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Research Article

**PREVALENCE OF BLOOD-BORNE PATHOGENS AMONG
BLOOD DONOR IN THE CENTRAL BLOOD BANK,
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Ministry of health, Jeddah, Saudi Arabia³ Joint Program of Postgraduate Studies of Family Medicine, Jeddah, Saudi Arabia⁴ Consultant family and community medicine, founder and former director of Saudi
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Saudi Arabia⁵ Laboratory specialist, Central blood bank, Makkah, Saudi Arabia**Article Received:** January 2020 **Accepted:** February 2020 **Published:** March 2020**Abstract:**

Introduction: Donating blood save millions of lives worldwide every year. According to the World Health Organization (WHO) recommendations, all blood donations should be screened for HIV, HBV, and HCV. Hazardous transfusion is extremely expensive from both human health and economic points of view.

Methods: Analytical Cross-sectional study was done using file records of blood donors in the central blood bank department in in Hadda, Makkah city for 1-year period (January to December 2018).

Result: Most of blood donors in Makkah were Non-Arabic males and was coming for blood replacement and the prevalence of HBV was only one case and no HCV or HIV cases were detected during routine screening. There was a significant relation between blood groups of donors and the nationality.

Key words: HIV, HBV, HCV, Blood donors, Makkah.

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INTRODUCTION

Blood donation procedure involve the collection, examination, preparing, and storing of blood and blood components. Blood donors are divided into groups. A volunteer blood donor who gives blood voluntarily and does not receive compensation, and donates only for humanity, or community duty. A replacement donor is someone who gives blood to replace the blood used in blood transfusion process, to ensure a constant supply. Donating blood save millions of lives worldwide every year [1].

Although blood donation have an vital role in the supportive care of patients, dangerous transfusion practices may lead to the persistent transfusion-transmissible infections (TTIs), including human immunodeficiency virus (HIV), hepatitis B and C virus (HBV and HCV, respectively), *Treponema pallidum*, arboviruses, malaria, filariasis and sporadically illnesses such as toxoplasmosis and brucellosis [2,3]. Conferring to the World Health Organization (WHO) recommendations, all blood donors, should be screened for HIV, HBV, HCV. Hazardous transfusion is extremely expensive from both human health and economic points of view. In the cohesive strategy recommended by World health organization, which include choosing blood donors with a low risk for TTIs and effective laboratory monitoring is important, and it has reduced the threat of transmission to relatively low levels over the past two decades [4, 5]. However, in developing nations, a major percentage of donated blood presents risks as it is neither screened for all of the prevalent TTIs nor screening performed in a quality-controlled manner [6,7]. Hepatitis C virus (HCV), hepatitis B virus (HBV), human immunodeficiency virus (HIV) can involve high burdens of illness in many countries, especially in developing one. For example, 184 million and 248 million individuals worldwide are chronic carriers of HCV and HBV, respectively [8, 9]. In addition, 37 million individuals are living with HIV/acquired immunodeficiency syndrome (AIDS) globally [10].

Transfer of these pathogens comprises a variety of routes, including sexual transmission, spread from mother to her infant (vertical transmission), exposure to contaminated blood due to using contaminated needles and syringes, and the transfusion of infected blood or its components. The latter route is very important as a blood transfusion is a common therapeutic process, with around 108 million units of donated blood gathered every year worldwide [11]. Thus, the World Health Organization (WHO) advises that all blood donors should be checked for selected infections prior to use and that screening should be mandatory for HBV, HCV, HIV, and *T. pallidum* [12]. Assessment of data on the

prevalence of these infections among blood donors may deliver information about the epidemiology of these infections in the general inhabitants [13].

More than 350 million HBsAg carriers in the world represent the main reservoir of hepatitis B people. Other populations with high rates of Hepatitis B Virus (HBV) infection include partners of acutely diseased persons, sexually licentious persons, health care workers exposed to blood, persons who require repeated transfusions especially with pooled blood product concentrates, residents and staff of custodial institutions for the mentally retarded persons, prisoners and, to a lesser extent, family members of chronically infected patients. Around 80% of HBV carriers reside in Asia [14].

