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COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF  
GHANA, LEGON.

**PREVALENCE OF HEPATITIS B VIRUS (HBV) AND  
HEPATITIS C VIRUS (HCV) INFECTIONS AMONGST  
CHILDREN IN THE WA DISTRICT OF THE UPPER WEST  
REGION OF GHANA.**



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OF THE MASTER OF PUBLIC HEALTH DEGREE,

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## DECLARATION

I hereby declare that, except for references to other people's work, which have been duly acknowledged, this work is as a result of my own research work, done under supervision, and has neither in part nor in whole been presented elsewhere for another degree.



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## DEDICATION

This work is dedicated especially to the children who made this work possible and to **ALL** those children in the country side whose lot can be improved much more with just a little commitment from **POLITICIANS!**

To **Jehovah Almighty**, "...what is mortal man that you keep him in mind, and the son of earthling man that you care for him?"- Psalm 8:3, 4.



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## LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
Anti-HBc	Antibodies to hepatitis B core antigen
Anti-HCV	Antibody to Hepatitis C virus
CI	Confidence Interval
DALYs	Disability adjusted life years
DHMT	District Health Management Team
DS	Down's syndrome
ELISA	Enzyme Linked Immunosorbent Assay
EPI	Expanded Programme on Immunization
FGM	Female Genital Mutilation
HAV	Hepatitis A Virus
HBcAg	Hepatitis B core Antigen
HBsAg	Hepatitis B surface Antigen
HBV	Hepatitis B Virus
HCC	Hepatocellular Carcinoma
HCV	Hepatitis C Virus
HEV	Hepatitis E Virus
HIV	Human Immunodeficiency Virus
ID	Intellectual Disability
J.S.S	Junior Secondary School
KATH	Komfo Anokye Teaching Hospital
KBTH	Korle-Bu Teaching Hospital
MCH	Mother and Child Health
MOH	Ministry of Health
NANB	Non-A, Non- B Hepatitis
OID	Other Intellectual Disability
SPSS	Statistical Package for Social Services.
UCC	University of Cape Coast

UDS	University of Development Studies
UWR	Upper West Region
WHO	World Health Organization
YRBSS	Youth Risk Behaviour Surveillance Survey

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## ABSTRACT

*Background:* Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections are major global public health problems transmitted primarily through exposure to percutaneous human blood and plasma and other mechanisms known as horizontal transmission.

*Objectives:* The goals of this study were to determine the seroprevalence of HBV and HCV infections, the related risk factors associated with transmission and the knowledge and risk perception of HBV and HCV amongst school children in the Wa district of the Upper West Region of Ghana.

*Methods:* A cross-sectional prevalence study of HBV and HCV infections was conducted amongst school pupils in the study area. Using a multi-stage sampling procedure, a total of 280 children [144 boys (51.4%) and 136 girls (48.6%)] were selected. 5 ml of blood was drawn from each enrolled pupil and the prevalence of hepatitis B surface antigen (HBsAg) and antibodies to hepatitis C virus (anti HCV) assessed using the 3<sup>rd</sup> generation HBV and HCV ELISA assay kits (Serodia Fujirbro Inc, Japan). Questionnaires were administered to collect information on demography, related risk factors, knowledge and behaviours that might put them at risk of acquiring HBV and HCV infections.

*Results:* The overall seroprevalence for HBsAg was 12.1% [95% (CI) 8%-16%], 10.7% [95% (CI) 7%-14%] for anti-HCV and 2.9% [95% (CI) 1%-5%] for both HBsAg and anti-HCV, with no significant difference between sexes. However, a higher rate of infection was observed in males than in females. HBsAg prevalence differed significantly among the religions: 18.0% and 8.4% among Christians and Moslems respectively. The anti-HCV was also predominantly higher among Christians (15.0%) than in Moslems (7.8%) [ $p=0.002$ ]. HBsAg and anti-HCV prevalence was highest among the Dargatis than any other ethnic group.

*Conclusion:* This study has demonstrated a high prevalence of HBV and HCV infection among school children in the Wa district. Though prevalence of specific risky behaviours

were very high they were not significantly associated with seropositivity. Effective preventive strategies that can help reduce the high prevalence of HBC and HCV infections include ensuring that all newborns access fully their vaccination schedules and the DHMT in collaboration with the Regional Education Directorate of the Ministry of Education, incorporate a comprehensive component on HBV and HCV infections into the schools health syllabus.

## CHAPTER ONE

### INTRODUCTION

Over the centuries, there have been several epidemics of jaundice, usually associated with poor hygiene, especially during wartime. The possibility of a viral etiology being responsible for these epidemics was not alluded to until as recent as the turn of the 20<sup>th</sup> century (Holt and Corelli, 2001). Since the beginning of the 1970s, at least six distinctly separate hepatitis viruses have been identified and these different subtypes appear to target the liver with resultant liver diseases as their major clinical manifestations. The mode of transmission of the viruses differs; as do the natural history and outcomes of the illness that each produces (Holt and Corelli, 2001).

Hepatitis viruses are spread through the faeco-oral route (hepatitis A virus [HAV] and hepatitis E virus [HEV] ) and blood, but blood-borne transmitted hepatitis viruses (hepatitis B virus [HBV] and hepatitis C virus [HCV] ) are the most important agents responsible for the enterically and parenterally transmitted disease worldwide (Chironna *et al.*, 2003).

Despite significant progress that has been made in the area of disease prevention through both passive and active immunoprophylaxis, advances in treatment have been hampered due to the amount of virus produced at a time and the rate of its mutation. For example persons with chronic hepatitis C infection produce approximately one (1) trillion viruses daily, compared to a daily production of one hundred (100) billion particles of hepatitis B, and ten (10) billion particles daily for those with HIV infection (Holt and Corelli, 2001).

Hepatitis B is an important and a major public health problem throughout the world for two reasons: first because of its chronic serious sequela and secondly because it is a potentially preventable disease. It is estimated that 30% of the world's population or approximately two (2) billion individuals have serologic evidence of HBV infection, of which an estimated three hundred and fifty (350) million have chronic HBV infection (Chironna *et al*, 2003; Lee, 1997; Huy *et al*, 2005). Out of these chronically ill persons, at least one million die each year of cirrhosis and hepatocellular carcinoma (HCC). Further estimates show that at most, 33% of infected subjects have evidence of clinical hepatitis and depending on the age at infection, up to one third of infected patients become chronic carriers of Hepatitis B surface antigen (HBsAg) (Stevens *et al.*, 1990).

