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Research Article

PREDOMINANT BLOOD GROUP ANTIGEN AND RISK FACTORS ASSOCIATED WITH HIV INFECTION AMONG HIV POSITIVE PATIENTS IN ZARIA, KADUNA STATE, NIGERIA

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ABSTRACT

Human Immunodeficiency Virus (HIV) is a retrovirus that primarily infects components of the human immune system such as $CD4^+$ T cells, macrophages and dendritic cells. Human immunodeficiency virus epidemic is one of the health challenges the world is facing. This cross sectional study determined the predominant blood group antigen and risk factors among HIV positive patients in Zaria, Kaduna state, Nigeria. A total of 600 participants comprising 400 patients attending the Adult Component of the HIV Clinic of Ahmadu Bello University Teaching Hospital (ABUTH) and 200 HIV negative patients (control) were enrolled in the study. Blood samples were collected from the participants and analyzed for blood group antigen using the tile method. The study and control populations had all the blood group types. In the HIV patients, blood group antigen O^+ predominated with a prevalence of 44.0% (176/400) while blood groups A^- was the least prevalent (0.8%: 3/400). In the control population blood group O+ was also the most frequently detected (47.0%: 94/200) while blood group A- and AB- was also the least prevalent showing a bimodal distribution of 0.5% (1/200) for each. In this study, there was no association between blood group antigens and HIV infection. Infection with HIV was highest in age group 26-40 years; the association was statistically significant ($P = 0.008$). The infection was highest among female than male; the association was statistically significant ($p< 0.001$). The risk factors associated with HIV infection were STI, blood transfusion among others. In conclusion, blood group antigens were not associated with HIV infection.

Keywords: Blood group antigen, HIV, Risk factors, Prevalence.

INTRODUCTION

Human immunodeficiency virus (HIV) is a lentivirus and a member of the *Retroviridae* family that causes acquired immunodeficiency syndrome (AIDS)[1]. The disease was first reported in United States of America in 1981 but the causative agent was not identified until 1983 [2,3]. Since then, the infection has been a serious global public health problem; Africa being the hardest hit continent[4]. Human immunodeficiency virus types 1 and 2, derived from primate lentiviruses are the aetiologic agents of AIDS[5].

The first two cases of HIV and AIDS in Nigeria were identified in 1985 and reported at an international AIDS conference in 1986[6]. According to the 2010 seroprevalence sentinel survey report, the prevalence rate for HIV in Nigeria is 4.1% with Kaduna state having 5.1%[7].

The ABO blood group system was the first human blood group system to be discovered. Blood groups are based on antigens that are located on red blood cells (RBCs) membranes and are coded by alleles on different loci on a chromosome. Individuals are divided into 4 major blood groups namely A, B, AB and O groups depending on the antigen present on their RBCs[8,9]. Type A blood has type A antigens and type B antibodies while type B blood has type B antigens and type A antibodies. Blood

type AB has both A and B antigens and none of their antibodies while type O blood has neither A nor B antigens but both A and B antibodies [8,10]. An individual of type A blood group raises anti – B antibodies against B – blood groups red blood cells if transfused with blood from B group, with resultant lysis of the RBCs. This is due to the presence of isoantibodies against non-self blood group antigen. The same happens for B and O blood groups. Blood group AB individuals do not have anti-A and anti-B isoantibodies because A and B antigens are present on the RBCs and are both self-antigens[8]. Similarly, rhesus blood group system is another important blood group next to ABO system because of its crucial role in blood transfusion. Although about 400 blood grouping antigens have been reported, ABO and rhesus which were the first and fourth to be discovered respectively are the most important [8,10]. The human red blood cells (RBCs) that contain antigen D are known as rhesus positive (Rh^+), while those without antigen D on their RBCs are rhesus negative (Rh^-)[8,9].

This work was therefore aimed at assessing the predominant blood group antigens and risk factors associated with human immunodeficiency virus (HIV) infection among HIV patients in Zaria, Kaduna State, Nigeria.

