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A Cross-Sectional Study of the HBV and HCV Based on Its Epidemiology in Mymensingh City, Bangladesh

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Abstract
Background: *Viral hepatitis is a serious and the most terrible life-threatening disease in the world. It has now become a ubiquitous health problem by affecting billions of women and men at any age. Although five types of virus have been identified that are responsible for causing hepatitis, among them till now HBV and HCV infection are considered as the devastating and rapidly spreading disease worldwide including Bangladesh. For the lack of proper knowledge, this infection has become the primary cause of morbidity and mortality in developing countries. So a population-based cross-sectional study was conducted in Mymensingh city, Bangladesh by the estimating age, sex and serological markers specific preponderance for HBV and HCV infection by calculating the absolute number of population that were chronically infected.*
Methods: *A total of 1938 serological data were collected from December 2017 to December 2018. We then determined the frequencies, bivariate or crosstabulation, and graphical representation of the categorical data according to their age, gender, and serological result. The statistical analyses were done by the SPSS software version 24.*
Results: *There has been a high level of heterogeneity observed between the prevalence estimation at the 1938 individual. From the total individual, 1004(51.8%) were male, and 934(48.2%) were female. Of them, the highest percentage (56.6%) of patients was seen in the ages between 20-40 and the lowest (0.5%) was seen in the age of more than 80. The prevalence rate of hepatitis B virus surface antigen (HBsAg) was 264(14.8%), hepatitis B virus enveloped antigen (HBeAg) was 38(23.3%), anti-hepatitis B virus core (Anti-HBc) was 4(36.4%), and anti-hepatitis c virus (Anti-HCV) was 16(6.9%). The positive rate of HBV and HCV were mostly seen at the age between 20-40. In almost all the cases of HBV serological result, the male is seen in predominance rate, and the opposite result has been visualized in the cases of HCV infection.*
Conclusion: *Bangladesh is stated as the highest risk zone of HBV, then HCV and the virus of hepatitis B is about ten times more infectious than hepatitis c. Proper health and education program may help to reduce the mortality of the disease.*
Keywords: *HBV, HCV, Prevalence, ELISA, Chemiluminescence*

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I. Introduction

Viral hepatitis is caused by a specific group of viruses that attack them, and the most known types are Hepatitis A (HAV), Hepatitis B (HBV), Hepatitis C (HCV), Hepatitis D (HDV) and Hepatitis E (HEV). Nowadays, it turns into the most severe health problem in the world, affecting several hundreds of millions of people [1, 2].

Among them, HBV & HCV infections are the most dangerous global health problems. The patients are at a high risk of death from chronic hepatitis, liver cirrhosis and hepatocellular carcinoma (HCC) [3, 4]. Both

HBV and HCV infections can be transmitted through the salivary exchange, unprotected sexual intercourse, exposure to contaminated blood, mother to child transmission, overcrowding, and using typical syringe [5]. HBV is a small encapsulated DNA virus that belongs to the family of hepadna viruses [6]. Every year nearly 2 billion people are infected with HBV & of them, 350 million have a chronic infection that causes killing of more than 1 million people unfortunately [5, 7, 8]. HBV infection remains a significant public health problem, especially in developing countries. This infection causes chronic liver disease. Those chronic carriers act as a potential source of HBV & are at a high risk of developing liver cirrhosis or liver cancer [9]. It has been estimated that among 350 million, 80% are Asians. According to a study the prevalence of HBV infection varies geographically throughout the world from high (>8%), intermediate (2-7%) to low (<2%) prevalence rates [10, 20]. The current prevalence of chronic Hepatitis B (based on a serological study for HBsAg) in our country ranges from 4.4-7.5% [11].

Bangladesh belongs to the intermediate prevalence region for viral hepatitisB [12]. Moreover, various research findings have shown that HBV is the principal etiologic agent of acute hepatitis, chronic hepatitis, cirrhosis of liver & HCC in our country [12]. Based on the interpretation of several serological and virological markers, viral hepatitis B is diagnosed [13]. HBsAg is the most reliable biological marker to detect viral Hepatitis B. Moreover, HBeAg, anti-HBe and anti-HBc also used as a significant marker for detecting HBV [7, 14, 15]. The differential presence of HBsAg, Antibodies to HBsAg (Anti- HBs) and antibodies to HBcAg (anti-HBc) is used to categorize patients as having acute or chronic infections [16]. Severe HBV infection causes a temporary illness with patients having symptoms of acute jaundice and very high serum ALT [16]. Chronic HBV infections are one of the leading risk factors for liver cirrhosis and hepatocellular carcinoma (HCC) in the world [17].

