UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

KNOWLEDGE OF HEPATITIS B AND VACCINATION STATUS AMONG PREGNANT WOMEN IN THE NORTH GONJA DISTRICT OF THE SAVANNAH REGION.

INUSAH ABDUL-WAHAB

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DECLARATION

Student's Declaration

I hereby declare that, except for reference to other peoples's work which I have duly acknowledged, this thesis is the result of the original work. It contains no materials previously presented by another person which has been accepted for award of any degree elsewhere.

Name: INUSAH ABDUL-WAHAB

Signature: ……. Date:……

Supervisor Declaration

I declare that they preparation and presentation of the dissertation was supervised in accordance with the guidelines on supervision of dissertation laid down by the University for Development Studies.

Name: Shamsu-Deen Ziblim (PhD)

Signature: ……. Date:……

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DEDICATIONS

I dedicate this thesis to my parents.

ABSTRACT

Hepatitis B virus (HBV) causes liver inflammation leading to Hepatitis B diseases such as liver cirrhosis and liver malignancy which can be a life-threatening disease to the infected person. Very severe cases of hepatitis B virus may lead to the death of a person, making it a public health concern. Majority of pregnant women are ignorant about Hepatitis B Virus (HBV) infection status.

The main objective of this study is to determine the level of knowledge, vaccination status and factors associated with hepatitis B infection among pregnant women in North Gonja District.

The study employed a descriptive cross-sectional study with a mixed-method approach. A total of 336 participants were selected for the study and administered with a closed-ended questionnaire, Focus Group Discussion and In-depth interviews. Participants were employed using the multi-stage sampling and the purposive sampling method respectively. Data were analyzed using strata and thematic content analysis (TCA) for qualitative data and SPSS version 25 for the quantitative data.

The study revealed that. Almost all (91.9%) have visited ANC, Over 60% have heard about HBV before. Overall, 61% of the women had good knowledge of the hepatitis B virus. The study further revealed that about 42% of the women were said to be at high risk of contracting HBV. Also, only 32% of women have taken the hepatitis B virus vaccination. Furthermore, about 39% adhere to the preventive measures of the HBV.

Though the study participants demonstrated appreciable knowledge of HBV, their risk profile was still high, adherence to preventive protocol very low, and very low vaccination coverage among the pregnant women. It was observed from the study that, most of the health facilities do not have the test strips to screen for hepatitis B virus. Ghana Health Service in collaboration with the National Health Insurance Scheme should make testing and vaccination of pregnant women visiting antenatal carefree by supplying test kits and vaccines to lower health facilities.

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ACRONYMS / ABBREVIATIONS

AIDS - Acquired Immune Deficiency Syndrome

ANC - Antenatal Care

CHB – Chronic Hepatitis B

CHBV – Chronic Hepatitis B virus

DMIS - District Management Information System

DNA - Deoxyribonucleic Acid

EPI - expanded Programme on Immunization

FGD - Focus Grouped Discussion guide

FP - Facility Performance

GES – Ghana Education Services

GSS – Ghana Statistical Service

HBeAg - Serum Hepatitis B Envelope Antigen

HBIG - Hepatitis B immune globulin

HBV - Hepatitis B virus

HCC - Hepatocellular Carcinoma

HIV - Human Immunodeficiency Virus

HSV-2 - Herpes Simplex Virus Type 2

IDI - In-depth interview guide

KATH – Komfo Anokye Teaching Hospital

KNUST – Kwame Nkrumah University of Science and Technology

LI - Legislative Instrument

LMIC - Low- and Middle-Income Countries

PHC - Population and Housing Census

SPSS - Statistical Package for Social Sciences

STDs – Sexually Transmitted Diseases

TDP - Total District Performance

UK - United Kingdom

WHO - World Health Organization

CHAPTER ONE

1.0 Introduction

This aspect of this project introduces the study from a broad outlook of the subject matter and narrows it to specific issues of concern. Thus, it begins with the scope, content, objectives and significance of the study by highlighting topical issues critical to the subject matter. The chapter is divided into subheading which includes the background of the study, stating the problems, the main research question, specific research questions, stating the main research objective, specific objectives, justification of the study, limitation of the study as well as the operationalization of some keywords, organization of the work and framework guiding the progress of the work.

1.1 Background of the study

Hepatitis B virus (HBV) causes liver inflammation leading to Hepatitis B diseases such as liver cirrhosis and liver malignancy which can be a life-threatening disease to the infected person(Bittaye et al., 2019). Very severe cases of hepatitis B virus may lead to the death of a person, making it a public health concern(WHO, 2017). Majority of pregnant women are ignorant about Hepatitis B Virus (HBV) infection status. Consequently, they live with this complex disease without knowing. HBV infections are sometimes asymptomatic; meaning there is a possibility that people will be contagious without his or her knowledge (WHO, 2015). However, some group of people may exhibit a couple of critical symptoms like vomiting/nausea, fatigue, low appetite for food, jaundice or pain in the abdomen(Yakasai et al., 2012). The transmission route of hepatitis B among the high-risk group in low endemic areas is through sexual contact whilst perinatal transmission route is among high endemic areas like Sub-Sahara Africa and

Asia thus; during labour and delivery, due to the infant exposure to maternal blood and other body fluids (WHO, 2015). Pregnant women with chronic hepatitis B virus have more than 69% but less than 91% probability of transmitting the infection to neonates, however, the transmission among young children under five years is 20% - 60% (WHO, 2017). Most hepatitis B virus infections are acquired during the perinatal period and early childhood (Otta et al., 2012). There is a soaring prevalence of hepatitis B infection among women of reproductive age and about 65 million women can potentially transmit the disease to their newborn (WHO, 2017). A segment of the "HBsAg positive mothers and HBeAg positive" may perhaps be at an increased risk of transmitting HBV infection to their unborn babies(Adekanle et al., 2015). These babies are at high risk (90%) of being chronic carriers of HBV infections leading to an increase in the population pool of the virus(Bayo et al., 2014). The most effective mediation to avert mother to child spread of Hepatitis B is through early identification of HBV disease-ridden pregnant women and the screening of asymptomatic pregnant women to diagnosis the infection early enough and place them under the appropriate treatment(Awiah, 2018). Universal Hepatitis B Immunization Programmes that aims at pregnant women and children, with the first dose at birth, have been highly active in reducing the occurrence and prevalence of hepatitis B in many endemic countries. Countries in sub-Saharan Africa are at different phases of introducing hepatitis B vaccines into primary health care (WHO, 2015). In Ghana, the Universal Hepatitis Immunization Programme was introduced into the Expanded Programme on Immunization in 2002 and all pregnant women visiting the antenatal clinics are tested for hepatitis B virus irrespective of whether she has been tested and taken the vaccine previously or not(Ofori-Asenso & Agyeman, 2016) Those who have

not received the vaccines are advised to go for it during ANC visit. HBsAg and HBeAg positive mothers are immediately placed on the tenofovir vaccine and providing the newborn hepatitis B birth dose and hepatitis B immune globulin within the first day of birth and completing the vaccine series(Awiah, 2018; WHO, 2017).

Awareness of pregnant women on hepatitis B and the knowledge on how it can be prevented through testing and vaccination is important for the effective control of the disease(Troung, 2019). As perinatal transmission remains the most important route of spread of the disease, it is critical to launching strategic ANC programs to involve women within the reproductive age to check the mother-to-child spread of HBV. Such interventions would entail mothers understand the essentials of HBV testing and vaccination when pregnant, the importance of appropriate infant hepatitis B vaccination, and for disease-ridden mothers the significance of the newborn getting hepatitis B birth dose and hepatitis B immune globulin within the first day of birth and finishing the vaccine series. However, a study conducted in Uganda indicates that a lot of Pregnant women and mothers lack knowledge concerning HBV transmission and its control measures irrespective of their age, educational level, job classification, household income, and previous exposure to HBV information and time and again do not see the importance of testing and vaccinating themselves against the disease(Bayo et al., 2014).

In Ghana, available relevant research has demonstrated that information about HBV, which comprises of how the disease is spread and control measures; are woefully inadequate among pregnant women. In northern Ghana, relevant literature as shown in a study conducted in the Upper West Region with a focus to look at the knowledge of HBV among pregnant women stated inadequate level of knowledge and misunderstandings

about the disease(Awiah, 2018). Concerning the above, a study carried out among pregnant women at antenatal clinics in the Kintampo North Municipal shows that about 61% of the respondents were unaware hepatitis B was a disease(M. A. Abdulai et al., 2016). Studies have also that HBV vaccination has been very low among pregnant women (Adeyemi et al., 2013; Eni et al., 2019). The inadequate level of information and its assimilation on HBV amongst women who are pregnant remains an unexploited prospect to teach pregnant women on the cascading problems associated with HBV complications on the pregnant women (mother) and the fetus. From the aforementioned, emphasizes should be placed on health promotion intervention to increase knowledge and vaccination of HBV among women of reproductive age.

1.2 Problem Statement

Hepatitis B Viral Infection (HBV) is one of the leading causes of illness and death in the globe, resulting in about 38-53% cases of chronic liver diseases and about six hundred and six thousand (686,000) deaths every year(Ngaira et al., 2016). In Sub-Saharan Africa, the prevalence of HBV infection is 9 – 20% and in Ghana, it is 12.3% among the universal population and 13.1 % among pregnant women, this exceeds the (≥8%) threshold for high endemic countries (Ngaira et al., 2016; Ofori-Asenso & Agyeman, 2016; WHO, 2015). Mother to child transmission of hepatitis B is still the principal causal factor of becoming a chronic hepatitis B infection carrier, thus about 95% for infections acquired during the perinatal period compared with only 5% for those acquired during adulthood (WHO, 2017).

Good knowledge of hepatitis B among pregnant women is the most effective way to improve testing and vaccination against this infection, however, there is low knowledge on hepatitis B among pregnant. A study conducted in Northern Vietnam shows limited knowledge regarding hepatitis B virus transmission and control/prevention irrespective of their age, household wealth and educational level(Hang Pham et al., 2019). Another study conducted among pregnant women in the Kintampo North Municipal in Ghana reported over 50% of the respondents were not aware of hepatitis B virus infection (Abdulai et al., 2016). Also, a study conducted among pregnant in Gushegu in the Northern Region of Ghana shows that only 47.5% of respondents have heard of HBV and only 2.5% of them received the vaccination before becoming pregnant(Zimtani, 2018). Two studies conducted among pregnant women in Nigeria also revealed that only 9.7% and 21.2% respectively received HBV vaccines(Adeyemi et al., 2013; Eni et al., 2019).

There is little data on the prevalence of hepatitis B in the North Gonja District due to the ineffective-testing and vaccination of HBV. From the district management information system (DMIS) data, the district recorded 21 cases of viral hepatitis in 2017, 7 cases in 2018 and 5 cases in 2019 among the general public. No effort has been to determine the prevalence of and vaccination level of this infection among pregnant women.

To the best of the researcher's knowledge, there has not been any study assessing pregnant women's knowledge and vaccination status on hepatitis B virus infection in the North Gonja District. This study will access both those who have access to the ANC clinic and those with limited access to health facilities.

1.3 Research Questions

1.3.1 Main Research Question:

What are the factors influencing Knowledge and Vaccination uptake on HBV among pregnant women in North Gonja District North Gonja District?

1.3.2 Specific Research Questions

1. What is the knowledge level of Hepatitis B virus infection among pregnant women in the North Gonja District?
2. What is the status of Hepatitis B Vaccination among pregnant women in the North Gonja District?.
3. What are risk factors are associated with HBV infection among pregnant women in the North Gonja District?
4. What measures are in place to prevent the risk of HBV infection among pregnant women in the North Gonja District?

1.4 Objectives of the study

1.4.1 Main Objectives

To determine the factors influencing Knowledge and Vaccination uptake of HBV among pregnant women in North Gonja District.

1.4.2 Specific objectives

1. Assess the knowledge level on Hepatitis B virus among pregnant women in the North Gonja District.
2. Examine Hepatitis B vaccination status among pregnant women in the North Gonja District.

3. To assess the risk factors associated with HBV infection amongst women who are pregnant in the North Gonja District.
4. To explore measures to avert the risk of HBV infection among women who are pregnant in the North Gonja District.

1.5 Conceptual framework on HBV amongst women who are pregnant

This conceptual framework provides a linkage between the Dependent variable(HBV Vaccination status) and the various independent variables such as; Socio-demographic characteristics, HBV risk factors, Prevention measures, knowledge on HBV and Health services availability.

An increase in age and educational level of pregnant women will influence their awareness of infectious diseases like HBV, leading to the adaptation of appropriate prevention strategies including testing and vaccination against HBV. The age, educational status and income of pregnant women may influence ANC attendance. ANC attendance influence knowledge on HBV, which leads to testing and vaccination against HBV.

Availability of health facility in the district may result in higher ANC attendance, leading to the provision of health education and promotion intervention such as HBV health talk, screening and vaccination against HBV as illustrated in the diagram below.

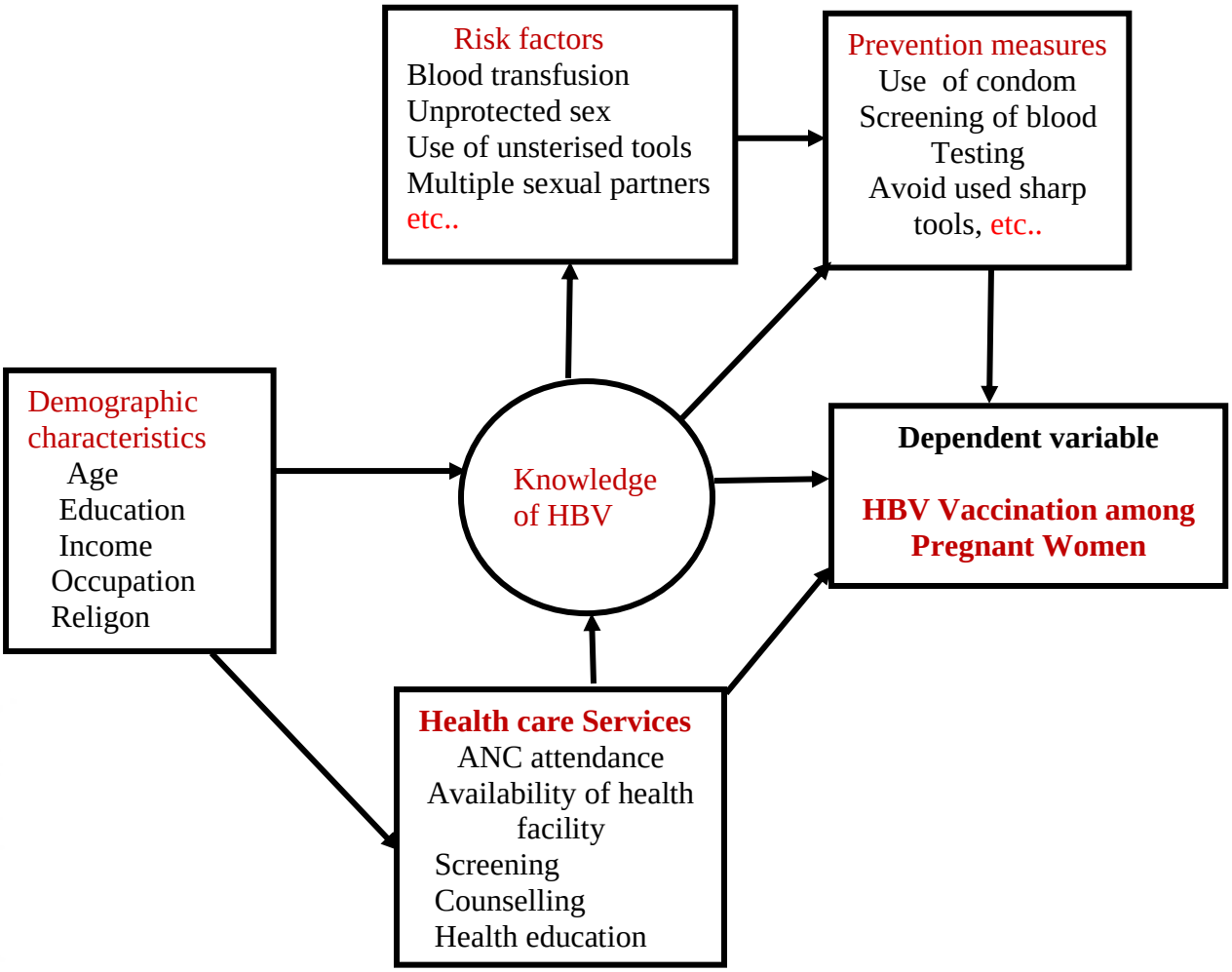

Figure1.1: Author's own design of Conceptual Framework

1.6 Significance of this Study

This study has provided data to support the need for the introduction/expansion of programmes/interventions to prevent mother to child transmissions of hepatitis B virus in the North Gonja District and Ghana at large. This study has unearthed people understanding of HBV infection in rural communities. This study also serves as a reference for future researches on this field(Sero-prevalence)

1.7 Limitations of the study

Every scientific study has potential study weaknesses that are usually out of the researcher's control, and this may be as a result of research design, the statistical methodology used, funding challenges, and many other constraints(Theofanidis & Fountouki, 2018). Ideally, all communities in the North Gonja District should have been part of this study but because of resource constraints, the researcher carefully sampled communities with health facilities where Antenatal attendance was encouraging and also sampled communities without health centre but maybe receiving health service through community health nurses.

The use of professionally trained nurses working at the selected health facilities for the data collection might have influenced the responses from the study participants as there to exist the temptations of respondents being influence by the healthcare workers. The researcher minimized this influence by conducting focus-grouped discussions across some selected study facilities, this data was used to support and validate the quantitative interviews conducted by the nurses.

The researcher initially planned to conduct two focus-grouped discussions in each of the selected communities but as a result of the Covid-19 pandemic, it became difficult to get participants to have dispassionate focus-grouped discussions. The researcher managed to organize four focus-grouped discussions, one in each selected community.

The limited time frame for the whole research work influenced the study sampled size used in the study. However, the researcher finally had an appropriate sample size that was representative of the study population.

1.8 Organization of the Thesis.

This thesis is organized into six Chapters. The First Chapter (Chapter One) consist of the introduction of the study, Problem Statement, Main research question, specific research questions, Main research objective, Specific research objectives, the study Conceptual Framework, Justification of the study, and conclusion with the study limitations.

The Second Chapter (Chapter Two) deals with the review of relevant literature on Hepatitis B which guides or supports the study.

The Third Chapter (Chapter Three) is made up of two subsections; Section A &B. Section A consist of Location of the District, the population of the District, Culture, and Ethnicity, Chieftaincy/ Local Administration, Education, Economic Activities, District Roads Network, and Health Infrastructures and Staff. Section B looks at the Study Design, types of data, Sources of Data, Tools for data collection, Study Population, Sampling techniques and sample size calculation, quality assurance measures, ethical clearance and ends with how Data was Analysis and Presentation. The fourth chapter (Chapter Four) deals with the analysis of data presentations, whilst the fifth Chapter (Chapter Five) covers the discussions of results and study findings. The last chapter (Chapter Six) covers a summary of key findings, recommendations, and conclusions**.**

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section of this thesis focuses on reviewing relevant scholarly materials on hepatitis B following the specific objectives of the study as well as a general overview of HBV. The section allows the researcher to provide the basis for the current study as well as giving credit where necessary to other relevant work published by other researchers. The literature review section disallows the duplication of information on the subject matter.

2.1 Overview of HBV infection

Hepatitis B virus (HBV) is the smallest virus and most dangerous species of the hepatitis family. They are usually caused by the hepatitis B virus, a partly double-stranded enclosed deoxyribonucleic acid (DNA) virus, that is said to be among the family hepadnaviral infections (Harris et al., 2018; Kolawole et al., 2012; WHO, 2017). The hepatitis B virus disease targets the liver, leading to the death of the liver cell and consequently, inflammation occurs (WHO, 2015). Though the virus affects the liver, it is usually highly concentrated in the blood, other areas where the virus could also be found are in semen and saliva(Budd et al., 2017). From the foregoing, therefore, the hepatitis B virus is said to spread from one person to another via kissing, saliva exchange and unprotected sexual intercourse with a person having HBV, it can also be transmitted from pregnant woman to the child at the time of childbirth, children sucking infected mother's breast can contract the infection (Djaogol et al., 2019; Posse et al., 2017; Shimakawa et al., 2016; Vyas et al., 2018; Wilson et al., 2018). Aside from the above, blood transfusion from an infected person(Adjei et al., 2018; Bawah et al., 2020), hospital-

acquired infection(Malewezi et al., 2016; Pan et al., 2018), unintentional piercing from sharp objects including syringes and needles from an infected person, glasses etc. and intentional piercing for beautification and medical purposes such as tattooing, ears and nose piercing, tribal marks, circumcision, cutting of umbilical cord etc. are supplementary ways a person can contract the hepatitis B infection(Afzali et al., 2015; Malewezi et al., 2016; Omatola et al., 2020; Yakasai et al., 2012). Available literature has shown that HIV/ AIDS (human immunodeficiency virus/ acquired immune deficiency syndrome) is 50 to 100 times less contagious than the hepatitis B virus (Hepatitis Foundation International, 2006; WHO, 2015). Hepatitis B virus can live when kept for less than 16 years at not more than -21℃ and lasts for about 168 hours (thus about 7 days) when kept at a temperature of 44 degree Celsius (Pievsky et al., 2018).

Through these 168 hours, the HBV can reproduce or replicate when it finds its way to the body of a person who has not taken the HBV vaccine. If the virus then gets the chance to reproduce, the projected nurturing period for the infection ranges from 75 days to about 180 days (Krugman et al., 1971). The hepatitis B virus is believed to show-up its signs and symptoms from the first 30 to 60 days after a person contracts the infection and can persevere and advance to the long-lasting HBV(Juszczyk, 2000). There is a high concentration of HBV in human; blood, serum, serous exudates, saliva, semen, vaginal fluids (Giri et al., 2016; Kumar et al., 2016).

Hepatitis B virus infection can be severe or long-lasting and could span from asymptomatic infection or minor disease to severe or uncommon fulminant hepatitis. “Acute hepatitis B infection is usually a self-limiting disease marked by acute inflammation and hepatocellular necrosis, with a case fatality of 0.5-1%” (Lavanchy &

Kane, 2016). Chronic HBV infection involves a range of the disease and replicates the existence of noticeable HBsAg in the person's bloodstream or serum for more than 180 days, with or without related active viral duplication and a sign of liver cells injury and tenderness (WHO, 2017a).

