

An Assessment of the Prevalence, Determinants of Viral Hepatitis B and Impact of Infant Vaccine and Circumcision as Preventive Measures in Malawi

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Abstract Hepatitis B virus is one of the neglected public health diseases leading to deaths in Malawi. However, few studies have examined the burden and factors associated with disease acquisition. The study aimed to assess the prevalence of hepatitis B infection and the factors associated with it in the Malawian population. This retrospective study used secondary data from the scan form register, pulling and analysing data from Jan 2023 to July 2025. Out of 1.9 million total tests, 1.6% (32566) were hepatitis B positive. Hepatitis B burden among males and non-pregnant females was 2.4% (14839/611,970). Males had a higher prevalence of 3% (9,873/334,299) than non-pregnant females at 1.7% (4962/284958). Bivariate analysis showed that males were twice as likely to have hepatitis B compared to females OR = 2, $p < 0.0001$. Infant-vaccinated clients were 77% less likely to be infected than the non-vaccinated (OR = 0.3, $p < 0.0001$). Pregnant women were less likely to be hepatitis B infected than non-pregnant women (OR = 0.8, $P < 0.001$). The study reveals that hepatitis B is less prevalent than in earlier studies done in Malawi. The Infant Vaccine seems effective in reducing hepatitis B infection among infants who receive this vaccine. Male gender, not being pregnant, and being circumcised increased the risk for hepatitis B infection. Further studies need to be carried out to study the role of circumcision and the association between pregnancy and Viral hepatitis.

Keywords Hepatitis B Virus, Infant Vaccine, Pentavalent Vaccine, Scanform Register.

Introduction

According to the World Health Organization, viral hepatitis in Africa poses a higher risk of death, surpassing deaths from Malaria, tuberculosis and HIV/Aids, resulting in a significant economic burden through hospitalizations and loss of productive people, which contributes to the socio-economic development of African states. However, despite the seriousness of the disease, data show that the disease is still neglected in many parts of the continent, with a very small proportion of those who need to be treated accessing treatment and vaccines [1].

According to a WHO report (2018), the disease affects 70 million people, of whom 60 million suffer from hepatitis B while 10 million people suffer from hepatitis C infection. Although Hepatitis B infection can be prevented and hepatitis C virus infection (HCV) can be cured, many African countries still show gaps in implementing well-known prevention and treatment strategies [2]. In their study, Lemoine (2017) reports that despite the availability of diagnostic tools and effective treatment, over 90% of people living with hepatitis B and C in Africa lack much-needed care [3]. As a result of the lack of needed health care, about 200 000 people die every year in Africa. These are often among the continent's youngest and middle-aged citizens who would contribute positively to the continent's development. Fewer than 1 in 10 people in Africa have access to testing and treatment, so the disease often progresses to advanced liver disease with its associated huge financial consequences for the families as well as the health care system. In addition to the heavy financial burden on families and the health system, end-stage liver disease causes huge psychological trauma for family members as well as guardians [4]. According to the WHO Global Hepatitis Report, hepatitis B burden was highest in the Pacific region, followed by the African continent, where prevalence was

estimated at 6.2% of the population on the continent [5]. In the neighboring countries of Zambia, Mozambique and Tanzania studies in hepatitis B prevalence are scarce except in Tanzania where a meta analysis study showed that prevalence of hepatitis was at 5.9% [6]. Vanikoor (2020) states that in Zambia, a study in 12 urban sites and 4 rural sites found a prevalence of 3.7% in the studied population [7]. In Mozambique, one study in Maputo among health workers estimated hepatitis B prevalence at 8.1% of the studied population [8].

