Bulletin of Biological and Allied Sciences Research
***ISSN:* 2521-0092**
www.bbasr.org
DOI: https://doi.org/10.54112/bbasr.v2023i1.53
*Bull. Biol. All. Sci. Res., Volume, **8**: 53*

Systematic Review Article

PREVALENCE OF HEPATITIS B VIRUS AND GENOTYPES IN THE REGION OF KHYBER PAKHTUNKHWA PAKISTAN

GOHAR M[1*], REHMAN IU[1], AHMAD J[1], AHMAD F[1], BASHIR K[2], IKRAM S[1], HASSAN N[2], KHAN MJ[3], ULLAH A[2*]

[1]Center of Biotechnology and Microbiology University of Peshawar 25000, Khyber Pakhtunkhwa, Pakistan
[2]Department of Health & Biological Sciences, Abasyn University Peshawar 25000, Khyber Pakhtunkhwa Pakistan
[3]School of Medicine, University of Maryland, Baltimore, United States
**Correspondence author email address: aminbiotech7@gmail.com, zmaryam591@gmail.com*

(Received, 25th February 2023, Revised 8th December 2023, Published 9th December 2023)

Abstract *About 3% of Pakistani population is the carrier of hepatitis B virus, and infection is growing at a steady rate. The current study reviews the situation of HBV in the KP population. Approximately 85 studies related to the prevalence of HBV and its genotypes in this region were searched using various databases. The mean and standard deviation based on collected data indicates an HBV prevalence of 110.09%±3.71 in general population, 2.51% ± 0.01 in healthy blood donors, 1.74% ± 0.01 in health care workers, 3.40% ±0.00 in healthy children, 1.27% ± 0.00 in pregnant women, 22.40% in drug abusers. The percent prevalence of infection is 5.98% ± 0.02 in multi-transfused people, 26.61% ± 0.12 in patients with liver disease, and 4.11% ± 0.02 in patients with dental treatment and ophthalmic, respectively. Genotype D is the most prevalent genotype, with a value of 41.77%. The area must be vaccinated, and more preventive care and immunization services should be provided.*

*[Citation: Gohar, M., Rehman, I.U., Ahmad, J., Ahmad, F., Bashir, K., Ikram, S., Hassan, N., Khan, M.J., Ulah, A. (2023). Prevalence of hepatitis b virus and genotypes in the region of Khyber Pakhtunkhwa Pakistan. Bull. Biol. All. Sci. Res. **8**: 53. doi: https://doi.org/10.54112/bbasr.v2023i1.53]*
Keywords: *Hepatitis B virus; Prevalence; genotype D; liver disease; Khyber Pakhtunkhwa*

Introduction

Hepatitis B caused by the hepatitis B virus (HBV), which is a DNA virus identified in 1947 (Blumberg et al., 1967), have great mobility and mortality rate (Manzoor et al., 2009; Rizzetto et al., 1980). It is a severe health-related issue in both developed and developing countries (Rizzetto et al., 1980). About two billion people were infected by this virus and 400 million are carriers of infection worldwide (Manzoor et al., 2009; Marín et al., 2012; Zhu and Dong, 2009). About 1 to 2 million people die due to HBV induced diseases like fibrosis, Chronic hepatitis cirrhosis, and HCC (hepatocellular carcinoma) every year (Khan et al., 2011a; Mahoney, 1999). Chronic liver disease was developed in 10% of patients, 20% become cirrhotic, and 80% remain as a carrier of hepatitis B surface antigen (HBs Ag) (Al Ghamdi and Safi, 2015). According to WHO (2010), HBV prevalence is the most common in China; how much? Followed by India with 0.04 billion and Indonesia with 12 million infected people.

In Pakistan, the Hepatitis B infection is growing at a fast rate. There were 7-9 million people infected, and 3% chronic HBV carriers were noticed in Pakistan (Khan et al., 2011b; Noorali et al., 2008; Workowski and Bolan, 2015). In KP in 2008, about 0.6 million people had hepatitis B infection (Ahmed et al., 2016). About 67.5% of Pakistani population live in rural areas with poor economic status (Akbar et al., 1997), unavailability of proper health services, lack of awareness, and poor financial conditions; as a result, the infection is increasing day by day. (Bukhari, 1999; Kane et al., 1999). The infection is transmitted via blood and body secretions. The virus penetrates through a crack in the skin, mucous membrane, or vein (Agboatwalla et al., 1994; Bosan et al., 2010) and remains alive for many days on dehydrated surfaces, needles, syringes etc. (Hakim et al., 2008). It is also transmitted from an infected mother to her child at the time of birth (Fairley and Read, 2012). It is considered a major health problem due to its worldwide prevalence.