MATERIALS AND METHODS

Study area

The study was carried out at the adult component of HIV Clinic, Ahmadu Bello University Teaching Hospital (ABUTH) Zaria, Kaduna State, Nigeria. It is at this clinic that HIV patients are being followed up routinely. The clinic holds Monday to Friday from 8.00am to 4.00pm. The control population was sourced from blood donors in the Haematology Department of ABUTH.

Zaria is a major city in Kaduna State in the North Western zone in Nigeria. It is a very large heterogeneous city whose 1.490,000 population comes from different parts of the world. It is on the high plain of Northern Nigeria, 652.6 meters above the sea level, some 950 kilometer away from the coast[11].

Ethical approval and consent

Ethical approval was obtained from the Ethical and Scientific Committee of ABUTH, Zaria. A written informed consent was obtained from patients and control population.

Data collection using questionnaire

A self designed structured questionnaire was administered to obtain demographic data and information on risk factors associated with HIV. The questionnaire was administered to each consenting study participant prior to sample collection.

Study design

The study was cross-sectional. Both study and control populations were from ABUTH, Zaria. Samples were collected from consenting patients aged 18 years old and above who came to the clinic during consultation period from 8am to 12pm every Monday through Friday.

The control populations were consenting blood donors matched for same age and sex from Haematology Department who were HIV negative. Structured questionnaire was administered; blood group antigen tests were carried out and the result of the two groups were compared.

Sample collection and laboratory analysis

About 3ml of blood sample was aseptically collected by venipuncture using a sterile disposable vacutainer syringe from each consenting patient with the assistance of clinicians and laboratory technologists and dispensed into sterile EDTA (ethylene diamine tetra-acetic acid, an anticoagulant) vacutainer bottles. All samples collected were analysed for ABO blood groups.

Blood group antigen test

The test was carried out according to methods previously described by Dacie and Lewis[12]. The tiles were ruled and labeled into columns as Anti A, Anti B, Anti AB and Anti D respectively and one drop of each of the standard blood typing reagents (Anti A, Anti B, Anti AB and Anti D) was placed into an appropriate column on the tiles. One drop of each of the blood sample was added to each of the blood typing reagents (anti-sera) and mixed well with a piece of applicator stick. Separate stick-ends were used for each spot. The tiles were rocked gently, avoiding spill over, at one minute interval for 3–5 minutes. (Mixing encourages agglutination) and examined macroscopically (visually) for agglutination (clumping of the red cells). Results were read immediately. Agglutinations were seen with only cells that were positive but no agglutination with cells that were negative.

Analysis of results

Results obtained from the laboratory and information from the questionnaires were reduced to percentages and presented in tables and analyzed statistically using the SPSS version 19 software. Pearson chi-square analysis was used to determine association between the variables at 95% confidence interval and 0.05 significant levels.

RESULTS

A total of 600 blood samples were collected from consenting participants (400 HIV positive patients and 200 controls) in Zaria and analysed for blood group antigens. In the study population, the most prevalent blood group antigen was O^+ occurring with a prevalence of 44.0% (176/400) while blood groups A^- occurred with the least prevalence of 0.8% (3/400). In the control population, blood group O^+ was also the most prevalent blood group occurring with a prevalence of 47.0% (94/200) while the least detected blood groups were A^- and AB^- occurring each with a prevalence of 0.5% (1/200) bimodally. There was no statistically significant association (χ^2=6.391, df=7, p=0.495) between the distribution of blood group antigens and the studied populations (Table 1).

The data obtained from the questionnaires were analysed according to demographic characteristics of the participants and the result is shown in Table 2. In the study population (HIV patients), the highest number of participants (23.5%: 94/400) were in age group 26-30 years while the lowest number of participants (2.0%: 8/400) were in age group 56-60 years. In the control population (HIV negative), the highest participants belonged to age group 26-30 years (22.0%: 44/200) while age group 66-70 years had the lowest number of participants (1.0%: 2/200). There was a significant association between HIV infection and age group (χ^2=22.166, df=9, p=0.008).

