

Full Length Research Paper

An appraisal of the prevention of mother-to-child transmission of hepatitis B virus health system in Nigeria

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The study aimed to assess the strengths and weaknesses, opportunities and threats influencing the achievement of prevention of mother-to-child transmission of hepatitis B virus. It also sought to suggest recommendations to improve the current prevention of mother-to-child transmission of hepatitis B virus health system in Nigeria. A critical appraisal of the prevention of mother-to-child transmission of hepatitis B virus health system in Nigeria was conducted. The WHO health system framework was used to assess the prevention of mother-to-child transmission of hepatitis B virus system. Considering the recent call by the World Health Organization to eliminate hepatitis and the existence of a robust prevention of mother-to-child transmission of human immunodeficiency virus health system, the prevention of mother-to-child transmission of hepatitis B virus health system in Nigeria is riddled with numerous challenges. These range from a health worker crisis, poor leadership and governance, inadequate health information, medicines, vaccines and technologies and poor service delivery. Urgent action in the Nigerian prevention of mother-to-child transmission of hepatitis B virus health system is required if Nigeria is to achieve its goal of eliminating hepatitis by 2021.

Key words: Mother-to-child-transmission, hepatitis B Virus, health system, Nigeria.

INTRODUCTION

Hepatitis B Virus (HBV) constitutes a huge public health burden worldwide (WHO, 2012). It is the commonest cause of Chronic Liver Disease (CLD) in Nigeria (Musa et al., 2015). This places an enormous burden on the healthcare system and leads to loss of productivity in the active population (Su et al., 2010). HBV is vaccine-

preventable yet Nigeria is hyper-endemic (14%) for HBV with about 24 million infected people, majority of who are children and young adults (Musa et al., 2015; Forbi et al., 2010). This estimate places Nigeria as one of the most HBV affected countries in Africa (Ott et al., 2012). A recent meta-analysis showed that the pooled prevalence

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of HBV in pregnant women attending Antenatal Care (ANC) in Nigeria was 12% (Musa et al., 2015). This data represents only a fraction of all pregnant women as many women (about 40% or more) still do not attend ANC (NPC and ICF, 2014); hence it could be greater than this. Other studies have shown a similarly high prevalence of HBV in pregnant women: 8 and 11% (Olokoba et al., 2011; Mbaawuaga et al., 2008). Mother-to-child-transmission of HBV (MTCT-HBV) is a main route of HBV transmission in Nigeria (Musa et al., 2015) and contributes significantly to the burden of HBV in the country. Some studies have reported HBV prevalence in infants as high as 12 and 17 % (Donbraye et al., 2014; Sadoh and Sadoh 2013). Studies in Nigeria have reported high HbeAg-positivity rates between 30-63% (Yakasai et al., 2012; Mbaawuaga et al., 2008). Other studies in Nigeria confirmed vertical transmission rates between 40 and 53% (Ogunlaja et al., 2014; Onakewhor et al., 2001). This shows that the risk of vertical-transmission/MTCT is high and cannot be ignored in Nigeria.

The recognition of HBV as a pandemic led to the drafting of the Global Health Sector Strategy (GHSS) on Viral Hepatitis (2016-2021) (WHO, 2015) by the World Health Organisation (WHO) and the recently released Global Hepatitis Report (GHR), 2017 (WHO, 2017). Hence, both the GHSS and GHR recommend PMTCT-HBV as the key to breaking the cycle of ongoing HBV infection globally (Andersson, 2015). Without an accelerated response, the number of people living with HBV globally is estimated to remain at high levels for the next 40-50 years, with about 20 million deaths occurring between 2015 and 2030 (WHO, 2015). Nigeria will experience a fair share of this burden considering its huge population and limited resources. It is therefore crucial that Nigeria adopts PMTCT-HBV as a pathway to reducing the HBV burden in Nigeria. In response to reducing the burden of HBV in Nigeria, the Honorable Minister of Health, reiterated the Federal Government's commitment to eliminating viral hepatitis by 2021 in line with the World Hepatitis Day, 2017 with the theme "Eliminate Hepatitis". A functional PMTCT-HBV health system is fundamental to reducing the HBV burden in the country. A health system, by the WHO is a system "whose primary purpose is to promote, restore, or maintain health". The WHO framework is composed of six building blocks: leadership and governance, human health resources, health financing, service delivery, medical products, vaccines and technology and health information systems (WHO, 2007a).

For the above reasons, an in-depth understanding of the PMTCT-HBV health system in Nigeria is essential to provide information for policy and system development. The aim of this study was to conduct a critical appraisal of the PMTCT-HBV health system in Nigeria with a view to assessing its strengths and weaknesses, opportunities and threats influencing the achievement of PMTCT-HBV.

It also sought to suggest recommendations to improve the current PMTCT-HBV health system in Nigeria.

