ANALYSIS OF FACTORS INFLUENCING PREVENTION OF MOTHER TO CHILD TRANSMISSION OF HEPATITIS B VIRUS IN NIGERIA

Adeyemi Mofolorunsho Adeyiga

Nigeria

57th Master of Public Health/International Course in Health Development

KIT (Royal Tropical Institute)

Vrije Universiteit Amsterdam (VU)

Analysis of factors influencing prevention of mother to child transmission of hepatitis B virus in Nigeria

A thesis submitted in partial fulfilment of the requirement for the degree of
Master of Science in Public Health

by

Adeyemi Mofolorunsho Adeyiga
Nigeria

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Table of Contents

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List of Figures and Tables

List of Figures

List of Tables

List of Abbreviations

ANC	Antenatal care
DNA	Deoxyribonucleic acid
FMOH	Federal Ministry of Health
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HBV	Hepatitis B Virus
HBeAg	Hepatitis B e Antigen
HBIG	Hepatitis B Immunoglobulin
HBsAg	Hepatitis B Surface Antigen
HCV	Hepatitis C virus
HIV	Human Immunodeficiency Virus
MNCH	Maternal Neonatal and Child Health
NASCP	National Acquired Immunodeficiency Syndrome and Sexually Transmitted Infections Control Programme
NDHS	Nigeria Demography and Health Survey
NPHCDA	National Primary Health Care Development Agency
PEPFAR	United States President's Emergency Plan for AIDS Relief
PHC	Primary Health Centre
PLHIV	Persons Living with HIV
PMTCT	Prevention of Mother-to-Child Transmission
RDT	Rapid Diagnostic Test
STIs	Sexually Transmitted Infections
TBAs	Traditional Birth Attendants
UHC	Universal Health Coverage
WHO	World Health Organization

Glossary

Chronic hepatitis B virus infection	Persistence of hepatitis B surface antigen (HBsAg) for at least six months
Cirrhosis	An advanced stage of liver disease characterised by extensive liver scarring secondary to prolonged inflammation of the liver
Elimination as a public health	Reduction of disease incidence, prevalence, morbidity or mortality to below a level at which public health burden is considered negligible because of deliberate efforts
Hepatitis B Immunoglobulin	Antibody given together with hepatitis B vaccine to infants at birth, especially in high-income settings to further reduce the risk of transmission of HBV
Hepatitis B surface antigen	HBV envelope protein usually produced and detectable in the blood in acute and chronic HBV infection
Hepatitis B virus DNA	HBV viral genomes that can be detected and quantified in serum nucleic acid testing (NAT)
Hepatitis B e Antigen	Viral protein that is found in the blood during high replicative phase of HBV. It is a marker of high level of viral replication, but not essential for replication
Hepatocellular carcinoma	Primary cancer of the liver arising from liver cells and maybe a complication of chronic hepatitis B or C infection
Laboratory-based immunoassay	Serological tests that detect antibodies, antigens or a combination of both
Nucleic acid testing	A molecular technology such as polymerase chain reaction that can detect very small quantities of viral nucleic acid (DNA or RNA), either qualitatively or quantitatively
Rapid diagnostic test	Serological tests that detect antibodies or antigens and can give a result in less than 30 minutes.

Source: All definitions are from the World Health Organization (2021b), Interim guidance for country validation of viral hepatitis elimination.

Abstract

Introduction: Hepatitis B virus (HBV) infection is endemic in Nigeria, with a prevalence of 8.1%. In 2016, Nigeria ranked first among the top 16 countries accounting for at least 80% of HBV infections in five-year-old children worldwide. This high number of cases is despite the availability of an effective vaccine and other interventions capable of preventing transmission from infected pregnant women to their babies. In addition, almost 90% of the children infected via this route will progress to have chronic HBV infection with an associated higher risk for developing liver complications later in life.

Objective: To describe and analyse factors influencing utilisation of Prevention of Mother to Child Transmission (PMTCT) of HBV programme interventions in Nigeria.

Methodology: A literature review

Results: Individual factors like poor HBV knowledge and low-risk perception contributed to the poor utilisation of PMTCT of HBV interventions. More importantly, the health system factors were the critical barrier constraining pregnant women's utilisation of the interventions. These resulted from lack of funding, inadequate knowledge and competence of health workers and poor implementation of guidelines for viral hepatitis control.

Conclusions and Recommendations: While other factors contributed to the poor utilisation of the PMTCT interventions, the health system factors primarily affect the availability and provision of maternal and child health services and, by extension, PMTCT of HBV interventions in Nigeria. Integration of the HBV programme into existing maternal, child health and HIV programmes is required to leverage the opportunities available in these programmes in terms of funding, infrastructure etc.

Keywords: PMTCT of HBV, hepatitis B vaccine birth dose, institutional delivery, routine immunisation, hepatitis B virus in Nigeria

Word count: 12,142

Chapter 1: Background Information

1.1 Geographic, Demographic and Political Features

Nigeria is a West African country located between latitude 4° and 14°N and longitude 5° and 14°E covering approximately 923,768 square kilometres, therefore making it the 32nd largest country in the world. The Niger Republic bounds it to the north, Cameroun to the east, the Benin Republic to the west, and the Gulf of Guinea – the northeastern part of the Atlantic Ocean – to the south; see figure 1 (Wikipaedia, 2021; Central Intelligence Agency, 2021).

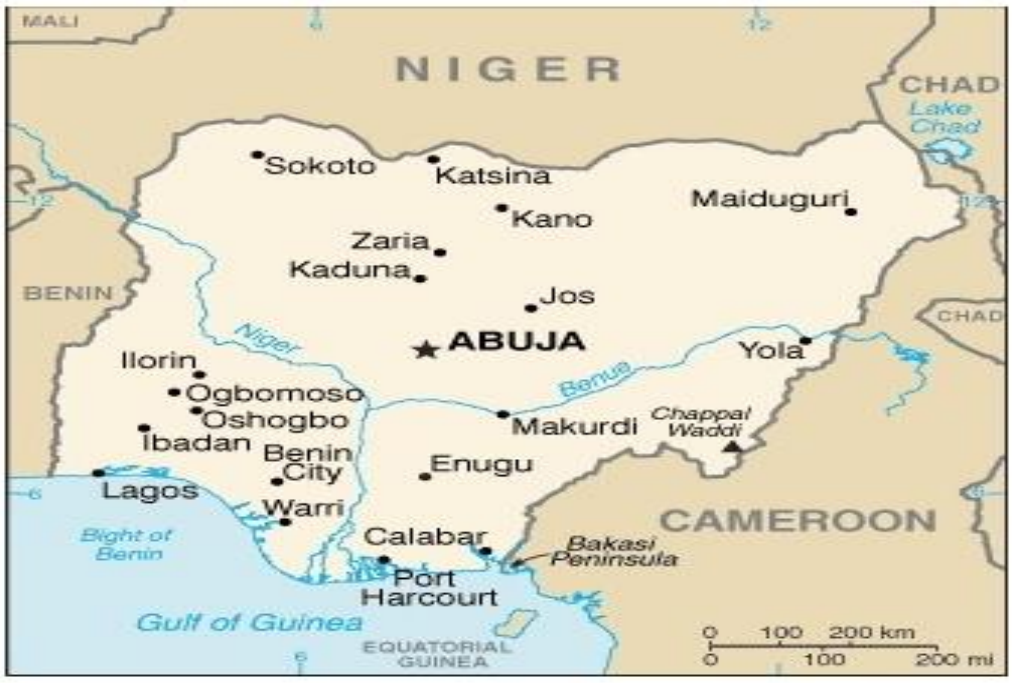


Figure 1: Map of Nigeria showing international borders with Cameroun, Niger, and Benin (Central Intelligence Agency, 2021)

It ranks seventh in the world and first in Africa in terms of population, with about 206 million people (United Nations Children Fund, 2020; International Monetary Fund, 2021a; Federal Ministry of Health, 2020; Worldometer, 2021). The percentage of children aged less than 15 years constitutes 45%, while young people between 10 to 24 years account for one-third of the population. Also, children under the age of five, women within the reproductive age bracket (15 to 49 years), and the aged (65 years or more)

constitute 20%, 22%, and less than 5% of the population, respectively; see figure 2 (Federal Ministry of Health, 2018).

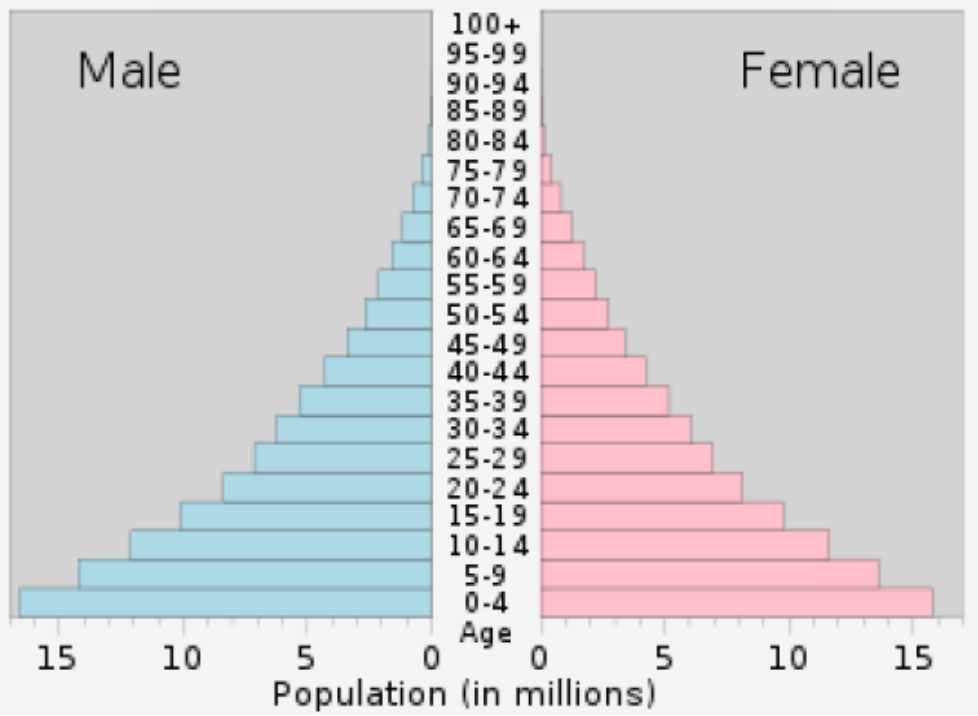


Figure 2: Nigeria's Population Pyramid (Federal Ministry of Health, 2018)

1.2 Socioeconomic profile

The Nigerian economy is primarily dependent on crude oil export for its foreign exchange and fiscal revenues. Crude oil accounts for 94% of export earnings and 62% of government income (Federal Ministry of Budget and National Planning, 2017). Despite being the largest economy in Africa, achieving sustainable economic growth, job creation for its enormous youth population, and poverty reduction have been a challenge (International Monetary Fund, 2021b; Federal Ministry of Budget and National Planning, 2017). Currently, the macroeconomic situation is vulnerable due to the global economic upset caused by coronavirus disease 2019 (COVID-19) and highly volatile oil prices in the international market. In 2020, the economic downturn from the COVID-19 pandemic pushed about five million Nigerians into poverty (The World Bank, 2020). According to the World Bank's 2018 Human Capital Index, Nigeria ranked 152 out of 157 countries, highlighting a weak human capital development. This ranking results from various developmental issues, including high poverty level (estimated at 40%), widespread inequality, and social

and political unrest (National Bureau of Statistics, 2020; The World Bank, 2020). In this year alone, numerous cases of kidnapping for ransom, especially in the northern region, and agitations for self-determination and protests against the government in the southern part of the country have occurred (Berger, 2021; Zika, 2021).

1.3 Organisation and Structure of the Health System

The health care system in Nigeria is pluralistic with public and private health facilities and traditional methods of health care provision. The three levels of government, namely: local government authority, state government, and federal government, are responsible for health facilities at the primary level, secondary level, and tertiary level, respectively, as shown in figure 3. In addition, through the Federal Ministry of Health (FMOH), the federal government is in charge of developing, coordinating, and implementing public health programmes at the national level. These include the National Acquired Immunodeficiency Syndrome and Sexually Transmitted Infections Control Programme (NASCP), within which the viral hepatitis control programme is domiciled, the National Tuberculosis and Leprosy Control Programme, and National Malaria Elimination Programme. The State Ministry of Health of each of the 36 states of the country manages these programmes at the sub-national level. The primary level of care is run by different categories of health workers (see figure 3) and is currently prioritised towards the achievement of Universal Health Coverage (UHC) (Federal Ministry of Health, 2018, 2016c).