2.2 Ways by which HBV infection can be transmitted

The spread of hepatitis B virus infection lengthways the three phases in life; periods of natal, during infancy, and in grown-up life (Cheung & Lao, 2020). The critical ways of the spread of HBV include; mother-to-child (perinatal), child-to-child (horizontal), sexual and parenteral (adult life) (Cheung & Lao, 2020; Jing et al., 2020). The mode of spread of HBV varies from country to country. For instance, in Africa where the rate of HBV is somehow is high it is observed that majority of the adolescent contract HBV via sexual intercourse and drugs abuse (Abesig et al., 2020; McNaughton et al., 2020). In a similar vein, jurisdictions with transitional prevalence usually have horizontal spread comparative to under highly developed states (Chamroonkul & Piratvisuth, 2017). In low- and middle-income countries thus countries with a higher prevalence of HBV, a vertical spread is very paramount among the population with a higher incidence among children (Zheng et al., 2018). transmission of HBV from a pregnant mother to her child and children transmitting it to a colleague at the early stage of their development are Mother-to-child (perinatal) and child-to-child transmission during the early years of life are the principal routes of the infection transmission (M. A. Abdulai et al., 2016).

The vertical spread of HBV is the most popular way of transmission globally (Pol et al., 2018). There exist some strict 3 likely paths for the spread of hepatitis B from the parent(mother) to the newly born baby; trans-placental spread of the infection in the

womb (when there is a cut in the placental resulting in womb infection); natal spread, that is the in process of childbirth (when the infant comes in contact with the blood and other body fluids, minor cut/ scratch on the child at birth); and postpartum spread through the breastfeeding process(Henderson et al., 2019b; Singh et al., 2016). A study conducted by Viviani et al, 2008 has revealed that hepatitis B reactive mothers have a greater probability of spreading the disease to their newly born babies, by extension these babies have over 50% chance of not able to effectively utilized the hepatitis B vaccine (Viviani et al., 2008). Similarly, babies who become HBV reactive before 12 months have more than 80% tendency of becoming a carrier (Hadziyannis, 2011).

The World Health Organization described in 2015 that, there is missing (fifty) 50 per cent Hepatitis B virus cases among mother to child spread of the infection (WHO, 2017a). The HBV disease can as well be spread between people living together (family) via contact of broken tissue (wounds etc.) or mucus membrane through semen, Saliva etc. Unprotected sexual encounter, blood and other blood product transfusion, hospital-acquired infection and percutaneous inoculation are all ways one can contract HBV via a horizontal transmission (Abedi et al., 2011; Schillie et al., 2018).

2.3 Clinical presentation of Hepatitis B virus infection

The signs and symptoms associated with hepatitis B are usually in stages or phase. The first or initial stage is characterized by the following; malaise, general bodily weakness, anorexia, fever, stomach tenderness, queasiness and vomiting, pains at the joint, urticaria etc. The second stage is usually called the icteric phase which happens within a week to about 8weeks after the first phase of the infection (Bartoloni & Zammarchi, 2012; Woodruff & Wright, 2013). This stage mirrors the time where the liver is swollen and

bile ceased to be excreted and is gathered in the stream of the blood. The reactive person would therefore display the following manifestation; yellowish of the eyes (jaundice), itching, urine with a dark color, increased enzymes of the liver, physical enlargement of the liver, and inflammation in the right upper side of the abdominal walls. People with fulminant hepatitis B could exhibit the following conditions; hepatic encephalopathy, somnolence, psychological delirium unconsciousness, ascites, intestinal haemorrhage and coagulopathy (Toris et al., 2011; Wijdicks, 2016).

2.4 Phases of HBV infection

They are three principal phases of HBV infection. These include; Acute, fulminant and chronic phases

Acute hepatitis B virus infection

This phase of the infection comes with or without symptoms. The symptomatic acute hepatitis B virus is much frequent and often occur in children. Acute hepatitis B virus infection elapses between a rapid sequence and recovery is manifest by “hepatitis B surface antibody (anti-HBs) seroconversion”. For a patient who shows signs and symptoms of the hepatitis B virus, they include the following; malaise, vomiting, anorexia, nausea and high temperature which could persevere for numerous weeks (Chisari et al., 2010; Trépo et al., 2014).

Fulminant HBV infection

Within 56 days before the start of the signs and symptoms of hepatitis B virus, the appearance of signs of chronic liver disease, including “coagulopathy, increasing bilirubin levels with declining aminotransferase levels, and a decreasing liver size, with

or without hepatic encephalopathy symbolizes Fulminant hepatitis B" (Alonso et al., 2017; Hernaez et al., 2017). The occurrence of fulminant HBV is greater in children than other categories of people and happens oftentimes at 8 weeks of age in newborns of HBsAg reactive- mothers (Tamandjou, 2014). Pol et al., (2018) shown that less than 1% of women who are pregnant could advance to fulminant hepatitis, leading to liver death (necrosis of the liver) (Pol et al., 2018).

Chronic HBV infection

The perseverance of HBsAg in serum for over 24 weeks of CHBV infection. Chronic infections progress in about 90% of infants (<12 months of age) disease-ridden with HBV, in roughly 30% of serious infections before 72 months, and in less than 1 to 12% among severely infected aged people (Harris et al., 2018; Henderson et al., 2019a; Terrault et al., 2018). The significance of untreated CHBV is grave long-standing wellbeing problems which include CHBV, cirrhosis of the liver, and hepatocellular (benign tumour). Chronic hepatitis B virus infection mostly comprises about three (3) to four (4) stages, according to the serum hepatitis B envelope antigen (HBeAg) and HBV DNA status (I. Abdulai, 2017).

The Four Phases of Chronic Hepatitis B virus (CHBV) **infection**

CHBV infection has 4 (four) diverse phases with various timing and results and these stages are allied to the extent of hepatitis B virus reproduction and how the immune system responds to the infection.

1. Immune - tolerant phase: This stage characteristically spans for two weeks to a month among healthy grown-ups and eras in infested newborns. HBV protein (HBeAg) exist in

this phase (Shi & Shi, 2009) and the harm to the liver is very scanty because the immune system endures or tolerate the virus (Oakes, 2014).

2. Immune-clearance stage (immuno-reactive): Immunotolerance is missing and the immune structure fights infected liver cells (Oakes, 2014). It mostly happens on personnel who contract hepatitis B virus infection in late childhood, puberty or matured individuals. Immunotolerance is missing, and the fighting mechanism attacks the disease-ridden liver cells (Oakes, 2014). HBeAg could be recognized within sera and deteriorates in hepatitis B DNA. This is realized in some category of hepatitis B reactive client whose immunity is removing the hepatitis B in the body. The length of this phase for reactive HBV patient with critical infection is nearly 3 weeks to a month (symptomatic period) (Pievsky et al., 2018).

3. Inactive-carrier stage: the hepatitis B viral reproduction in this phase is low and usually no longer measured (Pievsky et al., 2018). The category of patients forms the greatest group with hepatitis B virus. This stage is featured by HBeAg negative HBV with low or untraceable hepatitis B DNA levels a normal ALT and without any danger/ destruction to the liver (Wiseman et al., 2009)

4. Re-activation stage: In this stage the infected person reconverts to HBeAg positive spontaneously or due to immunosuppression. Individuals can transmit the virus easily. This stage is featured usually by noticeable hepatitis B virus DNA levels, high alanine-aminotransferase (ALT) levels, moderate to severe necrosis, inflammation and liver tissue removal shows variable quantities of fibrosis (Oakes, 2014).

2.5 Possible complications of HBV infection

Liver cirrhosis and hepatocellular (liver cell) carcinoma (HCC) are the main problems of chronic hepatitis. In general, Hepatitis B virus infection results in about 45 per cent of cases of HCC and about 30 per cent of liver cirrhosis, with greater proportions in underdeveloped countries (Labarga et al., 2007). The World Health Organization (WHO) predicts that less than 30% of those who become chronically infected will improve these obstacles, and a predict that about six hundred and fifty thousand (650 000) people with HBV infection will pass on a year due to CHB (WHO, 2017b). The capacity of the hepatitis B virus to produce the above-stated health complications couple with reproductive impediments, throughout the stages of birth can't be undermined (Borgia et al., 2012).

2.6 Treatment/management of hepatitis B virus infection among reactive patient.

The ideal standard with regards to the treatment of HBV is to prevent the progression of the infection to advance stage such as liver cirrhosis, failure of liver or hepatocellular (liver cells) carcinoma (HCC) (Sorrell et al., 2009). In general, the treatment regime and management modalities of HBV are usually very limited due to the cascading effects of the available treatment on the foetus (Pol et al., 2018). The following medications; Lamivudine, Telbivudine and Tenofovir are the best choice of treatment for HBV in pregnancy. Though the drugs listed above are safe in pregnancy, Telbivudine and Lamivudine not recommended treatment options for breastfeeding mothers due to a higher concentration of drugs in breast milk (Pol et al., 2018). In cyesis, it is commended that reactive client with a greater viral load (above two thousand (2000) copies per ml) be

administered with tenofovir in 32nd-week pregnancy this should continue until three weeks after childbirth at a dose of 300mg each day (Dyson et al., 2014).

2.7 Global Hepatitis B Prevalence

According to a (WHO, 2015) report, more than 2, 000, 000, 000 (2 billion) people are infected with hepatitis B virus infection globally. Out of the 2 billion, 5% representing three hundred and sixty million (360,000,000) people worldwide are severely infested with the HBV infection (WHO, 2015).

Besides, the above, a projected six hundred and twenty thousand (620,000) people are infected with HBV infection annually (Wiktor & Hutin, 2016). According to the Global Burden of Disease 2010 as cited by Lozano et al, (2012) revealed that about seven hundred and eighty-six thousand (786,000) people die as a result of hepatitis B virus infection of which 17% (representing about 132,200) of the deaths were attributed to acute hepatitis B (AHBV), 43% (representing about 341,400) were attributed to liver cancer and about 40% (312,400) were attributed to liver cirrhosis (Lozano et al., 2012).

The hepatitis B virus remains a serious public health issue despite the availability of vaccine for prevention and antiviral medication for the management of the infection. In 2015, chronic hepatitis B virus (CHBV) (measured by seroprevalence of HBsAg) was said to have affected about 3.5 per cent of the population (representing a total of about 257,000,000 peoples) globally which comprises about (65,000,0000) sixty-five million women of reproductive age. According to the World Health Organization, the highest incidence of HBV occurs in Africa (6.1%) and Western Pacific regions (6.2%) which represents over 95 million people and more than 75 million people in Africa and Western Pacific region respectively (Schweitzer et al, 2015). The statistics affirm that there are a

lot of people with HBV reactive status (chronic) in the Western Pacific region as compared to those living in the Americas (Akapa et al., 2014).

Concerning the above figures, the World Health Organization has put the globe into three (3) main blocks with regards to the CHBV cases. These blocks range from low, intermediate and high prevalence.

Places that are considered high prevalence have an overall prevalence of CHBV to be equivalent to or more than eight per cent (8%). Countries in these categories include the following; North America, South America, Sub Saharan Africa and most Asian countries. Also, areas that are considered to be intermediate prevalence are those areas with an overall prevalence of CHBV being between more than 2 per cent but less than 7 per cent. Countries within the intermediate zone include "South America, North Africa, Western Europe, Eastern Europe and the Indian subcontinent"

Lastly, areas that are considered low prevalence zones are those areas or zones with an overall prevalence of CHBV being not more than two per cent (2%). Countries within the low prevalence zone include the following most of the North American countries, Australia and most of Western Europe including the United Kingdom (UK) (I. Abdulai, 2017).

According to WHO (2016), more than ninety per cent (90%) of pregnant women live in Sub- Saharan Africa, China and South Pacific (WHO, 2016). Research conducted retrospectively to explore the variations in HBV prevalence amongst women who were pregnant and visiting the Mahosot Prenatal in the Lao People's Democratic Republic (PDR) revealed that the yearly prevalence of HBV ranges from about 4.6 per cent to 6.2 per cent. The HBs Ag prevalence perceived in women who are pregnant in Vientiane

mirrors a great risk of hepatitis B virus infection perinatal spread and call for a pervasive infant vaccination with an HBV vaccine birth dose (Choisy et al., 2017).

2.8 Prevalence of HBV infection in Africa

The HBV infection offers a serious public health challenge and very critically looked at in sub-Saharan Africa (Stockdale & Geretti, 2015). It is observed that in Africa, the prevalence of HBV infection is less than eight per cent (8%) with about two billion (2,000,000,000) individuals having markers of present or previous infection with hepatitis B virus (Leung, 2009; Liaw et al., 2009). In the southern part of African, the rate of hepatitis B virus infection among women who are pregnant is be within the ranges of 2.0 per cent to about 2.9 per cent except for South Africa that has a higher rate of about 4.6 per cent (Sinha & Kumar, 2010). The prevalence of hepatitis B virus in the Central Africa countries are a bit higher and ranges between 6.0 per cent to 9.5 per cent (Kfutwah et al., 2012). "HBV prevalence in Western Africa shows the highest variations between 6.2% and 16%" (Okusanya et al., 2013). According to the (WHO), about 5 per cent of women who are pregnant in high endemic zones are transporters of Hepatitis B infection (Abdi et al., 2015; Umare et al., 2016).

According to Kassa et al, (2019) in research to assess the trends in seroprevalence of four main sexually infected diseases such as (HIV, HBV), herpes simplex virus type 2 (HSV-2), and syphilis) for a ten(10)-year period (2005–2014) in women during their pregnancy in Ethiopia, about 4887 women in their pregnancy were enrolled on the study. Findings presented a drop-in prevalence of STIs by about 40 to 60 per cent throughout the study (2005–2014) and hepatitis B also decline from 12.6 per cent to 6.7 per cent (Kassa et al., 2019). In a similar vein, a health facility based-research was carried out

among pregnant women who attend ANC (antenatal care) centres for regular pregnancy assessment in Ethiopia. The research showed the prevalence of hepatitis B infection to be about 6.9 per cent (Umare et al., 2016). Contrary to the above, similar studies as conducted in Ethiopia indicated a greater prevalence of about 14 per cent (Mohebbi et al., 2011).

In the Gambia, the prevalence is slightly different from that of Ethiopia. A study conducted by Bittaye et al., (2019) among 426 women attending antenatal care clinic and tested for hepatitis B virus revealed a rate of about 9.2 per cent. Also, the rate of HBV infection was revealed to be somehow high but was lesser than the national average of 15 per cent (Bittaye, Idoko, Ekele, Obed, Nyan, et al., 2019). In Cameroon, the prevalence of HBV was reported to be slightly lower than that of Gambia and Ethiopia. The prevalence of the virus was revealed to be 7.7 per cent in Cameroon (Fomulu et al., 2013).

2.9 HBV infection epidemiology in Ghana

The prevalence of long-lasting hepatitis B virus (chronic HBV) present in Ghana was estimated to be 12.92 per cent as of 2013, but some professionals also estimated it within the ranges of 10 per cent to 15 per cent (Schweitzer, 2015). This makes Ghana as part of the zones considered to have a prevalence rate of hepatitis B virus being high (thus, more than or equals to 8 per cent) of chronic HBV. The precise rate of HBV infection in Ghana is not known as various studies target diverse and unlike a group of respondents.

The hepatitis B virus prevalence as reported by various studies from the year 2003 to the year 2009 range from 10.5 per cent to 22.1 per cent (Ofori-Asenso & Agyeman, 2016). From the year 2010 to the year 2015, a total of 18 pieces of research reveal a prevalence

rate of between 3.6 per cent to about 16.8 per cent (Ali-Abdulai et al., 2016). Ghana HBV infection rate was stated to around 12.3 per cent among women who are pregnant (Ofori-Asenso & Agyeman, 2016). Also, the prevalence of the virus among women in pregnancy was predicted to be about 14.33 per cent (Adade, 2016). Similar research work carried in a health facility in the Volta Region of Ghana to examine the seroprevalence of HBV infection and its accompanying risk factors amongst 135 pregnant women during ANC visit spotted HBsAg in 37 pregnant women, giving a pool prevalence of above 27 per cent (Tetteh, 2017). In the same study, five (5) of the pregnant women representing (13.5%) tested positive for HBeAg demonstrating that this percentage of pregnant women were infectious and could transmit the virus to the babies (Tetteh, 2017).

The prevalence of hepatitis B in Africa and Ghana as established in several studies are more than the WHO recommended standard which less than or equals to about 8 per cent. This higher prevalence of HBV infection as recorded in Africa could be attributed to various factors extending from inadequate knowledge levels on hepatitis B virus infection, lack of health infrastructure and service deliveries and low coverage of the expanded programme of immunization (EPI) (Cho et al., 2012; Ikobah et al., 2016; Kao, 2011; Kye-Duodu et al., 2016; McNaughton et al., 2020). Chotun et al., (2017) stated that in developing countries, pregnant women generally have a poor understanding of HBV mode of transmission, the virus prevention and control measures are still low in most at-risk populaces like children and pregnant women (Chotun et al., 2017)

2.10 Knowledge of HBV infection among pregnant women.

The World Health Organization recognizes the inadequate information and awareness on HBV is one among the many factors affecting the efforts that recognized organization

such as WHO has established to control the hazard related to hepatitis B virus infection worldwide (WHO, 2017a). This inadequate knowledge persists among personnel who provide health service, social service authorities, the youth, the general public and sometimes those at the top of policy making (WHO, 2015). The inadequate information and awareness of hepatitis B tied with other related factors explain the little attention given to HBV screening in Asia (van der Veen et al., 2010). Hepatitis B has proven to be a public health issue because of the mortality rate associated with it. Poor knowledge of the virus among the at-risk population makes the infection a serious health issue that demands much public attention. People with adequate knowledge of the signs and symptoms of a disease condition means they people can promptly look for medical care without any delays. In the same manner, individual with good knowledge of the routes of HBV transmission, prevention and control measures will take the right steps to protect themselves from the virus infection. Several research works have been studied to evaluate pregnant women's knowledge and awareness of Hepatitis B (De Hert et al., 2011; Ng et al., 2013; Ocana et al., 2011).

In Ghana, a study conducted among two hundred and nine (209) women who were pregnant and a total of thirty-six doctors in a cross-sectional study intended at assessing the knowledge status of these respondents on HBV and readiness to roll out the to bring down the HBV rate of spread. The authors revealed that as high as 96% of women who are pregnant revealed that have had information on HBV infection before. Most of the study participant did not know that HBV infection tends to cause cancer. About 20 per cent of the women doubted the possibility of HBV infection to be transferred from a mother to their babies. The study further revealed that; a majority of the study

participants did not present appreciable knowledge on how HBV was transmitted from one person to another. However, for those who had appreciable knowledge on the subject matter (HBV infection), 55 per cent of the study participant were convinced that hepatitis B infection could be spread from a pregnant mother to her baby. Also, about 48 per cent believed that unprotected sexual intercourse with an infected person was one other key ways of spreading the disease. The study suggested that an enhancement in the teaching on hepatitis B virus infection in pregnancy during the antenatal care visit to be enforced at the same time talking about possible suitable cost for services, waste of time in accessing the services as well as periodic education courses for the health care delivery professionals (Cheng et al., 2015).

Inadequate knowledge of HBV reported by Awiah (2018) in research to measure women's awareness of HBV infection spread and ways of preventing it. This study showed that most of the respondents were not knowing that pregnant women can transmit the disease to the unborn child (Awiah, 2018).

In Africa, the knowledge level of HBV infection during pregnancy is usually poor. They are a couple of studies that go to confirm the earlier statement. For instance, in South-Western Nigeria, a descriptive cross-sectional study design conducted amongst three hundred and fifty-three women who were pregnant across about ten(10) health delivery centres in the region in a comparative valuation of hepatitis B reactive and non-reactive pregnant women concerning the level of knowledge on hepatitis B virus infection on and its spread among the population (transmission). It was observed by the study that, a greater percentage of women who were HBV reactive believed that hepatitis B virus infection was more easily transmitted from one person to another than HIV does as

compare to 46 per cent (being the minority of the study participants) of their counterparts who were non-reactive to HBV infection. Furthermore, more than 90% of both reactive and non-reactive HBV women believed that HBV was a vaccine-preventable disease and more than 70 per cent believed it could be transmitted via blood. The study established a statistically weighted association between the level of knowledge on HBV and unprotected sex. Pregnant women reported to be HBV negative had higher knowledge of the sexual spread of the virus infections (Atilola et al., 2018). In the same jurisdiction, one more study was carried in three (3) antenatal care services centres at Ibadan. The study recruited six hundred and forty-three women who were pregnant employing the cross-sectional design with the chief objective of determining the level of knowledge of hepatitis B virus infection and explore the scope of testing and vaccination among women visiting antenatal care centres at several healthcare delivery facilities. The research revealed that majority of the pregnant women had poor knowledge of the hepatitis B virus infection (Adeyemi et al., 2013).

In Cameroon, research work conducted among one hundred and seventy-six study participants (pregnant women) to determine the rate of HBsAg and the level of information they have on HBV infection in pregnancy. The research reveals a very weak understanding of the infection among these pregnant women. More than half of the participants have never any information on HBV infection and more than 80% of these participants could not tell if hepatitis B infection was caused by a virus infection. The study participants also had inadequate knowledge that the disease could be prevented by receiving the HBV vaccine. Only about 17% of the study participates had a better understanding of Hepatitis B and this was associated with the participants educational

level (p-value=0.0037) (Frambo et al., 2014). Again, retrospective research was conducted to examine the prevalence of HBsAg, knowledge status and the risk factors connected with HBV among women who were pregnant, prevention and spread in the Limbe Health District (LHD) and Muyuka Health District (MHD). The research showed that women who were pregnant in the LHD had sufficient knowledge on HBV but stick to bad practices while those in the MHD, women who were pregnant were observed to have poor knowledge on HBV infection as well as adopts negative practices towards the of the spread and control of HBV infection (Eyong et al., 2019).

In a different place, research conducted in seven antenatal care units in Honiara, the Solomon Islands to weigh the knowledge, attitude and practice as proofs for active hepatitis B virus infection awareness rising and promotion program. The study showed that pregnant women had very weak (poor) knowledge. This was said to cover the lack of appreciations on the fundamentals of infection control and the control of the spread of HBV (Giri et al., 2016).

In Vietnam, a survey carried out to assess the KAP among three hundred and eighty women who were pregnant and breastfeeding mothers regarding the prevention and HBV immunization. A total of 18 questions were used to assess the knowledge level of the study participants, out of the eighteen questions, the average knowledge score was computed as (mean±SD) 12.05±3.37. Regardless of 70.3 per cent of study participants stated that they have received information about hepatitis B virus d at the time of pregnancy, only 10.8 per cent of the study participants answered all questions correctly concerning hepatitis B virus infection spread and preventive measures. Respondents knew that hepatitis B infection could be transferred from one person to another via

perinatal (84.2%), unprotected sexual intercourse (75.3%), and transfusion with HBV infected blood (85.8%). Nevertheless, they were mutual that misunderstandings hepatitis B virus could be spread via coughing and sneezing was (41.8%), polluted water (45.8%), and sharing a meal with infected persons (52.4%) (Hang Pham et al., 2019).