On the other hand, HCV is a small enveloped virus with a positive sense, single-stranded RNA genome. HCV infections are a major global health problem with an evaluated 170 million people chronically infected and 3-4 million people acquire new infections every year [18, 19]. Anti - HCV is used as a satisfying marker for observing the HCV infection in blood [7, 14]. Some studies have estimated that HCV infections lead to acute hepatitis in 20% cases and whom 10-20% develop liver cirrhosis and 1-5% develop liver cancer in 20-30 years [7]. The prevalence of HCV infection is approximately 2.5% among healthy adults in Asia [21]. There is a high incidence of HCV in Japan, Italy, the Middle East, and it is particularly prevalent in developing countries. However, the prevalence rate of HCV in Bangladesh is about 1% [20]. Prevalence of HBV and HCV infection in Bangladesh has been studied in selected population groups, mainly in professional blood donors, pregnant mothers, children, patients with acute hepatitis, drug users, truck drivers, etc. However, these groups are not representative of the whole population of a city or a country. All the previous study was carried out in different cities in Bangladesh but not in Mymensingh. In these aspects, a study in Mymensingh city was high importance to understand the actual situation of the area, the country, and even its neighbors. In our study, the prevalence of HBV and HCV was determined among the healthy people, which include students, service holders, businessmen, and others attending a clinic or a hospital of Mymensingh city, Bangladesh.

II. Methods And Materials

Study design and location: The study was constructed in Mymensingh city, and the data were collected routinely from the Department of Biochemistry and Immunology laboratory of the popular Diagnostic Center, Charpara, Mymensingh, Bangladesh from 1 December 2017 to 31 December 2018.

Sample collection: 5ml of the venous blood sample was collected from the patients who were sanctioned for hepatitis B and C testing by their doctors. After receiving, the samples were taken for centrifugation by centrifuge machine (universal 320) 4000 rpm for 10 minutes.

Study procedure: For disclosure of HBV infection, HBV surface antigen (HBsAg), HBV enveloped antigen (HBeAg), antibody to HBV core antigen (anti-HBc) and antibody to HBV enveloped antigen (anti-HBe) were diagnosed using HBV reagent pack (ortho-clinical diagnostics U.K). The method used for the test was an indirect chemiluminescence immune assay. For HCV infection, anti-HCV antibody test was done using an anti-HCV reagent pack (ortho-clinical diagnostics UK). The method used for the anti-HCV test was also was an indirect chemiluminescence immune assay. The instrument used for both serological tests were Vitros Eciq Auto Analyzer (USA). The machine was taken 37 minutes for HBV detection and 56 minutes for anti-HCV detection.

Statistical analysis: Version 24 of the statistical package for social science (SPSS) were used to analyze all the data. The variables were gender, age, and the serologic markers of the HBV and HCV. As there was no dependent variable in the data set, so we could be only able to show the frequency of the gender, age, and serologic marker and could also be able to show the bivariate or crosstabulation between each of the variables.

III. Results

From 1 December 2107 to 31 December 2018 laboratory data collected from the patients whom initially referred to the popular diagnostic center, Mymensingh, Bangladesh by specialists for determining the HBV and HCV in their blood. In total, 1938 data were possibly collected in a 1-year and crossectional study from them has been visualized that higher proportion (56.6%) of the patients were found in the age between 20-40 (Figure-1). In the age between 20-40 maximum patients have been comprised and proportion of female (584) was higher than in male (513). The ages <20 and 40-60 the percentage of the male and female were quite moderate but the ages 60-80 and >80 the patients were very low in sense (Figure 2). The 1938 patients were screened, from them 264(14.8%) patients were chronically infected with HBsAg. Among the 163 patients, 38(23.3%) were susceptible to HBeAg. Out of 9 patients, 2(22.2%) were positive for Anti HBe and among the 11 patients, 4(36.4%) were positive for Anti HBc. Among the 232 people, 16(8.9%) were positive for HCV antibody (Table 1). The current study clearly showed that from 264 HBsAg positive patients, 172(65.2%) were male, and 92(34.8%) were female, which is the most prevalent seromarker in this study. The positivity of other serologic marker is seen very low on average, and most of the cases males are seen in the higher rate. In the case of HCV, 16 patients are positive from them 9(56.3%) patients were female, and 7(43.8%) were male (Table 2). Moreover, the ages between 20-40 are the more vulnerable in all the possible seromarker of HBV, from them 161(61.0%) were positive for HBsAg and next frequent seromarkers were HBeAg (Table 2).

