American Journal of Epidemiology and Infectious Disease, 2016, Vol. 4, No. 3, 47-63
Available online at http://pubs.sciepub.com/ajeid/4/3/2

DOI:10.12691/ajeid-4-3-2

A Comparative Study on Hepatitis B Surface Antigen Seroprevalence between Outpatients in Public and Private Hospitals within Kaduna Metropolis Nigeria

Waje Timothy[1,*], Muhammad Yusha'u[2], Dadah Anthony[1], Maikaje Dominic Bawa[1]

[1]Department of Microbiology, Faculty of Science, Kaduna State University, P.M.B.2339, Kaduna, Nigeria
[2]Department of Microbiology, Faculty of Science, Bayero University P.M.B. 3011 Kano, Nigeria
*Corresponding author: wajetim@yahoo.com

Abstract Viral hepatitis which is characterized by inflammation and damage to the liver due to prolong infections by Hepatitis viruses is a rising global problem, especially in developing countries including Nigeria. Over 350 million people suffer chronically from Hepatitis B Virus infection. Hepatitis B surface antigen (HBsAg), though disappears after six months in acute cases, is a marker for the Hepatitis B Virus in chronic infections. Three hundred Outpatients in six hospitals were sampled in this study. One hundred and fifty samples were collected in equal proportion from outpatients in 3 public hospitals and the other 150 samples from 3 private hospitals within the Kaduna metropolis respectively. They were screened for HBsAg which is a marker for HBV infections. A prevalence rate of 9.33% was obtained among outpatients in public hospitals and 10.67% among those in private hospitals. This prevalence rates were both categorized as high based on the World Health Organization endemicity classification for HBV infections. There were significant associations between Rhesus factor ($P \le 0.01$), sharing of clothes or beddings infected persons ($P \le 0.001$), persons from positive family history ($P \le 0.02$), Individual level of education ($P \le 0.01$) and seropositivity for HBsAg. These were observed as potential risk factors among outpatients in private hospitals. On the other hand there were no significant associations between the risks factors above and HBsAg seroprevalence among outpatients in public hospitals.

Keywords: *Comparative, Hepatitis B Virus, Hepatitis B surface Antigen, Seroprevalence, Public Hospitals, Private Hospitals, Kaduna Nigeria*

Cite This Article: Waje Timothy, Muhammad Yusha'u, Dadah Anthony, and Maikaje Dominic Bawa, "A Comparative Study on Hepatitis B Surface Antigen Seroprevalence between Outpatients in Public and Private Hospitals within Kaduna Metropolis Nigeria." *American Journal of Epidemiology and Infectious Disease*, vol. 4, no. 3 (2016): 47-63. doi: 10.12691/ajeid-4-3-2.

1. Introduction

Hepatitis B Virus formerly known as the "Dane particle" is among the hepatotropic viruses that cause inflammation and damage to the human liver resulting to hepatitis disease on prolong infections [1]. The Virus pose a significant health problem around the globe and account for about 350 million chronic cases with over 20 million new ones arising yearly [2,3]. Prevalence of the virus is more in developing countries including Nigeria [4]. The Hepatitis B Virus contains an envelope, a double stranded circular DNA, a relatively complex structure and belongs to a class of viruses called Orthohepadnavirus of the *hepadnaviridae* family [5,6]. Like other Viruses, the Hepatitis B Virus is capable of replication producing viral particles but with a complex surface antigen known as Hepatitis B surfaceAntigen (HBsAg) [4]. The Hepatitis B surface antigen (HBsAg) though disappears during acute infections within six months, still serves as a marker for chronic infection on persistence for a long time [7]. Common complication associated with Hepatitis B Viral infection include chronic liver disease leading to either cirrhosis or hepatocellular carcinoma [8]. The virus can be transmitted through the use of contaminated sharp objects like needles / blades in tattooing or ear piercing, also sexually and through small tissue tears opened to contact with body fluids and secretions like saliva, semen and vaginal secretions from infected persons [1]. Intravenous injections in either medical treatment or on illegal drug use as well as contaminations with traces of blood from infected persons may transmit HBV [7]. Perinatal transmission also occur from mother to unborn infants [9]. Symptoms of Hepatitis B Viral infections among others include: fatigue, loss of appetite, nausea vomiting and dark urine [1,5,6]. Previous studies in Nigeria have reported Incidence of Hepatitis B Viral infections among sickle celled anemic children, prevalence rates of 18% among blood donors at Abubakar Tafawa Balewa University Teaching Hospital Bauchi, 10% among mentally ill persons in the University of Ibadan Teaching Hospital, 12% among outpatients attending a public Tertiary Hospital in Kaduna State, Nigeria,9.2% in a Tertiary institution in North West Nigeria [4,10,11,12,13]. Individual at risk of Hepatitis B infections include

injection drug users, health care personnel, blood and organ recipients, haemodialysis patients and staff, highly promiscuous persons and children born by infected mothers [1,9,13]. The use of available vaccines play an important role in the control of the virus [9]. The study was conducted in private and public hospitals to make assessment of the disease burden among outpatients in these hospitals whose patronage is determined by their financial status. Medical bills in the public hospitals are relatively less than those of the private hospitals. More so, all patients are at liberty to choose the type of hospital to attend except on medical referral. This research work aimed at determining the seroprevalence of HBsAg among outpatients and making comparisons between the respective seroprevalence of the study groups in relation to key risk factors. The hypothesis tested is the association between positivity for HBsAg and certain risk factors among the study subjects using Chi Square test for independence between two variables.

The null hypothesis "There is no close/significant association between outpatients HBsAg seropositivity and a particular risk factor". Seropositivity for HBsAg and a particular risk factor are independent

The alternative Hypothesis "There is a close/significant association between outpatients HBsAg seropositivity and a particular risk factor". That is, HBsAg seropositivity and a particular risk factor are completely dependent.

The significance of this work was to assess the Hepatitis B Virus disease burden with a view of making key recommendations that could mitigate spread and improve public health among the inhabitants of the metropolis.

2. Materials and Methods

The study was conducted in six hospitals within the Kaduna metropolis. Three hospitals were public and three were private hospitals. Ethical approval was obtained from the Kaduna State Ministry of Health ethical Committee to visit each of the selected hospital. The study population included all gender and children from age one to the elderly at age ninety. Participants were well informed about the study and its relevance and their consents to participate in the study were sought through the use of positive consent forms. Questionnaires were issued to those that responded positively to the consent forms to provide Socio demographic information as well as possibly risk factors associated with HBV transmission [13].

A total of 300 samples were collected in all. Fifty samples were taken from each hospital making 150 samples from 3 public hospitals and 150 from 3 private hospitals [13,14]. Three milliliters of blood was collected intravenously from each consented patient from the different hospitals using a 5 ml syringe and transferred immediately into a plain bottle with the corresponding label for the patient. The samples were taken to the Microbiology laboratory of Kaduna State University, Kaduna for processing.

Serum was separated from each blood sample by centrifuging at 1000 rpm for 5 minutes and used for testing the presence of HBsAg using an in vitro one step rapid test kits for the detection of HBsAg in human serum/Plasma (ISO 13485 Certified Wondfo Biotech Co,Ltd. USA). Positive results were read based on the appearance of distinct color bands in the test region and the control region of the test strip indicating the presence of detectable amount of HBsAg The appearance of color band in only the control region indicate absence of HBsAg (Manufacturer's instruction or interpretation).The Result was organized according to demographic and other possible risk factors respectively. Chi square test for independence between two variables was used for testing the associations between HBsAg seropositivity and potential risk factors at 5% level of significance.

