INTRODUCTION

Hepatitis is an inflammatory condition of the liver, most commonly caused by a viral infection. Of these viruses, hepatitis B virus (HBV) and hepatitis C virus (HCV) infections account for a substantial proportion of liver diseases worldwide. They are the major causes of severe liver disease, including hepatocellular carcinoma and cirrhosis-related end-stage liver disease.

Both HBV and HCV are blood-borne viruses with distinct routes of transmission. Modes of infection are more or less similar. HBV can be prevented with vaccine which is not possible in case of HCV.

Globally, Hepatitis B has been found to infect about 350 million people and result in 563,000 deaths annually. Most commonly, HBV infection is
acquired by vertical transmission from an HBsAg positive mother or via horizontal transmission in childhood\textsuperscript{6} through blood and blood products and unsafe sexual contacts, intrafamilial transmission is also reported.\textsuperscript{6}

Globally, hepatitis C virus (HCV) has infected an estimated 130 million people, most are chronically infected. HCV-infected people act as a reservoir for transmission to others and are at risk for developing chronic liver disease, cirrhosis, and primary hepatocellular carcinoma (HCC). Worldwide, HCV accounts for 27% of cirrhosis and 25% of HCC worldwide.\textsuperscript{7} The major modes\textsuperscript{8,9} of HCV transmission are use of contaminated needles and instruments in medical practice, unsafe blood and blood product transfusion, intravenous drug use, face and armpit shaving with unsterilized instruments by barbers, ear and nose piercing, poor personal hygiene habits and treatment (practice by non-qualified people). In Pakistan,\textsuperscript{10} the single most important cause of HCV transmission is lack of proper screening of the transfusion blood.

Pakistan\textsuperscript{11,12} is among the worst afflicted nations due its large population (165 million) and intermediate to high rates of infection. Estimated prevalence of chronic carrier state of Hepatitis B amongst high-risk groups in Pakistan\textsuperscript{13} ranges from 6-12% whereas prevalence of Hepatitis C in the high-risk population is much higher - ranging from 15-25%. More ever, it has also been estimated that in general population chronic carriers of Hepatitis C and Hepatitis B is 5% and 3% respectively.

These viruses are present in the saliva\textsuperscript{14} or blood of an infected patient therefore dentists and dental health care workers are at a high risk of acquiring infection. In Pakistan,\textsuperscript{15-18} several previously conducted studies have shown different prevalence rates of HBV and HCV infection in general population. Many studies are also conducted on prevalence of HBV and HCV in dental patients, but no data is available on finding the risk factors for HBV and HCV in dental patient. Therefore the present study was designed to screen out adult patients for HBV and HCV infections, visiting KCD for different dental treatments and to identify the associated risk factors.

METHODS

The present study was conducted at Khyber College of Dentistry Peshawar during the year 2013. Outdoor patients, referred from different sections of KCD, aged > 15 years and of both sexes were included in the study. The patients had different dental problems and visited for the treatments like scaling, dental extraction, dental filling, root canal treatment, minor oral/maxillofacial surgery. A total of 1540 participants were included in the study. Institutional ethical approval was taken and informed consent was taken from every patient. In patients age 16-17 years consent was taken from the parents/guardians. Brief personal, family and medical history was taken on a structured performa and data was analyzed using Epi info version 6.

The blood samples of all these patients were taken in the KCD lab under strict aseptic conditions by a qualified technician. Gel tubes were used for collection of blood samples (5ml). Sera were collected from these samples and were screened for HBsAg and Anti HCV using immunochromatography technique (ICT) in the PMRC (Pakistan Medical Research Council) labs of Khyber Medical College Peshawar. Positive tests were confirmed by ELISA method.

Test results were kept strictly confidential and were only conveyed to the participants. Those with a positive test result were given advice for further testing and treatment, and were referred to the nearest government health facility.

RESULTS

A total of 1540 patients were screened during the study. Among these 561(36.4%) were males and 979(63.6%) females. The percentage of married and educated participants was 1265(82.1%) and 361(23.4%) respectively. On screening, 33(2.14%) were found to be HBsAg positive of which 14(2.5%) were males and 19(1.9%) were females. HCV was found positive in 46(2.98%) individuals. Male and female distribution was 1.6% and 3.8% respectively. Overall percentage of HBV and HCV was 79(5.12%) as shown in Table-I.