WHO estimates for 2001 of deaths from selected vaccine-preventable diseases taking immunization coverage into account shows that the greatest burden of disease is in Sub-Saharan Africa (Brenzel *et al.*, 2006). With specific reference to hepatitis B, Sub-Saharan Africa ranks third with a percentage of 10 after East Asia and the Pacific and South Asia. In terms of economic loss, WHO( 2001) estimates of Disability-Adjusted Life Years (DALYs) lost from vaccine-preventable diseases demonstrates that there is a high burden of disease associated worldwide with the sequela of hepatitis B. With respect to acute hepatitis B infection, liver cancer and cirrhosis of the liver, the 2001 estimates show that the region has a percentage DALYs loss of 24, 79 and 8 respectively (Brenzel *et al.*, 2006).

In Ghana, 3500 autopsies performed at the Korle-Bu Teaching Hospital (KBTH) from 1991-99 showed that hepatoma was the leading cause of death from cancers (MOH, 1998;

Personal communication, Prof. Akosah, Head of Pathology Department, Korle-Bu Teaching Hospital).

HCV belongs to a small family of flavivirus (Vellinga *et al.*, 1999). Before the isolation or identification of HCV, most post-transfusion hepatitis cases were designated as non-A, non-B (NANB) hepatitis (Holt and Corelli., 2001). HCV is now recognized as the most common cause of chronic NANB transfusion- associated hepatitis (Stevens *et al.*, 1990; Alter *et al.*, 1990; Center for Disease Control and Prevention., 1998).

Overwhelming evidence available shows that the reduction in mortality and morbidity through accelerated research and interventions (i.e. vaccinations) is possible and will substantially contribute to the realization of the Millennium Development Goals (MDGs). Goal 4 of the MDG aims at reducing child mortality by two-thirds whilst goal 6 seeks to combat HIV/AIDS, Malaria, Vaccine preventable diseases (e.g. HBV infections), halt and begin to reverse the spread of such infections as mentioned above by 2015.

### **1.1 Background**

In Ghana, the most important of the viral Hepatitides are Hepatitis B and C (Nkrumah and Foli, 2005). Both may be acquired in childhood and anytime thereafter, progress through the chronic course leading to chronic liver disease, cirrhosis, and eventually HCC (Nkrumah and Foli, 2005; Zein, 2003; Zou *et al.*, 2000). The latter is one of the most common causes of death in the country and has 100% mortality (Nkrumah and Foli, 2005; Zou *et al.*, 2000; Blankson *et al.*, 2005).

HBV infection is common in Ghana. Some prevalence studies, done among blood donors and jaundiced patients in Kumasi for HBsAg, put it at 8.6% and 54.1% respectively (Acheampong, 1991). A recent survey among non-alcoholic cirrhotics at KBTH found prevalence as high as 42 % (Martinson *et al.*, 1996). Most infections are acquired during childhood and at birth or from contaminated blood or through percutaneous inoculation. These are the primary routes of hepatitis B virus transmission. Secondary routes of acquiring HBV include intravenous drug use, through tattooing, ear piercing, and circumcision by local wanzams (surgeons) and from accidental needle sticks (Holt and Corelli, 2001). Transmission is also effected through contaminated body fluids e.g. the semen and vaginal secretions (Holt and Corelli, 2001).

Once infected with HCV, infection persists in most patients. Disease progression is mostly asymptomatic thus making HCV infection very subtle or insidious (Nkrumah and Foli, 2005). Because of shared routes of transmission (sexual, parenteral, and from mother-to-child) co-infection with HBV and /or HCV can occur frequently (Chiaromonte *et al.*, 1991). In non-immunosuppressed patients, the time between acute infection and manifestations of chronic liver disease is usually between 20 to 30 years (Holt and Corelli, 2001).

Because of the diversity and numerous strains of HCV, there is no immunity after having a mild attack or infection unlike it is in the case of HBV (Holt and Corelli, 2001). The non-percutaneous (that is from mother-to-child and sexual contact) routes of transmitting HCV are less efficient compared with the percutaneous route. In Ghana, the national prevalence

is not known but some studies have reported prevalence rates of about 5.4 % in blood donors (Nkrumah and Foli, 2005).

In both HBV and HCV, co-infection with other viruses for example HIV is possible and accelerates liver damage. Many individuals, with both HBV and HCV remain asymptomatic until end stage decompensated cirrhosis or hepatocellular carcinoma ensues (Holt and Corelli, 2001).

### **1.2 Problem statement**

Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections are major global public health problems transmitted primarily through exposure to percutaneous human blood and plasma and other mechanisms known as horizontal transmission.

In Ghana, no national survey has been conducted. Information available on the national prevalence is based on WHO estimates for the West Africa sub region (MOH, Document number 10, 1998). However, some studies have been conducted among specific populations such as blood donors and jaundiced patients at the Komfo Anokye Teaching Hospital in Kumasi (KATH), (Acheampong, 1991), patients with cirrhosis of the liver at the Korle Bu Teaching Hospital in Accra (KBTH), (Blankson et al., 2005) and in some selected communities in the Ashanti Region (Acheampong and Twumasi, 1993).

All the above studies were limited to the southern part of the country. Within the northern sector of Ghana and especially in the UWR no prevalence data exist on HBV and HCV

infections either in the adult or children populations. Limited clinical or Hospital data however, exist on this subject matter.

Prevailing cultural practices in the northern part of the country promote and accelerate the transmission of HBV and HCV infections. Such practices include female genital mutilation (FGM), scarification (means of making tribal marks) and tattooing, circumcision by local “wanzams” or “surgeons” and ear piercing for females and lately for males. All the above practices serve as potential transmission routes from one person to another. It is general knowledge that the local wanzams use unsterilized blades and other sharp instruments in the performance of their profession. These instruments serve as inoculums, thus placing children who undergo such practices at greater risk of getting infected with HBV or/and HCV.