3. Results

Among the 150 samples from outpatients in public hospitals analyzed, 14 were positive for HBsAg. These accounted for 9.33% of the total samples collected from these hospitals. In contrast, 16 samples were found to be positive for HBsAg making 10.67% of the 150 samples analyzed from outpatients in private hospitals (Table 1).

Table 1. Seroprevalence of HBsAg among outpatients attending Public and Private Hospitals in Kaduna metropolis, Nigeria

Hospital Type	Number of persons tested.	Positive Cases	Prevalence Rates (%)	Rate Classification	Rate Classification Limits (%)		
					High	Intermediate	Low
					>8	2.0-7.9	<2
Public Hospitals	150	14	9.33	High			
Private Hospitals	150	16	10.67	High			
Total	300	30					

*Rates Classification limits [15].

The highest prevalence in relation to age observed among outpatients in public hospital was within ages 31-40 years (19.05%, mean age = 30.10, CI=30.10 ±2.74 years). However, more prevalence was observed among subjects within ages 11-20 years (28.57%, mean age = 34.30, CI=34.30 ±2.91 years) from outpatients in private hospitals. No positive sample was observed among outpatients within age group 41-90 years in public hospitals. On the other hand a prevalence of 17.86% was observed among those within ages 41-50 years in private hospitals. There was no positive case among outpatients within age group 51-90 years in private hospitals. There were no statistical significant associations between age and seroprevalence of HBsAg in samples from either public ($P \leq 0.28$) or private hospitals ($P \leq 0.41$) (Table 2).

Table 2. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis Nigeria, in relation to Age

Risk Factor	Public Hospital				Private Hospitals			
Age	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
01-10	17	0	0	$P \leq 0.28$	14	0	0	$P \leq 0.41$
11-20	19	2	10.53		7	2	28.57	
21-30	40	4	10.00		36	5	13.89	
31-40	42	8	19.05		48	4	8.33	
41-50	21	0	0.00		28	5	17.86	
51-60	6	0	0.00		10	0	0.00	
61-70	5	0	0.00		3	0	0.00	
71-80	0	0	0.00		3	0	0.00	
81-90	0	0	0.00		1	0	0.00	
Total	150	14			150	16		

Out of the fifty two male samples analyzed from public hospitals outpatients, three (5.77%) were positive for HBsAg. Ninety eight (98) samples were from females with 11 (11.22%) positive cases. Among the samples from private hospitals, 62 were from males and 8 (12.90%) were found positive for HBsAg while 88 samples from females with 8 (9.09) positive for HBsAg. There were no statistical significant association between Sex and HBsAg seropositivity among outpatients in public ($P \leq 0.28$) and private ($P \leq 0.46$) hospitals respectively (Table 3).

Table 3. Seroprevalence of HBsAg among outpatients attending Public and Private Hospital within Kaduna Metropolis, Nigeria in relation to Sex

Risk Factor	Public Hospitals				Private Hospitals			
Sex	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
Male	52	3	5.77	$P \leq 0.28$	62	8	12.90	$P \leq 0.46$
Female	98	11	11.22		88	8	9.09	
Total	150	14			150	16		

Table 4 shows the seroprevalence of HBsAg in relation to marital status. The highest prevalence of HBsAg was observed among the married attending either public (11.34%) or private hospitals (11.11%).No positive case was observed among the widowed (0.00%), separated (0.00%) and the divorced (0.00%) outpatients in either public or private hospitals. There was no statistical significant association between seropositivity of HBsAg and marital status among samples from public or private hospitals ($P \leq 0.83$, $P \leq 0.99$) respectively.

Table 4. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relations to Marital Status

Risk Factor	Public Hospitals				Private Hospitals			
Marital Status	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
Single	49	3	6.12	$P \leq 0.83$	32	3	9.38	$P \leq 0.99$
Married	97	11	11.34		117	13	11.11	
Widowed	2	0	0.00		1	0	0.00	
Separated	2	0	0.00		0	0	0.00	
Divorced	0	0	0.00		0	0	0.00	
Total	150	14			150	16		

Patients from public hospitals with blood group O had the highest seroprevalence of HBsAg (13.51%). No positive case was observed among those with blood group AB (0.00%) On the other hand, analysis of samples of outpatients from private hospitals revealed more seroprevalence of HBsAg to be among those with blood group B (14.71%) with the leas observed amongst blood group A outpatients (8.33%) (Table 5).

Table 5. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relations to Blood Group

Risk Factor	Public Hospitals				Private Hospitals			
Blood Group	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
A	38	1	2.63	$P \leq 0.25$	48	4	8.33	$P \leq 0.80$
B	32	3	9.38		34	5	14.71	
AB	6	0	0.00		7	1	14.29	
O	74	10	13.51		61	6	9.84	
Total	150	14			150	16		

Though more Rhesus positive outpatients were encountered in this study (141/i50) from public and (143/150) from private hospitals respectively, 13 (9.22%) were positive among samples from public hospitals and 13 (9.09%) also positive in samples from private hospitals. More prevalence was observed among Rhesus negative outpatients in public (11.11%) and among those from private (42.86%) hospitals respectively. There was no statistical significant association between Rhesus factor and seropositivity for HBsAg among outpatients in public hospitals ($P \leq 0.85$) but a significant association was observed between seropositivity for HBsAg and Rhesus factor among samples from private hospitals ($P \leq 0.01$) (Table 6).

Table 6. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relations to Rhesus Reaction

Risk Factor	Public Hospitals				Private Hospitals			
Rhesus Factor	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
RH^+	141	13	9.22	$P \leq 0.85$	143	13	9.09	$P \leq 0.01$
RH^-	9	1	11.11		7	3	42.86	
Total	150	14			150	16		

There were no statistical significant associations between seropositivity of HBsAg and the respective outpatients' clinical history at a 0.05 level of significance on samples from both public and private hospitals (Table7).

Table 7. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relation to individual clinical history

Risk Factor	Public Hospitals				Private Hospitals			
Clinical history	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
Blood recipients	13	1	7.69	$P \leq 0.84$	11	0	0.00	$P \leq 0.24$
Hypertensive	13	2	15.39	$P \leq 0.43$	12	2	16.67	$P \leq 0.46$
Diabetics	2	0	0.00	$P \leq 0.65$	11	2	18.18	$P \leq 0.40$
HIV/AIDS	4	0	0.00	$P \leq 0.65$	1	0	0.00	$P \leq 0.72$
Others	121	12	9.92	$P \leq 0.58$	115	12	10.43	$P \leq 0.87$

No statistical significant association was observed between seropositivity for HBsAg and educational status on samples from public hospitals ($P \leq 0.28$). The highest prevalence was observed among Secondary School patients (13.85%).However, there was a significant association between seropositivity for HBsAg and Education Status on samples collected from private hospitals ($P \leq 0.01$). The highest prevalence was also observed among secondary school level patients (26.67%) (Table 8).