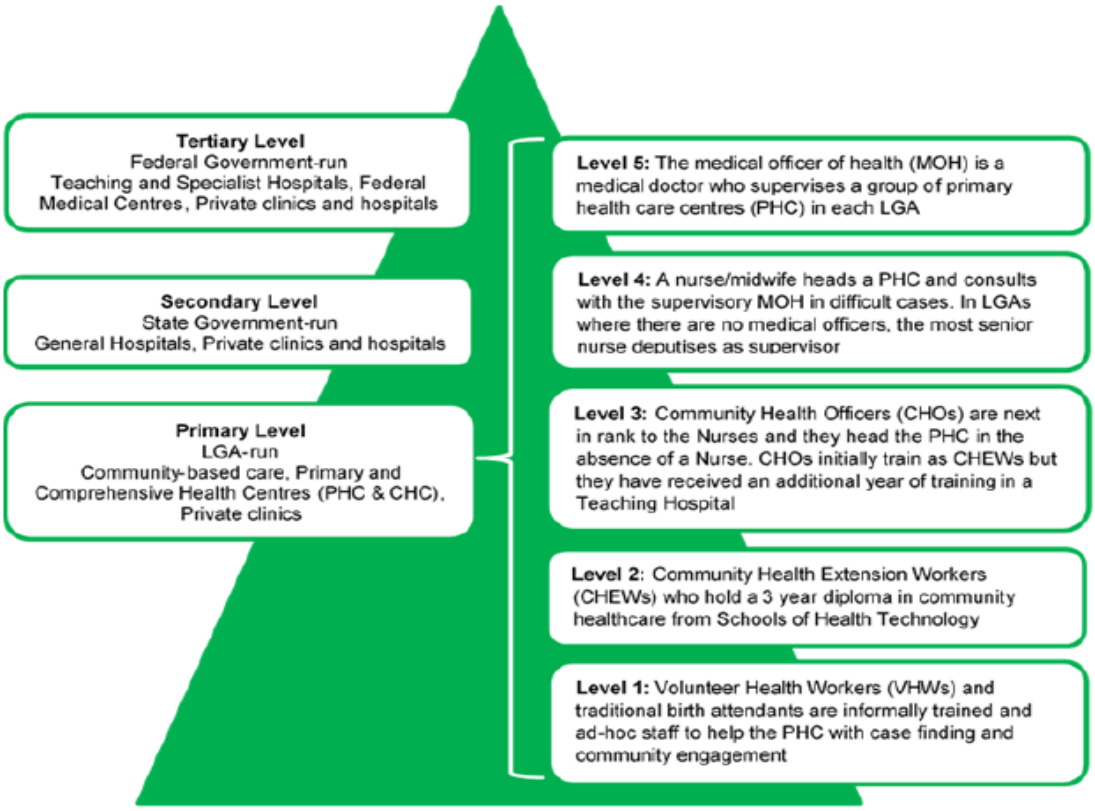


Figure 3: The health system structure Nigeria (Federal Ministry of Health, 2018)

1.4 Viral Hepatitis Control Programme in Nigeria

The FMOH established the viral hepatitis control programme in October 2013 following a baseline study conducted in 2012, which revealed for the first time the enormous burden of viral hepatitis in the country (Federal Ministry of Health, 2018). Initially, NASCP was only responsible for coordinating and implementing Nigeria's health sector response to HIV/AIDS until late 2013, when the government included the viral hepatitis control programme. The NASCP is a division under the Department of Public Health, FMOH, with the mandate to formulate public health policies, develop strategic plans and guidelines, and ensure implementation of various disease control programme interventions at the sub-national level (Federal Ministry of Health, 2020).

The FMOH developed the first national policy on viral hepatitis control in July 2015 to reduce the morbidity, mortality, and associated socioeconomic consequences of the infection in Nigeria (Federal Ministry of Health, 2015). Likewise, through the FMOH, the federal government developed a five-year

(2016 – 2020) strategic plan as a roadmap to achieving the ambitious global target of eliminating viral hepatitis by 2030. The objectives to be completed in the course of the five years were:

- To expand awareness and ensure 50% of persons infected with Hepatitis B and C are aware of their infection status
- To achieve a 50% reduction in the transmission of vaccine-preventable viral hepatitis (HBV)
- To achieve a 50% reduction in the prevalence of viral hepatitis C
- Ensure that 50% of all persons infected with Hepatitis B and eligible for treatment receive treatment (Federal Ministry of Health, 2016d).

However, very little has been achieved concerning these set objectives due to numerous factors discussed in this dissertation.

Chapter 2: General Overview of Viral Hepatitis, Problem statement, Justification, Objectives, methodology, and limitations.

2.1 Overview of viral hepatitis

Hepatitis is inflammation of the liver, which could have fatal consequences on the affected individual's health either in the short or long term (Razavi, 2020)(World Health Organization, 2020a). It is caused by various factors and health conditions, including autoimmune disease, fatty liver disease, certain medications, alcohol consumption, and viral infection. Globally, viral causes of hepatitis account for the highest proportion of hepatitis cases (Razavi, 2020). There are five common subtypes of viral hepatitis, as shown in table 1. They are Hepatitis A Virus (HAV), Hepatitis B virus (HBV), Hepatitis C Virus (HCV), Hepatitis D Virus (HDV), and Hepatitis E Virus (HEV) (Razavi, 2020). However, they vary depending on the severity of the illness they cause, geographical spread, modes of transmission and prevention, and associated public health burden (World Health Organization, 2020a).

Table 1: Description of the types of viral hepatitis

	Hepatitis A	Hepatitis B	Hepatitis C	Hepatitis D	Hepatitis E
Major sources of transmission	Contaminated food & water, inadequate sanitation, poor personal hygiene, behaviors associated with injection drug use	Mother to child, contact with blood and body fluids, sexual transmission	Contact with blood (injection of drugs, contaminated blood transfusion, sexual practices that lead to blood exposure)	Requires hepatitis B infection; contact with blood and body fluids, sexual transmission	Fecal-oral routes due to contaminated drinking water
Acute infection	✔	✔	✔	✔	✔
Chronic infection		✔	✔	✔	
Vaccine	✔	✔			✔ (China only)
Treatment		✔ (chronic)	✔ (2–3 mo)		

Source: Global Epidemiology of Viral Hepatitis by Razavi (2020)

Worldwide, about 354 million people were estimated to be living with HBV and HCV in 2019, with a significant majority not having access to testing and treatment services, thus causing an enormous public health challenge. Even though there is a potent vaccine for HBV and antiviral medications for prevention and chronic management of HBV, inadequate access to prevention and treatment services continue to persist worldwide (World Health Organization, 2020a; Razavi, 2020). As a result, both viruses caused

about 1.1 million deaths in 2019 and an estimated three million new infections per year (World Health Organization, 2021a).

As of 2019, an estimated 296 million persons (3.8% of the world's population) are living with chronic HBV infection, with the highest number of cases estimated to be in the Western Pacific Region – 116 million – followed by the African region with 82 million cases (see figure 4). Out of the estimated total number of HBV cases worldwide, only 10% have been diagnosed, and just above 20% of the people diagnosed are on treatment. For HCV, about 58 million people were estimated to be infected globally during the same period (see figure 5), with 21% of them being diagnosed and only 62% of those diagnosed having access to treatment. HCV infection, unlike HBV, can be treated and cured after two to three months of antiviral therapy (World Health Organization, 2021a).

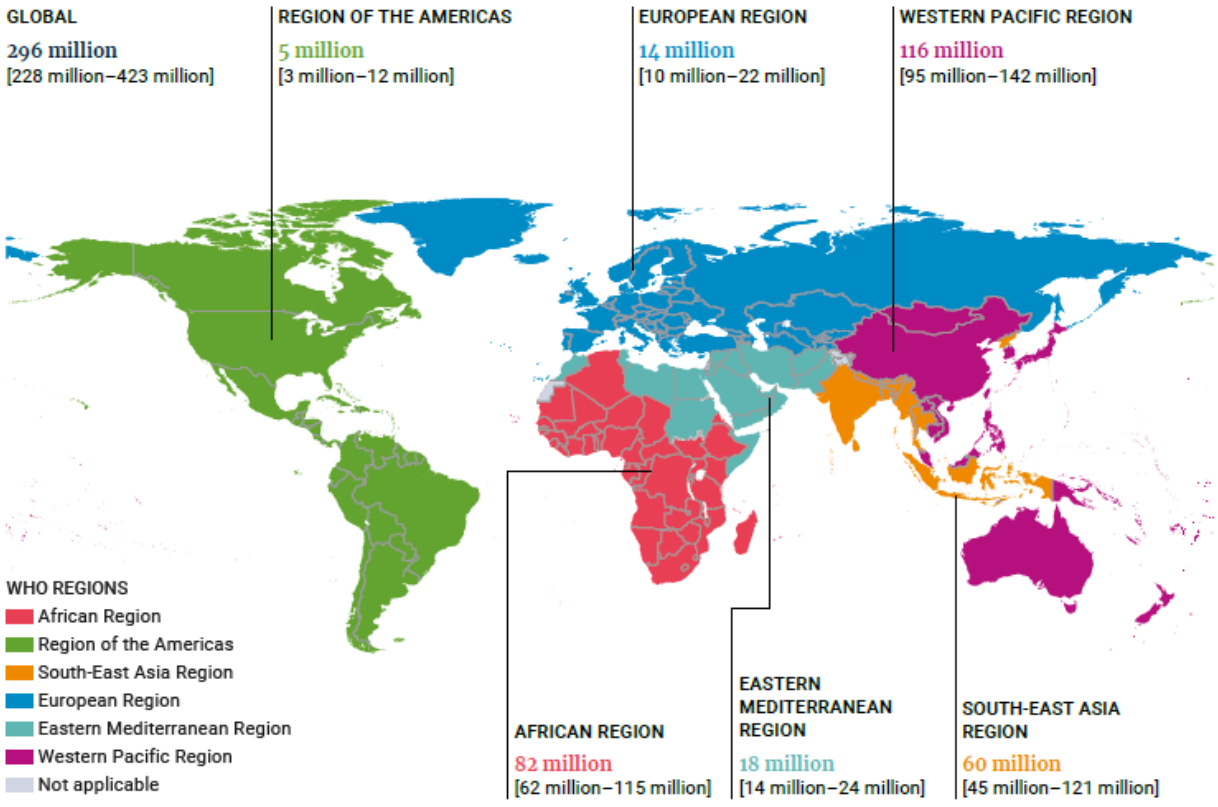


Figure 4: The burden of chronic hepatitis B infection (HBsAg positivity) by WHO region as of 2019 ((World Health Organization, 2021b)

The large number of cases that are yet to be identified and commenced on treatment has highlighted the vast gaps along the treatment cascade of the HBV infection. In addition, pregnant women with chronic hepatitis B infection unaware of their status also contribute significantly to this gap. Therefore, developing

and implementing health interventions targeted at diagnosing HBV infection in this sub-group of the population is crucial. Furthermore, these interventions would enable health interventions for the mother's well-being and prevent new HBV infection in the unborn baby.

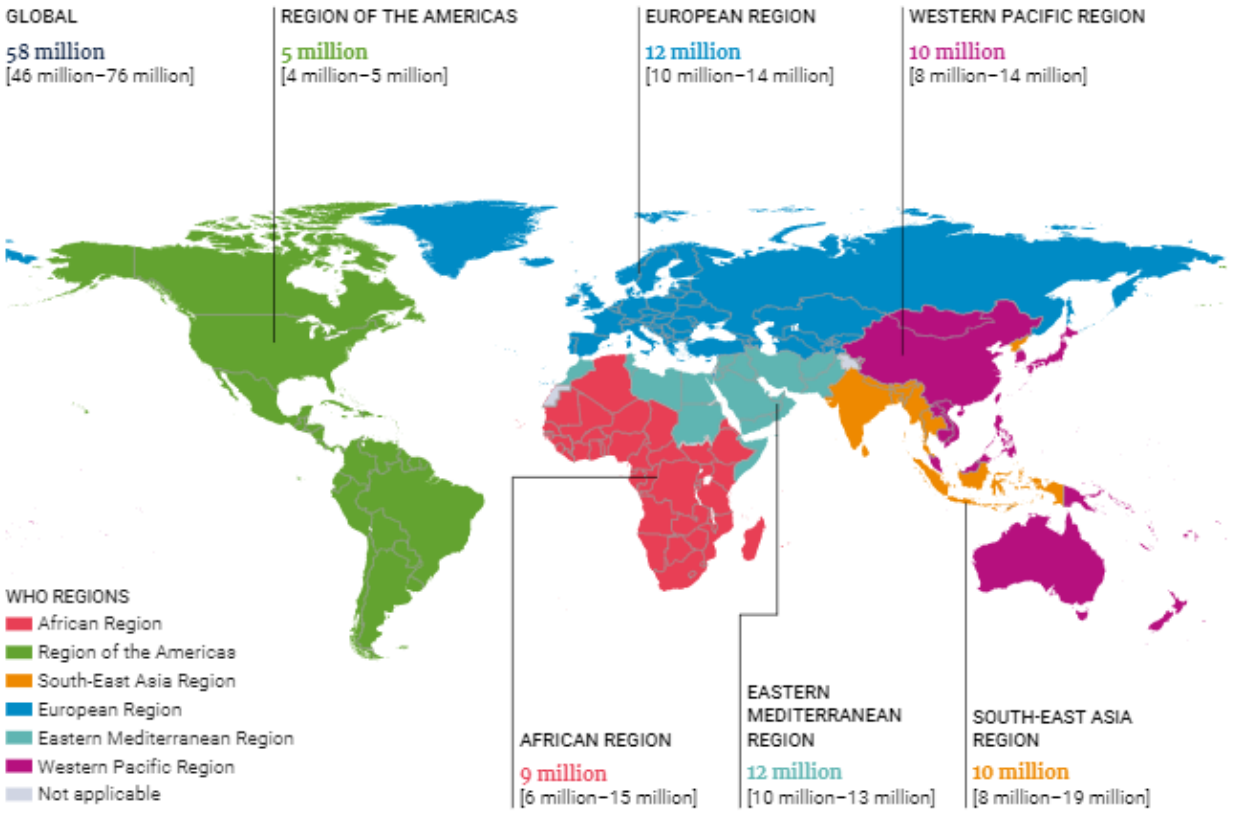


Figure 5: The burden of chronic hepatitis C viraemic infection by WHO region as of 2019 ((World Health Organization, 2021b)

2.2 Current strategies for Hepatitis B control

There are five evidence-based core thematic areas of intervention for HBV control that could yield far-reaching results with appropriate political will and enhanced response. These are outlined as follows:

- Hepatitis B vaccination
- Prevention of mother-to-child transmission (PMTCT) of HBV
- Injection, blood, and surgical safety
- Harm reduction for people who inject drug
- Treatment (World Health Organization, 2016)

The PMTCT of HBV involves implementing maternal and infant interventions that can significantly reduce the risk of transmission of HBV from an infected pregnant woman to her infant. The maternal interventions include Hepatitis B surface antigen (HBsAg) screening at first or earliest antenatal care (ANC) visit using rapid diagnostic test (RDT) kits or laboratory-based immunoassay. In addition, HBV deoxyribonucleic acid (DNA) viral load or Hepatitis B e Antigen (HBeAg) in low resource settings where viral load is unavailable is conducted for pregnant women that test positive for HBsAg. The HBV DNA viral load or HBeAg is done to determine the risk of transmission to the infant. The higher the maternal viral load, the higher the risk of infection (World Health Organization, 2020b).

