Seroprevalence of hepatitis B virus among blood donors at National Blood Transfusion and Research Center-Taiz branch

Abstract

Hepatitis B Virus (HBV) represents one of most health problems. Almost more than 350 million infected persons were reported universally. Blood transfusion is commonly the most route transmission of HBV. Recently, Hospitals in Yemen are increasing demands for blood and blood products due to war injury, anemia, and malnutrition. The risk of transfusion transmission of infection relatively increases. This study aimed to determine hepatitis B virus prevalence among blood donors at National Blood Transfusion Center -Taiz branch (NBTRC- TB). Data were collected from National Blood Transfusion and Research Center (Taiz branch) from 1/4/2020 to 16/12/2020. A total of 3174 blood donors donated blood at the center. A descriptive cross-sectional study was conducted on them. Blood donor information was registered at the reception department, and all blood screening tests were performed. Data of HBsAg and total anti-HBc were analyzed statistically by using IBM SPSS version 26. Among 3174 blood donors, male blood donors were 3158 (99.5%) and female blood donors 16 (0.5%). Furthermore, 41 (1.3%) were positive for HBsAg (Which all positive results for male donors and no positivity for female donors) while 353 (11.1%) (that divided positivity as 350 (11%) for male donors and 3 (0.1%) for female donors) were positive for total anti- HBc Ab. On other hand, the result of HBsAg and total anti-HBc Ab together were showed three levels of positivity as the (HBsAg positive / anti-HBc negative) were 12 (0.4%) which was a low percentage and reversely, the (HBsAg negative / HBcAb positive) were 316 (10.2%), While the HBsAg positive / anti-HBc positive were 27 (0.9%). So this study shed light on the result of (HBsAg negative /anti-HBc positive) which the percentage was the highest result 316 (10.2%) that was statistically significant (p. value = 0.000) which this result indicate donors with post HBV infection or have low HBV infection. This study showed the high prevalence of post-HBV infection among blood donation. Using both markers HBsAg and total anti-HBc Abwill improve the detection of HBV before blood transfusion.

Keywords: HBV, Blood Transfusion, HBsAg; anti-HBc.

1. Introduction

Hepatitis B virus (HBV) is a small and enveloped virus that belongs to *hepadnaviridae*. It has a partially double-stranded DNA circular genome (Chisari *et al.*, 1989; Fopa *et al.*, 2019). HBV represents one of the most common health problems, with more than 350 million infected persons universally (Sallam *et al.*, 2012; Thabit *et al.*, 2012; Jayalakshmi *et al.*, 2013).

HBV infection can cause liver damage that appears as acute or chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma (HCC)(Ott *et al.*, 2012). In addition, some individuals develop acute phase with symptoms that appear for several weeks including jaundice, fatigue, abdominal pain, nausea, vomiting, dark urine, and elevated liver enzymes (Said & Hassan, 2019). Some HBV patients develop chronic liver (liver cirrhosis or (HCC)) with more than 600,000 deaths annually (Said & Hassan; Jayalakshmi *et al.*, 2013; Alzahrani *et al.*, 2019; Moonsamy *et al.*, 2022). It may be the third reason for cause cancer in the universal (Kabamba *et al.*, 2021). The world health Organization (WHO) has defined three levels of endemicity of HBV with HBsAg carrier rate; low level less than 2%, intermediate 2–8%, and high level more than 8% (Akinbami *et al.*, 2012; Sallam *et al.*, 2012). HBV transmits through one commonly route blood or blood product transfusion that will increase HBV infection around the world (Olotu *et al.*, 2016; AlZubiery *et al.*, 2017).

Furthermore, HBV transmits from asymptomatic donors which at low HBV or occult HBV infection (OHI), when HbsAg are not detectable and can cause residual infections like transfusion-transmitted infections (TTI) , thus an additional sero-marker should be investigate (Alabdallat & Bin Dukhyil, 2018). Accordingly, detection of hepatitis B virus infection by both HBsAg and total anti-HBc before blood transfusion is very important to minimize the risk of HBV infection among recipients (Akinbami *et al.*, 2012; AlZubiery *et al.*, 2017).

Many methods are used for HBV diagnostics such as chromatographic device (rapid test), ELISA and molecular assays. They varied in their sensitivity and specificity (AlZubiery *et al.*, 2017).
Recently, In Yemen blood transfusion increased due to injuries, suffered from anemia and malnutrition (AlZubiery *et al.*, 2017).

National Blood Transfusion and Research Centers in Taiz, Sana'a, and Aden examine donated blood by detection of both HBsAg and total anti-HBc. Blood bag rejects when HBsAg is negative, and total anti-HBc is positive. (AlZubiery *et al.*, 2017). This study aimed to determine hepatitis B virus seroprevalence among blood donors at National Blood Transfusion Center (Taiz branch).

