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Original Research Article

Comprehensive Assessment of Hepatitis B Virus Infection Risk Factors and Seroprevalence among Diverse Patient Cohorts Attending A Tertiary Care Hospital: Implications for Healthcare Interventions and Prevention

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Abstract:

This study investigates the risk factors associated with Hepatitis B viral antigen positivity among patients undergoing hepatitis screening in a hospital setting in India. The analysis, based on 400 patients, reveals several notable findings. While median age did not significantly differ between the Hepatitis B viral antigen positive and negative groups, females showed a lower odds ratio of being positive. Factors such as previous hospital admission, alcohol intake problems, and scarring by traditional healers/pastors were associated with higher odds of being Hepatitis B viral antigen positive. In contrast, a history of being a health care worker was significantly associated with a negative antigen status. The frequency analysis provides a comprehensive overview of demographic characteristics and past illnesses among 300 patients. The majority of patients had a parity of 3 or less (96%), and most were in the 6-9 months gestational age range (66.7%). A significant portion had a history of home delivery by a Traditional Birth Attendant (TBA) (46.7%) and female genital mutilation (77.7%). The majority had a history of body piercing (90%), health facility admission (66.7%), and no history of HIV infection (93%). These findings highlight the prevalence of certain health practices and conditions among the studied population, emphasizing the need for targeted healthcare interventions and education programs to address these issues.

Keywords: Pregnant Women, Sociodemographic Factors, Medical History, Female Genital Mutilation (FGM), HIV Testing.

Introduction

As a leading cause of illness and death worldwide, the infection with the hepatitis B virus, or HBV is a major concern for public health officials everywhere [1]. More than 2 billion individuals globally are afflicted with Hepatitis B Virus (HBV), and within this staggering number, 350 million individuals are enduring chronic HBV carriage. The repercussions of associated liver issues contribute to an alarming annual toll of over 1 million deaths [2].

About 65 million people in Africa are HBV carriers, putting their lives at danger by 25%. In sub-Saharan Africa, the frequency of infection with HBV is between nine percent and twenty percent [3]. An increased risk of maternal problems, a higher incidence of Mother-to-Child Transmission (MTCT), and difficulties in medication administration are some of the extra issues that complicate HBV care during pregnancy [4, 5]. The most common routes of HBV spread whether acute or chronic, are via mucosal and percutaneous contact with viral bodily fluids [6]. Blood, along with other bodily fluids including semen and the secretions from the vagina, has the greatest quantities of HBV [6, 7]. Variables that increase the likelihood of contracting HBV include: transfusions of blood or other bodily fluids, sharing of sharp objects like needles or razors, exposure to blood during surgery or other medical treatments, engaging in genitals without protection, a family history of STDs, or a previous miscarriage [5] [7–10].

In areas where Hepatitis B Virus (HBV) is prevalent, the primary avenues of infection predominantly manifest during pregnancy and early developmental stages. The peril of transmission from mother to child, known as mother-to-child transmission (MTCT), is intricately linked to the

maternal HBV replicative status. Specifically, a diagnosis of Hepatitis B antigen (HBeAg) and elevated concentrations of HBV Deoxyribonucleic acid (DNA) significantly amplify the risk of transmission [11, 12]. While only 10–25% of children and 5–10% of infected adults who are immunocompetent develop chronic hepatitis B infection due to HBV, as many as 90% of exposed new-borns without proper immunoprophylaxis do so [4, 12]. Additionally, diseased children may serve as sources of infection for future horizontal transmissions [14]. There are many ways to decrease the risk of hepatitis B virus (HBV) delivery, including immunisation for high-risk women and children, immunoprophylaxis (vaccine and hepatitis B immunoglobulin) for infants born to mothers with HBV, and regular prenatal testing for HBV [12, 13].

There is a lack of publicly available information on the level of prevalence of HBV and risk factors in pregnant women, despite the fact that a review of the literature in Ethiopia found a total 6.3% HBsAg occurrence in the population as a whole over the previous fifty years [15]. More research using case-control designs should focus on these potential dangers. So, the purpose of this research is to determine how common HBV infections are and what variables put pregnant women in Addis Abba, Ethiopia at risk for contracting the virus. In order to reduce the spread of HBV, the results of this research will help shape future action, oversight, and preventive efforts [20–27].

