REVIEW ARTICLE

STATUS OF HEPATITIS B AND C IN PATIENTS UNDERGOING OCULAR SURGERIES IN PAKISTAN

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ABSTRACT
A literature search was conducted using Google Scholar, Pak Medi Net and Pubmed databases. Two thousand three hundred and twenty-three articles were found. After exclusion of irrelevant articles, only 18 articles satisfied the inclusion criteria. There were nine studies from Punjab, three from KPK and six were from Sindh. Total number of patients were 15,786. Mean age was 57.7 years. Male constituted 50.9% and females 49.05%. Immune chromatography was performed as an initial screening test. Twelve studies included patients undergoing cataract surgery and eight studies included all ocular surgeries done at a particular center. Percentage of affected females was greater in Punjab. Percentage of patients suffering from Hepatitis C was greater than B in all provinces. Highest percentage of Hepatitis C was from Jaranwala (47.6%) and lowest (2.6%) was from Dera Ismail Khan. Maximum number of hepatitis B positive individuals were from Khanpur. Hepatitis B was lowest (0.7%) in Rawalpindi.

Key Words: Hepatitis B, Hepatitis C, ELISA, PCR, Cataract, Pakistan

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INTRODUCTION

Of all the hepatitis virus serotypes, A, E and D are related with high morbidity, while hepatitis B and C are causes of mortality especially in the developing world. According to WHO, approximately 360 million people have chronic hepatitis B infection worldwide. This results in about 600,000 deaths each year.[1] Similarly, there are about 71 million people who are affected by chronic hepatitis C virus infection. Three to four million new cases of HCV are added each year, which add to the gravity of disease burden. Approximately 350,000 persons die of HCV related diseases and their complications throughout the world. These patients have a higher risk of liver cancer and/or liver cirrhosis.[1]

Countries in which infection control facilities are insufficient and there is illiteracy, the disease is rising at a fast pace. Pakistan is among one of those countries where hepatitis B and C are spreading at an alarming rate. The virus is spreading with contaminated needles, acupuncture needles, razors, hemodialysis, tattooing and needle stick injury. Another source is peri-natal spread from mother to child during child birth.

World Health organization launched 'annual world hepatitis day' in 2011 and involved government and non-government organizations to fight against these deadly viruses. The purpose was to make the populations aware of these diseases. WHO chose 28th of July for this purpose because it was the birthday of Dr Baruch Bloomberg, Nobel-prize winner, who not only discovered the hepatitis

B virus but also developed a diagnostic test and vaccine for the virus. This year, on 28th July 2020, the theme is "Hepatitis-free future." There is a strong focus on the preventing HBV infection in newborns and mothers.[2]
In 2016, 23,720 people died of hepatitis in Pakistan (WHO data).[2] It was compared to a bus full of 64 people dying every day. The purpose of this study is to review the disease burden in Pakistan and to highlight the importance of hepatitis B and C screening before ocular surgeries. Everyone including the ophthalmic surgeons have to play a role in preventing this bomb of deadly disease from exploding.

