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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15944

DOI URL: <http://dx.doi.org/10.21474/IJAR01/15944>



RESEARCH ARTICLE

A SINGLE-CENTER CROSS-SECTIONAL STUDY OF SEROPREVALENCE OF HEPATITIS B AND C IN MOGADISHU, SOMALIA

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Manuscript Info

Manuscript History

Received: 30 October 2022

Final Accepted: 30 November 2022

Published: December 2022

Key words:-

Hepatitis B Virus (HBV), Hepatitis C Virus (HCV)

Abstract

Introduction: Chronic viral hepatitis continues to be a global problem responsible for significant morbidity and death and a substantial economic burden. The World Health Organization estimated 296 million and 58 million individuals to be infected with HBV and HCV in 2019. In Somalia, few studies reported on HBV and HCV have shown varying results. This study is conducted to give insights on prevalence in Somalia.

Methods: This cross-sectional study was conducted on data collated from June 2019 to July 2022 among patients visiting Kalkaal Hospital, Mogadishu, Somalia. The Kolmogorov-Smirnov test was used to determine the data's normality, and the Chi-square test to determine the difference between categorical variables. A total of 24,017 people were included in the study, comprising 58.4% females and 41.6% men. The prevalence of hepatitis B was 4.2%, while the prevalence of hepatitis C was 0.3%. The HBV prevalence was highest among females aged 50 to 59 (10.1%). HCV prevalence was highest among males aged over 60 (3.6%).

Conclusion: The high prevalence of HBV and HCV across genders and its variation for different age groups in this study highlights a severe public health issue that requires rethinking vaccination strategy and policy.

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Introduction:-

Chronic viral hepatitis remains a global threat responsible for high morbidity and mortality and a heavy financial burden. Hepatitis B and C are viral infections that cause acute and chronic diseases and attack the liver. Both hepatitis B and C are blood-borne pathogens. (1) Both hepatitis B and C are blood-borne pathogens transmitted through the blood, primarily due to unsafe transfusion, unsafe injection, and sexual practices that lead to exposure to infected blood. (2)

The WHO estimate for the infection of HBV in 2019 was 296 million people and 1.5 million new infections annually. The deaths caused by HBV in 2019 were 820 000. They were mainly caused by cirrhosis and hepatocellular carcinoma. (1) On the other hand, the WHO reports that the global estimate of people with hepatitis C in 2019 was 58 million, with 1.5 million new cases annually. The WHO report indicates that 3.2 million adolescence

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and children with chronic hepatitis C infection in 2019. The deaths attributed to hepatitis C in 2019 were approximately 290 000 people, mainly caused by cirrhosis and hepatocellular carcinoma. (2)

The WHO estimated the prevalence of HCV in Africa at 5.3%. Egypt is reported to have the highest prevalence of 17.5% worldwide. Zambia has been reported to have a prevalence of 0.3%(3). The reported prevalence of HBV within Eastern African countries is 6.015%, with Kenya having 8.54% and Uganda having 8.454%. (4)The African data indicate that both HBV and HCV infections inflict substantial public health problems that need to be addressed through relevant health policies(4).

Somalia is categorized among countries with a high prevalence of hepatitis B surface antigen (HBsAg), which is more than 8%(5). Viral hepatitis, particularly hepatitis B, is a public health problem in Somalia. Previous studies have indicated that the country's overall prevalence of hepatitis B is at 20% as of 2018(5). HCV affects people of all ages, but acute hepatitis C mainly affects young adults. Furthermore, studies have reported the prevalence of HBsAg among participants aged 40-49 to be the highest compared to other age groups, with a percentage of 5.9%(5). The overall reported prevalence of HCV in Somalia is at 4.84%, with studies indicating that the highest proportion with anti-HCV was 50-59 years of age, with a rate of 1.1%(5).

The prevention and the control of HBV can be done through vaccination in a safe, available and effective manner(1). Over 95% of people with hepatitis C infection can be cured through antiviral medicines, but access to diagnosis and treatment is low. Presently, there is no effective vaccine against hepatitis C(2). In Somalia, few studies reported on HBV and HCV have shown varying results. This study is conducted to give insights on prevalence in Somalia and the benefits of implementation of policy for vaccination strategy.