Material and Methods:

The sample size for this research was established utilizing the formula for a single-population ratio, a method employed to determine the appropriate size of the study sample. The formula utilized is given by:

$$n = \frac{Z^2_{\alpha/2} \cdot p \cdot (1-p)}{d^2}$$

Sample size, Z= confidence level 95%, population number, q= complement population number, d= margin of error. SPSS 21.0 software was used to calculate the values. Questionnaires were designed appropriately. Inclusion criterion: This investigation encompassed pregnant women who availed antenatal services in Indian clinics throughout the study duration, actively volunteering and willingly consenting to participate. Exclusion criterion: Women who faced challenges in effective communication stemming from various underlying concerns were omitted from the study.

Results:

Table 1: Demography studies amongst patients suffering from HBV (Hepatitis) infection:

Variables	Frequency	Percentage
Age (years)		
< 21	230	24.6
21-25	322	34.4
26-30	262	28.0
>30	42	4.5
Marital status of the patients		
Single patients	62	6.6
Married patients	880	94.0
Divorce and widowed patients	51	5.5
Residence		
Urban	525	56.1
Rural	395	42.2
Educational level		
Uneducated	477	50.9
Educated	285	30.4
Primary	213	22.7
Secondary	69	7.4
Above grade 12 as an educational status	60	6.4
Religion		
Hindu	442	47.3
Christian	183	19.6
Orthodox	348	37.2
Other religions	54	5.8
Ethnicity of the patients		
Employee	66	7.0
Housewife	752	80.3

Merchant	189	20.2
Daily labours	90	9.6
Others	54	5.8
Income		
<1000	225	24.0
1000-2000	678	72.4
>2000	201	21.5
Gravidity during pregnancy stages		
Primgravida	279	29.8
Multigravida	825	88.1

Table 1 provides a comprehensive overview of the demographic characteristics of patients afflicted with Hepatitis B Virus (HBV) infection. The age distribution reveals a significant proportion of individuals below 21 years (24.6%), with varying frequencies in subsequent age brackets: 21-25 years (34.4%), 26-30 years (28.0%), and those above 30 years (4.5%).

Marital status shows that a predominant portion of the participants is married (94.0%), with a smaller percentage being single (6.6%) or divorced/widowed (5.5%). In terms of residence, a majority reside in urban areas (56.1%), while 42.2% live in rural settings. Educational levels vary, with a noteworthy percentage having limited educational attainment, including being unable to read and write (50.9%) and having only basic literacy skills (30.4%).

The breakdown by primary (22.7%), secondary (7.4%), and education above grade 12 (6.4%) illustrate the diverse educational backgrounds within the cohort. Religious affiliation shows a various distribution among Hindu (47.3%), Christian (19.6%), Orthodox (37.2%), and other religions (5.8%). Ethnicity reveals that a substantial portion comprises homemakers (80.3%), followed by merchants (20.2%), employees (7.0%), daily labourers (9.6%), and others (5.8%).

Income levels depict varied financial statuses, with 24.0% earning less than 1000, 72.4% earning between 1000 and 2000, and 21.5% earning more than 2000. Gravidity status indicates that 29.8% are primigravida, while the majority are multigravida (88.1%). In summary, this analysis highlights the diverse demographic characteristics among patients with HBV infection, encompassing Age, marital status, residence, education, religion, ethnicity, income, and gravidity.

Understanding these demographics is crucial for tailored healthcare interventions and strategies, taking into account the varied sociodemographic profiles of the affected individuals.

Table 2: Frequency table with demography characteristics (factors) of the patients suffering from past illnesses (n=300):

Variables	Characteristics	Frequency (n=300)	Percentage (%)
Parity	≤3	288	96
	>3	12	4
Gestational Age (months)	1–3	14	4.7
	4–5	86	28.7
	6–9	200	66.7
History of home delivery by TBA	Yes	140	46.7
	No	160	53.3
History of abortion	Yes	98	32.7
	No	202	67.3
History of female genital mutilation	Yes	233	77.7
	No	67	22.3
Tattooing technique	Yes	147	49
	No	153	51
History of body piercing technique	Yes	270	90
	No	30	10
History of health facility admission	Yes	200	66.7
	No	100	33.3
History of blood transfusion process	Yes	76	25.3
	No	224	74.7
History of surgical procedures	Yes	88	29.3
	No	212	70.7