Nation wide, it is a fashion these days to see the male population, especially children and teenagers shave their hair completely off their head in what is known as “crop” The sterility of the barbering instruments used at the various makeshift barbering shops in Wa is of concern and may possibly be sources of infection or inoculums.

Anecdotal reports on the prevalence of HBV in the region indicate that Upper West Region (UWR) has the highest prevalence of 18% within the West African sub region (The Ghanaian Times, Monday, February 6, 2006). The 2005 half year report (Hospital Records) for the district showed a 72.7 % rise (from 66 in 2004 to 114 by July 2005) in number of

cases of HBV infection (Basilia, 2005). Very limited clinical data is available on HCV infections.

Majority of infections occur in infancy and childhood, primarily through horizontal transmission with a lifetime risk greater than 80 % (MOH, 1998). Behaviours associated with positivity for any marker for hepatitis B infection included sharing a bath towel, sponge, dental cleaning material, chewing gum or candies with chronically infected person(s) and having been bitten by a chronically infected person (MOH, 1998; Martinson *et al.*, 1996).

In the Wa district, 3 out of every 5 children has one form of a skin infection or the other. Personal hygiene and poor general sanitation are major health challenges of the district of study (DHMT, 2005).

Given the absence of prevalence data on HBV and HCV infections, the prevailing cultural practices, the health challenges and poor socioeconomic status of the district and the possibility of horizontal transmission among the school children, there is the need for a study to document the prevalence of HBV and HCV infections in the district.

### **1.3 Justification for the study**

HBV and HCV infection with its various acute and chronic clinical manifestations are important public health problems, especially in developing countries. Where it occurs in young children, it rarely produces symptoms that are recognizable as hepatitis (Armstrong

*et al.*, 2001; Beasley *et al.*, 1982; McMahon *et al.*, 1985) which frequently leads to chronic infection that progress to end stage liver damage.

Children therefore constitute a high risk group for HBV and HCV infections for several reasons. First their behaviours and level of interaction enhances the spread of the virus. Secondly and especially for children in this district, the level of care and socio-cultural practices that confront them puts them at higher risk of contracting HBV and HCV infections. Given that horizontal transmission largely accounts for the spread of infection among children, identifying children with infection may be an important stimulating factor for initiating preventive measures.

Considering that no national prevalence survey was done in children prior to the introduction five years ago of hepatitis B vaccine as part of the Expanded Programme on Immunization (EPI), this study could give an indication as to what the prevalence was within the district before the commencement of hepatitis B vaccination as part of EPI. Identifying the risk factors and possible routes of transmission within the study population is essential in reducing the transmission of infections.

The information collected will inform the District Health Management Team (DHMT), about possible interventions needed to be put in place to reduce HBV and HCV infection within the district. Results from this study will also be used for advocacy for policy change with respect to practices identified as risk factors and possible routes of transmission.

## **1.4 OBJECTIVES**

### **1.4.1 General Objective:**

To determine the prevalence of HBV and HCV infections amongst school going children in the Wa district.

### **1.4.2 Specific objectives:**

1. To determine the seroprevalence of Hepatitis B and C infections amongst school children in the Wa district of UWR.
2. To identify the related risk factors associated with the transmission of HBV and HCV infections amongst the study population.
3. To determine the pupils knowledge and perception about the risk of having HBV and HCV infection.

## CHAPTER TWO

### LITERATURE REVIEW

#### HEPATITIS B

##### Global distribution

The global prevalence of HBV infection varies widely from a high ( $\geq 8\%$  in Africa, Asia, and Western Pacific) to intermediate (2-7% as in Southern and Eastern Europe) and a low ( $\leq 2\%$  in Western Europe, North America and Australia) (Stevens *et al.*, 1990). In Africa, the prevalence of HBsAg has been shown to range from a low of 3% in Northern Africa to as high as 20% in West Africa (Chiaromonte *et al.*, 1991; Ayoola, 1998). Between 70-95% of the adult population in Sub-Saharan Africa, have shown evidence of past exposure to HBV (Chiaromonte *et al.*, 1991; Personal communication, Kiire CF, International Conference on Prospects for eradication of hepatitis, Geneva). In Ghana, no national surveys have been undertaken to measure the burden of disease associated with HBV infection. However, data available indicates that hepatitis B is hyperendemic in Ghana, with a prevalence of chronic infection of 8-15% (MOH, Document number 10, 1998).

##### Serological markers

Viral hepatitis may present either as an acute or chronic illness, with the most common cause of chronic hepatitis being viral in origin due mostly to HBV and HCV. The first specific detectable serological marker in the diagnosis of acute infection is the hepatitis B surface antigen, HBsAg, 6 weeks after exposure (Grosheide *et al.*, 1996). The presence of this marker reflects infectivity but does not distinguish acute from chronic infection.

Following the disappearance of HBsAg is the formation of the antibody against hepatitis B surface antigen [anti-HBs] (Vellinga *et al.*, 1999). The anti-HBs marker indicates a successful vaccination as well as recovery from infection. The only marker found and detectable in the liver is the hepatitis B core antigen, (HBcAg). Antibodies to this core antigen, anti-HBc is usually detectable at the onset of clinical illness and indicates current or past infection.

### **Route and Vehicle of spread**

From the first documented cases of hepatitis B in the 1880s until the 1960s, hepatitis B transmission was thought to be exclusively limited to percutaneous exposure to human blood or plasma (Lurman, 1885). Krugman *et al* in 1967 however, reported that Hepatitis B as well as hepatitis A were endemic in a mentally retarded institution where there was obviously no percutaneous exposure to human blood or plasma. This finding, convincingly demonstrated that hepatitis B virus could be transmitted within a human population without recourse to percutaneous exposure to human plasma or blood.

Some further seroepidemiological surveys of HBsAg and other serologic markers of hepatitis B amongst a wide variety of different populations, showed very high levels of the prevalence of HBsAg and antibody to HBsAg (Bernier *et al.*, 1982). For the levels identified, direct exposure to human blood could not explain the high rates. A new thinking thus emerged pointing to other mechanisms being postulated to be responsible for the transmission process of hepatitis B. This new thinking has led to studies among household

contacts of HBsAg chronic carriers which have provided evidence to corroborate this postulate (Bernier *et al.*, 1982).