Methods:-

Study design and Setting:

This is a cross-sectional study conducted from June 2019 to July 2022 among patients visiting Kalkaal Hospital, Mogadishu, Somalia. The Federal Republic of Somalia is located in the East Africa region of the Indian Ocean and is characterized by the longest coastline that stretches along the Indian Ocean to the Gulf of Aden. The country has a land mass of 637657 km² and borders Kenya to the East, Ethiopia to the west, and Djibouti to the north. Somalia has an approximate population of a 16million(6), with an urban population size of 7,431,038(46.8 %) in 2020. (6) The median in Somalia is 16.7 years, and the life expectancy is 58.34 years at birth, both male and female. (6) Along Digfeer Road in the heart of Mogadishu, Kalkaal Hospital is one of the city's most efficiently and safely accessible private hospitals. Its location within the Km4 area enables quick and secure access for the corporate class and the general public without jeopardizing security or the quality of the health care provided.

Study participants and variables:

Hepatitis B surface antigen (HBsAg) and Hepatitis C virus were found in the blood samples of patients in the hospital's outpatient department (OPD). Over the period multiple platforms, including radio, television, and social media, had been utilized in campaigns to encourage large number of people to undergo hepatitis screening for vaccination if a negative test result or treatment if positive.

Data sources and Handling Bias:

Data recorded in the hospital's management system from June 2019 to July 2022, a period of three years, were included and cleaned for analysis using Microsoft excel 2019.

Diagnostics Approaches:

Within one hour of sample collection, all participants were evaluated for the presence of Hepatitis B surface antigen (HBsAg) using fast chromatographic immunoassays. Using ELISA equipment for quantitative testing, positive individuals were confirmed. Similarly, a Hepatitis C blood test was performed using a rapid and a PCR test to validate the result.

Data analysis:

In the data analysis phase of the study, the Statistical Package for Social Science (SPSS) version 20 was used as the analysis tool. All variables, including the mean and standard deviation or frequency, were subjected to descriptive analysis. The researcher used the Kolmogorov-Smirnov test to determine the data's normality(7) and the Chi-square test for categorical variables(8).

Results:-

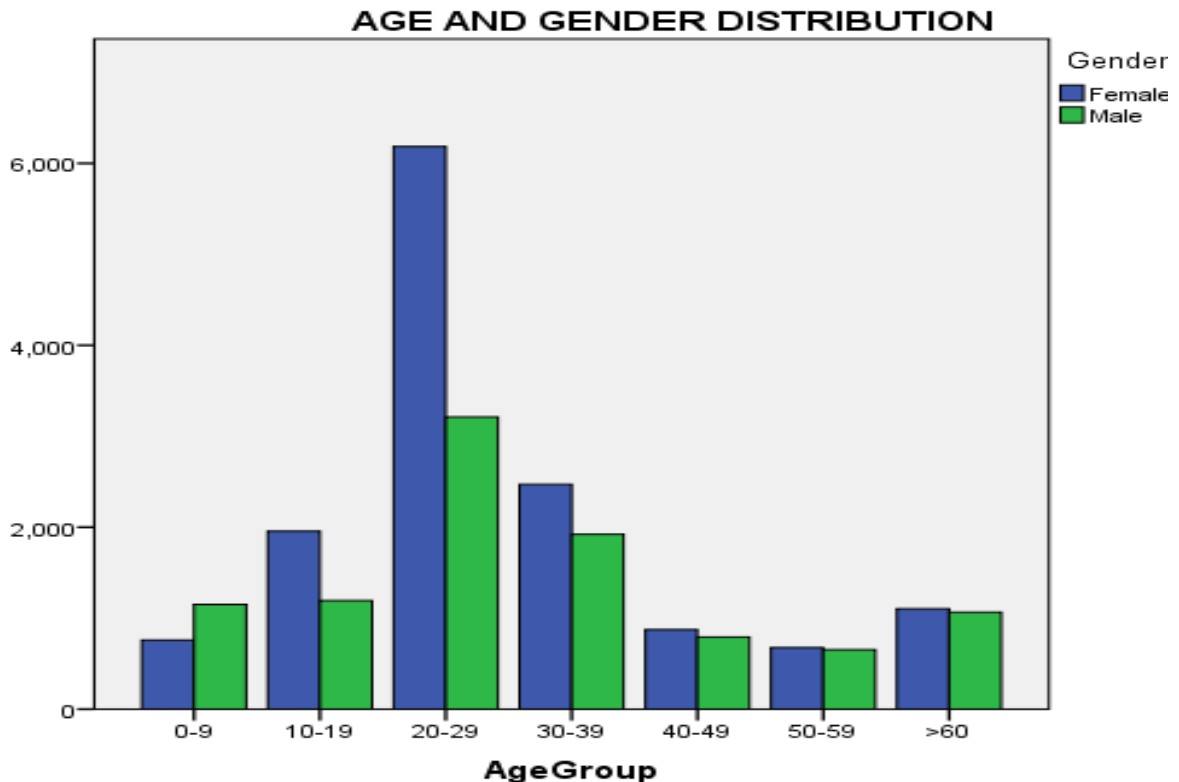
Overall, 24017 participants were included in the study. 14,026(58.4%) were female and 9,991(41.6%) were male. Most participants were between 20-29 years of age, numbering 9397(39.1%), 30-39 4394; 18.3%, 10-19; 3150(13.1%), 0-9; 1909(7.9%), >60; 2169(9.0%), 40-49; 1668(6.9%) and 50-59; 1330(5.5%).