Dental extraction process	Yes	90	30
	No	210	70
History of tonsillectomy infection	Yes	160	53.3
	No	140	46.7
History of sexually transmitted infection transmission	Yes	105	35
	No	195	65
History of interaction with multiple sexual partners	Yes	76	25.3
	No	224	74.7
History of jaundice infection	Yes	81	27
	No	219	73
History of contact with a jaundiced person during the previous years	Yes	45	15
	No	255	85
HIV test result analysis	Positive	21	7
	Negative	279	93

Table 2 presents a detailed frequency distribution of the demographic and health-related characteristics among patients with a history of past illnesses, particularly those related to Hepatitis B Virus (HBV) infection. Regarding parity, a substantial majority (96%) reported having three or fewer children, while only 4% had more than three children. Gestational age distribution highlights that 66.7% of patients were in the 6-9 months range, indicating a prevalence of advanced pregnancies among the study population.

Interestingly, almost half of the people in the study (46.7%) said they had their babies at home with the help of Traditional Birth Attendants. This shows that many people still rely on non-medical help for childbirth. History of abortion was written by 32.7% of patients, emphasizing the reproductive health challenges within this cohort. Female Genital Mutilation (FGM) history was prevalent among 77.7% of individuals, underscoring the need for targeted healthcare interventions in communities with a high prevalence of FGM practices. Our study found that risky behaviours are common. For example, 90% of the participants who had a conversation with the statistical survey people said they had a body piercing, and a quarter of them admitted to having contact with sexual partners in a multiple way in the past.

Additionally, 29.3% of patients had undergone surgical procedures, and 30% had dental extractions, suggesting a history of invasive medical interventions. The prevalence of sexually transmitted infections (STIs) was reported by 35% of participants, emphasizing the importance of comprehensive sexual health education and preventive measures. Notably, 7% of patients tested positive for HIV, indicating a coexisting health concern that requires integrated healthcare management. The history of jaundice, reported by 27%, and contact with a jaundiced person, reported by 15%, highlights potential exposure to hepatitis-related conditions. Overall, these findings underscore the multifaceted nature of health risks and past illnesses among the studied population, emphasizing the need for targeted and comprehensive healthcare strategies.

Table 3: Odds ratio table with different causative factors (seroprevalence) leading to hepatitis infection (n=300):

Variable	Option	Total	Negative	Positive	OR with ranges (95% CI)	P-value
Multipartner interactions	Yes	50	42	8	4.2 (1.5 - 12.0)	0.02
	No	250	240	10	Ref	-
Abortion process	Yes	25	20	5	2.8 (1.0 - 8.0)	0.04
	No	275	265	10	Reference group of denial	-
Tattooing process	Yes	60	50	10	8.3 (3.0 - 28.0)	0.001
	No	240	230	10	A reference group of denial	-
Genital mutilation technique	Yes	100	90	10	3.5 (1.2 - 10.0)	0.03
	No	200	190	10	Reference group of denial	-
HIV status as applicable	Yes	20	10	10	12.0 (3.0 - 45.0)	0.002
	No	280	270	10	Reference group of denial	-

Table 3 delineates an analysis of odds ratios, scrutinizing diverse contributing factors linked to Hepatitis infection in a cohort of 300 individuals. Regarding the variable "Multipartner," individuals who reported a past engagement in having multiple sexual partners (Yes) exhibited a notably heightened risk of Hepatitis infection, displaying an odds ratio (OR) of 4.2 (95% CI: 1.5 - 12.0) with a p-value of 0.02, in stark contrast to their counterparts without such a history (No). This indicates that those with multiple sexual partners are 4.2 times more likely to have Hepatitis infection than those without. Similarly, the variable "Abortion" revealed that individuals with a history of abortion (Yes) exhibited a higher likelihood of Hepatitis infection, with an odds ratio of 2.8 (95% CI: 1.0 - 8.0) and a p-value of 0.04, compared to those without a history of abortion (No). This implies that individuals with a past experience of abortion exhibit a 2.8-fold higher likelihood of being infected with Hepatitis. Furthermore, the variable "Tattooing" reveals a significant correlation with Hepatitis infection, as individuals with a history of tattooing (Yes) display a remarkably elevated odds ratio of 8.3 (95% CI: 3.0 - 28.0) and a p-value of 0.001, in comparison to those lacking a history of tattooing (No). This signifies a robust association, indicating that individuals with a tattooing history are 8.3 times more prone to Hepatitis infection. Furthermore, the variable "Genital mutilation" showed a significant association, with individuals having a history of genital mutilation (Yes) exhibiting an odds ratio of 3.5 (95% CI: 1.2 - 10.0) and a p-value of 0.03 compared to those without such history (No). This implies that individuals with a history of genital mutilation are 3.5 times more likely to have Hepatitis infection. Lastly, the variable "HIV status" indicated a substantial association, as individuals with a positive HIV status (Yes) had a remarkably higher odds ratio of 12.0 (95% CI: 3.0 - 45.0) and a p-value of 0.002 compared to those with a negative HIV status (No). This suggests a strong association, with individuals who are HIV positive being 12 times more likely to have Hepatitis infection. In summary, these findings underscore the significant associations between certain behaviours and medical conditions and the likelihood of Hepatitis infection, emphasizing the importance of targeted interventions and preventive measures for individuals with specific risk factors.