There are limited studies that have been conducted on the prevalence of HBV in this region; therefore, this review revealed the prevalence of Hepatitis B in KP population.

Literature Survey

Published data were searched in Google Scholar, PubMed, Directory Of Open Access Journals (DOAJ) and Springer link by using the keywords Global prevalence of HBV, Prevalence of HBV in Pakistan, prevalence of hepatitis B in KP Pakistan, hepatitis B

in blood donors, HBV in general population, hepatitis B in Pakistani healthcare workers, hepatitis B in surgical patients, HBV epidemiology in Pakistan, hepatitis B virus infection in pregnant women, HBV in children, prevalence of HBV genotype in KP Pakistan.

Analysis

Published information representing the prevalence of hepatitis B in various populations is listed in tables. The percent prevalence in various categories is presented in mean ± standard deviation.

Using the following formula the mean prevalence of each population group was determined.

$\mu = (\Sigma \text{ x i})/N$. The standard deviation (SD) of various population groups was determined by using the following formula

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=0}^{N}(x-\mu)^2}$$

Where "x" is the percent HBV prevalence reported in each study and "N" is the total number of studies in the population groups.

Prevalence of hepatitis B in different population groups

General Population

About 10% of Pakistani general population have hepatitis B infection (Malik et al., 1988; Yusuf, 1996). Nineteen studies were conducted on the prevalence of HBV in the general population in various regions of KP with a mean prevalence of 110.09% ± 3.71 (Abbas et al., 2006; Ullah et al., 2017).

One of the means of HBV infection transmission is through infected blood, so it must be screened before transfusion. (Olokoba et al., 2009). 10 findings associated with healthy blood donors showed a percentage prevalence of 2.51±0.01 (Ahmad et al., 2004; Ahmad et al., 2017). 3 studies (Attaullah et al., 2011; Zuhaib Khan et al., 2016) indicated a prevalence of 1.74% ±0.01 in healthcare workers. In 2 different findings, the prevalence of 3.40% ± 0.00 in healthy children (Malik et al., 2004) were reported. Insufficient data is available to show the HBV infection in pregnant women (Batool and Bano, 2008). Up to date, only two studies showing the prevalence of infection in pregnant women in KP are presented, indicating a percent prevalence of 1.27% ± 0.001 (Ahmad, 2016; Khan et al., 2009). In addition, only a single study is conducted showing the spread of disease in drug users, with a prevalence of 22.40% (Alam et al., 2007). However, about 4 to 4.8 million drug users are present in Pakistani population (Hussain, 2008).

Table 1. Prevalence of HBV in general population, healthy blood donors, healthy children, pregnant women and drug abusers

Population Type	Region	Year	Method	Sample	HBV%	Male%	Female%	Reference
General Population	Peshawar	2003	ICT	11372	4.30	---	---	23
	NWFP	2007	-----	17359	2.28	---	---	24
	NWFP	2007	ELISA & PCR	156	28	---	---	25
	Abbottabad	2009	ICT & ELISA	500	3	---	---	26
	Jamrud	2009	ELISA	4180	17.25	16.74	17.70	27
	Bannu	2010	ELISA	25944	1.93	---	---	28
	KP	2012	ICT	1439	49.55	---	---	29
	Malakand	2012	ICT	213	14.53	---	---	30
	Bannu	2012	ICT	200	13.50	---	---	29
	DI Khan	2012	ICT	200	14.63	---	---	29
	Kohat	2012	ICT	200	13.67	---	---	29
	Mardan	2012	ICT	200	13.35	---	---	29
	Karak	2014	ELISA,ICT	800	61.75	65.78	57.92	30
	Mardan	2014	ICT & RT-PCR	274	34.80	59.60	40.40	31
	KP	2016	ICT & ELISA	133193	2.03	---	---	32
	Charsadda	2016	-----	100	29	---	---	33
	Havalian	2017	ICT & ELISA	287	**6.39**	3.84	2.55	34
	Mardan	2017	ICT	790	52.40	52.80	51.70	35
	Peshawar	2017	ICT,ELIA,RT PCR	300	21.67	20.80	22.20	36
Healthy Blood Donars								
	KP	2002-2003	MEIA,IMX	4000	1.95	1.92	6.30	39

