistani women have pierced their ears and nose, putting them at a greater risk of infection [31, 32]. The equipment used to pierce the ears and nose is not usually sterilised. According to one study, hepatitis C was found in 17.8% of patients with pierced ears or nose [18]. A dental treatment history was reported in 48 patients(6.3 %). Needless to say, there is a much higher risk of blood contamination and needlestick accidents during dental procedures since the majority of dental professionals do not utilise sterile devices, which contributes to the spread of the disease [33]. In our study, 481 (62.7%) male patients had more than 286 (37.3%) females. It is more common in men than in women, according to the research [34]. Noreen *et al.*, conducted a study on low socioeconomic communities and found a higher prevalence of hepatitis C in male 5%) than in female 3%) [20]. Pakistani men are more likely to spend time outdoors, have an array of sexual partners, sometimes engage in gay behavior, and be subjected to communal barbering and circumcision practices, according to the study. In the present study, 108 (14.1 %) patients were vaccinated against hepatitis B virus infection. As they participate in mass vaccination campaigns that entail injections, vaccine providers may potentially increase the risk of infection. Viral infections may sometimes be transmitted from infected to uninfected individuals during vaccination via contaminated blood [32]. Tattooing was also observed in 34 respondents (4.4 %). Since tattooing is less common in Pakistan than in Europe and Africa, there is an unknown risk factor associated with it. Very few studies have been published on HCV infection in Pakistan. A previous study conducted by Noreen *et al.*, in 2022 reported a significant association, whereas another study conducted by Alibrahim *et al.*, in 2018 observed that 1.5 of patients reported tattooing [20, 32]. A total of 151 (19.7 %) respondents reported sharing various items (Tooth-Brush, Hukkah, Miswak, Blades, Vax, and towel). Interactions, which are inevitable in a family setting but may sometimes be harmful, are inevitable. The virus can also be transmitted through contact with an infected household, as shown in studies of HCV by Shafiq *et al.*, in 2015 and Bibi *et al.*, in 2013 and Akhtar *et al.*, in 2015 [7, 27, 34]. In this study, 640 (83.4%) hepatitis-positive patients belonged to the low-income class and 115 (15%) were hepatitis-positive employees from the middle-income class. Only 12 (1.5%) patients with hepatitis belonged to the high-income class. A study conducted in Isfahan, Iran, by Ataei *et al.*, in 2019 found a 75.3% low-income rate of hepatitis [35]. Not only does a country's population vary greatly depending on its socioeconomic conditions, but the same is also true for other nations. Others who are well off may afford private healthcare providers and pristine facilities, while others with less means must make do with public health services that are underfunded. Only one study identified a statistically significant correlation between socioeconomic level and viral transmission, as opposed to other studies that cited it as a significant issue among low-income individuals and manufacturing workers [28, 36]. In our study, On the other hand patients asked about Knowledge about spread of hepatitis and 283 (36.9%) of patients response. Mansour-Ghanaei *et al.*, determined the low level of knowledge toward HBV among medical students in Iran and suggested more training for students [37]. In healthcare professional research, medical students' awareness was found to be lower than that of other study groups, with excellent knowledge 15.59 ± 3.69 and an analysis of variance (ANOVA) score of 11.57 ± 2.16, out of a total possible score of 22 [38].

CONCLUSIONS

The most common forms of hepatitis in underdeveloped nations are types B and C. The most common vectors for the spread of HIV are barbers, blood transfusions, and Intravenous Drug Use (IDUs), although newer variables, including piercings of the nose and ears and IDPs, also contribute. Many investigations have failed to identify virus-related risk variables because it is difficult to trace the history of the virus in patients.

Acknowledgement

The authors acknowledge the teaching and non-teaching staff at the University of Punjab for providing support.

Authors Contribution

Conceptualization: YAJ, SK
Methodology: RF, AAM
Formal analysis: JAK
Writing, review and editing: HSK

All authors have read and agreed to the published version of the manuscript.

DOI: https://doi.org/10.54393/pjhs.v5i05.1599

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Kulkarni AV and Duvvuru NR. Management of hepatitis B and C in special population. World Journal of Gastroenterology. 2021 Oct; 27(40): 6861. doi: 10.3748/wjg.v27.i40.6861.

[2] Al-Busafi SA and Alwassief A. Global Perspectives on the Hepatitis B Vaccination: Challenges, Achievements, and the Road to Elimination by 2030. Vaccines. 2024 Mar; 12(3): 288. doi: 10.3390/vaccines12030288.

[3] Anwar F, Khan M, Salman M, Ahmad S, Ullah F, Khan J *et al.* Seroprevalence of hepatitis B virus in human population of district Buner Khyber Pakhtunkhwa Pakistan. Clinical Epidemiology and Global Health. 2021 Apr; 10: 100688. doi: 10.1016/j.cegh.2020.100688.

[4] Dekker SE, Green EW, Ahn J. Treatment and prevention of acute hepatitis B virus. Clinics In Liver Disease. 2021 Nov; 25(4): 711-24. doi: 10.1016/j.cld.2021.06.002.