Table-I: Overall Prevalence of HBV & HCV in patients of KCD Peshawar.

| Variables       | N (1540) | %   |
|-----------------|----------|-----|
| Male            | 561      | 36.4|
| Female          | 979      | 63.6|
| Married         | 1265     | 82.1|
| Educated        | 361      | 23.4|
| HBsAg Positive  | 33       | 2.14|
| Male            | 14       | 2.5 |
| Female          | 19       | 1.9 |
| HCV Positive    | 46       | 2.98|
| Male            | 9        | 1.6 |
| Female          | 37       | 3.8 |
| HBV & HCV Positive | 79 | 5.12|
A previous history of dental treatment like extraction, scaling and filling, 14 (5.4%) were HBsAg positive, while it was not a significant risk factor in case of HCV.

Results show that 13 (3.7%) dental patients having a history of therapeutic injections were positive for HBsAg having p < 0.02 (Table-III). Anti-HCV antibody was positive in 11 (3.1%) cases with previous history of therapeutics injections [OR 2.69; CI 1.35-5.41].

History of blood transfusion and surgical operation: HBsAg was reported as positive in 4 (11.5%) patients having a history of blood transfusion with statically significant value p < 0.001. On other hand 5 (14.3%) cases were positive for anti-HCV antibody in previously blood transfused patients with a significant value of p<0.0007 (5.4%) cases were positive for HBsAg having a history of surgical operation. Anti-HCV antibody was positive in 11 (6.5%) cases with a history of surgical operation having a significant value p<0.002 and p<0.003 respectively.

Dental treatment: Among 274 (17.8%) patients with a previous history of dental treatment like extraction, scaling and filling, 14 (5.4%) were HBsAg positive having a statistically significant value p<0.02, while it was not a significant risk factor in case of HCV.

Haemodialysis: There was only one case reported as HBsAg positive in dental patients with a previous history of haemodialysis.

Sharing of tooth brush/clippers: These were significant risk factors in case of HBV and HCV with statistically significant value p<0.0004 and p<0.05 respectively.

Visit to barber/piercing ear & nose: In case of HBsAg positive cases, 9 (1.7%) visited barber shop [OR 0.19; CI 0.04-0.72] and 17 (1.9%) were having experience of piercing ear & nose with significant value p<0.05.

**DISCUSSION**

The overall prevalence of of HBV and HCV in this study was 79 (5.12%). On screening, 33 (2.14%) were found to be HBs Ag positive while HCV positive accounted for 46 (2.98%). Viral Hepatitis is a major problem throughout the world. There have been studies regarding the prevalence of hepatitis B surface antigen (HBsAg) and anti-hepatitis C antibody (HCVab). However, the majority of these have reported a variety of rates, depending on their study population, which limits the generalizability of their results to the general population. On the other hand, cultural diversity in the different cities of Pakistan also necessitates the performing separate population-based studies in the various regions.

A review study conducted by Huma et al 19 on prevalence and risk factors of HBV and HCV in general population of Pakistan and showed an overall prevalence in adults 2.4% for HBV and 3.0% for HCV. Another study conducted by Javed et al 20 reported an overall prevalence of 2.8% for HBV and 3.19% for HCV in general population of NWFP.

A similar study conducted on the dental patients visiting Bacha Khan Medical & Dental College 21 showed a prevalence of 7.75% for HCV and 7.0% HBV with no significant difference in males and females. This ratio is quite higher than what we found in our study. However, there is statistical significance among gender based prevalence in HBV as well HCV.

Another study conducted at dental sector of Ayub Medical College Abbottabad, 22 showed total infection with HBV & HCV as 4.1% which is quite lower than our findings. The percentage of female was higher that correlates with our findings. However, in above mention studies HCV is more prevalent than HBV.

Another study conducted by Dilhan et al in Istanbul 23 on dental patients showed almost similar prevalence of HBV i.e. 2.3% but a lower prevalence of HCV i.e. 0.1%. However, males were more prone to be infected in contrast to our study.
Table III: Risk factors associated with the prevalence of HBV and HCV in dental patients.

