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HEPATITIS B VIRUS INFECTION AND ASSOCIATED FACTORS AMONG BLOOD DONORS IN ETHIOPIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Blood transfusion is a mandatory therapeutic maneuver that provides life-saving benefits to patients who are suffering from severe anemia due to medical disorders. **Purpose:** this study was aimed to determine HBV infection and associated factors among blood donars in Jigjiga zone Somali region. **Methods:** A facility-based cross-sectional study design was conducted among a sample blood donor in Jigjiga city Blood Bank Somali regional state of Ethiopia. A standardized questionnaire using Epidata was used. A bivariate and multivariate logistic regression was used to assess the independent predictors association (pvalue<0.25) in bivariate as candidate of multivariable logistic regression model-A significant (pvalue<0.05) was considered as statistical significance. **Results:** A total of 323 blood donars participated with a response rate of 95.5%. The overall prevalence of hepatitis B virus infection was (7.1%) (95% CI: 4.3-10.2)After adjusted analysis, marital status being single (AOR=5.3 CI: 1.018-27.859), unsafe therapeutic drug injections (AOR=10.1 CI: 2.791-36.566) unprotected sex (AOR4.6=CI: 1.533-14.116), razor and sharp material sharing (AOR=5.5 CI: 0.852-16.530), having poor knowledge on hepatitis B virus infection (AOR=3.4 CI: 1.107-10.485) were identified as statistically significant associated with hepatitis virus infection. **Conclusion:** Overall prevalence of the study was 7.1%, which needs intervention by the government and other stakeholders.

Keywords: hepatitis b, blood donors, ethiopia

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INTRODUCTION

Blood transfusion is a mandatory therapeutic treatment that provides life-saving benefits to patients with severe anemia due to medical, surgical, or obstetric disorders (Mohammed and Bekele, 2016). Virus causes serious liver complications leading to death in patients with liver failure, cirrhosis, and hepatocellular carcinoma, and d is the most challenging and common infectious disease in the world (Ringehan and McKeating, 2017) . According to the World Health Organization (WHO) Western Pacific Region, 116 and 81 million people are chronically infected, respectively (Rugaatwa Ndibarema and Olum, 2022). Around 240 million people worldwide are chronically ill with HBV (Burns and Thompson, 2014). Owing to the high risk of developing end-stage liver disease or HCC, chronic hepatitis B is associated with high mortality (15–40% in 10–25 years) (Ringehan and McKeating, 2017) . With about 880 000 deaths per year due to complications of CHB. The common modes of transmission, apart from blood transfusion, include exposure to unprotected sexual contact, infected blood, and various body fluids. The reuse of needles and other sharp materials can be a major source of transmission in healthcare institutions(Abalkhail and Alslamah, 2022). Despite there are numerous blood-borne infections in the cells of human beings among the top once is HBVI, most people do not show symptoms of HBV and simply transmit the virus to the populations, and the individuals suffer long-term direct overwhelming impact on the health and wellbeing of the entire society since the infection circulates throughout the community (Mohammed and Bekele, 2016).

Africa has the highest demand for blood transfusions and suffers from severe TTIs. Therefore, health checkups, individual and community mass screening,wise donor selection, and high-quality laboratory tests are among the crucial steps in detecting and preventing the spread of HBV infection. Since poor and resource-scarce regions have a great deal of challenges for early detection of the virus during the window period due to lack of sufficient laboratory tests, expert individuals in this area, lack of infrastructure and poverty, and an unhealthy environment are among the top registered obstacles to tackle this problem (Negash *et al.*, 2019). According to WHO guidelines, countries are classified on the basis of hepatitis B virus infection endemicity as low when its 2% incidence or intermediate 2-7% and>7 higher endemicity (Ajuwon *et al*., 2021). Poor and low-income countries, including Ethiopia, where there is limited access to blood transfusion services, lack of well-organized and designated polices for blood transfusion services, and lack of physical infrastructure, poorly trained health professionals, and resource constraints remain the major bottlenecks that lower blood safety and testing (Assefa *et al*., 2022).