METHODS

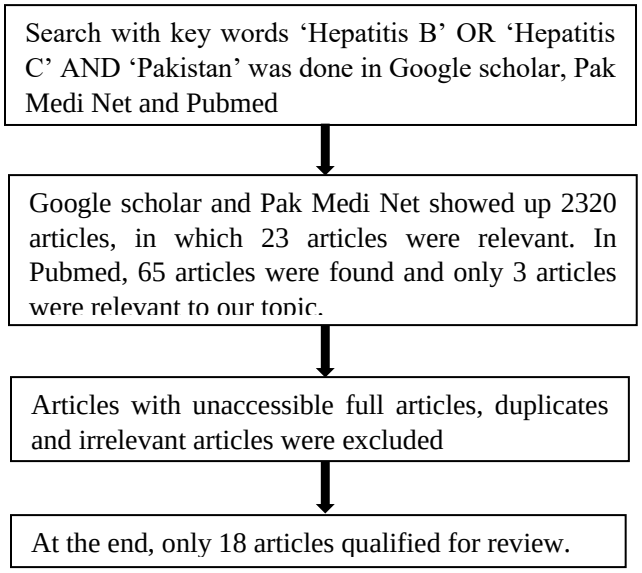
PRISMA guidelines were followed for this systematic review and modified according to the need of the study. A literature search was conducted on the 8th of May 2020. Google Scholar, Pak Medi Net and Pubmed databases were used with search terms 'Hepatitis B' OR 'Hepatitis C' AND 'Pakistan' (from 2000 to 2020). Two thousand three hundred and twenty-three articles were found in Google scholar/Pak Medi Net and 65 in Pubmed. The articles irrelevant for the study question, the articles addressing population other than Pakistani population, the articles published in a non-standard format and not suitable for review and the articles, which were duplicate of another article, were excluded from the review. We were left with 26 items. Review articles were not included in this study. We also excluded articles, which were published only as abstracts or were presented only in conferences without publication. At the end, only 18 articles were found exactly relevant to the study question. Two independent authors selected studies to avoid selection bias. The flow chart for data retrieval is shown below.

Table 1: Summarized data of different studies done on Hepatitis B and C. Simple font shows results from Punjab, italics from Sindh and underlined studies are from KPK.

Author	Journal	Year	Area of study	No. of patients	Mean Age	Gender %		Further test to confirm	surgical procedure	B+ %	C+ %
						M	F				
Hameed A[3]	Rawal Med J	2012	Kharian	554	52	80	20	ELISA	All	2.4	6.4
Soomro MZ et al[4]	PJO	2013	Khanpur	2056	65	51	49	None	All	2.3	18
Latif MZ et al[5]	PJMHS	2013	Jarranwala	379	58	47	53	None	cataract	1.6	47.6
Mansha M et al[6]	PJMHS	2019	Lahore	200	61	56	44	ELISA	cataract	13.5	19
Nisar MY et al[7]	PJO	2017	Khanpur	50	57	46	54	None	cataract	16	20
Mehmood T[8]	PJO	2008	Lahore	468	58.3	48	52	None	cataract	not done	11.1
Khan N et al[9]	Med forum	2017	Sargodha	767	61	54	46	None	cataract	1.95	11
Riaz S et al[10]	Ophthalmology update	2016	Lahore	500	55	55	45	ELISA	cataract	14.4	23.8
Rizwan A et al[11]	Ophthalmology update	2019	Rawalpindi	3143	62	7	93	None	All	0.7	8.3
Lohano MK et al[12]	*Br J Med Prac*	*2016*	*Hyderabad*	*2200*	*50*	*57*	*43*	*ELISA and PCR*	*All*	*2.5*	*12.8*
Huda W et al[13]	*PJO*	*2013*	*Karachi*	*150*	*60*	*60*	*40*	*ELISA*	*cataract*	*4.7*	*4.2*
Jatoi SM et al[14]	*PJO*	*2009*	*Jamdhoro*	*1128*	*50*	*48*	*52*	*None*	*All*	*not done*	*29.6*
Nangrejo KM et al[15]	*PJO*	*2011*	*Nawanshah*	*437*	*60*	*44*	*56*	*None*	*cataract*	*4.3*	*20.4*
Naeem et al[16]	*BMC research notes*	*2012*	*Karachi*	*377*	*54.16*	*53*	*47*	*ELISA*	*cataract*	*2.1*	*11.1*
Tahir MA[17]	*PJMS*	*2015*	*Karachi*	*648*	*63*	*46*	*54*	*None*	*cataract*	*2.6*	*6.2*
Ahmad I et al[18]	Gomal J Med Sci	2006	DIK	1130	59.5	60	40	ELISA	cataract	3.2	2.6
Khan SB et al[19]	Gomal J Med Sci	2013	DIK	330	63.7	50	50	ELISA	cataract	3.9	9.7
Alam M et al[20]	Ophthalmology update	2011	Peshawar	1269	49.69	54	46	ELISA, PCR	All	4.5	6.9

