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Rate of hepatitis B infection in hospital patients and blood donors in Ha'il, KSA and associated risk factors: A retrospective study

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Abstract---HBV infection is still a major public health and economic concern worldwide. Therefore, epidemiological studies are still at high concern. There are no epidemiological studies conducted for the prevalence of hepatitis B infection in Ha'il in Saudi Arabia so far. This study aimed to estimate the rate of hepatitis B infection and identifying potential risk factors, among patients/blood donors at King Khalid general hospital in Ha'il, KSA. Therefore, a retrospective analysis was performed to estimate Hepatitis B surface antigen (HBsAg) positivity among patients/blood donors. Data of 3727 patients/blood donors for HBsAg test was collected and analyzed using Microsoft Excel. Correlations and regression analysis were performed using the statistical package for social sciences (SPSS) programs. The level of statistical significance for the study was set at $p < 0.05$. The results showed that the rate of HBsAg among patients/blood donors was 1.1%. The rate of HBsAg was higher in male, age group >50 years old, blood donors and kidney artificial unit as well as gastroenterology/hepatology patients and in September. Logistic regression analysis demonstrated that only male ($P < 0.01$), progressing age ($P < 0.001$), blood donors ($P < 0.05$) as well as gastroenterology/hepatology patients ($P < 0.01$) made significant contributions to prediction. In conclusion: the rate of HBsAg is reasonable among patients and blood donors in Ha'il. However, precautions should be implemented in the gastroenterology/hepatology unit as well as blood bank to prevent HBV transmission. Moreover, it is recommended to increase public knowledge (in particular among men and the elderly) on routes of transmission and infection prevention that aid to lower the burden of both HBV infection in Ha'il.

Keywords---Hepatitis B, Blood donors, Surveillance, Epidemiology, Saudi Arabia.

Introduction

Although Hepatitis B virus (HBV) infection can be prevented through vaccination, it continues to remain a global public health issue, with an approximately 257 million persons (3.5 %) living with chronic HBV infection. As a result, it is a major causative agent for morbidity and mortality, causing more than 887,000 deaths, the most of which are due to cirrhosis and hepatocellular carcinoma (World Health 2019). HBV is transmitted parentally by different routes including exposure to infectious blood or body fluids, organ transplant, or by sexual contact (Franco, Bagnato et al. 2012).

In the Arab countries, HBV infection rates vary from 0.6% in Iraq to higher than 8% in Sudan (Ghasemian 2016). This variation is most likely due to differences in the risk factors associated with HBV infection through different countries. Although several studies reported that the prevalence of chronic HBV infection to be decreasing in some Arab countries, it is still undesirably high. This was particularly apparent in the Arabian Gulf region, in Sudan, Lebanon, Egypt and

Libya. These significant declines are most likely due to the Expanded Immunization Programs (Gasim 2013).

In KSA, several studies were conducted at the national and sub-national levels. Recent estimations have shown that more than 50% of the reported cases were from the population of the Western region (Makkah, Jeddah, Taif, Medinah, Tabuk, and Qunfudah), while the highest rate of infection was in the Southern region (Makkah, Jeddah, Taif, Medinah, Tabuk, and Qunfudah), while the highest rate of infection was in the Southern region (Aljumah, Babatin et al. 2019). Sub-national studies have reported different prevalence rates of HBV infection among blood donors from various regions, including central, southern, western, and eastern regions. In 2004, the prevalence rates of HBV in the central region of KSA (Riyad) were 1.5%. It has been also pointed out that HBV infection tends to increase with increase in age and more abundant among expats (El-Hazmi 2004). Recently, the prevalence of HBV infection in Riyadh dramatically declined to approximately 0.7% (Alshayea, Eid et al. 2016). Aseer region has been estimated at a higher rate of HBV seroprevalence reaching to 7.9% (Al-Humayed and sciences 2017). A five-year retrospective Study of HBV infection estimated the prevalence of HBV infection in the Eastern Province of KSA to 2.3% (Alzahrani, Muzahheed et al. 2019). Remarkably, no studies conducted to estimate the prevalence of HBV infection in some other regions (e.g. Ha'il) so far.