Hepatitis B Prevalence Studies in Malawi

Few studies have assessed hepatitis B prevalence in Malawi in recent decades. So far, only three studies have been done: one among students at the College of Medicine in Blantyre and two among the general population. However, these studies were done a long time ago, with one done in 2002 and another in 2004, in which co-infection with HIV was studied. The study found that hepatitis B prevalence was 20% of the samples studied [9]. Participants in this study were sick clients admitted to the hospital, so the results are not generalisable. In the 2002 study done among sugar cane workers, hepatitis B was generalisable. In 16.9% of the participants [10]. However, this was done among people with HIV infection, as in the 2004 study. The earliest study was done 30 years ago, in 1993, where the study was done in rural Shire Valley among HIV positive clients [11]. They found a high prevalence of hepatitis B infection among the participants. However, this study was conducted a long time ago, so the results may not be relevant now, as health systems and demographic dynamics may have changed. Another study among students was conducted in 2014, when first-year students at the College of Medicine were assessed for hepatitis B antigens. The study found that, out of all 213 students, none tested positive for hepatitis B virus [12], but the sample was composed of students only students at the

College of Medicine campus in Blantyre, which was not reflective of the general population, as these were young and based in one geographical location, namely Blantyre city in the Southern part of Malawi [13].

Stockdale (2018) concludes that hepatitis B prevalence is about 8.1 percent of the general population and concludes that Hepatitis B is highly prevalent in Malawi (13). However, they admit a scarcity of epidemiological data from rural areas, where 85% of the population resides. The authors note that no data inform prevalence in rural settings or in the general population. They further recommend that priority research include large-scale, representative community studies to assess the prevalence of hepatitis B, in addition to hepatitis C and others, in Malawi. The aim of the study was to add knowledge regarding hepatitis B burden using the most recent data.

Impact of Hepatitis B vaccine Studies in Malawi

Malawi introduced hepatitis B vaccine for children in 2002 to prevent transmission of hepatitis from their mothers through breastfeeding and other exposures after birth. The weakness of this approach is that intrauterine and perinatal transmission of hepatitis B is not covered by this approach. This is so because the vaccine is only given from 6 weeks after birth when intrauterine and perinatal exposure has already occurred. However, few studies have been carried out to assess the impact of the vaccine in the country. However, despite that we don't not yet have birth dose, infant vaccine offers a potential benefit for those who access it. Therefore, it is still critical to evaluate the impact of the current vaccines in as the results will inform policy on other preventive strategies that are needed to augment the current strategies.

The authors who carried out a meta-analysis to assess the burden of hepatitis in Malawi recommended further studies to evaluate the impact of HBV vaccines for the under-five

children, whose impact on the general population is not yet known [13]. So far, only one study has assessed the impact of the infant vaccine in Malawi. The study was conducted in Ndirande township in Blantyre City. In this study, they found that in an urban setting in Blantyre, HBV prevalence among adults born before vaccination started was 5.1%, compared with 0.3% among participants born after the vaccine was introduced across all districts in Malawi [14].

The authors further recommend more similar studies in rural areas. The present study aimed to assess the impact of infant vaccination using large data from across the country.

Circumcision

While hepatitis B virus is a blood-borne disease, it is also considered a sexually transmitted disease because it is also spread through sexual contact through unprotected vaginal, anal and oral sex. While Male Circumcision is known to reduce HIV infection risk by 50%–60% over time and reduces the risk of men acquiring herpes simplex virus-2 and human papillomavirus (HPV), which can cause penile and other anogenital cancers, by 30% there are mixed study findings about the impact of circumcision on hepatitis B infection [15]. Some studies. While there are many studies done on the impact of circumcision on preventing STI, most of the studies have focussed on prevention of HIV, Syphilis, human papilloma virus, gonorrhoea and cervical cancer. Study conducted in Ghana carried out among the university students found that those circumcised had higher risk of hepatitis B infection than those who were not circumcised [16]. A study in Egypt found similar finding that participants who were circumcised while children had a higher risk of hepatitis B infection than those who were not circumcised. The authors hypothesized that the circumcised males were infected during the circumcision itself because of poor hygiene during the procedures. Megan et al found out

that while there was significant reduction of HIV, and other STIs, there was no difference in terms of hepatitis B infection between the circumcised and the non-circumcised [17]. In Malawi no similar studies have been done yet. The present study aimed to assess the impact of male circumcision on the burden of hepatitis B infection in the Malawian context where most of the circumcision was under medical male circumcision program.