Over the years, increased knowledge has made an attempt to identify the routes and vehicles of spread in person-to-person transmission of hepatitis B, and about the contagiousness of hepatitis B virus infected persons. To ascertain the findings of previous surveys in household settings and identify risk factors associated with prevalence of hepatitis B infection among households, Bernier *et al.*, (1982) carried out prevalence study of household contacts of chronic hepatitis B virus carriers and control contacts.

Findings from the survey showed that the percentage of antigen positives (HBsAg) from among the total seropositives for each age group decreased with increasing age. Thus, whilst 86% of hepatitis B positive children were in the age bracket of 0-9, 48% of HBsAg positives were in the age group of 10-19 (Bernier *et al.*, 1982). For successive older age groups, the percentage of positives decreased. Results from the Bernier-*et al* survey goes to show that majority of infections occur in childhood.

With regards to shared items and intimate contact, the findings showed that those who shared on a daily basis washcloths had a significantly higher prevalence rate (70.6%) than those who never shared (39.7%) or shared only sometimes (29.9%) (Bernier *et al.*, 1982).

### **Horizontal transmission**

Horizontal transmission is the non-sexual, non-vertical (from mother to child) and non-parenteral means of acquiring HBV infection. Transmission between family members (from father to children or between sisters and brothers) does occur in communities with poor socioeconomic, poor hygienic conditions and with longer periods of interaction (Craxi *et al.*, 1991). In Turkey, the positivity of HBsAg is less than 10%, thus putting the country in the moderately endemic regions (Doganci *et al.*, 1992). For regions like these, horizontal transmission is quite common and has been implicated in the majority of acute HBV infections in countries regarded as moderately endemic ones (Erol *et al.*, 2003). To determine the impact of horizontal transmission of HBV infection, Doganci *et al.*, (2005) retrospectively investigated by analyzing the risk factors and family screenings of children diagnosed with chronic HBV infection.

### **Most vulnerable age group**

Findings from the above study showed that HBsAg positivity was highest in the age group of 6-10 year (Doganci *et al.*, 2005). The results significantly showed that primary school age could be stated as the most risky period of transmission of HBV infection within low socioeconomic settings (Doganci *et al.*, 2005).

In another study conducted in Eastern Anatolia, Turkey, HBsAg seropositivity was significantly higher in children than infants [13.5% and 0.11% respectively]. (Uner *et al.*, 2001).

In developing countries with high prevalence rates, children born to HBsAg negative mothers are at risk of acquiring HBV infection during their perinatal period with rates of infection ranging from 7% to 13% (Alter *et al.*, 1994; Beasley *et al.*, 1983). For children of HBsAg positive mothers who are not infected at birth, such children still remain at very high risk of getting infected during their childhood years. Acquiring infection outside the family is highly probable for children who live in highly endemic regions (Alter *et al.*, 1994; Beasley *et al.*, 1983).

### **Socioeconomic influence**

Socioeconomic and cultural status of an area or a people also does influence strongly HBV infection. In places with low socioeconomic and “negative” cultural practices, HBV infection is usually high.

### **Transmission processes**

Sub-Saharan Africa specifically West Africa, Asia, the Far East and the Mediterranean have been shown through epidemiological studies to be the highly endemic areas for HBV infection in the world (Sobeslavsky, 1980). These studies indicated that majority of these infections in these highly endemic regions occur in infancy and childhood (Tabor *et al.*, 1985; Szmuness *et al.*, 1973). Although the common modes of acquiring HBV infection are through direct exposure to percutaneous human blood, sex and transmission and from mother to child, steep increases in prevalence of serum markers of HBV infection in children and preadolescents have indicated that horizontal transmission was the most probable mode of spread in sub-Saharan Africa (Davis *et al.*, 1989; Martinson *et al.*, 1996).

To investigate the mechanisms of horizontal transmission in sub-Saharan Africa, Martinson et al studied the risk factors for horizontal transmission of hepatitis B in a rural district in Ghana (Martinson *et al.*, 1998).

The results from the above study gave an overall prevalence of HBV seropositives (any HBV marker) as 74.7% with HBsAg specific prevalence being 20.9% (Martinson *et al.*, 1998). Data collected implied an uninterrupted non-uniform acquisition of HBV as a person advanced in age predominantly through horizontal transmission in childhood. The household rather than the domestic compound was identified as the primary source of transmission especially in the 5-15 years age group.

#### **Risky behaviours as a factor**

Among the behaviours most strongly associated with the prevalence of HBV infection were sharing of bath towel or sponge, sharing of partially eaten chewing gums or candies, sharing of dental cleaning material, having been bitten with the teeth by a carrier, biting of fingernails and scratching the back of a carrier, having a tribal mark or scarification and having received an injection from a traditional healer (Martinson *et al.*, 1998).

A higher seroprevalence of HBV markers was observed within compounds compared with school population, suggesting that the operational mode of spread must involve features shared in common by residents of a compound e.g. contact with HBV carriers as a source of infection. The study also revealed that there was increasing risk of infection with increasing age, which meant that there was a corresponding increase in the frequency of

risky behaviour within the study location with increasing age. Most of the risk factors associated with horizontal transmission were found to be entrenched in the society due to cultural practices, the closely knit interpersonal relationships and the low socioeconomic status of the community (Martinson *et al.*, 1998).

Studies carried out in Senegal (Szmunness *et al.*, 1973), Liberia (Prince *et al.*, 1981), and Nigeria (Tabor *et al.*, 1979) have supported findings elsewhere that majority of HBV infections in sub-Saharan Africa occur during childhood and that majority of these result from horizontal transmission. Most of these data linking childhood infections and horizontal transmission were obtained from the rural populations.

In a study conducted in Cameroon, Chiaramonte *et al.*, in 1991 assessed the prevalence of HBV infection among city school children living in an urban area of Cameroon because epidemiological data was lacking. Findings from this survey showed increasing prevalence of any HBV marker with increasing age. HBsAg prevalence increased steadily from 15.0% in the 4-6 year age group to 26.4% in the > 9 year group (Chiaramonte *et al.*, 1991). The overall prevalence of HBV infection found in the study confirmed the study location as one of high endemicity. This is consistent with literature and other studies that the sub-Saharan region is a highly endemic zone. The survey also revealed a higher prevalence of any HBV markers in the suburban schools (73.9%) compared to the central town schools (53.6%). Regarding gender and HBsAg positivity, there were significant differences between both sexes with a higher ratio in males (Chiaramonte *et al.*, 1991).