2.11 Vaccination against Hepatitis B infection during pregnancy.

Right now, hepatitis B virus infection is the only sexually transmitted diseases (STD) that are vaccine-preventable (Lavanchy & Kane, 2016; Ott et al., 2012). The WHO has registered Hepatitis B virus infection among the eight (8) infectious or communicable diseases that ought to be prevented by way of immunization. Owing to the above, the World Health Organization in 1991 made all states to integrate hepatitis B virus vaccination into their routine immunization programs (WHO, 2006). Since 1982, a workable, safe vaccine against HBV has been found and made accessible for all. The vaccine is about 95% effective in controlling disease infection and its complications(WHO, 2015). Reports from WHO indicates that, before early 2011, the hepatitis B vaccine was already been introduced routinely in one hundred and seventy-nine (179) nations or countries, with a world coverage of about 75 per cent. The percentage cover in the Americas was close to 90%; in Europe, it was 78%, Africa was 76% and Southeast Asia was 52% (WHO, 2011).

Hepatitis B Vaccine

The structure of the HBV vaccine contains one of the viral envelope proteins. A protein implanted into this viral enveloped protein is the genetic code for HBsAg (Merck, 2010). The HBV infection vaccine is supposed to be given in a three (3)-shot (dose) course (Beasley, 1988) with the second (2^{nd}) shot within a minimum of one month after the first

(1st) shot and the third(3rd) dose given six (6) months after the first (1st) dose (Hepatitis B foundation 2009). After all the three shots are taken within the right times, the body immune system builds antibody or a defence in the bloodstream. Immunity to hepatitis B virus is developed by this antibody and immune system memory (CDC viral Hepatitis 2009). The major form by which the hepatitis B virus vaccine is administered is usually via the muscles at 90 degree Celsius (Intramuscular). Enhancements in the production of hepatitis B has come "with the recombinant DNA technology lately has been used to produce HBV vaccines to substitute the initially licensed hepatitis B vaccines that were plasma-derived and consist purified HBsAg" (Nuhaila, 2016).

The vaccines when completed last for a very long time (thus decade or more than 10 (ten) years after the date of completed vaccination) (Van Damme, Leroux-Roels, Law, Diaz-Mitoma, Desombere, Collard... & Van Herck, 2001). Available literature has shown a person could form a faster rise in defence or antibodies to the hepatitis B virus when an additional dose of hepatitis B vaccine normally referred to as "booster" is given (Madhavan, Palappallil, Balakrishnapanicker, & Asokan, 2020; Jia, Yu, Zhou, Chen, Gu, & Ma, 2020; de Almeida Pondé, 2019). It was previously held and promoted that the hepatitis B virus infection vaccination could only offer active protection for a person between five (5) and seven (7) years but as at this time, it is held that the hepatitis B virus infection vaccine offers indeterminate cover for HBV infection (Petersen et al. 2004).

In Ghana, the HBV infection vaccination for babies was incorporated into the Expanded Programme of Immunization (EPI) in 2002 (Owusu-Ansah, 2014). Newly born children from 6 weeks forwards take the pentavalent vaccine (thus, diphtheria, polio, tetanus, hepatitis B, influenza type B) (Madhavan, Palappallil, Balakrishnapanicker, & Asokan,

2020). The coverage of EPI (Expanded Programme of Immunization) is considered good across all regions of the nations as well as the maximum in SSA (Sub-Saharan Africa) (Menaca, 2014). Usually, pregnant women upon getting the understanding of vaccination as well as the safety of the vaccine, are enthusiastic in accepting for themselves the hepatitis B virus and their infants (Healy et al., 2015). Vaccination decreases the dangers of contracting the hepatitis B virus infection among babies of reactive hepatitis B mothers by 3.5 or more times (Mannava & Morgan, 2009).

In the Gambia, a study conducted by Bittaye et al., (2019) revealed that women who were likely to vaccinate against hepatitis B virus were directly proportional to a low rate of the disease for instance in Gambia women with the possibility of receiving the vaccines have a pool prevalence of about 2.30% and those who may not have the chance of been vaccinated also have a pool prevalence of 13.7% (Bittaye, Idoko, Ekele, Obed, & Nyan, 2019).

In Nigeria, a study recruited six hundred and forty-three (643) pregnant women in a cross-sectional study in Ibadan in three antenatal care (ANC) unite and the main aim of the study was to determine the vaccination status among women who were attending antenatal care. The research revealed that only 9.7 per cent were vaccinated against the HBV infection (Adeyemi et al., 2013). In the same nation, it was revealed that in the face of the high effectiveness of hepatitis B virus vaccine, low awareness creation on vaccine, accessibility and ability to provide the cost of the vaccine and immunization-associated encounters hinders the acceptance of the hepatitis B vaccine among women attending ANC services in Nigeria (Ophori et al, 2014).

2.12 Factors that are allied with HBV infection among women who are pregnant

Some factors usually make the hepatitis virus very likely to occur or infect. These much talk about factors lays the foundation for the virus to infect someone. These factors are not only related to the infection of pregnant women but include the entire populations. From the foregoing, literature is been presented in line with the general factors which includes; socio-demographic characteristics such as the age of the pregnant women, their geographical location, their job classifications, obstetrics/Medical condition, including many other risk factors

2.12.1 Socio-Demographics

Age

The health-seeking habits, overall hygiene practices and high-risk taking behaviours are greatly influenced by the age of a person. For example, usually individuals within the ages of 10 and 19 (thus adolescent), they are risk-takers which is usually a social involvement and this category of peoples often takes more risky habits with their colleagues (Gardner & Steinberg, 2005). These risky habits include but not limited to; risks associated with sex, tattooing of the body and piercings of the body with drugs and others. Often, the older generation of individuals is less likely to practice this risky behaviour. A study within the setting of the Catholic Hospital, Battor, Ghana to assess the seroprevalence of hepatitis B and C virus infections and related risk factors among women who are pregnant at the same time attending the antenatal care services. The study at the end revealed that the age of the respondents was statistically significant with the acquisition of hepatitis B and C virus infection (Tetteh, 2017).

In another study, age was seen to strongly connect with a higher HBV infection rate. The study further indicated that women whose ages were less than or equals to twenty-five (25 years) were said to be statistically significant with a higher HBV virus infection rate (Lao et al, 2013). According to a study conducted by Ndams et al. (2008), the greatest infection rate of hepatitis B virus infection is noted to be profound among people in their middle age brackets (which consist of individuals between the ages of 10 and 30 years). These age brackets would oftentimes engage in active and risky sexual life than those less than 10 years and that of those more than 30 years (Ndams et al, 2008).

Geographical distribution

Regarding the geographical dispersal, the focus of this review would be narrowed to rural (deprived) and urban (cities) areas. Usually, the urban settlements are known to be overcrowded and sanitation issues become very common due to the increasing human activities, this environment becomes a fertile group for hepatitis virus infestations. In deprived communities, open defecation is a common practice, water sources are often polluted which serve as a fertile ground for hepatitis B virus infection. In Ghana, the rate of hepatitis B virus infection is slightly higher (about 13.3 per cent) in deprived setting compared to the 12.2 per cent in urban (Ofori-Asenso & Agyeman, 2016). Contrary to the above, Abongwa et al. (2016) revealed that there was a higher rate of hepatitis B virus infection among pregnant women who reside in urban settlement than their counterparts who reside in a rural settlement. The study did not establish any significance between the two (Abongwa et al, 2016).

Occupation

The form of job a pregnant woman engages in was detected as a significant socio-demographic danger factor that is linked with liver health amongst women who are pregnant. In this study, the professional status of health workers was shown to be greatly related to Hep B Virus infection (Eke et al, 2011).

2.12.2 Obstetric and Gynecological History

The Obstetrics and gynaecology of a woman can predict the actual amount of exposures that may predispose one's self to the hepatitis B virus infection. A protuberant predisposing factor that is seen to be significantly connected with hepatitis B virus infection in women who are pregnant with a past abortion (Yakasai et al, 2012). Most abortions are usually unsafe, they are carried out by personnel that lacks the proper skills, under unhygienic and unsterile surroundings and most likely to be a medium to expose the women to hepatitis B virus infection. A study amongst women who are pregnant who were visiting ANC (antenatal care) service for regular check up on their regular pregnancy revealed that women who had an abortion in the past were about ten (10) more likely of being reactive for HBV compare to their counterparts who have not had any form abortion in the past (Umare et al., 2016). In a case-control study to explore the risk factors linked to Hepatitis B infection pregnancy in the Kunene region, one hundred and fifteen (115) cases and two hundred and thirty (230) controls were recruited for the study. The findings show the history of abortion-related activities to be strongly associated with HBV infection (Mwaningange, 2018).

Another study revealed that these women who were pregnant and were in their third (3rd) trimesters (about 30 weeks and above) had a higher chance of being infected with the hepatitis B virus infection than their colleagues or counterparts who were in their first(1st) and second (2nd) trimesters (Ndams et al., 2008).

In another study, it was evidenced that women (pregnant) and had more than one pregnancy and whose siblings have been reactive for the hepatitis B virus were likely to be reactive for HBV than those whose siblings are non-reactive (Adegbesan-Omilabu et al., 2015).

2.13 Predisposing factors of hepatitis B virus infection

Piercings and tattooing of the body

A lot of studies have shown that ear piercing, tattooing of the body and scarification are connected to hepatitis B infection in pregnancy (Abonga et al 2016). According to Dwivedi et al., 2011, some outmoded way of life in most communities includes penetrating sharp objectives to make perforations on the ears and nose for beauty, scarification, and using unsterile objects to make all sort of marks on the body (tattooing) can lead to a greater rate of certain zones but not inevitably in cyesis (Dwivedi et al, 2011). Concerning the above, research conducted among women attending antenatal care services showed that making perforations on the nose for beautification and all other purposes was a significant predictor of the hepatitis B virus infection (Umare et al., 2016). An unmatched case-control study conducted among pregnant women found that ear and nose piercing, scarification of the body and tattooing of the body, was statistically significant with Hepatitis B infection (Mwaningange, 2018).

Blood transfusion

Usually, before a donor's blood is taken for another, a series of test are done to be sure the donor does not transmit some disease to the recipient. Some of the tests include but not limited to testing to rule out HBV, HIV/AIDS, and many others. Where any of the diseases to rule out are present, the donor's blood would not be taken. This is just a precautionary measure to prevent the possible spread of a host of disease. Furthermore, available literature suggests that the main route for the spread of HIV/AIDS and HBV infection among pregnant women is a blood transfusion from a reactive or positive donor's blood used for transfusions the is next to after multiple sexual contacts, predominantly in S.S.A. (Candotti & Allain, 2009). In some Africa countries such as Cameroon, a study has shown that the hepatitis B virus infection rate was at 12.1 per cent amongst donors of blood in various hospitals' blood banks (Noubiap et al, 2013).

Research conducted in southwestern Nigeria to study the epidemiology of Hepatitis B infection among three hundred and fifty-three (353) women who are pregnant among ten (10) health centres demonstrated a positively strong correlation between hepatitis B infections via blood transfusion in the last three months. These findings further present a strong case that blood transfusion is a strong route for the spread of hepatitis B virus infection among women who are pregnant (Atilola et al., 2018).

In another Africa country (Ethiopia), a study aimed at determining the extent of serum HBsAg and the causal factors associated with HBV infections was carried out among three hundred and thirty-eight (338) women who are pregnant as well as had a previous record of blood transfusion, having a history of several sexual cohorts and having a

history tonsillectomy were the major risk factors linked to hepatitis B virus infection (Gedefaw et al, 2019)

History of Sexually Transmitted diseases (STDs) predispose to HBV infection

Often the major channel for the spread of hepatitis B virus infection and sexually transmitted diseases (STDs) are very common (Siakwa et al, 2014). The primary direction to the spread of STDs is unprotected sexual interaction which consists of sexing without condoms as well as having various sexual cronies which encompass multiple sexual partners. The understanding regarding STDs such as HIV/AIDs and others have shown that these infections compromised the ability of the body to fight other infections such as HBV infection (Unemo et al., 2017). A research work conducted in the Volta Region of Ghana to assess the seroprevalence of hepatitis (HBV&HCV) and their causal factors in pregnancy during ANC attendance in Battor Catholic Hospital revealed that of the numerous predisposing factors analyzed, engaging in sex with many other persons was the only significant factor in the attainment of hepatitis B virus infection (Tetteh, 2017). In another study conducted in our neighbouring Nigeria, the main predisposing variables recognized were the advanced number of sex mates since sexual debut, multiple sexual partners and previous sexually transmitted infection (Obi et al., 2006). In another African country (Ethiopia), research carried out among women who were pregnant and accessing the health services at the antenatal care (ANC) clinic for a regular checkup during pregnancy revealed women with many sexual cronies had sixteen (16) times chances of getting the hepatitis B virus infection than those without many sex partners (Umare et al., 2016).

A study to assess the rate of spread and the risk factors link with HBV infection amongst one hundred and twenty-four women who were pregnant which included seventy-four HIV positive participants as well as fifty negative HIV participants were including 74 HIV-infected were recruited for the study. The research at the end disclosed that the rate of hepatitis B virus infection among the women who were positive for HIV participants was higher as compared to their counterparts who were negative for t HIV (thus 14.9 per cent versus 10 per cent) (Ntiamoah, 2016). Mwaningange, 2018 case-control study on Hepatitis B risk factors also shows that STI's were strongly correlated to Hepatitis B infection(Mwaningange, 2018)

A hospital-acquired infection (HAI) (Nosocomial infection)

The environment of the hospital presents a conducive atmosphere for the spread of numerous diseases (Malewezi et al., 2016; Ogundele, 2018). The medium to the spread of HBV infection nevertheless is basically via fluids which are very paramount in the hospital setting (Lesi, 2016). Clients and their relatives who are seeking care for other ailments shares "washrooms, utensils and other spaces" Thus making the spread of hepatitis B virus in the hospital area very easy Notwithstanding above, health care professional who reactive for HBV infection could also transmit it to the patient by way of giving treatment, negligence or accidental behaviours during a blood transfusion, use of sharp objectives and other could also become a medium in which the hepatitis B virus can be transmitted(IBITOYE, 2016)

In a research work conducted in a hospital setting, it was reported that pregnant women who were admitted into the hospital were at a greater risk of contracting nosocomial hepatitis B infection (Nazzal & Sobuh, 2014). Other possibly factors or behaviours that

can serve as a suitable medium for the spread of hepatitis B virus infection consist of the following; "severe immune-suppression secondary to the other diseases, prolonged hospital admission, repeated venipuncture and an increased need for invasive procedures" (Büchner et al., 2015).

2.14 Measures to avert the dangers of HBV infection

According to literature, there exist three (3) main components in the management of hepatitis B virus infection. The component consists of intersecting HBV spread, treating individuals who have the disease and controlling the deaths connected to HBV infection such as HCC (Lesi, 2015). Essentially, reducing the impact of HBV infection encompasses three phases, that is; primary method of HBV prevention (vaccines and post-exposure prophylaxis), a secondary method of HBV prevention and spread (once the individual is infected) and finally a tertiary method of HBV prevention; thus; preventing the medical consequences of long-lasting Hepatitis B infection by administering the patient with anti-viral drugs. (Abdulai, 2017).

Primary Prevention Measures

The Primary preventive is targeted at curbing the infection (in this case, the HBV infection) from affecting anyone (Lai & Yuen, 2013). This is achieved by dropping or removing exposures and habits that are seen to give rise to a person's likelihood of contracting the disease. With Hepatitis B, increasing the patient's resistance to HBV infection is crucial to primary prevention. The spread of hepatitis B virus infection can be excellently controlled by way of immunization with any appropriate hepatitis B vaccine. Since the year 1982, the hepatitis B vaccine was developed and is proven to have about 95% efficacy in avoiding the infection and the growth of chronic disease caused by the

hepatitis B virus infection (WHO, 2015) For low- and middle-income countries (LMIC), worldwide vaccination policy for the children is the most effective way to prevent the spread of hepatitis B virus infection (Franco, Bagnato, et al., 2012; Franco, Meleleo, et al., 2012). The prevalence of HBV infection in pregnancy is still high (≈1 in 8) which rationalizes the formation of a national HBV screening program for all women in antenatal clinics in all parts of Ghana (Ephraim et al., 2015). The testing for hepatitis B virus infection one of the recommended routine test for all women who attend antenatal care clinic in Ghana (Awiah, 2018). Ephraim et al, (2015) upon completion of their research work recommended that all pregnant women tested negative for Hepatitis B must be vaccinated against the infection which should be a National policy (Ephraim et al., 2015).

It has been established that the inadequate level of information and awareness available on hepatitis B virus infection with demographic variables like little education and poor socioeconomic conditions results in few people going for Hep B screening leading to a lack of action toward Hep B testing and the provision of vaccines (van der Veen et al., 2010).

Secondary Preventive Measures

This usually occurs in the initial phases of the processes leading to the disease. The paramount target in this phase of preventive measures is to curb the transmission of hepatitis B virus infection. The events would usually include detecting the disease at the early stage, testing or screening and appropriate medical remedy and treatment (Cheung & Lao, 2020; Kamarulzaman et al., 2016; Lin & Kao, 2018).

In the whole world wide, blood transfusion of an infected donor's blood to the recipient is the chief cause of hepatitis B virus (Abate & Wolde, 2016; Tigabu et al., 2019). Ghana has a policy on blood donation which makes it mandatory for all donated blood to be screened for infections like Hepatitis C, HIV 1&2 Hepatitis B and syphilis (Sarkodie et al., 2016). Studies have shown that there is the need to adhere strictly to the policy as communicated by the national blood commission likes screening all donors before the bleed for possible transfusion and among others to avert the dangers of infecting others via blood transfusion (Garraud et al., 2016; Soi, 2018).

One other channel in which the hepatitis B virus infection spread is via the vertical spread (transmission) reactive or positive mother to their babies (Cheung & Lao, 2020; Khuroo et al., 2016; Tovo et al., 2016). Curbing the perinatal spread of hepatitis B virus infection depends strictly on the appropriate time for administration of post-exposure therapy (prophylaxis), Most importantly among babies whose mothers are reactive to the hepatitis B virus infection (Schillie et al., 2018). The dangers of the spread of hepatitis B virus declines when there exist periodic perinatal hepatitis B virus testing or screening, immune prophylaxis (hepatitis B Immunoglobulin) for babies born to reactive hep B mothers and hepatitis vaccine given both to the high-risk mother and the newborn (Henderson et al., 2019a; Negussie & Beyene, 2016; Sibia et al., 2016). It has been demonstrated that the "passive-active post-experience prophylaxis with hepatitis B Immunoglobulin and HBV vaccine; vaccinated in two phases is 85 to 95% potent in controlling vertical spread compared to 70 to 95% of taken hepatitis B vaccine alone. It is ideal for a newly born baby to be given these vaccines within the first day of birth. (Abesig et al., 2020; Pan et al., 2018).

Engaging sex that is protected, use of sterile equipment for activities like tattooing of the body, piercing of the body (especially the nose and ear piercing), barbering, tribal marks etc. These are all secondary control measures which when implemented could effectively prevent the spread of Hepatitis B virus infection (I. Abdulai, 2017; Ahmad et al., 2019; Avege, 2016; Dzidzinyo, 2017; Sarah et al., 2020).

Tertiary Preventive Measures

This comes at the later phase of the virus progression. The aim is to minimize the risk associated with the infection or reverse the effects. When a person contracts HBV, the agenda is to provide the patient with a treatment to avert the progression of the disease to liver cirrhosis stage, liver failure, or hepatocellular carcinoma (HCC) (Sorrell et al., 2009). The approved drugs for the treatment of hepatitis B in pregnancy are; Lamivudine, Telbivudine and Tenofovir. Tenofovir other than the two drugs is safer to be taken during breastfeeding because it has a lower concentration in breast milk (Pol et al., 2018). Dietary control of the infection involves taking a low-sodium, high protein diet and fluid restriction are necessary for cases of decompensated cirrhosis (Pievsky et al., 2018). Liver transplant is the Last Option in cases of fulminant hepatic failure and for individuals at the end-stage hepatitis B liver (Pievsky et al., 2018).

CHAPTER THREE

STUDY AREA AND RESEARCH METHODOLOGY

3.0 Introduction

This section focuses on the geography of the study area and the research methods adopted in conducting this study. The chapter is divided into two main sections. Section "A" focuses on the study setting such as the location, population, landmass, economic activities, road network, education, health infrastructure availability and health staff in the area. Section "B" provides a detailed explanation of how the study was conducted. It starts by looking at the study design, sources of data, and tools for data gathering and collection, sampling techniques and methods of data analysis.

3.1 SECTION A

3.1.1 Location and Land Mass

The North Gonja District Assembly was established by legislative instrument (LI) 2065 (2012). The district was inaugurated on Thursday, 28th June 2012 in Daboya, the capital town. The district was carved out of the West Gonja District in 2012 following the Population and Housing Census, 2010 as part of the efforts to deepen decentralization processes in the country. The North Gonja District shares boundaries with Tolon to the East, Mamprugu/Mogduri to the North, West Gonja to the west and central Gonja to the south. It lies between latitude 9º39'01" North and Longitude 1º23'23" West. The district occupies approximately 2315.272 Km2 (GSS, 2014) representing 13.5% of the total topography of the Savannah Region. The location of the place gives it a high advantage over its counterparts with regards to its closeness to Tamale with regards to movements of goods and services. This is very advantageous to the district but it is not utilized

properly until proper access is enhanced through the construction of a bridge to completely open up the place.