Demographic Based burden of Hepatitis B

Like any other disease, certain demographic groups of people are affected disproportionately compared to their counterparts. The study aimed to assess and assess risk of acquiring hepatitis B infection based on gender, pregnancy status, age and circumcision status. An improved understanding of the demographic features and outcomes of chronic HBV infection and hepatitis D virus (HDV) infection may improve prevention, early identification and management both at individual and community levels [18].

The main objective of the study was to define the burden and distribution of the viral hepatitis B infection and to assess the impact of infant vaccines and circumcision as some of the vertically and sexually transmitted diseases preventive public health interventions on viral hepatitis and in the Malawian population. The specific objectives included the following.

1. To assess the viral hepatitis prevalence in the general population in Malawi.
2. To describe the social demographic factors that affect the risk of acquiring viral hepatitis B in Malawi.
3. To assess the impact of hepatitis B vaccination program in Malawi.
4. To analyze the impact of male circumcision on the burden of hepatitis B among the males in Malawi.

Materials and Methods

The study utilized data documented in the Malawi ministry of health register called scan

form register where data from all health facilities in Malawi where routine testing for HIV, Hepatitis B and syphilis are recorded. Data from January 2023 to July 2025 was pulled and analyzed using excel. To assess the prevalence rate of hepatitis B in the entire study population sample, prevalence analysis was carried out on the entire collected data. Data for all who tested hepatitis B positive was pulled and used to estimate hepatitis B positivity rate among those who accessed the testing. Secondly prevalence rates within specific socio demographic variables of age, gender, vaccination status, circumcision status, pregnancy status and geographical location was carried out to assess the burden of the diseases within these specific demographic parameters. The number of positive tests was pulled and aggregated for each demographic parameter and used to evaluate the positivity rate within the demographic indicator. Thirdly a bivariate inferential assessment comparing different categories within the demographic factors of gender (Males vs Females), Pregnancy status (Pregnant versus non pregnant), circumcision status (Circumcised Vs non circumcised) Age status (less than 23 years Versus above 23 years was carried out to determine which category was at an increased risk of hepatitis B infection than the other. Medical application using contingency tables was used to assess risk associations and significance of the associations between the categories within the different categories of the demographic factors listed above. To assess statistical significance of the differences in diseases burden within a specific demographic categories, a Z test was used to assess the significance of the associations.

Results

From this data a total of 1.99 million tests were carried out across the country. Of these tests men comprised of 20% (327012) while 80% (1,653,596) were female. Of the females who got the tests, 22% (334299) were non

pregnant while, 78% (1,292,524) were pregnant. Among the men, 34% (112266) were circumcised while 66% (222033) were not circumcised.

Most of the tests were from the southern region at 49% (977502) followed by the central region at 39% (778484). The northern region contributed the least rate at 12% (240139). See Figure 1 below.