IV. Discussion

Due to higher cost, prevalence study is not always easily possible in the developing countries like Bangladesh, but avoiding these obstacles, we made an effort to do a crossectional study to estimate the prevalence of HBV and HCV infection among the general population living in the Mymensingh city near Dhaka, Bangladesh. HBV and HCV infection may cause a serious, economic, and the most prevalent health problem over the next 10 to 20 years in the world [22-24]. Our study explores that the prevalence rate of HBV is higher than the HCV infection (Table 1). Among the markers of HBV positivity, HBsAg remains in the highest position than the others seromarkers of Hepatitis B virus infection (Table 1). This significant differences concluded that not only Mymensingh but also whole Bangladesh is an endemic area for HBV infection and this study also supported the previous report [25]. The remarkable differences have been shown in HBsAg across different ages with higher positivity in children than adults. It is also being reported that higher prevalence of HBsAg has been found in the developing countries [8, 25-28]. Our serologic data suggest that the ages between 20-40 are the most affected correspondence from age category which is clearly shown in the table 2. This means that the adults and the middle-aged people are more vulnerable than any other age group people in case of Mymensingh city, Bangladesh. Moreover, most of the patients tested here are the ages between 20-40 (56.6%), and from them, women patients are in prevailing rate (Figure 1 and Figure 2). However, in the case of serologic positivity, males are in higher position except for anti-HCV and anti-HBe (Table 2). Our study correlated with a crossectional study in which it is denoted that the highest prevalence of HBV was seen between young adults and middle-aged individuals where the predominance was in male patients. The same observation found in Nepal and India [6, 29]. The reason of the higher rate of positive infection in males belongs that in the adult ages for the lack of cultural knowledge, healthcare, education and the deprivation of socio-economic status they involved some illegal and unsocial activities [7]. From a surveillance study, it is reported that HBV and HCV were significantly associated with sharing needles [14]. In a study of about 164 sex workers, 129(78.7%) contain the proofing of past HBV infection. This indicates that the hepatitis virus also spread through sexual route [30]. It is a devastating health problem because of its worldwide distribution and adverse effect, including cirrhosis and HCC [31]. Among the HBV infected patients, 5-10% are the carriers and 4% suffering from a chronic infection like cirrhosis or hepatocellular carcinoma [14]. It is a huge health burden and responsible for 76.3% chronic hepatitis and 49.22% liver cirrhosis [32, 33]. Almost 60% of cases of chronic hepatitis and 40% of cases of cirrhosis in the liver are seen in Nepal [6, 36]. HCV has also been associated with the progression of chronic liver diseases [34, 14]. From 50% of HCV develop chronic liver diseases, and some progress cirrhosis or HCC [35]. In the Indian adult population, the preponderance rate varies from 2% to 8%, which denotes the higher percentage in the south than north and west India [37, 38]. However, in Pakistan, the percentage of HBV in healthy adults is 10% [39]. It is also ranked as the first cause of HCC in Bangladesh. In Bangladesh, about 33.3% of cases is responsible for HCC [6], whereas 61%-80% are responsible in India and 59%-67% in Pakistan [40, 41]. As it is a survey based data analysis study, there is some limitation of our study. At first, we did not perform HBV and HCV diagnostic test of our own, eg-anti-HBe-IgM, which indicates the presence of infection, anti-HBs which differentiate a susceptible person from the immune response. Second, we did not analyze the test for HCV like recombinant immune blot assay or PCR to detect individual persons that are infected by HCV. We collect the data from the renowned popular diagnostic center, Mymensingh and analyze it by SPSS to see how the prevalence rate of hepatitis in Mymensingh in recent days. The third limitation is that the study is conducted only a single population in Mymensingh city, which may not reflect the whole of Bangladesh,

although the literature we have cited that suggests it should [7]. In all the above limitation, our main goal of this crossectional study is to highlight the prevalence rate of HBV and HCV in the Mymensingh city, the mode of transmission and try to give awareness in the mass people of Bangladesh through these study.