The prevalence of TTIs among blood donors can be used as a valuable guide to evaluate the safety of the blood supply and potential risk of infection. Changes in the spread may also reflect trends in infections that are of interests among the population. Previous epidemiological data of immigrants from Equatorial Guinea (EG) indicated an incredibly high prevalence of HIV, HBV, HCV and HDV affectioning [15]. The current blood safety guidelines necessitate blood banks to routinely perform serological testing for HIV, HBV and HCV [16].

In Saudi Arabia, the average prevalence of HBsAg in blood donors ranges from 2.7% to 9.8% [17]; however, several studies of blood donors in Saudi Arabia have shown regional variations in the prevalence of HBsAg [18]. The overall prevalence of HCV among blood donors in Saudi Arabia is 1.1% [19].

It was important to conduct the current study in the central blood bank department in Makkah to identify the determinant of HBV HCV, and HIV and prevent the occurrence of new cases and to assess the associated risk of HBV, HCV, and HIV among blood donors in Makkah city.

METHODOLOGY:

Analytical Cross-sectional study was done using file records of blood donors in the central blood bank department in in Hadda, Makkah city for 1 year period (January to December 2018), as all blood donors are subjected for mandatory scanning of HBV, HCV, HIV through a serology testing using ARCHITECT® HIV Ag/Ab Combo Assay, ARCHITECT® Anti-HCV reagent kit and ARCHITECT® HBsAg Qualitative II kit.

Aim of the study:

To identify the determining factor of HBV, HCV, and HIV and prevent the occurrence of new cases.

Objectives

- To determine the prevalence of HBV, HCV, and HIV among blood donors in the central blood bank department in Makkah for 1-year period (from January to December 2018).
- To assess the associated risks of HBV, HCV, and HIV among blood donors in the central blood bank department in Makkah.
- To assess the association between the nationality and blood group, purpose of donation and previous donation history.

Inclusion criteria

All file records of blood donors who donated blood at Central blood bank from first of January 2018 to the 31st of December 2018

Exclusion criteria

No exclusion criteria.

Sample size

- According to information from central blood bank, Makkah, the total number of donors attended the donation center is around 8156 blood donors in year period of 2018.
- Sample size calculation was done by <http://www.raosoft.com/samplesize.html> (margin of error= 5%, Confidence level = 95%)
- Total number of samples was around 367

Sampling technique

- Total number of samples was around 367
- This total Number of samples was randomly selected from the total number of donors attended donation center in 2018.

The file record is computerized by this website:

- (random number generator): <https://stattrek.com/statistics/random-number-generator.aspx>

Data Collection technique

All Files of blood donors randomly selected was checked for positive blood testing for HBV, HCV, and HIV in the specified study period, and then the data was filled in SPSS.

Study Variables:

Dependent variable:

HBV HCV, and HIV infection.

Independent variables:

Age, Gender, Nationality, Address, Type of donor, Blood group, Rh, and history of blood transfusion.

Pilot study

A pilot study was conducted on approximately (10%) of the sample (blood donors who donated blood in December 2017).The data from the pilot study will not be included in the research.

Data and Analysis

Data were collected, coded, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non-parametric distribution.

Chi-square test was used in the comparison between two groups with qualitative data and **Fisher exact test** was used instead of the Chi-square test when the expected count in any cell found less than 5.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

$P > 0.05$: Non-significant (NS)

$P < 0.05$: Significant (S)

$P < 0.01$: Highly significant (HS)

Ethical Considerations:

1. Approval from the ethical committee from the Joint Program of Family Medicine in Jeddah was obtained.
2. Approval from directorate of Health affairs in Makkah.
3. All collected data was kept confidential and will not be used except for the scientific research.
4. Ethical considerations was observed throughout the study.

RESULTS:**The demographic characteristics of the blood donors**

367 blood donors were randomly selected from total 8156 blood donors in year period of 2018, 100% of the blood donors were males, the age range was between 18 and 57 years old and the Mean \pm SD was 32.40 ± 7.27 , 44.5% of them were between 18 and 30 years old, 42% were between 31 and 40 years, 13.0% were between 41 and 50 years and 0.5% were more than 50 years old. Half of them (50.0%) were non- Arabic nationality, 31 % of them were Arabs and only 19 % of them were Saudi and 98.9% of the blood donor were resident in Makkah (**Table 1**).