Table 2: Comparison between the provinces

Province	Earliest study	Latest study	Number of patients	Mean Age	Gender		Studies with different Procedures	B+ %age	C+ %age
					M	F			
Punjab	2008	2019	8117	59	49	51	Cataract=6, All=3	6.6	18.4
Sindh	2009	2016	4940	56	51	49	Cataract=4, All=2	3.3	14
KPK	2006	2013	2729	58	55	45	Cataract=2, All=1	3.9	6.4



RESULTS

In 18 original articles, which qualified the selection criteria, nine were from Punjab province, three from Khyber Pakhtun Khwa (KPK) and six articles were from Sindh. No study was found from Baluchistan. All the studies were descriptive observational studies. The earliest study was done in 2006. Total number of patients were 15,786. Mean age was 57.7 years (range, 49 to 65 years).

Male constituted 50.9% and females 49.05%. Immune chromatography was performed as an initial screening test. ELISA was done in 7 and ELISA plus PCR were done in only two studies to further confirm the initial results. Twelve studies included patients undergoing cataract surgery and eight studies included all ocular surgeries done at a particular center. In two researches Hepatitis B test was not done. Further details are depicted in table 1. Comparison among provinces is shown in table 2. Earliest retrieved study was from KPK (2006) and the latest was from Punjab (2019). Mean age of the patients was more or less same in all provinces. However, percentage of affected females was greater in Punjab. Percentage of patients suffering from Hepatitis C was greater than B in all provinces. Percentage of both B and C was highest in Punjab as compared to KPK and Sindh.

Highest percentage of Hepatitis C was from Jaranwala (47.6%) and maximum number of hepatitis B positive individuals were from Khanpur (both cities are located in the province of Punjab. Lowest percentage of hepatitis C positive cases (2.6%) were from Dera Ismail Khan in 2006. Another study conducted in the same city showed a higher percentage of 9.7 in 2013, indicating more than three times increase. Hepatitis B was 0.7% in a study from Rawalpindi in 2019 which was the lowest percentage recorded from all over Pakistan in this review.

DISCUSSION

The earliest records of Hepatitis B are available from year 1885, which show that Lurman was the first to report an epidemic caused by hepatitis B virus.[21] However, Choo et al isolated Hepatitis C Virus from the serum of a person in 1989. Two articles were published about hepatitis C virus (HCV) infection, in April 1989, in the journal Sciences.[22,23]

Now almost all parts of the world are affected with Hepatitis B and C. WHO Eastern Mediterranean Region and the WHO European Region are the most affected areas by HCV. Although 23% of new HCV infections and 33% of HCV mortality is caused by injectable drug use but the research on these patients is scarce. Contrary to hepatitis C, WHO Western Pacific Region and the WHO African Region have the highest percentages of hepatitis B infection. WHO Eastern Mediterranean Region, the WHO South-East Asia Region and the WHO European Region have approximately 3.3%, 2.0% and 1.6% affected persons out of the general population. In the WHO Region of America, 0.7% of the population is infected with HBV.[24]

Current state of affairs in Pakistan is alarming. According to a report published on 28th July 2019, there are 5 million people affected with hepatitis B and 10 million from hepatitis C in Pakistan.[2] There are multiple factors contributing to this wide spread of disease. To combat the situation, recently a new campaign has been launched to eliminate this disease from Pakistan by 2030. This

program includes prevention, diagnostic testing and treatment of hepatitis. One of the reasons for this high hepatitis C prevalence is public unawareness. Even though Pakistan is producing cheaper drugs for hepatitis C but few people have access to these medicines. Another reason is that there are very few of the hepatitis C patients who are recovered spontaneously without treatment. Majority of the HCV positive patients develop chronic infection.