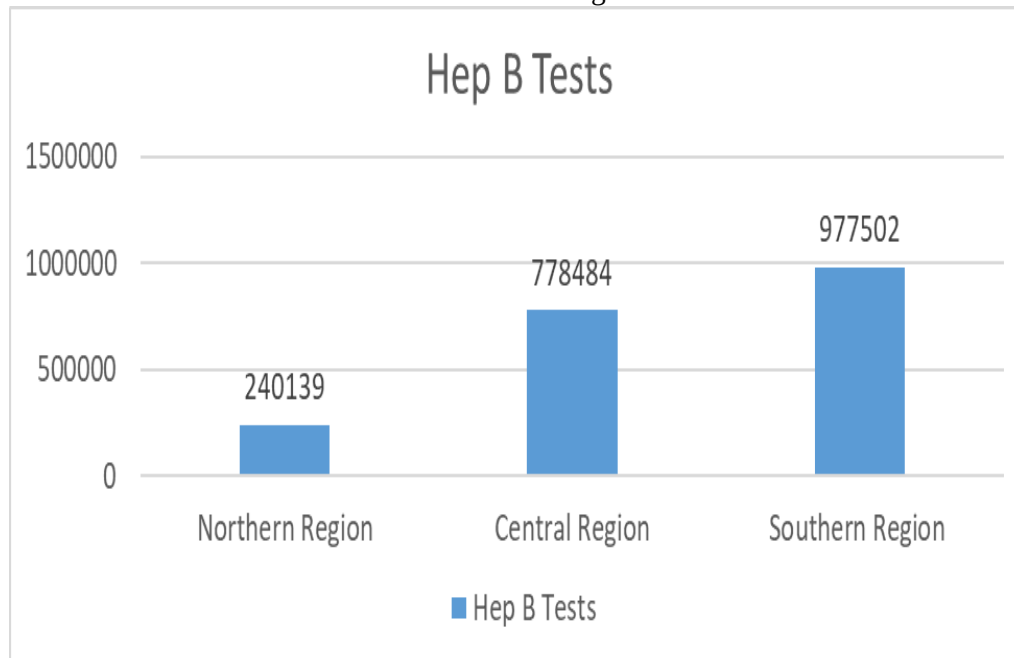


Figure 1. Hepatitis B Testing Numbers by Regions

Diseases Burden

Of all the tests done in the period, 1.6% (32566/1,990,000) tested positive for hepatitis B. After excluding pregnant and breastfeeding females, the prevalence in males and non-pregnant females was 2.4% (14839/611970). This result is significantly lower than the assumed prevalence in the hypothesis. It is also much lower than earlier studies, which reported a Hep B prevalence of 8.1%, according to Stockdale et al. This could be attributed to the introduction of the vaccines in 2002. Secondly, this result may reflect the availability of large datasets that include both rural and urban areas,

compared with earlier studies whose data were obtained mainly from urban areas, making their results less representative of the general population. Secondly, most of the earlier studies were done in inpatient settings, resulting in higher prevalence rates.

Disease Burden within Specific Demographic Categories

Although the general population prevalence was lower, there were variations within the specific social demographic variables of age, gender, circumcision status, pregnancy status, as well as regions from where the data were captured, as in Table 1 below.

Table 1. Prevalence of Hep B Demographic Factors and Region of Residence

Table of Test Results for Various Demographic Groups				
Parameters	All tests	Positive	Negative	HBV Rate (%)
All	1,988,786	32,566	1,956,220	1.6
Non-Pregnant women and Males	611,970	14,835	597,136	2.4

Men	327,012	9873	317,139	3.0
Circumcised Males	112,266	3596	108670	3.2
No Circumcised Females	222,033	6,277	215756	2.8
Females	1,653,596	22680	1,630,916	1.4
Pregnant women	1,292,524	16261	1,276,271	1.3
Non-Pregnant women	284,958	4,962	279,997	1.7
Northern region	240,139	3367	236772	1.4
Central Region	778,484	11596	766888	1.5
Southern Region	977,502	17747	959755	1.8
Not Vaccinated (Born before 2002)	944,239	24938	919301	2.6
Vaccinated (Born after 2002)	1,044,037	7614	1,036,423	0.7

Prevalence by Gender

Hepatitis B prevalence was higher in males at 3% (9,873/334,299), while in females 1.4% (22,680/1,653,596) were tested positive for hepatitis B virus. Meaning that men have a higher burden of hepatitis B compared to females. Based on pregnancy status, the prevalence among the non-pregnant was higher at 1.7% (4,962/284,9580) while the prevalence rate was 1.3% (16261/1,292,524) among the pregnant women. See Table 1.

Prevalence by Pregnancy

Based on pregnancy status, the prevalence among the non pregnant was higher at 1.7% (4,962/284,9580) while the prevalence rate was 1.3% (16261/1,292,524) among the pregnant women. This was surprising, as the expectation was that there would be a higher prevalence rate

among the pregnant women than the non-pregnant women because pregnancy indirectly indicate recent unprotected sexual exposure which is one of the risk factors for hepatitis B infection. See Table 1.