For HBsAg-positive pregnant women with HBV DNA viral load greater than or equal to 200,000IU/ml (5.3 log 10 IU/ml) or who test positive for HBeAg, Tenofovir Disoproxil Fumarate – an antiviral medication – prophylaxis is offered from 28th-week gestation till delivery to suppress viral replication and maternal viral load. Therefore, helping to significantly lower the risk of transmission of the virus to the neonate (Federal Ministry of Health, 2016a; World Health Organization, 2020b). Furthermore, a systematic review and meta-analysis on the efficacy of the antiviral medication revealed a 77% reduction in the risk of mother-to-child transmission of HBV (Hyun *et al.*, 2017).

The infant interventions include administering Hepatitis B birth dose vaccination (monovalent) within 24 hours of birth to all infants, irrespective of the HBV status of the mother. However, Hepatitis B immunoglobulin (HBIG) is given in addition to the birth dose vaccine to HBV-exposed newborns (babies born to HBsAg positive mothers). The birth dose vaccination is followed with subsequent two or three doses for all infants (World Health Organization, 2020b). In Nigeria, these subsequent doses are given in the sixth, tenth, and fourteenth week of life in combination with other vaccines against diphtheria, pertussis, tetanus, and Haemophilus influenza type B as Pentavalent vaccine as shown in table 2 (Federal Ministry of Health, 2016a). Administration of timely hepatitis B birth dose vaccine dramatically reduces the risk of mother-to-child transmission of HBV to 10 – 30% in neonates born to HBeAg-positive mothers and less than 0.5% in neonates born to HBeAg-negative mothers; while administration of the complete hepatitis B vaccine doses results in immune protection and HBV prevention in greater than 95% of vaccinated infants (Nayagam, Shimakawa & Lemoine, 2020; World Health Organization, 2019a).

Vaccination against HBV is one of the many success stories of public health. About 310 million cases of hepatitis B infection were estimated to have been prevented between 1990 and 2020 worldwide. However, as the proportion of new patients increases significantly due to mother-to-child transmission in HBV-

endemic countries like Nigeria, ensuring access and utilisation of hepatitis B birth-dose is vital (Griswold *et al.*, 2019).

Table 2: Hepatitis B vaccination schedule in Nigeria

Age	HBV Vaccine	Dose	Route
At birth (within 24 hours)	Monovalent	10µg / 0.5 ml	Intramuscular
6 weeks	Pentavalent	0.5 ml	Intramuscular
10 weeks	Pentavalent	0.5 ml	Intramuscular
14 weeks	Pentavalent	0.5 ml	Intramuscular

Source: Federal Ministry of Health (2016a)

The maternal and infant interventions involved in preventing mother-to-child transmission of HBV, with an assessment of the mother for treatment eligibility for her health, are shown in the flowchart below (figure 4). The interventions from level one to level three in the algorithm or flowchart are offered to pregnant mothers during their routine antenatal care visits to health facilities. In contrast, interventions in level four are provided at the delivery of the newborn and subsequently during postnatal or immunisation clinics in the health facility.

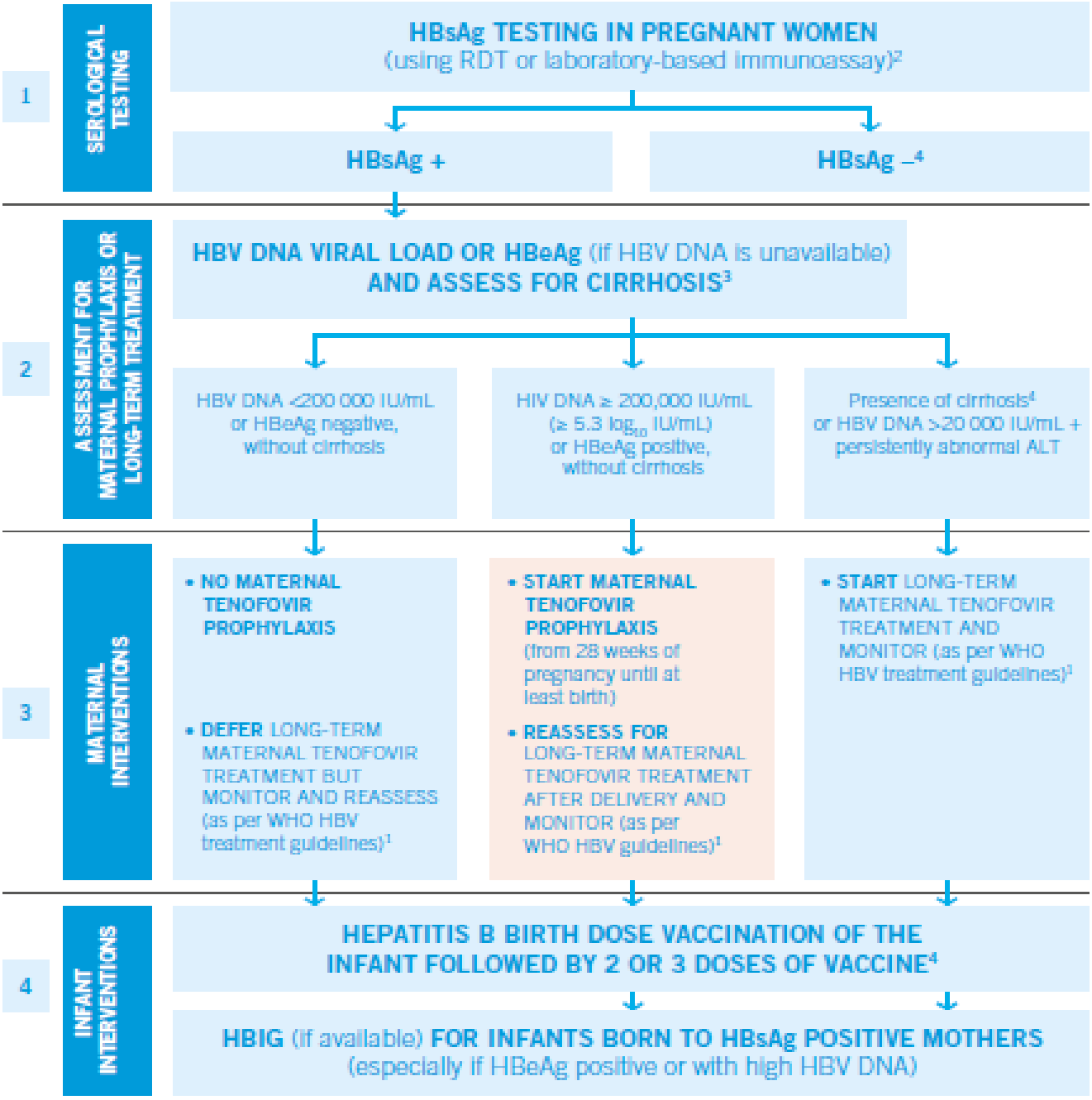
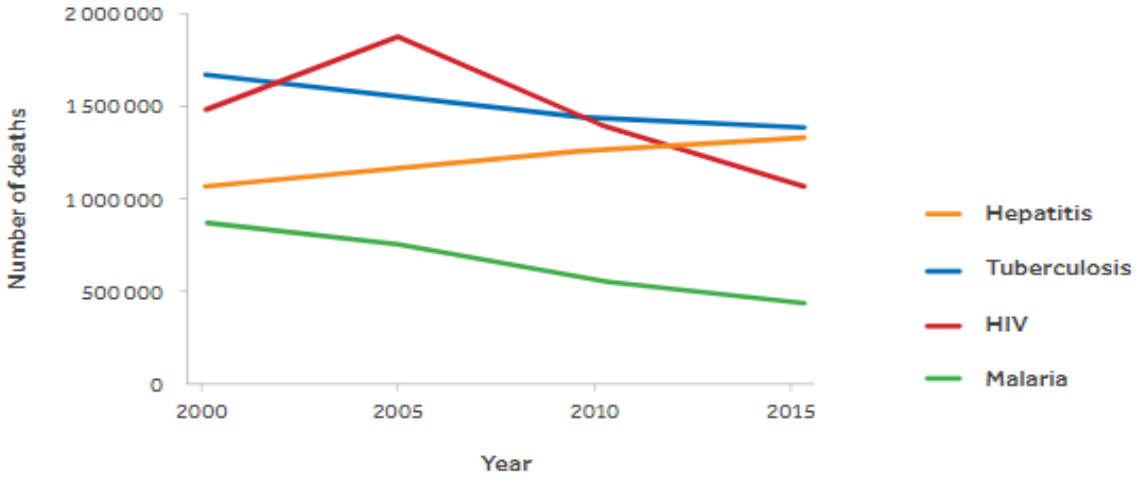


Figure 6: Algorithm for maternal and infant interventions for PMTCT of HBV (World Health Organization, 2020b)

2.3 Problem statement

HBV infection is a public health concern. Close to 70% of the estimated chronic HBV infection cases globally occur in the WHO's African and Western Pacific regions as of 2019 (see figure 4). (World Health Organization, 2021b). In the same year, 1.34 million deaths, higher than HIV or malaria, were reported worldwide due to complications arising from viral hepatitis, 96% of which were from chronic HBV and HCV. In addition, the complications of chronic HBV infection – liver cirrhosis and liver cancer – accounted for 66% of these deaths (World Health Organization, 2017a, 2020a).

Moreover, the number of deaths from hepatitis-related complications has been steadily rising, with about a 22% increase between the years 2000 and 2015, while the mortality from other diseases of public health concern such as HIV (which share similar routes of transmission with HBV), tuberculosis, and malaria declined within the same period (see figure 7). This was due to priority given to these diseases regarding financing and innovations for case identification and treatment at the global and national levels (World Health Organization, 2017a). Globally, the estimated prevalence of HBV infection in persons living with Human Immunodeficiency Virus (PLHIV) was 7.6% in 2015, with about 2.7 million people co-infected with HBV and HIV. Sixty-nine per cent of the estimated total number of HBV and HIV co-infection cases worldwide occur in Sub-Saharan Africa (Platt *et al.*, 2020).



Source: WHO global health estimates (Global Health Estimates 2015: deaths by cause, age, sex, by country and by region, 2000-2015. Geneva: World Health Organization; 2016.)

Figure 7: Global annual mortality from hepatitis, HIV, tuberculosis, and malaria. (World Health Organization, 2017a)

Approximately 6.1% of the adult population live with chronic HBV infection in the WHO African region, one of the highest worldwide (World Health Organization, 2020a). Nigeria, one of the member countries of the region, is endemic for HBV. A systematic review of published data between 1965 and 2013 reported the prevalence of chronic HBV infection in most countries in West Africa, including Nigeria, to be greater than 8%; see figure 8 (Schweitzer *et al.*, 2015). According to the most recent population-based survey on HBV and HIV conducted in Nigeria in 2018, the prevalence of chronic HBV infection is 8.1% (10.3% in men and 5.8% in women) in persons aged 15 – 64 years. The peak prevalence was in persons aged 35 – 39 years (10.2%) and was lowest in 55 – 59 years (2.5%). In adults PLHIV aged 15- 64 years, HBV prevalence was 8.9% (Federal Ministry of Health, 2019b). The individuals with HBV-HIV co-infection are significant in that rapid progression to liver cirrhosis, and higher mortality from the liver disease occur in this group of people (Federal Ministry of Health, 2019b).