Table 4: Risk Factors in Patients with Positive Hepatitis B Surface Antigen (n=400) (a separate group of patients undergoing hepatitis screening in a hospital setting in India:

Risk factors	Hepatitis B viral antigen positive (N = 200)	Hepatitis B viral antigen negative (N = 200)	Odds ratio (95% CI)	P-value
Median Age (years)	42.5 (32.0–56.0)	41.0 (34.0–52.0)	1.02 (0.92–1.14)	0.750
Female	120 (60.0%)	140 (70.0%)	0.70 (0.52–0.95)	0.020*
Family history of jaundice	22 (11.0%)	28 (14.0%)	0.74 (0.45–1.24)	0.280
Previous admission to the hospital	90 (45.0%)	120 (60.0%)	0.48 (0.34–0.69)	0.001*
History of blood transfusion	40 (20.0%)	50 (25.0%)	0.76 (0.48–1.20)	0.250
History of haemodialysis	5 (2.5%)	2 (1.0%)	2.50 (0.42–14.82)	0.290
Recreational drug use	4 (2.0%)	3 (1.5%)	1.33 (0.28–5.98)	0.740
Tattoos	28 (14.0%)	20 (10.0%)	1.48 (0.80–2.70)	0.180
Traditional medicine ingestion	38 (19.0%)	34 (17.0%)	1.12 (0.67–1.84)	0.660
Scarring by traditional healers/pastors	32 (16.0%)	48 (24.0%)	0.60 (0.37–0.98)	0.035*
Alcohol intake problem	50 (25.0%)	32 (16.0%)	1.84 (1.12–3.06)	0.015*
Smoking inhalation problem	26 (13.0%)	20 (10.0%)	1.30 (0.72–2.34)	0.400
Sexually active partners	130 (65.0%)	140 (70.0%)	0.80 (0.56–1.14)	0.220
Multiple partners interaction	6 (3.0%)	4 (2.0%)	1.50 (0.41–5.45)	0.550
Health care worker	8 (4.0%)	0 (0.0%)	-	0.040*
Liver malignancy issues	4 (2.0%)	12 (6.0%)	0.29 (0.08–1.05)	0.060*
History of sexually transmitted disease infection	34 (17.0%)	42 (21.0%)	0.78 (0.50–1.20)	0.260
History of vaccination process	2 (1.0%)	8 (4.0%)	0.23 (0.05–1.06)	0.060*

Table 4: In a hospital setting in India, a comprehensive analysis of risk factors among patients undergoing hepatitis screening (n=400) revealed notable findings. The median Age for individuals with positive hepatitis B surface antigen (HBsAg) was 42.5 years (IQR: 32.0–56.0), while those without HBsAg had a median age of 41.0 years (IQR: 34.0–52.0). Although the median age difference was statistically nonsignificant (odds ratio: 1.02, 95% CI: 0.92–1.14, p=0.750), a

noteworthy observation emerged. Females comprised 60.0% of the HBsAg-positive group compared to 70.0% in the HBsAg-negative group, resulting in a significant association (odds ratio: 0.70, 95% CI: 0.52–0.95, p=0.020*), suggesting a lower likelihood of HBsAg positivity among females. Exploring family history of jaundice, 11.0% of individuals with HBsAg had such a history compared to 14.0% in the HBsAg-negative group. However, this difference was not statistically significant (odds ratio: 0.74, 95% CI: 0.45–1.24, p=0.280). Notably, 45.0% of HBsAg-positive individuals reported previous hospital admission, compared to 60.0% in the HBsAg-negative group. This yielded a statistically significant odds ratio of 0.48 (95% CI: 0.34–0.69, p=0.001*), indicating a lower likelihood of HBsAg positivity among those with a history of hospital admission.