Table 1:- Descriptive.

Variable	Category	Frequency	Percent % and 95% Confidence Interval
Gender	Female	14026	58.4(57.7-59.0)
	Male	9991	41.6(41.0-42.3)
	Total	24017	100.0
Age Group	0-9	1909	7.9(7.6-8.8)
	10-19	3150	13.1(12.7-13.5)
	20-29	9397	39.1(38.6-39.7)
	30-39	4394	18.3(17.8-18.8)
	40-49	1668	6.9(6.6-7.3)
	50-59	1330	5.5(6.6-7.3)
	>60	2169	9.0(8.7-9.4)
	Total	24017	100.0
HCV	Negative	23933	99.7(99.6-99.7)
	Positive	84	0.3(0.3-0.4)
HBsAg	Negative	23012	95.8(95.6-96)
	Positive	1005	4.2(4.0-4.4)

In total, 23,933 out of 24,017(Table1) participants tested negative for HCV, while 84 participants tested positive for HCV. On the other hand, 23012 (95.8 percent) and 1005 (4.2 percent) participants tested negative and positive for Hepatitis B surface antigen, respectively.

Figure 1:- Age and Gender Distribution.



According to the data, as shown in figure1, most individuals were between the ages of 20 and 29, and most were female. The number of screened individuals increased with age from 0 to 20-29 years, after which both male and female categories experienced a decline.

Table 2:- HBV Prevalence per age Group among Female.

Age Group	Negative	Positive	Total
0-9	753(99.2%)	6(0.8%)	759(100.0%)
10-19	1937(99.0%)	20(1.0%)	1957
20-29	6086(98.4%)	99(1.6%)	6185
30-39	2374(96.1%)	97(3.9%)	2471
40-49	811(92.8%)	63(7.2%)	874
50-59	608(89.9%)	68(10.1%)	676
>60	997(90.3%)	107(9.7%)	1104
Total	13566(96.7%)	460(3.3%)	14026

The results of the data analysis(Table2) indicate that ages 50-59 had the highest prevalence (10.1 percent) among females between 50 and 59 years. They were followed by those above 60 years (9.7 percent) and 40-49(7.2 percent). (7.2 percent). The prevalence decreased with age.

Table 3:- HBV Prevalence per age Group among Male.

Age Group	Negative	Positive	Total
0-9	1140(99.1%)	10(0.9%)	1150
10-19	1166(97.7%)	27(2.3%)	1193
20-29	3064(95.4%)	148(4.6%)	3212
30-39	1789(93.0%)	134(7.0%)	1923
40-49	718(90.4%)	76(9.6%)	794
50-59	593(90.7%)	61(9.3%)	654
>60	976(91.6%)	89(8.4%)	1065
Total	9446(94.5%)	545(5.5%)	9991

The data analysis (Table3) reveals that the highest prevalence of HBV (19.6 percent) was among men aged 40 to 49. Followed by those aged 50 to 59 (9.3 percent) and older than 60 (8.4 percent). The prevalence decreased with age.

Table 4:- Gender and HCV Seroprevalence in People 30 Years and Older.