METHODOLOGY

This involved literature search via an internet-based search of websites, databases and search-engines. These include: The World Health Organisation (WHO) website, the Nigerian Federal Ministry of Health (FMOH), PubMed database and Google Scholar. Keywords and their synonyms used in the search strategy for the dissertation include: Mother-to-child-transmission (MTCT), vertical transmission, HBV, Nigeria, developing countries, Sub-Saharan Africa, health system, health services, policies. These keywords were chosen because they form the basis of the study topic. Boolean operators "AND" and "OR" were then used to obtain a final set of results containing all aspects of the study topic. Initial article selection was based on article title/abstracts. Snowballing was then used to identify relevant articles by scanning the references of those identified from the database-search. Full-text articles were read for eligibility. Inclusion criteria applied to articles for this study referred to the objectives of the study and the quality of the published material. Only full text articles written in English were used (author reads only English); articles relevant to mother-to-child transmission of HBV; maternal and child health; articles on HBV in low-and-middle-income settings. The WHO Health system framework (WHO, 2007a) (Figure 1) was adopted to assess the PMTCT-HBV health system in Nigeria. The framework is made up of 6 building blocks.

RESULTS

This section is structured following the components of the WHO health systems framework.

Service delivery

In Nigeria, health services are delivered through tertiary, secondary and primary health facilities run by the Federal, State, and Local government tiers of government respectively (Okonofua et al., 2011; FMOH, 2016a). The tertiary level of health care is provided by teaching hospitals and specialist hospitals. PMTCT-HBV services are mainly domiciled at this level, situated far away from majority of people, especially those in rural and hard-to-reach areas (Okonofua et al., 2011; FMOH 2016a).

The State Ministries of Health (SMoH) oversee the secondary level of healthcare (General and State hospitals) while the 774 Local Government Areas (LGAs) oversee the Primary Health Care (PHC) level, with support from the SMoH and private organisations (FMOH, 2016a). As at December 2011, there were over 34,000 health facilities across the country: 11,395 (33%) were private health facilities and 23,028 (67%) government health facilities. In total, 30,345 (88%); 3,993 (12%); and 85 (1%) facilities were primary, secondary, and tertiary health facilities, respectively (Makinde et al., 2014). This is a far cry from what is expected.

The WHO Health System Framework



Everybody's Business. Strengthening Health Systems to Improve Health Outcomes. WHO's Framework for Action. WHO, 2007.

Figure 1. The WHO health system framework (WHO, 2007a).

Table 1. Types of Health facilities in Nigeria by level of management and expected coverage.

Health facility	Levels of management	Expected numbers
Teaching facilities	Federal Government	1/State: Hence in 36 States + FCT = 37
General hospitals	State Government	1/LGA: Hence a minimum of 774 are expected
Primary health centres	Local Government	1/ward: Hence with an average of 10 wards Per LGA a total of 7740 are expected
Primary health clinics	Local Government and WDC	1/group of villages/neighbourhoods with about 2000-5000 persons
Health Posts	VDC/CDC	1/village or neighbourhood of about 500 persons As many as the number of villages

FCT, Federal Capital Territory; LGA, Local Government Area; WDC, Ward Development Committee; VDC, Village Development Committee; CDC, Community Development Committee. Source: Minimum Standards for Primary Health Care in Nigeria (NPHCDA, 2012).

Table 1 shows the expected numbers of facilities at each level of healthcare.

Many of the PHC facilities which several (71%) of Nigerians have access to do not offer PMTCT-HBV services. This is due to lack of essential supplies, equipment and qualified staff. Although 24-h service is available in most tertiary and secondary health facilities, very few PHCs, if any in the country offer 24-h services (NPHCDA, 2012). The administration of Hepatitis B-birth Dose (HB-BD) within 24 h of birth is crucial in preventing MTCT-HBV, yet majority (64%) of births in Nigeria occur

at home in the absence of a skilled provider (doctor, nurse, midwife or trained community health worker) with only 36% in health facilities (NPC and ICF, 2014) leading to a delay in the receipt of the HB-BD and Hepatitis B Immunoglobulin (HBIG) which is critical in PMTCT-HBV (Sadoh and Eregie, 2009). Similarly, many women, especially in the rural areas do not receive Antenatal Care (ANC), (Sadoh and Sadoh, 2014) with an urban: rural ratio of 88 %: 56 % (NBS, 2011). Those who do, book late during the second or third trimester (Oladokun et al., 2010). The ANC attendance rate in 2013 was 61

