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Prevalence of HIV, HBV and HCV and their co-infection during primary investigation and before ART in Eastern Region of Nepal

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ABSTRACT

The aim of this study was to determine the seroprevalence of hepatitis B viruses (HBV), hepatitis C viruses (HCV) and human immune deficiency viruses (HIV) and their co-infection during primary screening before antiretroviral therapy (ART) in the Eastern region of Nepal. This was a cross-sectional observational study, in which 3,716 individuals, attending Koshi Zonal Hospital, Biratnagar, Nepal, were investigated for HBV, HCV, and HIV from June 2016 to May 2017. Among 3,716 patients [female 2880 (77.5%) and male 836 (22.5%)], HIV was found in 101 (2.7%), HBV in 53 (1.4%) and HCV in 15 (0.4%). HIV was found in 65.3% of males and 34.7% of females, HBV in 47.2% of males and 52.8% of females, and HCV in 93.3% of males and 6.7% of females. The overall rate of co-infection with HBV and/or HCV was 5.9% (6 out of 101 HIV positives). Only 3.0% were positive for both HIV and HBV infection marker and 2.0% were positive for HIV and HCV markers. Only isolates (1.0%) was positive for all three markers of HIV, HBV and HCV. A significant association was observed between gender and the prevalence of HIV, HBV or HCV ($p<0.001$). Marital status and the prevalence were non-significant. Most of the HIV positive was found in 30-39 years of age group (32.2%), while HBV in 20-29 years group (45.3%) and HCV in 30-39 years group (40.0%). The co-infections were restricted to the age group of 30-39 and 40-49 years. Regular screening for HIV, HBV and HCV among patients with a doubtful history can help in detecting many new cases at the appropriate time.

INTRODUCTION

Hepatitis B viruses (HBV), hepatitis C viruses (HCV) and human immune deficiency viruses (HIV) are the three most common chronic viral pathogen known. Despite their biological differences and natural history of chronic infection, the viruses have common routes of transmission (such as blood and blood products, sharing needles to inject drugs and sexual activities) and similar risk factors (Kellerman et al., 2003; Chen et al., 2016). These viruses are associated with increased morbidity and mortality. An estimated 240 million people have chronic hepatitis B virus infection, 130-150 million people have chronic hepatitis C virus infection (WHO, 2016) and 34-39.8 million people have HIV (WHO, 2017a). Moreover, hepatitis B is estimated to result in 887,000 deaths annually versus 399,000 deaths from hepatitis C worldwide (WHO, 2017b; WHO, 2017c). Prevalence of hepatitis B and C in HIV-infected individuals has been reported to be higher than that of the general population.

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About 2.9 million people (2-15%) living with HIV are co-infected with hepatitis C virus and 2.6 million (5-20%) with hepatitis B virus (WHO, 2016). These co-infections have been linked with reduced survival, drug-related hepatotoxicity, drug resistance, cross-resistance and sub-optimal response (Balogun et al., 2012; Pennap et al., 2016). Several studies highlight that the rate of HBV is higher than that of HCV in HIV-infected patients (Noubiap et al., 2015; Brandão et al., 2015; Muriuki et al., 2013). On the contrary, few results are conflicting (Muriuki et al., 2013; Supram et al., 2015). Not only sub-Saharan Africa is the most affected region with 25.6 million HIV infection, but also accounts two-third of the global total of new HIV infections (WHO, 2017a). Prevalence of hepatitis B virus is highest in sub-Saharan Africa and East Asia with a chronic infection in 5-10% adult population. Central and East Asia (3.8%) and north and West Africa (2.3%) are the most affected regions with hepatitis C. These infections are because of unsafe medical injections and other medical procedures (WHO, 2016; Khayriyyah et al., 2013; Mutagoma et al., 2017). Interestingly 18-34% of acute hepatitis infections are spontaneously cleared (Westbrook and Dusheiko, 2014).