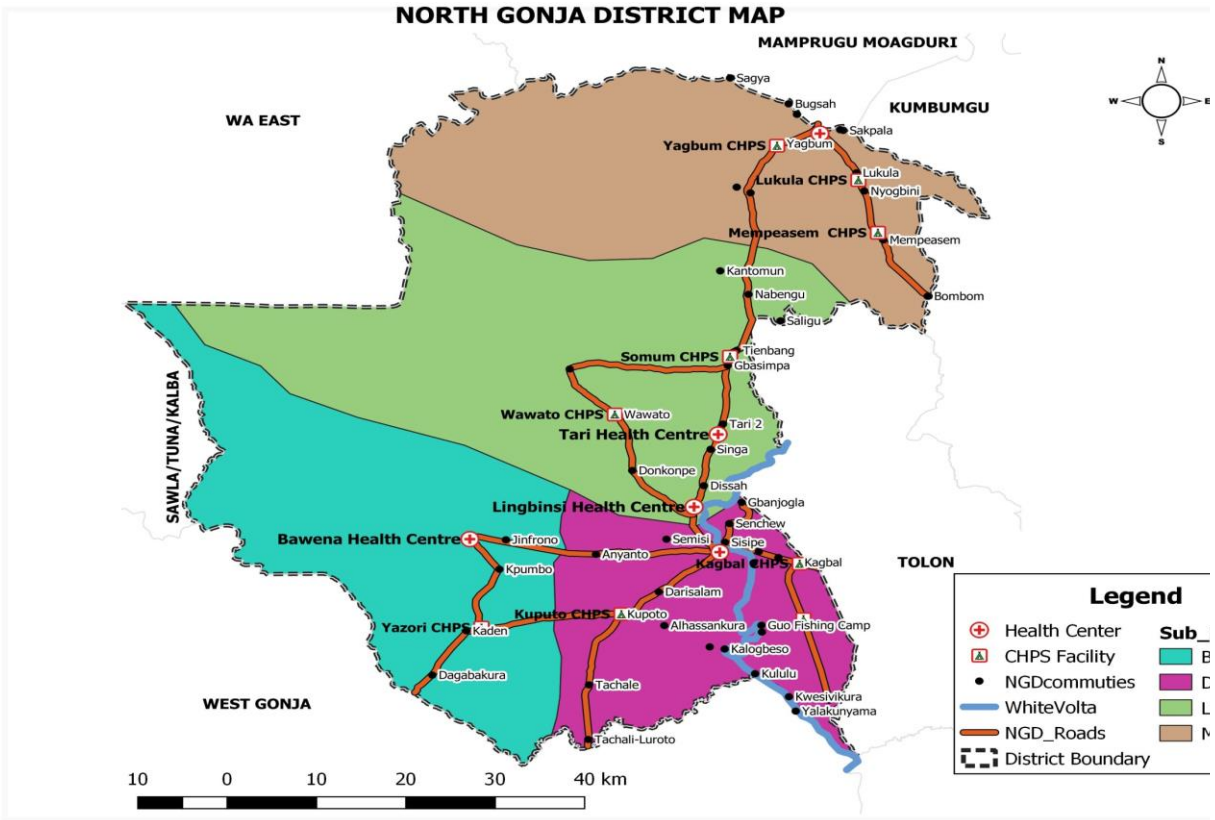

Figure 3.1: Map of the Study Site

3.1.2 Population

Population and Housing Census (PHS) conducted in 2010 revealed that the total number of people residing in the district was 43,547 made up of 21,599.3 representing 49.6 per cent males and 21,947.7 representing 50.4 per cent females (GSS, 2014). Out of the total population, the majority of the inhabitants 37,037 (85.1%) lives in rural areas with the remaining 6,510 (14.9%) in the urban areas. Women within the fertility age group (15-49) in the district is 9,935 and with a total fertility rate of 5.3 which is the highest in the Northern Region and above the regional average fertility rate of 3.54 (GSS, 2014). Again,

more than half that is 54.6 per cent of the population 12 years and over are married. 8.5 per cent of the population age 12-14 years are married in District which is far below the 18 years legal age for marriage in Ghana (GSS, 2014).

3.1.3 Culture and Ethnicity

The North Gonja district has more than twenty (20) ethnic groups; but the major ones include the following: "Gonja, Tampulma, Dagomba, Hanga and Mamprusi". History has it that there were some few Konkombas also in the district but left somewhere in 1994 due to a conflict. The lack of ethnic homogeneity turns to constrain socio-cultural organization and development. To solve the above problem, the major ethnic groups that are found in the district should be encouraged to inter-marry.

Before the arrival of both "Western and Eastern Religions", the inhabitants were generally traditionalist. Their way of life was greatly influenced by their customary practices, values and beliefs systems. The result of this is still manifested in the numerous traditional festivals practised in the Gonja land. Contrary to the above, the existence of these customary practices is no more noticeable in the district due to the existence of different ethnic groupings and the infiltration of Christianity and Islamic religions. As the district stands now, there are three most practised religions which include: Islam, Christianity and the traditional religion which is mostly interlaced either with Islam or Christianity in some cases.

3.1.4 Chieftaincy/ local administration

The North Gonja District is located in the Wasipe traditional area, a historical area in the administrative and traditional circles of Ghana. Wasipe is one of the Five (5) very important Gates that ascend to the overlord skins, Yagbon, (the other divisional areas are

Kpembi traditional area, Bole traditional area, Kusawgu traditional area, and Tulwe traditional area). The Wasipe-wura has 80 sub-chiefs including Yazori-wura, Gbengben-wura, Mun-wura, Garima-wura who serve as council of elders and advice the overlord. There are also Queen mothers in the chieftaincy set up such as Bru-wurche who is senior to the overlord (Wasipe-wura), Sey-wurche, and Nyankpani-wurche who help in the traditional administration of the area.

3.1.5 Education

The North Gonja District has 45 Pre-School and Primary Schools, 13 Junior High Schools and two (2) Second cycle Schools with the total enrollment for the 2018/19 academic year to be 7,646, 1,433 and 401 respectively (North Gonja GES 2019/20 report). Regarding the 2010 PHC (Population and Housing Census), 68.2 per cent of the inhabitants who are within the ages of three (3) and above have never been to school. Also, only 34.4% of males and 29.4% of the female population have been to school (GSS, 2014). This indicates a generally low level of education in the district and there is the need for the district to put in measures to improve their schools' enrolments and retention across all levels of education in the district.

3.1.6 Economic Activities

The history behind settlements within the borders of the White Volta is economical. This is so because the livelihood of the people solely depended on peasant fishing. As fishing activities boomed with so much success, the people decided to go commercial with their catch, selling them to their neighbouring communities. As this proceeded, they saw the need to include weaving, kneading of yarns, making of smocks and other activities.

Farming is the highest economic activity in the district, this includes the cultivation of basic food crops like maize, groundnut, rice, yam, cassava and millet. They are also engaged in fishing but people do not make it a profession as most fishermen and women double in crop production. Indeed, Farming represents 74.4% of all economic activities, followed by Handicraft (weaving and smock making) 9.3%, consultancy services also being 9.3% and people engaged in petty trading, jobless people (students) and jobless people representing 2.3% each (GSS, 2014).

Collectively, however, those that are jobless and jobless students bring the total to 4.6%. The type of work of the people gives the chance for seasonal unemployment to crop in since majority are involved in single-season peasant farming. To ensure that families are fed throughout the year, household heads have to find ways and means of getting food on the table for the family. So, a family head could be a fish farmer, but also into crop production, kneading and smock making at the same time.

3.1.7 The District Roads Network

It is important to note that, the road network in the district is very poor making access difficult, as a result, more of the district's income from both locally and donors may have to be channelled into creating access through the construction of more roads and bridges. Due to the road network problem, most communities are often cut-off during the raining season limiting their access to quality healthcare and other important social amenities. Crop production has dwindled over the years giving rise to alternative peasantry livelihoods such as fishing (traditional) and weaving. This is so because the only viable market is located in Mankarigu with a terrible road network, making it very difficult for farmers to easily transport their farm produce to the market centres.

Table 3.1: Road network in the North Gonja District.

.NAME OF ROAD	LENGTH	STATUS	CONDITION	SURFACE TYPE
Daboya-Lingbinsi-Mankarigu	72km	Non-engineered	Very poor in all seasons	Gravel
Goa – Kito	8km	Partially engineered	Poor	Gravel
Lingbinsi-Wawato-Donkonpe	32km	Non-engineered	Poor	Earth
Tachali-Daboya	29km	Non-engineered	Very poor	Earth
Daboya –Bawena	28km	Non-engineered	Poor	Earth

Source: District Health Profile, 2019

3.1.8 Health Infrastructures and Staff

The District is divided into four health sector operational zones (sub-districts), namely Bawena, Daboya, Lingbinsi and Mankarigu. The district has 5 health centres located in Bawena, Daboya, Lingbinsi Tari and Mankarigu and with 9 CHPS located at Yazori, Kuputo, Kagbal, Guo, Somum, Wawato, Lukula, Mempeasem and Yagbum. The district has a staff strength of 94 make-up of 66-Male Staff and Female Staff 28. The various categories of staff are; (18 Professional Nurses, 1 Registered Nurse Practitioner, 33 Enrolled Nurses, 18 Community Health Nurses, 6 Staff Midwives, 5 Technical Officers (Nut, HI, DC, HP), 8 Support Staff, 3 Field Technicians and 2 Orderlies. The district has no Medical doctor, nor Medical laboratory technicians. It is also seriously challenged with health infrastructure such as medical laboratory exposing the inhabitants to a lot of health challenges.

3.2 Section B

3.2.1 Study Design

The design was a descriptive cross-sectional study using the mixed-method approach. A mixed-method was appropriate for this study because the objectives were better assessed using quantitative and qualitative method. The quantitative instrument (Closed-ended questionnaire) was used to document participants' general knowledge on HBV, their HBV status, and the predisposing variables related to HBV and the various HBV prevention measures. Whilst the qualitative instrument explores the pregnant women in-depth knowledge on the same study objectives using an Open-ended Focus Group. An in-depth interview was also used to document the various HBV prevention strategies form the healthcare workers in the district. This approach was used because the disadvantages of one method were complemented with the advantages of the other method.

3.2.2 DATA COLLECTION TOOLS

3.2.2.1 The Primary Data Collection Tools

The primary data was gathered using Focus Grouped Discussion, in-depth interview and Questionnaire.

3.2.2.2 The Secondary Data Collection Tools

The Secondary data were collected from relevant books, journals reports from the DHMT and internet sources.

3.2.3 Data Collection Procedure

3.2.3.1 Quantitative Data

Questionnaire: Questionnaire was the data collection instrument employ to gather the quantitative data. A closed-ended questionnaire was put into five sections. 1. The biodata of the respondent. This section had a total of nine (9) variables 2. Twelve(12) variables were used to Assess respondents' general knowledge of HBV. 3. Nine(9) variables to assess the respondents' Hepatitis B vaccination status 4. Risk factors associated with HBV, eight(8) variables were used. 5. Only five(5) variables were used to assess Hepatitis B prevention measures among the respondents. This questionnaire was adopted and modified from(I. Abdulai, 2017; Geberemariyam et al., 2018) Participants were recruited during their ANC attendance. The questionnaire was administrated to only consented participants using face to face interview. This was necessary because majority of the respondents could not read nor write in English language. A total of three hundred and ten (310) pregnant women were interviewed using the closed-ended questionnaire from some selected communities in the four sub-districts of the North Gonja District. The questionnaire was adopted for these studies because it is capable of gathering data from a larger population from dispersing communities within a limited period. A total of 10 nurses were trained on the data collection tool using both paper and electronic questionnaire for the training however, handheld mobile devices (Android-smartphones) with KoboCollect Application were used for the actual fieldwork. Data collectors were also trained on the sampling procedure used in selecting study participants.

3.2.3.2 Qualitative data

Two Qualitative data collection tools were used; the FGD guide and the IDI guide were used.

Focus Group Discussion (FGD)

A Focus group discussion guide was used to further gather in-depth information on participants Knowledge, Vaccination status, Risk factors and the various strategies of preventing HBV. The data collected from the focus group discussion was used to complement those collected using the other data collection tools. The researcher and one trained nurse conducted the Focus group discussion. The researcher moderated all discussions whilst the nurse serves as a note-taker. Four (4) focus-group discussions were organized. In all, twenty-two (22) pregnant women participated. Each discussion group consisted of 5-6 participants thus; (Daboya-5 FDG, Kuputo-6 FGD, Tari-5 FGD and Somum-6 FGD). The data were collected mainly in Gonja and Tampulma, which are the two main local languages in the district. All discussion section was recorded with permission from the participants and they were later translated into English Language.

In-Depth Interview (IDI).

An in-depth interview is a type of qualitative investigative method that involves carrying out exhaustive face to face interviews using a small number of respondents to unravel their insights or views on a particular issue (Jacobvitz et al., 2002). This is useful when you want to explore in details the persons understanding or knowledge of the phenomenon.

Four in-depth interviews were conducted using an in-depth interview guide among four healthcare workers in selected health centres. Two of the respondents were midwives and

the remaining were community health nurses. The in-depth interviews were conducted along with the study objectives which provided more detailed information to support both the Focus group discussion and the quantitative data collected.

Table 3.2: Summary of the Study Design and Methodology

Type of data	**Source of data**	**Tools for data collection**	**Study population**
Quantitative	Primary	Closed-ended Questionnaire	310
Qualitative	Primary	Focus group discussion guide In-depth interview guide	22 4
Documentary, literature review	Secondary	Reports, DMIS, Theses, journal, internet sources	Refer to references

3.2.4 Study Population

All women who are pregnant and health providers in the North Gonja District were considered as the study population.

3.2.5 Inclusive and exclusive criteria

3.2.5.1 Inclusion Criteria

All pregnant women visiting ANC at selected health centres. All pregnant women in selected communities without health facilities. Pregnant women who consented to undertake the study. Also, Health care workers with a minimum of two years of working experience in the North Gonja District.

3.2.5.2 Exclusion Criteria

The population was delimited to all other pregnant women. Pregnant women that refused to give their consent. Health care workers working outside the sampled communities were exempted.

3.2.6 Sample size calculation

To calculate the sample size, the population of Women of the Reproductive Age (WIFA) of the district was used. The total inhabitants of the North Gonja District were 43,547(PHC, 2010). The District also have women of childbearing age (thus from 15years but less than 50 years) to be 9,935 representing 22.8% of the total population in the district (GSS, 2014). With a confidence level of 95% and a MOE (margin of error) estimated at 0.05(5%) of the sample size of pregnant women and 25% non-response rate was used for the research.

The sample size was calculated using the Cochran (1977) formula. This was used because the formula permits for computing a perfect sample size with a given chosen MOE (margin of errors), confidence level and projected percentage of the characters present in the population. It is also suitable in circumstances of a large population where the sample size offers more information about a larger one (Bartlett, et al., 2001). The sample size was calculated from the expression

$$n = \frac{(z)^2 pq}{(d)^2}$$

Where;

z = the value for the given confidence interval =95% or 1.96

d = margin of error; = 5%

p = Women of reproductive age population proportion in the North Gonja District = 22.8% (0.228)

q = (1-p) and n = Base sample size required = (1- 0.228) = 0.772

$$n = \frac{(1.96)^2(0.228)(0.772)}{(0.05)^2}$$

$n = 271$ WIFA

After calculating the sample size of the 271 women of reproductive age. To obtain reliable data, the researcher increased the sample size to 336 accounting for a 25% non-response. The final sample size for the study was, therefore, = 339.

Proportional allocation of ANC performance coverage for the selected sub-districts using the District 2019 ANC Registrants as the Sample Frame in the study

FP/TDP*n, where FP= Facility performance, TDP= Total district performance and n= sample size which is 336

Table 2.1 North Gonja District ANC Performance per Sub-District for 2019

No	Name of sub-district	ANC Performance coverage for 2019	Number of selected pregnant women for each facility
1	Daboya sub-district	594	88
2	Lingbinsi sub-district	847	126
3	Bawena sub-district	83	12
4	Mankarigu sub-district	760	113
	Total performance	**2284**	**339**

Source: North Gonja DMIS REPORT, 2019

3.2.7 Sampling Technique

The probability sampling method was used to select study participant for the quantitative data collection. The researcher used proportional, simple random and systematic sampling methods. Whilst a non-probability sampling method (convenient sampling) was used to select health care workers for the qualitative interviews.

The Sampling procedures

A cluster sampling method was used to group the various health facilities according to their respective sub-districts within the North Gonja District; Bawena, Daboya, Lingbensi and Mankarigu.

At each sub-district, communities were grouped into two; 1-Communities with Health facility and 2-Communities without Health facility using a stratified sampling method.

From each sub-district the number of participants was proportional to the number of pregnant women registered in the ANC record book for 2019; Daboya sub-district 88, Bawena sub-district 12, Lingbensi sub-district 126 and Mankarigu sub-district was 113

A simple random sample method (balloting) was employed to choose communities without health facilities in each sub-district this included Yazori, Kuputo, Wawato Somum and Yagbum whilst all the five Health Centers thus; Daboya Health Center, Bawena Health Center, Lingbensi Health Center, Tari Health Center and Mankarigu were included to the research.

Systematic random sampling was applied in recruiting study participants in each community using a 3rd person in the sample frame who gave consent until the desire sample size was attained

Convenient sampling was used to select two Midwives and two Community Health Workers, one from each sampled health facilities.

3.2.8 Ethical Consideration

Ethical clearance with Reference number **CHRPE/AP/155/20** was obtained from the KNUST/KATH Ethical Review Committee who reviewed a submitted research proposal before the study starts. Permission was sought from the Regional Health and District Health Directorate and health facilities before the commencement of the study. Written permission was required from each of the respondents before they were enrolled on the study.

3.2.9 Data Analysis and Presentation

3.2.9.1 Quantitative Data Analysis and Presentation

Analysis of descriptive analysis was done using Statistical Package for Social Sciences (SPSS) and Microsoft Excel. All computation was done at 95% confidence level and 5% level of significance ($P<0.05$). The analyzed data were presented in the form of tables and figures as well as graphs and charts where appropriate. Chi-2 test of association was done to determine the association between Socio-demographic characteristics and other variables in the research objectives. Respondents knowledge were classified as sufficient and Insufficient knowledge. This was calculated using the twelves variables that were used to assess their knowledge. For each variable, a correct response was given a score of 1 and an incorrect, a score of 0. The number of the correct score was calculated as a per cent of the total variables(12). All those who score <50 were classified as insufficient knowledge and those =>50 sufficient knowledge. The same classification was used for other objectives(Mesfin & Kibret, 2013)

3.2.9.2 Qualitative Data Analysis

All qualitative interviews were analyzed using thematic analysis techniques. The analysis was done along with the quantitative data analysis which was based on the various research objectives.

3.2.9.3 Quality control

All questionnaires were coded onto Kobo Toolbox, checked for completeness, consistency and logical accuracy of the survey instrument before it was deployed. All responses to the questionnaire were randomized to reduce the enumerator's selection bias.

Android (smartphones) would use to collect the data this allows the researcher to track the progress of work and also provide feedback to the enumerators on the field. The data was clean before being exported onto SPSS version 25 for analysis.

CHAPTER FOUR

RESULTS

4.0 Introduction

This section shows the findings of this study. The data was collected among three hundred thirty-nine (339) pregnant women and four (4) healthcare workers within the North Gonja District. Seven (7) respondents' data were excluded due to the incompleteness of their data. After the data cleaning, 310 responses were used in the quantitative data analysis whilst twenty-two (22) participated in the focus group discussion. Pregnant women who had already filled the questionnaire were excluded from the focus group discussion. The presentation of data was done in two types. Firstly, Descriptive statistics of the socio-demographic variables of the respondents and the other variables were presented in charts and tables. The study also used qualitative data to complement the quantitative data. The study findings have been organized according to the objectives through thematic content analysis. The results have been presented in the form of a verbatim quotation from study participants.

4.1 Sociodemographics and obstetric characteristics of the respondents.

This study recruited 310 pregnant women from selected health facilities in North Gonja District for the quantitative study. Within the ages, most of the respondents (25.8%) were within the ages of 30 to 34 years followed by 27.10% of the women were being within 25 to 29 years, 24.5% were within 20 to 24 years, 12.30% were above 35 years and 10.3% below 19 years. Almost all (89.6%) of the respondents were married, 5.50% were single, 2.60% were cohabiting and 2.3% being either divorce, widow or separated. Majority of the women (79.7%) were Muslims, with 19.0% being Christians and 1.30% being

traditionalist. The Tampulma ethnic group was the majority (47.70%), followed by Gonjas (20.6%), other (thus, the sum of all other minor ethnic groups who participated in the study) was 16.50% and Mamprusi (15.20%). On the level of education of the study participants, majority of the women (68.70%) had no formal education, 14.80% of the women have been in school up to the basic level, 15.10% ended at senior high school and 1.3% have had some level of tertiary education. On occupation, most of the women (52.6%) were housewives, 33.2% of the women were farmers, 11.6% were traders, 0.6% had a professional job (a teacher and a nurse), and 1.90% engage in other forms of jobs.

On the health and obstetrics characteristics of the study, the study revealed that the majority of respondents had health facilities in their community whereas 30.6% had no health centre. From above, almost all (95.80%) walk for a short distance (within 5km) to the nearest health facility whereas 4.20% of the women are required to walk for a long distance (above 5km) to have access to a health facility. Most of the respondents (41.3%) were within their second trimesters (thus between 120 days to 180 days of pregnancy), 33.20% were in their third trimesters (between 7 to 9 months of pregnancy) and 25.5% being in the first trimester (between 1 to 3 months of pregnancy). Majority of the women (74.2%) had between 1 to 5 children, 13.2% had no child (thus are being pregnant for the first time), and 12.6% having between 6 to 10 children. Most of the women (60%) were within the low-income status, 31% within middle-income status and 9.0% high-income status. On antenatal clinic (ANC) attendance, almost all the women (91.9%) had visited ANC while 8.1% have not had any ANC visit (Table 4.1).

Table 4.1; Socio-demographic and obstetrics characteristics

Variables	Categories	Frequency	Percentage
Age	14 -19 years	32	10.30%
	20-24 years	76	24.50%
	25-29 years	84	27.10%
	30-34 years	80	25.80%
	35 years and above	38	12.30%
Marital status	Single	17	5.50%
	Cohabiting	8	2.60%
	Married	278	89.60%
	Divorce/separated/window	7	2.30%
Religion	Christianity	59	19.00%
	Islam	247	79.70%
	Traditional	4	1.30%
Ethnicity	Tampulma	148	47.70%
	Mamprusi	47	15.20%
	Gonja	64	20.60%
	Other	51	16.50%
Educational Status	No education	213	68.70%
	Primary	46	14.80%
	Secondary	47	15.10%
	Tertiary	4	1.30%
Occupation	Farming	103	33.20%

	Housewife	163	52.60%
	Trader	36	11.60%
	Professional	2	0.60%
	Others	6	1.90%
Number of children	No birth	41	13.20%
	1-5 children	230	74.20%
	6-10 children	39	12.60%
Category of income status	Low income	186	60.00%
	middle income	96	31.00%
	High income	28	9.00%
Gestation	First trimester	79	25.50%
	Second trimester	128	41.30%
	Third trimester	103	33.20%
Category of Distance to health facility (Km)			
	Long-distance	13	4.20%
	Short distance	297	95.80%
ANC visit	No	25	8.10%
	Yes	285	91.90%
Availability of health facility			
	No Health Center	95	30.6%
	Health Center	215	69.4%

Field survey, 2020

4.2 Continues variables: Parity, age and monthly income among pregnant women in north Gonja district.

The minimum age of the respondents was 14 years and the maximum being 41 years with a mean of 27.13+/- 5.8 (Table 2). On parity, the minimum number of children was zero (0) and the maximum is ten (10) with a mean of 2.95+/-2.1. The least average monthly income was fifty-seven Ghana cedis (GHS 57.00) while the highest average monthly income was seven hundred Ghana cedis (GHS 700.00). The mean being 146.04+/-106.6(Table 4.2)

Table 4.2; Continues variables: Parity, Age and monthly income among pregnant women in north Gonja district.

Variables	N	Mode	Maximum	Minimum	Mean	Std Dev.
Age	310	30	41	14	27.13	5.8
Parity	310	2	10	0	2.95	2.1
Avg. Monthly Income	310	100	700	57	146.04	106.6

Field survey, 2020

4.3 Reasons Why Some Pregnant Women Do Not Attend Antenatal Care in the North Gonja District

On the reasons for not visiting ANC, 44.0% attributed the cause to the attitude of health staff, 24.0% attributed it the distance of the health facilities, and 4.0% mentioned no health facility and 28.0% said they had no money (figure 4.1).