| Risk Factor                        | Patients (1540) | Hepatitis B Positive (N=33) | Hepatitis C Positive (N=46) |
|------------------------------------|----------------|-----------------------------|-----------------------------|
|                                    | N  | %  | N  | %  | OR (95% CI) | P   | N  | %  | OR (95% CI) | P   |
| Male                               | 561 | 36.4 | 14 | 2.5 | 1.45 (0.63-2.61) | 0.47 | 9  | 1.6 | 0.41 (0.19-0.87) | 0.01 |
| Female                             | 979 | 63.6 | 19 | 1.9 |             |      | 37 | 3.8 |             |      |
| Married                            | 1265 | 82.1 | 29 | 2.3 | 1.59 (0.55-4.56) | 0.38 | 43 | 3.4 | 3.19 (0.98-10.36) | 0.14 |
| Unmarried                          | 275  | 17.9 | 4  | 1.5 |             |      | 3  | 1.1 |             |      |
| Educated                           | 361  | 23.4 | 8  | 2.2 | 1.05 (0.47-2.34) | 0.91 | 9  | 2.5 | 0.79 (0.37-1.66) | 0.54 |
| Un-Educated                        | 1179 | 76.6 | 25 | 2.1 |             |      | 37 | 3.1 |             |      |
| Spouse patient of Hep B/C          |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 25  | 2    | 2  | 8   | 4.60 (1.02-20.67) | 0.02 | 7  | 28  | 9.64 (3.92-23.75) | 0.0001 |
| No                                 | 1240 | 98   | 23 | 1.9 |             |      | 36 | 2.9 |             |      |
| Hx jaundice Self                   |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 519 | 33.7 | 15 | 2.9 | 1.67 (0.83-3.32) | 0.14 | 15 | 2.9 | 0.95 (0.51-1.77) | 0.87 |
| No                                 | 1021 | 66.3 | 18 | 1.8 |             |      | 31 | 3.0 |             |      |
| Hx. Injections                     |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 351 | 22.8 | 13 | 3.7 | 2.25 (1.11-4.57) | 0.02 | 11 | 3.1 | 2.69 (1.34-5.41) | 0.003 |
| No                                 | 1189 | 77.2 | 20 | 1.7 |             |      | 35 | 2.9 |             |      |
| Hx. Blood Transfusion              |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 35  | 2.3  | 4  | 11.5 | 6.57 (2.18-19.81) | 0.001 | 5  | 14.3 | 5.91 (2.18-16.01) | 0.0007 |
| No                                 | 1505 | 97.7 | 29 | 2.1 |             |      | 41 | 2.7 |             |      |
| Surgical Operation                 |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 167 | 10.8 | 9  | 5.4 | 3.20 (1.46-7.01) | 0.002 | 11 | 6.5 | 2.69 (1.34-5.41) | 0.003 |
| No                                 | 1373 | 89.2 | 24 | 1.7 |             |      | 35 | 2.5 |             |      |
| Previous Dental treatment          |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 274 | 17.8 | 9  | 3.3 | 1.76 (0.81-3.82) | 0.15 | 14 | 5.4 | 2.08 (1.09-3.94) | 0.02 |
| No                                 | 1266 | 82.2 | 24 | 1.9 |             |      | 32 | 2.5 |             |      |
| Sharing of clippers                |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 1517 | 98.5 | 33 | 2.2 |             | 0.47 | 42 | 2.7 | 0.13 (0.04-0.41) | 0.0004 |
| No                                 | 23  | 1.5  | 0  | 0   |             |      | 4  | 17.4 |             |      |
| Sharing of tooth brush             |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 27  | 1.7  | 2  | 7.4 | 3.82 (0.87-16.86) | 0.05 | 1  | 3.7 | 1.25 (0.16-9.45) | 0.82 |
| No                                 | 1513 | 98.3 | 31 | 2.04 |             |      | 45 | 2.9 |             |      |
| Trimmer/Blade                      |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 434 | 77.5 | 9  | 2.1 | 0.87 (0.23-3.26) | 0.83 | 8  | 1.8 | 2.30 (0.28-18.6) | 0.42 |
| No                                 | 126  | 22.5 | 3  | 2.4 |             |      | 1  | 0.8 |             |      |
| Visit to Barber Shop               |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 525 | 93.8 | 9  | 1.7 | 0.19 (0.04-0.72) | 0.03 | 9  | 1.7 | -             | 0.43 |
| No                                 | 35  | 6.2  | 3  | 8.6 |             |      | 0  | 0  |             |      |
| Ear/Nose pierced                   |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 877 | 89.5 | 17 | 1.9 | 0.38 (0.13-1.07) | 0.05 | 31 | 4.2 | 1.22 (0.37-4.07) | 0.74 |
| No                                 | 103 | 10.5 | 5  | 4.9 |             |      | 3  | 1.1 |             |      |
| Haemodialysis                      |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 6   | 0.4  | 0  | 0   |             | 0.71 | 1  | 16.7 | 6.62 (0.75-57.8) | 0.04 |
| No                                 | 1534 | 99.6 | 33 | 2.2 |             |      | 45 | 2.9 |             |      |
| Acupuncture                        |     |      |    |     |             |      |    |     |             |      |
| Yes                                | 9   | 0.6  | 0  | 0   |             | 0.65 | 0  | 0  | -             | 0.59 |
| No                                 | 1531 | 99.4 | 33 | 2.2 |             |      | 46 | 3.0 |             |      |
According to another study conducted at KCD\textsuperscript{24} in 2005, the percentage of HBV was 1.66\% and HCV was 1.26\%. The present study reported higher prevalence that indicates an increase in the incidence rate of HBV & HCV in our region.