The type of the blood donors

Regarding blood grouping of the blood donors, 36 % of them were blood group O, 29 % were blood group A, 29 % were blood group B and 6 % were blood group AB. Most of them were Rh positive (93.5 %) and only (6.5 %) were Rh negative donors. It was the first time for blood donation in 79.6% of blood donors while 20.1% reported history of donation. Most of donors (82 %) were donating for blood replacement, 15 % of them were donating because of Traffic license and only 11 donors representing (3.0%) were blood volunteers (**table 1**).

The seroprevalence of HIV, HBV and HCV among Blood Donors

96 % of the blood donor had negative Antibody to Hepatitis B core antigen (anti-Hbc), Also 98% of them had negative antibodies of Hepatitis B surface Antigen, (anti HBS), 99.7% had negative HBsAg and only one donor (0.3%) had positive HBV screening. All donors (100%) had negative HCV and HIV screening (*table 2*).

Comparison between groups

As regards relation between nationalities and prevalence HBV, HCV and HIV, there was non-significant relation between them as, the only positive HBV case was Non Arabic subject (*table 3*).

Regarding the relation between prevalence of HBV and blood groups, there was significant (p value = 0.002) relation between them as the only positive HBV case was blood group AB and was Rh positive donor representing (4.2%) of HBV prevalence among AB blood group and 0.3% of prevalence of HBV among Rh positive individuals, as shown in *table 4*.

Regarding relation between blood groups and nationality, there was a high significant relation (p value <0.001) between blood groups and nationality as, most of non-Arabic were blood group B (71.7% of total group B participants), In Arabs the most prevalent blood group was blood group O (40.5% of total group O donors), *Arabs and non-Arab were equal regarding blood group A* (36.8% each of total A group donors), Also the most prevalent blood group in Saudi was group A (26.4% of total group A donors), regarding blood group AB it was more prevalent in Non-Arab Nationality as shown in *table 5 & figure 1*.

Regarding the relation between nationalities and the purpose of donation, there was significant relation (p value =0.002) between them, most of donor coming for blood replacement and traffic license were non-Arab (77.7% & 20.1% respectively), while most blood volunteers were Saudi as shown in *table 6 & figure 2*.

The current study found that, there was significant relation between previous donation and nationality (p value < 0.05) as, 24.6 % of Saudi donors had positive donation history, 23.4% of non Arabic donors had positive donation history, while 12.3% of arbs had positive donation history as shown in *Table 7*.

DISCUSSION:

367 blood donors were randomly selected from total 8156 blood donors in year period of 2018, 100 % of the blood donors were males, this was in accordance

with *Khedrnat et al.*, [20] while conducting a Seroepidemiologic Study of Hepatitis B Virus, Hepatitis C Virus, Human Immunodeficiency Virus in Iranian Blood Donors and also found that, 957 (94.4%) were male and 57 (5.6%) were female. Also, *Xie et al.*, [21] found that 76.81 % of donor were males in their study conducted in Bioko Island, Equatorial Guinea.

This was in contrast with *Cao et al* [22] who conducted a study in Xiangya hospital Central South University, China from 2011 to 2016 and found that male donors were 49.395 % while Female donors were about 50.61%.

In the current study the age range was between 18 and 57 years old and the Mean \pm SD was 32.40 \pm 7.27 , 44.5 % of them were between 18 and 30 years old, 42 % were between 31 and 40 years, 13 % were between 41 and 50 years and 0.5% were more than 50 years old, this was in accordance with *Xie et al.*, [21] who also found that 41.13% of donor were between 28- 37 years and *Negash et al.*, [23] who found that most of donors (41.4 %) were between 18 and 27 years in study conducted in South Gondar District blood Bank, Northwest Ethiopia.

The result of our study was in contrast with *Seri et al.*, [24] who found that the age range of blood donors were between 20-28 years old in the study conducted in Côte d'Ivoire and *Alshomrani.*, [25] who found that the age rang was between 40 and 49 years in his study conducted among heroin injectors in the central region of Saudi Arabia.

The present study found that, half of blood donors (50 %) were non- Arab, 31 % of them were Arabs and only 19 % of them were Saudi, the large number of non-Arab and Arabs donor is due to the nature of Makkah as a Muslim tourist attraction place from the whole world.