In relation to the gender of the participants, 65.5% (262/400) of the study population (HIV patients) were females and 34.5% (138/400) were males; while in the control population, the highest number of participants were males (84.0%: 168/200) and the lowest were females (16.0%: 32/200). There was a high statistically significant association (χ^2=118.972, df=1, p=0.000) between gender and HIV infection.

There was no observed statistical significant association between the patients' religion and HIV infection (χ^2=0.010, df=1, p=0.862). About 47.3% (189/400) of the HIV patients were Christians while 52.8% (211/400) were Moslems. Similarly, in the control population, 47.0% (94/200) were Christians while 53.0% (106/200) were Moslems.

There was an observed statistically significant association (χ^2 = 46.209, df =5, p=0.002) between the patients geopolitical zones of residence with HIV infection. In the study population, the highest number of participants (60.0%: 250/400) were patients resident in North Western Nigeria while the least number of participants (3.5%: 13/400) resides in South Western Nigeria. In the control population, HIV negative individuals from North Western Nigeria also had the highest participants (35.0%: 70/200) while residents of South Southern Nigeria had the lowest participants 3% (6/200).

There was an association between marital status and HIV infection (χ^2 = 16.000, df=2, p = 0.001). The highest number of HIV patients were married (69.8%: 279/400) while the lowest were widowed (7.5%: 30/400) in both the study and control populations. In the study, the participants were more (77.0%: 154/200) while the widowed were fewer (7.5%: 15/200).

There was statistical significant association between HIV infection and educational status of the participants (χ^2=62.569, df=4, p=0.001). The highest number of HIV participants (40.0%: 160/400) were patients who had tertiary education while the lowest number of participants (8.5%: 34/400) were patients with no formal educational background while in the control population, the highest number of participants had no formal education (32.0%: 64/200) compared to 12.0% (24/200) of the participants with Quranic education.

Analysis of the result according to type of marriage of HIV patients showed that majority of the patients were in polygamy (58.0%: 232/400) compared to those in monogamy (42.0%: 168/400). In contrast to the control population, individuals in monogamy were more (54.0%: 108/200) compared to those in polygamy (46.0%: 92/200). Human immunodeficiency virus infection was not associated with type of marriage (χ^2=9.664, df=1, p = 0.802).

Some possible risk factors for viral acquisition among HIV positive patients were also determined (Table 3). The result was analysed according to history of sexually transmitted infection (STI) prior to infection. There was a statistically significant association (χ^2=27.268, df=1, p=0.002) between STI prior to infection and HIV infection (Table 4.4); with a higher number of HIV patients haven had STI prior to infection (56.5%: 226/400) compared to those without history of STI prior to infection (43.5%: 174/400). In contrast to the control population, individuals with history of STI were less (3.0%: 6/200) compared to those without history (97.0%: 194/200).

The result was also analysed according to history of blood transfusion prior to infection. There was statistically significant association (χ^2=12.730, df =2, p=0.002) between HIV acquisition and blood transfusion. The highest number of HIV participants were those with history of blood transfusion prior to infection

(52.3%: 209/400) as compared to those who do not know whether they had it before they were transfused (3.0%: 12/400) while in the control population, the highest number of participants were those without history of blood transfusion (84.0%: 168/200).

Analysis of the result according to history of accident prior to infection showed that there was a statistically significant association between HIV infection with history of accident prior to infection (χ^2=7.045, df=1, p=0.008). Majority of the HIV participants were patients with history of accident prior to infection (56.5%: 226/400) compared to patients who had no history of accident prior to infection (43.5%: 174/400). However, in the control population, higher number of participants were those without history of accident (95%: 190/200) as shown in Table 4.4.