MATERIALS AND METHODS

The informed consent was taken from the patients. The study was approved by AASRA Research and Education Academy Counsel Ethics Committee (Approval no. AREC 1606 A002). This cross- sectional observational study was conducted in the eastern region of Nepal at Koshi Zonal Hospital, Biratnagar, Morang for a duration of 12 months (June 2016 to May 2017). The study was carried out in the Pathology and Microbiology Laboratory unit of Koshi Zonal Hospital and the data analysis was done at Aasra Research and Education Academic Counsel, Biratnagar, Nepal. A total of 3716 patients were tested during the study period. The patients investigated for HIV, HBV, and HCV were not aware of their infection status as no test were done earlier. So the patients were not having any sort of ART. If any patient was aware HIV positive and was having ART, they were excluded from the study. This was also confirmed by questioning the patients. The study was aimed at studying the prevalence of HIV, HBV, and HCV as well as co-infection of HBV and/or HCV among HIV-positive patients.

Demographic profile like age, gender and marital status of the patients was taken. The age was categorized into different groups with a regular class interval. The prevalence of HIV with or without HBV and/or HCV in male was compared with the female. The HBV, HCV, and HIV were tested by kits HEPACARD, HCV TRI-DOT and HIV TRI-DOT (J. Mitra and Co. Pvt. Ltd, New Delhi, India.), respectively. For HIV, another kit test with Uni-Gold™ HIV (Trinity Biotech, Ireland) was also performed to verify the result.

HBV test

Based on the antigen capture, or “sandwich” principle; HEPACARD (J. Mitra and Co., India) is a visual, rapid, sensitive and accurate one-step immunoassay for qualitative detection of Hepatitis B Surface Antigen (HBsAg) in human serum or plasma. The assay is intended to be used as an aid in the recognition and diagnosis of acute infections and chronic infectious carriers of HBV (http://www.jmitra.co.in/ourdivision/diagnosticdivision/rapidtestkits/hbvrange/hepacard.aspx).

HCV test

The fourth generation HCV TRI-DOT is a visual, rapid, sensitive and qualitative *in vitro* diagnostic test for the detection of antibodies to hepatitis C virus in human serum or plasma. The test is designed with increased sensitivity for core and NS3 antibodies using a unique combination of modified HCV antigens. They are highly purified HCV antigens like the putative core (structural), protease/helicase NS3 (non-structural), NS4 (non-structural) and replicase NS5 (non-structural) regions of the virus that is immobilized on the device (http://www.jmitra.co.in/ourdivision/diagnosticdivision/rapidtestkits/hcvrange/hcv_tri_dot.aspx).

These antigens are in the form of two test dots “T1” and “T2” to provide a highly sensitive and specific diagnostic test. Testing was for antibodies against HCV, which does not differentiate active (HCV RNA+) versus previously cleared (HCV RNA-) HCV infection. The prevalence estimates should, therefore, be viewed as potential overestimates of the actual rate of active HCV infection in the study group.

HIV test

Based on flow through technology, HIV TRI-DOT test is a visual, rapid, sensitive and accurate immunoassay for the differential detection of HIV-1 and HIV-2 antibodies (IgG) in human serum or plasma using HIV-1 and HIV-2 antigens immobilized on an immunofiltration membrane. It uses envelop antigens gp41 and C-terminus of gp120 for HIV-1 and gp36 for HIV-2 (http://www.jmitra.co.in/ourdivision/diagnosticdivision/rapidtestkits/hivrange/hiv_tri_dot.aspx).

The test is a screening test for anti-HIV-1 and anti-HIV-2 and is for in vitro diagnostic use only. The Trinity Biotech Uni-Gold™ HIV test is a single reagent assay for the detection of antibodies to human immunodeficiency

Table 1. Gender wise age group distribution of patients subjected for tests of HBV, HCV and HIV.

Age group (years)	Female (%)	Male (%)	Total (%)
<10	24(0.8)	36(4.3)	60(1.6)
10-19	419(14.5)	77(9.2)	496(13.3)
20-29	1751(60.8)	211(25.2)	1962(52.8)
30-39	367(12.7)	188(22.5)	555(14.9)
40-49	139(4.8)	122(14.6)	261(7.0)
50-59	74(2.6)	106(12.7)	180(4.8)
60-69	66(2.3)	49(5.9)	115(3.1)
70-79	23(0.8)	36(4.3)	59(1.6)
80-89	17(0.6)	11(1.3)	28(0.8)
Total	2880(100.0)	836(100.0)	3716(100.0)

Table 2. Gender wise distribution of patients with positive results of HBV, HCV, HIV and their co-infection.