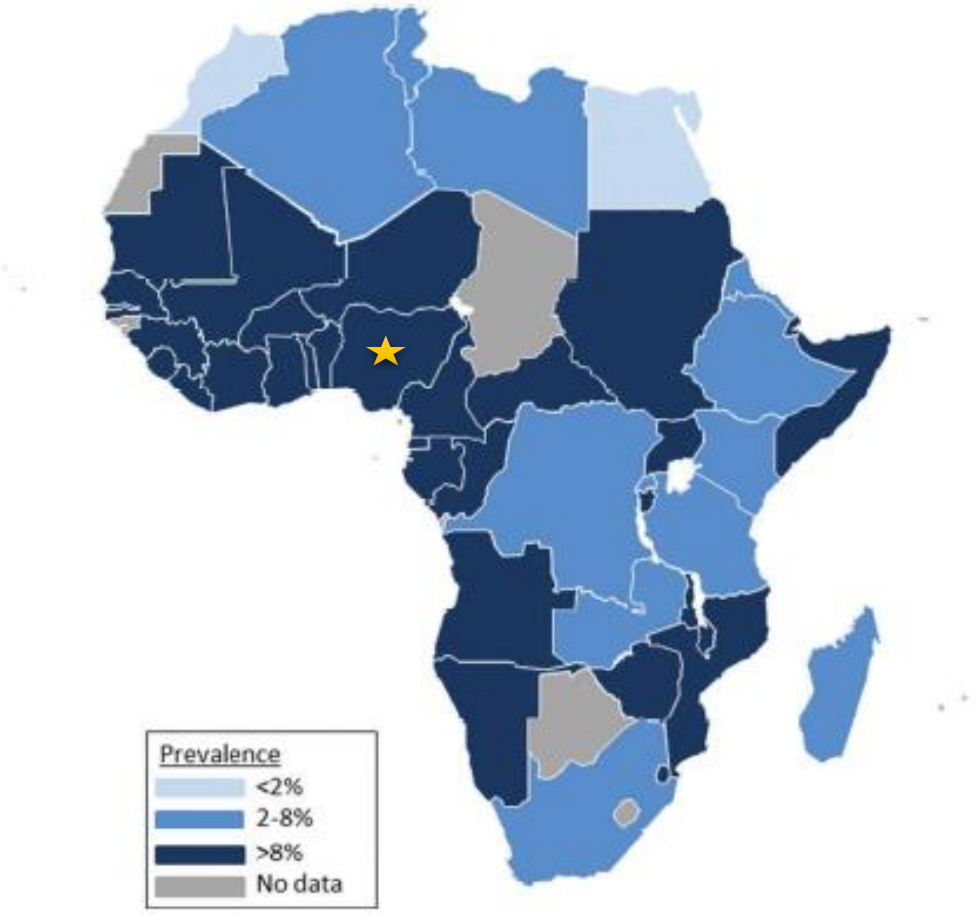


Figure 8: Prevalence of chronic HBV infection in sub-Saharan Africa (yellow star: Nigeria)(Schweitzer *et al.*, 2015)

Before the population-based survey was conducted, some individual studies have been carried out to estimate the burden of HBV infection in the general population and pregnant women. For example, Olayinka *et al.* (2016) reported a prevalence of 12.2% in the general population in a study done across the six geopolitical zones of the country, while a prevalence of 11.4% was observed in a three-year review of results of HBsAg tests done in Aminu Kano Teaching Hospital, Kano State, Nigeria (Nwokedi *et al.*, 2010; Olayinka *et al.*, 2016; Mbaawuaga, Iroegbu & Ike, 2014).

Furthermore, a review and meta-analysis of HBV prevalence studies done between 2000 and 2013 showed a pooled prevalence of 14.1% in pregnant women attending ANC in Nigeria (Musa *et al.*, 2015). Howell, Lemoine & Thursz (2014) reported HBsAg seroprevalence of 7.2% in pregnant women after combining the results from different studies. In the northern part of the country, HBsAg prevalence studies in pregnant women conducted in ANC settings ranged from 6.7% to 17.2% (Ndako *et al.*, 2012; Olokoba *et al.*, 2011; Nongo *et al.*, 2016; Mustapha *et al.*, 2020). On the other hand, the prevalence of pregnant women attending ANC in the southern part of the country ranged from 6.6% to 10.5% (Utoo, 2013; Anaedobe *et al.*, 2015; Atilola *et al.*, 2018).

The observed high prevalence in pregnant women makes newborns and infants at increased risk of being infected as transmission can occur during birth and delivery in an infected pregnant mother. More disheartening is that almost 90% of such infected infants will progress to have chronic HBV infection, which is a risk factor for consequences of cirrhosis and liver cancer later in life. Conversely, healthy individuals infected in adulthood only have a two to six per cent risk of developing chronic HBV infection (Centre for Disease Control, 2020; Razavi-Shearer *et al.*, 2018; World Health Organization, 2020a). In a modelling study conducted in 2016, Nigeria ranked first among 16 countries (see figure 6), accounting for greater than 80% of the total estimated cases of HBV infection in children aged five years globally (Razavi-Shearer *et al.*, 2018).

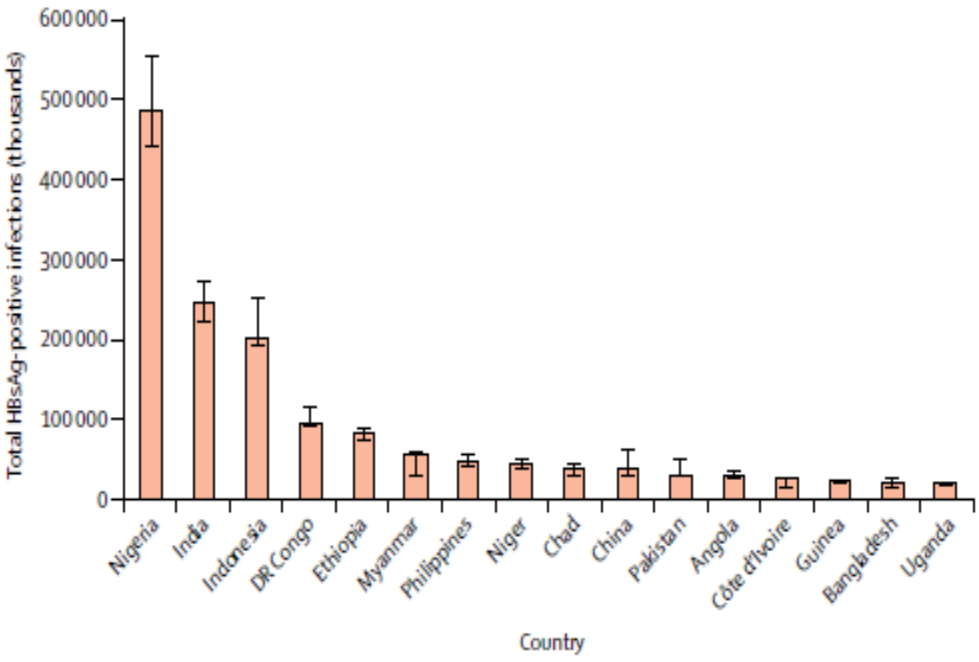


Figure 9: Countries accounting for at least 80% of HBV infections in five-year-old children in 2016 (Razavi-Shearer *et al.*, 2018)

Despite the availability of a vaccine and antiviral treatment options for those living with chronic HBV and who meet the eligibility criteria for treatment, a vast majority of people are unaware of these options. In addition, affected individuals are ignorant about being infected until complications set in much later in life as the infection is mainly asymptomatic in its early phase (World Health Organization, 2017b). As a result of the global burden caused by viral hepatitis, the World Health Assembly developed and adopted the first Global Health Sector Strategy in 2016. The strategy aimed to end viral hepatitis as a public health threat with the goal of a 90% reduction in new infections and a 65% reduction in mortality due to HBV by 2030.

Unfortunately, progress towards achieving these targets in Nigeria has been lagging because of several challenges. The access and utilisation of ANC by pregnant women has been suboptimal. ANC is the 'gateway' to PMTCT-HBV services, consisting of the initial HBsAg screening until hepatitis B birth dose vaccination for newborns after delivery (PMTCT of HBV algorithm, figure 4). As stated by Nigeria Demographic and Health Survey (NDHS), only 67% of women aged 15-49 years who delivered within five years preceding the survey received antenatal care from a skilled provider for their most recent

delivery, out of which only 57% had the required the minimum of four ANC visits (National Population Commission, 2019). The patronage of Traditional Birth Attendants (TBAs) as the preferred option for ANC services by some pregnant women could also constrain PMTCT of HBV in Nigeria (National Population Commission, 2019).

In addition, the coverage of Hepatitis B vaccination in infants is inadequate, despite being part of routine immunisation schedule in Nigeria since 2004 (Breakwell *et al.*, 2017). For example, the percentage of children between 12 – 23 months who had hepatitis B birth dose vaccine (within 24 hours of birth) was 52%, while only 50% completed the third pentavalent vaccine dose in 2018. These poor immunisation statistics, especially for hepatitis B birth dose vaccine, could be due to the low institutional deliveries (deliveries that occur in a health facility) of 39%, home delivery of 59%, among other factors (National Population Commission, 2019).

2.4 Justification

The problem of mother to child transmission of HBV was recently brought to the fore during the 2020 World hepatitis day held every 28th of July with the theme "hepatitis-free future." It was an opportunity for a global call for countries, especially low- and middle-income countries, to set up structures for a robust viral hepatitis control programme to ensure the prevention and treatment targets are met by 2030 (World Health Organization, 2020a). However, while the viral hepatitis control program has been established in Nigeria, it faces numerous challenges and constraints with implementing and utilising interventions to control its spread. In addition, the fact that the hepatitis B vaccine was only introduced in Nigeria about 17 years ago means that the majority of persons currently within the reproductive age group are at risk of being infected with HBV. This is due to them missing the routine infant vaccination against HBV infection, which is free of charge compared to adult vaccination which comes at a cost.

This study on PMTCT of HBV in Nigeria is essential. It will help identify the root causes of the challenges facing HBV control in Nigeria, especially the elimination of mother-to-child transmission of HBV. In addition, it will add to the body of knowledge on PMTCT of HBV because less literature is available on HBV control in Nigeria compared to similar infections like HIV and syphilis that are also transmittable from mothers living with the illness to their infants. In Nigeria, HIV/AIDS control programme has enjoyed

robust support and attention in terms of funding primarily from donor grants like Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and United States President's Emergency Plan for AIDS Relief (PEPFAR), implementation research, and interventions such as screening and antiretroviral medications at no cost to the clients. On the contrary, there is less attention for HBV, where, for example, the cost of screening and management in pregnant women and the general population is solely born by themselves. Furthermore, focusing on utilising interventions preventing HBV is vital because the co-infection of HBV and HIV do occur in the same individual, with the risk of morbidity and mortality being higher in such individuals, including pregnant women.

This study will explore factors specific to pregnant women, their immediate surroundings, the health system, and the broader context. The algorithm (figure 4) will be taken into consideration, from antenatal care to Hepatitis B virus birth dose vaccination (within 24 hours of life) and use of antiviral prophylaxis from 28th week of pregnancy to birth (World Health Organization, 2016, 2020b).

2.5 Study Objectives

2.5.1 General Objective

The study aims to describe and analyse factors influencing the utilisation of PMTCT of HBV programme interventions (maternal and infant interventions) in Nigeria and propose recommendations that will inform HBV control programme policy, guidelines, interventions and research towards accelerating the progress of Nigeria's HBV elimination in infants.

2.5.2 Specific Objectives

1. To explore the individual factors influencing utilisation of PMTCT of HBV programme interventions in Nigeria
2. To examine the social network and community factors influencing utilisation of PMTCT of HBV programme interventions in Nigeria
3. To identify the sociocultural factors influencing utilisation of PMTCT of HBV programme interventions in Nigeria

4. To explore the health system factors and their impact on utilisation of PMTCT of HBV programme interventions while comparing them with the HIV programme in Nigeria and lessons from other countries in implementing PMTCT interventions in HBV control programme
5. To suggest recommendations to the Viral Hepatitis Control Programme through the FMOH, other government agencies, and stakeholders towards fast-tracking the elimination of mother-to-child transmission of HBV in Nigeria.

2.6 Methodology

2.6.1 Study Design

The study method used was a literature review. A search for peer-reviewed articles and grey literature on HBV control and PMTCT of HBV in Nigeria was conducted. The inquiry also considered available data and documents on PMTCT programmes, including HIV and HBV, in Sub-Saharan Africa and globally.

2.6.2 Search Strategy

For this study, I searched for literature using the following databases: ProQuest, CINAHL, PubMed, and other databases through the Vrije Universiteit (VU) online library portal. In addition, I used Google Scholar and Google for the search. Furthermore, the websites of international organisations such as the WHO, World Bank (WB), International Monetary Fund (IMF), etc., were used to search for documents relevant to the thesis topic. Moreover, national documents such as policy briefs, reports, guidelines and strategic plans from the FMOH and other government agencies related to PMTCT of HBV and Nigerian health systems were examined to provide context to the description and analysis of the review. Finally, I used snowballing technique to identify relevant articles relating to PMTCT of HBV from search results generated from the databases and systematic reviews on HBV infection. The search process was guided by the socioecological model adapted by Busza *et al.* (2012) while looking out for articles related to the factors described in the framework which influence utilisation of PMTCT of HBV interventions.

The inclusion criteria were as follows:

- Journal articles and grey literature in the English language related to the factors described in the framework, PMTCT of HBV interventions, ANC, and immunisation in Nigeria and sub-Saharan Africa
- Journal articles and grey literature whose dates of publication falls between 2010 and 2021
- Relevant international documents such as WHO technical guidelines and reports were used as additional resources on the overview on viral hepatitis but not in the result section

Exclusion criteria used include the following:

- Studies conducted before 2010 or studies published in other languages different from English were excluded from the study findings and results
- Literature with only access to the abstract and not the entire article was excluded

2.6.3 Key words

The literature search was conducted using different combinations of the following keywords as search protocol: viral hepatitis, hepatitis B virus, HBV, PMTCT, hepatitis B vaccine birth dose, routine immunisation, skill birth attendance, institutional delivery, antenatal care utilisation, Nigeria, pregnant women, hepatitis B and C, risk perception, prevalence, awareness, discrimination, stigma, funding, health system, social support, women's empowerment, gender norms, quality of care, religion, health beliefs, guidelines, policy, disclosure, sub-Saharan Africa

2.6.4 Study limitations

The potential limitations of this literature review include limited literature on PMTCT of HBV in Nigeria when compared to the array of studies available on other diseases of public health importance such as HIV, which can also be transmitted through the mother-to-child transmission route. In addition, a field study to collect primary data on the thesis topic using qualitative techniques such as key informant interviews and focus group discussions could have been an additional source of information about the current state of the HBV control programme in Nigeria.

2.6.5 Conceptual framework

The socioecological model has been in use since the 1970s by sociologists to study how behaviours were developed from the interplay of personal characteristics, influence of family and close networks, sociocultural and community factors, and prevailing policy environment (Poux, 2017). The model has different variations in terms of the number of layers of the model and nomenclature, depending on the study or research the model is being used to analyse (National Centre for Injury Prevention and Control, 2021; Busza *et al.*, 2012). However, the version with five layers, i.e., the policy/enabling environment within which the remaining four layers are embedded, is commonly used.