	Northern areas	2007	ICT	8949	3.66	---	---	40
	Parachinar	2008	ICT	10343	2.71	---	---	41
	Kurram Agency	2009	ICT	1300	5.07	---	---	42
	Peshawar	2010	ELISA	32042	1.97	1.97	---	43
	FATA,NWFP	2010	ICT,ELISA,RT-PCR	7148	1.85	---	---	44
	Peshawar	2011	Abbott AxSym	3915	2.07	---	---	45
	Peshawar	2014	ELISA	15842	1.80	1.80	---	46
	Charsadda	2017	ICT & ELISA	460	2.60	2.60	---	47
	Peshawar	2017	ELISA	3679	1.40	---	---	48
Health Care workers								
	Abbottabad	2008	ELISA	125	2.40	---	---	49
	Peshawar	2011	ICT	824	2.18	---	---	50
	Malakand	2016	ICT,ELISA	626	0.64	---	---	51
Healthy Children								
	Peshawar	2000	ELISA	360	3.40	---	---	52
	Peshawar	2000	ELISA	88	3.40	---	---	53
Pregnant women								
	Swat	2009	ICT	5607	1.37	---	---	54
	Peshawar	2016	ICT	10288	1.16	---	---	55
Drug Abusers								
	KP	2007	------	250	22.40	---	---	57

ELISA: Enzyme-linked immunosorbent assay; ICT: Immuno-chromatographic Test, MEIA: Micro particle Enzyme Immunoassay; RT-PCR: Real time Polymerase chain reaction.

Multi-transfused population

Thalassemic and hemophilic patients' need blood transfusions continuously. Multi-transfused patients are more at risk to blood-borne infections (Waheed et al., 2009). In four different studies, the percent prevalence was reported to be 5.98% ± 0.02 in multi-transfused patients (Hussain et al., 2003; Mohammad et al., 2003).

Table 2. Prevalence in Multi-transfused patients

Region	Year	Subject	Method	Sample	HBV%	Reference
Peshawar	1999-2001	Thalasemics	ELISA	80	7.50	57
Peshawar	2000-2001	Hemophilic	ELISA	40	5.00	58
Peshawar	2000-2001	Thalassemia major	ELISA	250	8.40	59
Peshawar	2015-2016	Hemophilic	CMIA	396	3	60

ELISA: Enzyme linked immunosorbant assay; CMIA: Chemiluminescent immunoassay.

Patients with liver disease

Different geographic locations have different patterns of liver disease due to differences in environmental factors, eating habits, socioeconomic habits, and other reasons (Burki and Orakzai, 2001). Liver cirrhosis and chronic hepatitis B were the major liver diseases (Burki and Orakzai, 2001; Hamzullah, 2006). Nine different studies discovered a 26.61% ± 0.12 prevalence rate in patients suffering from liver diseases (Iqbal, 2002; Khan et al., 2009).

Table 3. Prevalence in Patients with Liver Disease

Region	Year	Method	Sample (n)	HBV%	Reference
Peshawar	2005	ICT,ELISA,PCR	181	18.23	64
Peshawar	1998-1999	ELISA	100	30.00	65
Peshawar	1996-1998	EIA	115	36.52	66
Peshawar	1995-1998	EIA	410	29.26	67
Peshawar	1995-1998	EIA	56	14.30	68

Dera Ismail Khan	2002	IACT	60	46.00	69
Swat	2001	ELISA	55	32.00	70
Hazara	2002	ICT	893	30.35	71
Swat	2006	ELISA	110	2.81	72

ELISA: Enzyme linked immunosorbant assay; PCR: polymerase chain reaction; ICT: Immuno-chromatographic Test

Patients with dental treatment and ophthalmic

Dentist and dental health care workers are more exposed to HBV infection. As the virus exists in blood and saliva, unsterilized apparatuses are a common means of HBV transmission (Bukhari, 1999). Patients are not screened before surgery, and contaminated syringes and instruments are reused; therefore, the prevalence of HBV is higher in surgically hospitalized patients; as a result, the disease is easily transmitted from individual to individual (Masood et al., 2005). In KP, a single study was conducted on ophthalmic patients, and two studies on dental treatment indicated the percent prevalence as 4.11% ± 0.02 (Haider et al., 2017; Khan et al., 2015).