This study was conducted to highlight the importance of HBV and HCV screening in ophthalmic surgeries because Ophthalmologists are at high risk of acquiring disease. According to a research, HBV surface antigens were detected in tears and aqueous humor of HBV-seropositive patients.[25] Thus, the ophthalmologists and the health care workers associated with them should take precautionary measure to avoid infection.

We reviewed different studies from all over Pakistan dealing with HBV and HCV positive patients in ophthalmic surgeries. Other studies from Pakistan have shown different prevalence among different groups of people. Studies have shown that blood transfusion is among the greatest risk factors for disease transmission. According to a rough estimate, there are about 1.5 million units of blood or blood products transfused in Pakistan every year. However, the available data is very limited as far as the safe transfusion is concerned.[26] A survey of blood banks in the large urban centers of the country showed that only about 25% of them tested blood and blood product donations for HCV to keep the cost down.[27] The result was that according to one report, HBV was seen in 9% in professional blood donors which is very high if we compare this to overall HBV positive patients in ophthalmic surgery studies, which was 5% as an average of all the studies in the three provinces.[28,29] However, this percentage is 4% in blood donors from normal healthy population.[30]

A linear correlation of anti-HCV positivity exists with the number of blood transfusions. According to a research, there were 9% seropositive cases in professional blood donors as compared to voluntary blood donors in whom this percentage was 0.8.[31] Contrary to that, HCV positive individuals in blood donor samples in developed countries is 0.2-2%.[32]

Another reason for wide spread of these infections is lack of immunization. Health care workers and ophthalmologists are exposed to all types of individuals. According to Mengal et al. who surveyed nursing students at nursing school, Bolan medical complex hospital, Quetta, only 37.2% of them were completely vaccinated and 25.0% were not vaccinated for HBV.[33] This increases the risk of acquiring infection from the patients. Another report shows HBV prevalence rates of 3.25% in health care workers in Pakistan.[34] This percentage is close to the HBV positive individuals found in our systematic review of 18 studies.

Although we found no study about HBV and HCV screening in ophthalmic surgeries in Baluchistan but few studies are available from this province regarding the general population status about hepatitis B and C virus infections. It was also observed that Afghan refugees had higher rates of prevalence of hepatitis B and C than Pakistani population in Baluchistan. This is attributed to poor literacy rate, low socioeconomic status and compromised hygienic conditions.[35]

In cross sectional surveys, the results are different. In a study by Abbas Z et al, 873 subjects belonging to 174 families from a small town of Sindh were surveyed. HBsAg was reactive in 44 (5%) and anti-HCV in 294 (33.7%).[36] When we compared these results with this particular systematic review of patients undergoing ophthalmic surgeries in Sindh, the percentage was comparatively lower 3.25% and 14% for HBV and HCV respectively.

Local studies report an incidence of HCV of 4.6% in general population in Buner, KPK, Pakistan.[37] However, in our review, percentage of HCV was 6 in KPK. General public survey has shown HBV positive individuals as 1.2% in Mianwali and 7.6% in Rahimyar khan. Higher percentages of HCV were reported from Faisalabad (17.7%), Vehari (7.03%), Shekhpura (5.83%), Rahimyar Khan (5.69%), Okara (5.39) and Muzaffargarh (5.95).[38]

Although general public surveys regarding prevalence of HBV and HCV are scarce in Pakistan but there are also some studies done in different hospitals where pre-operative screening of the patients of general surgery shed some light on the situation. Chaudhry et al conducted a study in the surgical OPD of Fauji Foundation Hospital, Rawalpindi. They found that Hepatitis B was 2.8% and Hepatitis C was 7.56%.[39] In ophthalmic surgeries done in a tertiary care hospital of Rawalpindi, it was 0.7% and 8.3% for HBV and HCV respectively.[11]