Each year, 81 million units of blood and products are donated by blood donors worldwide, while 18 million units are not screened and transfused for the recipient, resulting in transfusion transmission infections primarily caused by hepatitis B virus infection. The World Health Organization (WHO) estimated that 8-16 million people suffer from episodes of new HBVI and 1.3 million new deaths occur annually worldwide (Abebe and Alemnew, 2020). Furthermore, in Africa, especially sub-Saharan Africa, whenever patients require blood transfusion, the risk of developing post-transfusion HBVI is 12.5%, which is a significant percentage (Bartonjo et al., 2019). Statistically, in Africa, particularly sub-Saharan regions, about 45,000 HBVI are transmitted among blood donors (Yigezu et al., 2022). According to reports regarding the magnitude of hepatitis B virus infection and its associated factors in Ethiopia, the reports shows that HBVI is high among blood donors (estimated as 8.4%) and immigrants (11.0%) (Belyhun et al., 2016). Whenever a unit of blood is transfused, there is a 1% chance of hepatitis B infection transfusion risk for the recipient (Cheema *et al*., 2022). The impact of contaminated and unsafe blood is very costly from the individual level to the entire community owing to the mortality and morbidity attributed to this deadly virus. The impact of the virus is not only limited to the individual, but also has a tremendous effect on families and the entire community (Nelson *et al., 2016*). The magnitude of HBVI among blood donors in Jigjiga is 11% (Mohammed and Bekele, 2016).

According of report regarding the magnitude of hepatitis B virus infection in Ethiopia revealed that HBV infection is highly among blood donors which is estimated as 8.4%

and the immigrants estimated as 11.0% respectively (Abebe and Alemnew, 2020). With each blood unit transfused, there is always a 1% chance and likelihood of transfusion-linked risks of hepatitis B virus infection among blood donors in Ethiopia (Solomon *et al.*, 2021).

In Ethiopia as there is highly needed of blood transfusion as a result of frequent mortality and morbidity including road traffic accidents, obstetrics and gynecology related blood loss, children suffering from malaria, medical and surgical procedures heightened the problems of blood safety in Ethiopia. Therfore continuous screening and monitoring the magnitude of transfusion transmissible infections in blood donors is important for ensuring and minimizing this infectious transfusion transmission infections and by optimizing strict donor recruitment strategies to minimize and prevent infectious disease transmission. Therefore, this study was conducted to determine the prevalence and associated factors of HBV infection from June 14 to July 14, 2021 among blood donors at jigjiga blood bank.

METHOD

Study Area and Period

This research was conducted in the Jigjiga Town Blood Bank. Somali Regional State, Ethiopia. It is located 638 km east of Addis Ababa, 's Ethiopia capital city. This study was conducted in June, 2021.

Study Design and Participant

A cross-sectional institution-based study was conducted among volunteer young and adult blood donors in Jigjiga city. All volunteer blood donors who met the eligibility requirements and volunteered to provide blood were included in the study. A nonprobability sampling technique was used during the study period.

Sample Size

The assumptions considered were a confidence level of 95%, 3.5% margin of error or degree of precision,11% prevalence of hepatitis B virus in jigjiga,10% non-response rate.

$$n = \frac{\left(Z_{\alpha/2}\right)^2 p^*(1-p^*)}{d^2} \quad n = \frac{(3.8416)0.11(0.89)}{(0.001225)} \quad = 307$$

Assuming a 10% non-response rate, the final sample size of the first objective was calculated as:

Nf = n + (n*10/100) = 338.

Data Collection Techniques and Tools

Data were collected using a semi-structured pre-tested questionnaire in face-to-face interviews.

Data Collection Procedure

Enumerators were recruited from two nurses and two laboratory assistants who were supervised and controlled throughout data collection. The laboratory technician, whose member of the blood bank team, not the data collectors, collected 5 ml of blood sample, which was then handled, and sterile test tubes were centrifuged and kept at 2–8°C. The samples were then transported to the main laboratory.

Blood Sample Processing and Testing

5 ml of blood that were drown from the donars veins and labeled by the member of blood bank team handed over to staff assigned the main blood bank (central blood bank), Then the laboratory technologists started to analyze and check the seropositivity and negativity of the blood sample by using enzyme-linked immunosorbent assay (ELISA,) test machine (Human type, manufactured in Germany).