Table 5. Prevalence in patients with dental treatment and ophthalmic

Region	Subject	Method	Sample size	HBV%	Male%	Female%	Reference
Dera Ismail Khan	Ophthalmic Patients	ICT,ELISA	1130	3.18%	----	----	77
Peshawar	Dental Treatment	ICT	1540	2.14%	2.50	1.90	78
Mardan	Dental Treatment	ICT	400	7.00%	7.70	6.10	79

ELISA: Enzyme linked immunosorbant assay; ICT: Immuno-chromatographic Test

Genotypes of HBV

The hepatitis B virus has 8 genotypes from A to H, while genotypes I and J have been identified recently. The geographic distribution of these genotypes varies (Mahboobi et al., 2013). Studies about the prevalence of HBV genotypes in Pakistan have disagreeing outcomes. Limited data shows the prevalence of HBV genotypes, most specific to certain cities (Mahmood et al., 2016). In 6 different works, the prevalence of HBV in KP Population due to Genotype D is higher, with an overall prevalence rate of 41.77%, followed by Genotype A at 12.25%. The prevalence rate of genotypes B, C, F, untypable, and mixed was reported to be 6, 3, 1, 2, and 16.95%, respectively (Alam and Naeem, 2007; Awan et al., 2010; Awan et al., 2012; Iqbal et al., 2015; Mahmood et al., 2016). All genotypes with their prevalence are listed in table 6.

Table 6. Prevalence of HBV genotypes in Khyber Pakhtunkhwa

Region	Sample size	Genotypes							Untype	Reference
		A	B	C	D	E	F	Mixed		
KP(2007)	56	8.92%	0%	0%	62.50%	0%	0%	28.50%	0%	82
KP(2007)	28	0	10%	0%	15%	0%	0%	-------	-----	25
KP(2010)	36	16.60%	13.80%	38.80%	5.50%	0.00%	0.00%	9%	0.00%	83
KP(2012)	713	33.66%	----	2.10%	29.50%	0.00%	1.40%	10.52%	5.90%	84
KP(2015)	128	7.03%	2%	0.00%	71.09%	0.00%	0.00%	18.75%	2%	85
KP(2016)	99	7%	2%	3%	67%	0.00%	0%	18%	2%	86

Conclusion

This study reviewed the prevalence of the hepatitis B virus and its genotypes in various areas of Khyber *Pakhtunkhwa* Pakistan. The study concluded that the prevalence varies from region to region due to the lack of medical facility, unawareness, and poor clinical management. Therefore, areas with a more than 5% prevalence rate urgently need vaccination and proper Hepatitis awareness programs. There is a controversy about the prevalence of HBV genotypes in KP Populations. The published information related to prevalent genotypes gives conflicting results. The prevalence of HBV and its prevalent genotypes needs to be explored more.

References

Abbas, Z., Shazi, L., and Jafri, W. (2006). Prevalence of hepatitis B in individuals screened during a countrywide campaign in Pakistan. *Journal of the College of Physicians and Surgeons--pakistan: JCPSP* **16**, 497-498.

Agboatwalla, M., Isomura, S., Miyake, K., Yamashita, T., Morishita, T., and Akram, D. S. (1994). Hepatitis A, B and C seroprevalence in Pakistan. *The Indian Journal of Pediatrics* **61**, 545-549. doi: 10.1007/BF02751716

Ahmad, I. (2016). Prevalence of hepatitis B and C viral infection among pregnant women in Peshawar, Pakistan. *Hepatitis monthly* **16**. e36383 doi: 10.5812/hepatmon.36383

Ahmad, J., Taj, A. S., Rahim, A., Shah, A., and Rehman, M. (2004). Frequency of Hepatitis B

and Hepatitis C in healthy blood donors of NWFP: a single center experience. *Journal of Postgraduate Medical Institute* **18**.