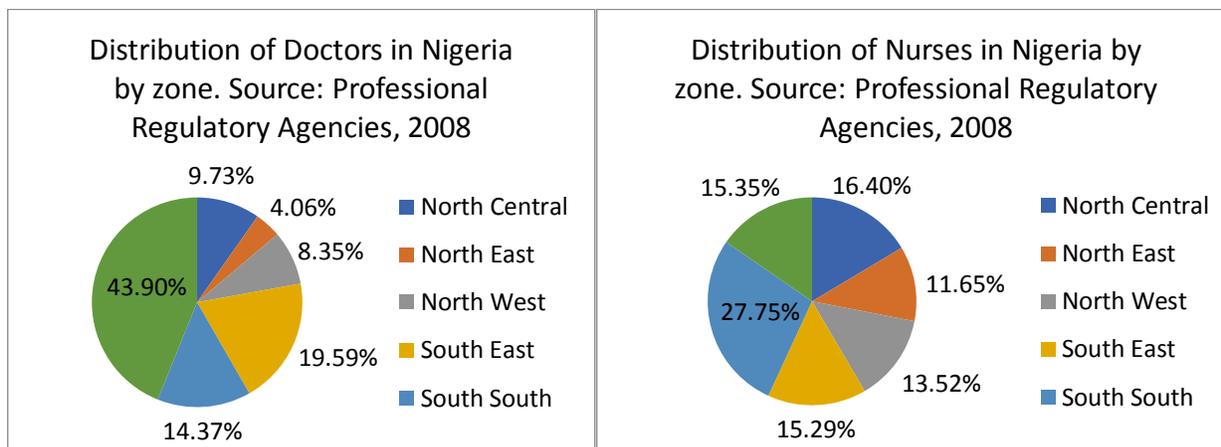


Figure 2. Distribution of Doctors and Nurses by zone in Nigeria.

and 51% for at least one visit and 4 visits respectively (NPC and ICF, 2014). Screening pregnant women for Hepatitis B-surface Antigen (HBsAg) is a prerequisite for vaccination to prevent vertical transmission (Franco et al., 2012). Unfortunately, most health facilities in Nigeria do not routinely screen pregnant women for HBV or offer vaccination services at ANC (Adekanle et al., 2015). Out of the 80% of mothers who received ANC in a study in Nigeria, only 6% of mothers were screened for HBsAg (Sadoh and Eregie, 2014). Some might argue that only those with risk factors should be screened based on cost-effectiveness but some studies showed that majority of HBsAg-positive pregnant women in Nigeria had no identifiable risk factor, making routine screening important (Adeyemi et al., 2014; Okusanya et al., 2013).

Health workforce

The WHO has estimated that a minimum of 23 health workers for every 10,000 people is required in countries seeking relatively high levels of health system coverage for the basic needs of their populations (WHO, 2016). Nigeria currently has 20 health workers per 10,000 (HRH, 2013). Impressive as the absolute figure might seem, Nigeria suffers from inadequate number of health workers. More worrisome is the inequitable distribution of health workers (Figure 2) with a disproportionately high concentration in urban areas, more in Southern Nigeria compared to the North especially with the current state of insecurity/communal clashes; in tertiary health care facilities and in facilities which mainly provide curative care. Health workers are reluctant to work in rural areas because of difficult working conditions, lack of continuing educational opportunities, shortages of medical supplies and equipment, or a lack of social services for their own families (FMoH, 2014). The frequent industrial strike actions by health workers also affect provision of PMTCT-HBV services (FMoH, 2014) (Figure 2).

In view of the health worker shortage, the Nigerian government increased the number of Community Health Workers (CHWs) by 10,000 in the first-half of 2014 and proposed to have 154,800 additional CHWs by the end of 2015, all being deployed to rural areas (FMoH, 2016a). In a similar manner, the Nigerian Government instituted the Midwives Service Scheme in 2009, as a way of increasing the numbers of midwives in the country though implementation of both schemes has been faulty (Abimbola et al., 2012). It is of utmost importance that PMTCT-HBV services are available 24 h a day/7 days a week in health facilities if Nigeria's high HBV prevalence is to be reduced. Unfortunately, very few doctors, nurses and midwives can be found at the primary level of health care which serves majority of Nigerians. Rather, most PHCs are staffed by CHWs and other lower skilled cadres who have not been trained in PMTCT-HBV, partly because a national policy on PMTCT-HBV has just been put in place (NPHCDA, 2012).

Studies showed that the knowledge of HBV management among health workers in Nigeria is low as only 32% of health workers were aware of the timing of HB-BD administration (Adeyemi et al., 2014; Nwokediuko, 2011). There are also misconceptions held by health workers concerning use of vaccine vials which lead to many infants missing the HB-BD, despite delivery in the hospital (Sadoh and Sadoh, 2014). Health professionals in Nigeria obtain the skills and competencies required to effectively care for people with viral hepatitis through schools for health professionals, on-the-job training and postgraduate training (WHO, 2013).

There are presently 14 professional regulatory bodies for maintaining standards of practice for health professionals. Some of them are the Medical and Dental Council of Nigeria, Pharmacists Council of Nigeria, Nursing and Midwifery Council, Community Health Practitioners Board, Medical Laboratory Science Council etc. but they are limited by weak structures and

institutional capacities to carry out their functions (FMoH, 2016a).

Health information and research

A National Health Research Policy and Priorities was developed by the Federal Ministry of Health (FMoH) in 2014 (FMoH, 2016a). There are also Research Institutes and training institutions supporting learning and dissemination of research products, yet research is still underfunded in most of these institutions (FMoH, 2016a). Research on advances in HBV is currently carried out by some societies such as the Society for Gastroenterology and Hepatology in Nigeria (SOGHIN) and the Nigerian Society for Paediatric Gastroenterology Hepatology and Nutrition (NISPGHAN) (Eke et al., 2016). A Hepatitis cancer registry is maintained by the National Cancer Control Programme, an arm of the FMoH, yet, routine HBV infection surveillance are not conducted in Nigeria (Howell et al., 2014). While hepatitis outbreaks are required to be reported to the government for further investigation, there is inadequate laboratory capacity nationally to support investigation of viral hepatitis outbreaks and other surveillance activities (WHO, 2015).