The major risk factors for HBV and HCV in general population, as reported by Huma et al\textsuperscript{19} are contaminated needle use in medical care, IDUs, unsafe blood and blood transfusion, shaving by barbers and spousal transmission. Another similar study conducted by Ahmed et al\textsuperscript{25} reported reuse of syringes, shaving by barbers, sharing of smoking utensils, ear / nose piercing as the risk factors for HBV and HCV. Additionally, tattooing was reported as risk factor for HCV.

A review conducted by Nima et al\textsuperscript{26} on the dental treatment as a risk factor for HBV and HCV showed that although weak, there is an all-time risk of HBV and HCV infection during dental treatment. The risk factors reported by our study are same as reported by these authors in general population with additional factor of history of surgical operation and sharing of tooth brush as risk factor for HCV only.

**Limitation of Study:** The limitations of this study are small sample size and collection of samples only from one dental hospital. Work must be conducted and data should be collected from different dental settings.
CONCLUSION

Prevalence of anti-HCV antibody and HBsAg is more common in our study. Previous history of injection, blood transfusion, surgical operation, sharing of tooth brush/clippers, visiting barber shop, nose/ear piercing and dental treatment/surgery were observed as risk factors for transmission of anti-HCV antibody and HBsAg in dental patients.

Declaration of interest: None.

Funding Source: Pakistan Medical and Research Council.

REFERENCES

1. Ali N, Khattak J, Anwar M, Tariq WZ, Nadeem M, Irfan M, et al. Prevalence of hepatitis B surface antigen and hepatitis C antibodies in young healthy adults. Pakistan J Pathol. 2002;13(4):3-6.

2. Jamil MS, Ali H, Shaheen R, Basit A. Prevalence, knowledge and awareness of hepatitis C among residents of three union councils in Manshera. J Ayub Med Coll Abbottabad. 2010;22(3):192-196.

3. Mohammad M, Hussain M, Khan MA. Frequency of Hepatitis B and Hepatitis C infection in Thalassemic Children. Pakistan Ped J. 2003;27(4):161-164.

4. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current emerging prevention and control measures. J Viral Hepat. 2004;11:97-107.

5. Sung JL. Prevention of hepatitis B and C virus infection for prevention of cirrhosis and hepatocellular carcinoma. J Gastroenterol Hepatol. 1997;12:S370–S376.

6. Ilyas M, Itfikhar M, Rasheed U, Yasmin S. Prevalence of Hepatitis B virus infection among population of factory workers in Gujranwala (Punjab) Pakistan. Biologia J. 2012;58(1):47-52.

7. Alter MJ. Epidemiology of hepatitis C virus infection. World J Gastroenterol. 2007;13(17):2436-2441.

8. Previsani N, Lavanchy D. WHO/CDS/CSR/LYO/2002.2: Hepatitis B. Geneva: World Health Organization; 2002.

9. Hassan M, Bhat N, Raseda J, Yasmin S. Seroprevalence of HBsAg in healthy blood donors in Pakistan. J Microbiol Immunol Infect. 2008;41:4-8.

10. Raja NS, Janjua KA. Epidemiology of hepatitis C virus infection in Pakistan. J Microbiol Immunol Infect. 2008;41:4-8.

11. Sarwar J, Gul I, Idris M, UR Anis, Farid J, Yasir Aheel M. Seroprevalence of hepatitis B and hepatitis C in health care workers in Abbottabad. J Ayub Med Coll Abbottabad. 2008;20(3):27-29.