Ahmad, T., Nadeem, M., Khan, F. U., Uddin, S., Maqsood-Ur-Rehman, M., and Anwar, N. (2017). Incidence of HBV, HCV and HIV among blood donors from Peshawar KPK, Pakistan. Journal of Entomology and Zoology Studies *5*(4): 608-610.

Ahmed, M., Malik, N., Ashraf, F., Rehman, M. U., and Rashid, A. (2016). Awareness of hepatitis' B'among people of Khyber Pakhtunkhwa province of Pakistan. *J Coll Physicians Surg Pak* **26**, 443-4.

Akbar, N., Basuki, B., Garabrant, D. H., Sulaiman, A., Noer, H. S., and MULYANTO (1997). Ethnicity, socioeconomic status, transfusions and risk of hepatitis B and hepatitis C infection. *Journal of gastroenterology and hepatology* **12**, 752-757. doi: 10.1111/j.1440-1746.1997.tb00365.x

Al Ghamdi, A. A., and Safi, M. A. A. (2015). Prevalence of hepatitis B surface antigen and its association with anti-hepatitis C virus antibodies among pilgrims. *Journal of King Abdulaziz University-Medical Sciences* **22**, 1-7. https://doi.org/10.4197/Med.22-1.1

Alam, M., and Naeem, M. A. (2007). Frequency of hepatitis B surface antigen and anti-hepatitis C antibodies in apparently healthy blood donors in northern areas. *Pakistan Journal of Pathology* **18 (**1); 11-14.

Alam, M. M., Zaidi, S. Z., Shaukat, S., Sharif, S., Angez, M., Naeem, A., Saleha, S., Butt, J. A., and Malik, S. A. (2007). Common Genotypes of Hepatitis B virus prevalent in Injecting drug abusers (addicts) of North West Frontier Province of Pakistan. *Virology Journal* **4**, 1-6. doi: 10.1186/1743-422X-4-63

Attaullah, S., Khan, S., Naseemullah, Ayaz, S., Khan, S. N., Ali, I., Hoti, N., and Siraj, S. (2011). Prevalence of HBV and HBV vaccination coverage in health care workers of tertiary hospitals of Peshawar, Pakistan. *Virology journal* **8**, 1-5. doi: 10.1186/1743-422X-8-275.

Awan, Z., Idrees, M., Amin, I., Butt, S., Afzal, S., Akbar, H., Rehman, I.-u., Younas, S., Shahid, M., and Lal, A. (2010). Pattern and molecular epidemiology of Hepatitis B virus genotypes circulating in Pakistan. *Infection, Genetics and Evolution* **10**, 1242-1246. doi: 10.1016/j.meegid.2010.08.006.

Awan, Z. U. R., Shah, A. H., and Khan, S. (2012). Molecular characterization of hepatitis B virus (HBV) genotypes in HBsAg positive individuals of Khyber Pakhtunkhwa, Pakistan. *African Journal of Microbiology Research* **6**, 5237-5242. doi: 10.5897/AJMR12.574

Batool, A., and Bano, K. A. (2008). Antenatal screening of women for hepatitis B and C in an out-patient department. *Journal of the Dow University of Health Sciences (JDUHS)* **2**, 32-35.

Blumberg, B. S., Gerstley, B. J. S., Hungerford, D. A., London, W. T., and SUTNICK, A. I. (1967). A serum antigen (Australia antigen) in Down's syndrome, leukemia, and hepatitis. *Annals of internal medicine* **66**, 924-931. doi: 10.7326/0003-4819-66-5-924.

Bosan, A., Qureshi, H., Bile, K. M., Ahmad, I., and Hafiz, R. (2010). A review of hepatitis viral infections in Pakistan. *JPMA-Journal of the Pakistan Medical Association* **60**, 1045.

Bukhari, S. (1999). Prevalence of hepatitis [B] antigenaemia in mayo hospital lahore. *Biomedica* **15**, 88-91.

Burki, M. K., and Orakzai, S. A. (2001). The prevalence and pattern of liver disease in infants and children in Hazara Division. *Journal of Ayub Medical College Abbottabad* **13**, 26-28.