In another study by Talpur AA et al, HBV was positive in 8.6% and Anti-HCV was positive in 11.6%.[40] These percentages are quite higher than the earlier reported studies. Ali et al, found Hepatitis B in 3.6%, Hepatitis C in 5.1% and both hepatitis B and C in 1.1% patients.[41] Askar Z et al found hepatitis B in 3.08% and hepatitis C in 5.90% of their studied population. Commenting on the risk factors, they found history of previous surgery in 20.92%, history of dental procedure in 8.42% and no known risk factor in 37.76%.[42]

Source of spread in surgical procedures include, reuse of contaminated syringes, contaminated surgical instruments and blood products. Strictly following the sterilization protocols can definitely prevent the spread of disease from

patient to patients as well as from patients to the health care workers.

Injectable drug users are another source of virus spread. A very high HBV prevalence of 14.95% was reported in two different studies on drug users.[43,44] In a country like Pakistan, transmission of hepatitis B and C virus is not limited to the injectable drug users but in general public there is a common belief that injected medicines are more effective than oral medications.

Mobilizing all the available resources to increase awareness among the masses and strictly following sterilization protocols in hospitals and other areas, which are nidus of virus spread can bring about a real change.

Strengths of this systematic review is that it has included all the published data regarding HBV and HCV screening in ocular surgeries all over Pakistan. Comparison with other general surveys and studies of general surgeries screening is also made.

Our limitation is lack of available data from Baluchistan, Gilgit-Baltistan and Kashmir. Further population surveys will help in finding the burden of disease in different areas which can help in adopting strategies to prevent the spread of these diseases.

CONCLUSION

Hepatitis B and C are spreading in Pakistan at an alarming rate. General population surveys and pre-operative screening in any surgical field is of utmost importance. Everyone including the ophthalmic surgeons should play a role in preventing this bomb of deadly disease from exploding.