	Female	Male	Total
HBV only	28	21	49
HCV only	1	11	12
HIV only	35	60	95
HIV + HBV	-	3	3
HIV + HCV	-	2	2
HIV + HBV + HCV	-	1	1
HBV + HCV	-	-	0

virus types 1 and 2 in serum, plasma or whole blood.

Data analysis

The distribution of HIV, HBV, and HCV was recorded according to the gender and age. The statistical analysis was done with Statistical Package for Social Sciences (SPSS 21.0) software package (SPSS Inc., Chicago, USA). Fisher's exact test was done. The p-value was derived using the chi-square test and a p-value of <0.05 was considered statistically significant.

RESULTS

A total of 3716 individuals was involved in this study and examined for the prevalence of HIV, HBV, and HCV. Out of 3716 individuals, 2880 (77.5%) were female and 836 (22.5%) were male (Table 1). They were aged between 2-89 years with a mean age of 28.94 years (±0.223). The results showed that the prevalence of HIV, hepatitis B and hepatitis C virus among different groups of population was 2.7% (female 0.9% and male 1.8%), 1.4% (female 0.8% and male 0.7%) and 0.4% (female 0.0% and male 0.4%) respectively. The overall rate of co-infection with HBV and/or HCV was 5.9% (6 out of 101 patients) as listed in Table 2.

The female to the male proportion who participated in the study was 3:1. Interestingly, the positive results were in a proportion of 1:2 (female: male) in HIV while nearly equal as 1:1 in HBV. Regarding the gender, the prevalence of HIV was higher in males (65.3%) compared to females (34.7%). Interestingly, the prevalence of HCV was exceptionally higher in males (93.3%) compared to females (6.7%). Unlike HCV, the prevalence of HBV was marginally higher in females (52.8%) compared to males (47.2%). The co-infection of HBV in HIV-infected patients was recorded as 4.0% while co-infection of HCV in HIV patients was 3.0%. However, 1.0% of HIV-infected were co-infected with both HBV and HCV. There was a highly significant association between gender and prevalence of HIV (χ^2=109.33, df=1, p<0.001) (Table 3). Such a significant association was also found between gender and prevalence of HBV (χ^2=18.77, df=1, p<0.001) (Table 4). Considering Fisher's exact test, the association between gender and prevalence of HCV (χ^2=43.34, df=1, p<0.001) was found to be

Table 3. Chi-square test for gender and HIV.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	109.327[a]	1	0.000		
Continuity correction[b]	106.815	1	0.000		
Likelihood ratio	87.419	1	0.000		
Fisher's exact test				0.000	0.000
N of valid cases	3716				

[a]0 cells (0.0%) have expected count less than 5. The minimum expected count is 22.72.
[b]Computed only for a 2×2 table.

Table 4. Chi-square test for gender and HBV.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	18.771[a]	1	0.000		
Continuity correction [b]	17.363	1	0.000		
Likelihood ratio	15.826	1	0.000		
Fisher's exact test				0.000	0.000
N of valid cases	3716				

[a] 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.92.
[b] Computed only for a 2×2 table.

Table 5. Chi-square test for gender and HCV.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	43.342[a]	1	0.000		
Continuity correction [b]	39.359	1	0.000		
Likelihood ratio	35.107	1	0.000		
Fisher's exact test				0.000	0.000
N of valid cases	3716				

[a] 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.37.
[b] Computed only for a 2×2 table.

significant (Table 5). No significant association was found between the marital status and the prevalence of HIV (χ^2=3.369, df=1, p=0.066), HBV (χ^2=1.996, df=1, p=0.158), and HCV (χ^2=2.999, df=1, p=0.153) as shown in Table 6, 7 and 8.