ELISA Test Method

The Wantai HBsAg Diagnostic and Testing Kit, which has 100% sensitivity and 99.9% specificity, specifies which polystyrene microwell strips are precoated with monoclonal antibodies specific to HBsAg infection positivity. The target antigens used for this procedure were specimen diluent, negative control, positive control, enzyme conjugate, and substrates A and B.

Data Quality Control

Data enumerators were chosen according to their communication skills and previous experience, the principal investigators who provided one-day training, and orientation on how to collect data from study participants' methods of data collection.

Ethical Clearance

The Institutional Health Research Ethics Review Committee (IHRERC) of the

College of Medicine and Health Sciences of Jigjiga University and Kebridehar University provided ethical approval letters Ref.No:Kdu/CHS/188/2021 and Jigjiga Blood Bank provided permission to start the research work. Written informed consent was obtained from each participant after providing detailed information about the study.

Data Processing and Analyzing

The data were entered using Epi-data version 3.1 and exported to the Statistical Package for Social Science (SPSS) version 25. The data were clarified, coded, edited, and cleaned prior to further analysis. Descriptive statistics were computed. Bivariate Logistic regression was applied to test the effect of independent predictors of hepatitis B infection. $p<0.25$ in the bivariate analysis were candidates and moved to the multivariable logistic regression model. p-value <0.05 in the multivariate model was considered as the cutoff point to determine statistical significance, and adjusted odds ratio along with 95% confidence interval.

RESULT

Table 1. Socia-demographic characteristics of respondent in Jigjiga City Blood bank Somali regional state of Ethiopia 2021

Variable	Category	Frequency (N=323)	Percent
Age (Years)	18-25	228	70.6
	26-33	52	16.1
	>33	43	13.3
Sex	Male	290	89.8
	Female	33	10.2
Religion	Muslim	309	95.7
	Non-Muslim	14	4.3
Ethinicity	Somali	300	92.9
	Amhara	19	5.9
	Oromo	4	1.2
Marital status	Single	225	69.7
	Married	98	30.3
Residence ststus	Urban	281	87.0
	Rural	42	13.0
Education status	Uneducation	12	3.7
	Primary school (1-8)	23	7.1
	Secondary school (9-12)	91	28.2
	Diploma	127	39.3
	Degree and above	70	21.7
Occupation status	Employed	110	34.1
	Daily laborer	20	6.2
	Merchant	16	5.0
	Farmer	4	1.2
	Student	155	48.0
	Jobless	18	5.6

A total of 323 blood donors with a mean age of 24.42 (SD) +6.64 years were involved. Most (70.6%) blood donars were in the age– 18-25years old, and the age of the participants ranged from to 18-56 years old. The majority of blood donors were male (89.8%), Somali in ethnicity (92.9%), and students (48.0%), while the least were farmers (1.2).

Table 2. Knowledge related question's response of study participants in Jigjiga City blood bank Somali regional state of Ethiopia 2021

Knowledge items	Category	Yes Number (%)	No Number (%)
General knowledge of HBVI	Ever heard about liver disease	289(89.5)	34(10.5)
	Ever heard about HBV	203(63.2)	119(36.8)
	Is HBV viral disease	166(51.4)	157(48.6)
	HBV can cause liver cancer	141(43.7)	182(56.3)
	HB can affect any age group	186(57.6)	137(42.4)

Continuation of Table 2. Knowledge related question's response of study participants in Jigjiga City blood bank Somali regional state of Ethiopia 2021

Knowledge items	Category	Yes Number (%)	No Number (%)
Mode of Transmission	HBV transmitted disease	228(70.6)	95(29.4)
	HBV transmitted unsafe sex	253(78.3)	70(21.7)
	HBVtransmittedunsterile syringe and needle	244(75.5)	79(24.5)
	HBV transmitted Tattooing ear nose piercing	236(73.1)	87(26.9)
Mode of Transmission	HBV Transmitted mother to child	150(46.4)	173(53.6)
	HBV transmits Contaminated blood and blood product	206(63.8)	117(36.2)
	HBV transmits contaminated water and foods	141(43.7)	182(56.3)
Sign and symptoms	Fever cough, running nose	137(42.4)	186(57.6)
	Jaundice	182(56.3)	141(43.7)
	HBVno symptoms some people	163(50.5)	160(49.5)
Treatment	HBV curable/treatable	144(44.6)	179(55.4)
	HBV self-curable by the body	144(44.6)	179(55.4)
	Availability of vaccine	215(66.6)	108(33.4)

Regarding awareness of the HBV, the majority (89.5%) and (63.2%) had ever heard of liver disease and could lead to liver cancer. The majority (78.3%) knew that hepatitis B virus was transmitted by unsafe sex, and (66.6%) knew that hepatitis B virus had been vaccinated.