Several studies have addressed various aspects of the prevalence of HBV infection in KSA, such as gender, age groups infected, of blood transfusion, nationality... etc. A retrospective analysis of patients in the Eastern Province of the KSA identified a 1.8 times greater likelihood of HBV infection in males vs. females (Al-Tawfiq and Anani 2008). Differently, in the southern region, HBV seroprevalence in male and female were found similar. Other studied reported that risk factors for HBV infection were referred to a history of blood transfusion and lack of hepatitis B vaccination (Alzahrani, 2019). However, older age groups of different regions show variations in the prevalence of HBV infection. Additionally, a history of surgical procedures was identified as a major risk factor for HBV infection in pregnant women (Al-Mazrou, Al-Jeffri et al. 2004). Thus, HBV associated risk factors differ and vary within the country. Therefore, identifying risk factors associated with HBV infection within a specific region enables designing a specific regional policy to estimate the disease burden, guide health intervention programs and evaluate vaccine efficiency.

In Ha'il province, we observed a consistent rise in the amount of persons infected with HBV during our daily work at King Khalid Hospital (the major hospital in Ha'il). However, no current estimates of hepatitis B burden so far. This is most likely to be due to the local population's refusal to engage in such studies. To address this issue, we conducted a retrospective analysis of HBsAg positivity among patients and blood donors who attended a tertiary care system in the Ha'il region of Saudi Arabia between June 2020 and June 2021. The goal of this study was to evaluate HBV seroprevalence among patients and blood donors, as well as to establish if gender, age and other associated risk factors may influence the rate of HBV infection.

Methodology

This is a retrospective data retrieved from King Khalid general hospital in Ha'il, KSA. The HBsAg tests of 3727 individuals, attending the hospital either as patients or blood donors within the period June 2020–June 2021, were collected from the hospital database. Data included age, medical department in which the individual registered to, date of the test and the results of HBsAg. Data were first organized and coded using Excel and then further analyzed using Statistical Package for Social Sciences (SPSS) version 20 programs. Significant association between ordinal variables or scale variables was tested using the Spearman correlation coefficient or Pearson's chi-squared test. Binary logistic regressions test was performed to predict the influence of variables on HBsAg positivity. The level of statistical significance for the study was set at $p < 0.05$. Age groups were distributed as <10 , 11–20, 21–30, 31–40, 41–50 and >50 years old. Positive cases of both tests were also aligned in context of the month. The study was approved by the BioMedical Ethics Committee of Ministry of Health-Ha'il branch (IRB log number: 2020-22).

Results

The reports of 3727 hospital patients were included in this study. Of all patients, 1748 (46.9%) were males and 1979 (53.1%) were females. The ages of those patients varied between 3 months and 97 years old with a mean age of 40.03 ± 0.33 years old. The majority of the patients (29.6% and 22.6%) were within the age group of >50 and 21–30, respectively. Most of the reported individuals were admitted as blood donors (31.6%) or in the artificial kidney unit (10.9%). Positive HBsAg cases were reported in 41 of these individuals, giving an overall HBsAg rate of 1.1% (Figure 1).

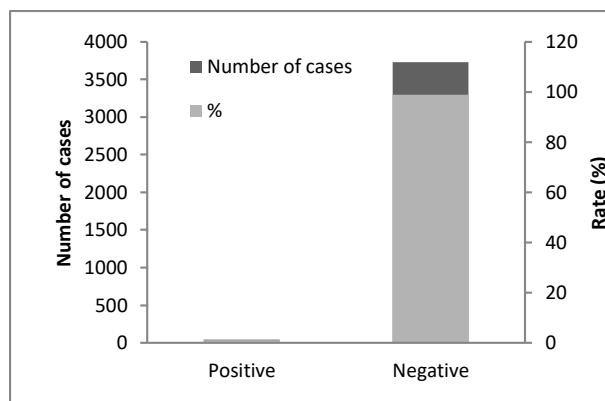


Figure 1: Frequency and rate of HBsAg among patients/blood donors

Figure 2 shows the distribution and rate of HBsAg positivity between genders. The majority of positive HBsAg cases was reported in males (29 cases, 70.7% of the positive cases and 0.72% of the total number of patients) while only 12 positive cases in females (29.3% of the positive cases and 0.32% of the total number of patients). This was statistically significant, $P < 0.01$.