Many studies on PMTCT service utilisation and uptake, such as Dirisu *et al.* (2020), Onono (2015), Lumbantoruan *et al.* (2018), and Busza *et al.* (2012), have made use of the socioecological model in describing their study findings. The choice of the model was because the decision to use or not to use health services by an individual is determined by a complex interplay of factors highlighted by the model. One of these factors, the health system-related factors, influence PMTCT of HBV mainly because the programme is relatively new and faced numerous challenges compared to the PMTCT of HIV programme in Nigeria. This challenge resulted in the initial consideration of the "Health system dynamics framework" developed by Van Olmen *et al.* (2010). With a primary focus on health systems strengthening, this framework describes ten elements (see figure 10), including the building blocks of the WHO health system framework (World Health Organization, 2007; Van Olmen *et al.*, 2010).

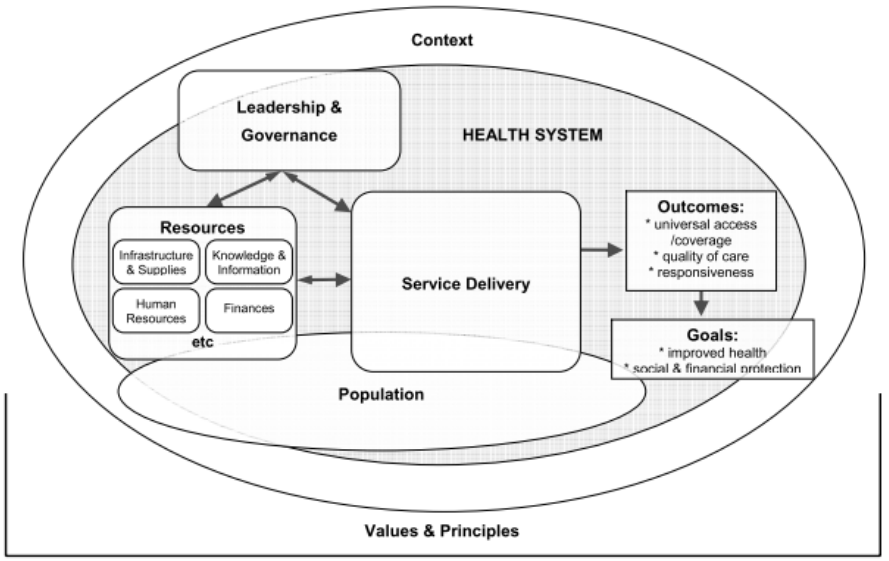


Figure 10: Framework for analysis of health systems by (Van Olmen *et al.*, 2010)

However, the adapted socioecological model from Busza *et al.* (2012) was eventually considered and employed to analyse this study. The adapted model comprises broader determinants that can influence PMTCT of HBV interventions, including the demand-related factors and the supply challenges, i.e., the health system-related concerns.

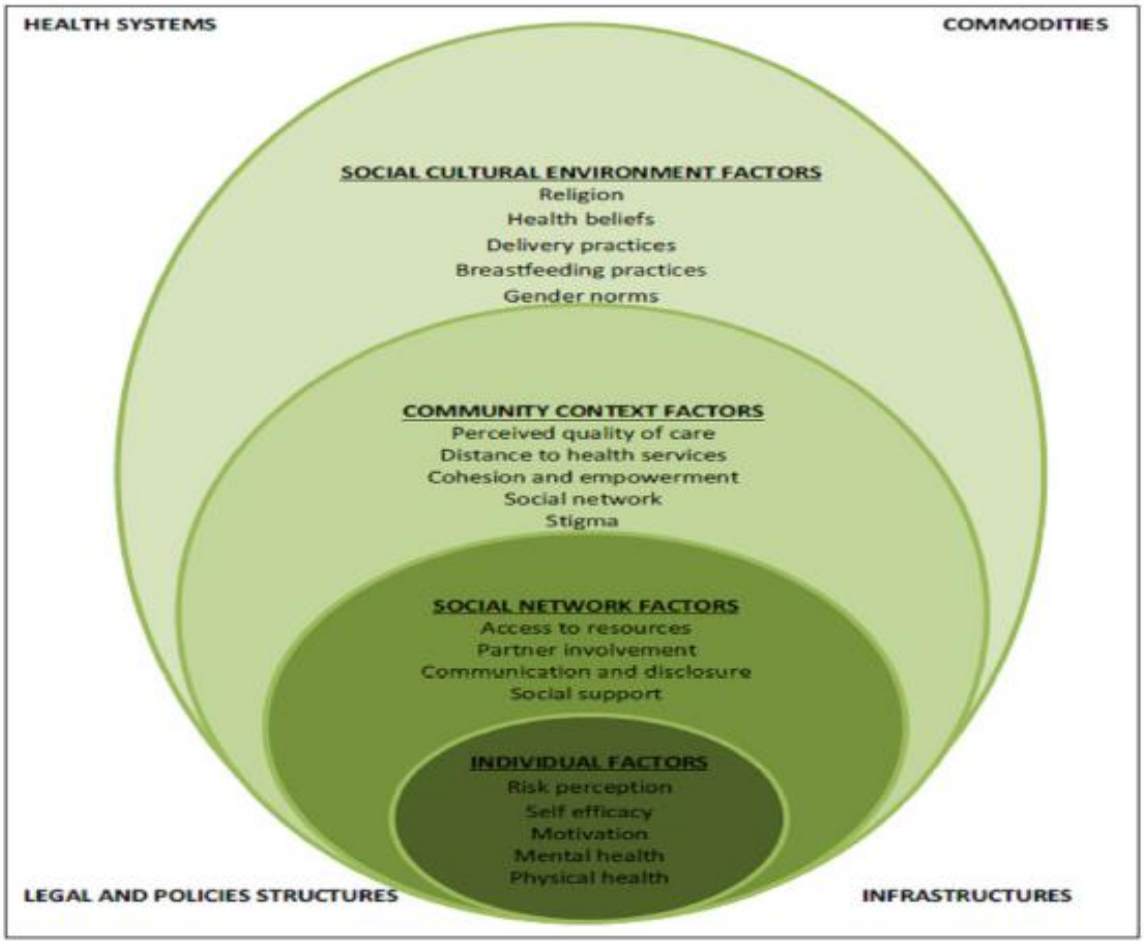


Figure 11: Socioecological model. Adapted from (Busza *et al.*, 2012).

Individual factors: This level will explore personal characteristics of pregnant women such as HBV risk perception, which is a function of their knowledge about the virus, motivation, self-efficacy, and health status, and how it influences PMTCT of HBV in Nigeria (specific objective 1).

Social network and community factors: The factors under the two levels will be examined under specific objective two. The perceived quality of care, distance to health services, availability, and access to resources, etc., all play a vital role in the decision of pregnant women to access health services such as ANC service, which is the gateway to PMTCT services, where to deliver when in labour and subsequent infant immunisation services utilisation.

Sociocultural Environment factors: The influence of delivery practices, health beliefs, religion, and gender norms will be described and analysed concerning PMTCT of HBV, but breastfeeding practices will not be considered because studies have shown that breastfeeding does not increase the risk of MTCT of HBV documented evidence of increased risk of mother-to-child transmission of HBV with breastfeeding provided (Chen *et al.*, 2013; Zheng *et al.*, 2011; Shi *et al.*, 2011; Montoya-Ferrer *et al.*, 2015; Wang *et al.*, 2015b). The sociocultural factors will be explored under specific objective three.

Health system factors: Factors such as availability of resources, including funding, commodities (test kits and antivirals), and viral load testing infrastructures, availability and knowledge of health workers about PMTCT of HBV interventions as well as guidelines and policies will be considered at this level, including their underlying policies (sub-objective 4).

Chapter 3: Study results and findings

The algorithm showing maternal and infant interventions necessary for PMTCT of HBV discussed earlier in chapter 2 (see figure 4) can only be achieved when pregnant women have access to and utilise ANC services, institutional (health facility) delivery services, and when parents or caregivers use immunisation services. Several factors are found to affect this, which in turn influence the PMTCT of HBV in Nigeria. This chapter will present the study findings from the literature following the different levels of the adapted socioecological model, described in figure 7.

3.1 Individual factors

3.1.1 Risk perception

The level of knowledge of people often determines risk perception. For example, in a study in Nigeria by Ahmad *et al.* (2020), insufficient knowledge and low-risk perception of the severity of HBV infection were observed in the community where the study was done. However, 94 (87.9%) of the study participants informed their sexual partners of their HBV-positivity status. Also, in South-southern Nigeria, out of 218 antenatal clinic attendees, only 18.3% (40) knew viral hepatitis, 7.3% (16) knew the routes of transmission, and 11.9% (26) had knowledge of the availability of HBV vaccine, despite 50% of the respondents have had tertiary education (Omote *et al.*, 2020). Similarly, another study from the Northern part of the country revealed that only 3.9% of expectant mothers who participated in a survey were aware of the HBV vaccine (Fidelis *et al.*, 2019). The insufficient knowledge was consistent with the findings from Okenwa *et al.* (2019) and Kaoje AU *et al.* (2018). They reported that knowledge of the timeliness and benefits of hepatitis B birth dose among mothers attending immunisation clinics in the Southeastern part of Nigeria and Sokoto in northern Nigeria was low.

Conversely, in their descriptive cross-sectional study, Eni et al. (2019) revealed HBV awareness of 70% amongst the general population sampled across Lagos, Ogun and Abia states while only 46.4% had good knowledge of HBV infection based on the assessment administered. In addition, they reported that participants who engaged in high-risk behaviours, such as having unprotected sex with multiple sex partners, also have poor HBV knowledge and vaccine uptake. Thus, the discordance between awareness and knowledge described above coupled with the low vaccine uptake and poor HBV knowledge despite

high-risk sexual behaviours could indicate a low-risk perception of the respondents (Eni *et al.*, 2019; Franklin *et al.*, 2018).

In Uganda, a low-risk perception of acquiring HBV infection was observed in 50% of pregnant women (Nankya-Mutyoba *et al.*, 2019). Likewise, in Ghana, low awareness of HBV was reported in pregnant women despite the high prevalence of HBV in the community where the study was conducted (Abdulai *et al.*, 2016).

Back to Nigeria, a lack of knowledge about the childhood immunisation schedule was identified as the reason for the non-receipt of birth dose vaccination. For example, some women said they did not know where or when to take their children for immunisation, while many respondents stated that their children were too young to start taking vaccination (Babalola, 2011). Thus, the awareness level of 44% for HBV reported in this study was much lower than the 96% reported among hospital workers in Nigeria. In addition, the usual methods of HBV transmission such as blood transfusion, sexual intercourse, and vertical transmission acknowledged by the respondents were limited (62%,53%, and 50%, respectively) (Okonkwo *et al.*, 2017).

3.1.2 Motivation/Self-efficacy

According to Warri & George (2020), self-efficacy is influenced by socioeconomic and demographic factors – age, marital status, income level – and describes the self-confidence that drives pregnant women to act concerning their health. The study conducted in Cameroun revealed pregnancy disclosure, support from spouse and reactions from parents (in unmarried women) all affect motivation/self-efficacy. In addition, some pregnant women delayed their presentation for ANC because of fear of harming the unborn baby by supposed "enemies", highlighting a link between individual factors and other layers of the socioecological model such as sociocultural factors. This delay, therefore, limits the window of opportunity for intervention to prevent mother-to-child transmission of HBV via early screening in pregnancy and possible initiation of antiviral medication when required.

3.1.3 Mental and Physical Health

Persons living with chronic hepatitis B (and C) infection have a high risk of having depression and anxiety disorder (Alian *et al.*, 2013; Vu *et al.*, 2019). In addition, the overall quality of life is affected by depression and anxiety, which can negatively affect self-efficacy and motivation for care-seeking (Keskin, Gümüs & Orgun, 2013). Also, Mokaya *et al.* (2018), in their study on stigma and HBV infection, reported that

stigma had a potentially negative impact on the mental health of persons living with HBV with a potentially adverse effect on care-seeking and treatment adherence. The physical health status of newborns was also found to be a reason for immunisation refusal. A study in Jos, Nigeria, revealed that prematurity with associated low birth weight (LBW) was one of the reasons for low vaccination coverage (Danjuma *et al.*, 2020).

3.2 Social Network and Community Factors

3.2.1 Access to resources

According to Fagbamigbe & Idemudia (2017), wealth status (and by proxy access to resources) was a strong determinant of ANC utilisation in Nigeria. They observed that women who had financial challenges in accessing ANC had much lower ANC utilisation. This observation corroborated the findings from the population-based study by Agho *et al.* (2018) and Gobezie Workneh & Kevany (2016) in their data analysis from the Demographic and Health Survey (DHS) of Sub-Saharan countries where DHS took place between 2008 and 2015. About 84% of women in the rich wealth bracket had at least 4 ANCs, while only 28% of women in poor households have had 4 ANC visits (Dahiru & Oche, 2015). Regarding PMTCT of HBV service utilisation, the cost implication of HBsAg screening, other laboratory tests and antiviral drugs which are not subsidised, also reduced access to these services for pregnant women (Ezeonu *et al.*, 2014).