Table 3. Factors associated with hepatitis B virus infection among Jigjiga City blood bank Somali Regional state of Ethiopia 2021

Variable	Category	HBsAginfection status		COR (95% CI)	P-value
		Positive (%)	Negative (%)		
Age group	18-25	15(6.5)	213(93.4)	0.939 (0.260-3.393)	0.923
	26-33	5(9.6)	47(90.4)	1.418 (0.319-6.307)	0.646
	>33	3(7.0)	40(93.0)	1	
Sex	Male	21(7.3)	269(92.7)	1.210 (0.271-5.408)	0.803
	Female	2(6.0)	31(94.0)	1	
Marital status	Single	20(9.0)	203(91.0)	3.153 (.092-1.093)	0.069*
	Married	3(3.0%)	96(97.0)	1	
Resident	Urban	17(6.0)	264(94.0)	0.386 (0.143-1.044)	0.061*
	Rural	6(14.3)	36(85.7)	1	
Education	Uneducation	1(8.4)	11(91.6)	1	
	Primary school (1-8)	1(4.4)	22(95.6)	0.500(0.028-8.772)	0.635
	Secondary school (912)	5(5.8)	86(94.2)	0.640 (0.068-5.989)	0.695
	Diploma	15(11.8)	112(88.1)	1.473 (0.177-12.235)	0.720
	Degree and above	1(1.5)	69(98.5)	0.159(0.009-2.739)	0.206*
Occupation	Employed	7(6.4)	103(93.6)	1.155 (0.100-7.484)	0.896
	Daily laborer	1(5.0)	19(95.0)	0.895 (0.052-15.437)	0.939
	Merchan	1(6.3)	15(93.7)	1.133 (0.065-19.739)	0.932
	Farmer	1(25)	3(75)	5.667 (0.273 117.448)	0.262
	Student	12(7.8)	143(92.2)	1.427 (0.175-11.662)	0.740
	Jobless	1(5.6)	17(94.4)	1	
Hospital admission	Yes	15(8.1)	170(91.9)	1.434 (0.590-3.484)	0.426
	No	8(5.8)	130(94.2)	1	
Surgical,procedure	Yes	3(6.3)	45(93.7)	0.850(0.243-2.979)	0.800
	No	20(7.3)	255((92.7)	1	
Blood,transfusion	Yes	5(17.3)	24(82.7)	3.382 (1.148-9.968)	0.027
	No	17(5.8)	276((94.1)	1	
Dental procedure	Yes	9(8.5)	97(91.5)	1.345 (0.563-3.217)	0.505
	No	14(6.5)	203((93.5)	1	

Continuation of Table 3. Factors associated with hepatitis B virus infection among Jigjiga City blood bank Somali Regional state of Ethiopia 2021

Variable	Category	HBsAginfection status		COR (95% CI)	P-value
		Positive (%)	Negative (%)		
HBV vaccine	Yes	3(4.2)	69((95.8)	0.529 (0.152-1.839)	0.316
	No	19(7.6)	231(92.4)	1	
Shared, razor	Yes	7(21.3)	26(78.8)	4.6129 (0.675-6.712)	0.002*
	No	16(5.6)	274(94.5)	1	
Unprotect sex	Yes	13(12.3)	93(87.7)	2.894 (1.225-6.838)	0.015*
	No	10(4.6)	207(95.3)	1	
tattooing	Yes	4(13.0)	27(87.0)	2.129 (0.675-6.712)	0.197*
	No	19(6.5)	273(94.5)	1	
Unsafe drug	Yes	19(13.0)	129(87.0)	6.260 (2.079-18.847)	0.001*
	No	4(2.3)	170(97.7)	1	
Number of donations	New	14(6.0)	219((94.0)	0.575 (0.240-1.381)	0.216*
	Repeat	9(10.0)	81(90.0)	1	
Knowledge	Poor knowledge	16(10.9)	131(89.1)	2.949(1.179-7.377)	0.021*
	Good knowledge	7(4.0)	169(96.0)	1	

*Candidate variables for multivariate logistic regression (p-value <0.25) COR Crud oddis ratio.