2. Methods

2.1.Study design: A descriptive cross-sectional study

Data were collected from National Blood Transfusion and Research Center (Taiz branch) from 1/4/2020 to 16/12/2020. A total of 3174 blood donors donated blood at the center. A descriptive cross-sectional study was conducted on them. Blood donor information was registered at the reception department, and all blood screening tests were performed. Blood samples were analyzed for HBsAg and anti-HBcAb by using Cobas 411e method (Elecsys HBsAgII) REF 0468778190, (Elecsys Anti- HBc) REF.

3. Statistical analysis:

Data of HBsAg and total anti-HBc were analyzed statistically by using IBM SPSS version 26.

4. Result

Through 3174 blood donors were investigated in this study 3158 (99.5%) were male and 16 (0.5%) were female donated blood at National Blood Transfusion and Research Center- Taiz branch (as seen in table 1). All these donors undergo HBsAg and anti-HBc investigation by Cobas method and almost 41 (1.3%) were positive for HBsAg Which all positive results for male donors and no positivity for female donors. On the other hand, 353 (11.1%) were positive for total anti-HBcAb that divided positivity as 350 (11%) for male donors and 3(0.1%) for female donors (as seen in table 1).

Table1: Distribution result of HBsAg and Anti-HBc among blood donors about gender.

Gender	Total 3174		HBsAg		Anti-HBc-Ab	
			Positive 41(1.3%)		Positive 353(11.1%)	
	No	%	No	%	No	%
Male	3158	99.5%	41	1.3 %	350	11%
Female	16	0.5%	0	0 %	3	0.1%
Total	3174	100%	41	1.3%	353	11.1%
X^2	3110		3012		1919	
P	0.000*		0.000*		0.000*	

χ2: Chi-square , P: Probability, * Statistically significant. (p < 0.05: significant) .

No: number, %; percentage.

Furthermore, the study HBsAg and anti-HBcAb together were showed three levels of positivity as the (HBsAg positive / anti-HBc negative) were 13 (0.4%) which was a low percentage and reversely the (HBs Ag negative / anti-HBc positive) were 325 (10.2%), While the (HBsAg positive / anti-HBc positive) were 28 (0.9%) as seen in table 2.

Table 2: Distribution result of both HBV markers together (HBsAg / Anti-HBc) among blood donors.

Both HBV marker	Number (No)	Percentage (%)	X^2	P
HBsAgPositive/anti-HBc Negative	13	0.4%	6897	0.000*
HBsAgNegative/anti-HBc Positive	325	10.2%		
HBsAgPositive/anti-HBc Positive	28	0.9%		
HBsAgNegative/anti-HBc Negative	2808	88.5%		
Total	3174	100%		

χ2: Chi-square , P: Probability, * Statistically significant. (p < 0.05: significant).

So that, this study shed light on the result of (HBsAg negative /anti-HBc positive) which this percentage was the highest result (10.2%)that was statistically significant (p. value = 0.000) (table 2). Undoubtedly this result indicates donors with post-HBV infection or at the low HBV infection which asymptomatic donors that may exist in (window period), late recovery phase or in the viral HBsAg was not detectable. So some blood units were rejected during blood donation in the center; at the same time minimizes the blood transfusion risk for recipients.