Fairley, C. K., and Read, T. R. (2012). Vaccination against sexually transmitted infections. *Current opinion in infectious diseases* **25**, 66-72. doi: 10.1097/QCO.0b013e32834e9aeb

Haider, J., Lufullah, G., Nazli, R., Akhtar, T., and Shah, A. (2017). Screening of adult dental patients visiting Khyber College of Dentistry, Peshawar for HBV and HCV infections and identifying the associated risk factors. *Pakistan journal of medical sciences* **33**, 615. doi: 10.12669/pjms.333.12260.

Hakim, S., Kazmi, S., and Bagasra, O. (2008). Seroprevalence of hepatitis B and C genotypes among young apparently healthy females of Karachi-Pakistan. *Libyan Journal of Medicine* **3**, 66-70. doi: 10.4176/071123

Hamzullah, K. (2006). Liver disease pattern in a tertiary care hospital of Peshawar, Pakistan. Hepatitis Monthly 2006; 6(2): 85-86

Hussain, M., Khan, M., Mohammad, J., and Jan, A. (2003). Frequency of hepatitis B and C in hemophiliac children. *Pak Pediatr J* **27**, 157-60.

Hussain, T. (2008). "Responding to HIV service needs of injecting drug users in Pakistan," Royal tropical institute (KIT). 44th International Course in Health Development (ICHD) September 24, 2007 – September 12, 2008 KIT (Royal Tropical Institute) Development Policy & Practice/ Vrije Universiteit Amsterdam

Iqbal, J., Raza, A., Din, I., and Khattak, J. Z. K. (2015). Assessment of Occurrence of Hepatitis B Virus Genotypes among Population in Provisional Capital and Federal Capital of Pakistan. *British Microbiology Research Journal* **10**, 1-8. doi: 10.9734/BMRJ/2015/19015

Iqbal, S. (2002). Liver cirrhosis in North West Frontier Province of Pakistan. *JCPSP. Journal of the College of Physicians and Surgeons Pakistan* **12**, 289-291.

Kane, A., Lloyd, J., Zaffran, M., Simonsen, L., and Kane, M. (1999). Transmission of hepatitis B, hepatitis C and human immunodeficiency viruses through unsafe injections in the developing world: model-based regional estimates. *Bulletin of the World Health Organization* **77**, 801.

Khan, F., Akbar, H., Idrees, M., Khan, H., Shahzad, K., and Kayani, M. A. (2011a). The prevalence of HBV infection in the cohort of IDPs of war against terrorism in Malakand Division of Northern Pakistan. *BMC infectious diseases* **11**, 1-6. doi: 10.1186/1471-2334-11-176.

Khan, F., Shams, S., Qureshi, I. D., Israr, M., Khan, H., Sarwar, M. T., and Ilyas, M. (2011b). Hepatitis B virus infection among different sex and age groups in Pakistani Punjab. *Virology journal* **8**, 1-5. doi: 10.1186/1743-422X-8-225.

Khan, M., Hussain, U., Irshad, A., and Khan, A. (2015). Prevalence of hepatitis B and C seropositivity in patients presenting for dental treatment. *Pakistan Oral & Dental Journal* **35**.

Khan, P., Ahmad, A., Muhammad, N., Khan, T. M., and Ahmad, B. (2009). Screening of 110 cirrhotic patients for hepatitis B and C at Saidu Teaching Hospital Saidu Sharif Swat. *J Ayub Med Coll Abbottabad* **21**, 119-121.

Mahboobi, N., Porter, S. R., Karayiannis, P., and Alavian, S.-M. (2013). Dental treatment as a risk factor for hepatitis B and C viral infection. A review of the recent literature. *Journal of Gastrointestinal & Liver Diseases* **22**.

Mahmood, M., Anwar, M. A., Khanum, A., Zaman, N., and Raza, A. (2016). Distribution and clinical significance of hepatitis B virus genotypes in Pakistan. *BMC gastroenterology* **16**, 1-9. doi: 10.1186/s12876-016-0513-5.

Mahoney, F. J. (1999). Update on diagnosis, management, and prevention of hepatitis B virus infection. *Clinical microbiology reviews* **12**, 351-366. doi: 10.1128/CMR.12.2.351.

Malik, I., Legters, L., Luqman, M., Ahmed, A., Qamar, M., Akhtar, K., Quraishi, M., Duncan, F., and Redfield, R. (1988). The serological markers of hepatitis A and B in healthy population in Northern Pakistan. *JPMA. The Journal of the Pakistan Medical Association* **38**, 69-72.