Circumcision Status

There was a higher prevalence rate among the circumcised as compared to the non-circumcised clients. The prevalence among the circumcised was 3.2% (3596/112,266), while it was 2.8% (6,277/222,033) among the non circumcised clients. This was also unexpected result as expected outcome was that prevalence among the circumcised would be lower compared to the circumcised men because like in HIV, male circumcision protects from HIV infection. But these results reveal the opposite that male circumcision was associated with higher prevalence. See Figure 2.

Test Outcomes by Circumcision status

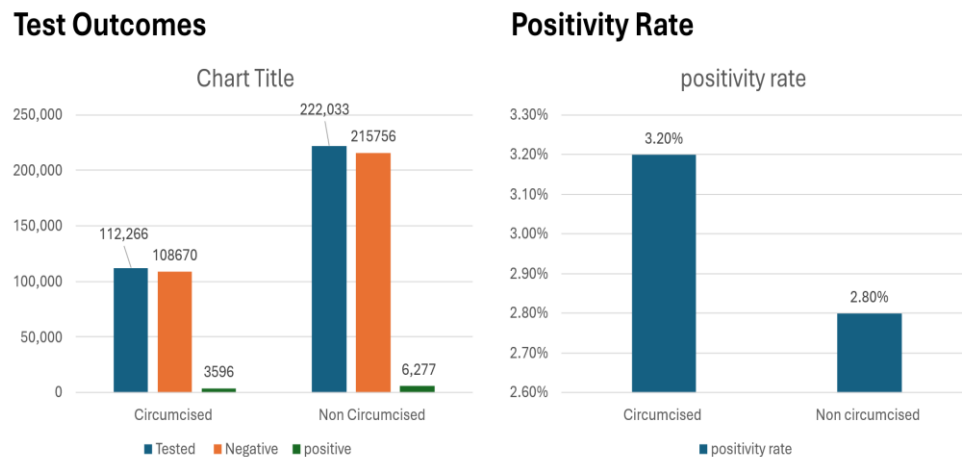


Figure 2. Test Outcomes by Circumcision Status

Vaccination

The study used age as a proxy for vaccination with the pentavalent vaccine -A vaccine that is given to infants after they are born. Since the pentavalent vaccine was introduced in Malawi in 2002, the study assumed all clients born before 2002 were not vaccinated, and all those born after 2002 were vaccinated.

Analysis of hepatitis B prevalence by vaccination status, using age as a proxy for vaccination, showed much lower prevalence among those born after 2002 than among those

born before vaccination started. Among those born after 2002 (vaccinated), hepatitis B prevalence was 0.7% (714/104,403), compared with 2.6% (24,938/944,239) among those who were born before 2002 (not vaccinated)

Risk Analysis

The study used inferential statistical analyses to assess whether certain categories of social demographic factors were associated with a higher risk of acquiring hepatitis B virus. A bivariate analysis was carried out, and the results are shown in Table 2 below.

Table 2. Bivariate Analysis for Demographic Factors

Bivariate Analysis comparing demographic factors							
	Positive	Negative	Total	Odds	Z test	95% CL	P Value
Pregnant	16261	1,276,271	1,292,524	0.7	20.179	0.6963 to 0.7424	<0.0001
Non-Pregnant	4,962	279,997	284,958				
Circumcised	3596	108670	112,266	1.1	6.062	1.0910 to 1.1858	<0.0001
Non-Circumcised	6,277	215756	222,033				
Males	9873	317,139	327,012	2.2	65.988		<0.0001

Females	22680	1,630,916	1,653,596			2.1857 to 2.2929	
Not vaccinated (Born before 2002)	24938	919301	944,239		99.178	0.2639 to 0.2779	<0.0001
Vaccinated (Born after 2002)	7614	1,036,423	1,044,037	0.27			

Gender

Gender comparison showed that males were 2 times as likely to have hepatitis B as compared to females (OR = 2, CI 2.0894-2.2909, $p < 0.0001$). This statistically significant result shows that males, partly due to higher risk-taking behaviour, have an increased risk of acquiring Hep B compared with their female counterparts (Table 2).