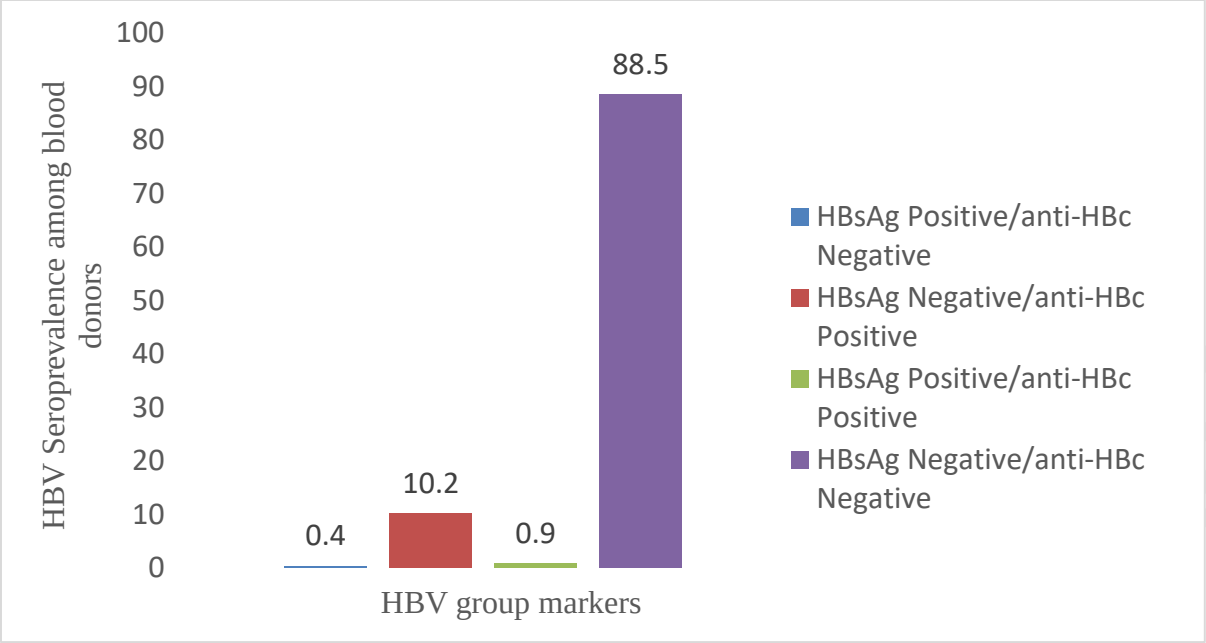

Figure 1: Seroprevalance of HBV markers (HBsAg/ HBcAb) among blood donors.

5. Discussion

This study showed that the HBsAg among blood donors was 41/3174 (1.3 %) when compared with a recent previous study conduct for blood donors at three blood bank centers in Sana'a that reflects slightly decreased than that reported by AlZubiery and his group as1.9% (AlZubiery *et al.*, 2017). Furthermore, other study carried out by Haider in Yemen that showed 9.8% were HbsAg positive among donors in Hajjah governorate(Haidar, 2002), while Sallam and his colleagues mentioned 6.7% among blood donors from Aden governorate (Sallam *et al.*, 2003). Furthermore Al-Waleedi study showed only 5.1% among blood donors in Aden bank were seropositive to HBV(Al-Waleedi & Khader, 2012). Otherwise Al Zubiary reported that 4.1% among blood donors were seropositive to HBV at National Blood Transfusion and Research Center Sana'a (AlZubiery *et al.*, 2017). Probably the result of this study was decreased than other previous studies in Yemen due to successful vaccine program, increased awareness of education, the difference of geographic for studies, occupational status, and used different methods which some method is less sensitivity and specificity.

On other hand this result was agreed to some extent studies that was done by Jadeja *et al* report in India which result as 1.32% (Jadeja *et al.*, 2014) and less than that concluded by Gurol *et al* report in Turkish blood donors, Khattab *et al*. report in Egypt, Pakistan report and Djibouti report which the result (1.5%, 1.65%, 6.2 and 10.4) respectively (Dray *et al.*, 2005; Gurol *et al.*, 2006; Mujeeb & Pearce, 2008; Khattab *et al.*, 2010).

The result of total anti-HBc of blood donors at NBTRC- TB were reactive 353/3174 (11.1%) which less than from result (14%) was reported by Alzubiery (AlZubiery *et al.*, 2017) and also less than result (18.9%) was reported by Mohammad Asim from Indian (Asim *et al.*, 2010), but higher rate Seroprevalence than other neighbor countries such as Saudi Arabia (8.8%) and Iraq (2.1%) as conducted by (Al-Rubaye *et al.*, 2016; Alabdallat & Bin Dukhyil, 2018).

In addition, this study was shown the reactivity of both markers (HBsAg and anti-HBc) 28/3174 (0.9%), whereas the result of anti- HBc was positive but HBsAg was negative 325/3174 (10.2%), which was the highest result that indicates the donors at post-HBV infection and the HBsAg was not detectable. So investigation of both markers (HBsAg and anti-HBc) for blood donors is very important before a blood transfusion to minimize risk transmitted by blood transfusion.

6. Conclusion

This study and other previous studies in Yemen and the world appeared risk in blood transfusion when the donors at post -HBV infection especially if donors with window phase, late recovery phase which HBsAg was undetectable. So addition anti-HBc marker to investigate blood donors along with HBsAg before blood transfusion can increase blood transfusion safety by rejecting blood units which anti-HBc reactive but HBsAg non- reactive.

7. Recommendation

Furthermore, This study recommended adding nucleic acid techniques (NAT) for investigating blood donors at NBTCs and blood banks in our country; addition to total anti- HBc along with HBsAg to enhance the blood transfusion safety and at the same time reduce the blood units rejecting.

Declarations

Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions:

Jamal M. S. Al-khulidi analyses the data and pre-write of manuscript.

Mohammed Al-Taj overall supervision of the manuscript.

Ashwaq Ahmed Abdullah supervise the manuscript and checks it.

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