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

Abstract

Hepatitis B Virus (HBV) represents one of the most health problems. Almost more than 350 million infected persons were reported universally. Blood transfusion is commonly the most common route of 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 the National Blood Transfusion Center -Taiz branch (NBTRC- TB). Data was collected from the 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 the positive results were for male donors and no positivity were for female donors) while 353 (11.1%) were positive for total anti- HBc Ab which is distributed at ratio of 11% (350) for males and 0.1% (3) for females. On the other hand, the result of HBsAg and total anti-HBc Ab together showed three levels of positivity as the (HBsAg positive / anti-HBc negative) were 12 (0.4%) in 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 (10.2%) of which statistically significant (p. value = 0.000) and was the highest result indicates donors with post HBV infection or have low HBV infection. This study showed the high prevalence of post-HBV infection among blood donors. Using both markers HBsAg and total anti-HBc Ab will improve the detection of HBV before blood transfusion.

Keywords: HBV, Seroprevalence, Blood donors, Taiz, Yemen

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 an 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, 2019; Jayalakshmi *et al.*, 2013; Alzahrani *et al.*, 2019; Moonsamy *et al.*, 2022). It may be the third reason for causing 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 of less than 2%, intermediate 2–8%, and high level of 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 who at low HBV or occult HBV infection (OHI), when HbsAg is not detectable and can cause residual infections like transfusion-transmitted infections (TTI) , thus an additional sero-marker be investigated (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 diagnosis such as chromatographic devices (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, 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 was collected from the 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 3158 (99.5%) male and 16 (0.55%) female blood donors were investigated at the National Blood Transfusion and Research Center- Taiz branch (as seen in table 1). All the donors underwent HBsAg and anti-HBc investigation by Cobas method and almost 41 (1.3%) were positive for HBsAg, all HBsAg positive samples were detected on males with no positivity sample among 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.

Table1: HBsAg and Anti-HBc among male and female blood donors.

Gender	Total 3174		HBsAg Positive		Anti-HBc-Ab Positive	
	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) .

Furthermore, the HBsAg and anti-HBcAb together were showed three levels of positivity as the (HBsAg positive / anti-HBc negative) had low rate of 13 (0.4%), and reversely the (HBsAg negative /anti-HBc positive) had high percentage of 325 (10.2%), While the (HBsAg positive / anti-HBc positive) was 28 (0.9%) as it is perceived in table 2.

Table 2: 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).

The result of (HBsAg negative /anti-HBc positive) was the highest (10.2%) and was statistically significant (p. value = 0.000) (table 2).

5. Discussion

This study showed that the HBsAg among blood donors was 41/3174 (1.3 %) which was very close to the percentage (1.9%) recorded conducted for blood donors at three blood banks in Sana'a (AlZubiery *et al.*, 2017). Furthermore, other study carried out by Haider in Yemen showed 9.8% 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 5.1% of blood donors in Aden bank (Al-Waleedi & Khader, 2012). Otherwise Al Zubiary reported that 4.1% of 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 the successful vaccine programs, increased awareness of education, the difference of geographic for studies, occupational status, and the use of different methods, which some of such have less sensitivity and specificity.

This result was agreed with a study done by Jadeja *et al* in India (Jadeja *et al.*, 2014) and was less than that concluded by Gurol *et al* in Turkish blood donors, Khattab *et al*. in Egypt, and Djibouti in Pakistan 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 showed 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 adding 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

This study recommends adding molecular nucleic acid techniques for investigating blood donors at NBTCs and blood banks in our country. In addition to total anti- HBc along with HBsAg to enhance the blood transfusion safety and at the same time reduce the blood rejecting.

Consent

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

Declarations

Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions:

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

Mohammed Al-Taj overall supervision of the manuscript.

Ashwaq Ahmed Abdullah supervised the manuscript and checked it.

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Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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