12. Shaw-Stiffel TA. Chronic hepatitis, InPrinciples and Practice of Infectious Diseases’(5th edition), G. L. Mandell, J. E. Bennett, R. Dolin, et al.,(Eds), Churchill Livingstone, New York, NY, USA, 2000; pp. 1297-1321.

13. Fayyaz M, Ghaus SM, Fahimullah, 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. J Ayub Med Coll Abbottabad. 2015;27(2):395-397.

14. Farooqi JI, Farooqi RJ. Relative Frequency of hepatitis B virus and hepatitis C virus infections in patients of Cirrhosis in NWFP. J Coll Phys Surg Pak. 2000;10:217-219.

15. Fayyaz M, Qazi MA, Ishaq M, Chaudhary G M, Bukhari MH. Frequency of hepatitis B and C seropositivity in prisoners. Biomedica. 2006;22:55-58.

16. Aziz MS. Prevalence of anti-Hepatitis C antibodies and Hepatitis B surface antigen in healthy blood donors in Baltistan Pak Armed Forces. Med J. 2006;56:189-191.

17. Mirza IA, Mirza SH, Irfan S, Siddiqi R, Tariq WZ, Janjua AN. Seroprevalence of Hepatitis B and C in young adults seeking recruitment in armed forces Pak Armed Forces. Med J. 2006;56:192-197.

18. Farooqi MA, Iqbal MA, Tariq WZ, Hussain AB, Ghani I. Prevalence of Hepatitis B and C in a healthy cohort Pakistan. J Pathol. 2005;16:42-46.

19. Asad SA, Donahue R, Qureshi H, VermundSH. Hepatitis B and hepatitis C in Pakistan: prevalence and risk factors. Int J Infect Dis. 2009;13(1):9-19. doi:10.1016/j.ijid.2008.06.019

20. Farooqi JI, Farooqi RJ, Khan N, Mussarat. Frequency of hepatitis B and C in selected groups of population in NWFP, Pakistan. JPMI. 2007;21(3):165-168.

21. Khan M, Hussain U, Ahmad I, Khan A. Prevalence of hepatitis B and C seropositivity in patients presenting for dental treatment. Pak Oral Dent J. 2015;35(2):250-253.

22. Fayyaz M, Ghaus 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. J Ayub Med Coll Abbottabad. 2015;27(2):395-397.

23. Ilgu Y, Ilguy M, Dincer S, Bayirli G. Prevalence of the patients with history of hepatitis in a dental faculty. Med Oral Patol Oral Cir Bucal. 2006;11: E29-32.

24. Khitab U, Khan AS, Shah SA, Haq NU. Hepatitis in dental practice - A study conducted on 1498 patients. Pak Oral Dent J. 2005;25(1):25-29.

25. Ahmed B, Ali T, Qureshi H, Hamid S. Population-attributable estimates for risk factors associated with hepatitis B and C: policy implications for Pakistan and other South Asian countries. Hepatol Int. 2013;7(2):500-507. doi: 10.1007/s12072-012-9417-9.

26. Nima M, Stephen R P, Peter K, Seyed M. Dental Treatment in SouthAsian countries. Hepatol Int. 2013;7(2):500-507. doi: 10.1007/s12072-012-9417-9.

27. Nima M, Stephen R P, Peter K, Seyed M. Dental Treatment as a Risk Factor for Hepatitis B and C Viral Infection. A review of the recent literature. J Gastrointest Liver Dis. 2013;22(1):79-86.

Authors' Contribution:

JH, RN conceived, designed and did statistical analysis & editing of manuscript.

GL, JH, AS did data collection and manuscript writing.

TA did review and final approval of manuscript.

Authors:

1. Jamila Haider, BS, PhD Scholar. Lecturer, Centre for Biotechnology & Microbiology, University of Peshawar, Peshawar, Pakistan.

2. Prof. Dr. Ghosia Lutfullah, M.Phil, Ph.D. Director, Centre of Biotechnology & Microbiology, University of Peshawar, Peshawar, Pakistan.

3. Prof. Dr. Rubina Nazli, MBBS, PhD. Institute of Basic Medical Sciences Khyber Medical University, Peshawar, Pakistan.

4. Dr. Taseem Akhtar, M. Phil, Ph.D. Senior Scientific Officer (Ex), PMRC Research Centre, Khyber Medical College, Peshawar, Pakistan.

5. Asma Shah, BS, PhD Scholar. Centre of Biotechnology & Microbiology, University of Peshawar, Peshawar, Pakistan.