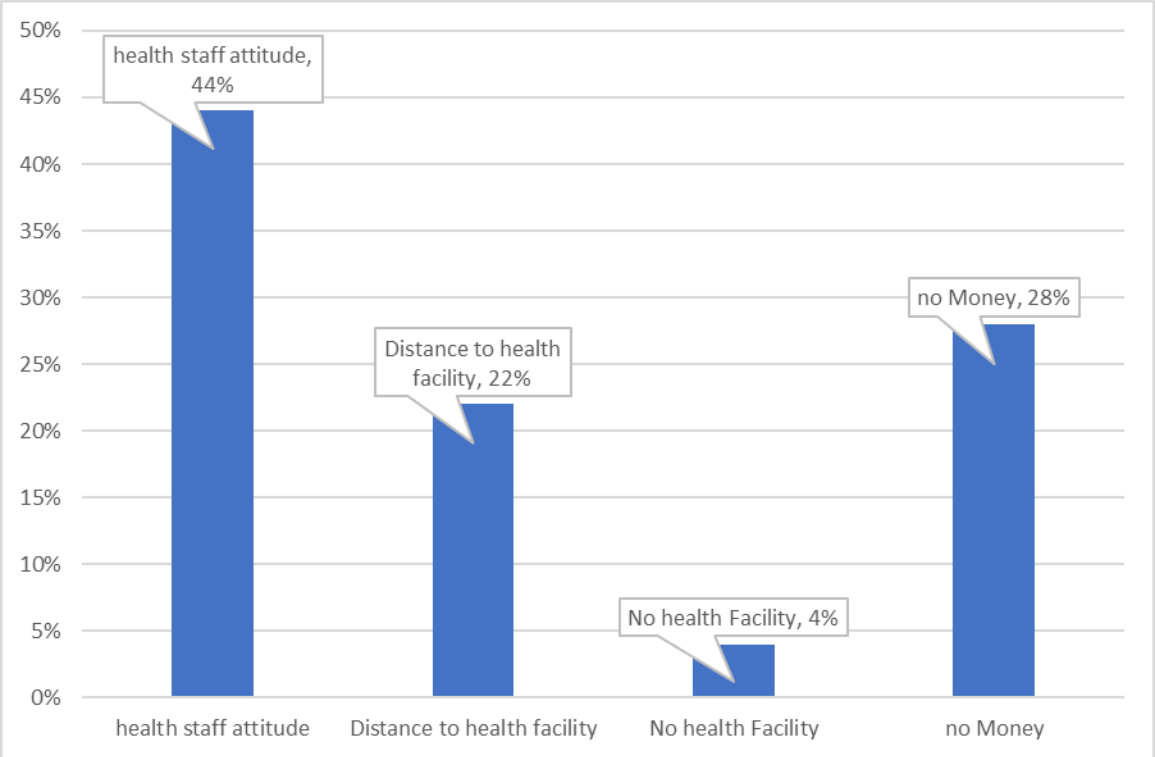

Figure 4.1: Reasons for no visit at ANC

Field survey, 2020

4.4 Objective 1: Level of knowledge of HBV among pregnant women in the North Gonja District

Majority (60.3%) of the women have heard about hepatitis B virus (HBV) whiles 39.7% had not heard of HBV before pregnancy. Most (65.2%) of the women heard about HBV from health staff, followed by Media (TV/Radio) (22.5%), community member (9.6%) and 2.7% from family members. Majority of the women (61%) receive information on HBV during pregnancy, 29% do not receive any information on HBV during pregnancy. Most women (54.5%) did not know about the sign and symptoms of HBV with 45.5% of women knowing about the signs and symptoms of HBV. Majority (70.2%) stated fever as

signs and symptoms of HBV, followed by loss of appetite (8.5%), fatigue (5.7%), jaundice (5.0%), joint pains (4.3%), dark urine, Nausea and vomiting were all 3.0% respectively. For most respondents, 55.5% stated chronic liver diseases as a health risk of HBV, 15.8% mentioned maternal death, followed by preterm babies (14.20%), stillbirths (12.6%) and low birth weight (1.95%). Majority of women (67.4%) believed HBV can be cured whereas 32.6% did not believe HBV could be cured. A total of 197(63.5%) believed vaccine can prevent HBV, 33.6% did not know have an idea on the subject matter and 2.9% of women do not believe vaccines could prevent HBV. Majority of women (60.6%) believe HBV could be transmitted from one person to another, 39.4% do not believe. Most women (42.9%) did not know the best time a newborn should take the first dose of HBV vaccine while 28.1% believed it should be within 24 hours of birth, 15.8% believed it should be in 1 month and 28.1% believed the first shot should be within 2 to 7 days after birth. For most of the women (62.6%), they would allow their babies to be vaccinated whereas 37.4% disagree with allowing their new babies to take HBV vaccines (Table 3). Overall, majority of women (60.6%) demonstrated sufficient knowledge (>50%) on HBV whereas 39.4% exhibited insufficient knowledge (below 50%) on HBV (Table 4.3).

Table 4.3; Level of knowledge of HBV infection among pregnant women in the North Gonja District

Variables	Categories	Frequency	Percentage
Did you hear about HBV before pregnancy			
	Yes	187	60.30%
	No	123	39.70%
Source of information on HBV			
	Health Staff	122	65.20%
	Community member	18	9.60%
	Family member	5	2.70%
	Media (TV/radios)	42	22.50%
Did you receive information on HBV during pregnancy			
	Yes	189	61.00%
	No	121	39.00%
Do you know about the sign and symptoms of HBV			
	Yes	141	45.50%
	No	169	54.50%
What are the signs and symptoms of HBV			
	Dark urine	3	2.10%
	fatigue	8	5.70%
	Fever	99	70.20%
	Jaundice	7	5.00%
	Joint pains	6	4.30%
	loss of appetite	12	8.50%
	Nausea	3	2.10%
	vomiting	3	2.10%

Health risk of HBV			
	Chronic liver diseases	172	55.50%
	low birth weight	6	1.95%
	maternal death	49	15.80%
	preterm babies	44	14.20%
	Stillbirths	39	12.60%
Can HBV be cured	Yes	209	67.40%
	No	101	32.60%
Can vaccine prevent HBV	Yes	197	63.50%
	No	9	2.90%
	Don't know	104	33.50%
Can a person transmit HBV	Yes	188	60.60%
	No	122	39.40%
best time to provide a newborn with the first dose of HBV vaccine			
	1 month old	49	15.80%
	2-7 days after birth	87	28.10%
	within 24 hours of birth	41	13.20%
	Don’t Know	133	42.90%
Will you allow the baby for HBV vaccination			
	Yes	194	62.60%
	No	116	37.40%

Field survey, 2020

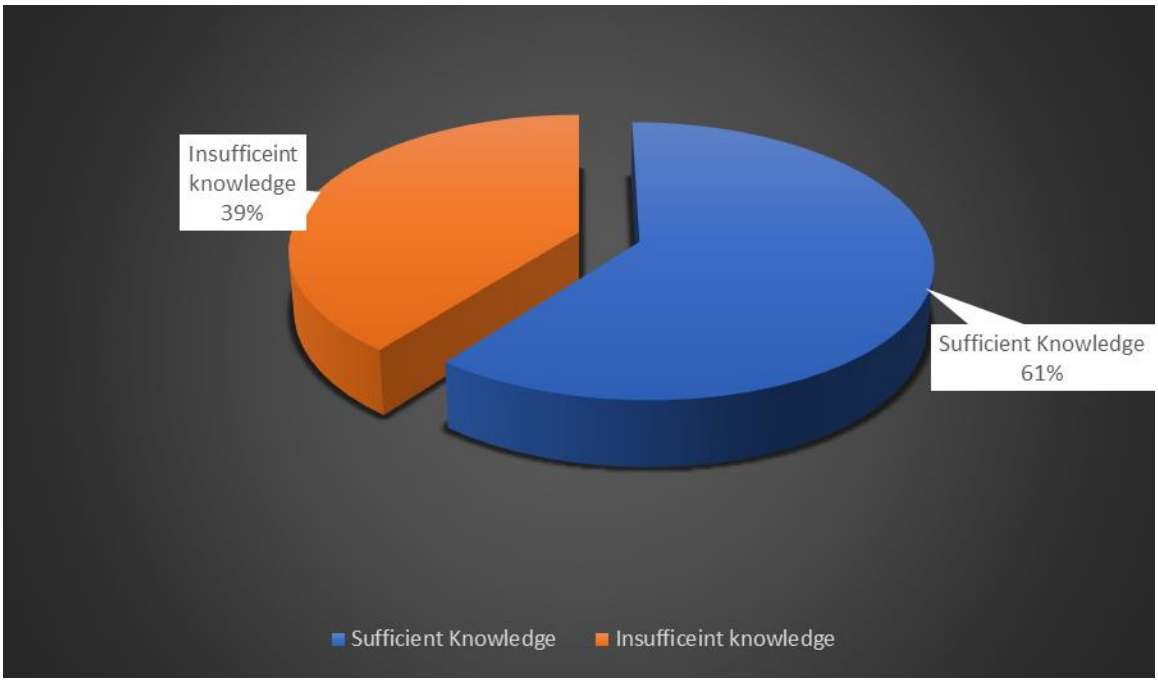

Figure 4.2: Overall knowledge of HBV

In a focus group discussion, most of the pregnant women have demonstrated sufficient knowledge of HBV.

"HBV is a sickness that affects the liver making you have a bloated stomach. Some of the people with the disease experience weight loss and may even die from the sickness. I first heard of HBV at this hospital during my first pregnancy, I heard about it on Radio and also the current Assemblyman brought some people to educate us and gave us HBV screening" (participant 2 in Daboya FGD)

In the same focus group discussion, one of the participants disclosed that:

"At my first ANC attendance, the nurse took my blood and later on told me to go to the drug store for injection. Some of the signs and symptoms I still remember are loss of appetite, Waist pains, difficulty in urinating and weight loss. The sickness can cause a

*woman to give birth before time, it may lead to the death of the baby. Eeeh……it can also cause the pregnant woman to die with the pregnancy. This can be prevented with you take the test and the injection before or during pregnancy". (*Participant 4 in Daboya FGD)

However, some of the participants exhibited limited knowledge on HBV and attributed the disease to superstitious believes as narrated by one of the participants in different focus group discussion.

"I don't believe this sickness is real. Our village bad people will poison you and say it's HBV. What kind of sickness it that when you get it, it affects only your stomach and it kills you? Any young persons who die now, people say it is hepatitis". (Participant 6 in Kuputo FGD)

4.4.1 Association between socio-demographic characteristics and knowledge of HBV

Majority (56.8%) of the respondents without health facilities in their communities had sufficient knowledge whereas 43.2% do not have sufficient knowledge of HBV. Also, 62.5% of women with health centres had sufficient knowledge and 37.7% had insufficient knowledge of HBV. There was no statistically significant between the availability of health facilities and knowledge on HBV (P; 0.360). Majority (71.1%, 65.5%, 52.5% and 57.9%) and minority 46.9% of women within 20 to 24 years, 25 to 29 years, 30 to 34 years and 35 years and above respectively and 14 to19 years of age had sufficient knowledge on HBV as compared to 28.9%, 34.5%, 47.5%, 42.1% and 53.1%(majority) of women in 20 to 24 years, 25 to 29 years, 30 to 34 years and 35 years and above and 14 to 19years respectively did not have sufficient knowledge on HBV. The study further revealed a significant association between age and knowledge of HBV

(P; 0.0049). On marital status, 82.4%, 12.5%, 71.4% and 60.4% of the single women, cohabiting, divorced/separated/widow and married respectively had sufficient knowledge compare to 17.6%, 87.5%, 28.6% and 39.6% of the single women, cohabiting, divorced/separated/widow and married respectively had insufficient knowledge on HBV. The marital status of these women was statistically significant with the overall level of knowledge of HBV (P; 0.009). However, the study did not establish any significant association between religion and knowledge on HBV (P; 0.428).

In order of prevalence, 73.4%, 63.5% 51.1%,45.3% of women belong to Gonja ethnicity, Tampulma, Mamprusi and others(minor tribes that participated in the study) respectively had sufficient knowledge of HBV whereas 26.6%, 36.5%, 48.9% and 54.9% of women belong to Gonja ethnicity, Tampulma, Mamprusi and others(minor tribes that participated in the study) respectively had insufficient knowledge of HBV. The study revealed a statistically significant between ethnicity and knowledge of HBV (P; 0.008). Majority (53.1%, 65.2%, 89.4%, and 75.0%) of the study participants who had no formal education, primary, secondary and tertiary respectively had sufficient knowledge on HBV whereas 49.6%, 34.8%, 10.6% and 25.0% of the study participants who had no formal education, primary, secondary and tertiary respectively had insufficient knowledge on HBV. The further revealed that it is statistically significant between the educational level of women and knowledge of HBV (P<0.001). Majority (52.4%,60.7%, 50.0%, 83.3% and 66.7%) of women who were farming, housewife, professional, traders and others respectively had sufficient knowledge on HBV compare to 47.6%, 39.3%, 50.0%, 16.7% and 33.3% of women who were farming, housewife, professional, traders and others respectively had insufficient knowledge on HBV. There was a statistically significant

occupation between knowledge on HBV (P; 0.028). On parity, 48.8%, 65.2% and 46.2% of women who had no child, 1 to 5 children and 6 to 10 children respectively had sufficient knowledge on HBV compare to 51.2%, 34.8% and 53.8% of women who had no child, 1 to 5 children and 6 to 10 children respectively had insufficient knowledge on HBV. There was a statistically significant between parity and knowledge on HBV (P; 0.021).

The study could not identify any statistically significant between income status, gestation, distance to the health centre and level of knowledge on HBV (P; 0.415, 0.104 and 0.220 respectively). Majority (60.6%) of women who visited ANC had sufficient knowledge than 12% who had not visit ANC whereas 35.1% of women who have visited ANC had insufficient knowledge on HBV as compared to 88.0% of women who have not visited ANC. Between a visit to ANC and knowledge on HBV, there was statistical significance (P<0.001) (Table 4.4).

Table 4.4; Association between socio-demographic characteristics and knowledge of HBV

Variables	Categories	Knowledge on HBV		Statistical Test
		Insufficient Knowledge	Sufficient Knowledge	
Availability of health facilities				
	No health center	41(43.2%)	54(56.8%)	X^2=0.830
	Health Center	81(37.7%)	134(62.3%)	P;0.362
Age groups	14-19 years	17(53.1%)	15(46.9%)	X^2=9.16
	20-24 years	22(28.9%)	54(71.1%)	P; 0049**
	25-29 years	29(34.5%)	55(65.5%)	
	30-34 years	38(47.5%)	42(52.5%)	
	35 years and above	16(42.1%)	22(57.9%)	
Marital status	Single	3(17.6%)	14(82.4%)	X^2=11.47
	Cohabiting	7(87.5%)	1(12.5%)	P;0.009**
	Divorce/separated/widow	2(28.6%)	5(71.4%)	
	Married	110(39.6%)	168(60.4%)	
Religion	Christianity	19(32.2%)	40(67.8%)	X^2=1.70
	Islam	101(40.9%)	146(59.1%)	P;0.428
	Traditional	2(50.0%)	2(50.0%)	
Ethnicity	Gonja	17(26.6%)	47(73.4%)	X^2=11.87
	Mamprusi	23(48.9%)	24(51.1%)	0.008**
	Tampulma	54(36.5%)	94(63.5%)	
	Others	28(54.9%)	23(45.1%)	
Educational status	No education	100(46.9%)	113(53.1%)	X^2=22.13
	Primary	16(34.8%)	30(65.2%)	P<0.001***
	Secondary	5(10.6%)	42(89.4%)	
	Tertiary	1(25.0%)	3(75.0%)	

Occupation	Farming	49(47.6%)	54(52.4%)	X^2=10.87
	Housewife	64(39.3%)	99(60.7%)	P;0.028**
	Professional	1(50.0%)	1(50.0%)	
	Trader	6(16.7%)	30(83.3%)	
	Others	2(33.3%)	4(66.7%)	
Parity	No birth	21(51.2%)	20(48.8%)	X^2=7.86
	1-5 children	80(34.8%)	150(65.2%)	P;0.021
	6-10 children	21(53.8%)	18(46.2%)	
Income status	High income	13(46.4%)	15(53.6%)	X^2=1.76
	Middle income	33(34.4%)	63(65.6%)	P;0.415**
	low income	76(40.9%)	110(59.1%)	
Gestation	First trimester	39(49.4%)	40(50.6%)	X^2=4.23
	Second trimester	45(35.2%)	83(64.8%)	P;0.104
	Third trimester	38(36.9%)	65(63.1%)	
Distance to a health centre				
	Long distance	3(23.1%)	10(76.9%)	X^2=1.51
	Short distance	119(40.1%)	178(59.9%)	P;0.220
Visit ANC	Yes	100(35.1%)	185(60.6%)	X^2=26.96
	No	22(88.0%)	3(12.0%)	P<0.001***

Chi^2 test of association (p=0.001, p>0.001 are marked*** and ** respectively showing the level of statistically significant)

4.5 Objective Two: Hepatitis B vaccination status among pregnant women in the North Gonja District.

Majority of women (85.5%) saw HBV testing as necessary whereas 14.2% do not see it as necessary testing for HBV. For 64.8% of the study, participants have never tested for HBV before, whilst the remaining have tested HBV before. Most of the women (61.5%) had their test in their community, followed by health facility within the district 14.7%, private health facility (10.1%), health facility outside the district (7.3%) and Pharmacy (6.4%). A total of 75(68.8%) of women who had tested for HBV paid for the services, 31.2% did not pay any fee for the services rendered. Almost all respondents (91.1%) were willing to disclose their HBV status with the remaining 8.9% not willing to disclose their status. Most of the respondents (95%) were non-reactive (negative) and 5.0% being reactive (positive). Most women (77.4%) believe the HBV vaccine was necessary for them and neonates while the remaining 22.6% disagrees. Most respondents (64.8%) have never received HBV vaccination whiles 35.2% of the women had receive HBV vaccination (figure 4). For those who have never had a vaccination, they gave these reasons in other of prevalence; majority of them said the vaccines are expensive (40%), don't see the need (15.24%), I am aware of my status (29.52%), don't know where to go (14.29%) and don't have time (0.95%). Among those who had taken their vaccinations, 87% had taken 3 shots (doses), 6.0% had taken 1 shot (dose), 5.0% had taken 2 shots (doses) and 2% had taken more than 3 doses. Most women 48.1% did not know the recommended full dose of HBV vaccinations, 45.8% stated 3 doses as the recommended full dose of hepatitis B, 0.6% mentioned 2 doses, 0.3% mentioned a dose and 5.2% mentioned more than 3 doses (Table 4.5)

Table 4.5; hepatitis B vaccination status among pregnant women in the North Gonja District.

Variables	Categories	Frequency	Percentage
HBV testing is necessary for pregnancy			
	Yes	266	85.80%
	No	44	14.20%
Have you tested for HBV before?			
	Yes	109	35.20%
	No	201	64.80%
Where do test for HBV			
	Health facility outside the district	8	7.30%
	Health facility within the district	16	14.70%
	At pharmacy	7	6.40%
	in this community	67	61.50%
	private health facility	11	10.10%
Did you pay for the testing			
	Yes	75	68.80%
	No	34	31.20%
Are you willing to disclose your HBV status			
	Yes	100	91.10%
	No	9	8.90%
What was your HBV status			
	Negative not seen	9	9.00%
	Negative seen	86	86.00%
	Positive seen	5	5.00%
Is HBV vaccine necessary for you and neonates			
	Yes	240	77.40%
	No	70	22.60%
Have you ever received the HBV vaccine?	Yes	100	32.26%
	No	210	67.74%
Reasons for no vaccinations			
	am aware of HBV status	62	29.52%
	don't have time	2	0.95%

	don't know where to go	30	14.29%
	don't see the need	32	15.24%
	It's expensive	84	40.00%
How many dose(s) of HBV vaccine have you taken?			
	1 dose	6	6.00%
	2 doses	5	5.00%
	3 doses	87	87.00%
	More than 3 doses	2	2.00%
What is the recommended full dose for HBV vaccination			
	1 dose	1	0.30%
	2 doses	2	0.60%
	3 doses	142	45.80%
	More than 3 doses	16	5.20%
	don't know	149	48.10%
Do you know where you took the vaccine			
	Yes	127	41.00%
	No	183	59.00%

Field survey, 2020

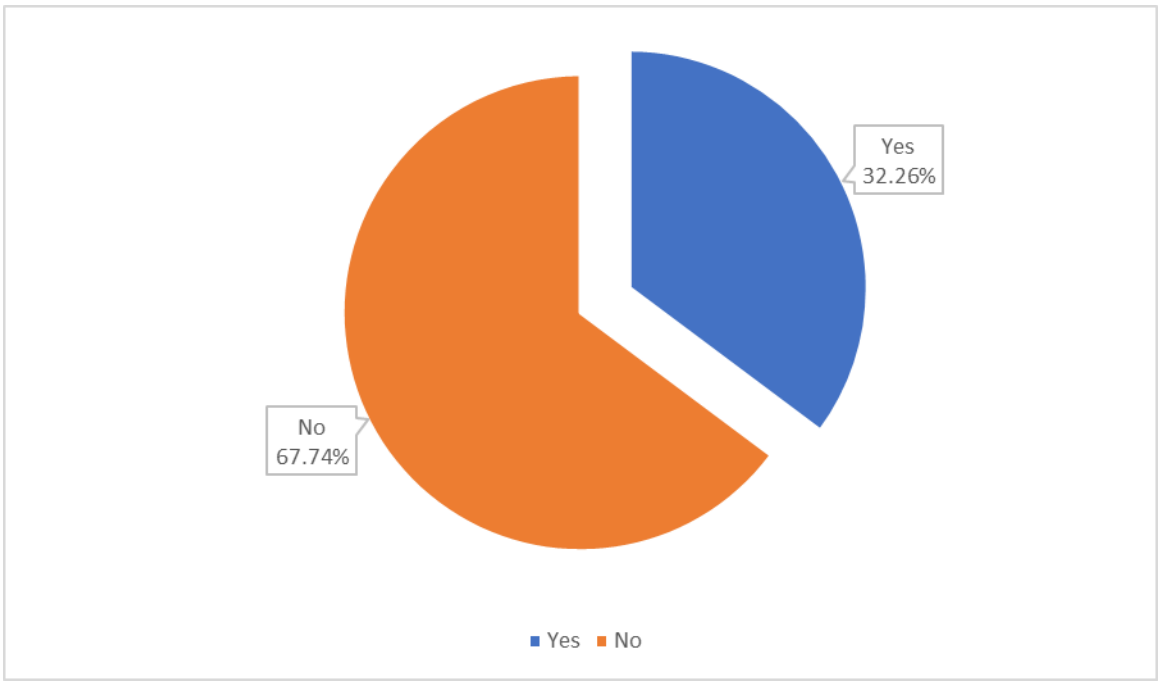

Figure 4.3: Have pregnant women ever vaccinated against HBV?