Table 8. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relation to individual level of Education

Risk Factor	Public Hospitals				Private Hospitals			
Education	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
No Education	15	1	6.67	$P \leq 0.28$	13	0	0.00	$P \leq 0.01$
Primary Education	39	1	2.56		17	1	5.88	
Secondary Education	65	9	13.85		30	8	26.67	
Tertiary Education	31	3	9.68		90	7	7.78	
Total	150	14			150	16		

The respective social factors in Table 9 showed no statistical significant associations with HBsAg Seropositivity for samples from public hospitals. However, significant associations were observed between some of these factors and HBsAg seropositivity among outpatients in private hospital such as: patients sharing clothes /Beddings (7.46%, $P \leq 0.001$ and those from seropositive families (28.57%, $P \leq 0.02$).

Table 9. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relation to Social Factors

Risk Factor	Public Hospitals				Private Hospitals			
Social Factor	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
Tribal Marks	27	2	7.40	$P \leq 0.70$	13	3	23.08	$P \leq 0.13$
Don't know HBV status	111	9	8.10	$P \leq 0.35$	115	12	10.43	$P \leq 0.87$
Eat in public Eateries	104	9	8.65	$P \leq 0.67$	109	11	10.09	$P \leq 0.71$
Share Clothes or Beddings	77	7	9.09	$P \leq 0.46$	134	10	7.46	$P \leq 0.001$
HBsAg positive Family	12	2	16.67	$P \leq 0.36$	14	4	28.57	$P \leq 0.02$

In Table 10, the highest prevalence observed on samples from public hospitals was from Business men and women (14.29%). No positive case was observed among the unemployed attending either public or private

hospitals (0.00%) respectively. The highest prevalence observed among outpatients in private hospitals was among unskilled workers (20.00%).The "others" consist of Farmers, Students and clergies (14.29%).There were no significant associations between seropositivity of HBsAg and Occupation for samples from either public ($P \leq 0.52$) or private ($P \leq 0.49$) hospitals respectively.

Table 10. Seroprevalence of HBsAg among outpatients in Public and Private Hospitals within Kaduna Metropolis, Nigeria in relation to Occupation

Risk Factor	Public Hospitals				Private Hospitals			
Occupation	Number of persons tested	Positive cases	%	$P \leq 0.05$	Number of persons tested	Positive cases	%	$P \leq 0.05$
Civil Service	14	1	7.14	$P \leq 0.52$	49	3	6.12	$P \leq 0.49$
Business	35	5	14.29		13	1	7.69	
Unskilled work	8	1	12.50		5	1	20.00	
Unemployed	20	0	0.00		6	0	0.00	
Others	73	7	9.59		77	11	14.29	
Total	150	14			150			

4. Discussions

Public hospitals have a higher patronage by patients of low economic status than those of high class. The reverse is the case regarding the patronage of private hospitals. This could probably be due to the high medical bills in the private than those in the public hospitals. Most times, the patronage is determined by financial availability. Patients are at liberty for choice of hospital type to attend for medical attention except in the case of referral. In most cases, the economic base of the patient and family plays a key role in selection of where to seek for medical attention where cost becomes a factor.

The 9.33% and 10.67% prevalence rates observed from outpatients in public and private hospitals respectively are regarded as high according to the World Health Organization categorization of HBV prevalence rates (<2% =low, 2-8%= intermediate and >8% =high) [15]. These indicate that the Kaduna metropolis is highly endemic with the Hepatitis B Virus. The Virus may be wildly circulating among the generality of the population regardless of class or economic status. The rate was observed to be higher among outpatients in private hospitals than those in public hospitals. This suggests that all categories of persons can contract the infection when exposed to the virus regardless of economic status, the more the exposure the more the infections and prevalence. The respective prevalence rates recorded are slightly above the 9.2% previously reported among students of a Tertiary Institution in Northwest Nigeria and less than the 12% reported among patients attending a Public Tertiary Hospital in Kaduna [4,13]. This could probably be due to the difference in the study sites and locations as prevalence rates have been reported to vary between one location and another [13]. The increasing trend observed in the prevalence rates may also suggest either a growing neglect on the use of available vaccines against the HBV or failure to take the booster dose by many persons within the metropolis on the elapse of previous vaccinated period.

There were no statistical significant associations between HBsAg seroprevalence and age for samples from both Public ($P \leq 0.28$) and Private hospitals ($P \leq 0.41$) respectively. These suggest that, age is not really a barrier or tendency for positivity without exposure to the Virus. It also means that all persons at all ages can be infected when exposed to the HBV. The higher prevalence (19.05%) observed among subjects within age group 31-40 years in Public hospitals suggest that this age group is more exposed than others. This could probably be attributed to the active lifestyles of individuals within this age group. These agrees with a previous report of a higher rate of 14% among study subjects within ages 25-34 years and 0.00% for those ages 45 and above within Kaduna [4]. On the contrary, this contradicts a previous report of high prevalence among subjects with ages above 40 years attending a Public Tertiary Hospital in Kaduna [13]. On the other hand, the absence of any positive case (0.00%) among those 41 years above in public hospitals could probably be due to maturity and responsibility which reduce their exposure to potential risks. On the contrary, the highest prevalence among samples from private hospitals (28.57%) was from subjects within ages 11-20 years while ages 51 years and above had no positive (0.00%) case. This implies that more children and young adolescents were positive for HBsAg in private hospitals than in public hospitals. The absence of any positive case for children within the age group 1-10 years in either of the study subjects group indicate the unlikely presence of mother to child HBV transmitted. This also suggests that children from less economic status are less exposed to HBV as much as those from economically viable families within the metropolis. This is different from a previous report of 17.3% prevalence rate among sickle cell anemic children in Sokoto, Nigeria [16]. The differences could probably be attributed to variations in the immunity of healthy children as compared to that of sickle cell anemic children.

The higher prevalence observed in females (11.22%) against 5.77% in males in public hospitals could be attributed to the difference in the number of females encountered (98/150) against the number of males (52/150). This trend agrees with a previous study which documented a higher prevalence of 19.40% in females against 7.8% among males in Kaduna [4]. However, the prevalence in males (12.90%) attending private hospitals was higher than that of females (9.09%). This suggests that more positive males attend private hospitals than public hospitals

Though a previous study within Kaduna reported higher prevalence in males (11.10%, 324/600) than in females (6.90%, 276/600) [13]. The trend observed in this study shows that the number of samples taken from a particular

gender play a key role in determining the prevalence rate. The higher the number of samples collected for a particular gender the more the chances for higher prevalence rate. The probability values for outpatients in public ($P \le 0.28$) and private ($P \le 0.46$) hospitals respectively at 5% level of significance indicated no statistical significant association between gender and HBsAg seropositivity. These also imply that gender is not really a predisposition factor or a tendency to HBV infection without exposure but as females are at risk, so do males are on exposure to the Virus [4].

The higher rates observed among the married attending both public (11.34%) and private (11.11%) hospitals respectively could be as a result of the large number of married subjects sampled in the respective study groups. This is different from previous reports of 9.5% among singles (Students) in ABU Zaria,13% higher rates among singles in Kaduna both in 2015 and 13.20% reported among the widowed ages 15-59 years in 2012 in the Anhui province of China [4,13,17]. The differences in this observations from these previous reports could probably be due to variations in lifestyles and locations hence prevalence rate have been reported to vary with location [13]. However, this study revealed the same trend in terms of the determinant of the rate; the higher the number of samples collected for a particular marital status, the higher the prevalence rate.