[5] Zahoor S, Khan A, Asif S, Tabraiz SA, Mustafa H, Ansar S *et al.* Past and future perspectives for hepatitis B and C in Pakistan. Cureus. 2021 Aug; 13(8): e17521. doi: 10.7759/cureus.17521.

[6] Seerat I, Mushtaq H, Rafiq M, Nadir A. Frequency and associated risk factors of hepatitis B virus and hepatitis C virus infections in children at a hepatitis prevention and treatment clinic in Lahore, Pakistan. Cureus. 2020 May; 12(5). doi: 10.7759/cureus.7926.

[7] Shafiq M, Nadeem M, Sattar Z, Khan SM, Faheem SM, Ahsan I *et al.* Identification of risk factors for hepatitis B and C in Peshawar, Pakistan. HIV/AIDS-Research and Palliative Care. 2015 Aug: 223-31. doi: 10.2147/HIV.S67429.

[8] Abbas Z and Abbas M. The cost of eliminating hepatitis C in Pakistan. The Lancet Global Health. 2020 Mar; 8(3): e323-4. doi: 10.1016/S2214-109X(20)30036-X.

[9] Al Kanaani Z, Mahmud S, Kouyoumjian SP, Abu-Raddad LJ. The epidemiology of hepatitis C virus in Pakistan: systematic review and meta-analyses. Royal Society Open Science. 2018 Apr; 5(4): 180257. doi: 10.1098/rsos.180257.

[10] Mansoor M, De Glanville WA, Alam R, Aslam K, Ahmed M, Isaakidis P *et al.* Prevalence and risk factors for hepatitis C virus infection in an informal settlement in Karachi, Pakistan. PLOS Global Public Health. 2023 Sep; 3(9): e0002076. doi: 10.1371/journal.pgph.0002076.

[11] Qureshi H, Bile KM, Jooma R, Alam SE, Afrid HU. Prevalence of hepatitis B and C viral infections in Pakistan: findings of a national survey appealing for effective prevention and control measures. EMHJ-Eastern Mediterranean Health Journal. 2010; 16: 15-23. doi: 10.26719/2010.16.

[12] Trickey A, May MT, Davies C, Qureshi H, Hamid S, Mahmood H *et al.* Importance and contribution of community, social, and healthcare risk factors for hepatitis C infection in Pakistan. The American Journal of Tropical Medicine and Hygiene. 2017 Dec; 97(6): 1920. doi: 10.4269/ajtmh.17-0019.

[13] Ghazal P. Rising trend of substance abuse in Pakistan: a study of sociodemographic profiles of patients admitted to rehabilitation centres. Public Health. 2019 Feb; 167: 34-7. doi: 10.1016/j.puhe.2018.10.020.

[14] Shayan SJ, Nazari R, Kiwanuka F. Prevalence of HIV and HCV among injecting drug users in three selected WHO-EMRO countries: a meta-analysis. Harm Reduction Journal. 2021 May; 18(1): 59. doi: 10.1186/s12954-021-00505-4.

[15] Mokhtari M, Basirkazeruni H, Rostami M. The correlation between different risk factors of hepatitis C and different genotypes. Advanced Biomedical Research. 2017 Jan; 6(1): 45. doi: 10.4103/2277-9175.204588.

[16] Khan A, Afzal S, Yaqoob A, Fatima R, Ul Haq M, Junaid K *et al.* Epidemiology of viral hepatitis B and C in Punjab, Pakistan: a multicenter cross-sectional study, 2017-18. F1000Research. 2019 Dec; 8: 2065. doi: 10.12688/f1000research.20174.1.

[17] Huang WC, Lin YC, Chen PJ, Hsu NT, Tu CL, Chang TS *et al.* Community-based screening for hepatitis B and C infectivity using two quantitative antigens to identify endemic townships. Viruses. 2022 Feb; 14(2): 304. doi: 10.3390/v14020304.

[18] Ali F, Tahir M, Ali W, Habib M, Zeeshan M, Ullah H. Hepatitis B and C: Prevalence and Evaluation of its Associated Risk Factors in General Population of Okara District. The Journal of Microbiology and Molecular Genetics. 2023 Dec; 4(3): 95-105. doi: 10.52700/jmmg.v4i3.125.

[19] Naqvi IH, Talib A, Baloch G, Mahmood K, Qadari Z. Hepatitis B and C: frequency, modes of transmission and risk factors along with some unorthodox routes of spread. Pakistan Journal of Public Health. 2019 Sep; 9(3): 161-5. doi: 10.32413/pjph.v9i3.273.

[20] Noreen A, Adnan F, Alam N, Syed Z, Aftab A, Shamim F *et al.* Prevalence and Associated Risk Factors

DOI: https://doi.org/10.54393/pjhs.v5i05.1599

Analysis of Hepatitis B & C Infections in the Low Socioeconomic Communities; A Cross-Sectional Study from Pakistan. 2022 Mar; 17(5): 291-303. doi: 10.2217/fvl-2021-0060.