Age	Gender	Negative	Positive	Significance
30-39	Female	2469(99.9%)	2(0.1%)	0.137
	Male	1918(99.7%)	5(0.3%)	
40-49	Female	873(99.9%)	1(0.1%)	0.08
	Male	789(99.4%)	5(0.6%)	
50-59	Female	672(99.4%)	4(0.6%)	0.359
	Male	652(99.7%)	2(0.3%)	
>60	Female	1081(97.9%)	23(2.1%)	0.025
	Male	1027(96.4%)	38(3.6%)	

The data (Table4) indicates a high HCV prevalence of 3.6% among males older than 60 and 2.1% for females of the same age group. There was a statistically significant difference in positivity among men and women, with men having more tendency for the disease.

Table 5:- Seroprevalence of hepatitis B and C.

Item	Variable	Category	Negative	Positive	Chi-Square value	P-value
HCV	Gender	Female	13994(99.8%)	32(0.2%)	14.306	.000
		Male	9939(99.5%)	52(0.5%)		

HBsAg	Gender	Female	13566(96.7%)	460(3.3%)	68.861 ^a	.000
		Male	9446(94.5%)	545(5.5%)		
HCV	Age Group	0-9	1909(100.0%)	0(0.0%)		.000
		10-19	3150(100.0%)	0(0.0%)		
		20-29	9393(100.0%)	4(0.0%)		
		30-39	4387(99.8%)	7(0.2%)		
		40-49	1662(99.6%)	6(0.4%)		
		50-59	1324(99.5%)	6(0.5%)		
		>60	2108(97.2%)	61(2.8%)		
HBsAg	Age Group	0-9	1893(99.2%)	16(0.8%)	479.469 ^a	.000
		10-19	3103(98.5%)	47(1.5%)		
		20-29	9150(97.4%)	247(2.6%)		
		30-39	4163(94.7%)	231(5.3%)		
		40-49	1529(91.7%)	139(8.3%)		
		50-59	1201(90.3%)	129(9.7%)		
		>60	1973(91.0%)	196(9.0%)		

Seroprevalence of hepatitis B and C:

The Seroprevalence of HCV (Table 5) among females was 0.2%, while males had 0.5%. The results indicate a significant association in the HCV positivity with gender $\chi(1) = 14.306$, $p < .000$. The Seroprevalence of HBV for the female gender was 3.3% while their male counterpart was (5.5%). Similar to HCV, that data indicates a significant association in the HBV positivity with gender $\chi(1) = 68.861$, $p < .000$. Furthermore, the results of this study indicate that most of the individuals with HCV were above 60 years 61(2.8%), this proportion reduced with age to 0.5% and 0.4% for ages 50-59 and 40-49 respectively $p < 0.000$. HBV prevalence was the highest for ages 50-59(9.7%), followed by >60(9.0%), then 40-49(8.3%), 30-39(5.3%), 20-29(2.6%), 10-19(1.5%), and 0-9(.8%), $p < 0.000$.

Discussion:-

Hepatitis B Virus (HBV) and hepatitis C virus (HCV) infections are severe causes of public health problems globally attributed to acute and chronic liver disease and 1.4 million deaths annually (9). According to World Health Organization (WHO), an estimated 296 million people were living with hepatitis B in 2019, with new infections at 1.5 million yearly (1). Effectively combatting hepatitis B demands massive screening, early detection, and ease of access to vaccination. Understanding the disparities among different demographic groups and rolling out targeted programs is vital in reducing prevalence in disproportionately affected populations. In Somalia, few studies reported on HBV and HCV have shown varying results. This study is conducted to give insights on prevalence in Somalia and the benefits of implementation of policy for vaccination strategy. The study was conducted among patients who visited Kalkaal Hospital between June 2019 and July 2022. During this period, 24,017 individuals were tested for both HBV and HCV by rapid kits, and a confirmation for the positive people was carried out through ELISA and PCR tests. Most individuals were females, 58.4%, which could be because most women were tested during pregnancy monitoring. 41.6% were males. Also, the data indicates that most individuals were between 20-29 years old and mainly were females. The high percentage of women screened between the ages of 20 and 29 can be attributed to this age group being within the childbearing age. Additionally, the high number of individuals screened within this age bracket could be explained by the population patterns of Somalia, with a considerable portion of the population being youthful, with the median age being 16.7 years and the life expectancy of 58.34 years at birth, both male and female.