### **Strength of Horizontal Transmission**

To determine whether horizontal transmission of hepatitis B virus contributed to the high prevalence of infection in an endemic region, Tabor *et al.*, in 1985 tested residents of five villages in Zambia for hepatitis B serologic makers. The outcome of this study indicated that, during its five years span, infections occurred in at least 14 (18%) children aged between 4-17 years and 10 adults (12%) aged 23-65 years. Since the mothers of the children and adolescents (the 18%) with new infections were HBsAg negative, the new infections were probably acquired from someone else other than their mothers (Tabor *et al.*, 1985). In one study where 50% of the seronegative newcomers were put into two institutions, HBV infections were observed in these individuals in the first 1.5- 2.5 years (Szmuness *et al.*, 1981).

The Zambian study showed that there was relatively lower prevalence of chronic infections, compared to some other endemic zones, and is consistent with horizontal transmission of HBV. Horizontal transmissions usually results in fewer cases of chronic infections than does vertical transmission (Tabor *et al.*, 1985).

### **High risk group**

People or individuals with intellectual disability are a well known high risk group for Hepatitis B virus (HBV) infection for several reasons. Whilst on one hand, their behaviour enhances the spread of the virus, on the other, the type of intellectual disability and factors related to institutionalization are characteristics which increase the risk (Vellinga *et al.*, 1999). A univariate comparison has shown significant association between blood

transfusion and HBV seroprevalence in individuals with Intellectual Disability (ID) but not all studies have differences between Down's syndrome (DS) and Other Intellectual Disability (OID), which means that other factors are responsible for HBV infection.

### **Role of Institutionalization in Infection**

Factors like institutionalization itself have been found to be an important factor influencing the risk and frequency of exposure and further spread (Cancio-Bello *et al.*, 1985; Lohiya *et al.*, 1986; Ster Green *et al.*, 1991). Studies of individuals living at home with people with Intellectual Disability (ID) or attending a day care showed the same prevalence for this group as for the general population (Perrillo *et al.*, 1984; Dicks *et al.*, 1987). A study comparing institutionalized with non-institutionalized patients has shown that those in institutions are twice at risk of getting infected with HCV than those in the general population (Cramp *et al.*, 1996). Institutionalization has also been shown to influence HCV infection (Dicks *et al.*, 1987). Thus for individuals with DS, institutionalization will increase the prevalence of HBV infection. Calculations have shown that the effect of DS and institutionalization increase the risk of HBV infection seven times whilst a combination of both increases the prevalence of HBV infection by 27 times (Dicks *et al.*, 1987).

Behavioural features like the under listed have been found to be responsible for the high rate of transmission amongst individuals with ID. These factors (Cancio-Bello *et al.*, 1985; Bakal *et al.*, 1980) include taking objects in the mouth and sharing food, dribbling and biting, small injuries inflicted by themselves and others, scratching and biting, self

mutilation, unhygienic toilet habits and bleeding lips and gum caused by antiepileptic medications. These risk factors apply similarly to the general population and especially in children.

Carriers form the reservoir of the virus and given the infectious nature of blood, saliva and semen (Fried *et al.*, 1992), the above behaviours form a risk for the individuals as well as for others. Horizontal transmission is probably the most important mode, unrelated to sexual, perinatal or parenteral exposure for those in institutions (Davis *et al.*, 1989). The architecture of the institution and often overpopulation in institutions can also enhance transmission (Vellinga *et al.*, 1999).

Because both HBV and HCV are blood borne and share virtually about the same mode of transmission, concerns about high HCV prevalence in institutions or in the general population where HBV is high have been raised. For a population at risk like ID, same prevalence figures have been found just like for the general population. However, a study in Spain has disputed this given that two different institutions for individuals with ID, gave two rates of 12.5% and 36% for individuals aged between 12 -17 and 6-11 years respectively (Martinez *et al.*, 1991).

## **HEPATITIS C**

The epidemiology of hepatitis C to a large extent is heavily influenced by the geography of the area. The worldwide seroprevalence based on antibody to HCV (anti-HCV) is approximately 1 % (Holt *et al.*, 2001). This percentage translates into one hundred and seventy (170) million infections globally (Zuckerman, 1999; WHO Technical Consultation on hepatitis C, 1999; Giovanna *et al.*, 2002).

### **Global distribution**

Geographically, the prevalence of HCV is low (0.2-2%) in the general population in Europe, USA, Indonesia and Japan but is higher (2-5%) in South America and Asia and highly endemic (> 5%) in many parts of Africa (Chironna *et al.*, 2003; Maertens *et al.*, 2000; Tandon *et al.*, 1997). In Egypt, some studies of blood donor volunteers gave prevalence figures of about 14% (Tess *et al.*, 2000). In Ghana, the prevalence is not known but some studies have reported prevalence rates of about 4.5% among blood donors (Nkrumah and Foli, 2005). About 70-80% of people infected with HCV show no sign or symptoms of infection.

### **Risky behaviours**

Whereas the transmission routes of HBV are well known or defined, HCV transmission is still controversial and often unknown. The high risk factors include transfusion of blood and blood products, haemodialysis, exposure to health care and organ transplants. However, more than 40-50% of the HCV infections are still transmitted through unknown routes (Van Damme and Vellinga, 1998). In some parts of Africa, HCV remains the major

Saharan Africa however, the routes of transmission have not been well defined; blood transfusion, mother-to-child transmission, non-sterile medical procedures and traditional practices (scarification, tattoo, and circumcision) have been implicated despite the absence of confirmatory surveys (Nicot *et al.*, 1997). In Egypt, epidemiological and genetic studies indicated that massive and generalized antischistosomal therapy and non-sterile medical practices were implicated in the spread of HCV (Frank *et al.*, 2000; Rao *et al.*, 2002).

#### **Factors associated with transmission**

Not excluding the two major risk factors associated with spread of HCV and given that contact with medical services is sporadic, it can only be emphasized that some specific activities including ritual procedures, such as circumcision, scarification and exchange of contaminated blood by sharing razor blades or knives which are very common in rural populations may be responsible for disseminating viruses (Nerrienet *et al.*, 2005).