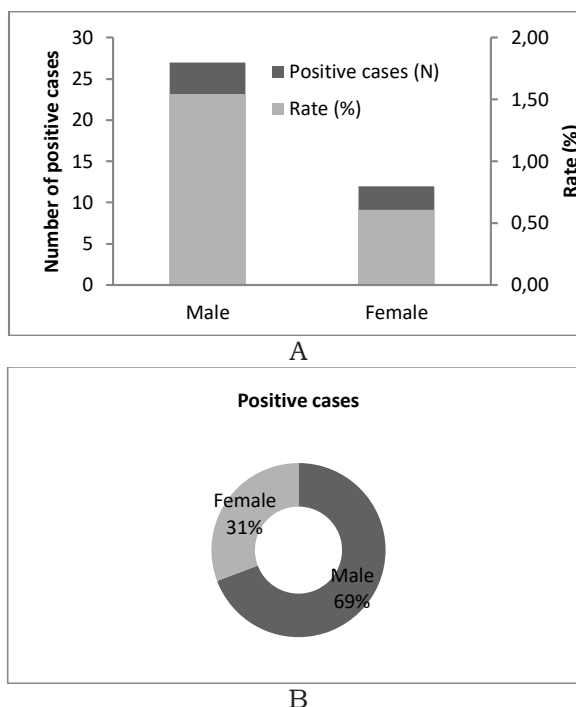


Figure 2: Distribution of HBsAg positive cases between genders. (A) The number of HBsAg positive v.s. negative cases. (B) The percentage of HBsAg positive cases between genders

As shown in Figure 3, the age group >50 years old had the highest positive cases (n=24, 58.5% of the positive cases and 0.64% of the individuals) among other age groups, followed by the age groups 31-40 years old (n=14, 34.2% of the positive cases and 0.38% of the individuals) and 41-50 years old (n=3, 7.3% of the positive cases and 0.08% of the individuals). Remarkably, no HBsAg cases were reported in ages under 30 years old. Moreover, the Spearman correlation coefficient was significant (P -value<0.001), indicating that there is a positive relationship between the frequency of HBsAg positivity and progressing age.

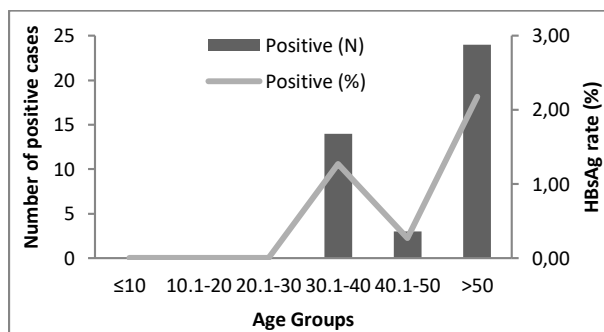


Figure 3: Distribution of HBsAg positive cases and rate of HBsAg between age groups.

As shown in Figure 4, most of the positive cases were reported by the blood donors (n=18, 43.9% of the positive cases and 0.48% of the individuals) followed by artificial kidney unit (n=7, 17.1% of the positive cases and 0.19% of the individuals). Interestingly, the correlation between HBsAg positivity and the medical departments where the individuals registered to was statistically significant (P -value < 0.05).

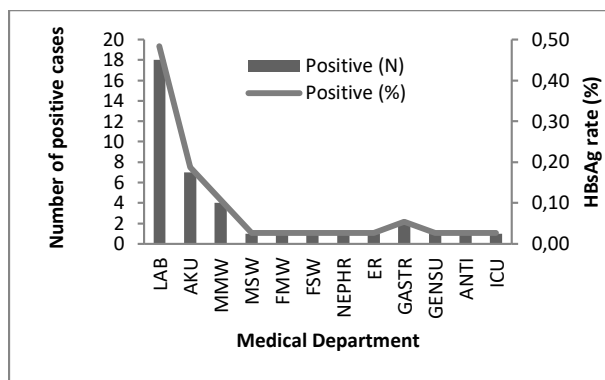


Figure 4: Frequency of HBsAg positive cases and rate of HBsAg according to medical departments.