The study reports a 4.2% prevalence of hepatitis B and 0.3% prevalence of hepatitis C by ELISA and rapid kits. The HBV prevalence in this study is unlike previous authors Hassan-Kadle, Osman, and Ogurtsov's systematic review, which showed that the overall prevalence of hepatitis was 20% in 2018. The HBV and HCV prevalence is lower than a Mali study reporting 14.78% and 2.32% among blood donors. (10) The HCV prevalence is significantly lower than what WHO reported in Africa, 5.3%, but slightly higher than in Zambia (0.2%). (3) It is lower than the prevalence (17.5%) reported in Egypt. (3)

According to the data, females aged 50 to 59 had the highest prevalence (10.1%), while males of the same age group (9.3%) had a lower prevalence. Females over 60 had a prevalence of 9.7%, while males of the same age had a

prevalence of 8.4%. Additionally, the data reveals that men aged 40 to 49 had a prevalence of HBV (9.6 percent), while their female counterparts of the same age group had a prevalence of 7.2%. Overall, the prevalence was higher among females (10.90 percent) than males (9.56 percent) for those born before 1970. Generally, the data indicated that prevalence increases with age. It is also important to note that, among older individuals, females had a higher prevalence than males. Due to a lack of governance, Somalia's healthcare sector became debilitated around thirty years ago, preventing many people from receiving hepatitis vaccinations; the ministry of health was recently re-established. Furthermore, this study's results indicate that most individuals with HCV were above 60 years (2.8%). This proportion reduced to 0.5% and 0.4% for ages 50-59 and 40-49, respectively, $p < 0.000$. HBV prevalence was the highest for ages 50-59 (9.7%), $p < 0.000$. Due to a lack of governance, Somalia's healthcare sector became debilitated around thirty years ago, preventing many people from receiving hepatitis vaccinations; the ministry of health was recently re-established. The ministry of health has a task to address the vaccination gap through massive screening, early detection, and accessibility.

Additionally, the results indicate a statistically significant difference in hepatitis B positivity for males and females, with males having a prevalence of 5.5% compared to 3.3% for their female counterparts. The results are consistent with a study in 2018 by Funeh C and others in Cameroon, which found a higher prevalence of 8.4% among males. Similarly, a study in Rwanda indicated an association of sex with HBV, with males being a risk factor. (11) More studies have reported that HBV tends to be highly prevalent in males and that its progression is faster in males. This difference can be attributed to the behavioral difference between males and females. In addition, it has been reported that males are four to seven times more likely than females to develop HBV-related HCC. Studies have also suggested that the serum testosterone levels of male HBV carriers may contribute to the development of HCC(12).

Similar to hepatitis B positivity, hepatitis C had a statistically significantly different in terms of sex, with more prevalence of the infection among males at 0.5%, while the prevalence was (0.2% among their female counterparts. The age group with the highest prevalence of HCV was those over 60, with males having a 3.6 percent prevalence rate compared to their female counterparts' 2.1 percent prevalence rate.

Conclusion:-

Hepatitis B Virus (HBV) and hepatitis C virus (HCV) infection are severe causes of public health problems globally attributed to acute and chronic liver disease and 1.4 million deaths annually. This study is conducted to give insights on prevalence in Somalia and the benefits of implementation of policy for vaccination strategy. The study reports a 4.2% prevalence of hepatitis B and 0.3% prevalence of hepatitis C by ELISA and rapid kits. Additionally, the results indicate a statistically significant sex difference in hepatitis B positivity, with males having a prevalence of 5.5% compared to 3.3% for their female counterparts. This difference can be attributed to the behavioral difference between males and females. Similar to hepatitis B positivity, hepatitis C had a statistically significantly different in terms of sex, with more prevalence of the infection among males at 0.5%, while the prevalence was (0.2% among their female counterparts. The age group with the highest prevalence of HCV was those over 60, with males having a 3.6 percent prevalence rate compared to their female counterparts' 2.1 percent prevalence rate. This study's high incidence of HBV and HCV across genders and ages reveals a critical public health issue that necessitates reforming the vaccination approach and policy.