3.2.2 Partner Involvement

Male partners have been influential and essential providers of support to women when adequately engaged during pregnancy, delivery, and postpartum due to the observed maternal and newborn health positive outcomes of male involvement (Daniele, 2021). Mfuh *et al.* (2016) also identified lack of male involvement as one of the constraints for access and utilisation of maternal health services, including PMTCT programmes. However, a study conducted by Sharma *et al.* (2019) showed limited active involvement of men during maternal and newborn care, despite being critical decision-makers in providing resources for accessing care by pregnant women and delivery location. Furthermore, the vital role of husbands and male partners was reported by Limaye *et al.* (2019) in a qualitative study conducted in Lagos. They observed that partner involvement is the most crucial factor that prompts a mother towards accepting immunisation for their children.

3.2.3 Communication and disclosure

In Nigeria, HBV-infected individuals' disclosure rate was high on average and even higher among married respondents than their single counterparts (Adekanle *et al.*, 2020; Ahmad *et al.*, 2020). A similar finding was observed in Zambia in which approximately 90% of the participants reported disclosing their positive HBV status to at least one contact despite having doubts before the disclosure; this was despite the stigma, perceived linkage with HIV, and anticipated negative impacts of couple and family relationships (Franklin *et al.*, 2018). Adjei *et al.* (2020) noted that disclosure of status could help improve treatment adherence and retention in care and support for mental health, notwithstanding the negative consequences such as stigma.

3.2.4 Social network and support

The extent of social support received by pregnant women from partners, relatives, and health service providers determines the usage of health services for antenatal care and delivery (Ademuyiwa, Farotimi & Ojo, 2020). Their study reported that a high (average score of 4.32 on a 5-point scale) level of social support was received by pregnant women, and consequently, the high level of satisfaction with the antenatal care service. Therefore, this high level of social support can increase access and utilisation of HBV screening in pregnancy. Also, a systematic documentary review of immunisation services uptake in developing countries, including Nigeria by Mazige, Kalwani & Kakoko (2016), showed that social network, family support, social approval and rumours influence the decision on immunisation uptake. Likewise, a qualitative study conducted in Lagos revealed the influence of husbands, mothers and intergenerational roles by mothers-in-law on childhood immunisation which could either be positive or negative, depending on the level of knowledge of these people (Olaniyan, Isiguzo & Hawk, 2021).

3.2.5 Stigma

A review conducted on HBV-associated stigma revealed a lack of data for Africa. However, studies from other climes were sufficient to demonstrate the stigma and discrimination of persons living with chronic HBV (Mokaya *et al.*, 2018; Smith-Palmer *et al.*, 2020; Rafique *et al.*, 2014). Stigmatisation and discrimination had implications for utilisation of health services, mental health, self-efficacy (discussed earlier in 3.1.2), economic opportunities, and relationships of persons living with HBV. These findings were corroborated by Dirisu *et al.* (2020) in their study in Nigeria, in which stigma was highlighted as a primary reason for women not wanting to participate in PMTCT programmes, especially when service

delivery points are referred to by the disease or infection for which they offer medical services, e.g. "Antiretroviral therapy (ART) Centre" in case of HIV. Conversely, Ahmad *et al.* (2020) reported that in Nigeria, HBV is a much less stigmatised infection when compared to HIV, as the majority of the study participants, 94 (87.9%), informed their sexual partners of their HBV positivity status. This was likely due to the low-risk perception of severity and low knowledge about HBV in the community where the study was conducted (as described earlier).

3.2.6 Women's Empowerment

Kareem *et al.* (2021) described women's empowerment as "social standing, position and the ability of women to make life decisions and choices' (p.1). Their study observed that women's empowerment, which is determined by labour force participation, health and household decision-making power, ownership of assets, etc., was associated with early presentation and utilisation of ANC in the first trimester and after that. Likewise, an analysis of DHS data from 31 developing countries, including Nigeria, showed inequity in women's empowerment was linked to poor maternal and child health service utilisation (Ahmed *et al.*, 2010). The analysis revealed that women with maximum empowerment were 1.52 (95% CI 1.37 – 1.66) and 1.31 (95% CI 1.11 – 1.54) times more likely to have gone for ANC four or more times and have had a delivery with skilled health personnel in attendance compared to those with minimum empowerment. Furthermore, regarding child health service utilisation, caregivers/mothers with medium decision-making power and high knowledge were more likely to seek and complete immunisation for their children than those with low decision-making power and knowledge (Seidu *et al.*, 2021).

3.2.7 Distance to health services

A recent DHS data review from Nigeria, Mali, Guinea, and Zambia showed that the location of health facilities played a vital role in the access and utilisation of antenatal care (Ahinkorah *et al.*, 2021). For example, according to Fagbamigbe & Idemudia (2015) and Okeke *et al.* (2019), distance from health facilities was reported to be the second-highest reason after lack of money that hindered access to antenatal care use in Nigeria. Similarly, many other studies revealed a strong association between the distance of health facility and antenatal care non-attendance (Onasoga, Afolayan & Oladimeji, 2012; Agho *et al.*, 2018; Ewa *et al.*, 2012; Sanda, 2014; Okeke *et al.*, 2019; Omer *et al.*, 2014). In addition, distance to health service was found to be one of the reasons for non-institutional delivery (delivery at home or with a traditional birth attendant) and non-utilisation of immunisation services (Johnson *et al.*, 2020; Egharevba *et al.*, 2017; Olaniyan, Isiguzo & Hawk, 2021; Oleribe *et al.*, 2017).

3.2.8 Perceived quality of care

Patients' quality and standard of care while accessing ANC/PMTCT services are associated with patient satisfaction (Nwaeze *et al.*, 2013). Also, the study conducted in a tertiary hospital in Ibadan, Nigeria, showed that women attending ANC were satisfied with the quality and standard of care received. Also, a cross-sectional survey of 1336 ANC attendees across four northern states revealed a 90% satisfaction with the ANC service provision, including responsive service, equipment availability, staff empathy etc. (Onyeajam *et al.*, 2018). Likewise, an increase of one standard deviation on the overall quality index (consisting of structural, process and outcome dimensions) was associated with a rise of 4.1% and 2.9% in the utilisation of antenatal and delivery care, respectively, according to a study involving PHCs across 12 states in Nigeria (Peet & Okeke, 2019). In a similar study in Ghana and Namibia, health worker attitude and interaction (process dimension) was an essential determinant of perceived quality of care during antenatal care, which eventually determines whether the client will return to the health facility or not (Atinga & Baku, 2013; Diamond-Smith, Sudhinaraset & Montagu, 2016).

3.3 Sociocultural factors

3.3.1 Religion

A qualitative study by Al-Mujtaba *et al.* (2016) in North-central Nigeria to investigate possible differences between Christians and Muslims regarding ANC utilisation showed that religion does not substantially influence the choices of pregnant women on utilisation of ANC. This observation could have resulted from the small sample size (68) and lack of representation of other religions (traditional) in the facility-based study. However, pregnant women who identified with traditional and different types of faith aside from Christianity and Islam were observed to be significantly less likely to use ANC from an analysis of 2013 Nigeria DHS data (Dahiru & Oche, 2015).

However, religion was a vital factor influencing ANC uptake in another study by Dirisu *et al.* (2020). According to one of the informants interviewed, some men would prefer to allow their wives to die than for their wives to be attended to by a male health worker during ANC and delivery.

"This our culture of privacy…I was surprised to hear that in our primary health centres, there are centres that ANC are being run by males, are you aware? Antenatal care, palpation…by a male, you understand?

Delivery the same thing. Sometimes it is the person in charge of the facility, who is a male…and this our notion in the community, 'wallahi' (by Allah) for a man to allow his wife…for her delivery to be taken by a male…he had rather leave her at home to die, they will say 'tayishahada' (she died as a martyr).''- KII Community Leader (p.7) (Dirisu *et al.*, 2020).

As regards immunisation service utilisation, data analysis from the 2016 Multiple Indicator Cluster Survey (MICS) in Nigeria showed that immunisation coverage was significantly higher in Christians than Muslims and that children of Muslim women were much more likely to be unvaccinated compared to children of Christians (as seen in figure 10 below) despite the religious composition of 40.4% Christians and 58.6% Muslims in the country (Costa *et al.*, 2020). These findings corroborated the position of Ophori *et al.* (2014). Furthermore, they affirmed that religion is one of the most significant challenges constraining acceptance of immunisation in Nigeria, particularly among the northern Muslims.

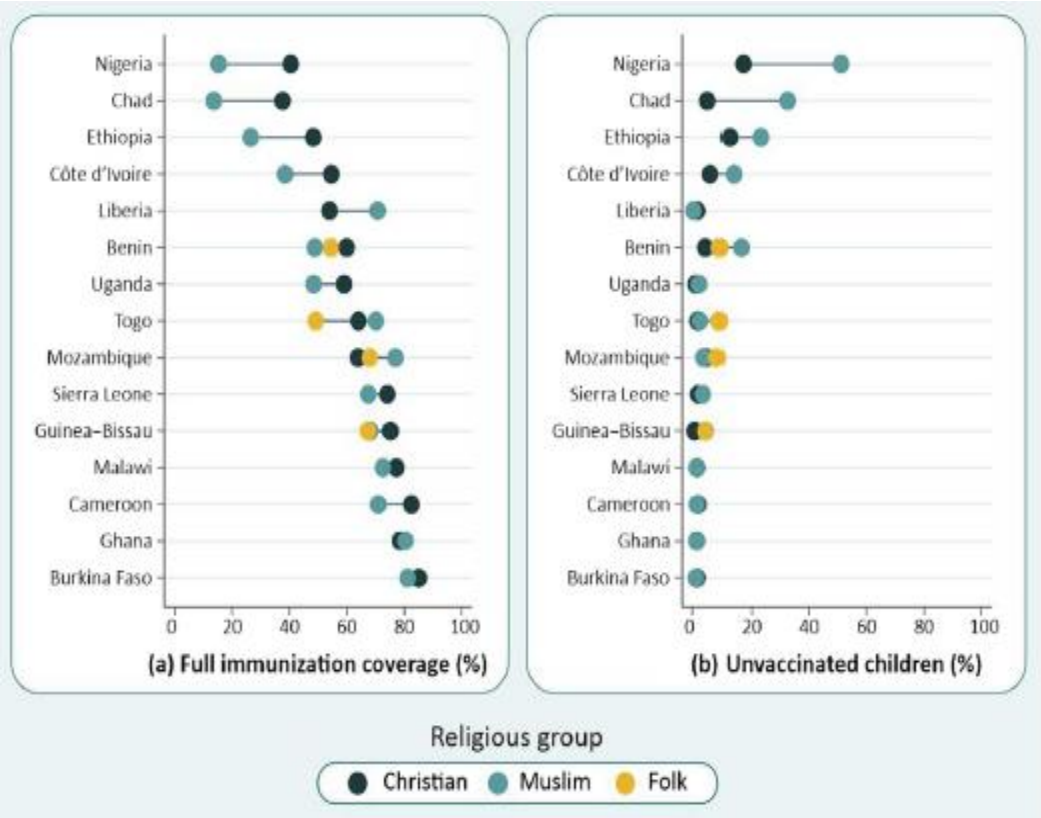


Figure 12: Full immunisation coverage and unvaccinated children by religious groups in Sub-Saharan Africa (Costa *et al.*, 2020)

3.3.2 Health beliefs and Delivery practice

In some instances, superstitious beliefs such as the linkage of the birth position used in health facility delivery rooms to "seeing the angel of death" has been reported to cause poor uptake of ANC and institutional delivery. This response was the submission of one of the participants of a qualitative study conducted by Dirisu *et al.* (2020) in Kano state, Nigeria. The following quote captured a response from a respondent:

"You know in the hospital when a woman comes to deliver, she has to be in the lithotomy position where she lies on her back while culturally…with their own superstitious belief, they believe (that when) she lies on her back she's facing the sky and the angel of death is there and if her eyes meet with his, obviously she's giving up the spirit (she will die). So that's why they prefer to stay at home to deliver because she will deliver using squatting position." -KII PMTCT Implementing Partner (p.6) (Dirisu *et al.*, 2020).

The practice of patronising TBAs and home delivery impact the utilisation of PMTCT of HBV interventions, especially infant hepatitis B birth dose vaccination. In a study by Abubakar *et al.* (2017), 73% of the 139 pregnant women sampled preferred to deliver at home, and only 27% chose hospital delivery. The reasons attributed to the choice of home delivery were: staff attitude (20%), male attendance at delivery (17%), tradition and custom (13%), unknown reason (15%), and 7% s a feeling of safety at home. The majority (102) of the participants ended up delivering at home with reasons ranging from family issues, negative health worker attitude, long distance to health facility and financial constraints (Abubakar *et al.*, 2017). These findings were similar to the outcome of a community-based survey where a significant majority delivered at home or elsewhere other than a health facility despite having one or more ANC sessions in a health facility (Atinge, Ogunnowo & Balogun, 2020). For babies given birth in places other than health centres, the culture of waiting till after the child's naming ceremony (done around the seventh day of life) before presentation for immunisation also affects the uptake of hepatitis B birth dose vaccination (Moturi *et al.*, 2018).

3.3.3 Gender norms

In a study in South-West Nigeria by Azuh, Fayomi & Ajayi (2015), 73% of the respondents of reproductive age revealed that family decisions such as when and where to access health care services and treatment were solely determined by their husbands. This was despite the husbands' deficient awareness and perception about the possible risks associated with pregnancy. Also, Al-Mujtaba *et al.* (2016), while

exploring the relationship between gender power dynamics and women's access to maternal and child health services, observed that some men (Muslim) believed that their wives should always ask for permission before accessing health care services with some exceptions like during emergencies. In contrast, another group of men (Christian) concluded that a request for approval before going for health care services was unnecessary.

Furthermore, household decision-making dynamics which can be affected by gender relations/roles, influence the uptake of immunisation services (Mazige, Kalwani & Kakoko, 2016). For example, according to a mixed-method study in Ogun state, Nigeria, women might find it difficult immunising their children without the consent of their husbands or might even require support from the husband in terms of resources to access the service (Akwataghibe *et al.*, 2019).