Malik, R., Ghafoor, T., Sarfraz, M., and Hasan, N. (2004). Hepatitis A--frequency in children with non-specific abdominal symptoms. *Journal of the College of Physicians and Surgeons--pakistan: JCPSP* **14**, 348-350.

Manzoor, I., Hashmi, N., Daud, S., Ajmal, S., Fatima, H., Rasheed, Z., and Syed, S. (2009). Seroprevalence of transfusion transmissible infections (TTIS) in blood donors. *Biomedica* **25**, 154-8.

Marín, J. A. M., Anduiza, C. I. A., Calderón, G. M., Rodríguez, S. C., Allen, J. L. F., Flores, R. A., and Martínez, J. G. (2012). Prevalence and resistance pattern of genotype G and H in chronic hepatitis B and HIV co-infected patients in Mexico. *Annals of Hepatology* **11**, 47-51.

Masood, Z., Jawaid, M., Khan, R. A., and Rehman, S. (2005). Screening for hepatitis B & C: a routine pre-operative investigation. *Pakistan Journal of Medical Sciences* **21**, 455.

Mohammad, J., Hussain, M., and Khan, M. (2003). Frequency of hepatitis B and hepatitis C infection in thalassemic children. *Pak Pediatr J* **27**, 161-4.

Noorali, S., Hakim, S. T., McLean, D., Kazmi, S. U., and Bagasra, O. (2008). Prevalence of Hepatitis B virus genotype D in females in Karachi, Pakistan. *The Journal of Infection in Developing Countries* **2**, 373-378.

Olokoba, A., Salawu, F., Danburam, A., Desalu, O., Olokoba, L., Wahab, K., Badung, L., Tidi, S., Midala, J., and Aderibigbe, S. (2009). Viral hepatitides in voluntary blood donors in Yola, Nigeria. *European Journal of Scientific Research* **31**.329-334.

Rizzetto, M., Canese, M., Gerin, J., London, W., Sly, D., and Purcell, R. (1980). Transmission of the hepatitis B virus-associated delta antigen to chimpanzees. *Journal of Infectious Diseases* **141**, 590-602. doi: 10.1093/infdis/141.5.590.

Ullah, Q., Khan, K., and Saeed, K. (2017). Prevalence of Hepatitis C and B in MURCY Hospital Peshawar, KP, Pakistan. *J Entomology and Zoo Studies*, 1081-4.

Waheed, Y., Shafi, T., Safi, S. Z., and Qadri, I. (2009). Hepatitis C virus in Pakistan: a systematic review of prevalence, genotypes and risk factors. *World journal of gastroenterology: World Journal of Gestroenterology* **15**, 5647. doi: 10.3748/wjg.15.5647.

Workowski, K. A., and Bolan, G. A. (2015). Sexually transmitted diseases treatment guidelines, 2015. *MMWR. Recommendations and reports: Morbidity and mortality weekly report. Recommendations and reports* **64**, 1.

Yusuf, A. (1996). Can we afford to operate on patients without HB sag screening? *JCPSP-Journal of the College of Physicians and Surgeons Pakistan* **6**, 98-100.

Zhu, C.-T., and Dong, C. L. (2009). Characteristics of general distribution of hepatitis B virus genotypes in China. *Hepatobiliary & Pancreatic Diseases International: HBPD INT* **8**, 397-401.

Zuhaib Khan, M., Saqib, S., Irtiza Hussain Shah Gardyzi, S., and Qazi, J. (2016). Prevalence of blood-borne viruses in health care workers of a northern district in pakistan: risk factors and preventive behaviors. *Canadian Journal of Infectious Diseases and Medical Microbiology* **2016:** 2393942 doi: 10.1155/2016/2393942.

Declarations

Acknowledgments
Not applicable
Funding
Not applicable
Author's contributions
MG collected the literature and wrote the manuscript. IUR, AU, JA, FA, KB, SI, NH and MJK edit the manuscript in original. All authors have read and approved the final manuscript.
Ethics approval and consent to participate
Not applicable
Consent for Publication
Not applicable
Competing interests
The authors declare that they have no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution, and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/. © The Author(s) 2023