This study revealed individuals with blood group O (Table 5) to be common and more in population than those with other blood groups [18]. This could explain the high prevalence of 13.51% among subjects with blood group O in public hospitals. The absence of any positive case among patients with blood group AB could be due to the fewer number of samples (6/150) taken from this group. On the other hand, the prevalence rate of 14.71% found among outpatients with blood group B in private hospitals suggests that more of these subjects were seropositive regardless of the sample size. The lowest prevalence rate of 8.33% recorded among those with blood group A for patients attending private hospitals show a similar trend for subjects in private hospitals. These suggest that subjects with Blood group A in both study groups were less seropositive to HBV than those with other Blood groups. The absence of statistical significant associations between HBsAg seropositivity and blood group among outpatients in public ($P \le 0.25$) and private ($P \le 0.80$) hospitals respectively indicate that all blood groups can be infected when exposed to the Virus. This also implies that having a particular blood group does not guaranty safety when exposed to the Hepatitis B Virus.

Based on this study, more Rhesus positive individuals are common than Rhesus negative individuals (Table 6). This confirms a similar previous report in Iran [19]. Rhesus factor is important in this study because Rhesus negative factor have been associated with HBV infection [20]. The absence of a significant association between Rhesus factor and HBsAg seropositivity for outpatients in public hospitals ($P \le 0.85$) suggests that the Rhesus status of these patients did not impact significantly on their seropositivity. On the other hand, The close statistical association observed between Rhesus factor and HBsAg seropositivity of outpatients in private hospitals ($P \le 0.01$) suggests that the Rhesus factor contributed significantly on the patients HBsAg seropositvity. More so, Rhesus negative individuals showed to be more susceptible to HBV infections than Rhesus positive persons. These could be the reason for the higher prevalence observed among Rhesus negative than Rhesus positive outpatients in both public(11.11%,9.22%) and private(42.86%,9.09%%) hospitals respectively.

The higher prevalence revealed among those with hypertension (15.39%, $P \le 0.43$) in public hospitals and diabetics (18.18%, $P \le 0.40$) in private hospitals did not signify these diseases are potential risk without contact with the Virus (Table 7). As healthy individuals are predispose to infection when exposed to the virus, so do these individuals are when they come in contact with the Virus. Though a double risk to HBV infection has been reported among diabetics, an equal predisposition has also been reported among diabetics and non diabetics in Ethiopia [21,22].

Education is important in this study as it determines an individual enlightenment and knowledge base which characterized lifestyles and safety of social exposure. An individual educational status plays a key role in the quality of life and management of exposure to the Hepatitis B Virus. This study revealed no significant associations between HBsAg seropositivity and individual level of education among subjects attending public hospitals ($P \le 0.28$). This suggests that educational level did not impact significantly to the positivity of the subjects to HBV. On the hand, the high significant association observed between level of education and seropositivity for HBsAg among subjects attending private hospitals ($P \le 0.01$) indicate the significant impact of Education on the subjects positivity for HBsAg. The higher prevalence recorded among those with secondary schools level of education in public (13.85%) and private (26.67%) hospitals respectively is in agreement with a previous report among pregnant women at secondary level of education in south western, Nigeria (60%, $P \le 0.038$) [23]. This could be attributed to the active lifestyles and effect of youthful exuberance of the study subjects as well as inadequate knowledge about dangers and risks associated with HBV transmission.

The higher prevalence noted among subjects from HBV positive families in public (16.67%) and private (28.57%) hospitals respectively suggest HBV can easily be spread across family members if not properly managed. This also implies individuals of high economic status from HBV positive families are at a significant risk for the infection compared to those from very low economic status with HBV positive family members within the metropolis ($P \le 0.02$, $P \le 0.36$). This could probably contribute to the high significant association observed between HBsAg seropositivity and persons Sharing clothes and Beddings attending private hospitals (7.46%, $P \le 0.001$). Similar reports have been documented among students attending a Tertiary Institution North West Nigeria and among newly admitted students (36.67%) in the University of Jos, Nigeria [13,24].

Occupation was not significantly associated with HBsAg seropositivity either among outpatients in public hospitals ($P \le 0.52$) or among those in private hospitals ($P \le 0.49$). This could probably be due to the absence of health personnel among the study subjects. This study revealed a high prevalence of 14.29% among patients in

Business attending public hospitals and 20.00% among unskilled workers (Carpenters, Drivers, Motor Mechanics, Technicians, Menial job workers) attending private hospitals. This could probably be contributed by the lifestyles of this category of subjects. There were no positive cases (0.00%) among the unemployed in either hospital group probably due to economic hardship which could limit their exposure to lifestyles that predisposed them to HBV infection. This result contrasts a report of previous study among pregnant women in South West Nigeria which documented higher prevalence (40%) among the employed [23]. This could be due to location differences and the number of subjects sampled per occupation in a particular location. Those individuals with occupation captioned "Others" included: Students, Farmers, Public Servants and Politicians. Analysis of samples from this group of subjects revealed a high prevalence of 9.09% among those attending public hospitals and 14.29% among those attending private hospitals. This higher prevalence observed among the subjects in private hospitals could be due to lifestyle differences compared to those attending public hospitals. High prevalence have been reported among students (8.7%) and Farmers (18.2%) in Kaduna and 16.67% among newly admitted students at the University of jos, Nigeria [3,13]. Also, this high prevalence obtained in this category in this study could probably be due to the large number of positive cases obtained from students or farmers which are known to be potential victims to of HBV infections.

5. Conclusion and Recommendations

The results of this study confirm previous reports that HBV infection is a growing Public Health problem in Nigeria. The high prevalence rates of 9.33% and 10.67% obtained from outpatients in public and private hospitals respectively revealed that Kaduna metropolis is a highly endemic city for the Virus regardless of class or status. Potential risk factors observed within the metropolis include: Rhesus factor particularly Rhesus negative individuals, Sharing of clothes/Beddings with HBV positive persons, Presence of HBV positive family members and Secondary school level of Education.

There is need for more public sensitization and enlightenment about potential risks for HBV infection as well as timely immunization against the virus. Also, Government needs to subsidize the drugs for treatment of infected cases particularly to assist those that cannot afford. There are some families with more than one positive case; this could spell economic hardship and painful suffering. There is also the need for more research work to be carried out on Hepatitis B viral Proteins, pathogenesis, treatment and control in order to mitigate spread and reduce the disease burden among the population within the metropolis and other parts of the world.

Conflict of Interest

I declare that I have no conflict of interest.

References

[1] Goering, R.V., Dockrell, H.M., Zukerman, M., Roitt, I.M., Chiodini, P.L. (2013). Mims Medical Microbiology Microbiology. Fifth Edition. pp. 293-300.

[2] Ugbebor, O., Aigbirior, M., Osazuwa, F., Enabudoso, E., Zabayo, O., Ewing, G.W.(2011). The prevalence of hepatitis B and C viral infections among pregnant women. *North American Journal of Medical Science.* 3: 238-241.

[3] Mohammed, J., Hussain,M., Khan,M.A.(2003).Frequency of Hepatitis-B and Hepatitis C infection in thalassaemic children. *Pakistan Paedaetric Journal* 27 :161-164.