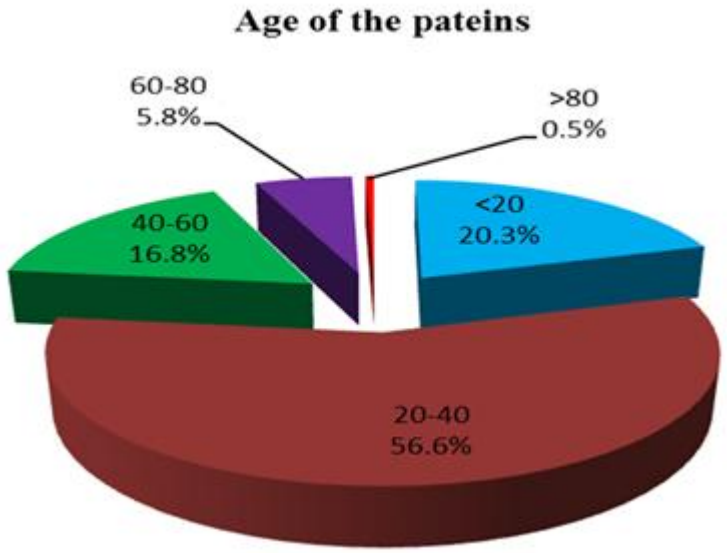

Figure 1: Percentage of the total patients according to their age category.

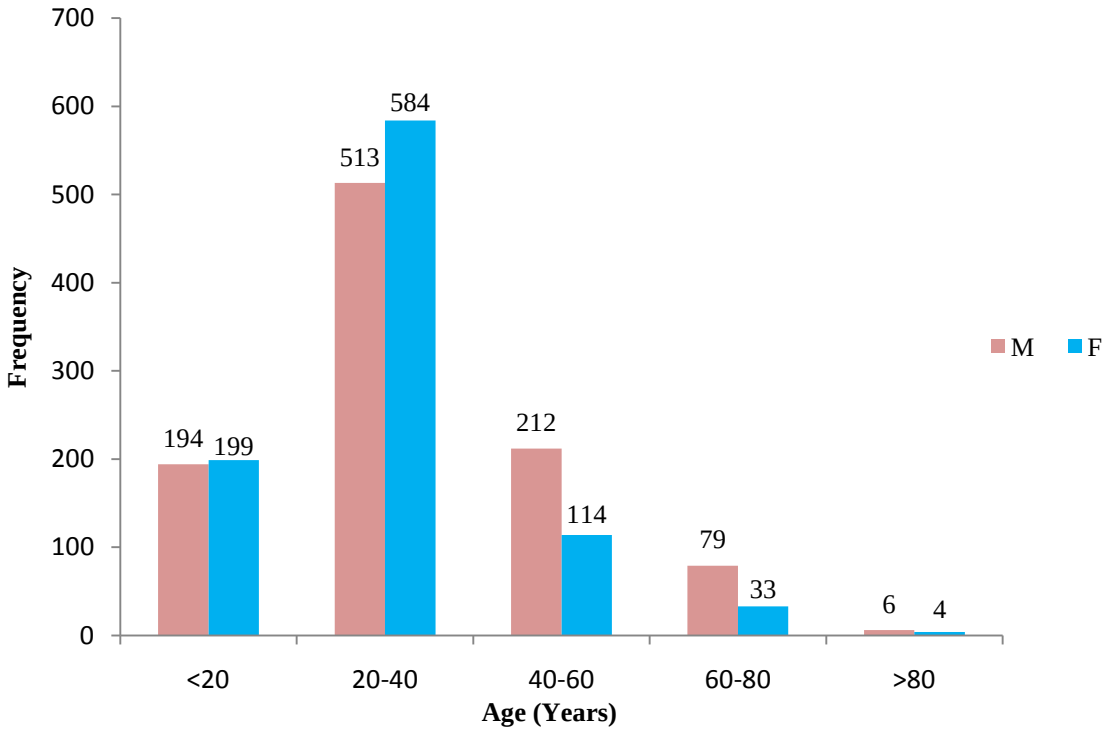

Figure 2: Frequency of the total patients according to their age category.