The result was also analysed based on use of condoms. Majority of the HIV participants were patients who were not using condoms prior to infection (79.5%: 318/400) compared to patients who were using condoms prior to infection (20.5%: 82/400). In the control population, majority 97.5% (195/200) of the individuals use condom (χ^2=237.023, df=1, p=0.000).

The result was also analysed according to history of surgery prior to infection with human immunodeficiency virus. The result showed that 83.5% (334/400) of the patients had undergone surgery prior to infection while 16.5% (66/400) had not. Similarly, in the control population, higher number of participants were those who had not undergone surgery (97.0%: 194/200) compared to those who had undergone surgery 3.0% (6/200).

DISCUSSION

In this study conducted to determine the predominant blood group antigen and possible risk factors for infection among HIV patients in Zaria, Kaduna State, Nigeria, blood group antigens were not associated with HIV infection. This suggests that there is nothing intrinsic in blood group antigens that predispose an individual to HIV infection. Blood group antigens of an individual cannot change as a result of any infection.

The result obtained in this study is similar to the findings of Ukaejiofo and Nubila[13] in which there was no association between the distributions of blood group antigens in HIV patients. However, the result differ from that reported in Yola, Adamawa State[14] where blood group AB was the predominant blood group associated with HIV-2 infection; whereas seroprevalence of HIV serotype was significantly higher among rhesus D positive subjects than their rhesus D negative counterparts.

In the present study, there was no association between the acquisitions of HIV with the different blood group antigens, but there are reports that linked specific blood group types with certain disease conditions. Ukaejiofo and Togbo,[15] reported association of blood group A with carcinomas and Jain[16] said people with blood group AB are more likely to contact pulmonary tuberculosis.

A large number of controversial reports have claimed the existence of an association between blood groups and disease merely on the basis of statistical comparison of the distribution of blood groups and haemoglobin types of patients with various diseases and among healthy controls[13].

However, there was no evidence advanced for some of the associations because it could be due to differences in the method of compiling the results or sampling that might have introduced a bias in the study or errors in techniques of blood typing.

Before drawing conclusion on association of blood groups with any disease, this evidence should be confirmed through many definitive studies. When this confirmation is done, the evidence indicating association of blood groups to any disease cannot be disputed.

Some demographic characteristics of the study population were compared with those of the control population. Age was shown to be associated with HIV infection (p = 0.008) with infection peaking within age group 26 – 30 years old in both study and control groups. The reason this age group had the highest HIV infection rate in the study population could be because they are in the period of high sexual activity and are in the age range were they tend to be adventurous thereby exposing themselves to the infection. On the other hand, the high number of HIV negative individuals in this age group among the control population suggests that large numbers of sexually active people are blood donors which might be at risk if infected with HIV hence, this group should be target for education on HIV mode of transmission and prevention. The Federal Ministry of Health reported in 2009 that in all epidemiological studies, younger age has always proved to be the most important factor[17]. The age of acquiring the infection is the major determinant of the incidence and prevalence rates. The result however contrasts Enquselassie and Girma[18] who reported that age group 35-44 had higher prevalence of HIV infection.

In this study, there were more female patients in the study population compared to control

population and gender was highly associated with HIV ($p<0.001$). This observation may be due to the fact that the anatomy of female sex organs makes them more susceptible to HIV infection than their male counterparts. In the control population, on the other hand, more males were seen than females probably because more males go for blood donation than females. In addition, the periodic loss of blood by females through menstruation makes them have apathy for blood donation and may be responsible for the low number of females in control population.

The observation in the present study is similar to reports by UNAIDS[19] that women are particularly affected by HIV. In 2009, women accounted for 56% of all adults aged 15 and above living with HIV/AIDS. Laga *et al*.[20] reported that in sub-Saharan Africa, girls aged 15-19 years are 2-8 times more likely than boys of the same age to become infected with HIV. The finding in this study differs from the findings of HPA[21] that reported majority of people newly diagnosed with HIV in United Kingdom to be male.