[4] Edie-Asuke,U.A.,Abubakar Z.,Asuke,S.(2015).Seroprevalence of Hepatitis B infection among outpatient attending a public Tertiary Hospital in Kaduna State in Nigeria.*A journal of Topical Medicine and surgery* :3.189.

[5] Prescott, Harley, Klein (2008). Microbiology. Seventh Edition. pp. 936.

[6] Greenwood, D., Black, R.G., Peutherer, J.F. (2007). Medical Microbiology, A guide to Microbial infections, Pathogenesis, Immunity, Laboratory diagnosis and control. Seventeen Edition pp. 529-531.

[7] Tortora, G.J., Berdell, F.R. and Case, C.L. (2008). Microbiology, An Introduction.ninth Edition. PP 764-765.

[8] Chisari, F.V., Ferrari, C. (2010). Hepatitis B virus immunopathogenesis. Annual Review Immunology; 13: 29-60.

[9] Levinson, W. (2013). Review of Medical Microbiology. Twelve Edition. pp.324-326.

[10] George, I.O. and Yaguo, L.E. (2011). Hepatitis B virus infection in Nigerian children with sickle cell anaemia. *Journal of Medicine and Medical Sciences.* Volume 2 (11). pp. 1213-1215.

[11] 11 Majolagbe, O. N., Oladipo, E. K., and Daniel, L. E.(2014). Prevalence and Awareness of Hepatitis B infection among Blood Donors in Abubakar Tafawa Balewa University Teaching Hospital Bauchi. *International Journal of Multidisciplinary and Current Research*.pp.955-960

[12] Durotoye, I.A., Issa, B.A., Fadeyi, A., Yusuf, A.D., Salami, A.K., Ajiboye, P.O., Olawumi, H.O., Adegunloye, O.A., Nwabuisi, C., Dauda, Sulyman (2014). Seroprevalence of Hepatitis Band C among mentally ill patients attending a tertiary hospital in Nigeria. *Annals of African Medicine.* 13(4).210-6.

[13] Isa, I.M., Abdullahi, S.A., Sani, M.A., Esona, M.D. (2015). Seroprevalence of hepatitis B virus in a tertiary institution in North Western Nigeria. *African Journal of Microbiology Research.* Volume.9 (3), pp 171-179, 21.

[14] Arya, R., Autonisamy, B., Kumar, S. (2012). Sample Size Estimation in Prevalence Studies, *Indian Journal of Pediatrics* Volume 79, Issue 11, pp 1482-1488.

[15] www.who.int/csr/disease/.../en/index1.html (2016). Where Hepatitis B is a problem globally.pp.1-2

[16] Jibrin, Baba; Jiya, Nma; Ahmed; Hamid(2014).Prevalence of HBsAg in children with sickle cell anemia in sokoto. *Sahel Medical Journal* Volume : 17 Issue : 1 pp : 15-18.

[17] Xiaoqing Li; Yingjun Zheng; Adrian Liau; Biao Cai; Dongqing Ye; Feng Huang; Xiaorong Sheng; Fuyang Ge; Liu Xuan; Shu Li and Jing Li (2012).Hepatitis B Virus infections and risk factors among the general population in Anhui Province of China: an epidemiological study. *International Journal of Behavioral Nutrition and physical activity*.BMC Public health BMC Series.

[18] Fatemeh MOHAMMADALI and Aliakbar POURFATHOLLAH (2014).Associations of ABO and RHBlood groups to blood borne infections among blood donors at Tehran Iran. *Iranian journal of public Health* 43(7): 981-989.

[19] Alireza, Emami Naeini; Mojtaba, Rostami; Sahar, Emami Naeini (2010). Chronic Viral Hepatitis and their relation to ABO Blood groups and Rhesus (Rh) factors. Medical Case Studies. Volume 1(1). pp.5-7.

[20] Zahra Naseri,Masoud Sabouri Ghannad, Seyed Mostafa Hosseini, Ghodratollah Roshanaei, Amir Sasan Mozaffari Nejad and Afshin Mohammadi (2016). Evaluation of Accompaniment of ABO Blood group system and Rhesus blood group types with infections to Hepatitis Bvirus and Hepatitis C virus in Hammadan, Iran. *International Journal of Medical Research and Health Science*:5:4.1-5.

[21] *The Centers for Disease Control and Prevention, Oct. 25, 2011.*

[22] Daniel, Mekonnen; Solomon, Gebre-Selassie; Surafel, Fantaw; Andualem, Hunegnaw; Adane, Mihret (2014). Prevalence of

Hepatitis B infections with patients with diabetes mellitus; a comparative crossectional study at Woldiya general Hospital Ethiopia. *Pan African medical Journal*: 17; 40.

[23] Chinenye Gloria Anaedobe; Adeola Fowotade; Chukwuma Ewean Omoruyi and Rasheed Ajayi Bakare (2015). Prevalence, Socio-demographic features and risk factors of HBV infection among pregnant women in South Western Nigeria. *The Pan African Medical Journal*: 20. 406.

[24] Odinachi Okoh Ekume; John Danjuma Mawak; Augustine Uwakwe; Ogbonnaya Ogbu; Felicia Ngozi Okoh; Maduka Victor Agah; Agwu Ulu Nyachi (2014). Prevalence of Hepatitis B surface Antigen among the newly admitted students at the University of Jos, Nigeria. *American Journal of life Sciences*. Volume 2.No. 1 pp.35-39.

Appendix

Chi square test of independence for 2 variables at 5% level of significance - for the journal.

Table 1. Prevalence of HBsAg among patients attending public Hospitals within Kaduna in relation to age

Ages	**HBsAg**		**Total Number of persons Tested**
	Negative	Positive	
01-10	17	0	17
	15.41	*1.59*	
11-20	17	2	19
	17.23	*1.77*	
21-30	36	4	40
	36.27	*3.73*	
31-40	34	8	42
	38.08	*3.92*	
41-50	21	0	21
	19.04	*1.96*	
51-60	6	0	6
	5.44	*0.56*	
61-70	5	0	5
	4.53	*0.47*	
71-80	0	0	0
	0.00	*0.00*	
81-90	0	0	0
	0.00	*0.00*	
Total	136	14	150

$X^2 = \frac{(O_i - E_i)^2}{E_i}$, X^2 =Chi Square, O_i=Observed Number of Cases in category i, E_i=Expected Number of cases in i.

For the different ages, $X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$. O_i=Non- italicized Figures in the table, E_i=Italicized Figures.