Medical products, vaccines and technologies

Nigeria approved the addition of HB-vaccine to the National Program on Immunisation in 1995 but only became widely available in 2004 (Sadoh and Eregie, 2008). In Nigeria, the HB-vaccine is given at birth as a monovalent vaccine, then at 6, 10 and 14 weeks as a pentavalent vaccine (FMoHN, 2012). The infant vaccination coverage in 2011 for HBV₃ was alarmingly low at 34% and for the birth-dose, 29% (NBS, 2011), while HB-vaccine coverage for adults was estimated at 41% in 2013 (GAVI, 2014). The constant availability of potent vaccines requires a functional cold chain system. This is sadly not the case in Nigeria which has led to the absence of vaccines in some health facilities (FMoHN, 2012). The Cold Chain Assessment (CCA) of the National Programme on Immunisation in Nigeria showed that 43% of cold chain equipment at the local government and health facility levels was non-functional (FMoHN, 2012).

Financing

The Nigerian Government with support from the Global Alliance for Vaccines and Immunisation (GAVI, 2014) routinely provides HB-vaccines at no cost to infants while couples provide HbIg for their exposed babies (Onakewhor et al., 2013). The cost of 1 vial of HbIg is about ₦360,000 (\$100) (Ezeonu et al., 2014) which is unaffordable for majority of parents. This was

consistent with a study in Nigeria (Ogunlaja et al., 2014) who showed that only 25% of women who were HBsAg-positive could afford HbIg due to the high cost. Majority of the population live below the minimum wage of ₦18,000 (\$50) with an average monthly income of ₦1000 (\$5) (Abdulraheem et al., 2012). The cost of screening is ₦1000 (\$2.7) in some tertiary facilities which is still prohibitive for the population's majority (Onakewhor et al., 2013).

Evidence shows that payment for PMTCT services mainly out-of-pocket or within the National Health Insurance Scheme (NHIS), which has limited coverage (Adeyemi et al., 2013). Less than 5% of the population is currently covered by any form of health insurance. Only Federal Government workers are currently enrolled in social health insurance and civil servants from most states are yet to be enrolled (FMoH, 2016a). Currently, only women in formal employment are covered by the health scheme which leaves out majority of poor unemployed women who cannot afford such services (Okonofua et al., 2011). WHO suggests that governments should aim at allocating a minimum of 5% of Gross Domestic Product (GDP) for health spending (Savedoff, 2003). Meanwhile, in Nigeria, 4.15% allocated to the health sector in the 2017 budget proposal falls short of the minimum 15% recommended by the Abuja Declaration of 2001 decided by African heads of state at a meeting. There is also no specific line item for tracking financial resources for PMTCT-HBV at all levels (FMoH, 2016b).

Leadership and governance

In 2013, the Nigerian Government through the FMoH established the Viral Hepatitis Control programme within the National AIDS and STI Control Programme (NASCP). But it was only in July 2015, that the Nigerian Government developed a national policy on viral hepatitis B control and a draft copy of the strategic plan for the control of viral hepatitis B (FMoH, 2015a; FMoH, 2015b). During the World Hepatitis Day, 2017, with the theme "Eliminate Hepatitis", the Minister of Health reiterated the commitment of the Federal Government to eliminate viral hepatitis by 2021 in line with the global commitment. Other policies which operate in Nigeria include the National Policy on screening of blood and blood products and the National Policy on injection safety in health-care settings (FMoH, 2006). It is also not known whether it is mandatory for healthcare workers to be vaccinated against HBV prior to starting work that might put them at risk of exposure to blood and blood products. This will also prevent the transfer of nosocomial infections from workers to their patients (WHO, 2015). Despite the existence of national policies, majority of healthcare providers do not have a management protocol for HBV in pregnancy (Ezeonu et al., 2014). The absence of hospital

Table 2. Strengths, Weakness, Opportunities and Threats of the PMTCT-HBV health system in Nigeria.