Before the advent of the use of Praziquantel in the treatment of Schistosomiasis some ten years ago in Egypt, parenteral treatment with tartar emetic injections was the mainstay. In Egypt, the HCV seroprevalence was 55% among children who had received blood transfusions, 67% among patients receiving renal dialysis, and 10% among sexually transmitted infection patients and even lower among children who had never received blood transfusion (Hassan, 1993; Khalifa *et al.*, 1993). At the time of this study therefore, parenteral transmission was the major route of HCV spread in Egypt (Yates *et al.*, 1999).

In an Egyptian survey, Yates et al, (1999) found no difference in infections with HCV among males and females.

During adolescence, many youths experiment with behaviours that usually put them at increased risk for HCV as well as HBV infection. From the 1999 United States Youth Risk Behaviour Surveillance Survey (YRBSS), 1.8% of students in grades 9 to 12 had injected illegal drugs and 49% had had sexual intercourse, with 8.3% initiating sex before 13 years of age (Kann *et al.*, 2000). In any given adolescent population with similar patterns as that reported by the Youth Risk Behaviour Surveillance Survey, the prevalence of HCV has been estimated to be between 0.1% – 0.4 % (Alter, 1993; Jonas *et al.*, 1997) .

Incarcerated youths have a higher prevalence of behaviours that possibly put them at risk for HCV than the general population. In a study of youths in 39 juvenile facilities in 5 states done in 1991, 10% of the male youths and 20% of their female counterparts, had used intravenous IV drugs and 89% of these population were sexually active (Morris *et al.*, 1995). In another study conducted in Australia, 21% of sampled incarcerated adolescents from a juvenile detention facility screened positive for HCV. 61% of these youths had used IV drugs (Ogilvie *et al.*, 1999).

In conclusion, this review has shown that HBV circulating among children in highly endemic regions like sub-Saharan Africa is very high, with the spread of infection being a continuous one throughout childhood. Horizontal transmission within the household is that which possibly facilitates the spread of HBV infection. Specific risky behaviours such as

sharing of bath towels, partially eaten toffees, dental cleaning materials and tribal marks are significantly associated horizontal transmission.

There is ample evidence that effective screening and vaccination programmes for children and adolescents with health education and socioeconomic development are the bedrocks in the prevention of HBV and HCV infection in sub-Saharan Africa.

## **CHAPTER THREE**

### **3.0 METHODS**

#### **3.1 STUDY DESIGN**

The study was a cross sectional survey and comprised descriptive and sero-prevalence assessments.

#### **3.2 STUDY AREA**

##### **3.2.1 Study Location**

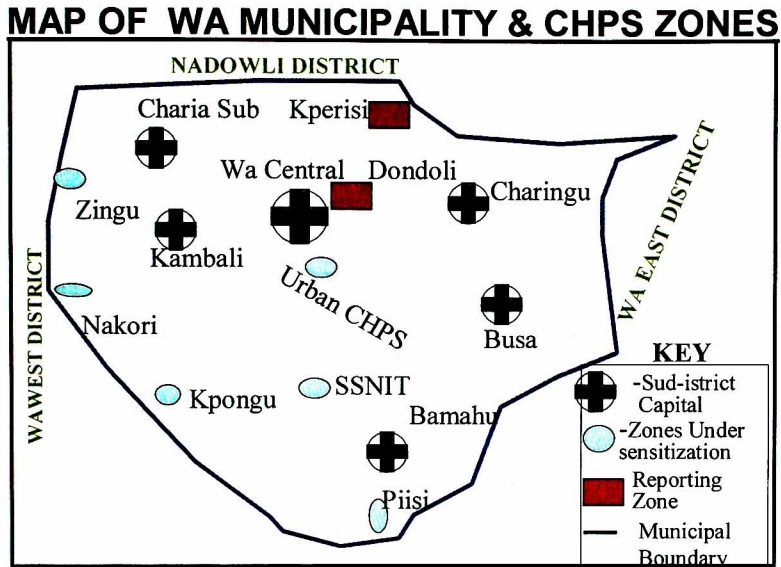
The study was conducted in the Wa district, the capital of the Upper West Region (UWR) located in the northern part of the country. This region was created in 1983 and is the last to have been created. Wa district is one of the eight districts of the UWR and has six (6) sub districts namely Bamahu, Busa, Charia, Cheringu, Kambali and Wa central. The district has the savannah type of vegetation. It is located between latitude 8 30 -10 N and longitude 0 30 -20 30 W. The municipality shares common boundaries to the east with Wa East District, to the south and west by Wa West District and to the north by Nadowli.

Fig. 1 shows the district map with the sub-districts.

##### **3.2.2 Population**

The 2005 population projected from the 2000 census for the district gives a total population of 103,059 (Basilia, 2005). The following are the sub-district breakdowns: Bamahu-5,381, Busa-3,366, Charia-15,501, Cheringu-7,651, Kambali-3,946, and Wa Central-43,650.

**Figure 1**



### 3.2.3 Educational Facilities

Wa has 27 nurseries, 53 Primary Schools, 35 JSS and 3 SSS, 2 Vocational institutes, 4 supplementary feeding centers and 11 CRC FAC Communities. The district also hosts part of the campus of the University of Development Studies (UDS).

### 3.2.4 Demographic Characteristics

The demographics give the following characteristics; annual growth rate of 2.7%, fertility rate of 6.1, Infant mortality rate of 71-105/1000 live births, under 5 mortality as 208/1000 live births, and a maternal mortality of 4.6/ 1000 live births. The percentage of under five malnourished is 29 (DHMT, 2005).

### **3.2.5 Health Care Services**

The district, has one government hospital which doubles as the regional hospital as well, 10 health centers located in Busa and Charia, 5 private hospitals all located in Wa sub district, one maternity home also in Wa sub district , one mother and child health ( MCH) clinic and 4 community nutrition centers.

The practice of traditional medicine is rife in the municipality, especially in the very rural parts of the district where access to modern health care services is virtually unavailable. These traditional healers thus handle very severe cases like cerebral malaria and pneumonia which most often are beyond their capabilities or know how.