Such that

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(17-15.41)^2}{15.41} + \frac{(17-17.23)^2}{17.23} + \frac{(36-36.27)^2}{36.27} + \frac{(34-38.08.)^2}{38.08} + \frac{(21-19.04)^2}{19.04} + \frac{(5-4.53)^2}{4.53} + \frac{(6-5.44)^2}{5.44}$$

$$+ \frac{(0-0.00)^2}{0.00} + \frac{(0-0.00)^2}{0.00} + \frac{(0-1.59)^2}{1.59} + \frac{(2-1.77)^2}{1.77} + \frac{(4-3.73)^2}{3.73} + \frac{(8-3.92)^2}{3.92} \frac{(0-1.96)^2}{1.96} + \frac{(0-0.56)^2}{0.56}$$

$$+ \frac{(0-0.47)^2}{0.47} + \frac{(0-0.00)^2}{0.00} + \frac{(0-0.00)^2}{0.00} = 9.8285 = P \leq 0.277$$

X^2 Tabulated critical value for 8 df at 0.05=15.5100- null hypothesis accepted

Table 1. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna Metropolis in relation to age

Ages	HBsAg		Total Number of persons Tested
	Negative	Positive	
01-10	14	0	14
	12.51	*1.49*	
11-20	5	2	7
	6.25	*0.75*	
21-30	31	5	36
	32.16	*3.84*	
31-40	44	4	48
	42.88	*5.12*	
41-50	23	5	28
	25.01	*2.99*	
51-60	10	0	10
	8.93	*1.07*	
61-70	3	0	3
	2.68	*0.32*	
71-80	3	0	3
	2.68	*0.32*	
81-90	1	0	1
	0.89	*0.11*	
Total	134	16	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(14-12.51)^2}{12.51} + \frac{(5-6.25)^2}{6.25} + \frac{(31-32.16)^2}{32.16} + \frac{(44-42.88.)^2}{42.88} + \frac{(23-25.01)^2}{25.01} + \frac{(10-8.93)^2}{8.93} + \frac{(3-2.68)^2}{2.68}$$

$$+ \frac{(3-2.68)^2}{2.68} + \frac{(1-0.89)^2}{0.89} + \frac{(0-1.49)^2}{1.49} + \frac{(2-0.75)^2}{0.75} + \frac{(5-3.84)^2}{3.84} + \frac{(4-5.12)^2}{5.12} \frac{(5-2.99)^2}{2.99} + \frac{(0-1.07)^2}{1.07}$$

$$+ \frac{(0-0.32)^2}{0.32} + \frac{(0-0.32)^2}{0.32} + \frac{(0-0.11)^2}{0.11} = 8.2165 = P \leq 0.413.$$

The Chi Square Critical region for df 8=15.5100 null hypothesis accepted

Table 2. Afrequency distribution Table for ages of patients from Public hospitals in Table 1

Age range	Mid Age M_1	No of persons tested (f_1)	$m_1\ f_1$	$(M_1 - \overline{X})^2\ f_1$
01-10	5.50	17	93.50	10,287.72
11-20	15.50	19	294.50	4,050.04
21-30	25.50	40	1,020	846.40
31-40	35.50	42	1,491	1,224.72
41-50	45.50	21	955.50	4,980.36
51-60	55.50	6	333.00	3,870.96
61-70	65.50	5	327.50	6,265.80
71-80	75.50	0	0.00	0.00
81-90	85.50	0	0.00	0.00
Total		150	4,515	31,526.00

The mean age is given by $\overline{X} = \frac{\sum_{n=150}^{n} M_1 f_1}{N}$

M_1= Middle age for the Age Range.
F_1=Number of persons tested in the age range /frequency.
N=Total number of persons in the study/Sample Size= 150.

$$\overline{X} = \frac{\sum_{n=150}^{n} M_1 f_1}{N} = \frac{4,515}{150} = 30.10 \text{ years}$$

i) The Standard Deviation $(\sigma) = \sqrt{\frac{\sum_{n=150}^{n} (M_1 - \overline{X})^2 f}{N-1}}$

$$\sigma = \sqrt{\frac{31,526}{150-1}} = \sqrt{\frac{31,526}{149}} = 14.55 \text{ years.}$$

ii) The standard error of the mean age $S_{\overline{X}} = \frac{\sigma}{\sqrt{n}}$

σ =Standard Deviation=14.55 Years.
N=Sample Size=150

$$S_{\overline{X}} = \frac{14.55}{\sqrt{150}} = 1.19$$

The 95% Confidence Interval (CI) of the mean age in years in the study is given by

CI= $\overline{X} \pm t_{\alpha/2} df * S_{\overline{X}}$

$\overline{X}$ =Mean age=30.10 Years.
$\alpha = 0.05$ Probability.
$df = 9-1 = 8$ (Nine age ranges used)
$S_{\overline{X}} = 1.19$
Therefore, the 95% CI for the mean age is

CI $= 30.10 \pm 2.306 \times 1.19$
$= 30.10 \pm 2.74$ Years.

Table 2. Afrequency distribution Table for ages of patients from Private hospital in table 2

Age range	Mid Age M_1	No of persons tested (f_1)	$m_1 f_1$	$(M_1 - \overline{X})^2 f_1$
01-10	5.50	14	77.00	11,612.16
11-20	15.50	7	108.50	2,474.08
21-30	25.50	36	918.00	2,787.84
31-40	35.50	48	1704.00	69.12
41-50	45.50	28	1274.00	3,512.32
51-60	55.50	10	555.00	4,494.40
61-70	65.50	3	196.50	2,920.32
71-80	75.50	3	226.50	5,092.32
81-90	85.50	1	85.50	2,621.44
Total		150	5,145	35,584.00

The mean age is given by $\overline{X} = \frac{\sum_{n=150}^{n} M_1 f_1}{N}$

M_1= Middle age for the Age Range.
F_1=Number of persons tested in the age range /frequency.
N=Total number of persons in the study/Sample Size=150.

$$\overline{X} = \frac{\sum_{n=150}^{n} M_1 f_1}{N} = \frac{5,145}{150} = 34.30 \text{ years}$$

i) The Standard Deviation $(\sigma) = \sqrt{\frac{\sum_{n=150}^{n} (M_1 - \overline{X})^2 f}{N-1}}$

$$\sigma = \sqrt{\frac{35,584}{150-1}} = \sqrt{\frac{35,584}{149}} = 15.45 \text{ years.}$$

ii) The standard error of the mean age $S_{\overline{X}} = \frac{\sigma}{\sqrt{n}}$,

σ =Standard Deviation=15.45 Years.
N=Sample Size=150

$S_{\overline{X}} = \frac{15.45}{\sqrt{150}} = 1.26$

The 95% Confidence Interval (CI) of the mean age in years in the study is given by

CI= $\overline{X} \pm t_{\alpha/2} df * S_{\overline{X}}$

$\overline{X}$ =Mean age=34.30 Years.
$\alpha = 0.05$ Probability
$df = 9 - 1 = 8$ (Nine age ranges used)
$S_{\overline{X}}$ =1.26, therefore, the 95% CI for the mean age is

CI $= 34.30 \pm 2.306 \times 1.26$
$= 34.30 \pm 2.91$ Years.