Strengths	Weaknesses
<p>Availability of PMTCT-HIV services in both the public and private sectors in many states</p> <p>Approximately 20 health workers/10000 persons</p> <p>Available capacity for training more human resources</p> <p>The National Health Act aims to improve health care financing through the Basic Health Care Provision Fund</p> <p>The Viral Hepatitis Strategic Plan is designed to leverage on the National Health Insurance Scheme (NHIS) Act- this could bring health insurance coverage to more Nigerians and promote disease prevention, data collection and reporting, and quality improvement.</p> <p>The National Viral Hepatitis Policy and National Strategic Plan (2016-2020) focuses on improving universal access to quality and affordable care and rapidly scale up services</p> <p>Nigeria has developed a strong health care infrastructure to provide chronic care for people living with HIV. This can be extended to viral hepatitis</p> <p>HBV surveillance can be added easily to the already existing routine surveillance for other infections</p> <p>Presence of regulatory bodies</p>	<p>Hepatitis control programmes are largely donor dependent and donor support is likely to decrease</p> <p>Low access to care because most people have low awareness of the need for prevention, early detection and treatment and cannot afford the cost of care</p> <p>Majority cannot afford the cost of care. The cost of Hepatitis B immunoglobulin is high.</p> <p>Inequitable distribution of the health care workforce</p> <p>Inequitable distribution of available PMTCT health care facilities. Majority are in tertiary institutions.</p>
<p>Opportunities</p> <p>The commitment of the Federal Government to eliminate viral hepatitis by 2021 in line with the global commitment.</p> <p>National hepatitis health awareness programmes celebrated on World Hepatitis Day sponsored by the FMoH and relevant stakeholders</p> <p>The interest in PMTCT has increased at the global and national level</p> <p>Primary health care facilities are available in every local government area with potential for developing public PMTCT health services</p> <p>Task shifting leading to training of CHWs translating to an increase in the availability of skilled health care during home deliveries</p>	<p>Threats</p> <p>PMTCT is still give low priority in the health care system</p> <p>Facilities for PMTCT are yet to be put in place in PHCs</p> <p>Inadequate human and financial capacity to provide and manage PMTCT health services</p> <p>Poor knowledge of and attitudes towards PMTCT</p> <p>Migration of health care workers to other countries for “greener pastures”</p> <p>Meagre budgetary allocations to health care at all levels of governance</p>

policies on PMTCT-HBV may hinder effective control of HBV (Adekanle et al., 2015).

Per the WHO health system framework (WHO, 2007a), the PMTCT-HBV health system in Nigeria still has some shortfalls. PMTCT-HBV services are not readily available nor accessible to majority of the Nigerian populace. Most of the services available especially at the tertiary centres

focus on curative rather than preventive care (WHO, 2000). The health workforce is also inadequate to meet the health care needs of the populace. In summary, the Nigerian PMTCT-HBV health system is not sufficient to respond to the needs of the populace. These problems highlight the need for an analysis of the strengths, weaknesses, opportunities and threats (Table 2)

associated with the PMTCT-HBV health system to proffer solutions.

DISCUSSION

The PMTCT-HBV health system in Nigeria is weak and riddled with challenges, thus underperforming across all building blocks as highlighted in the results above. Nigeria's health system performance by the WHO in 2000 was abysmally low with a rank of 187 out of 191 countries (WHO, 2000). In 2017, the situation is not any different. It is worrisome that the exact numbers of health facilities offering PMTCT-HBV services in Nigeria is unknown (FMOH, 2016a) and that majority of these services are concentrated in the few tertiary centers, and to a lesser extent the secondary facilities (FMOH, 2016a). To tackle this problem, a need assessment of health facilities and implementation of findings needs to be carried out by the FMOH to identify the gaps. PHCs need to be equipped with resources for routine screening to improve access to the majority in rural-settings. Considering that only 36% of deliveries occur in health facilities, (NPC and ICF, 2014) scaling up skilled attendance at birth during home deliveries is of utmost importance. This is feasible due to the ongoing policy of task-shifting using CHWs but will require extensive engagement of both public and private sectors (FMOH, 2014). Studies have shown the effectiveness of home-visits by CHWs in improving other interventions like malaria treatment and breastfeeding practices (Findley et al., 2013). The role of Traditional Birth Attendants (TBAs) should not be overlooked, due to their high demand especially in the Northern part of Nigeria where 22% of deliveries had a TBA in attendance. TBAs can aid in hard-to-reach areas especially in the wake of the lingering Boko Haram crisis in the North-East (NPC and ICF, 2014). The TBAs can be trained and supervised by higher cadre of health professionals. TBAs have been used successfully in Malawi and Cameroon to implement PMTCT services in areas where women had limited access to skilled-staff delivery (Hamela et al., 2014; Findley et al., 2013).

The relatively heat-stable nature of the Hepatitis-B vaccine and its use in a safe single-dose (Uniject®) makes it suitable for use in home visits Outside the Cold Chain (OCC) (Sutanto et al., 1999). The National Primary Health Care Development Agency (NPHCDA, 2012) and National Programme on Immunisation (NPI) should explore ways of improving the cold chain and OCC to reach home-births. In Indonesia, the use of Hepatitis-B vaccine OCC by village midwives to all new-borns led to an increase in vaccine coverage and minimal vaccine wastage (Wang et al., 2015). In a Randomised Controlled Trial conducted in rural China, the two study arms with home-visits by village health workers witnessed a significantly greater increase in birth-dose coverage, from 11 to 68% and from 7 to 77%, respectively, than the

group which relied on vaccination in town-clinics, with a lower coverage increase from 8 % to 58 % (Hamela et al., 2014).

The health work force is the crux of any health system hence the shortage and inequitable distribution of health workers needs to be solved. Task-shifting needs to be scaled up as several studies have shown that lower cadres of health personnel are capable of effectively delivering PMTCT-HBV services when compared to higher cadres. Training, retraining, provision of appropriate technology and supportive supervision are what is required to make this effective (FMOH, 2014). The FMOH and heads of facilities should also develop guidelines on integrating HBV into existing healthcare programmes especially HIV. This is organisationally feasible because both HIV and HBV have shared approaches hence it is easy to make use of the HIV prevention-infrastructure to address the problem of MTCT-HBV (Andersson, 2015). This also leads to better utilisation of scarce human and financial resources (Lemoine et al., 2015). The scale up of PMTCT-HBV services requires reliable and timely information to provide evidence-based information. Emphasis should be placed on a nationwide electronic medical record system (EMRS) and this needs to involve the PHCs and all PMTCT-HBV providers (WHO, 2007b).