About 81.0% of the individuals were aged from 10 to 39 years who visited the hospital for screening of such diseases (Table 1). Age group 20-29 years accounted highest visit of 52.8% followed by 30-39 years (14.9%) and 10-19 years (13.3%). The highest numbers of female (60.8%) were from age group 20-29 years who were screened for HIV, HBV and HCV. Age group 20-29 years was followed by age group 10-19 years (14.5%) and 30-39 years (12.7%). The results show that the female of high sexual activity age is frequent for screening. Comparative to female, male age group was more distributed. Among male participants, 25.2% were aged between 20-29 years while 22.5% were aged between 30-39 years. Age group 40-49 years accounted 14.6% while 50-59 years were 12.7%. Even the age group 10-19 years was higher as 9.2%. These findings point out the risk of disease in a wide range of age group.

Though the female participants were three times higher than the male, approximately two-third (65.3%) of HIV positive were male comparative to female (34.7%). There were no cases of HIV above 70 years of age in male and

Table 6. Chi-square test for marital-status and HIV.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	3.369[a]	1	0.066		
Continuity correction [b]	2.889	1	0.089		
Likelihood ratio	3.821	1	0.051		
Fisher's exact test				0.077	0.039
N of valid cases	3716				

[a] 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.77.
[b] Computed only for a 2×2 table.

Table 7. Chi-square test for Marital-status and HBV.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	1.996[a]	1	0.158		
Continuity correction [b]	1.505	1	0.220		
Likelihood ratio	2.293	1	0.130		
Fisher's exact test				0.194	0.105
N of valid cases	3716				

[a] 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.80.
[b] Computed only for a 2×2 table.

Table 8. Chi-square test for marital-status and HCV.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	2.999[a]	1	0.083		
Continuity correction [b]	1.915	1	0.166		
Likelihood ratio	5.459	1	0.019		
Fisher's exact test				0.153	0.065
N of valid cases	3716				

[a] 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.49.
[b] Computed only for a 2×2 table.

above 60 years of the female (Table 9). In the female, a larger share of infection (40%) lied in the age group 20-29 years followed by 31.4% of age group 30-39 years, 20% of age group 50-59 years, 17.1% of age group 40-49 years, 8.6% of 10-19 years and 2.9% of less than 10 years. Unlike female, the male of age group 30-39 years topped the infection chart with 33.3% followed by age group 40-49 years with 25.8%, and then, age group 20-29 years with 19.7%. Age group less than 10 years showed 3.0% of infection among male while age group 60-69 years showed the least with a value of 1.5%.

Overall, the highly infected age group were 30-39 years (32.7%) followed by the age group 20-29 years (26.7%) and then by 40-49 years (22.8%). The share of age group 10-19 years and 50-59 years was equal to 6.9%.

Unlike HIV, the prevalence of HBV was nearly 1:1 in proportion, that is, marginally higher in females (52.8%) compared to males (47.2%) although the sample of female to male was in 3:1 proportion. HBV was not seen in the age group of less than 10 years and above 70 years group (Table 9). Among female, the highest portion of infection (60.7%) was occupied by age group 20-29 years followed by age group 30-39 years (14.3%). Nearly 10.7% of age group 60-69 years and 7.1% of age group 10-19 years were HBV positive. 3.6% of female belonging to age group 40-49 years and 50-59 years

Table 9. Age group distribution of patients with HBV, HCV, HIV, and their co-infections.

Age (years)	HBV only		HCV only		HIV only		HIV+HBV		HIV+HCV		HIV+HBV+HCV	
	F	M	F	M	F	M	F	M	F	M	F	M
<10	-	-	-	-	1	2	-	-	-	-	-	-
10-19	2	3	-	-	3	4	-	-	-	-	-	-
20-29	17	7	1	3	14	13	-	-	-	-	-	-
30-39	4	5	-	4	11	18	-	2	-	1	-	1
40-49	1	5	-	4	6	15	-	1	-	1	-	-
50-59	1	-	-	-	-	7	-	-	-	-	-	-
60-69	3	1	-	-	-	1	-	-	-	-	-	-
70-79	-	-	-	-	-	-	-	-	-	-	-	-
80-89	-	-	-	-	-	-	-	-	-	-	-	-
Total	28	21	1	11	35	60	0	3	0	2	0	1

each were HBV positive. Male of age group 30-39 years showed the highest infection of HBV (32%) followed by age group 20-29 years with 28%. Age group 40-49 years showed 24% of HBV infection while age group 10-19 years accounted 12% of HBV infection. Age group 60-69 years showed the least HBV infection of 4%.