In relation to religion of the participants, there were more Moslems participants than Christians in both study and control populations. This could be as a result of the study being carried out in a predominantly Moslem dominated settlement. Another reason for the lower HIV infection rate observed in the Christians could be due to HIV screening prior to marriage; the Christians are adherents of monogamy due to Biblical injunction but go for HIV testing and counseling prior to marriage as a matter of religious obligation. The findings contrast that of Gray[22] that reported higher prevalence of HIV among Christians in United States of America where majority of the populace are Christians.

Most of the HIV patients were from Northwestern zone while those from Southwestern zone were fewer. Similarly, in the control population majority of the blood donors were from Northwest while South Southerners had the lowest number of individuals. The highest number of participants from the Northwestern zone is due to the fact that the study was conducted in Northwestern zone where most of the participants reside. The variation recorded among the zones may be a reflection of differences in sexual practices and behavioural awareness of HIV infection and testing as well as social-cultural practices and accessibility to healthcare. UNAIDS[19] reported that within countries, prevalence varies widely by geographic regions and vulnerable populations.

There was no statistical significant association between HIV and marital status ($p > 0.05$), though in the study population the infection was highest among married patients than in the singles and widows. Similarly, the control population had the highest number of participants among the married than in the singles and the widows. This result may be due to the fact that the married individuals tend to be more responsible for their family and donate blood to sick family member or member of the community hence their high number among the control population. This finding agrees with that of Fleming and Wasserheit,[23] which showed higher prevalence of HIV infection in the married than in the single in Kenya, Zambia and Uganda. The finding in this study may be explained by the fact that unprotected sexual intercourse is the major route of human procreation among couples; and unfaithfulness on the part of any of the partners by way of being involved in unprotected extramarital relationship constitutes a risk factor for HIV. Some studies have revealed that marital life itself becomes a risk factor for those patients who get infected by their HIV-infected spouse [24]. In couples, insistence on use of condom during sex may be a sign of lack of trust towards the partner which may generate acrimony. It was also reported that men are twice as likely as women to bring HIV into a marriage presumably through extramarital sexual behaviour[25].

This study found correlation in terms of educational status with HIV infection. Among the study population, the highest numbers of patients were those who had tertiary education probably because they were more conscious of their HIV status and more knowledgeable about antiretroviral therapy (ART) and so were attending HIV clinic for treatment and counseling. This however contrasts the findings of Enquselassie and Girma[18], and Buseri *et al.*[26] who reported that those with low educational level in their study were at a higher risk of HIV infections. The lowest numbers of HIV patients were those with no formal educational background. On the other hand, the control population had the highest percentage among people with no formal education followed by those with secondary education and the least in those with quranic education. Individuals with no formal education made up the highest number of blood probably because blood donors are usually given incentive before donating blood.

Majority of the HIV patients were practitioners of polygamy while in the control population, practitioners of monogamy were more. This may be because of multiple sexual relationships in

polygamous families. This agrees with the findings of Schmauz *et al.*[27] and Serwadda *et al.*[28] in which a higher prevalence of infections was detected among those in polygamy.

There was statistical significant association between HIV infection and history of STI prior to HIV infection. Higher numbers of HIV patients have had STI prior to infection. This could be as a result of the fact that STI is a predisposing factor for acquiring HIV infection. The participants that had STI were higher in the study than in the control population because having had HIV these patients came to hospital to access antiretroviral therapy hence their higher rate. Also, in the study, sexually transmitted infections increase susceptibility to HIV infection because of the breaks in the genital tract lining or skin which create a portal of entry for HIV. There is substantial biological evidence demonstrating that the presence of other STI increases the likelihood of both HIV infectiousness and HIV susceptibility[29]. Individuals who are infected with STI are at least two to five times more likely than uninfected individuals to acquire HIV infection if they are exposed to virus through sexual contact, in addition if an HIV-infected individual is also infected with another STI, that person is more likely to transmit HIV through sexual contact than other HIV-infected persons[30]. Fleming and Wasserheit[23] showed that treating STI in HIV-infected individuals decrease both the amount of HIV in genital secretions and how frequently HIV is found in those secretions. On the other hand, STI is low among the control group because those who had STI may not be willing to avail themselves for blood donation except when a very close relative is in dire need of blood transfusion and they happened to be compatible hence this group had low cases of STI.