Field survey, 2010

In a focus group discussion, it was also revealed that most pregnant women have never tested for HBV. Some of the participants said:

"You know HBV vaccines are stored in the laboratory but this facility did not have a laboratory. I am sure that is the reason why nurse does not vaccinate us during ANC. Even if they want to vaccinate you, they will ask you to pay for it and you know most of us here are very poor we can't pay unless it's made free but they nurse always tell us the vaccines are not from the government". (Participant 4, Daboya FGD)

"*They don't test nor give us the injection on the disease during ANC neither do they refer us to anybody for vaccination. I know TJ is doing the testing and injection but because of the cost of the testing and the cost of the 3months injection that is why I have not gone for it". (Participant 3, Tari FGD)*

"TJ has asked me to come for the injection but I have not gone because I don't have money. None of the nurses has ever given me any hepatitis B injection. I am not sure they have them. Where will they even keep them? There is no electricity in this community". (Participant 3, Tari FGD)

The focus group discussion also brought to light varied reasons why most of the participants were not vaccinated. Some of the participants said:

"The medicine is expensive we paid Ghc30.00 each for my daughter's injection in Daboya and where are we going to get that money? Even though we know it's important to take the medicine as pregnant women but we don't have the money. The government have to make it free like health insurance for pregnant women". (Participant 2, Kuputo FGD)

"Somebody told me the drugstore close to the MP's Fuel Station have the drug for this sickness. I went there with a friend for her to take the injection because the nurses in Tamale told her she is having the sickness. But I am yet to take the test and injection because of the cost of the injection. I am told one injection is Gh.25.00 and you must take the injection three times. I think that is the reason why most of us have not gone for the test and injection". (Participant 4, Daboya FGD)

4.6.1 Association between socio-demographic characteristics and vaccination status of pregnant women.

Majority (50.5% and 71.2%) of those without health centre and those with health centre respectively had vaccinated against HBV as compared with 49.5% and 28.8% of those without health centre and those with health centre not taking any vaccine to protect

themselves against HBV. There was a statistically significant association between the availability of health facility and the vaccination status of pregnant women (P<0.001).

The study further establishes that there was a statistically significant relationship between ethnicity and vaccination status (P<0.001). Thus, 34.4%, 91.5%, 69.6%, and 64.7% of women belong to the Gonja ethnic group, Mamprusi, Tampulma and others respectively took HBV vaccine as compared to 65.6%, 8.5%, 30.4% and 75.0% of women belong to the Gonja ethnic group, Mamprusi, Tampulma and others have not taken any vaccine to protect themselves against HBV infections. On education, 74.6%, 58.7%, 29.8% and 25.0% of women with no formal education, primary, secondary and tertiary level respectively had vaccinated against HBV whereas 25.4%, 41.3%, 70.2% and 75.0% of women with no formal education, primary, secondary and tertiary level respectively did not take any HBV vaccine. There was a statistically significant association between education and vaccination status (P<0.001). On occupation, 91.3%, 55.3%, 0.0%, 38.9% and 50.0% of women who were farmer, housewives, professionals, trader, others (some jobs women do for survival) respectively have taken the HBV vaccine as compared to 8.7%, 44.8%, 100.0%, 61.1% and 50.0% of women who were farmer, housewives, professionals, trader, others (some jobs women do for survival) respectively have not taken shot of HBV vaccine. There was a significant association between occupation and vaccination status of the women. Those with a short distance to the health centre (66.3%) took the HBV vaccination compare to their counterparts (30.8%) with a long distance to access the health centre. Also, 28.0% of women who walked a short distance to access health centre had not taken the HBV vaccine compared to 69.2% of women with long

distance to access health facilities did not take the HBV vaccine. There was a significant association between distance and vaccination status (P; 0.009).

However, there is no statistical significance established between vaccination status and age(P;0.050), marital status(P;0.176), religion (P;0.054), parity (P;0.180), income status (P;0.343), gestation(P;0.351) and visit ANC (P;0.434) (Table4.6).

Table 4.6; Association between socio-demographic characteristics and vaccination status of pregnant women.

Variables	Categories	Vaccination status		Statistical Test
		Yes	No	
Availability of health facilities				
	No health center	48(50.5%)	47(49.5%)	X2=12.31
	Health Center	153(71.2%)	62(28.8%)	P<0.001***
Age groups	14-19 years	19(59.4%)	13(40.6%)	X2=9.47
	20-24 years	41(53.9%)	35(46.1%)	P;0.050**
	25-29 years	53(63.1%)	31(36.9%)	
	30-34 years	59(73.8%)	21(26.3%)	
	35 years and above	29(76.3%)	9(23.7%)	
Marital status	Single	7(41.2%)	10(58.8%)	X2=4.94
	Cohabiting	6(75.0%)	2(25.0%)	P;0.176
	Divorce/separated/widow	4(57.1%)	3(42.9%)	
	Married	184(66.2%)	94(33.8%)	
Religion	Christianity	46(78.0%)	13(22.0%)	X2=5.82
	Islam	152(61.5%)	95(38.5%)	P;0.054
	Traditional	3(75.0%)	1(25.0%)	
Ethnicity	Gonja	22(34.4%)	42(65.6%)	X2=42.16
	Mamprusi	43(91.5%)	4(8.5%)	P<0.001***
	Tampulma	103(69.6%)	45(30.4%)	
	Others	33(64.7%)	18(35.3%)	
Educational status	No education	159(74.6%)	54(25.4%)	X2=37.86
	Primary	27(58.7%)	19(41.3%)	P<0.001***
	Secondary	14(29.8%)	33(70.2%)	

	Tertiary	1(25.0%)	3(75.0%)	
Occupation	Farming	94(91.3%)	9(8.7%)	X2=53.07
	Housewife	90(55.2%)	73(44.8%)	P<0.001**
	Professional	0(0.0%)	2(100.0%)	
	Trader	14(38.9%)	22(61.1%)	
	Others	3(50.0%)	3(50.0%)	
Parity	No birth	28(68.3%)	13(31.7%)	X2=3.43
	1-5 children	143(62.2%)	87(37.8%)	P;0.180
	6-10 children	30(76.9%)	9(23.1%)	
Income status	High income	21(75.0%)	7(25.0%)	X2=2.14
	Middle income	58(60.4%)	38(39.6%)	P;0.343
	low income	122(65.6%)	64(34.4%)	
Gestation	First trimester	46(58.2%)	33(41.8%)	X2=2.10
	Second trimester	85(66.4%)	43(33.6%)	P;0.351
	Third trimester	70(68.0%)	33(32.0%)	
Distance to the health centre				
	Long distance	4(30.8%)	9(69.2%)	X3=6.91
	Short distance	197(66.3%)	100(33.7%)	P;0.009**
Visit ANC	Yes	183(64.2%)	102(35.8%)	X2=0.61
	No	18(72.0%)	7(28.0%)	P;0.434

Chi^2 test of association (p=0.001, p>0.001 is marked*** and ** respectively shows the level of statistically significant)

4.6 Objective 3: Risk factors associated with hepatitis B virus infection among pregnant women in the North Gonja District.

In assessing the risk factors associated with HBV among the respondents, a total of 86(27.70%) of the respondents were in a polygamous marriage. 78(25.30%) have ever had a blood transfusion. On the issue of ear-piercing/tattooing, only 129(41.60%) was reported, 30.30% of the women uses unsterilized instruments such as needles, used-blades and other sharp objects. whereas 35.8% were engaged in kissing which are a potential source of acquiring or transmitting HBV. (Table 4.7).

Table 4.7: Risk factors associated with hepatitis B virus infection among pregnant women in the North Gonja District.

Variables	Categories	Frequency	Percentage
Have you ever had Unprotected sex with a different person?			
	Yes	91	29.40%
	No	219	70.60%
Have you ever had blood transfusion?			
	Yes	78	25.30%
	No	232	74.80%
Does your husband have another wife?			
	Yes	86	27.70%
	No	224	72.30%
Have someone ever breastfeed your baby?			
	Yes	91	29.40%
	No	219	70.60%
Do you use Unsterilized instruments?			
	Yes	94	30.30%
	No	216	69.70%
Do you engage in tattooing/ear-piercing of your body?			
	Yes	129	41.60%
	No	181	58.40%
Do you engage in circumcision/tribal marks?			
	Yes	101	32.60%
	No	209	67.40%
HBV can be transmitted via kissing			
	Yes	111	35.80%
	No	199	64.20%

4.5.1 Risk of pregnant women on HBV

On the risk profile of the respondents, 41.6% of pregnant women were said to be high-risk people whereas 58.4% were considered to have a low risk (figure 3).

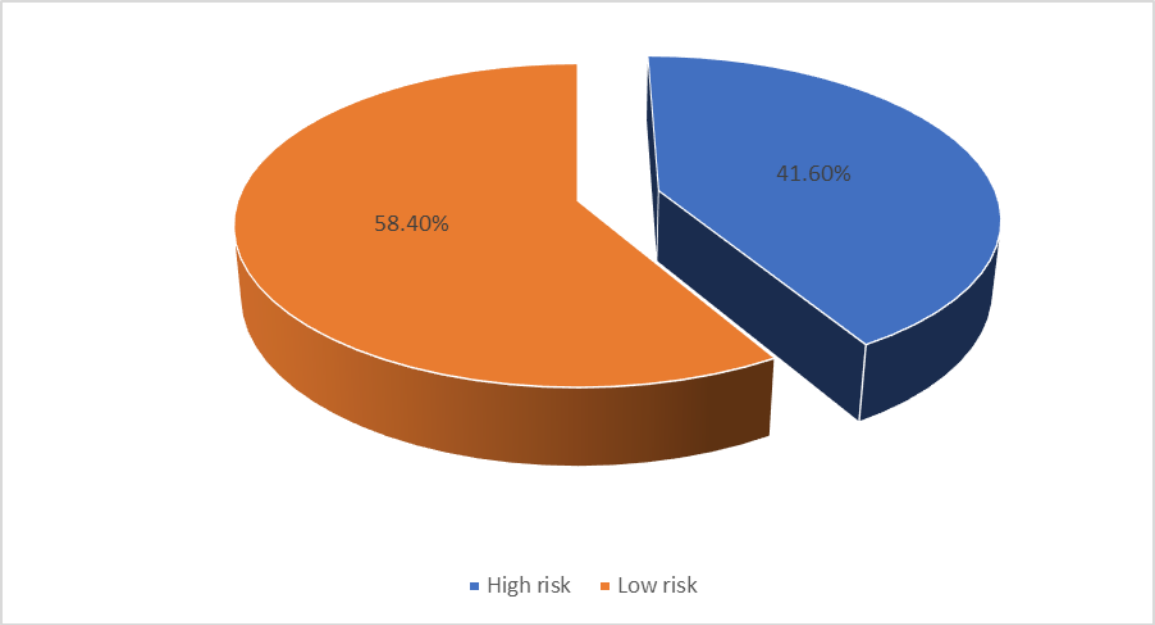

Figure 4.4: Risk profile of pregnant women

Field survey, 2020

The qualitative interviews supported the quantitative one as some of the study participants lifestyles were potential risk factors associated with HBV. One of the participants in a focus group discussion said:

"We are told somebody with the virus can transmit it to the partner and I am worried these days because my husband has four of us in the house. What it means is that any of us with the sickness to spread it among us". (Participant 5, Tari FGD)

"I heard about the sickness back at SHS. I know one can get the sickess through blood transfusion but was given blood last month when was referred to Tamale Teaching Hospital". (Participant 1, Tari FGD)

However, some of the focus group participants were very careful dealing with the risk factors.

"Me all the male children that I have given birth, I do not allow the Wamzam to do the circumcision. My husband always carry us to Daboya health centre for the nurses there to cut the penis". (Participant 1, Kuputo FGD)

4.5.2 Association between socio-demographics characteristics and the risk of HBV

On education, the study revealed that 52.1%, 69.6%, 76.6% and 50.0% of women who had no formal education, primary, secondary and tertiary education had a low risk of contracting HBV as compare to their counterparts 47.2%, 30.4%, 23.4% and 50.0% of women who had no formal education, primary, secondary and tertiary education respectively had a low-risk profile on HBV. The study further revealed a significant association between educational status and the risk profile of HBV (P: 0.006). On the number of children poses by each of the respondents, the study revealed that 56.1%, 62.2% and 38.5% of women had no children, had between 1 to 5 children and 6 to 10 children respectively had a low risk of contracting HBV as compared to 43.9%, 37.8% and 61.5% of women had no children, had between 1 to 5 children and 6 to 10 children respectively had a high risk of contracting HBV. There was a significant association between parity and risk profile of respondent (P; 0.020). For those who visited ANC, 61.8% had low risk as compared to 20.0% who did not visit ANC, whereas 38.2% of those who visited ANC had a higher risk compared to 80% of those who did not visit ANC. There was a statistically significant association between visiting ANC and the risk of contracting HBV (P<0.001).

However, there was no association between risk of HBV and availability of health facilities (P; 0.362), religion (P; 0.428), income status (P; 0.415), gestation (P; 0.104) and distance to the health centre (P; 0.220) (Table 4.8)

Table 4.8; Association between socio-demographic characteristics and the risk of HBV

Variables	Categories	Risk of getting HBV		Statistical Test
		High Risk	Lower Risk	
Availability of health facilities				
	No health center	41(43.2%)	54(56.8%)	X2=0.830
	Health Center	81(37.7%)	134(62.3%)	P;0.362
Age groups	14-19 years	17(53.1%)	15(46.9%)	X2=9.16
	20-24 years	22(28.9%)	54(71.1%)	P; 0049
	25-29 years	29(34.5%)	55(65.5%)	
	30-34 years	38(47.5%)	42(52.5%)	
	35 years and above	16(42.1%)	22(57.9%)	
Marital status	Single	3(17.6%)	14(82.4%)	X2=11.47
	Cohabiting	7(87.5%)	1(12.5%)	P;0.009**
	Divorce/separated/widow	2(28.6%)	5(71.4%)	
	Married	110(39.6%)	168(60.4%)	
Religion	Christianity	19(32.2%)	40(67.8%)	X^2=1.70
	Islam	101(40.9%)	146(59.1%)	P;0.428
	Traditional	2(50.0%)	2(50.0%)	
Ethnicity	Gonja	17(26.6%)	47(73.4%)	X^2=11.87
	Mamprusi	23(48.9%)	24(51.1%)	0.008**
	Tampulma	54(36.5%)	94(63.5%)	
	Others	28(54.9%)	23(45.1%)	
Educational status	No education	100(46.9%)	113(53.1%)	X2=22.13
	Primary	16(34.8%)	30(65.2%)	P<0.001***
	Secondary	5(10.6%)	42(89.4%)	
	Tertiary	1(25.0%)	3(75.0%)	
Occupation	Farming	49(47.6%)	54(52.4%)	X2=10.87
	Housewife	64(39.3%)	99(60.7%)	P;0.028**
	Professional	1(50.0%)	1(50.0%)	
	Trader	6(16.7%)	30(83.3%)	

	Others	2(33.3%)	4(66.7%)	
Parity	No birth	21(51.2%)	20(48.8%)	X2=7.86
	1-5 children	80(34.8%)	150(65.2%)	P;0.021**
	6-10 children	21(53.8%)	18(46.2%)	
Income status	High income	13(46.4%)	15(53.6%)	X2=1.76
	Middle income	33(34.4%)	63(65.6%)	P;0.415
	low income	76(40.9%)	110(59.1%)	
Gestation	First trimester	39(49.4%)	40(50.6%)	X2=4.23
	Second trimester	45(35.2%)	83(64.8%)	P;0.104
	Third trimester	38(36.9%)	65(63.1%)	
Distance to a health centre				
	Long distance	3(23.1%)	10(76.9%)	X2=1.51
	Short distance	119(40.1%)	178(59.9%)	P;0.220
Visit ANC	Yes	100(35.1%)	185(60.6%)	X2=26.96
	No	22(88.0%)	3(12.0%)	P<0.001***

Figure 4: Chi^2 test of association (p=0.001, p>0.001 is marked*** and ** respectively shows the level of statistically significant)

4.7 Measures to prevent the risk of Hepatitis B virus infection among pregnant women in the North Gonja District.

Most study participants (72.9%) stated that vaccines could prevent HBV and they were at a different level of receiving the vaccine, whereas 27.1% disagrees. Majority (70.3%) of women said avoiding reuse and sharing of injections can prevent HBV whereas 29.7% disagrees that avoiding reuse and sharing of injections could prevent HBV. The use of condoms, 62.9% of the women could prevent transmission of HBV while 37.1% disagrees. Majority (74.2%) of women agrees that proper screening before blood transfusion can prevent HBV, 25.8% of the women did not see the sense in this and hence disagrees (Table 4.9). Overall, a minority (38.7%) of the women comply with HBV preventives measure with 61.3% not complying with the HBV preventive measures (figure 5).

Table 4.9; Measures to prevent the risk of Hepatitis B virus infection among pregnant women in the North Gonja District.

Variables	Categories	Frequency	Percentage
HBV can be prevented with HBV vaccine			
	Yes	226	72.90%
	No	84	27.10%
Avoiding reuse or sharing of injection can prevent HBV needles/syringes			
	Yes	218	70.30%
	No	92	29.70%
Use of condoms can prevent HBV transmission			
	Yes	195	62.90%
	No	115	37.10%
HBV can be prevented by the proper screening of blood before transfusion			
	Yes	230	74.20%
	No	80	25.80%

Field survey, 2020

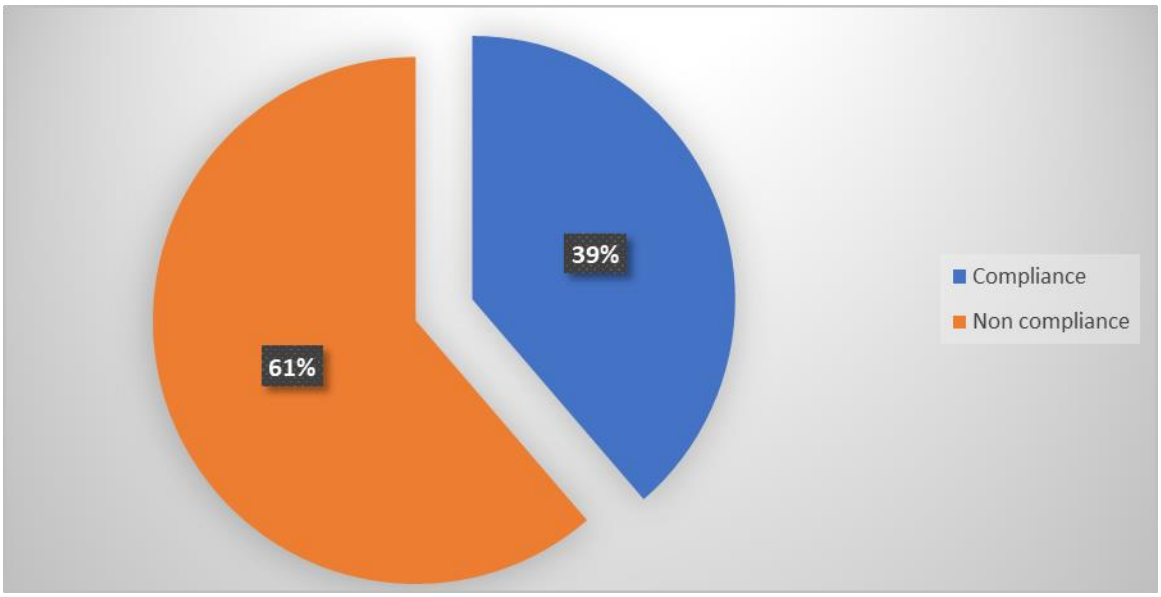

Figure 4.5: Compliance with HBV preventive measures

Field survey, 2020

The participants in a focus group discussion demonstrated sufficient knowledge in the prevention measures as presented in the quantitative measures. Most of the participants attributed this to the information on the disease they receive from health care workers.

"The nurses always educate us on the disease during ANC. I now know the prevention measures such as avoidance of used razor blade, the use of condom, avoiding close contact with HBV patients. They sometimes refer us to somebody for testing. I know Mr. TJ is also doing the test but because of the cost of the test and the cost of the 3months injection that is why I have not tested for the disease". (Participant 3, Tari FGD)

In an in-depth interview with some selected nurses, it was revealed that the only way to prevent the disease transmission was through health education, HBV screening and vaccination. Participants disclosed that they always sensitized the pregnant women on the disease during ANC days just like they do for other diseases, mostly on the signs and

symptoms, the risk factors associated with the disease and how to prevent the disease transmission. Translating into the sufficient knowledge on the disease control measures by the pregnant women.

"During ANC, just like we do for other diseases, we provide general education on hepatitis B, we educate them on the signs/symptoms, the importance of HBV screening, vaccination and the various prevention strategies and I think most of them are now aware of the disease". (HCW, Daboya).

"If you ask them, they will tell. As a community health nurse, my job is to sensitize them on their health-related problems. HBV is one of the diseases I give much of my attention to because the test kits and the vaccines are not readily available even in Daboya. So most often after educating them on the prevention measures, I often refer them to a friend in Daboya for the test. But you know this your people, most of them don't go and when you ask them, they say they don't have money to go to Daboya" (HCW, Kuputo).

4.7.1 Screening pregnant women for HBV during ANC

The individual interviews revealed that only the Daboya Health Center provides the HBV testing for pregnant women during ANC all other facilities do not have the HBV test kits and they often refer them to other facilities or individual nurses who have the test kits but most pregnant women don't have the money to go for the test.

"*Hmmm…. we are supposed to screen every pregnant for HVB just like we do for syphilis and HIV&AIDS but because of the logistical challenge, we don't do that. However, we encourage them to go for the test. Some of my colleagues here have the test kits and the vaccines so we sometimes refer them to our colleagues for screening at a fee. Some of them also travel out of this community for the test".* (HCW1, Tari)

"Recently, we have started testing every pregnant woman during their first ANC visit just like HIV&AIDS screening we provide. But because the test kits are not enough, there are certain months they will come and we don't have the test kit to test them. When that happens, we either refer them to some of the nurses who have the test kits or we postpone the testing until the test kit are available. Anytime you refer them kuraaa because of the payment issues most of them don't go". (HCW, Daboya).

4.7.2 Provision of HBV vaccination service during ANC

"Like I said early on the HBV test, we don't provide vaccination service to. But if we get them, I think we can start the vaccination. Director always encourages us to tell every pregnant to go for the vaccination. One of the nurses here even brought the vaccines but the women are not showing interest maybe because they have to pay for vaccination that is why the interest is not there. If the government provide us with these vaccines, I think that will be fine". (HCW1, Tari)

"We don't provide vaccination service in this facility but our in-charge has the vaccines so we always refer them to him but because of the payment most of them don't go". (HCW, Daboya).