Overall, the highly infected age group was 20-29 years (45.3%). Age group 30-39 years (22.6%) was followed by age group 40-49 years (13.2%). Age group 60-69 years had HBV cases of 7.5% and 10-19 years had 9.4% of HBV. And the least HBV positive cases were found in 50-59 years (1.9%).

The prevalence of HCV was approximately one-third of HBV. The prevalence of HCV was higher in males (93.3%) compared to females (6.7%). Out of 15 HCV positive individuals, only one lied in female. HCV was not found in the age group of less than 20 years and above 49 years group. In the female, the only infection was found in the age group 20-29 years. Unlike female, age group 30-39 years showed the highest infection of 42.9% followed by age group 40-49 years with 35.7%, and then, age group 20-29 years with 21.4%.

Overall, the infection of HCV was 40.0% in the age group 30-39 years, 33.3% in the age group of 40-49 years and 26.7% in the age group 20-29 years.

HBV and HCV co-infection

The co-infection was studied in individuals who even did not have the idea of them suffering from HIV. The overall rate of co-infection with HBV and/or HCV was 5.9% (6 out of 101 patients), among which 4 [4.0% (Confidence Interval 0.1, 7.8)] were positive for both HIV and HBV infection while 3 [3.0% (Confidence Interval 0.0, 6.0)] were positive for HIV and HCV. Among such co-infection, only one [1.0% Confidence Interval (-1.0, 3)] was positive for all three (HIV, HBV, HCV) markers.

Age

The age-specific seroprevalence was not significantly different among HBV and HCV co-infection in HIV-positive patients, although it was marginally higher in the age group 30-39 years.

Gender

Non-significant association of gender with co-infection of HBV or/and HCV in HIV-positive patients was observed, though the co-infection of HBV or/and HCV in HIV-positive patients were only found in the male.

Marital status

Though all the cases of co-infection of HBV and/or HCV in HIV-positive patients were found in the married male, the chi-square test revealed no significant association among them.

Injectable drug users (IDUs)

Less than 2% of participants were found to be IDUs. One IDU was found to be suffering from HCV co-infection while 4 IDUs cases were positive for HCV infection. Two IDUs were suffering from HBV co-infection while 5 IDUs cases were positive for HBV infection. In total 6 IDUs were suffering from HIV, of which 2 were co-infected with HBV and 1 with HCV.

DISCUSSION

More than three-fourth of the individuals in the study were

aged between 15-39 years. Although the risk in male age group was more widely distributed over age groups, the findings were true in both male and female. Among the age group 15-39 years, approximately two-third were between 20-29 years of age. The results show that the individuals of high sexual activity age are frequent for screening. Marriage, pregnancy, surgery, and injection are high in female aged between 15-39 years. Factors like affairs, having more than one sexual partner, unsafe sex are more frequent in this age group.

Our study also revealed that the prevalence of HCV (93.3%) and HIV (65.3%) was higher in male, but HBV was higher in female (52.8%). HCV was evenly confined between 20-49 years of age in the male. The distribution of HBV was seen over a wide range of age group from 10 years to 69 years. An alarmingly high share of infection of about 61% occupied the age group 20-29 years in female was worrisome. Unlike female, nearly 84% of HBV was seen among the age group 20-49 years in male. Overall, three-fourth of the HBV was seen in the age group 20-39 years.

The study of the clinical prevalence of HIV, HBV and HCV and their co-infection have been very few and decades old as well (Rai et al., 1994; Shrestha et al., 1998; Sawayama et al., 1999), yet the studies of HBV and HCV in the blood donated to blood bank have been in considerable number (Chander and Pahwa, 2003; Karki et al., 2008; Shrestha et al., 2009; Tiwari et al., 2010). A study by Kinkel et al. (2015) in Nepal points out the use of injection for drugs as a major reason for the surge in the prevalence of such infection and co-infections. The prevalence of HIV in our study (2.7%) was higher than the similar study (0.8%) conducted in western Nepal while the co-infection of HBV and/or HCV (5.9%) in HIV positives in our study was slightly lower than the findings (7.3%) of western Nepal (Supram et al., 2015).