Table 1: Distribution of the positive and negative serologic marker according to the number of the patients

Serologic markers		No. of the patients
For HBV	**HBsAg** P N	 264(14.8%) 1519(85.2%)
	HBeAg P N	 38(23.3%) 125(76.7%)
	Anti HBe P N	 2(22.2%) 7(77.8%)
	Anti HBc P N	 4(36.4%) 7(63.6%)
For HCV	**Anti HCV** P N	 16(6.9%) 216(93.1%)

P indicates positive; N indicates negative

Table 2: Distribution of the serologic marker according to the gender and age

Test	Gender		Age (Years)				
	Male	**Female**	**<20**	**20-40**	**40-60**	**60-80**	**>80**
HBsAg							
P	172(65.2%)	92(34.8%)	44(16.7%)	161(61.0%)	47(17.8%)	11(4.2%)	1(0.4%)
N	738(48.6%)	781(51.4%)	325(21.4%)	848(55.8%)	250(16.5%)	88(5.8%)	8(0.5%)
HBeAg							
P	28(73.7%)	10(26.3%)	5(13.2%)	26(68.4%)	7(18.4%)	0(0.0%)	0(0.0%)
N	77(61.6%)	48(38.4%)	21(16.8%)	84(67.2%)	11(8.8%)	9(7.2%)	0(0.0)%
anti-HBe							
P	1(50.0%)	1(50.0%)	0(0.0%)	1(50.0%)	0(0.0%)	1(50.0%)	0(0.0%)
N	4(57.1%)	3(42.9%)	1(14.3%)	4(57.1%)	2(28.6%)	0(0.0%)	0(0.0)%
anti-HBc							
P	4(100.0%)	0(0.0%)	1(25.0%)	2(50.0%)	1(25.0%)	0(0.0%)	0(0.0%)
N	4(57.1%)	3(42.9%)	1(14.3%)	3(42.9%)	2(28.6%)	1(14.3%)	0(0.0)%
anti-HCV							
P	7(43.8%)	9(56.3%)	1(6.3%)	9(56.3%)	3(18.8%)	3(18.8%)	0(0.0%)
N	150(69.4%)	66(30.6%)	21(9.7%)	94(43.5)%	69(31.9%)	28(13.0%)	4(1.9%)

P indicates positive; N indicates negative

V. Conclusion

In conclusion, the result of our study indicates that the endemicity of hepatitis B virus and hepatitis C virus infection in Mymensingh city, Bangladesh. Infection of HBV means the overall prevalence of HBsAg. However we observed that the prevalence rate of HBsAg is higher than the global serologic observation and the lower cases are seen in case of HCV in the same community. In almost all the instances, males are in predominant condition, and the adult to middle ages patients are at the highest risk position in that case. As we have some limitation of our study, stated that we only collect data from the diagnostic center so we cannot identify the independent risk factor of the patients which is very crucial to the health care providers for designing the effective preventive programs. The study also highlights the necessity for the prevention of HBV and HCV infection in Bangladesh. Proper vaccination of HBV is needed to be implemented.

Moreover creating public awareness to control the use of disposable needles for the piercing in ear-nose and other parts of the body. Future planning of studies is required to confirm the clustering family effect of HBV infection, as observed in Korea [42]. Transmission dynamics and the identification of their common risk factor of HBV and HCV disease by comparing with family members of hepatitis positive patients with those who are harmful to the tests will also be included in future studies. Such a kind of research is intended to be conducted in the same community. Furthermore, long-term population-based surveillance studies are needed more accurately to assess hepatitis true disease. The proper health care and public awareness programs help to understand the fatality of the disorders which may ensure a better life in the Bangladeshi population.