REFERENCES

1. https://www.who.int/news-room/fact-sheets/detail/hepatitis-b. (Accessed 29 August 2020)
2. https://www.who.int/hepatitis/news-events/pakistan-hepatitis-elimination-plan/en/ (Accessed 29 August 2020)
3. Hameed A. Frequency of hepatitis B and C among patients undergoing elective eye surgery. Rawal Med J. 2013;38(1): 15-17
4. Soomro MZ, Mahmood R. Prevalence of Hepatitis B and Hepatitis C in Elective Ocular Surgery (rural origin) at Shifa Eye Hospital, Khanpur. Pak J Ophthalmol. 2013;29(1):31-33
5. Latif MZ, Hussain I, Nizami R, Dar U. Prevalence of Hepatitis B & C in Patients Visiting a Free Eye Camp for Cataract Surgery at Jarranwala District Faisalabad. Pak J Med Health Sci. 2013; 7(2): 436-438
6. Mansha M, Azhar F, Afzal F, Shahbaz M, Mustafa A. Prevalence of Hepatitis B and C among Cataract Surgery Patients in Avicenna Hospital Lahore. Pak J Med Health Sci. 2019;13(4): 876-877
7. Nisar MY, Salahuddin T. Prevalence of Hepatitis B & C at Tehsil Headquarter Hospital in Cataract Surgery Patients. Pak J Ophthalmol. 2017;33(2): 98-103
8. Mahmood T, Iqbal M. Prevalence of Anti Hepatitis C Virus (HCV) Antibodies in Cataract Surgery Patients. Pak J Ophthalmol. 2008;24(1):16-19
9. Khan N, Iqbal T, Kanju WA. Prevalence of Hepatitis B, Hepatitis C and HIV in Cataract Surgery Patients at DHQ Teaching Hospital Sargodha. Med Forum. 2017;28(11):59-61
10. Riaz S, Khan MT, Mahmood K, Akhtar S. Frequency of Hepatitis B & C in Previously Unscreened Patients Admitted for Elective Cataract Surgery. Ophthalmol Update 2016; 14(3): 128-130
11. Rizwan A. Frequency Of Hepatitis B & C in Patients Undergoing Ocular Surgery in Rawalpindi. Ophthalmol Update. 2019;17(2):119-121
12. Lohano MK, Su L, Narsani AK, Jawed M, Naveed H. Frequency of Hepatitis B surface antigen (HBsAg) and Hepatitis C antibody (HCVAb) seropositivity among preoperative eye surgery patients. Br J Med Prac. 2016;9(2):a918
13. Huda W, Jameel N, Fasih U, Rehman A, Shaikh A. Prevalence of Hepatitis B and C in Urban Patients Undergoing Cataract Surgery. Pak J Ophthalmol. 2013;29(3):147-150
14. Jatoi SM, Narsani AK, Kumar M. Frequency of Anti Hepatitis C Virus in Eye Surgery Patients at Tertiary Referral Center LUMHS. Pak J Ophthalmol 2009;25(2):86-89
15. Nangrejo MK, Qureshi MA, Sahto AA, Siddiqui SJ. Prevalence of Hepatitis B and C in the Patients Undergoing Cataract Surgery at Eye Camps. Pak J Ophthalmol. 2011;27(1):27-29
16. Naeem SS, Siddiqui EU, Kazi AN, Khan ST, Abdullah FE, Adhi. Prevalence of Hepatitis 'B' and Hepatitis 'C' among preoperative cataract patients in Karachi. BMC Research Notes 2012 5:492.
17. Tahir MA, Cheema A, Tareen S. Frequency of Hepatitis-B and C in patients undergoing cataract surgery in a tertiary care Centre. Pak J Med Sci. 2015;31(4):895-898. doi: 10.12669/pjms.314.6771
18. Ahmad I, Khan SB, Rehman H, Khan MH, Anwar S. Frequency of hepatitis B and hepatitis C Among cataract patients. Gomal J Med Sci. 2006;4(2):61-64
19. Khan SB, Alam M, Khan MA, Marwat M, Ahmad I, Idris M, et al. Frequency and risk factors of hepatitis B and C Virus infections in patients undergoing cataract Surgery. Gomal J Med Sci. 2013;11(2):155-158
20. Alam M, Behttani F. Prevalence of Risk Factors in Hepatitis B & C Patients admitted in Eye Department of Khyber Teaching Hospital, Peshawar. Ophthalmol Update. 2011;9(4): 39-41