Table 4. Multivariate logistic regression model analysis for factors associated with HBVI among blood donars, Jigjiga City blood bank, Somali regional state of Ethiopia, 2021

Variable	Category	COR (95%CI)	AOR (95%CI)	P -value
Marital status	Single	3.153 (.092-1.093)	5.325 (1.018-27.859)	0.048**
	Married	1		
Unsafe therapeutic injection	Yes	6.260 (2.079-18.847)	10.102(2.791-36.566)	0.000**
	No	1		
Unprotected sex	Yes	2.894 (1.225-6.838)	4.652 (1.533-14.116)	0.007**
	No	1		
Rosar and sharp material sharing together	Yes	4.6129 (0.675-6.712)	5.533(1.852-16.530)	0.009**
	No	1		
Knowledge	Poor knowledge	2.949(1.179-7.377)	3.406(1.107-10.485)	0.033**
	Good knowledge	1		

**Statistically significant at (p- value <0.05) COR-CRUD oddis Ration-AOR Adjusted Odds Ratio, 1reference.

DISCUSSION

Blood and blood product transfusion is an integral part of human life and the best maneuvers that can save millions of people affected by a lack of blood (Belyhun *et al.*, 2016). The proportion of male and female blood donors in this study was comparable with the findings of other studies. For instance The majority 290(89.8%) of blood donars in this study were male compared to females33(10.2%) in contrast of some studies that were done in Ethiopia showed that the majority of blood donars were male in 98.7% in jigjig (Mohammed and Bekele, 2016).74.6% in walita (Bisetegen *et al.*, 2016) and 87.9% in Gondar (Tigabu *et al.*, 2019) . This clearly indicates that the awareness of female blood donation in jigjiga is very low and that Somali women are usually indoor activity owners by culture, which may prevent them from public gathering and donate blood voluntarily. By nature, women have lower hemoglobin levels than men, which is another factor that may cause a high rate of blood donation refusal (Jemberu *et al.*, 2016). 228 (70.6%) Of the members of the blood donors were between 18-25years, the minimum age was 18 years, and the maximum age was 56 years.) These research findings partly agreed with the WHO report that 45.0% of the blood donors are aged 25 years or less, which is consistent with other research conducted in Jimma (60.96%) (Mekonnen *et al.*, 2022) and in Arbaminch

(80.2%) (Kabato, 2016). In this study, the majority of 155(48.0%) blood donors were students, and the minority 4(1.2) were farmers (4(1.2%)).

Prevalence of HBV Infection

The seroprevalence rate detected in this study was(7.1%). The findings of this study are consistent with those of previous studies conducted in Ghana (Dongdem *et al*., 2012). Cameroon (Bigna *et al*., 2017), and burkinofaso, all of which are included in the WHO classification of higher endemicity areas (Nagalo *et al.*, 2012) . Locally, the study partly agreed and was in line with the study conducted in jigjiga (Mohammed and Bekele, 2016).