The prevalence of such infections and co-infections worldwide displays a great variation. It may be due to the regional topography, awareness, sexual practice and social hesitation to visit hospitals, lack of surveillance and well-equipped hospital and laboratory and poverty in the different geographical area. The overall co-infection (5.9%) of HBV and/or HCV in HIV positives supports the idea of the negative impacts of HIV infection with the progression of HBV and HCV infection. High rates of viral persistence, higher hepatitis viral load and a more rapid progression of liver fibrosis and hepatocellular carcinoma in co-infected patients are the major negative impacts (Westbrook and Dusheiko, 2014; Michielsen et al., 2005; Zamor et al., 2017). HIV-hepatitis co-infection are at higher risk of developing liver enzyme elevations on antiretroviral therapy (Hoffmann et al., 2014). Co-infection with the three viruses may result early death due to increase in the risk of acute and chronic liver insufficiency, cirrhosis, hepatic failure in comparison to when a person is mono-infected. Unlike other studies, our study reported that only male population of 30-49 years of age was co-infected with HBV and/or HCV. Through questioning the infected patients, it was established that most of them were drug addicts and few might have acquired it from unsafe sex and visit to prostitutes and homosexuality. The association between older age groups and HBV is a widely observed fact resulting from the increased risk of exposure with time and greater vaccination coverage in younger populations (Oliveira et al., 2014; Brandão et al., 2015).

Unfortunately, the practice of screening for HCV and HBV is not routine in Nepal at the initial assessment of HIV-positive patients. According to Chakravarti (2011), the most common identifiable risk factor for HCV acquisition was a history of surgery followed by blood transfusion. Less than 2% participants reported a history of injectable drug use. The prevalence of HCV and HBV was 0.4 and 1.4% respectively while the IDUs accounted 26.7% of total HCV and 9.4% of total HBV which were lower than the previous study in Nepal (Kinkel et al., 2015). In comparison to HCV, sexual transmission of HBV is higher followed by injection use by drug addicts (Kinkel et al., 2015). IDUs accounted 13.2% of total HBV. The high rate of drug addiction in Nepal is of great concern. A total of 5.9% HIV positives were identified as IDUs.

The gender-wise HIV positive proportion revealed that the male population is at maximum risk. It may be because of unsafe sex with sex workers, extra marital affairs having more than one sexual partner, injection of the drug among drug addicts. As Nepal is a remittance-based economy, several individuals working abroad and their spouse residing locally have multiple sex partners. In most of the cases, the person who returned home infected their spouse. Drug addiction and use of injection are also contributing to HIV among the jobless people. As per gender, nearly three-fourth male are accounting the HIV of injection group. Unemployment force female to prostitution which is illegal by law. This forces them to unsafe and compromised sex. Government negligence and making prostitution illegal have forced sex worker of not having routine medical check-ups for sexually transmitted diseases (STDs). Hence, the sexually active age group are at maximum risk and accounts higher infections.

Despite the methodological limitations, this study was aimed at prevalence estimation and outlining of the profile of HBV, HCV and HIV and HIV-infected patients co-infected with HBV and HCV coming for primary check-ups before ART.

Conclusion

The prevalence of HIV, HBV and HCV is 2.7, 1.4 and 0.4% respectively. 65.3% of males and 34.7% of females

suffer from HIV, 47.2% of males and 52.8% of females suffer from HBV, and 93.3% of males and 6.7% of females infect from HCV. The overall rate of co-infection with HBV and/or HCV is 5.9%. 3.0% are positive for both HIV and HBV infection marker while 2.0% are positive for HIV and HCV markers. 1.0% case is positive for all three markers of HIV, HBV and HCV. Age group 20-39 are at more risk for such an infection. Screening of HIV, HBV, and HCV for patients with suspected history should be done. Routine screening for HBV and HCV among all HIV-positive individuals and their sexual partners are advisable in order to stop liver-related morbidity and mortality due to co-infections. Higher prevalence of HIV and HBV in this region highlights the need of awareness program and government intervention to equip the hospitals for primary screening. For a true picture of these infections, a nationwide study involving all health centers has to be initiated and regulated.

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