21. Lurman A. "Eine icterus epidemic". Berl Klin Woschenschr. 1885; 22: 20–23.
22. Choo QL, Kuo G, Weiner AJ, Overby LR, Bradley DW, Houghton M. "Isolation of a cDNA clone derived from a blood-borne non-A, non-B viral hepatitis genome". Science. 1989; 244: 359–362.
23. Kuo G, Choo QL, Alter HJ, Gitnick GL, Redeker AG, Purcell RH, et al. et al. "An assay for circulating antibodies to a major etiologic virus of human non-A, non-B hepatitis". Science 1989; 244: 362–364.
24. Mokdad AA, Lopez AD, Shahraz S, Lozano R, Mokdad AH, Stanaway J, et al. Liver cirrhosis mortality 187 countries between 1980 and 2010: A systematic analysis BMC Medicine 2014 12: 145.
25. Tsai C Y, Lin C L, Liou S W. Detection of hepatitis B virus in the aqueous humor of a hepatitis B virus carrier. Ophthalmolgica 2009; 223(2): 93-9511
26. Janjua NZ, Hutin YJ, Akhtar S, Ahmad K. Population beliefs about the efficacy of injections in Pakistan's Sindh province. Public Health 2006;120: 824-833.
27. Khan AJ, Luby SP, Fikree F, Karim A, Obaid S, Dellawala S, et al. Unsafe injections and the transmission hepatitis B and C in a periurban community in Pakistan. Bull World Health Organ 2000, 78:956–963.
28. Ishaq M, Ali SS, Karim N, Usmani NI, Hassan N. Frequency of hepatitis B and C virus among the healthy volunteer blood donors at Taluke Hospital Sujjewal, District Thatta, Sindh. Ann Abbasi Shaheed Hosp Karachi. Med Dent Coll 2007;12:97-101.
29. Ahmad M. Hepatitis B surface antigen study in professional and volunteer blood donors. Ann Abbasi Shaheed Hosp Karachi Med Dent Coll 2001;6:304-6.
30. Ahmad J, Taj AS, Rahim A, Afzal S, Rehman M. Frequency of hepatitis B and hepatitis C in healthy blood donors of NWFP: a single center experience. J Postgrad Med Inst. 2004;18:343-352.
31. Jan M, Hussain M. Frequency of Hepatitis B and C in Hemophiliac Children. Pakistan Ped J Dec 2003;27:157-160.
32. Alter MJ. Epidemiology of hepatitis C virus infection. World J Gastroenterol. 2007;13:2436–2441.
33. Mengal H, Howteerakul N, Suwannapong N, Rajatanun T. Factors relating to acceptance of hepatitis B virus vaccination by nursing students in a tertiary hospital, Pakistan. J Health Popul Nutr 2008;26:46-53.
34. Sarwar J, Gul N, Idris M, Rehman A, Farid J, Adeel MY. Seroprevalence of hepatitis B and C in health care workers in Abbotabad. J. Ayub Med Coll Abbotabad 2008;20:27-29.
35. Quddus A, Stephen P. Prevalence of hepatitis B among Afghan refugees living in Balochistan, Pak International J Infec Diseases. 2005; 4:07.
36. Abbas Z, Jeswani NL, Kakepoto GN, Islam M, Mehdi K, Jafri W. Prevalence and mode of spread of hepatitis B and C in rural Sindh, Pakistan. Trop Gastroenterol. 2008; 29: 210-216.
37. Muhammad N, Jan A. Frequency of Hepatitis C in Buner, NWFP. J Coll Physician Surg Pak. 2005;15:11-14.
38. Khokhar N, Gill LM, Malik GJ. General prevalence of Hepatitis C and Hepatitis B virus infections in population. J Coll Physician Surg Pak. 2004;14:534-536.
39. Chaudhry IA, Khan SS, Majrooh MA, Alvi AA. Seroprevalence of Hepatitis B and C among the patients reporting at surgical OPD at Fauji Foundaiton Hospital, Rawalpindi. Pak J Med Sci 2007;23(4):514-517.
40. Talpur AA, Ansari AG, Awan MS, Ghumro AA. Prevalence of Hepatitis B and C in Surgical Patients. Pak J Surg 2006;22(3):150-153.
41. Ali SA, Shah FA, Ahmed K. Prevalence of Hepatitis B and C Virus in Surgical Patients. Pak J Surg 2007;23:109-112
42. Askar Z, Khan NU, Tariq M, Durrani Z, Hakeem A, Faheem Ullah. Prevalence of hepatitis B and C and their risk factors in patients admitted in orthopaedic unit. J Med Sci 2010;18(3):154-156.
43. Alam MM, Zaidi SZ, Shaukat S, Sharif S, Angez M, Naeem A, et al. Common genotypes of hepatitis B virus prevalent in injecting drug abusers (addicts) of North West Frontier Province of Pakistan. Virol J 2007, 4:63.
44. Altaf A, Shah SA, Zaidi NA, Memon A, Rehman N, Wray N. High risk behaviors of injection drug users registered with harm reduction programme in Karachi, Pakistan. Harm Reduct J 2007;4:7.

AUTHOR'S CONTRIBUTIONS

HU: Data collection, manuscript write up and review, approval of final version,