4.7.3 In general what can be done to prevent the risk of HBV transmission?

"First of all, as health care workers, we must ensure that we educate these women on these diseases. They need to know the signs and symptoms of HBV, how it's transmitted, its impact on their health and that of the baby. I think it's equally important if government to can supply us with the test kits and vaccines so that whenever they come to this facility, we can take care of them". (HCW, Daboya).

"The only way to prevent the risk of HBV transmission is by vaccinating these pregnant women and that of their household. The district assembly can start to supply us with the vaccines free of in-charge like the HIV&AIDS test kit. I think mass screening is another way we can prevent the risk of transmission. Through this process, community members will become aware of the disease and adopt to HVB vaccination". (HCW, Tari)

"Government can make testing and vaccination of free and ensure the both the test kit and vaccines are available this will help a lot. Because of the low level their education, I mean the prevent women, I think we need the support of people like the NGOs to compliment government effort in reaching out to these pregnant women in their communities. At least the NGOs can pay for both the testing and vaccination during pregnancy to control perinatal transmission". (HCW, Kuputo)

4.7.4 Association between socio-demographics and prevention of HBV among pregnant women.

Majority of women (62.9%, 60.9%, 51.1% and 100.0%) who had no formal education, primary, secondary and tertiary education respectively were adhering to HBV preventive measures as compared to 37.1%, 39.1%, 48.9% and 0.0% who had no formal education, primary, secondary and tertiary education respectively were not adhering (noncompliance) to HBV preventive measures. There was a statistically significant association between educational status and preventive measures. (P; 0.042).

Distance to the health and adherence to preventive measures were statistically significant (P; 0.021). Thus 30.8% and 62.6% of women who had to walk for long-distance and short-distance respectively to access health facilities were complying with the preventive

measures of HBV while 69.2% and 37.4% of women who had to walk for long-distance and short-distance respectively do not comply with the preventive measures.

For those who had visited ANC, 92.0% of the women adhere to preventive measures of HBV as compared to 58.6% of those who do not visit ANC. Also, 8.0% of women who visits ANC did not comply with the preventive measures as compared to 41.4% of women who did not visit ANC.

The study revealed an insignificant association between the rest of the socio-demographic characteristics and preventive measures (see table 4.10 below for details).

Table 4.10; Association between socio-demographics and prevention of HBV among pregnant women.

Variables	Categories	HBV preventive measures		Statistical Test
		Compliance	Non-compliance	
Availability of health facilities				
	No health center	37(38.7%)	58(61.1%)	X2=0.003
	Health Center	83(38.6%)	132(61.4%)	P;0.954
Age groups	14-19 years	11(34.4%)	21(65.6%)	X2=7.45
	20-24 years	37(48.7%)	39(51.3%)	P;0.114
	25-29 years	36(42.9%)	48(57.1%)	
	30-34 years	25(31.3%)	55(68.8%)	
	35 years and above	11(28.9%)	27(71.1%)	
Marital status	Single	4(23.5%)	13(76.5%)	X2=4.31
	Cohabiting	1(12.5%)	7(87.5%)	P;0.230
	Divorce/separated/widow	3(42.9%)	4(57.1%)	
	Married	112(40.3%)	166(59.7%)	
Religion	Christianity	19(32.2%)	40(67.8%)	X2=1.46
	Islam	99(40.1%)	148(59.9%)	P;0.481
	Traditional	2(50.0%)	2(50.0%)	
Ethnicity	Gonja	28(43.8%)	36(56.3%)	X2=1.10
	Mamprusi	17(36.2%)	30(63.8%)	P;0.785
	Tampulma	57(38.5%)	91(61.5%)	
	Others	18(35.3%)	33(64.7%)	
Educational status	No education	79(37.1%)	134(62.9%)	X2=4.84
	Primary	18(39.1%)	28(60.9%)	P;0.042**

	Secondary	23(48.9%)	24(51.1%)	
	Tertiary	0(0.0%)	4(100.0%)	
Occupation	Farming	36(35.0%)	67(65.0%)	X2=2.57
	Housewife	68(41.7%)	95(58.5%)	P;0.635
	Professional	0(0.0%)	2(100.0%)	
	Trader	14(38.9%)	22(61.1%)	
	Others	2(33.3%)	4(66.7%)	
Parity	No birth	15(36.6%)	26(63.4%)	X2=1.40
	1-5 children	93(40.4%)	137(59.6%)	P;0.498
	6-10 children	12(30.8%)	27(69.2%)	
Income status	High income	7(25.0%)	21(75.0%)	X2=2.46
	Middle income	39(40.6%)	57(59.4%)	P;0.293
	low income	74(39.8%)	112(60.2%)	
Gestation	First trimester	29(36.7%)	50(63.3%)	X2=0.36
	Second trimester	52(40.6%)	76(59.4%)	P;0.834
	Third trimester	39(37.9%)	64(62.1%)	
Distance to a health centre				
	Long distance (above 5km)	9(69.2%)	4(30.8%)	X2=5.328
	Short distance(5km)	111(37.4%)	186(62.6%)	P;0.021**
Visit ANC	Yes	2(8.0%)	23(92.0%)	X2=10.81
	No	118(41.4%)	167(58.6%)	P;0.001**

Chi^2 test of association (p=0.001, p>0.001 is marked*** and ** respectively shows the level of statistically significant)

CHAPTER FIVE

DISCUSSION

5.0 Introduction

In Africa, the Hepatitis B virus (HBV) is a leading cause of chronic liver disease, maternal complications and neonatal deaths. These consequences are felt more in pregnant women (Atilola et al., 2018). This study was conducted to determine the level of knowledge, vaccination status and factors associated with Hepatitis B infection among pregnant women in the North Gonja District. The study takes a mixed-method approach (qualitative and quantitative) with a descriptive cross-sectional design. The perspectives of pregnant women and midwives were surveyed. This chapter discusses pertinent results from the study with new insights and comparisons made with studies conducted in other jurisdictions. The discussion is done based on the objectives of the study.

5.1 Sociodemographics and obstetric characteristics of the respondents

With credence to outliers, maternal age typically starts at 15 years and extends through to 49 years (GSS, GHS & ICF, 2018). In this study, the minimum age of the respondents was 14 years and the maximum being 41 years with a mean of 27.13±5.8. It emerged in this study that the majority of the respondents had between 1 to 5 children. This reflects the 2017 Ghana Maternal Health Survey(GMHS) conclusion that rural women have a fertility rate of 4.7 children (GSS, 2018). The average parity in this study however was 2.95. It must be noted that most of these women were within the age bracket of 20-34 and had the intention to give birth to more children.

The World Health Organization recommends the antenatal clinic (ANC) attendance for all pregnant women (WHO, 2016). In this study, almost all of the women had visited the

ANC. This could be as a result of the proximity of health facilities to participants in the study as majority had health centres in their communities and those without health centres were required to walk a short distance (within 5km) to access ANC services. Regardless, no woman must be left out when it comes to access to ANC services. For some of the respondents who did not access ANC services, some of the reasons pushed were the poor attitudes of health staff, long distance to health centres, no health centres and lack of money. Similar hindrances such as rude service providers, cost of services and distance to health facilities were identified in a study conducted in Cameroun (Warri & George, 2020).

5.2 Level of knowledge of HBV among pregnant women in the North Gonja District

Inadequate information and awareness on infectious diseases such as Hepatitis B remain one among many factors affecting efforts by recognized institutions such as the WHO control over the hazards associated with Hepatitis B infection worldwide (WHO, 2016). In this current study, majority of the pregnant women (60%) had heard about Hepatitis B (HBV). A higher percentage was however reported in an urban area study whereas high as 96% of pregnant women in the study had information on HBV infection before (Cheng et al., 2015). This reflects knowledge gaps in the rural/urban divide. Education and testing for hepatitis B virus infection are some of the recommended routines for pregnant women attending antenatal care clinic in Ghana (Awiah, 2018). Consequently, majority of the women in this study mentioned health staff as their main source of information on Hepatitis B. This however differed from another cross-sectional study conducted in Ghana among pregnant women where Radio was reported to be the main source of

information on Hepatitis B (Abdulai et al., 2016). It must be stated that in this current study, media (TV/Radio) was the next source of information for pregnant women.

A high percentage of pregnant women in this study did not know about the signs and symptoms of HBV. Those who knew mentioned signs such as fever, loss of appetite, fatigue, jaundice, joint pains and dark urine, nausea and vomiting in that order as the signs and symptoms of the infection. With regards to complications of the disease, majority mentioned chronic liver diseases, maternal death, pre-term babies, low-birth-weight and stillbirths. Similar signs and symptoms as well as complications were mentioned in a study conducted in India (Jha et al., 2016). Majority of the participants believed HBV could be prevented and in treatment cases, be cured. The finding was consistent with a study conducted in Nigeria where majority of the women believed that HBV was a vaccine-preventable disease (Atilola et al., 2018). However, poor knowledge about HBV infection prevention by vaccination was also recorded among study participants in Buea District in Cameroun (Frambo et al, 2014). A reason for the disparity could be that unlike the study by Frambo et al., (2014), this current study covered more communities.

Regarding HBV mode of transmission, majority were aware of the person to person transmission and mother to child transmission. This result differed from that of a study conducted in Uganda where more than half of participants were not knowledgeable about both horizontal and vertical transmission of HBV (Nankya-Mutyoba et al., 2018).

Overall, in this study, majority of women demonstrated sufficient knowledge of HBV. This assertion differed from several studies including a study conducted in Wa, Ghana (Awiah, 2018), Ningo-Prampram District, Ghana (Kwadzokpui, et al., 2020), Ibadan,

Nigeria (Adeyemi et al, 2013), Buea, Cameroun (Frambo et al., 2014), Limbe and Muyuka, Cameroun (Eyong et al., 2019) where inadequate knowledge on HBV was reported among pregnant women. Inadequate knowledge of HBV remains a popular theme in many African studies. The continent of bereft with poor ANC coverage. Antenatal care (ANC) coverage remains at two-thirds of pregnant women (69 per cent) have at least one ANC contact (Lincetto et al., 2006). Contact which may not be enough to fully educate pregnant women on the myriad of disease that pose threat to the pregnancy.

5.2.1 Association between socio-demographic characteristics and knowledge of HBV

Inferential analyses conducted revealed a statistically significant association between age and knowledge. Majority of participants were in the 20-29-year range and of these, a significantly higher percentage had sufficient knowledge than those that had insufficient knowledge. This result was consistent with a study in Malaysia where age was found to be significantly associated with good knowledge of Hepatitis B (Rajamoorthy et al., 2019).

The study also revealed a statistically significant between ethnicity and knowledge of HBV. From the data, it showed that across all ethnicities, a higher percentage of participants had higher knowledge than those that had insufficient knowledge. The finding was again consistent with Rajamoorthy et al., (2019) where Malay ethnicity was found to be associated with knowledge on HBV.

In this study, regarding participants who had no education, the difference between those who had sufficient knowledge and those who had insufficient knowledge was little. The same cannot be said for the educated. A higher percentage of educated had sufficient

knowledge. The educational level of women was found to be significantly associated with knowledge of HBV (P<0.001). This finding was consistent with a study conducted in Ningo-Prampram District, Ghana (Kwadzokpui, et al., 2020), Baeu District, Cameroun (Frambo et al., 2014), Uganda (Nankya-Mutyoba, et al., 2018) and in Malaysia (Rajamoorthy et al., 2019) where the level of education was found to be significantly associated with knowledge on HBV.

Further analyses revealed a significant association between occupation and knowledge on HBV in this study. The assertion was consistent with the study conducted in Ningo-Prampram District (Kwadzokpui, et al., 2020).

Antenatal care centres have been touted as the citadel of knowledge for pregnant women. In this study, analyses showed that between a visit to ANC and knowledge on HBV, there was statistical significance (p<0.001). Majority of women who had visited ANC showed sufficient knowledge compared to those who had never visited the ANC. Kwadzokpui, et al., (2020) reported that participant's knowledge of Hepatitis B was significantly associated with the health facility.

Also, there was statistical significance between parity and knowledge on HBV in this current study. It could be read from the data that pregnant women who had not given birth before were split equally between sufficient and insufficient knowledge. Contrarily, women who had given birth several times had more sufficient knowledge. Pregnancy several times implies repeated exposure to ANC and more importantly education on relevant issues of health.

5.3 Risk factors associated with hepatitis B virus infection among pregnant women in the North Gonja District.

Risk factors associated with HBV infection in literature include the history of blood transfusion, having multiple sexual partners, a history of tonsillectomy (Gedefaw et al., 2019). In this study, regarding the risk profile of the respondents, a high percentage of pregnant women were said to be high-risk people contracting hepatitis B. From analyses, the study revealed that as the ages increased, the percentage of pregnant women at high risk for HBV was higher. Statistical significance was noted between age and risk profile of HBV. Studies conducted in Battor, Ghana (Tetteh, 2016), in British Columbia (Préfontaine, et al., 1994) and Iran (Ataei et al., 2019) revealed the age of the respondents were statistically significant with the acquisition of hepatitis B infection. Also, it emerged from analyses that majority of the participants who had some education had a low risk of contracting HBV.

The study further revealed a significant association between educational status and the risk profile of HBV. This finding was consistent with a study conducted in Iran were lower educational attainments increased the risk of affecting by HBV (Ataei, et al., 2019). Regarding ANC visits and risk for HBV, results showed that for those who visited ANC, majority had low risk as compared to those who did not visit ANC. There was a statistically significant association between visiting ANC and the risk of contracting HBV (p<0.001). Knowledge attained at the health facility implies the pregnant women engage less in riskier behaviour that could expose them to HBV.

5.4 Hepatitis B vaccination status among pregnant women in the North Gonja District.

The Hepatitis B virus vaccine is known to be 95% effective in preventing infection and hepatitis B complications (WHO, 2015). Majority of respondents in this study were aware Hepatitis B was vaccine-preventable. They saw the need for HBV testing despite majority of the participant had never been tested before for HBV infection. The testing for hepatitis B virus infection one of the recommended routine test for all women who are pregnant and attending antenatal care clinic in Ghana (Awiah, 2018). According to some of the nurses interviewed, every pregnant woman is supposed to be tested for HBV just like it is done for syphilis and HIV. Logistical challenges remain one of the main hindrances to the successful implementation of the HBV routine screen at the ANC. Most of the women had the test done in their community while others had it done in a health facility or pharmacy. Oral examination on the prevalence of HBV revealed that most of the respondents were non-reactive (negative) and 5.0% being reactive (positive). Compared to the national infection rate of 12.3% (Ofori-Asenso & Agyeman, 2016), the rate in this study was significantly smaller. Compared to other studies, Tetteh (2017) found an infection rate of 13.5%, Umare et al., (2016) found a rate of hepatitis B infection to be about 6.9% in Ethiopia, in the Gambia, Bittaye et al., (2019) found an infection rate of 9.2% and Fomulu et al., (2013) found 7.7% hepatitis B virus infection rate in Cameroun. It must be noted the rate of infection was on a self-report basis and this could have an impact on the rate of Hep B infection in the district. The disparities could also be a result of the difference in sample sizes which determines the denominator for the calculation of percentages.

At a rate of 5% Hep. B reactive, it was alarming to notice that majority of the participants had never received the vaccinations. Of those who had completed the vaccinations, majority had completed the full course of 3 doses. The percentage of those that were vaccinated (32.26%) was however significantly higher than an earlier study conducted in Gushegu (a similar rural area) where just 2.5% had received the vaccinations (Zimtani, 2018). Adeyemi et al., (2013) also reported a 9.7% vaccination status among pregnant women in Ibadan. ANC services in Ghana demand hep B testing as a routine procedure in a visit to the facility. However, vaccination is not free and non-reactive women are simply encouraged to go for vaccination. For those who had never had a vaccination in this study, some of the reasons given in order of prevalence; majority of them said the vaccines are expensive, some didn't see the need, others claimed they were aware of their status, others neither knew where to go for vaccination nor had the time. Similar hindrances were reported in a study in Nigeria and some of these include low awareness of the vaccine, accessibility and ability to provide the cost of the vaccine and immunization-associated encounters hinder the acceptance of the hepatitis B vaccine among women attending ANC services in Nigeria (Ophori et al, 2014). Usually, pregnant women upon getting the understanding of vaccination as well as the safety of the vaccine, are enthusiastic in accepting for themselves the hepatitis B virus and their infants (Healy et al., 2015). In this study, majority were willing to pay for screening and vaccination despite its high price. This was reflected in a study conducted in Malaysia where it was found that 273 (37.5%) of the households were willing to pay for hepatitis B vaccination (Rajamoorthy et al., 2019).

5.4.1 Association between socio-demographic characteristics and vaccination status of pregnant women.

Inferential analyses revealed that there was a statistically significant association between the availability of health facility and the vaccination status of pregnant women. Majority of participants in communities with health centres had vaccinated against Hepatitis B. Also, the analyses showed that higher percentages of the educated pregnant women in this study had vaccinated against Hepatitis B compared to the uneducated. There was a statistically significant association between education and vaccination status. Salindou et al., (2013) found an association between education qualification and vaccination. According to Van Der Veen et al., (2010), a low level of education implies a lack of action toward Hep B vaccination. Ertekin & Selimoglu (2004) noted that the educational status of mothers was an important factor for the protection of children from preventable diseases such as Hepatitis B.

In this study, it has been established that majority of the women were willing to pay to be vaccinated. Analyses showed that more employed women in this study had taken the Hepatitis B vaccine compared to the unemployed with a statistically significant association recorded between occupation and vaccination status of the women. This finding was consistent with the analyses in a study where occupation (employed) was found to be associated with vaccination status (Salindou et al., 2013).

5.5 Measures to prevent the risk of Hepatitis B virus infection among pregnant women in the North Gonja District.

In this study majority of the participants were able to identify that vaccine prevention, avoiding reuse and sharing of injections, use of condoms, proper screening before blood transfusion were cited as the measure to prevent the risks of Hepatitis B infection. Responses on each measure were over 70%. This high awareness of the measure did not materialize into compliance with majority of the participants not complying with the HBV preventive measures. Some of the respondents affirmed that nurses always educate them on the preventive measures of the disease during ANC. Nurses interviewed also confirmed that the only way to prevent disease transmission was through health education, HBV screening and vaccination.

5.5.1 Association between socio-demographics and prevention of HBV among pregnant women.

Again, education was noted as a major determinant of the prevention of HBV. It emerged from analyses that majority of the participants with formal education were adhering to HBV preventive measures as compared to lower percentages of the educated and a higher percentage of uneducated women in this study. There was a statistically significant association between educational status and preventive measures. Knowledge of the preventive measures of Hepatitis B as well as its complications is an essential step in the primary prevention efforts. A higher level of education is often time synonymous with higher knowledge.

The chief source of knowledge as identified in this study was the ANC. During the in-depth interview session, a health care worker asserted that the education of these women

on the signs and symptoms as wells as a preventive measure is key to limit the spread of Hepatitis B. The education offered at these ANC can be said to sit well with pregnant women as evidenced by that fact that 92% of women who had visited ANC in this study adhere to preventive measures of HBV as compared to 58.6% of those who do not visit ANC. Adequate information from the ANC centres aids the mission of the WHO in thwarting the hazards associated with Hepatitis B infection worldwide (WHO, 2016).

CHAPTER SIX

SUMMARY OF RESULTS, CONCLUSION AND RECOMMENDATION

6.1 Summary of Results

Most of the pregnant women were within the ages of 25 to 29 years with a mean age of 27.13+/- 5.8. Almost all (91.9%) have visited ANC, about 60% have heard about HBV from Health providers, media (Tv/radio), community members and family other (in order of higher responses). Overall, the participants demonstrated an appreciable knowledge of the hepatitis B virus. Age, marital status, ethnicity, educational status, occupation, parity and visit to ANC were significantly associated with the level of knowledge of the women.

The study further revealed that about 42% of the women were said to be at high risk of contracting HBV. The study in a multivariate analysis revealed that age, marital status, ethnicity, educational status, occupation, parity and visit to ANC were also statistically significant to the risk of contracting the hepatitis B virus.

Also, only 32% of women have taken the hepatitis B virus vaccination. Furthermore, about 39% adhere to the preventive measures of the HBV.

6.2 Conclusions

In conclusion, though the study participant demonstrated appreciable knowledge of HBV, their risk profile was still high, adherence to preventive protocol very low, and very low vaccination coverage among the pregnant women. It was observed from the study that, most of the health facilities do not have the test strips to screen for hepatitis B virus. Also, more than half of the district is considered rural with most of her communities having very poor road network, electrical challenges etc. Thus, the CHPS compounds are

unable to preserve the potency of the vaccines. Women who wish to know their hepatitis B virus status are expected to pay and sometimes they women would have to walk or travel for a long distance to know their status. Despite the levels of knowledge, it was observed not all of the safety or preventive measures were strictly followed thereby increasing the risk of these women contracting the hepatitis B virus.

6.3 Recommendation

1. Ghana Health Service (GHS) in collaboration with the National Health Insurance Scheme (NHIS) should make testing and vaccination of pregnant women visiting antenatal care (ANC) free in all health facilities across the Nation.
2. Ghana Health Service needs to scale up efforts on the testing regime of pregnant women to at least one-time during pregnancy to identify reactive mothers for immediate management and preparation towards birth.
3. Ghana Health Service GHS, non-governmental organizations (NGOs) and philanthropist should as a matter of urgency make obtainable and within reach of Hepatitis B immunoglobulin for rapid administration to babies whose mothers are reactive immediately after birth to prevent the mother from infecting the baby with the hepatitis B virus.
4. Lastly, this research further endorses that information on hepatitis B should be available and be part of the daily health talk at service centres (antenatal care), durbar etc. to increase the awareness of pregnant women and the general population at larger about this infection.

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Appendix I: Participant Information Leaflet and Consent Form

UNIVERSITY FOR DEVELOPMENT STUDIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF COMMUNITY HEALTH AND FAMILY MEDICINE

CONSENT FORM

NAME OF INTERVIEWER …….. PARTICIPANT ID……

PLACE OF INTERVIEW……. DATE…….

I am from University for Development Studies. I am seeking for your voluntary participation in this important scientific study. The purpose of this study is to assess your knowledge on Hepatitis B, your vaccination status and risk factors that are associated with Hepatitis B in pregnancy.

Your participation is very important to the success of the study. All information that you give us will be treated with care and will not be released to anyone but researchers conducting the study. All your information provided would be stored as confidential documents in a locked file accessible only to study staff. I would take 30 minutes of your time to complete the questionnaire.

Results from this study would provide data to support the need for introduction/expansion of interventions to prevent mother to child transmissions of hepatitis B virus. We would also share findings of this study with all participants.

Do feel free to skip any question or you can voluntarily stop at any point of the interview. Please, do you have any questions about the study?