List of abbreviations

ELISA: Enzyme-Linked Immunoassay

HBV: Hepatitis B Virus

HCV: Hepatitis C Virus,

PCR: Polymerase Chain Reaction

Ethical Approval and Consent to participate:

The Kalkaal Hospital Research Review Board assessed and approved the research protocol. Before statistical analysis, anonymization of the patients was performed. All the research was conducted per the Helsinki Declaration's ethical standards for scientific inquiry.

Consent for publication

The authors hereby submit their consent to the International Journal of Advanced Research (IJAR) to publish their work and contributions to the work.

Availability of data and materials

The datasets generated and analyzed during the current study are available in the Zenodo repository, <https://doi.org/10.5281/zenodo.7078788>

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable

Authors' contributions

Research conception and drafting of the manuscript: Sakariye Abdullahi Hassan(Tuuryare), Research design, analysis, and interpretation: Timothy Kiprotich Kimutai, and research drafting and review: Suleyman Abdullahi Mohamed.

Acknowledgements:-

We want to thank the administration of Kalkaal Hospital for their approval of the study and Dr. Suleyman Abdullah Mohammed, in particular, for his pioneering efforts to promote the publication of scientific literature. In addition, the authors would like to thank the laboratory department of Kalkaal Hospital for its assistance in obtaining data and clarifications for the study. In addition, we would like to extend our gratitude to Drs. Zakarie Mohamoud, Sharmake Abdi, Jibril Abdi Maalin, AbdirhmanTohow, Ayub, and, Dr Abdirahman Omar Moallim. Due to their numerous contributions to this research.

References:-

1. Hepatitis B [Internet]. [cited 2022 Aug 2]. Available from: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-b>
2. Hepatitis C [Internet]. [cited 2022 Aug 17]. Available from: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-c>
3. Karoney MJ, Siika AM. Hepatitis C virus (HCV) infection in Africa: a review. *Pan Afr Med J.* 2013 Jan 31;14:44.
4. Kafeero HM, Ndagire D, Ocama P, Kudamba A, Walusansa A, Sendagire H. Prevalence and predictors of hepatitis B virus (HBV) infection in east Africa: evidence from a systematic review and meta-analysis of epidemiological studies published from 2005 to 2020. *Archives of Public Health.* 2021 Sep 18;79(1):167.
5. Hassan-Kadle MA, Osman MS, Ogurtsov PP. Epidemiology of viral hepatitis in Somalia: Systematic review and meta-analysis study. *World J Gastroenterol.* 2018 Sep 14;24(34):3927–57.
6. Somalia Population (2022) - Worldometer [Internet]. [cited 2022 Aug 17]. Available from: <https://www.worldometers.info/world-population/somalia-population/>
7. Mishra P, Pandey CM, Singh U, Gupta A, Sahu C, Keshri A. Descriptive Statistics and Normality Tests for Statistical Data. *Ann Card Anaesth.* 2019;22(1):67–72.
8. Chi-Square Test of Independence [Internet]. [cited 2021 Sep 26]. Available from: https://www.jmp.com/en_ch/statistics-knowledge-portal/chi-square-test/chi-square-test-of-independence.html
9. World Health Organization. Updated recommendations on treatment of adolescents and children with chronic HCV infection: policy brief [Internet]. Geneva: World Health Organization; 2022 [cited 2022 Aug 2]. Available from: <https://apps.who.int/iris/handle/10665/357085>
10. Jary A, Dienta S, Leducq V, Le Hingrat Q, Cisse M, Diarra AB, et al. Seroprevalence and risk factors for HIV, HCV, HBV and syphilis among blood donors in Mali. *BMC Infect Dis.* 2019 Dec 19;19(1):1064.
11. Makuza JD, Rwema JOT, Ntihabose CK, Dushimiyimana D, Umutesi J, Nisingizwe MP, et al. prevalence of hepatitis B surface antigen (HBsAg) positivity and its associated factors in Rwanda. *BMC Infectious Diseases.* 2019 May 3;19(1):381.
12. Funeh CN, Ebasone PV, Chunga EM, Nkwawir F, Ajeh R, Barche B, et al. Seroprevalence of hepatitis B virus among people screened at a primary care hospital in Bamenda: a cross-sectional study. *Pan Afr Med J.* 2022 Mar 22;41:237.