3.4 Health system factors

3.4.1 Service availability

As of 2015, 34176 health facilities, including private health facilities, are in Nigeria (see table 3 showing the breakdown). The PHCs, which are the first level of care, account for at least 88% of the total number of health facilities, with only about 61% of the population having access to these PHCs (Federal Ministry of Health, 2018). On the other hand, private health facilities provide the majority (53.5%) of essential services, accounting for only two-thirds of the country's total health facilities. In addition, almost all HBV prevention and treatment services – HBsAg screening and antiviral prophylaxis and/treatment (except for Hepatitis B immunisation services), are mainly provided at the tertiary level of care, which accounts for only about 1% of the health facilities in the country (Hepatitis B Foundation, 2020).

Table 3: Health facilities and service delivery in Nigeria as of 2015

	Public	Private	Total
Primary facilities	21,808	8,290	30,098
Secondary facilities	969	3,023	3,992
Tertiary facilities	76	10	86
TOTAL	**22,853**	**11,323**	**34,176**
Share of delivery of essential services (%)	46.5	53.5	100.0
Share of healthcare facilities (%)	66.9	33.1	100.0

Source: Federal Ministry of Health (2018)

A cross-sectional study conducted among 415 mothers in the lay-in wards of two health facilities in Jos, Plateau state Nigeria showed that timely administration of hepatitis B birth dose vaccine was 50%. The factors responsible for delay were weekend delivery, delivery outside routine immunisation days (Tuesdays and Thursdays at the two facilities) and public holidays (Danjuma *et al.*, 2020). Also, an assessment conducted across five countries, including Nigeria, during which 23 health facilities (both private and public) were visited, highlighted the lack of vaccination services during weekends and public holidays as barriers to timely hepatitis B birth dose vaccination (Moturi *et al.*, 2018). This finding was similar to Ibraheem et al. (2019) study from 480 mother-infant pairs at the immunisation centre of General hospital, Ilorin, Nigeria.

3.4.2 Health workers' knowledge, practice and availability

In a study conducted in three (3) tertiary health facilities in southwest Nigeria, 94% of the health workers were aware of the possibility of mother-to-child transmission of HBV. However, more than half of the health workers had poor knowledge about HBV infection management in pregnancy, while only two-third offered routine antenatal screening for HBsAg (Adeyemi, Afolabi & Adeomi, 2014). This insufficient knowledge observed amongst health workers was similar to the findings by Ekpenyong, Tawari-Ikeh & Ekpenyong (2016) and Ezeonu *et al.* (2014). In contrast, in another study on PMTCT of HIV, all the health workers were aware of mother-to-child transmission of HIV, and only 8.5% of them had poor knowledge of PMTCT of HIV interventions per guidelines (Ashipa *et al.*, 2017). However, this was not the case in a study conducted in a rural area where almost 70% had poor knowledge of PMTCT of HIV (Aishat & Olubunmi, 2016).

Apart from the issue of knowledge and practice of health workers, an acute shortage of skilled health workforce for essential health service provision and liver disease specialists involved in the management of chronic HBV infection exists in Nigeria (Federal Ministry of Health, 2016a; Nwokediuko, 2011; Adebayo *et al.*, 2016). Moreover, the few specialists practice in tertiary facilities, often located in urban centres, while patients with chronic HBV infection live in rural areas (Nwokediuko, 2011).

3.4.3 Financing of Viral Hepatitis Control

Globally, lack of funding is a significant hindrance affecting viral hepatitis elimination efforts. In the LMICs especially, financial investments in proven interventions to eliminate HBV have been essentially lacking (Popping *et al.*, 2019; Gore, Hicks & Deelder, 2017; Waheed *et al.*, 2018). For example, in Nigeria, utilisation of HBV prevention and treatment services is predominantly dependent on out-of-pocket payments, except for vaccination against HBV, which is offered free of charge to all infants according to immunisation schedule (Federal Ministry of Health, 2016d; Moturi *et al.*, 2018).

According to Ezeonu *et al.* (2014) and Onakewhor *et al.* (2013), the majority of HBsAg-positive pregnant women were unable to carry out the required tests – HBsAg, HBeAg, HBV DNA viral load, etc., and procure HBIG for passive immunoprophylaxis of their babies because of the enormous cost implication considering their socioeconomic status and economic situation of the country (Ezeonu *et al.*, 2014; Onakewhor *et al.*, 2013). The finding was corroborated by the evaluation conducted by David, Phillip & Bello (2013). They found that the management of viral hepatitis constitutes a significant economic burden to affected persons living with HBV compared with HIV. The lack of funding of the programme compared to other diseases of public health importance like HIV, tuberculosis, and malaria was mainly responsible for this (David, Phillip & Bello, 2013).

The 2017 national health account did not contain any financial commitment or spending by the government on viral hepatitis. The document only showed the details of the funding sources for HIV/AIDS to the tune of N374.5 billion, as shown in Table 4, despite the possibility of co-infection of HBV and HIV occurring in the same individual. In addition, the persons living with HIV (PLHIV) and their families were responsible for 36% of the programme's financing through some user fees payments for investigations and hospital registration. The more significant remaining proportion was sourced by the government and international donors (see figure 8) (Federal Ministry of Health, 2019a).

Table 4: HIV control programme financing in 2017

Financing Source	Amount	Percentage
Federal Government	68,409	18.3%
State Government	33,256	8.9%
Local Government	9,435	2.5%
Corporations	661	0.2%
Households	134,868	36.0%
Donors (Rest of the world)	126,108	33.7%
Others & Unspecified	1,782	0.5%
Total	**374,519**	**100.0%**
Share of CHE	8.7%	

Source: Federal Ministry of Health (2019a)

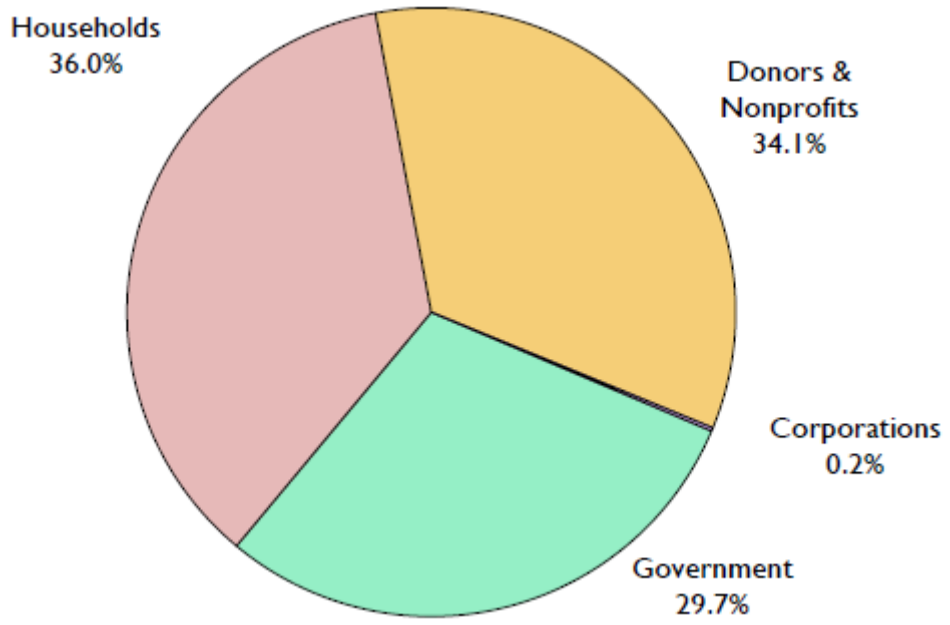


Figure 13: Proportion of HIV Financing by Households, Government, Donors and Corporations (Federal Ministry of Health, 2019a)

3.4.4 Availability of Commodities

Nigeria's Expanded Programme on Immunization (EPI), responsible for providing commodities such as vaccines, cold chain equipment, and needle and syringes, often faces funding challenges. This funding challenge has resulted in an inadequate supply of vaccines, as reported by Ophori *et al.* (2014) and Akwataghibe *et al.* (2019) in their studies. Also, the practical vaccine management assessment (EVMA) conducted in 2017 revealed a performance of 69% against 80%, which is the minimum threshold recommended by the WHO. The suboptimal vaccine management system thus led to irregular vaccine supply to health facilities, hindering the receipt of hepatitis B vaccine doses (National Primary Health Care Development Agency, 2018). In addition, outright stock out of vaccines, including Hepatitis B vaccine, was observed in some health facilities across the country following a recent analysis of stock status data from the National Immunization Supply Chain Management Information System (NISCMIS) (Gooding, Spiliotopoulou & Yadav, 2019; Jegede & Owumi, 2013).

3.4.5 Infrastructure

According to the Federal Ministry of Health (2016d, 2016b), infrastructural challenges such as inadequate medical equipment, lack of electricity and piped-in water, the poor state of access roads to health facilities, especially in rural areas, contributed to low utilisation of health facilities for ANC and facility births. Also, in a study by Ophori *et al.* (2014), cold chain equipment for vaccines across eight states was either inadequate or faulty.

3.4.6 Policies and Guidelines

Hepatitis B birth dose vaccination, a component of the algorithm for PMTCT of HBV as described earlier in figure 4, has not been fully integrated into Nigeria's essential newborn care package. Despite the availability of policy and guidelines on birth dose vaccination to control the virus at the national level, many health facilities, especially the PHCs, do not have clear standard operating procedures for hepatitis B birth dose vaccination (Moturi *et al.*, 2018; Federal Ministry of Health, 2015, 2016a). Also, standard operating procedures on how and when the vaccine is to be given were unavailable in 74% (17 out of 23) of surveyed health facilities, including PHCs (Moturi *et al.*, 2018).

Chapter 4: Discussion of the findings

The findings showed that varied factors were responsible for the poor utilisation of interventions for PMTCT of HBV in Nigeria. While some elements were demand-related, others were due to the supply challenges affecting maternal and child health services in health facilities across the country.

Individual factors influencing utilisation of PMTCT of HBV interventions

Generally, limited knowledge and low awareness about HBV, its vaccine and how it is transmitted from one person to another were observed in both the general population and ANC enrollees from the study findings. The low awareness and limited knowledge were likely responsible for the low-risk perception of pregnant women. In addition, the natural course of HBV infection with no symptoms occurring in the early phase of the infection also contributes to the low-risk perception about the severity of HBV.

Social network and community factors influencing utilisation of PMTCT of HBV interventions

Furthermore, women's access to resources and empowerment, involvement of their partners and social support were vital factors that promote the utilisation of ANC. Thus, these factors are positive determinants of access and utilisation of PMTCT of HBV interventions. For example, a woman's access to financial resources will enable her to afford the cost of ANC services and HBsAg screening and other supplementary tests required for HBV diagnosis and subsequent management if needed. It also influences the choice of where to deliver, such as in a health facility which is a determinant of the uptake of hepatitis B birth dose vaccine for the infant.

The factors are interconnected in that a woman who has resources at her disposal will most likely be empowered and motivated to take action regarding her health. It also enables her to engage her partner appropriately in matters affecting her health and their unborn children. The utilisation of PMTCT interventions is also strongly linked to the distance to health facilities. It determines the use of ANC, institutional delivery and immunisation services, especially in rural areas. The low-risk perception due to lack of awareness and poor knowledge discussed above is a possible reason for the less stigma associated with HBV infection than HIV. Having support from social networks – partners, families and friends – following disclosure of positive status for HBV influences the likelihood of a pregnant mother to seek care for herself and her unborn baby. However, the extent of the support provided by the social networks could also be limited due to a lack of knowledge and awareness on HBV infection in the community.

Sociocultural factors influencing utilisation of PMTCT of HBV interventions

According to the findings, religion, gender norms, health beliefs, and practices significantly influenced the utilisation of health facilities for ANC, delivery and immunisation services in Nigeria. However, the extent of the influence, especially on ANC and immunisation uptake, varies from the northern region of the country (consisting majorly of Muslims) compared to the southern part (majorly Christians). The study that suggested that religion did not significantly influence pregnant women's choices on utilisation of ANC was conducted in Lagos, southern Nigeria, where most of the study participants were Christians. Other factors promoting ANC utilisation, such as access to resources, level of education, women empowerment, etc., could have masked the effect of religion in the study sample. However, this is less likely to have been the case in Dirisu et al. (2020) study conducted in a rural community in Kano state.

Furthermore, the home delivery rate of 59% highlighted earlier in the problem statement is due to the interplay of the sociocultural factors mentioned above, social network and individual characteristics. The findings showed that some cultures and traditions reinforce the choice of women's delivery in non-health institutions such as homes or TBAs. Therefore, uptake of hepatitis B birth dose vaccine by infants in Nigeria is significantly impacted by these beliefs and practices. This category of newborns born outside health facilities is not reached within 24 hours of life for vaccination. In some cases, parents on the grounds of traditional beliefs and customs refuse vaccination for infants.

Health system factors influencing the utilisation of PMTCT of HBV interventions

There is an enormous gap between the supply of HBV prevention and treatment services for pregnant women in Nigeria and factors affecting demand discussed earlier. Firstly, PHCs, the level of health care that is the first and closest to the people, do not offer HBsAg screening; the essential and first step in the HBV prevention algorithm in pregnant women. The health facilities providing comprehensive prevention and treatment services for HBV are the few tertiary health centres that are mostly located in capital cities or other peri-urban areas beyond the reach of most of the population. Also, the share of delivery of essential services such as ANC provided by private facilities that account for more than half of all the health facilities is a challenge due to affordability. Furthermore, the quality of HBV prevention and treatment services provided in some of the few tertiary health facilities is poor due to a gross shortage of health workers, lack of facility standard operating procedures and inadequate competence in managing HBV in pregnancy. The situation described above is also similar to what is obtainable in the PHCs in terms of lack of routine HBsAg testing for pregnant women, viral load testing equipment and hepatitis B

birth dose for infants due to supply chain management challenges. Also, the prevailing circumstances like health facility distance and previous negative experience from contact with health facility staff such as unwelcoming attitude or outright verbal abuse during delivery play a role in the utilisation of health care services.