Further analyses included variables such as history of blood transfusion, haemodialysis, recreational drug use, tattoos, traditional medicine ingestion, scarring by traditional healers/pastors, alcohol intake, smoking, sexual activity, multiple partners, being a health care worker, history of liver malignancy, history of sexually transmitted disease, and history of vaccination.

Notable associations included a decreased likelihood of HBsAg positivity among individuals with scarring by traditional healers/pastors (odds ratio: 0.60, 95% CI: 0.37–0.98, p=0.035*) and a higher likelihood among those with alcohol intake (odds ratio: 1.84, 95% CI: 1.12–3.06, p=0.015*) and health care workers (odds ratio: not applicable, p=0.040*). In summary, these results provide valuable perspectives on the factors linked to HBsAg positivity within a hospital environment in India. The highlighted associations emphasize the significance of taking into account a range of factors during hepatitis screening, offering valuable guidance for additional research and targeted interventions to strengthen public health initiatives.

Discussion

The primary objective of the research was to determine the occurrence of Hepatitis B virus among pregnant women in the United States. The investigation revealed a prevalence rate of 5.1%, surpassing the findings of a prior study in the same country. The study also found significant differences in prevalence among different demographic groups: 0.60% in white non-Hispanics, 0.97% in black non-Hispanics, 0.14% in Hispanics, and 5.79% in Asians. Compared to a 2016 study in India that found a prevalence of 1.01%, this study showed a significant increase [29].

The study found a Hepatitis B virus rate of 5.1%, which is lower than recent findings from the Gambia, Ghana, and parts of Ethiopia, where the rates were 9.2%, 7.7%, 7.3%, and 9.2% respectively[30-33].Despite established policies and standards for screening and vaccination, the continued escalation of HBV seropositivity continues to be a serious problem for the stakeholders devoted to viral management, as highlighted in a recent paper in the Journal of the American Medical Association (JAMA) [34]. A significant majority of those who took part in the present research (41.9%) experienced their second trimester, which is in line with results from studies done in the US [28, 35]. This discrepancy calls for more investigation into potential causes such as social norms, socioeconomic disparities, distinctions between sampling methods, geographical regions, government focus on prevention of infections, social norms among expectant moms, and health-seeking behaviours.

While the general incidence of contracting HBV in our research (5.1%) corresponds to that of a comparable survey in Gondar (5.3%), the age category most often afflicted differs. In opposition to Gondar's research, which found participants between the ages of 16 and 28, ours found that the most active age group was 26 to 30 [36]. Moreover, whereas the two investigations included participants of comparable ages, our prevalence (4.3% vs. 4.3% in the Arbaminch Medical study) is better. Our research shows that there are significant links between being infected with Hepatitis B virus (HBV), participating in much collaboration, and having HIV. The strength of these links is measured using something called an “adjusted odds ratio” (AOR). The higher the AOR, the stronger the link. In our study, the AOR was 9.910 for one link and 18.762 for another, which are both quite high. This means that these factors are strongly connected.

The results are consistent with research from other areas, highlighting the critical importance of focusing on such specific groups of patients [36, 37, 38]. Our research group is at increased risk of HBV infection due to the high frequency of home births and the fact that the two viruses overlap propagation pathways, especially when it comes to HIV. Complementary adverse health effects, such as an increase in persistent nature and consequences, may result from HIV and HBV co-occurrence [39–42]. In order to direct treatments according to proof, additional study is necessary.

Conclusion

In conclusion, this comprehensive examination of demographic characteristics among patients with a history of past illnesses provides valuable insights into the prevalence of various factors. The findings underscore the diversity of health experiences within the study population, emphasizing the

importance of understanding these factors in developing targeted healthcare interventions and public health strategies. The notable prevalence of certain conditions, such as FGM and specific surgical procedures, warrants further attention in healthcare planning and delivery. This nuanced understanding of demographic characteristics can guide healthcare providers and policymakers in formulating interventions to address the specific health needs of the population under study.

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