In our study , it was found that, Most of donors (82%) were donating for blood replacement, 15% of them were donating because of Traffic license and only 11 donors representing (3 %) were blood volunteers, this was in accordance with *Abdullah.*, [26] in his study conducted in Jazan Region of Saudi Arabia and found that, 76.6 % of blood donors were coming for blood replacement and was in contrast with *Degefa et al.*, [27] who claimed that 58.7% of blood donors were volunteers in their study conducted in Mekelle blood bank, Northern Ethiopia.

The current study found that 96 % of the blood donor had negative Antibody to Hepatitis B core antigen (anti-Hbc), Also 98% of them had negative antibodies of Hepatitis B surface Antigen (anti Hbs), this was in accordance with *Abdullah.*, [26] as he

found that the prevalence of anti-HCV and anti HBS was 4.3% and 2.3% respectively.

This results were in contrast with *Alshomrani.*, [25] who claimed that the prevalence for HBV surface antigen 7.7%, also *Seri et al.*, [24] who found that The incidence rate of HBsAg positive was 7.3%, *Khednat et al.*, [20] found that The prevalence of HBsAg, anti-HCV, HIV were 3.6%, 3.1% and 0.78% respectively.

In our study, All donors (100%) had negative HCV and HIV screening, 99.7% had negative HBV and only one donor (0.3%) had positive HBV screening, this may be due to the Islamic nature of Makkah as improper sexual acts and drug abuse is prohibited. Current study results was in accordance with *Mavenyengwa et al.*, [28] in a study conducted in Namibia, and the results of the study found that, prevalence of HBV, HCV and HIV among blood donors was 0.3%.

This was in contrast with *Negash et al.*, [23] who proved that the prevalence of HIV, HBV and HCV among blood donors were 2.6, 5.8 and 4.2% and *Tigabu et al.*, [29] who found that, the overall prevalence rates of HIV, HBV, and HCV were 2.5%, 4.1% and 1.6%, respectively.

Regarding the relation between blood groups and nationality, current study found that, the most prevalent blood group in Saudi was group A that was in contrast to *Bashwari et al.*, [30] who conducted a study in Blood Bank Department of King Fahd Hospital of the University, Al-Khobar, Saudi Arabia and claimed that the most frequent blood group in Saudis is O-positive, also in contrast with *AlBilali et al.*, [31] who conducted A cross-sectional study that was carried out at Al-Madinah Blood Bank, and found that the most prevalent blood group in Saudi donors was blood group O (47%) and *Sarhan et al.*, [31] who conducted a study in the southwest region of Saudi Arabia including Aseer, Jizan, and Najran regions. And their results show that the most frequent blood group in the Saudi population in the southwest region is O-positive.

CONCLUSION:

From the present study it was concluded that, most of blood donors in Makkah were Non-Arabic males and was coming for blood replacement and the prevalence of HBV was only one case and no HCV or HIV cases were detected during routine screening.

There was a significant relation between blood groups of donors and the nationality as blood group B was more prevalent in non-Arab, In Arabs the most prevalent blood group was blood group O, the most prevalent blood group in Saudi was group A

and group AB was more prevalent in Non-Arab. Also, negative history of previous blood donation predominate in either Saudi, Arabs and non Arabs.

RCOMMENDATIONS

- Current study recommends respecting this difference when searching for specific blood group during blood transfusion.
- Health education to the public about the importance and benefits of regular blood donation is needed.

Budget, Fund or Grant:

No source of funding

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TABLES

Table (1): Personal characteristics of study sample (n= 367) in a period of one year (1 January to 31 December 2018)

Personal characteristics	Value
Age group (in years)	
• Range	18-57
• Mean \pm SD	32.4 \pm 7.2
• > 50	2 (0.5%)
• 18- 30	163 (44.5 %)
• 31- 40	154 (42 %)
• 41-50	48 (13 %)
Gender	
• Male	367 (100%)
• Female	0 (0%)
Nationality	
• Saudi	69 (19%)
• Non Arabic	184 (50%)
• Arabic	114 (31%)
Region	
• Makkah	363 (98.9%)
• Jeddah	3 (0.8%)
• Abha	1 (0.3%)
Donation type	
• Volunteer	11 (3%)
• Replacement	300 (82%)
• For Traffic license	56 (15%)
Blood type	
• A	106 (29%)
• B	106 (29%)
• AB	24 (6%)
• O	131 (36%)
Rh	
• Positive	343 (93.5%)
• Negative	24 (6.5%)
Previous donation history	
• Yes	74 (20%)
• No	293 (80%)