Furthermore, a significant constraint, according to the findings, was funding. The total lack of financing for the viral hepatitis control programme means that pregnant women and their families have to bear the expensive cost of diagnosis and treatment – ranging from screening, viral load testing, liver function tests etc., and antiviral agents. The national health insurance scheme that could have helped prevent direct out-of-pocket expenses by covering such health costs covers formal workers only, representing just about 5% of the entire population in Nigeria. Also, compared to the viral hepatitis programme, other diseases of public health importance like HIV are more subsidised mainly through government and donor funding, which has yielded significant progress over the years.

In Nigeria, access to resources by patients is vital considering the abysmal health system funding architecture and performance, which has resulted in out-of-pocket spending accounting for not less than 70% of current health expenditure (Federal Ministry of Health, 2019a). Moreover, in a situation where almost 40% of the population lives below the poverty line, preventive health services such as HBsAg screening will most likely be ignored because of the inability to afford the cost.

Lessons from proven PMTCT strategies in HIV programme in Nigeria and HBV programmes in other parts of the world

The WHO developed and introduced a comprehensive set of interlinked public health interventions or strategies used in Nigeria in the PMTCT programme for HIV (Federal Ministry of Health, 2016b). These strategies include the following:

- Primary prevention of HIV in women of reproductive age and their partners
- Prevention of unintended pregnancy among HIV-positive women
- Prevention of HIV transmission from HIV positive mothers to their infants
- Provision of appropriate treatment, care and support to HIV positive mothers, their infants and families

Obinna *et al.* (2016) advanced the HBV four-pronged approach based on the above-listed strategies developed by the WHO. This approach includes preventing HBV infection in women and their partners,

preventing unintended pregnancies in women living with HBV, PMTCT of HBV, and treatment support for women living with HBV, their partners, and children. This strategy is feasible because HBV and HIV share similar epidemiology, treatment and interventions. Hence, an integrated disease control strategy involving both infections has the prospect of delivering rapid and sustainable progress towards eliminating mother-to-child transmission of both infections (Cohn *et al.*, 2021).

The integrated strategy has been documented in the results achieved by Rwanda, China and Georgia. In Rwanda, testing platforms that incorporate the diagnosis of HBV, HIV, STIs and tuberculosis have been introduced at service delivery points in health facilities, while Georgia decentralised screening and treatment to the PHC level in addition to the integration of viral hepatitis care into existing HIV, tuberculosis and malaria programmes (World Health Organization, 2019b; Popping *et al.*, 2019). China commenced implementing integrated and standardised PMTCT interventions for HIV, syphilis, and HBV. As a result, the number of pregnant women attending ANC with access to the integrated PMTCT services increased from 5.5 million to 13.1 million within three years (Wang *et al.*, 2015a).

Furthermore, huge investments have been made over the years in terms of capacity building of health workers and programme managers, health infrastructural development and implementation research on HIV programme in Nigeria. These resources and experiences can serve as a springboard for HBV control, including PMTCT in the country. For instance, the roles of expert mothers or mentor mothers (women living with HIV who had given birth to HIV-negative babies due to PMTCT interventions) in HIV programme have been studied and found to impact ANC (Cataldo et al., 2017) significantly. They provide peer support, health information, and motivation for identified pregnant women living with HIV to overcome self-stigma as described in the integrating and scaling up PMTCT through implementation research studies (see figure 13) in Nigeria, Malawi and Zimbabwe (Cataldo *et al.*, 2017).

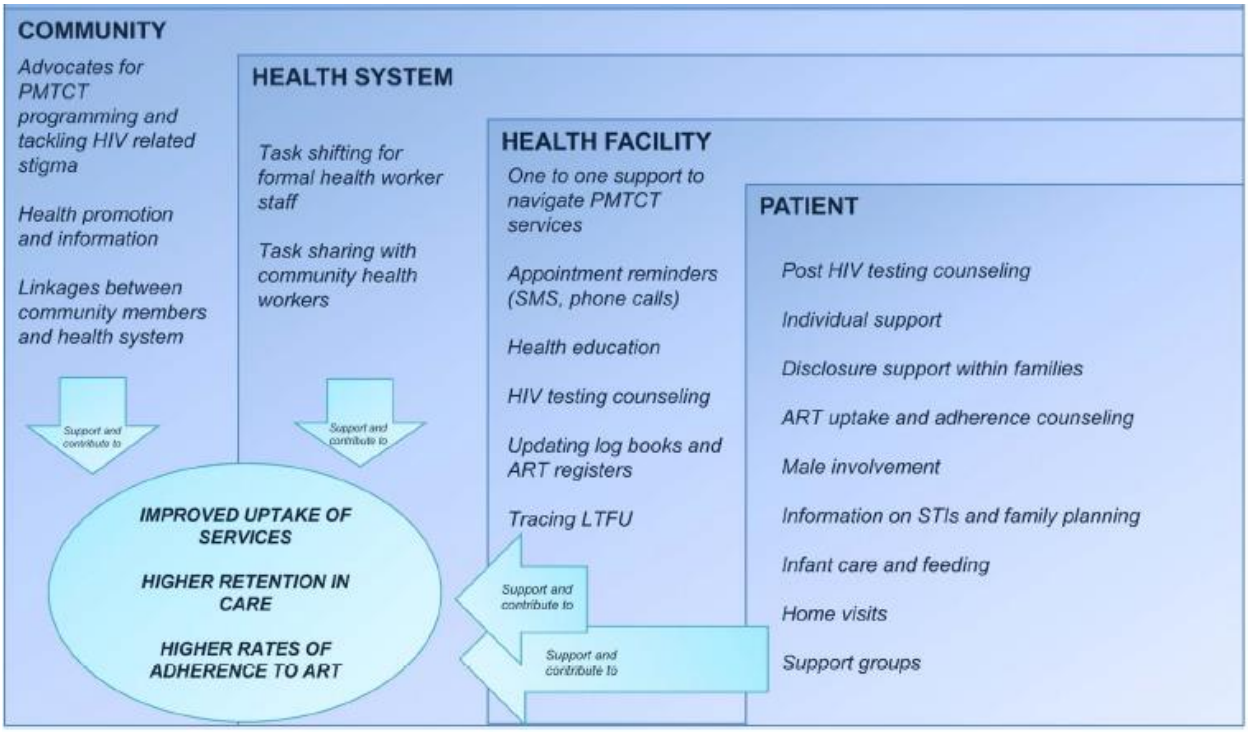


Figure 14: Roles of expert/mentor mothers in HIV PMTCT programme (Cataldo *et al.*, 2017) *LTFU: Loss to follow up

Furthermore, while the provision of antiretroviral drugs for HIV treatment is as at no cost to PLHIV, initial adoption of a reimbursement system for approved anti-HBV treatment costs incurred by persons who are living with chronic HBV could be implemented, as was done in Taiwan, pending full integration of the two programmes in terms of supply chain management of antiviral medications for the two programmes. The reimbursement program in Taiwan, which has been in operation since 2003, resulted in increased uptake of anti-HBV treatment and contributed to the significant decline in the disease progression and attributable mortality due to viral hepatitis in the country (Liu & Chen, 2020).

The socioecological model used in the analysis of this literature review was sufficient in describing the possible factors – both 'demand' and supply-side factors – influencing the interaction between the health system and pregnant women. However, no literature was seen to have directly linked motivation/self-efficacy and PMTCT of HBV in Nigeria, aside indirectly through other factors. However, the factors related in the model were relevant to the study because the interplay of these factors determines the access and utilisation of ANC, facility delivery and immunisation services. These services are critical components of the maternal and child health service package, vital for a successful PMTCT of HBV

programme in Nigeria. The study revealed a crucial gap in the immunisation service provision concerning HBV prevention in Nigeria. For example, the unavailability of immunisation clinics on weekends, public holidays, and some days of the week (according to the literature used for this study), despite the national policy on immunisation stating all newborns are supposed to have hepatitis B birth dose vaccine with 24 hours of life.

This study described and analysed factors that influence the uptake of interventions geared towards preventing mother-to-child transmission of HBV right from ANC, delivery, neonatal and infancy period. Therefore, it provides a broad overview of the PMTCT cascade in the HBV programme with potential areas for strategic interventions to improve access and utilisation of HBV screening, HBV treatment in pregnant women, and the uptake of hepatitis B vaccines in infants. However, some of the findings might have been influenced by limited literature on PMTCT of HBV in pregnant women and the general population compared to health workers with a high risk of infection due to occupational exposure from sources such as needle stick injury infected blood and blood products. For instance, the findings on stigma suggesting that it was not a significant barrier to utilising PMTCT interventions were based on limited literature. Nevertheless, the study is an addition to the little literature on PMTCT of HBV in Nigeria. It has provided a comprehensive account of different factors that require urgent attention if Nigeria makes significant progress and contributes to achieving the global 2030 target of a 90% reduction in new infections and a 65% reduction in mortality from HBV-related complications.

Chapter 5: Conclusion and Recommendations

5.1 Conclusion

This study described and analysed the factors that affect the access and utilisation of PMTCT of HBV interventions in Nigeria, with the health system-related barriers observed to be fundamental to the existence of this public health challenge. Even though other factors such as individual, social network, community and sociocultural factors that reduce the access and utilisation of these interventions exists, the state of the Nigerian health system has severely affected the availability and provision of maternal and child health services and, by extension, PMTCT of HBV interventions. Therefore, the health system needs to be repositioned and strengthened as a matter of priority while other constraints to health services – ANC, delivery and immunisation – utilisation are addressed after that. Furthermore, as the discourse on HBV infection continues to attract attention recently due to the global target of eliminating HBV infection as a public health threat by 2030, Nigeria needs to address the challenges due to the enormous projected burden of the disease.

5.2 Recommendations

To ensure Nigeria does not lag in eliminating HBVstrides, concerted efforts should be made to implement the suggested recommendations below. These recommendations are informed by the evidence identified from this literature review and are divided into policy, intervention, and research recommendations.

5.2.1 Policy recommendations

The FMOH should review and update the priority diseases of public health importance in Nigeria to include viral hepatitis (HBV) to give visibility to the disease and subsequently needed attention in terms of financing across all levels of government. For example, the basic minimum package of health services at the primary level of care funded by the Basic Health Care Provision Fund, according to the National Health Policy of 2016, needs to be expanded to include HBV screening (as a minimum) and treatment services for pregnant women.

In addition, integration of the PMTCT of HBV and HIV intervention efforts is necessary, as this is cost-effective while still achieving desirable programme outcomes from evidence gathered from other

countries. The integration policy will provide the needed opportunities in the HIV PMTCT programme, which the HBV programme can leverage, such as laboratory infrastructure for diagnosis and HBV DNA viral load monitoring, and funding opportunities from the GFATM and PEPFAR funding channels. These funding opportunities can help subsidise the cost of screening and treatment for HBV in pregnant women even if the entire cost cannot be covered in the short term.

The FMOH with NPHCDA should decentralise HBV prevention (screening) and PMTCT services to all facilities that offer ANC services, including the PHCs, as in the HIV programme. At the same time, a referral framework should be developed by nesting such PHCs offering these services to the secondary and tertiary health facilities to have a coordinated referral of clients and ensure accountability.

Another vital recommendation is to integrate PMTCT of HBV into the Maternal, Neonatal and Child Health (MNCH) programme activities at the PHC level to raise awareness of the health workers and pregnant women and their families about HBV infection.

The task sharing policy currently in effect should be made to cover the HBV programme. This policy adjustment can be achieved by simplifying prevention guidelines, algorithms for PMTCT of HBV and capacity building of all health workers, especially the lower cadres of health workers, towards mitigating the effect of the enormous specialist workforce gap in the country.

5.2.2 Intervention recommendations

Community awareness and sensitization through engagement meetings and media programmes on the importance of immunisation and antenatal care are required at the local level to drive demand generation among the general population and pregnant women for ANC, institutional delivery and immunisation service utilisation. The awareness programmes should also contain health information on PMTCT of HBV interventions and the services accessed. Also, HBV screening outreach for the general population should be done regularly to promote early identification, management of the infection, and prevention of sexual transmission of the infection.

There is a need to invest in a robust surveillance system for HBV through the existing National Health Management Information System (NHMIS). The system will enhance data-driven decisions for HBV, such as the level of financial investment required to control its transmission.

The concept of expert mothers or mentor mothers should be replicated in the HBV programme to provide mentorship and peer support for the mothers living with HBV. They can also function as community informants to link pregnant women in the community to ANC care.

Hepatitis B vaccines should be pre-positioned in the delivery room of all facilities offering labour and delivery services with clearly stated guidelines for administering the vaccine. In addition, interventions such as linkage of TBAs to the nearest PHCs (with incentives for prompt notification by the TBAs) can help to reach infants given birth to in traditional birth centres, while community informants can help track home deliveries as they do for acute flaccid paralysis case search in the polio eradication programme.

5.2.3 Research recommendations

There is a need to conduct a national survey to estimate the prevalence of HBV in pregnant women attending ANC across the country and individual states to identify states in the country that are high burden states for HBV. It will help direct more attention to such states and, in effect, quickly drive down mother to child transmission of HBV.

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