The percentage of HIV infection in relation to history of blood transfusion showed the highest in patients that had history of blood transfusion prior to infection. This may be due to transfusion of improperly screened blood, or seroconversion after blood transfusion because not all Nigerian hospitals have the technology to effectively screen blood and therefore there is a risk of using contaminated blood. The control group had lower number of participants with history of blood transfusion compared to the HIV patients which explains the fact that the HIV patients might have contracted the infection through blood transfusion. This finding is in agreement with Egesie and Egesie[31] who reported that HIV transmission through unsafe blood accounts for the second largest source of HIV infection in Nigeria. FMOH[32] also reported that blood and blood products accounts for 10% of HIV transmission in Nigeria[32] and WHO[33] estimated that up to 15% of HIV infections in developing countries come from transfusion of infected blood and blood products, representing between 5% and 10% of global infections. The result of the study however, contrast that of Buseri *et al.*[26] that found a high number of seropositive women among those that have not been exposed to blood transfusion.

There was an association between HIV infection and history of accident prior to infection. Patients with history of accident prior to infection made up higher percentage of participants while patients without history of accidents prior to infection were fewer. This may be due to the fact that when people are involved in an accident they tend to lose blood and will need to be transfused and hence may be at risk of contracting HIV infection. In addition, accident victims stand the risk of coming in contact with body fluids from other accident victims thereby increasing the risk of HIV infection among accident victims as opposed to the lower rate recorded in the control group. This is possible through body fluids like blood in an accident from infected person coming in contact with an uninfected person through cut or open sore on the skin of uninfected person.

The study found a correlation in terms of the use of condom prior to infection with HIV. Though there were fewer HIV patients among those that used condoms when compared to those that do not use condoms, the number (20.5%) seemed quite high. This could be a pointer to the fact that contraction of HIV is not only through unprotected sexual intercourse but other means of contraction like blood transfusion, accident, among others equally veritable means of HIV infection. This could be because when sex is unprotected, or a new condom is not properly used each time, the risk of HIV/AIDS increases. Data on sexual behaviors indicated that risky behaviors are very common in Nigeria, while condom use remains low due to religious and cultural beliefs[34].

There was no association between HIV infection and surgery. Patients with history of surgery prior to infection had lower number of participants while patients without history had higher. This suggests that surgery is not a main risk factor for HIV infection.

CONCLUSIONS

In this study conducted to determine the predominant blood group antigen and risk factors for HIV infection, there was no association between blood group antigens with HIV infection. Hence, blood group antigens

cannot be said to have either protective or predisposing characteristics to HIV infection. The major risk factors associated with HIV infection in this study were not using condoms, STI, blood transfusion and accidents.

Table 1: Blood Group Antigens Associated with HIV Positive Patients and non HIV Positive Individuals in Zaria, Kaduna State

Blood group	Population		
	HIV Positive (%)	HIV Negative (%)	Total (%)
A^+	102 (26.0)	39 (19.5)	141 (23.5)
B^+	90 (22.5)	46 (23.0)	136 (22.7)
AB^+	17 (4.3)	7 (3.5)	24 (4.0)
O^+	176 (44.0)	94 (47.0)	270 (45.0)
A^-	3 (0.8)	1 (0.5)	4 (0.7)
B^-	6 (1.5)	2 (1.0)	8 (1.3)
AB^-	0 (0.0)	1 (0.5)	1(0.2)
O^-	6 (1.5)	10 (5.0)	16 (2.7)
Total	400	200	600 (100)