References

[1]. Parvin, M. N., Uddin, R., & Chowdhury, S. A. (2011). Hepatitis in Bangladesh: Pattern and treatment options. *Journal of Applied Pharmaceutical Science*, *1*(6), 118.

[2]. Khan, W. I., Sultana, R., Rahman, M., Akhter, H., Haq, J. A., Ali, L., ... & Khan, A. K. A. (2000). Viral hepatitis: recent experiences from serological studies in Bangladesh. *Asian Pacific journal of allergy and immunology*, *18*(2), 99.

[3]. Marinho, T. A., Lopes, C. L. R., Teles, S. A., Reis, N. R. S., Carneiro, M. A. D. S., Andrade, A. A. D., & Martins, R. M. B. (2013). Prevalence of hepatitis C virus infection among recyclable waste collectors in Central-West Brazil. *Memórias do Instituto Oswaldo Cruz*, *108*(4), 519-522.

[4]. Leroi, C., Adam, P., Khamduang, W., Kawilapat, S., Ngo-Giang-Huong, N., Ongwandee, S., ... & Jourdain, G. (2016). Prevalence of chronic hepatitis B virus infection in Thailand: a systematic review and meta-analysis. *International Journal of Infectious Diseases*, *51*, 36-43.

[5]. Sarker, N. R., Saha, S. K., Ghosh, D. K., Adhikary, A., Mridha, A., & Alam, M. R. (2014). Seropositivity of hepatitis viral markers in icteric children. *Bangladesh Medical Journal*, *43*(1), 26-29.

[6]. Mahtab, M. A., Rahman, S., Karim, M. F., Khan, M., Foster, G., Solaiman, S., & Afroz, S. (2008). Epidemiology of hepatitis B virus in Bangladeshi general population. *Hepatobiliary & pancreatic diseases international: HBPD INT*, *7*(6), 595-600.

[7]. Ashraf, H., Alam, N. H., Rothermundt, C., Brooks, A., Bardhan, P., Hossain, L., ... & Gyr, N. (2010). Prevalence and risk factors of hepatitis B and C virus infections in an impoverished urban community in Dhaka, Bangladesh. *BMC infectious diseases*, *10*(1), 208.

[8]. Zaki, M. H., Darmstadt, G. L., Baten, A., Ahsan, C. R., & Saha, S. K. (2003). Seroepidemiology of hepatitis B and delta virus infections in Bangladesh. *Journal of tropical pediatrics*, *49*(6), 371-374.

[9]. Marinho, T. A., Lopes, C. L. R., Teles, S. A., Matos, M. A. D., Matos, M. A. D. D., Kozlowski, A. G., ... & Martins, R. M. B. (2014). Epidemiology of hepatitis B virus infection among recyclable waste collectors in central Brazil. *Revista da Sociedade Brasileira de Medicina Tropical*, *47*(1), 18-23.

[10]. Iloh, G. U. P., Chuku, A., Amadi, A. N., & Obiegbu, N. P. (2013). Risk factors for hepatitis B virus infection among adult Nigerians with clinical features of liver diseases in a resource-constrained environment of a primary health care clinic in Eastern Nigeria. *Science Journal of Clinical Medicine*, *2*(3), 98-105

[11]. Matin, A., Islam, M. R., Mridha, M. A. A., Mowla, M. G., Khan, R., & Islam, M. R. (2011). Hepatitis B & C viral markers status in icteric children at a tertiary care hospital. *Journal of Shaheed Suhrawardy Medical College*, *3*(2), 35-37.

[12]. Afroz,H.,Hossain,M.M.,Fakruddin,M.,Khan,M.A.R.,Khan,Z.U.M&Datta,S.(2013).A Retrospective Study on Seroprevalence of Hepatitis B Virus SurfaceAntigen (HbsAg) among Healthy Individuals Attending a Tertiary CareClinic in Dhaka, Bangladesh.*International Journal of Biomedical Research*,04(06),245-250

[13]. Kolou, M., Katawa, G., Salou, M., Gozo-Akakpo, K. S., Dossim, S., Kwarteng, A., & Prince-David, M. (2017). High prevalence of hepatitis B virus infection in the age range of 20-39 years old individuals in Lome. *The open virology journal*, *11*, 1

[14]. Shirin, T., Ahmed, T., Iqbal, A., Islam, M., & Islam, M. N. (2000). Prevalence and risk factors of hepatitis B virus, hepatitis C virus, and human immunodeficiency virus infections among drug addicts in Bangladesh. *Journal of Health, Population and Nutrition*, 145-150.