Table 3. Prevalence of HBsAg among patients attending public Hospitals within Kaduna Metropolis in relation to Sex

Sex	HBsAg		Total Number of persons Tested
	Negative	Positive	
Male	49	3	52
	47.15	*4.85*	
Female	87	11	98
	88.85	*9.15*	
Total	136	14	150

$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} .= \frac{(49-47.15)^2}{47.15} - \frac{(87-88.85).^2}{88.85} + \frac{(3-4.85^2}{4.85} + \frac{(11-9.15)^2}{9.15} = 1.1908 = P \leq 0.28.$

The Chi Square Critical Region for 1 df at 0.05 is 3.8400. null hypothesis accepted

Table 3. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna in relation to Sex

Sex	HBsAg		Total Number of persons Tested
	Negative	Positive	
Male	54	8	62
	55.39	*6.61*	
Female	80	8	88
	78.61	*9,39*	
Total	134	16	150

$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} .= \frac{(54-55.39)^2}{55.39} + \frac{(80-78.61).^2}{78.61} + \frac{(8-6.61)^2}{6.61} + \frac{(8-9.38)^2}{9.38} = 0.5548 = P \leq 0.46$

X^2 critical value f or 1 df at 0.05=3.8400 null hypothesis accepted

Table 4. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to Marital Status

Marital Status	HBsAg		Total Number of persons Tested
	Negative	Positive	
Single	46	3	49
	44.43	*4.57*	
Married	86	11	97
	87.95	*9.05*	
Widowed	2	0	2
	1.81	*0.19*	
Separated	2	0	2
	1.81	*0.19*	
Divorced	0	0	0
	0.00	*0.00*	
Total	136	14	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} .= \frac{(46-44.43)^2}{44.43} + \frac{(86-87.95)^2}{87.95} + \frac{(2-1.81)^2}{1.81} + \frac{(2-1.81)^2}{1.81} + \frac{(3-4.57)^2}{4.57} + \frac{(11-9.05)^2}{9.05} + \frac{(0-0.19)^2}{0.19} + \frac{(0-0.19)^2}{0.19} + \frac{(0-0.00)^2}{0.00} + \frac{(0-0.00)^2}{0.00} = 1.4782 = P \leq 0.831$$

The chi square Critical region for DF=4 at 0.05 is 9.4900 null hypothesis accepted

Table 4. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in relation to Marital Status

Marital Status	HBsAg		Total Number of persons Tested
	Negative	Positive	
Single	29	3	32
	28.59	*3.41*	
Married	104	13	117
	104.52	*12.48*	
Widowed	1	0	1
	0.89	*0.11*	
Separated	0	0	0
	0.00	*0.00*	
Divorced	0	0	0
	0.00	*0.00*	
Total	134	16	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(29-28.59)^2}{28.59} + \frac{(104-104.52)^2}{104.52} + \frac{(1-0.89)^2}{0.89} + \frac{(3-3.41)^2}{3.41} + \frac{(13-12.48)^2}{12.48} + \frac{(0-0.11)^2}{0.11} + \frac{(0-0.00)^2}{0.00} + \frac{(0-0.20)^2}{0.20} + \frac{(0-0.00)^2}{0.00} + \frac{(0-0.00)^2}{0.00} = 0.2031 = P \leq 0.995.$$

The chi square Critical region for DF=4 at 0.05 is 9.4900,null hypothesis accepted

Table 5. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to Blood Group

Blood Group	HBsAg		Total Number of persons Tested
	Negative	Positive	
A	37	1	38
	34.45	*3.55*	
B	29	3	32
	29.01	*2.99*	
AB	6	0	6
	5.44	*0.56*	
O	64	10	74
	67.09	*6.91*	
Total	136	14	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(37-34.45)^2}{34.45} + \frac{(29-29.01)^2}{29.01} + \frac{(6-5.44)^2}{5.44} + \frac{(64-67.09)^2}{67.09} + \frac{(1-3.55)^2}{3.55} + \frac{(3-2.99)^2}{2.99} + \frac{(0-0.56)^2}{0.56} + \frac{(10-6.91)^2}{6.91} = 4.1623 = P \leq 0.245$$

The Chi Square critical value tabulated for the df =3 is 7.8100 null hypothesis accepted

Table 5. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in relation to Blood Group

Blood Group	HBsAg		Total Number of persons Tested
	Negative	Positive	
A	44	4	48
	42.88	*5.12*	
B	29	5	34
	30.37	*3,63*	
AB	6	1	7
	6.25	*0.75*	
O	55	6	61
	54.59	*6.51*	
Total	134	16	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(44-42.88)^2}{42.88} + \frac{(29-30.37)^2}{30.37} + \frac{(6-6.25)^2}{6.25} + \frac{(55-54.59)^2}{54.59} + \frac{(4-5.12)^2}{5.12} + \frac{(5-3.63)^2}{3.63} + \frac{(1-0.75)^2}{0.75} +$$

$$\frac{(6-6.51)^2}{6.51} = 0.9892 = P \leq 0.804.$$

The Chi Square critical region tabulated for the DF=3 at 0.05 significance is 7.8100 null hypothesis accepted

Table 6. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to Rhesus Factor

Rhesus	HBsAg		Total Number of persons Tested
	Negative	Positive	
RH^+	128	13	141
	127.84	*13.16*	
RH^-	8	1	9
	8.16	*0.84*	
Total	136	14	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} .= \frac{(128-127.84)^2}{127.84} + \frac{(8-8.16).^2}{8.16} + \frac{(13-13.16)^2}{13.16} + \frac{(1-0.84)^2}{0.84} = 0.0358 \quad P \leq 0.85$$

Null hy

The Chi Square critical region tabulated for the DF=1 at 0.05 significance is 3.8400

Table 6. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in relation to Rhesus Factor

Rhesus	HBsAg		Total Number of persons Tested
	Negative	Positive	
RH^+	130	13	143
	127.75	*15.25*	
RH^-	4	3	7
	6.25	*0.75*	
Total	134	16	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} .= \frac{(130-127.75)^2}{127.75} + \frac{(4-6.25).^2}{6.25} +. \frac{(13-15.25)^2}{15.25} + \frac{(3-0.75)^2}{0.75} = 7.9316 \quad P \leq 0.01.$$

The Chi Square critical region tabulated for the DF=1 at 0.05 significance is 3.8400. Null hypothesis rejected, alternative hypothesis accepted.

Table 7. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to individual Clinical history

Clinical History	HBsAg		Total Number of persons Tested	Critical Region/Pvalue
	Negative	Positive		
Blood Recipient(Yes)	12	1	13	0.0440 $P \leq 0.843$ X^2 critical value tabulated for 1 df at 0.05=3.8400
	11.79	*1.21*		
(No)	124	13	137	
	124.21	*12.79*		
Total	136	14	150	
Hypertensive(Yes)	11	2	13	0.6225 $P \leq 0.430$
	11.79	*1.21*		
(No)	125	12	137	
	124.21	*12.79*		
Total	136	14	150	
Diabetics (Yes)	2	0	2	0.2128 $P \leq 0.645$
	1.81	*0.19*		
(No)	134	14	148	
	134.19	*13.81*		
Total	136	14	150	
				0.2128 $P \leq 0.645$
HIV/AIDS(Yes)	2	0	2	
	1.81	*0.19*		
(No)	134	14	148	
	134.19	*13.81*		
Total	136	14	150	
Others (Yes)	108	12	120	0.3151 $P \leq 0.575$
	108.80	*11.20*		
(No)	28	2	30	
	27.20	*2.80*		
Total	136	14	150	

Table 7. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in relation to individual Clinical history