You can contact the following people for further clarification

Inusah Abdul-Wahab (Principal Investigator): 0249270338

Dr. Ziblim (Project Supervisor): 0244202759

Committee on Human Research Publication and Ethics

School of Medical Sciences, Kwame Nkrumah University of Science and Technology Kumasi, Ghana. Tel: 233 3220 63248 or 233 20 5453785. Email: chrpe.knust.kath@gmail.com

PARTICIPANT SIGNATURE/THUMB PRINT

INTERVIEWER SIGNATURE

Appendix II: Structured Questionnaire

STUDY QUESTIONNAIRE
KNOWLEDGE ON HEPATITIS B AND VACCINATION STATUS AMONG PREGNANT WOMEN IN THE NORTH GONJA DISTRICT OF THE SAVANNAH REGION.

Enumerator, please administer the consent form first and ensure the participant understands the purpose of the survey and is willing to participate in the survey.
Do you agree to participate in this study?

1- Yes
2- No

Question	**Response**	**Instruction**
G1. Name of enumerator	Text (type in)	
G2. Questionnaire number	Number (type in)	
G3. Respondent Contact information	Number (type in)	This is optional
G4. Date of interview	Autogenerate	
G5. Sub- district	Drop down 1-Bawena Sub-district 2-Daboya Sub-district 3-Mankarigu Sub-district 4-Lingbensi Sub-district	Select one
G6. Facility type	1-Polyclinic 2-health center 3-CHPS 4-Home(community without health facility)	Single Select
G6i. Name of community	Text (type in)	if 4-Home
G6ii. Name the nearest health facility	Text (type in)	if 4-Home

SECTION A: SOCIO-DEMOGRAPHIC DATA

A1. How old are you?	Number (type in)	Last birthday of the respondent
A2. What is your marital status?	1-Single 2- Married (Polygamous) 3-Married (Monogamous) 4-Cohabiting 5-Separated/Divorced 6-Widowed	Single Select
A3. What is your religious	1-Christianity	Single select

affiliation?	2-Islam 3-Traditional	
A4. What is your level of education completed?	1-No Education 2- Primary Education 3-Secondary 4-Tertiary Education 5-Others	Single select
A41.Please specify others	Text (type in)	
A5. What is your main occupation?	1-Farming 2-Small trade business 3-Housewife 4-Clerk/admin 5-Professional 6-Others	Single select
A5i. Please specify others selected	Text (type in)	
A6. How many times have you given birth?	Number	
A7. At what stage is your pregnancy?	1-First-trimester check-up (1-3 month) 2-Second-trimester check-up (4-6 month) 3-Third-trimester or delivery (7month-delivery)	Single select
A8. How much is your household Average monthly income?	Decimal	
A9. What is the distance of your house to the nearest health center?	Decimal	
A9i. The unit of measurement of the distance	1-kilometer 2-Miles 3-Meters 4-Yards 5-don't know	

SECTION B: KNOWLEDGE ON HEPATITIS B AMONG PREGNANT WOMEN

B1. Have you visited the ANC clinic ever since you became pregnant?	1-Yes 2-No 3-Don't know	
B1i. Why haven't you visit the ANC clinic ever since you became pregnant?	1-Distance to the health facility 2-No health facility 3-Pregnancy is too early	If no,

	4-No money 5-Because of the attitudes of nurses 6-Don't think it's necessary 7-others	
B2. Did you receive any prior information or education on HBV infection before getting pregnant?	1-Yes 2-No 3-Don't know	Single select
B2i. What was the information on HBV about?	1-Causes of HBV 2-Transmission routes 3-HBV vaccination 4-HBV prevention 5-Others (please specify)	If yes, Multiple select
B2ii. Please specify others selected.	Text (type in)	
B3. During your pregnancy, did you receive any information/education about hepatitis B?	1-Yes 2-No 3-Don't know	
B3i. what was the information on HBV about?	1-the Symptoms of HBV 2-the transmission routes 3-the HBV vaccination-3 4-HBV prevention-4 5-Others (please specify)	if yes to B3 Multiple select
B3ii. Please specify others selected	Text	
B3iii., from what source/s	1-Advice from health care worker during ANC visit 2-Radio programs 3-Television programs 4-community member 5-family relative 6-Other (specify)	If yes to B3. Multiple select
B3iiia. Please specify others selected.	Text	
B4. Do you know some of the symptoms of HBV?	1-Yes 2-No 3-Do not know	
B4i.which of the following are the symptoms?	1-Fever 2-Fatigue	If yes to B3 Multiple select

	3-Loss of appetite 4-Nausea 5-Vomitin 6-Abdominal pains 7-Dark urine 8-Joint pains 9-Jaundice (yellow color in the skin or eyes) 10-Others(specify)	
B4ia. Please specify others selected	Text (type in)	
B5. What are the health risks of HBV?	1-Chronic Liver diseases 2-Preterm babies 3-Stillbirth 4-Low birth weight 5-Maternal deaths 6-Don't know 7-Others(specify)	Multiple select
B5i. Please specify others selected	Text (type in)	
B6. Can Hepatitis B be cured/ managed?	1-Yes 2-No 3-don't know	Single select
B7. Have you ever heard about hepatitis B vaccination?	1-Yes 2-No 3-Don't know	Single select
B8. Can vaccination prevent one from getting Hepatitis B infection?	1-Yes 2-No 3-don't know	Single select
B9. If someone is infected with hepatitis B but look healthy, do you think that person can spread hepatitis B?	1-Yes 2-No 3-Do not know	Single select
B10. In your opinion, what is the best time to provide a newborn with the first dose of HBV vaccine?	1-Within the first 24 hours of birth 2-1-7 days of birth 3-1-month-old 4-Don't know	Single select
B11. If your newborn is healthy and stable, would you let your baby receive the	Yes -1 No-2 Don't know-3	Single select

hepatitis B vaccine in the first 24 hours after birth?		
B12. If your doctor tells you that HBV vaccine is safe to be given to newborn, will you be willing to get your child HBV vaccine?	1-Yes 2-No 3-Don't know	Single select

SECTION C: HEPATITIS B RISK FACTORS AMONG PREGNANT WOMEN

Ask respondents whether they egage/ever engaged in the following activities		
C1. Do you have unprotected sex with other person different from their partner?	1-Yes 2-No 3-Don't know	Single select
C2.Have they ever had blood transfusion?	1-Yes 2-N 3-Don't know	Single select
C3. Does your husband has another wife/wives?	1-Yes 2-No 3-Don't know	Single select
C4. Does another mother reastfeeds your children?	1-Yes 2-No 3-Don't know	Single select
C5. Do you use unsterilized instrument like syringes,blade,needles?	1-Yes 2-No 3-Don't know	Single select
C6. Do you use Ear piercing/tatoing your body?	1-Yes 2-No 3-Don't know	Single select
C7. Do they engaged in Circusition/tribal marks using local instruments?	1-Yes 2-No 3-Don't know	Single select
C8. Which other activities do they engage in?	Text (type in)	

SECTION D: HEPATITIS B VACCINATION STATUS AMONG PREGNANT WOMEN

D1. As a pregnant woman, do you think you need to be	1-Yes 2-No	Single select

tested for Hepatitis B?	3-Don't know	
D2. Have you ever tested for hepatitis B during this pregnancy or any of your pregnancy?	1-Yes 2-No 3-Don't remember	Single select (*enumerator please confirm from her ANC recordbook*)
D2i. what motivated you to test?	Text (type in)	If yes in D2
D3. Where did the testing take place?	1-At this clinic 2-At a chemical store 3-During community mass screening 4-At the consultant's home 5-At a facility outside this community 6-Others (specify)	Single select
D3i. Please specify others selected	Text (type in)	
D4. Did you pay for the testing?	1-Yes 2-No 3-Don't know	Single select
D5. Are you willing to disclose your HBV status?	1-Yes 2-No	
D6. What was your test results? (please confirm from the ANC book)	1-Positive seen 2-Positive not seen 3-Negative seen 4-Negative not seen 5-Not recorded	If D6. Is Yes Single select
D7. Do you think HBV vaccination is necessary for you and your neonate?	1-Yes 2-No- 3-Don't know	Single select
D8. Have you ever received hepatitis B vaccination?	1-Yes 2-No 3-Don't remember	Single select
D8i.Why haven't you receive hepatitis B vaccination?	1-I am not aware of hepatitis B vaccination 2-I do not know where to go and receive it 3-I don't have time 4-It is expensive 5-I don't see the need 6-I am afraid of contracting the virus from the vaccine 7-Others	if No in D8 multiple select

B8ii. Please specify others selected		
D8b. How many doses of hepatitis B vaccine have you received?	1-dose 2-2 doses 3-3 doses 4-More than 3 doses	If Yes in D8
D9. What do you think is the recommended full dose of hepatitis B vaccine?	1-1 dose 2 -2 doses 3-3 or more doses 4-I don't know	Single select

SECTION D: HEPATITIS B PREVENTION MEASURES

Ask respodents what they are doing to prevent the risk of getting HBV.		
Received/planning to receive vaccine?	1-Yes 2-No 3-Don't know	Single select
E2.Avoiding reuse or sharing of injection needles/syringes?	1-Yes 2-No 3-Don't know	Single select
E3. Using condom?	1-Yes 2-No 3-Don't know	Single select
E4.Proper screening of blood before transfusion?	1-Yes 2-No 3-Don't know	Single select
E5. What other prevention measures do you undertake?	Text (type inn)	
G9.GPS location	Autogenerate	Do not stand under a shade.
We have come to the end of the survey. Thank you for your time.		

Appendix III: Interview guide

KNOWLEDGE ON HEPATITIS B AND VACCINATION STATUS AMONG PREGNANT WOMEN IN THE NORTH GONJA DISTRICT OF THE SAVANNAH REGION.

Enumerator, please ensure the participant understands the purpose of the survey and is willing to participate in the survey.

KEY INFORMANT INTERVIEWS

Name of Sub-district: ***Name of facility:*** ***Rank/Position:*** ***Name of Interviewer:*** ***Date:***
knowledge on hepatitis b among pregnant women
1.What kind of education do you give your clients (pregnant women) about HBV?
2. When do you start your education on HBV *Before pregnancy and why?* *After pregnancy and why?* *3. In your opinion, do you think your clients (pregnant women) have good knowledge on HBV and how do you know?* *4. How often do you give health talk on HBV?*
Hepatitis b transmission routes
1. What are the main routes of transmission among your clients? *2. Why?*

Hepatitis b vaccination status among pregnant women
1.Do you test your clients (pregnant women) for HBV? *2.If yes, where do you get your test kits from?* *3.Are the test kits always available:* *4.If No, why are your clients not tested?* *5.Do you have records on HBV testing?* *6.What are the challenges with the HBV testing?* *7. Do provide your clients with requisition form for HBV test?* *8.Do you vaccinate your clients (pregnant women)?* *9.If yes, where do you gets vaccines from?* *10.How do you keep the vaccines?* *11. If No, how do they (pregnant women) get vaccinated?*
Hepatitis b prevention measures
1.What are the HBV prevention measures you know of? *2. What prevention measures have you been giving your clients?* *3. How do you ensure your clients follow those measures?*

Appendix IV: Focus group Discussion guide

KNOWLEDGE ON HEPATITIS B AND VACCINATION ST ATUS AMONG PREGNANT WOMEN IN THE NORTH GONJA DISTRICT OF THE SAVANNAH REGION.

Please administer the consent form first and ensure the participants understand the purpose of the study and are willing to participate in the study.

Focus Group Discussion guide

Community: **Number of Participants:** **Date:**		
Variables	**Sample Questions**	**Responses**
knowledge on hepatitis b among pregnant women	Can you share with me your knowledge and understanding of HBV? **Probes,** What is HBV Who is susceptible? How is HBV transmitted? How is HBV prevented? Source of knowledge	
ANC Attendance	Can you share with me what motivates you to visit ANC? **Probes** Household income Husband level of education Pregnant woman level of education Quality of health services at the facility Proximity	
ANC SERVICES	Can you discuss with me the services rendered during ANC? **Probes** Education HBV HBV testing Cost of testing What factors influence testing? Requisition form Place of testing	
HBV Vaccination	If a pregnant woman is infected with chronic HBV what do you think can be done to protect the mother and the child? **Probes** HBV vaccination What factors influence vaccination? Recommended doses Where to access vaccines Cost of vaccination Place of vaccination	

Appendix V: Introductory letter

UNIVERSITY FOR DEVELOPMENT STUDIES
School of Medicine and Health Sciences
(Department of Community Health and Family Medicine)

Tel : 03720 - 93295
E-Mail :
Local : 5:7811/106.15
Internet: www.uds.edu.gh

Post Office Box TL 1883,
Tamale, Ghana, West Africa.

03/03/2020

Office of the Head

The Chairperson
Institutional Review Committee
Kwame Nkrumah University of Science and Technology
Kumasi,
Asante Region

LETTER OF INTRODUCTION

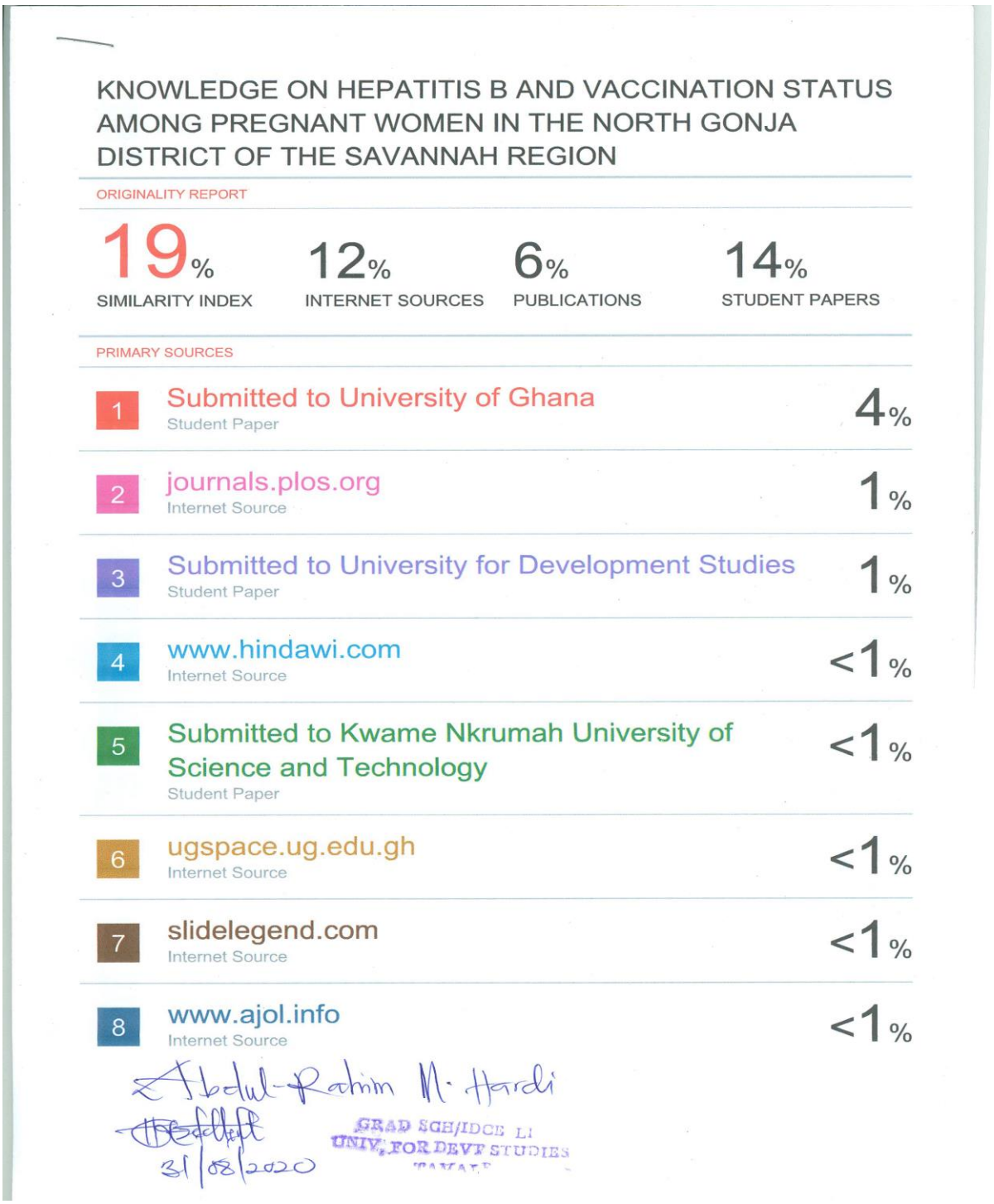
I write to introduce to you Mr Inusah Abdul-Wahab, a second-year Master of Public Health student in the Department of Community Health and Family Medicine, School of Medicine and Health Sciences. As part of the requirement, Mr Inusah is expected to write and submit a well-written thesis to the department as part of the requirements for graduation. As part of the process, Mr Inusah is applying to your committee for ethical clearance on the topic: ***Knowledge on Hepatitis B and Vaccination Status among pregnant women in the North Gonja District of the Savannah Region***. I would be very grateful if you could assist him by way of ethical clearance to enable him execute this project to a successful end.

Thank you very much.

Yidana Adadow *(PhD)*
(HoD, CH&FM)

Dr. Yidana Adadow
SENIOR LECTURER HOD
DEP. OF COM. HEALTH & FAM MED
SMHS-UDS, TAMALE

Appendix VI: Plagiarism Report



KNOWLEDGE ON HEPATITIS B AND VACCINATION STATUS AMONG PREGNANT WOMEN IN THE NORTH GONJA DISTRICT OF THE SAVANNAH REGION

ORIGINALITY REPORT

19%	12%	6%	14%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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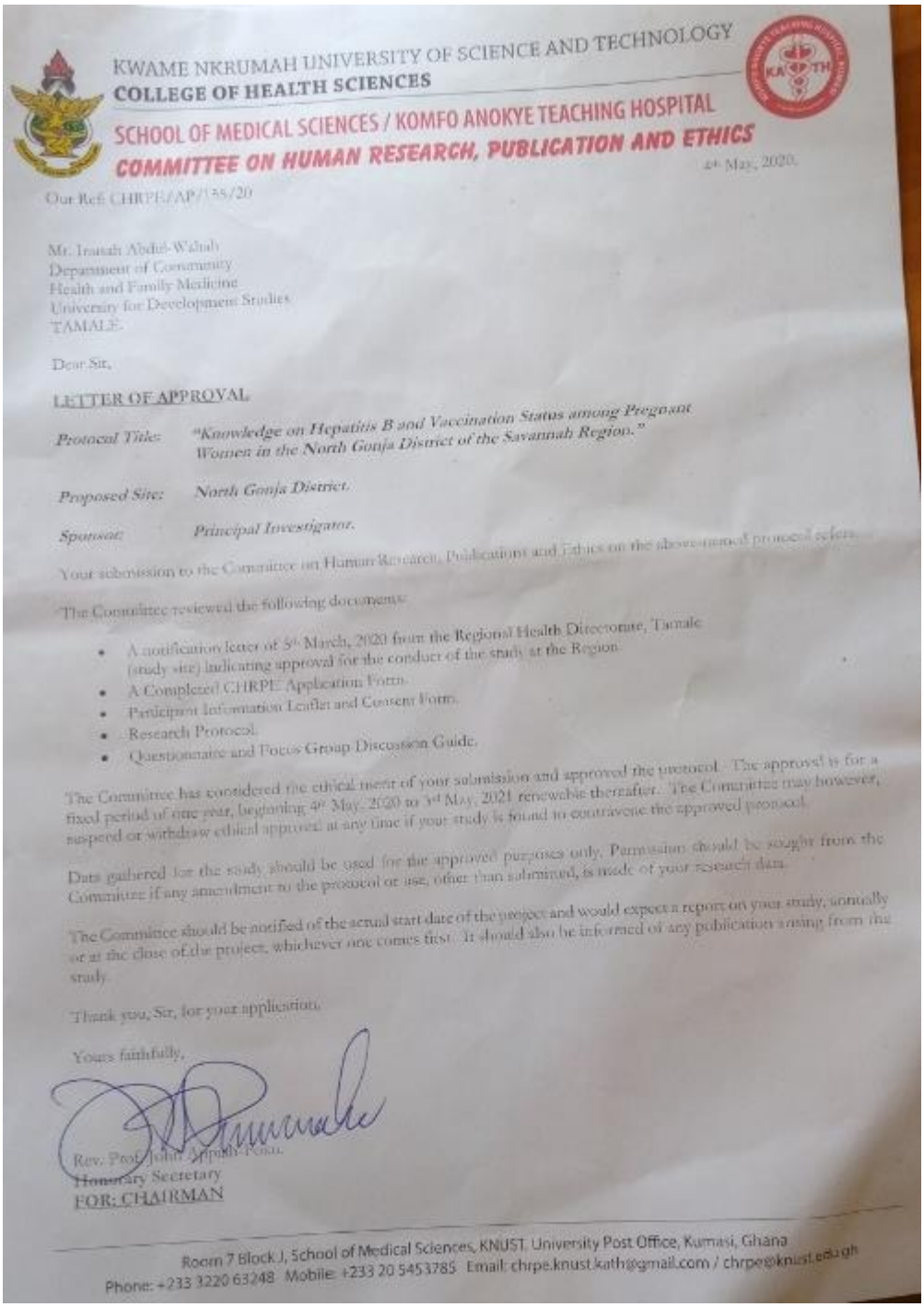
Abdul-Rahim M. Hardi

31/08/2020

GRAD SCH/IDCE LI
UNIV. FOR DEVT STUDIES
TAMALE

Appendix VII: Ethical Clearance obtained from KNUST-KCCR



KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICAL SCIENCES / KOMFO ANOKYE TEACHING HOSPITAL
COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

4th May, 2020.

Our Ref: CHRPE/AP/158/20

Mr. Issiah Abdul-Wahab
Department of Community
Health and Family Medicine
University for Development Studies
TAMALE.

Dear Sir,

LETTER OF APPROVAL

Protocol Title: *"Knowledge on Hepatitis B and Vaccination Status among Pregnant Women in the North Gonja District of the Savannah Region."*

Proposed Site: *North Gonja District.*

Sponsor: *Principal Investigator.*

Your submission to the Committee on Human Research, Publications and Ethics on the above-named protocol refers.

The Committee reviewed the following documents:

- A notification letter of 5th March, 2020 from the Regional Health Directorate, Tamale (study site) indicating approval for the conduct of the study at the Region.
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Protocol.
- Questionnaire and Focus Group Discussion Guide.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, beginning 4th May, 2020 to 3rd May, 2021 renewable thereafter. The Committee may however, suspend or withdraw ethical approval at any time if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you, Sir, for your application.

Yours faithfully,

Rev. Prof. John Appah-Poku.
Honorary Secretary
FOR: CHAIRMAN

Room 7 Block J, School of Medical Sciences, KNUST. University Post Office, Kumasi, Ghana
Phone: +233 3220 63248 Mobile: +233 20 5453785 Email: chrpe.knust.kath@gmail.com / chrpe@knust.edu.gh