[15]. Ott, J. J., Stevens, G. A., Groeger, J., & Wiersma, S. T. (2012). Global epidemiology of hepatitis B virus infection: new estimates of age-specific HBsAg seroprevalence and endemicity. *Vaccine*, *30*(12), 2212-2219.

[16]. Kurdi, M., Abughararah, M., Mulike, M., Yamani, O., Bugdady, M., & Noor, M. (2014). Molecular detection of hepatitis B virus (HBV) among voluntary ELISA positive blood donors in Almadinah Almunawwarah. *Journal of Taibah University Medical Sciences*, *9*(2), 166-170.

[17]. Petruzziello, A. (2018). Suppl-1, M3: Epidemiology of Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) Related Hepatocellular Carcinoma. *The open virology journal*, *12*, 26.

[18]. 18.Azam, G. M., Bhuiyan, M. T., Hoque, N. M., Rahman, A. M., & Khan, A. A. (2016). Seroprevalence of hepatitis B and C Virus infections among type 2 diabetic patients in a tertiary care diabetic centre in Dhaka City. *Int J Gastroenterol Hepatol Transpl Nutr*, *1*(iv), 17-22.

[19]. Rantala, M., & Van de Laar, M. J. (2008). Surveillance and epidemiology of hepatitis B and C in Europe–a review. *Eurosurveillance*, *13*(21), 18880.

[20]. Biswas, R. S. R., Hasan, F. U., Sultana, A., Uddin, M. K., Chowdhury, D., Rosy, S. N., & Mamun, S. M. H. (2018). A Documentation of Hepatitis Outbreak in Chittagong. *Chattagram Maa-O-Shishu Hospital Medical College Journal*, *17*(2), 2-5.

[21]. Hwang, J. P., Mohseni, M., Gor, B. J., Wen, S., Guerrero, H., & Vierling, J. M. (2010). Hepatitis B and hepatitis C prevalence and treatment referral among Asian Americans undergoing community-based hepatitis screening. *American journal of public health*, *100*(S1), S118-S124.

[22]. Zarkesh-Esfahani, S. H., Kardi, M. T., & Edalati, M. (2010). Hepatitis C virus genotype frequency in Isfahan province of Iran: a descriptive cross-sectional study. *Virology journal*, *7*(1), 69.

[23]. Islam,M.J.,Das,S.A.,Nawfal,K.T.,Juliana,F.M.,Sabrina,S.,Nobel,F.A.,Akter,Sharmin.,Jebin,R.A.,Sarker,T.C.,Mozibullah,M.,Sohel,M.,Mogal,M.R.,Hossain,M.A.,Hasan,M.M.,&Khatun,M.M.(2019). Determination of HCV genotyping for therapeutic purpose in capital city Dhaka, Bangladesh.Bioresearch Communications, 05(02), 765-9

[24]. Abbas, Z., Jeswani, N. L., Kakepoto, G. N., Islam, M., Mehdi, K., & Jafri, W. (2008). Prevalence and mode of spread of hepatitis B and C in rural Sindh, Pakistan. *Trop Gastroenterol*, *29*(4), 210-6.

[25]. Chamberlin, J., Bryan, J. P., Jones, D. L., Reyes, L., & Hakre, S. (1996). Seroprevalence of hepatitis B virus among school-age children in the Stann Creek district of Belize, Central America. The American journal of tropical medicine and hygiene, 55(4), 452-455.

[26]. 26.McMahon, B. J., Alward, W. L., Hall, D. B., Heyward, W. L., Bender, T. R., Francis, D. P., & Maynard, J. E. (1985). Acute hepatitis B virus infection: relation of age to the clinical expression of disease and subsequent development of the carrier state. *Journal of infectious diseases*, *151*(4), 599-60

[27]. Barin, F., Perrin, J., Chotard, J., Denis, F., N'Doye, R., Diop, M. I., ... & Maupas, P. (1981). Cross-sectional and longitudinal epidemiology of hepatitis B in Senegal. Progress in medical virology. Fortschritte der medizinischen Virusforschung. Progres en virologie medicale, 27, 148.