### **3.2.6 Health Challenges**

The study area has its health challenges. These include poor general sanitation and personal hygiene, low utilization of supervised delivery services, weak disease surveillance and response system especially at the community level, high burden of diseases like malaria, HIV/AIDS, HBV, acute eye infection, guinea worm, anaemia and Tuberculosis, inadequate access to potable water and sanitary facilities, skin infections and diseases, weak transport systems and ill equipped and poorly staffed health facilities.

### **3.3 VARIABLES**

Information on the following variables were collected;

- |                                |                             |
|--------------------------------|-----------------------------|
| - Age                          | - Religion                  |
| - Gender                       | - Ethnicity                 |
| - The class of pupil           | - HBV Seropositivity        |
| - The Sub district (Community) | - HCV Seropositivity        |
| - Occupation of parents        | - Circumcision / FGM status |
| - Presence of tribal mark      | - Other Risk Factors        |

### **3.4 SAMPLING**

#### **3.4.1 Study Population**

The study population comprised pupils from selected primary and junior secondary schools in the district.

#### **3.4.2 Sample Size**

The sample size for the study was based on achieving a 95% confidence of finding all pupils who will be positive for HBsAg and anti-HCV. With a significance level and a margin of error set at 5% and 0.064 respectively, using a prevalence proportion of 18% (The Ghanaian Times, 6th February 2006), the sample size was determined to be 139. Correcting for the design effect associated with strata or clusters by a factor of 2.0, the operating sample size for the study was 277 approximated to 280.

### **3.4.3 Sampling Method/ Procedure**

A multi-stage sampling technique was employed in selecting respondents for the study.

The existing sub districts (Appendix A) served as the first strata or first stage in the selection process.

The second stage involved the selection of the required number of primary and junior secondary schools from the list of schools in each stratum (Appendix B) using a simple random technique.

The method of weighting or proportional allocation was applied in selecting the required number of schools from each district (Appendix C).

### **3.4.4 Selection of Pupils**

In selecting the pupils, the number of respondents required from each stratum was equally shared among the participating schools whenever possible. To ensure gender balance, the number of evaluable pupils for each school/class was equally distributed whenever possible amongst the male and female respondents.

For every selected primary school where ten (10) pupils ought to be drawn, five (5) classes were chosen at random from which two (2) pupils were finally picked at random. The school registers were not used in enrolling the pupils for the survey due to the erratic attendance by pupils. For each selected class, the number present (boys or girls) at the time of the visit by the survey team, picked in turns a small card inscribed with a “YES” or a

“NO” These cards were picked from a non-transparent bag. At any particular point of selection, the number of “YES” cards corresponded to the number of respondents wanted. A total of five days (17<sup>th</sup>- 21<sup>st</sup> July) were spent in selecting the study subjects, collecting blood samples and administering questionnaires.

### **3.5 DATA COLLECTION TECHNIQUES AND TOOLS/ INSTRUMENTS**

#### **3.5.1 Permission to Conduct Survey**

##### **- Ethical Clearance**

This study was approved by the following institutions:

- Research and Review Committee of the Ghana Health Service / Ministry of Health.
- The Upper West Regional Health Administration/ Wa Municipal Health Administration.
- The Wa Municipal Education Directorate of the Ministry of Education.

##### **- Voluntary Written Informed Consent**

Voluntary written informed consent and permission to draw blood samples was given by the various headteachers on behalf of the pupils’ parents before inclusion in the study (Appendix D). Prior to taking of blood samples, the Principal Investigator together with a member of the DHMT visited the selected Primary and Junior Secondary schools to discuss the objectives and methods of the study with the school heads and some teachers present at the time of our visit. The school heads in turn discussed the intended survey with the various school executive committees and Parent Teacher Associations. Having agreed to let their wards be part of the study, the various school heads were authorized to act on

behalf of the parents. Parents in the study area place much confidence in headmasters and teachers.

On the day of taking pupils' blood samples, the school heads or their assistants, signed each duly completed questionnaire of enrolled pupils.

### **3.5.2 Training of Research Assistants.**

The field work (from collection of samples to administration of questionnaires to enrolled pupils) was preceded by the training of research assistants. These assistants were equipped with skills of administering questionnaires and as a requirement were fluent in the local Wale and Dagati dialects. These requirements were vital so as to get the right responses from the respondents. Three out of the seven assistants were first degree holders from UDS, whilst the rest 4 were Senior Secondary School graduates; one of the 4 was a community health nurse. They have all been involved in previous data collection for the Municipal directorate.

### **3.5.3 Pre-testing and Review of Instruments.**

The questionnaires were pre-tested in two non-participating schools (Tendamba L.A. primary and St. Paul's Methodist J.S.S.). Memoranda from the DHMT, wanting to conduct pre-testing of the questionnaires were sent to the two school heads. Following the memos and the granting of permission to go ahead with the pre-testing, ten pupils each (10 boys and 10 girls) were selected at random and questionnaires administered to them. The pre-

testing allowed some questions to be better reframed. It also enabled us see the average time spent on each pupil.

#### **3.5.4 Blood Sample Collection**

From each enrolled pupil, 4-5mls of blood was collected by a Phlebotomist (a staff of the Wa Regional Central Hospital) into plain Vacutainer tubes. At the Phlebotomist's desk, a unique code was assigned to each pupil and written on the Vacutainer tube containing the pupil's blood sample. From the blood collection point, the respondent had his or her name, unique code and sex written in a well guarded exercise book, given a questionnaire with his or her unique code, and asked to see a Research Assistants for the administration of the questionnaire.

All samples collected at the close of each day (2.00pm), were sent to the BIL Clinical Laboratory (a private Laboratory near the Wa Regional Central Hospital) and centrifuged, separating sera from whole blood. The sera were kept at -20° C for further analysis.

The frozen sera were transported on dry ice to the Korle-Bu Teaching Hospital's Virology Department, where they were tested for hepatitis B surface antigen (HBsAg) and antibodies to hepatitis C (anti-HCV). The testing was done using the 3<sup>rd</sup> generation ELISA test kits (Serodia Fujirbio Inc, Japan) in accordance with the manufacturer's instruction.

Administered questionnaires were designed to collect information on demography, potential risk factors and other variables. (Appendix D). To get the right responses from

pupils, the research assistants administered the questionnaires using the local Wale and Dagare dialects when necessary.