Viral load testing should also be incorporated into existing ANC services for HBV infected mothers (FMOH, 2015a). Point-of-care (POC) tests for HBsAg and HBeAg detection are currently available, affordable and need minimal training and can be used in low-resource settings (Arora et al., 2013). Their performance has been validated in both Europe and Sub-Saharan Africa. In the Gambia, and Tanzania, sensitivity and specificity of two HBsAg POC tests have been observed to be precise (Njai et al., 2014; Khuroo et al., 2014).

HBV research should be encouraged and funding made available to carry out such research. Research and operational projects on HBV are very scarce in Sub-Saharan Africa hence increasing knowledge on global HBV prevalence and risk factors for transmission should be a priority through well-defined epidemiological surveys. The PROLIFICA programme in The Gambia and Senegal is one of the few addressing the issue of HBV testing, severity assessment of chronic hepatitis B and screening of liver cancer. It also aims at demonstrating the efficacy of Tenofovir-based antiviral therapy for preventing cirrhosis and hepatocellular carcinoma in West Africa (Lemoine et al., 2015).

The high cost of the HBIG and antiviral medications is another major challenge. The Federal Government needs to improve access to the vaccine and medication by reducing cost. This can be done in collaboration with organizations like GAVI and other donors. Alternative solutions to overcome the barriers of cost do exist. Nigeria can learn from Trade-Related Aspects of Intellectual Property Rights experiences of Egypt and

India in obtaining antiviral drugs at low prices (Lemoine et al., 2015). Social protection schemes like the NHIS should also be scaled up to cater for the majority who are not in the employ of the Federal Government. Viral hepatitis testing can be included as a preventive service in the NHIS scheme (FMoH, 2015a). Community-based health insurance system for the poor has proven to be effective in countries like Mexico, Brazil, Bangladesh and Cambodia, Guinea, Mauritania (Ahmed et al., 2016; Macinko et al., 2015).

Conclusion

This paper has tried to assess the PMTCT-HBV health system by making use of the WHO building blocks of leadership and governance, service delivery, health manpower, financing, medicines, vaccines and technologies and health information. Suggestions have also been made towards improving this health system before Hepatitis B Virus becomes a pandemic too difficult for the world to handle. The fight against HBV requires a multi-sectoral approach and strong political will on the part of the government for Nigeria to attain its goal of eliminating hepatitis by 2021.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