Vaccination Status (Pentavalent)

The study found that vaccinated clients were 78 percent less likely to have hepatitis than unvaccinated clients (OR = 0.2708, CI = 0.2639–0.2779, $P < 0.0001$). This means the vaccine, namely Pentavalent, significantly reduces hepatitis B infection, preventing over 80% of vaccinated individuals from acquiring hepatitis B virus (Table 2).

Circumcision Status

Contrary to expectations, the results revealed that males who were circumcised were at a statistically significant increased risk of contracting hepatitis than those who were not circumcised (OR = 1.1, CI: 0.10910–1.1858, $P = 0.0001$). This could be attributed to the confidence gained as a result of being circumcised, resulting in some men engaging in more unprotected sex than those not circumcised. Secondly, this could be because

most of the clients who are circumcised come from the southern region, where prevalence is higher than in the other two regions.

Pregnancy Status

The study compared the hepatitis B risk between those who are pregnant and those not pregnant, with the assumption that those who are pregnant may have been at an increased risk for acquiring hepatitis than those who are not pregnant. The study revealed that pregnant women had a statistically significant reduced risk of acquiring hepatitis B infection compared to the non-pregnant women (OR = 0.7190, 95% CI: 0.6963–0.7424, $P = <0.001$).

Vaccination Status

The prevalence among those who were vaccinated was lower (0.70%) than among those who were not vaccinated (2.60%) in the study population. In terms of risk analysis, the vaccinated had a 73% lower risk of acquiring hepatitis B infection than those who were not vaccinated. The prevalence among those who were vaccinated was lower (0.70%) than among those who were not vaccinated (2.60%) in the study population. In terms of risk analysis, the vaccinated had a 73% reduction in the risk of acquiring hepatitis B infection compared with those who were not vaccinated (OR = 0.2708, CI: 0.2639–0.2779, $P < 0.0001$). See figure 2.

Results

Odds ratio	0.2708
95 % CI:	0.2639 to 0.2779
z statistic	99.178
Significance level	$P < 0.0001$

Figure 6. Bivariate Risk Analysis comparing the Vaccinated and those not Vaccinated

The figure shows that those who were vaccinated had a 73% reduction in Hep B infection compared with those who were not vaccinated. This was statistically significant.

Discussion

General Prevalence

The prevalence (1.6%) of hepatitis B in the general population is much lower than in earlier studies, where hepatitis B prevalence was estimated at 8.1% and 5.1%, respectively [18, 19]. Earlier studies in Malawi agree with a similar study in Tanzania, where hepatitis B prevalence was estimated at 6.9%, with variations by region [6]. The present prevalence results may be lower than those in earlier studies because the other recent study was a meta-analysis that pooled data from prevalence studies whose participants were selected from self-selected population groups, such as in-patient participants and participants from urban communities. These are clients who were already sick and were coming from urban areas of Blantyre and Lilongwe, where the populations are dense, hence predisposed to a higher chance of acquiring hepatitis B infection. The results from the present study are similar to the most recent results from a study in Zambia, where prevalence was 3.7% in communities across 12 urban centers and 4 rural areas [7]. The results from the present study present the most accurate picture, as they come from large data generated across the country, including urban and rural areas. These results are also in agreement with the WHO

estimates, which project that the country has a 2.7% prevalence rate [20].

Circumcision Status

There was a higher prevalence among the circumcised compared to the non-circumcised at 3.4 % and 2.8%, respectively. These results were statistically significant (OR = 1.1, CI: 1.0910–1.1858, $p < 0.001$). This result is surprising as the expectation was that circumcision provides some protective effect on hepatitis transmission. This is in agreement with another study in Ghana which found that hepatitis B was 4 times higher in the circumcised college students compared to those not circumcised [16]. While the study in Ghana assumed the circumcised participants had a higher prevalence of hepatitis B due to the possibility of poor hygiene during circumcision as the community in Ghana does traditional circumcision, which runs the risk of not being done in medically hygienic conditions, the case is different in this study as the data used in this study was a mixture of medically circumcised and those with traditional circumcision. A study done by Meghan et al found that while circumcision had a protective effect on HIV and Syphilis, it had no impact on hepatitis B transmission [17]. Further studies need to be carried to assess the impact of circumcision on hepatitis in Malawi.