Table (2): The prevalence of HBV, HCV, and HIV during period of one year (1 January to 31 December 2108)

Parameters	Number of unit and percentage	
	NAT- HBV	Reactive
Non- reactive		366 (99.7%)
HBsAg	Reactive	1 (0.3%)
	Non- reactive	366 (99.7%)
Anti-HBs	Reactive	7 (2%)
	Non- reactive	360 (98%)
Anti-HBc	Reactive	14 (4%)
	Non- reactive	353 (96%)
NAT-HCV	Reactive	0 (0%)
	Non- reactive	367 (100%)
Anti-HCV	Reactive	0 (0%)
	Non- reactive	367 (100%)
NAT-HIV	Reactive	0 (0%)
	Non- reactive	367 (100%)
HIV Ag & Ab	Reactive	0 (0%)
	Non- reactive	367 (100%)

Table (3): Relation between nationalities and HBV, HCV and HIV in a period of one year (1 January to 31 December 2018)

		Nationality						Chi square test	
		Arab		Non-Arab		Saudi		x ²	p value
		No	%	No	%	No	%		
HBV	Negative	114	100.0%	183	99.5%	69	100.0%	0.997	0.607
	Positive	0	0.0%	1	0.5%	0	0.0%		
HCV	Negative	114	100.0%	184	100.0%	69	100.0%	NA	NA
HIV	Negative	114	100.0%	184	100.0%	69	100.0%	NA	NA

Table (4): relation between blood groups, RH and HBV, HCV and HIV in a period of one year (1 January to 31 December 2018)

		Blood group								Chi square test			
		A		AB		B		O		x ²	p value		
		No	%	No	%	No	%	No	%				
HBV	Negative	106	100.0%	23	95.8%	106	100.0%	131	100.0%	14.331	0.002		
	Positive	0	0.0%	1	4.2%	0	0.0%	0	0.0%				
HCV		Negative	106	100.0%	24	100.0%	106	100.0%	131	100.0%	NA	NA	
HIV		Negative	106	100.0%	24	100.0%	106	100.0%	131	100.0%	NA	NA	
		Rh								x ²		p value	
		Negative				Positive							
		No	%	No	%	No	%	No	%				
HBV	negative	24	100.0%	342	99.7%					0.07	0.791		
	positive	0	0.0%	1	0.3%								
HCV		negative	24	100.0%	343	100.0%					NA	NA	
HIV		negative	24	100.0%	343	100.0%					NA	NA	

Table (5): Relation between blood groups and nationality in a period of one year (1 January to 31 December 2018)

		Blood group								Chi square test	
		A		AB		B		O		x ²	p value
		No	%	No	%	No	%	No	%		
Nationality	Arab	39	36.8%	6	25.0%	16	15.1%	53	40.5%	34.292	<0.001
	Non-Arab	39	36.8%	13	54.2%	76	71.7%	56	42.7%		
	Saudi	28	26.4%	5	20.8%	14	13.2%	22	16.8%		