- Abdulraheem IS, Olapipo AR, Amodu MO (2012). Primary health care services in Nigeria: Critical issues and strategies for enhancing the use by the rural communities. *J. Public Health Epidemiol.* 4(1):5-13.
- Abimbola S, Okoli U, Olubajo O, Abdullahi MJ, Pate MA (2012). The Midwives Service Scheme in Nigeria. *PLoS Med.* 9(5):e1001211
- Adekanle O, Ndububa DA, Olowookere SA, Ijarotimi O, Ijadunola KT (2015). Knowledge of Hepatitis B Virus Infection, Immunisation with Hepatitis B Vaccine, Risk Perception, and Challenges to Control Hepatitis among Hospital Workers in a Nigerian Tertiary Hospital. *Hepat Res. Treat.* pp. 1-6.
- Adeyemi AB, Enabor OO, Ugwu IA, Belo FA, Olayemi OO (2013). Knowledge of Hepatitis B virus infection, access to screening and vaccination among pregnant women in Ibadan, Nigeria. *J. Obstet. Gynaecol.* 33(2):155-159.
- Adeyemi AS, Adeola FA, Adeleye AA (2014). Hepatitis B Virus (HBV) Infection in Pregnancy: Knowledge and Practice of Care Providers in Nigeria. *Open J. Obstet. Gynecol.* 4(10):621-627.
- Ahmed S, Hoque ME, Sarker AR, Sultana M, Islam Z, Gazi R, Khan JAM (2016). Willingness-to-Pay for Community-Based Health Insurance among Informal Workers in Urban Bangladesh. *PLoS One.* 11(2):e0148211.
- Andersson M (2015). Mother-to-child transmission of Hepatitis B Virus in Africa: is elimination feasible? *South African Centre for Epidemiological Modelling and Analysis (SACEMA quarterly).*
- Arora DR, Maheshwari M, Arora B (2013). Rapid Point-of-Care Testing for Detection of HIV and Clinical Monitoring. *ISRN AIDS.* doi.org/10.1155/2013/287269.
- Donbraye E, Japhet MO, Adesina AO, Abayomi OA (2014). Prevalence of asymptomatic Hepatitis B Virus surface antigenemia in children in Ilesha, Osun State, South-Western Nigeria. *Afr. J. Microbiol. Res.* 8(23):2329-2331.
- Eke CB, Onyire MB, Amadi OF (2016). Prevention of mother to child transmission of hepatitis B virus infection in Nigeria: A call to action. *Niger. J. Paediatr.* 43(3):201-208.
- Ezeonu PO, Onoh RC, Lawani LO, Nkwo P (2014). A Survey of the Current Management of Hepatitis B Virus in Pregnancy among Obstetrics and Gynaecological Medical Trainees in Nigeria. *JMSCR.* 2(10):2841-2855.
- Federal Ministry of Health (FMoH) (2006). Nigerian National Blood Policy. National Blood Transfusion Service. Abuja: Nigeria.
- Federal Ministry of Health (FMoH) (2014). Task shifting policy. August 2014. Abuja: Federal Ministry of Health, Nigeria.
- Federal Ministry of Health (FMoH) (2015a). A Draft Strategic Plan for the control of Viral Hepatitis in Nigeria: Prevention, Test, Care and Treatment. 2016-2020. Abuja: Nigeria.
- Federal Ministry of Health (FMoH) (2015b). National HIV/AIDS and STIs Control Program. National Policy for the control of Viral Hepatitis in Nigeria. Abuja: Nigeria.
- Federal Ministry of Health (FMoH) (2016a). National Health Policy. Abuja: Federal Ministry of Health.
- Federal Ministry of Health (FMoH) (2016b). Nigeria Every Newborn Action Plan: A plan to end preventable newborn deaths in Nigeria.
- Federal Ministry of Health Nigeria (FMoHN) 2012. National Routine Immunisation Strategic Plan, 2013-2015. Intensifying Reaching Every Ward through Accountability.
- Findley SE, Uwemedimo OT, Doctor HV, Green C, Adamu F, Afeyandu GY (2013). Early results of an integrated maternal, newborn, and child health program, Northern Nigeria, 2009 to 2011. *BMC Public Health* 13:1034.
- Forbi JC, Vaughan G, Purdy MA, Campo DS, Xia G, Ganova-Raeva LM, Ramachandran S, Thai H, Khudyakov YE (2010). Epidemic history and evolutionary dynamics of hepatitis B virus Infection in two remote communities in rural Nigeria. *PLOS One* 5(7):e11615.
- Franco E, Baqnato B, Marino MG, Meleleo C, Serino L, Zaratti L (2012). Hepatitis B: Epidemiology and prevention in developing countries. *World J. Hepatol.* 4(3):74-80.
- Global Alliance for Vaccines and Immunisation Alliance (GAVI) (2014). Country Tailored Approach for Nigeria 2014-2018.
- Hamela G, Kabondo C, Tembo T, Zimba C, Kamanga E, Mofolo I (2014). Evaluating the benefits of incorporating traditional birth attendants in HIV prevention of mother to child transmission service delivery in Lilonge, Malawi. *Afr. J. Reprod. Health* 18(1):27-34.
- Howell J, Lemoine M, Thursz M (2014). Prevention of materno-foetal transmission of hepatitis B in sub-Saharan Africa: the evidence, current practice and future challenges. *J. Viral Hepat.* 21(6):381-396.
- Khuroo MS, Khuroo NS, Khuroo MS (2014). Accuracy of Rapid Point-of-Care Diagnostic Tests for Hepatitis B Surface Antigen-A Systematic Review and Meta-analysis. *J. Clin. Exp. Hepatol.* 4(3):226-240.
- Lemoine M, Eholie S, Lacombe K (2015). Reducing the neglected burden of viral hepatitis in Africa: Strategies for a global approach. *J. Hepatol.* 62(2):469-476.
- Macinko J, Harris MJ, Phil D (2015). Brazil's Family Health Strategy-Delivering Community-Based Primary Care in a Universal Health System. *N Engl. J. Med.* 372:2177-2181
- Makinde OA, Azeez A, Bamidele S, Oyemakinde A, Oyediran KA, Adebayo W (2014). Online J. Public Health Inform. 6(2):e184.
- Mbaawuaga EM, Enenebeaku M, Okopi J, Okopi J (2008). Hepatitis B Virus Infection (HBV) among pregnant women in Makurdi, Nigeria. *Afr. J. Biomed. Res.* 11(2008):155-159.
- Musa BM, Bussell S, Borodo MM, Samaila AA, Femi OL (2015). Prevalence of hepatitis B virus infection in Nigeria, 2000-2013: a systematic review and meta-analysis. *Niger. J. Clin. Pract.* 18(2):163-167.
- National Bureau of Statistics (NBS) (2011). Monitoring the situation of children and women- Nigeria Multiple Indicator Cluster Survey 2011, Main report, Abuja, Nigeria.
- National Population Commission (NPC) and ICF-International (2014). Nigeria Demographic and Health Survey 2013. Abuja, Nigeria and Rockville, Maryland, USA: NPC and ICF-International.
- National Primary Health Care Development Agency (NPHCDA) (2012). Minimum Standards for PHC in Nigeria. 2012. Abuja: Federal Government of Nigeria. P 13.
- Njai HF, Shimakawa Y, Ferguson L, Sanneh B, Dalessandro U, Njie N,