We also analyzed the frequency of positive cases across the time periods of the reported cases. The frequency of positive cases showed a heterogeneous distribution across the assigned period (Figure 5). Remarkably, 4 prominent peaks of HBsAg positive cases/rate were noticed during the autumn and spring seasons including; September (n=7, 17% of the positive cases and 0.19% of the individuals), October (n=5, 12% of the positive cases and 0.13% of the individuals), November (n=6, 15% of the positive cases and 0.16% of the individuals) and March (n=5, 12% of the positive cases and 0.13% of the individuals). However, the correlation between HBsAg positivity and the reported date of the test was insignificant, P -value>0.05. Thus, it is unlikely that HBsAg followed a seasonal pattern.

To assess the influence of different variables (gender, age and the medical department where the individuals belong to) on HBsAg positivity, we performed binary logistic regression analysis. The regression analysis revealed that male patients are 2.84 times more likely to be positive for HBsAg than female patients (Table 1). Additionally, HBsAg is more likely increases with 1.04 times for every one year increases in age. Regarding the medical department where the patient registered to; the blood donors and gastroenterology/ hepatology patients are 4.68 and 17.56 times more likely to be positive for HBsAg than patients from other departments, respectively. Collectively, the results indicate that male, old people and blood donors as well as gastroenterology/hepatology patients are risk factors for being infected with HBV.

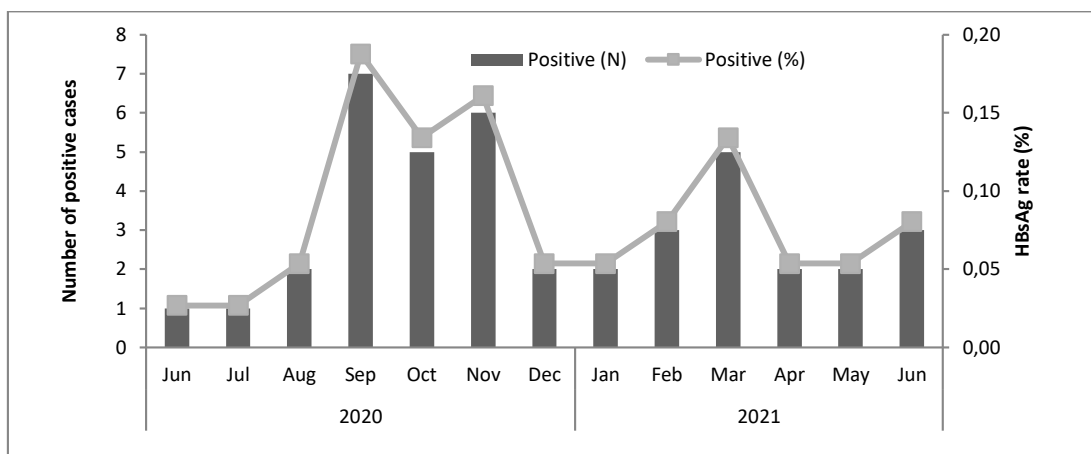


Fig.5: Frequency of HBsAg positive cases and rate of HBsAg according to the epidemiological month/season.

Table 1. The effect of the different variables on HBsAg positivity (Binary regression analysis)

Variables	AOR (95% CI)	P-Value
Medical department		
Other departments	Reference	
Blood donors	4.68 (1.08-20.37)	.040*
Male Medical Ward	2.30 (0.39-13.47)	.356
Male Surgical Ward	1.12 (0.10-12.98)	.929
Female Medical Ward	2.26 (0.19-27.44)	.522
Female Surgical Ward	3.65 (0.309-43.88)	.307
Artificial Kidney Unit	3.29 (0.67-16.28)	.144
Emergency	.82 (0.03-9.38)	.873
Gastroenterology And Hepatology Clinic	17.56 (2.36-130.51)	.005**
General Surgery Ward	.94 (0.08-10.47)	.959
Anti-Coagulation Medical Clinic	9.87 (0.83-116.66)	.069
Intensive Care Unit	1.22 (0.10-14.22)	.876
Gender		
Female	Reference	
Male	2.836 (1.35-5.97)	.006**
Age	1.037 (1.02-1.06)	.000***
Constant		.000