[21] Asad M, Ahmed F, Zafar H, Farman S. Frequency and determinants of Hepatitis B and C virus in general population of Farash Town, Islamabad. Pakistan Journal of Medical Sciences. 2015 Nov; 31(6): 1394. doi: 10.12669/pjms.316.7047.

[22] Khan M, Hussain U, Irshad A, Khan A. Prevalence of hepatitis B and C seropositivity in patients presenting for dental treatment. Pakistan Oral and Dental Journal. 2015 Jun; 35(2): 250-253.

[23] Maan MA, Fatma H, Muhammad J. Epidemiology of hepatitis C viral infection in Faisalabad, Pakistan: a retrospective study (2010-2012). African Health Sciences. 2014 Dec; 14(4): 810-4. doi: 10.4314/ahs.v14i4.6.

[24] Janjua NZ and Nizamy MA. Knowledge and practices of barbers about hepatitis B and C transmission in Rawalpindi and Islamabad. Journal of Pakistan Medical Association. 2004 Mar; 54(3): 116-9.

[25] Hussain S and Ali Z. Prevalence of hepatitis B virus in the Kurram Agency, Pakistan: A 5-year observational study in a war-affected region. Journal of Clinical Virology. 2016 Sep; 82: 17-9. doi: 10.1016/j.jcv.2016.06.009.

[26] Irshad H, Aziza F, Rahman AU. Frequency and associated risk factors of hepatitis B and C infection in Tehsil fort Abbas, Pakistan. Pakistan Journal of Medical Research. 2021 May; 60(1): 44-8.

[27] Bibi S, Dars S, Ashfaq S, Qazi RA, Akhund S. Seroprevalence and risk factors for hepatitis C virus (HCV) infection in pregnant women attending public sector tertiary care hospital in Hyderabad Sindh. Pakistan Journal of Medical Sciences. 2013 Apr; 29(2): 505. doi: 10.12669/pjms.292.3211.

[28] Akhtar N, Ilyas M, Muhammad K, Shams S, Saeed K, Asadullah A. Prevalence of Hepatitis C virus infections among the general population of Buner, Khyber Pakhtunkhwa, Pakistan. Biomedical Research and Therapy. 2016 Dec; 3(12): 1003-17. doi: 10.15419/bmrat.v3i12.139.

[29] Rana NA, Munir B, Hussain N, Imtiaz N. Seroprevalence, biochemical investigation and risk factor assessment for HBV & HCV Infection in Hospital Based Patients of Islamabad, Pakistan. Journal of Bioresource Management. 2020; 7(2): 2. doi: 10.35691/JBM.0202.0127.

[30] Saleem HA, Roman U, Mughal HH. Prevalence of Hepatitis B and C and associated risk factors in rural areas of Punjab. Pakistan Journal of Medical and Health Sciences. 2020 Oct; 14(4): 2062-3.

[31] Memon AR, Shafique K, Memon A, Draz AU, Rauf MU, Afsar S. Hepatitis B and C prevalence among the high risk groups of Pakistani population. A cross sectional study. Archives of Public Health. 2012 Dec; 70: 1-6. doi: 10.1186/0778-7367-70-9.

[32] Alibrahim OA, Misau YA, Mohammed A, Faruk MB, Izzeldin SS. Prevalence of hepatitis C viral infection among injecting drug users in a Saudi Arabian hospital: a point cross sectional survey. Journal of Public Health in Africa. 2018 May; 9(1): 726. doi: 10.4081/jphia.2018.726.

[33] Fayyaz M, Ghous SM, Ullah F, Abbas I, Ahmed N, Ahmed A. Frequency of hepatitis B and C in patients seeking treatment at the dental section of a tertiary care hospital. Journal of Ayub Medical College Abbottabad. 2015 Jun; 27(2): 395-7.

[34] Akhtar AM, Majeed S, Jamil M, Rehman A. Prevalence of hepatitis C infection: General patients attending various hospitals of Lahore, Pakistan: a cross sectional study. The Professional Medical Journal. 2015 Nov; 22(11): 1390-6. doi: 10.29309/TPMJ/2015.22.11.861.

[35] Ataei B, Alavian SM, Shahriari-Fard F, Rabiei AA, Safaei A, Rabiei A *et al.* A case-control study of risk factors for hepatitis B infection: A regional report among Isfahanian adults. Journal of Research in Medical Sciences. 2019 Jan; 24(1): 22. doi: 10.4103/jrms.JRMS_761_18.

[36] IJAZ RR and Bhatti S. Risk of hepatitis C in factory workers and their relatives. Biomedica. 2013; 29(1): 42-3.

[37] Mansour-Ghanaei R, Joukar F, Souti F, Atrkar-Roushan Z. Knowledge and attitude of medical science students toward hepatitis B and C infections. International Journal of Clinical and Experimental Medicine. 2013; 6(3): 197-205.

[38] Ali A, Khan S, Malik SM, Iqbal MH, Aadil M. Comparison of knowledge and attitudes regarding hepatitis B among healthcare professionals in Pakistan. Cureus. 2017 Feb; 9(2): e1049. doi: 10.7759/cureus.1049.