- Lemoine M (2014). Performance of two rapid tests of hepatitis B surface antigen for screening hepatitis B virus (HBV) infection in the rural communities of the Gambia. *J. Hepatol.* 60(1):S522.
- Nwokediuko SC (2011). Chronic hepatitis B: management challenges in resource-poor countries. *Hepat. Mon.* 11(10):786-793.
- Ogunlaja OA, Fawole AA, Adeniran AS, Olawumi HO, Ogunlaja IP (2014). Mother to Child Transmission of Hepatitis B Virus in the University of Ilorin Teaching Hospital, Nigeria. *Int. J. Res. Med. Health Sci.* 4(2):1-6.
- Okonofua F, Lambo E, Okeibunor J, Agholor K (2011). Advocacy for free maternal and child health care in Nigeria-Results and outcomes. *Health Policy* 99(2):131-138.
- Okusanya BO, Adewale OA, Egbaname OA, Siyaka ES, Hassan R (2013). Scaling up prevention of mother to child transmission of HIV infection to primary health facilities in Nigeria: findings from two primary health centres in northwest Nigeria. *Afr. J. Reprod. Health* 17(4):130-137.
- Oladokun A, Oladokun RE, Morhason-Bello I, Bello AF, Adedokun B (2010). Proximate predictors of early antenatal registration among Nigerian pregnant women. *Ann. Afr. Med.* 9(4):222-225.
- Olokoba AB, Salawu FK, Danburam A, Olokoba LB, Midala JK, Badung LH, Olatinwo AWO (2011). Hepatitis B virus infection amongst pregnant women in North-eastern Nigeria- a call for action. *Niger. J. Clin. Pract.* 14(1):10-13.
- Onakewhor UE, Offor FE, Okonofua J (2001). Maternal and neonatal seroprevalence of hepatitis B surface antigen (HBsAg) in Benin City, Nigeria. *J. Obstetr. Gynaecol.* 21(6):583-586.
- Onakewhor JUE, Charurat M, Matthew O, Esosa O, Asemota MO, Omoigberale A (2013). Immunologic Pattern of Hepatitis B Infection among Exposed and Non-Exposed Babies in A PMTCT Program in Low Resource Setting: Does Every Exposed Newborn Require 200IU of Hepatitis B Immunoglobulin? *J. Vaccines Vaccin.* 4(7):207.
- Ott JJ, Stevens GA, Groeger J, Wiersma ST (2012). Global epidemiology of hepatitis B virus infection: new estimates of age-specific HBsAg sero-prevalence and endemicity. *Vaccine* 30(12):2212-2219.
- Sadoh AE, Eregie CO (2008). Age at presentation for infant immunization in Nigeria: implications for hepatitis B immunisation. *Public Health* 12(12):1318-1320.
- Sadoh AE, Eregie CO (2009). Timeliness and Completion Rate of Immunization among Nigerian Children Attending a Clinic-based Immunisation Service. *J. Health Popul. Nutr.* 27(3):391-395.
- Sadoh AE, Sadoh WE (2013). Serological markers of hepatitis B infection in infants presenting for their first immunization. *Niger. J. Paediatr.* 40(3):248-253.
- Sadoh AE, Sadoh WE (2014). Does Nigeria need the birth dose of the hepatitis B vaccine? *Niger. J. Paediatr.* 41(2):104-109.
- Savedoff WD (2003). How much should countries spend on Health. World Health Organisation. Discussion Paper (2). EIP/FER/DP.03.2.
- Su J, Brook RA, Kleinman NL, Corey-Lisle P (2010). The impact of hepatitis C virus infection on work absence, productivity, and healthcare benefit costs. *Hepatology* 52(2):436-442.
- Sutanto A, Suarnawa IM, Nelson CM, Stewart T, Soewarso TI (1999). Home delivery of heat-stable vaccines in Indonesia: outreach immunisation with a prefilled, single-use injection device. *Bull World Health Organ.* 77(2):119-126.
- World Health Organisation (WHO) (2000). World Health Report. Geneva: World Health Organization.
- World Health Organisation (WHO) (2012). Prevention and Control of Viral Hepatitis Infection: Framework for Global Action. Geneva: World Health Organization.
- World Health Organisation (WHO) (2013). Global Policy Report on the prevention and control of viral hepatitis B in WHO member states. Geneva: World Health Organization.
- World Health Organisation (WHO) (2015). Global Health Sector Strategy on Viral Hepatitis, 2016-2021. Draft for Consultation. Geneva: World Health Organization.
- World Health Organization (WHO) (2007a). Everybody's Business: Strengthening Health Systems to Improve Health Outcomes-WHO's framework for action. Geneva: World Health Organization.
- World Health Organization (WHO) (2007b). Electronic Health Records. A Manual for Developing Countries. Geneva: World Health Organization.
- World Health Organization (WHO) (2016). Achieving the Health-Related MDGs. It Takes a Workforce. Geneva: World Health Organization.
- World Health Organization (WHO) (2017). Global Hepatitis Report. Geneva: World Health Organization.
- Yakasai IA, Ayyuba R, Abubakar IS, Ibrahim SA (2012). Sero-prevalence of Hepatitis B Virus infection and its risk factors among pregnant women attending antenatal care at Aminu Kano Teaching Hospital, Kano, Nigeria. *J. Basic Clin. Reprod. Sci.* 1(1):49-55.