(χ^2=6.391, df=7, p=0.495)

Table 2: Comparison of Demographic Data of the Study and Control Populations Accessing ABUTH, Zaria, Kaduna State

Demographic Factor	Study Population (HIV Positive) (%)	Control Population (HIV Negative) (%)	Total (%)	P – value
Age (Years)				
21 – 25	42 (10.5)	18 (9.0)	60 (10.0)	
26 – 30	94 (23.5)	44 (22.0)	138 (23.0)	0.008
31 – 35	91 (22.8)	42 (21.0)	133 (22.2)	
36 – 40	83 (20.8)	33 (16.5)	116 (19.3)	
41 – 50	43 (10.8)	22 (11.0)	65 (10.8)	
46 _ 50	29 (7.3)	19 (9.5)	48 (8.0)	
51 – 55	10 (2.5)	8(4.0)	18 (3.0)	
56 – 60	8 (2.0)	7 (3.5)	15 (2.5)	
61 – 65	0 (0.0)	4 (2.0)	4 (0.7)	
66– 70	0 (0.0)	2 (1.0)	2 (0.3)	
Gender				
Female	262 (65.5)	32 (16.0)	294 (49.0)	
Male	138 (34.5)	168 (84.0)	306 (51.0)	0.000
Religion				
Christianity	189 (47.3)	94 (47.0)	283 (47.2)	
Islam	211 (52.8)	106 (53.0)	317 (52.8)	0.862
Residential Geopolitical Zone				
North Central	56 (14.5)	42 (21.0)	98 (16.3)	
North East	30 (7.5)	46 (23.0)	76 (12.7)	0.002
North West	250 (62.5)	70 (35.0)	320 (53.3)	
South East	29 (7.3)	14 (7.0)	43 (7.2)	
South South	22 (5.5)	6 (3.0)	28 (4.7)	
South West	13 (3.3)	22 (11.0)	25 (4.2)	
Marital Status				
Single	91 (22.8)	31 (15.5)	122 (30.5)	
Widow	30 (7.5)	15 (7.5)	45 (7.5)	0.001
Married	279 (69.8)	154(77.0)	433 (72.2)	
Educational Status				
None	34 (8.5)	64 (32.0)	98 (16.3)	
Primary	68 (17.0)	31 (15.5)	99 (16.5)	0.001
Secondary	98 (24.5)	54 (27.0)	152 (25.3)	
Tertiary	160 (40.0)	27 (13.5)	187 (31.2)	
Quranic	40 (10.0)	24 (12.0)	64 (10.7)	
Type of Marriage				
Monogamy	168 (42.0)	108 (54.0)	276 (46.0)	
Polygamy	232 (58.0)	92 (46.0)	324 (54.0)	0.802

Table 3: Comparison of Possible Risk Factors of the Study and Control Populations of Individuals Accessing ABUTH, Zaria, Kaduna State

Possible Risk Factor	HIV Positive (%)	HIV Negative) (%)	Total (%)	P – value
STI				
Yes	226 (56.5)	6 (3.0)	232 (38.7)	0.002
No	174(43.5)	194 (97.0)	368 (61.3)	
Blood Transfusion				
Yes	209 (52.3)	32 (16.0)	241 (40.2)	
No	179 (44.6)	168 (84.0)	347 (57.8)	0.002
I Do not Know	12 (3.0)	0 (0.0)	12 (2.0)	
Accident				
Yes	226 (56.5)	10 (5.0)	236 (39.3)	
No	174 (43.5)	190 (95.0)	364 (60.7)	0.008
Use of Condom				
Yes	82 (20.5)	195 (97.5)	277 (46.2)	
No	318 (79.5)	5 (2.5)	323 (53.8)	0.000
Surgery				
Yes	66 (16.5)	6 (3.0)	72 (12.0)	
No	334 (83.5)	194 (97.0)	528 (88.0)	0.600

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