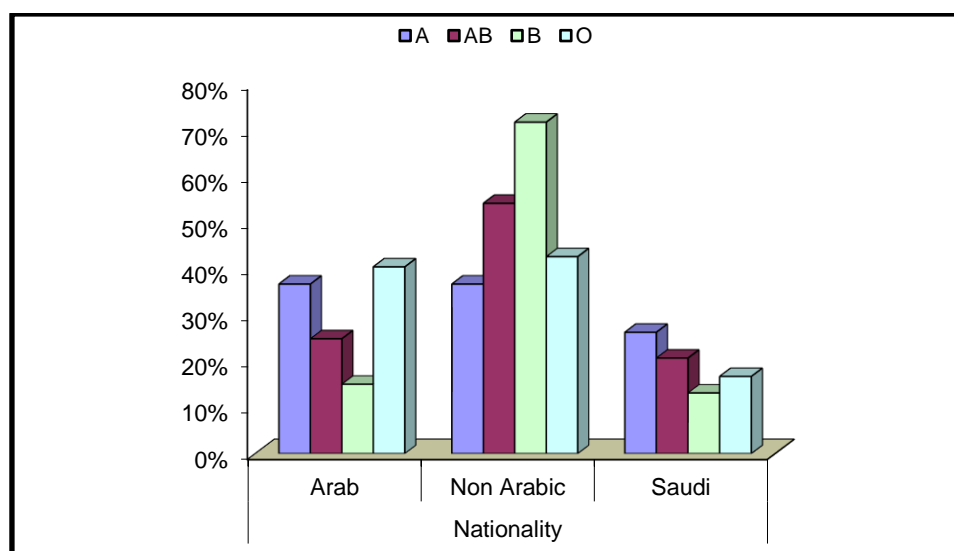
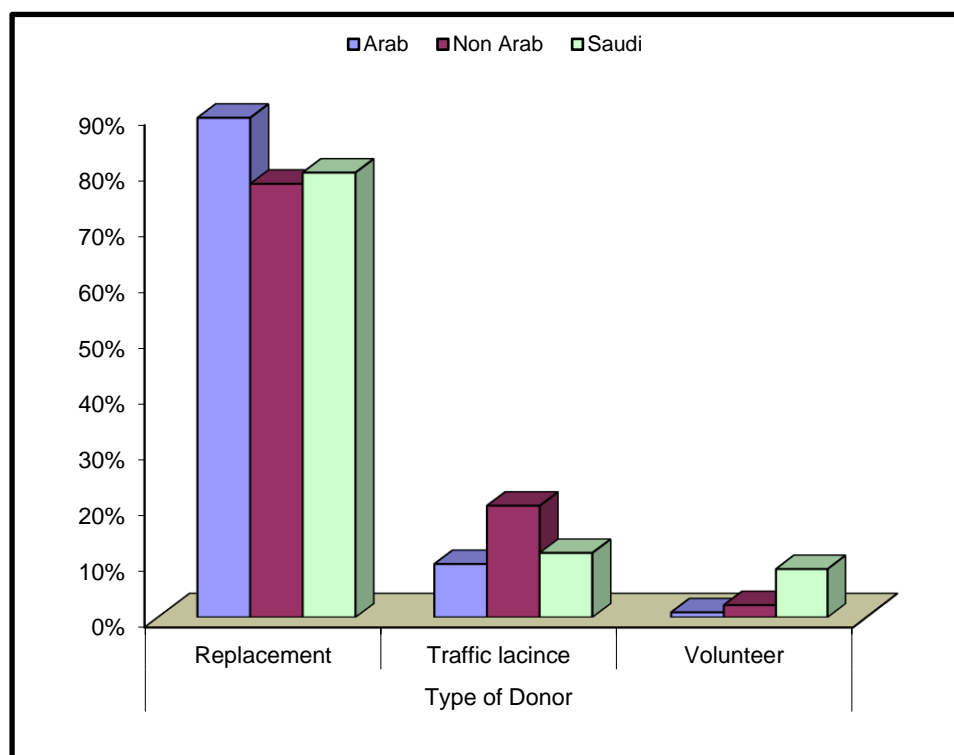
**Figure (1):** Relation between Nationality and blood group

Table (6): Relation between nationalities and purpose of donation in a period of one year (1 January to 31 December 2018)

		Nationality						Chi square test	
		Arab		Non-Arab		Saudi		x ²	p value
		No	%	No	%	No	%		
purpose of donation	Replacement	102	89.5%	143	77.7%	55	79.7%	16.629	0.002
	Traffic license	11	9.6%	37	20.1%	8	11.6%		
	Volunteer	1	0.9%	4	2.2%	6	8.7%		

**Figure (2):** Relation between nationalities and purpose of donation.**Table 7:** The association between previous donation history and nationality in a period of one year (1 January to 31 December 2018)

Nationality	Previous donation history (n= 367)		Total (n= 367) No. (%)	P-value	Likelihood Ratio
	Yes (n= 74) No. (%)	No (n= 293) No. (%)			
Saudi	17 (24.6%)	52 (75.4%)	69 (19%)	< 0.05	6.89
Arabic	14 (12.3%)	100 (87.7%)	114 (31%)		
Non- Arabic	43 (23.4%)	141 (76.6%)	184 (50%)		