[28]. Chen, D. S. (2000). Public health measures to control hepatitis B virus infection in the developing countries of the Asia–Pacific region. Journal of gastroenterology and hepatology, 15, E7-E10.
[29]. Tandon, B. N., Acharya, S. K., & Tandon, A. (1996). Seroepidemiology of HBV and HCV in India. Strategy for control of maternal transmission of HBV and its effect. Screening methods of blood donors for control of post-transfusion hepatitis and their effects. *International Hepatology Communications*, *5*(1), 14-18.
[30]. Sattar, H., & Islam, M. N. (1996). Hepatitis B virus markers among the prostitutes of Dhaka. Bangladesh Medical Research Council Bulletin, 22(1), 8-11.
[31]. Lavanchy, D. (2004). Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *Journal of viral hepatitis*, *11*(2), 97-107.
[32]. Lee, W. M. (1997). Hepatitis B virus infection. *New England journal of medicine*, *337*(24), 1733-1745.
[33]. Das, D. C., Al Mahtab, M., Rahim, M. A., Malakar, D., Kabir, A., & Rahman, S. (2016). Hepatitis B virus remains the leading cause of cirrhosis of liver in Bangladesh. *Bangladesh Medical Journal*, *45*(3), 164-166.
[34]. Alter, M. J., Margolis, H. S., Krawczynski, K., Judson, F. N., Mares, A., Alexander, W. J., ... & Meeks, E. L. (1992). The natural history of community-acquired hepatitis C in the United States. *New England journal of medicine*, *327*(27), 1899-1905.
[35]. GILLIAM, J. H., GEISINGER, K. R., & RICHTER, J. E. (1984). Primary hepatocellular carcinoma after chronic non-A, non-B post-transfusion hepatitis. *Annals of internal medicine*, *101*(6), 794-795
[36]. Shrestha, S. M., Tsuda, F., Okamoto, H., Tokita, H., Horikita, M., Tanaka, T., ... & Mayumi, M. (1994). Hepatitis B virus subtypes and hepatitis C virus genotypes in patients with chronic liver disease in Nepal. *Hepatology*, *19*(4), 805-809.
[37]. Khan, M., Husain, M., Yano, M., Hashizume, K., Yousuf, M., Tanaka, E., ... & Kiyosawa, K. (1993). Comparison of seroepidemiology of hepatitis C in blood donors between Bangladesh and Japan. *Gastroenterologia Japonica*, *28*(5), 28-31.
[38]. Tandon, B. N., Acharya, S. K., & Tandon, A. (1996). Seroepidemiology of HBV and HCV in India. Strategy for control of maternal transmission of HBV and its effect. Screening methods of blood donors for control of post-transfusion hepatitis and their effects. *International Hepatology Communications*, *5*(1), 14-18.
[39]. Malik, I. A., Legters, L. J., Luqman, M., Ahmed, A., Qamar, M. A., Akhtar, K. A., ... & Redfield, R. R. (1988). The serological markers of hepatitis A and B in healthy population in Northern Pakistan. *J Pak Med Assoc*, *38*(3), 69-72.
[40]. Sarin, S. K., Chari, S., Sundaram, K. R., Ahuja, R. K., Anand, B. S., & Broor, S. L. (1988). Young v adult cirrhotics: a prospective, comparative analysis of the clinical profile, natural course and survival. *Gut*, *29*(1), 101-107.
[41]. Mujeeb, S. A., Jamal, Q., Khanani, R., Iqbal, N., & Kaher, S. (1997). Prevalence of hepatitis B surface antigen and HCV antibodies in hepatocellular carcinoma cases in Karachi, Pakistan. *Tropical doctor*, *27*(1), 45-46.
[42]. Kim, Y. S., Ahn, Y. O., & Kim, D. W. (1994). Familial clustering of hepatitis B and C viruses in Korea. *J Korean Med Sci*, *9*(6), 444-9.

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