Clinical History	HBsAg		Total Number of persons Tested	Critical Region/Pvalue
	Negative	Positive		
Blood Recipient(Yes)	11	0	11	1.4126 $P \leq 0.235$ X^2 critical value tabulated for 1 df at 0.05=3.8400
	9.83	*1.17*		
(No)	123	16	139	
	124.17	*14.83*		
Total	134	16	150	
Hypertensive(Yes)	10	2	12	0.5548 $P \leq 0.456$
	10.72	*1.28*		
(No)	124	14	138	
	123.28	*12.88*		
Total	134	16	150	
Diabetics (Yes)	9	2	11	0.71095 $P \leq 0.399$
	9.83	*1.17*		
(No)	125	14	139	
	124.17	*14.83*		
Total	134	16	150	
HIV/AIDS(Yes)	1	0	1	0.1245 $P \leq 0.724$
	0.89	*0.11*		
(No)	133	16	149	
	133.11	*15.89*		
Total	134	16	150	
Others (Yes)	103	12	115	0.0282 $P \leq 0.867$
	102.73	*12.27*		
(No)	31	4	35	
	31.27	*3.73*		
Total	134	16	150	

Table 8. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to individual level of education

Education	HBsAg		Total Number of persons Tested
	Negative	Positive	
No Education	14	1	15
	13.60	*1.40*	
Primary Education	38	1	39
	35.36	*3.64*	
Secondary Education	56	9	65
	58.93	*6.07*	
Tertiary Education	28	3	31
	28.11	*2.89*	
Total	136	14	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(14-13.60)^2}{13.60} + \frac{(38-35.36)^2}{35.36} + \frac{(56-58.93)^2}{58.93} + \frac{(28-28.11)^2}{28.11} + \frac{(1-1.40)^2}{1.40} + \frac{(1-3.64)^2}{3.64} + \frac{(9-6.07)^2}{6.07} +$$

$$\frac{(3-2.89)^2}{2.89} = 3.8061 = P \leq 0.283.$$

The Chi square critical value tabulated for 3 df at 0.05 is 7.8100

Table 8. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in relation to individual level of education

Education	HBsAg		Total Number of persons Tested
	Negative	Positive	
No Education	13	0	13
	11.61	*1.39*	
Primary Education	16	1	17
	15.19	*1.81*	
Secondary Education	22	8	30
	26.80	*3.20*	
Tertiary Education	83	7	90
	80.40	*9.60*	
Total	134	16	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(13-11.61)^2}{11.61} + \frac{(16-15.19)^2}{15.19} + \frac{(22-26.80)^2}{26.80} + \frac{(83-80.40)^2}{80.40} + \frac{(0-1.39)^2}{1.39} + \frac{(1-1.81)^2}{1.81} + \frac{(8-3.20)^2}{3.20} +$$

$$\frac{(7-9.60)^2}{9.60} = 10.8101 = P \leq 0.013$$

The Chi square critical value tabulated for df 3 at 0.05 level of significance is 7.8100.

Table 9. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to social factors

Social Factors	HBsAg		Total Number of persons Tested	Critical Region/Pvalue
	Negative	Positive		
Tribal Marks	25	2	27	0.14435 $P \leq 0.704$ X^2 critical value tabulated for 1 df at 0.05=3.8400
	24.48	*2.52*		
No Marks	111	12	123	
	111.52	11.48		
Total	136	14	150	
Have Knowledge of Hepatitis	34	5	39	0.7573 $P \leq 0.354$
	35.36	*3.64*		
No knowledge of Hepatitis	102	9	111	
	100.64	*10.36*		
Total	136	14	150	
Eat in public places	95	9	104	0.1869

	94.29	*9.71*		$P \leq 0.667$
Don't eat in public places	41	5	46	
	41.71	*4.29*		
Total	136	14	150	
Sharing clothes/Beddings	70	7	77	
	69.81	*7.19*		0.5361
Don't Share clothes/Beddings	68	5	73	$P \leq 0.464$
	66.19	*6.81*		
Total	136	14	150	
Positive Family History	10	2	12	0.8287
	10.88	*1.12*		
No positive Family History	126	12	138	$P \leq 0.363$
	125.12	*12.88*		
Total	136	14	150	

Table 9. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in relation to social factors

Social Factors	**HBsAg**		**Total Number of persons Tested**	**Critical Region/Pvalue**
	Negative	Positive		
Tribal Marks	10	3	13	2.2867
	11.61	*1.39*		
No Marks	124	13	137	$P \leq 0.131$
	122.39	14.61		X^2 critical value tabulated for 1 df at 0.05=3.8400
Total	134	16	150	
Have Knowledge of Hepatitis	31	4	35	
	31.27	*3.73*		0.02844
No knowledge of Hepatitis	103	12	115	$P \leq 0.866$
	102.73	*12.27*		
Total	134	16	150	
Eat in public places	98	11	109	0.1400
	97.37	*11.63*		
Don't eat in public places	36	5	41	$P \leq 0.708$
	36.63	*4.37*		
Total	134	16	150	
Sharing clothes/Beddings	124	10	134	13.4921
	119.71	*14.29*		
Don't Share clothes/Beddings	10	6	16	$P \leq 0.00024$
	14.29	*1.71*		
Total	134	16	150	
Positive Family History	10	4	14	5.2181
	12.51	*1.49*		
No positive Family History	124	12	136	$P \leq 0.022$
	121.49	*14.51*		
Total	134	16	150	

Table 10. Prevalence of HBsAg among patients attending Public Hospitals within Kaduna metropolis in relation to Occupation

Occupation	**HBsAg**		**Total Number of persons Tested**
	Negative	Positive	
Civil Service	13	1	14
	12.69	*1.31*	
Business	30	5	35
	31.73	*3.27*	
Unskilled Worker	7	1	8
	7.25	*0.75*	
Unemployed	20	0	20
	18.13	*1.87*	
Others	66	7	73
	66.19	*6.81*	
Total	136	14	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(13-12.69)^2}{12.69} + \frac{(30-31.73)^2}{31.73} + \frac{(7-7.25)^2}{7.25} + \frac{(20-18.13)^2}{18.13} + \frac{(66-66.19)^2}{66.19} + \frac{(1-1.31)^2}{1.31} + \frac{(5-3.27)^2}{3.27} +$$

$$\frac{(1-0.75)^2}{0.75} + \frac{(0-1.87)^2}{1.87} + \frac{(7-6.81)^2}{6.81} = 3.2559 = P \leq 0.516.$$

The Chi square critical value for 4 df at 0.05 is 9.4900 accept null hypothesis

Table 10. Prevalence of HBsAg among patients attending Private Hospitals within Kaduna metropolis in in relation to Occupation

Occupation	HBsAg		Total Number of persons Tested
	Negative	Positive	
Civil Service	46	3	49
	43.77	*5.23*	
Business	12	1	13
	11.61	*1.39*	
Unskilled Worker	4	1	5
	4.47	*0.53*	
Unemployed	6	0	6
	5.36	*0.64*	
Others	66	11	77
	68.79	*8.2*	
Total	134	16	150

$$X^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} =$$

$$\frac{(46-43.77)^2}{43.77} + \frac{(12-11.61)^2}{11.61} + \frac{(4-4.47)^2}{4.47} + \frac{(6-5.36)^2}{5.36} + \frac{(66-68.79)^2}{68.79} + \frac{(3-5.23)^2}{5.23} + \frac{(1-1.39)^2}{1.39} +$$

$$\frac{(1-0.53)^2}{0.53} + \frac{(0-0.64)^2}{0.64} + \frac{(11-8.20)^2}{8.20} = 3.4388 = P \leq 0.487.$$

The Chi square critical value for df= 4 at 0.05 is 9.4900. accept null hypothesis.