Gender

The study found that the prevalence of hepatitis was higher in men than women, with a prevalence of 1.4% in the study population.

This inferential analysis finding shows that males are 2 times likely to acquire hepatitis B infection than females (OR = 2, CI: 2.0894–2.2909, $p < 0.0001$). These results are in agreement with findings in the Chiwindi study, where they found a higher prevalence in males (5.1%) than in females (3.4%) of the studied population [19]. Although the trend is similar, the current study found a lower prevalence in both males and females than in the former study. The difference could be partly due to the impact of the infant vaccine (Pentavalent), which includes the hepatitis B vaccine, given to all infants born after 2002, when the vaccine was introduced in Malawi. No known study has been done in Malawi to assess the risk based on gender for hepatitis B infection. More studies are needed in this area.

Infant Vaccination (Pentavalent Vaccine)

The prevalence among those who were vaccinated was lower (0.70%) than among those who were not vaccinated (2.60%) in the study population. In terms of risk analysis, the vaccinated had a 73% reduction in risk of acquiring hepatitis B infection compared with those who were not vaccinated (OR = 0.2708, CI: 0.2639–0.2779, $P < 0.0001$; Figure 2). This shows that the vaccine, introduced in Malawi in 2002, has a significant protective effect among recipients. These results agree with another study by J Stockdale, which found a 96% reduction rate among those accessing the infant vaccine compared with those not vaccinated [14]. This slight difference in effectiveness may be because the other study was conducted in an urban setting with good access to health services, whereas the present study included participants from rural communities where access to health services, including vaccines, may be more challenging than in urban settings. Further studies are needed in Malawi to ascertain the impact of the vaccine.

Pregnancy Status

The study found that pregnant women had a 30% lower risk of acquiring hep B infection than non-pregnant women (OR = 0.7190, 95% CI: 0.6963–0.7424, $P < 0.001$). This result is paradoxical in that it is expected that pregnant women would be at an increased risk due to their compromised immune status because of being pregnant, and secondly, by virtue of being pregnant, an indication that they are sexually active and hence more prone to Hep B infection, which is mostly transmitted through unprotected sex, than those women who are not pregnant. This result could be because pregnant women were younger and therefore more likely to have received the infant vaccine, compared with non-pregnant women who may be older and not have received the infant vaccine in addition to having prolonged exposure to sex by virtue of being older. More studies need to be done to understand why pregnant women were at a reduced risk for hepatitis B infection as compared with non-pregnant women.

Conclusion

The study findings show that hepatitis B prevalence is generally lower than in most previous studies in Malawi. This may be partly due to infant vaccination, which started in Malawi over 20 years ago. Secondly, the data in the present study are based on large data pulled across the country, combining urban and rural settings. This provides a more accurate picture of the burden of hepatitis B in Malawi. However, males gender, circumcised men, and non-pregnant women seem to have a higher prevalence and increased risk of getting hepatitis infection female gender, non-circumcised males and pregnant women respectively. There is need for increased awareness among men and non-pregnant women on how to prevent hep B infection. More studies need to be carried out to understand the role of circumcision in prevention of hepatitis B infection.

Conflict of Interest

The authors have no conflict of interest in this work.

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Authors' Contribution

Prof Giuseppe Liotta – Assisted with reviewing and updating the research proposal, data analysis, and interpretation of the results. He also supported manuscript writing for publication.

Haswel Jere – Responsible for study conceptualization and implementation, data

analysis and interpretation, and writing the publication.

Ethical Approval

The research proposal was submitted to the National Ethics Committee in December 2025. I am currently waiting for approval. The proposal was resubmitted after amendments based on feedback from the ethics committee.

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The student self-funded the study.

Data Availability

Data from which the results was derived can be assessed from Malawi Scan register with permission from the Ministry of Health at https://auth.scanform.hiv.health.gov.mw/realms/malawi-hts-scale/protocol/openid-connect/auth?approval_prompt

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