The national prevalence of HBV infection (Belyhun *et al*., 2016) and studies conducted in Walaita soda included the WHO classification of higher endemicity areas (Bisetegen *et al*., 2016). The findings of this research are higher than and oppose studies conducted in Africa like Nigeria,3.3% (Ajayi *et al*., 2021), Eretria (2.6%) (Geta *et al*., 2021), india %1.76 (Hulinaykar and Krishna, 2016) Jordan (1.4%) (Gasim, 2013), and Iraq (0.78%) (Merza, 2020). This may be due to regional variations in HBV vaccine availability and socioeconomic variation of the countries. The findings of this research are lower than and opposing those of similar studies. Darfur Sudan 12.69% (Badawi *et al*., 2018). Furthermore, the findings of this study were higher when we compared other research conducted in different parts of the country likeAdama5.9%(Yilma et al., 2021), Gondar4.05%, and jimma 3.05% (Mekonnen *et al*., 2022). tigray 5.9 % (Weldemhret *et al*., 2016). These findings are also higher than those of studies conducted in different parts of the country, including Addis Ababa(3.9%) (Geta *et al*., 2021). Debre markos blood bank center 4.7% (Bialfew *et al*., 2018) Nekemte blood bank,Oromia 3.06% (Abebe and Alemnew, 2020), Dire Dawa blood bank 4.67% (Ataro *et al*., 2018) and Bahir Dar 4.2% (Birku *et al*., 2015). This might be explained by the socioeconomic variation in African countries, knowledge status, and awareness of hepatitis B infection. In the multivariate model, single, unsafe therapeutic drug injections, unsafe sexual intercourse razor, sharp material sharing, and poor knowledge of hepatitis B virus were strongly significant predictors associated with hepatitis B virus infection. According to this study, being single was 5.3 times more likely to develop HBV infection compared to married participants. This is in line with other studies conducted in Gondar (Tessema *et al*., 2010) Jimma (Yami *et al*., 2011) and Dire Dawa (Habte *et al*., 2016). This strong association might be attributed to the fact that single people are more prone to multiple unprotected sexual contacts compared to married people, as those married populations are 70% less likely to develop HBV infection compared to single people.

Unsafe therapeutic drug injections were 10.1 times more likely to develop hepatitis B virus infection when compared to non-exposed groups; this result is in line with other studies conducted in the jima Arbaminch (Yami *et al*., 2011) and a global report on contaminated injections causing 21 million new HBV virus infections worldwide, which is equivalent to 32% risk (Shepard *et al*., 2006). This might be because drug injection providers use contaminated syringes and needles, or either unflow the statandar procedure for medication administration. Having unprotected sexual intercourse had 2.8 times more risk of HBV infection than those not exposed to unprotected sex, which is in line with studies conducted on bahardar (Assefa *et al*., 2022). In addition, in eastern Ethiopia (Heyredin *et al*., 2019). A possible explanation is that the key mode of acquiring transmitted diseases in Africa is unprotected sexual intercourse, and multiple partners remain the top roots of infectious disease transmission in Africa. Being exposed to razor and sharp material sharing had an odds of 4.6 times more likely to develop HBV infection than those not using sharp material together. This study is in agreement with a study conducted in Ethiopia and emphasizes policy, regulation, and strategies for its control and elimination in Ethiopia's national study on HBV infection (Shiferaw *et al*., 2016). Having poor knowledge had the odds of 2.9 times more likely to develop hepatitis B virus infection compared to those who had good knowledge on hepatitis B virus infection. This study is in agreement with studies conducted in Sudan (Mursy and Mohamed, 2019) and Malaysia (Ahmad *et al*., 2016). This indicates an alarming situation that needs to take action and create inclusive awareness of HBV infection among blood donor groups in the

study area. The cross-sectional design, however, limits the study of causal inference.

CONCLUSION

The overall prevalence of HBsAg among blood donors participating in this study were (7.1%). Which shows higher and significant number therefore to combat this deadly virus, jigjiga blood bank should form a team to conduct vigorous health education lessons, aimed at teaching the community about blood-borne infections, particularly voluntary donation groups prior to and after donation. Simultaneously, the blood bank should assume responsibility for community-based mass-screening programs for both preventive and curative purposes.

SUGGESTION

The Ministry of Health, together with blood banks and other stakeholders, should advocate for hepatitis B vaccination to protect high-risk groups. It is also vital to address and issue proclamations on the sharing of sharp materials, which has aided the spread of HBV infection. The blood bank team that conducts a blood donation campaign should critically perform screening before blood donation. Despite the fact that blood bank employees interact with people side by side to donate blood, they should also endeavor to spread health education messages aimed at reducing infectious diseases, such as HBV infection, in communities and target groups.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTION

Author Abdifetah Abdulahi for tittle selection and data analysis. Author Fental Getnet was assigned for checking and reviewing the article. Author Mowlid Akil for data entry. Author Abdulahi Mahamud assigned with discussions. Author Ahmeddahir determined by making dummy tables and filling with results.

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