OR: Odd ratio; CI: Confidence interval

* P-value<0.05, ** P-value<0.01, *** P-value<0.001

Discussion

HBV infection leads to significant morbidity and mortality and therefore the WHO's sought to eliminate viral hepatitis by 2030 (WHO 2016). Recently, an

increase in the number of primary hepatic carcinoma cases has been notified. The main etiological factor is hepatitis infections (Farzaei, Zobeiri et al. 2018). In this study, we assessed HBV sero-prevalence among hospital patients in Hail, KSA. The overall prevalence rate (1.1%) of HBsAg among patients and blood donors is relatively low, while it slightly increased among blood donors alone (1.53%). In general, this study revealed a lower prevalence rate of HBsAg than the general estimation of HbSAg positivity in KSA (3.24%) (Alzahrani, Muzahed et al. 2019). Moreover, the HBsAg rate obtained in our study is comparable and more close to the lowest rate reported for blood donors in other regions of the country (0.7%-7.9%) (Alshayea, Eid et al. 2016, Al-Humayed and sciences 2017). The central-northern regions, where Ha'il is part of, consists only 17% of the country HBV cases, while more than 50% of the reported cases were from the population of the Western region, and the highest rate of infection was in Aseer (Aljumah, Babatin et al. 2019). So, it is likely that these differences in the infection rate of HBV are attributed to geographical and socioeconomic differences across the country.

We also observed a statically significant difference of HBsAg seropositivity between males and female. Although male patients/blood donors consisted only 46.9% of the population of this study, about 71% of the positive cases were in males. Our model predicted that male patients are 2.84 times more likely to be positive for HBsAg than female patients/blood donors. These results are consistent with other studies in the Eastern Province of KSA which reported a significant increase of HBV infection in males versus females (Al-Tawfiq and Anani 2008). The result is also in agreement with studies done in another study area (Tserenpuntsag, Ouynbileg et al. 2008, Mavenyengwa, Mukesi et al. 2014). Additionally, this could also be because males are 1.5 more likely have lower plasma disappearance rate for HBsAg than females (Thursz 1997). However, the lower rate of HBsAg in females is interesting since this will potentially reduce the vertical transmission of HBV infection, as the vertical transmission from mother to infant of HBV represent more than 90% of HBV infection (Cheung and Lao 2020).

Notably, no HBsAg positive cases were found in the individuals under 30 years old reported in this study, our model showed that HBsAg is more likely increases with 1.04 times for every one year increases in age. This is consistent with other studies which showed age as independent predictors of acquiring HBV infection (Behal, Jain et al. 2008, Zhang, Li et al. 2011, Dongdem, Kampo et al. 2012, Song, Bian et al. 2014). This likely due to the absence of the immunization program at their birth time and therefore those older people above 30 years old are not vaccinated, while almost all those who was under 30 years old had the vaccination which has been initiated in 1989 (Tufenkeji and Kattan 1994, Lindenberg Ade, Motta-Castro et al. 2013).

Surprisingly, despite that approximately 2 to 15% of patients on hemodialysis are usually HBV infected; only 0.19% of the hemodialysis patients in this study were HBsAg positive (Deray, Buti et al. 2015). This might be accounted for the hygiene and precaution measures employed in the AKU at this hospital. In contrast, our study reported that the blood donors are 4.68 times more likely to be positive for HBsAg than patients from other departments. As discussed above, the rate of HBV infection among blood donors in this study is still relatively low in

comparison to their counterparts from other regions in the country. However, this shed the light to the importance of keeping high standard and precaution measures in this unit as it might be foci for transmitting HBV among the patients attending the hospital.

Conclusions

The rate of hepatitis B infection is relatively low in Ha'il. The sero-prevalence of HBsAg is higher in males than females and rises with the progressing age. Special concern still should be given to gastroenterology/hepatology patients as well as blood donors. Strict universal precautions should be kept in hospitals to prevent HBV transmission.

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Competing interests

Authors have declared that no competing interests exist.

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