### **3.5.5 Safety precautions**

All materials were collected taking the maximum required safety measures for the handling of blood samples. The syringes, needles, gloves cotton wool and sharps used were disposed off using safety boxes.

### **3.5.6 Quality Control**

To ensure quality of data gathered, the selected Research Assistants were those who were fluent in the local dialects. A Phlebotomist recruited from the Wa Central Hospital, was responsible for taking the blood samples. To avoid mix ups with the coding of the samples, a simple code starting from one (1) to the last number of 280 was assigned to each sample as they were taken. The letters “WA” was attached to each number. Two seasoned laboratory technologists were in charge of centrifuging and labeling to assure for that process. The separated sera were stored under -20°C and transported on dry ice to Korle-Bu Virology department for analysis. Two laboratory technologists examined the same sample in turns to assure for the results. A third technical person repeated analysis on 5 randomly selected samples from each batch. Daily checking for the completeness of returned questionnaires were made and identified mistakes quickly rectified. A few questionnaires were selected at random each day and readministered to check for consistency.

### **3.5.7 Confidentiality of data**

All data were handled confidentially. These included survey questionnaires, laboratory data sheets and sera samples. During data entry and validation, database files were accessible to only the Principal Investigator and his supervisors and were password protected. All specimen receptacles (for blood) bore only the identification number (assigned code) of the enrolled respondent and not the name of the pupil concerned.

The findings of the study were communicated to UWR, Wa health administrations and the enrolled pupils in line with the standard procedures of the Ministry of Health/ Ghana Health Service and the Government of Ghana in consultation with the relevant partners (i.e. Ministry of Education). Oral and written presentations of the outcome were made by the Principal Investigator.

### **3.6 DATA PROCESSING AND ANALYSIS**

Responses generated from the enrolled pupils via the administered questionnaires, were imported into a Microsoft Excel worksheet. Data generated were processed using Statistical Package for Social Services (SPSS) version 13.0 and Epi-info version 3.3.2 for analysis. Frequencies and percentages for the various variables were generated. Age-specific, gender specific and other socio-demographic specific seroprevalences were calculated. Prevalence of risk behaviours among seropositive children were also calculated. Chi-square for linear trend was used to evaluate differences in age-specific seroprevalences, whilst differences in seroprevalences by other socio-demographic characteristics were tested for significance using the chi-square test of independence. Also compared were the risk

behaviours of seropositive children and those with no evidence of infection. Differences observed were assessed using the chi-square. Further, the seropositives were zeroed on, to determine the prevalence of the risky behaviours and practices. A significance level of 5% (that is 95% confidence level) was used.

### **3.7 LIMITATIONS OF THE STUDY**

There were no respondents from J.S.S. 3. At the time of the survey, pupils from this class were out of school. Due to communication difficulties between the Research Assistants and pupils from the Wa Deaf Primary and J.S.S, the two schools were dropped from the list of randomly selected schools and their expected number of respondents redistributed over some schools within the same sub-district, which were however, selected at random.

The Hepatitis B vaccination status of respondents was not assessed and due to financial difficulties, other important HBV markers namely anti-HBs, HBcAg and anti-HBcAg were not tested for.

## CHAPTER FOUR

### RESULTS

#### **Enrollment and Socio-demographic characteristics of children**

280 pupils (100%) of pupils consented to participate and were enrolled in the study: 144 boys (51.4%) and 136 (48.6%) girls. Fifty-nine point six percent (59.6%) of the pupils were aged between 12 and 17 years, 27.9% between 6-8 years with 12.5% being older than 17 years. About forty percent (39.7%) of the evaluable pupils were in J.S.S., 32.1% in upper primary and 28.2% in lower-primary. When grouped according to geographical location (sub districts), most of the respondents came from Wa and Kambali (40.4% vs. 26.4% respectively). Almost all the children were known to be Christians and Moslems [279 (99.6%)]. 263 (93.9%) were also known to be either Walas or Dargatis. An overwhelming proportion of Walas (97.5%) were Moslems, whilst an equally large percentage of Dargatis (85.4%) shared the Christian faith.

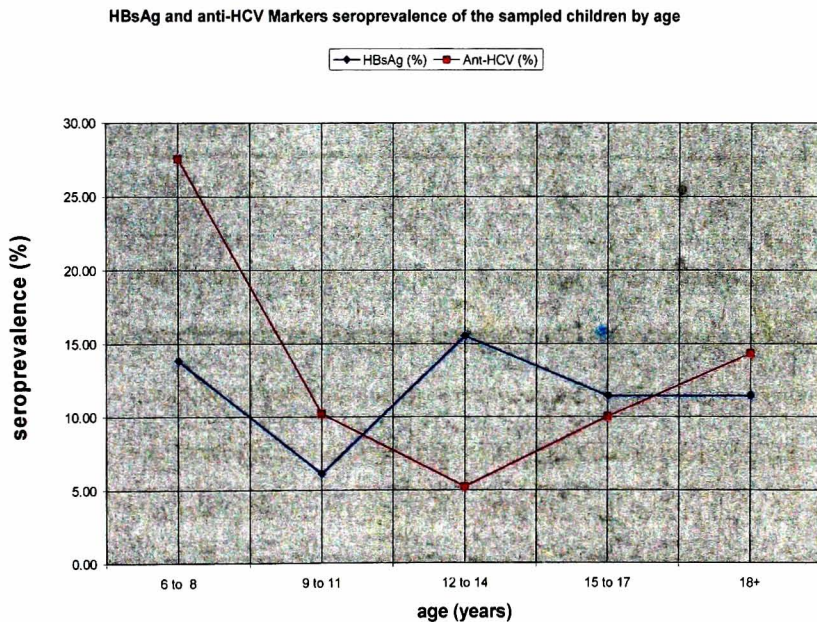
#### **Serological Results**

Of the 280 sera examined, 34(12.1%) [95% confidence interval (CI) 8%-16%] were positive for HBsAg and 30 (10.7%) [95% confidence interval (CI) 7%-14%] were positive for antibodies against HCV (anti-HCV). Eight pupils representing (2.9%) [95% confidence interval (CI) 1%-5%] were positive for both HBsAg and anti-HCV.

**a) Prevalence of HBsAg by Age and Gender:**

The HBsAg prevalence rates reflects no increasing trend, ranging from 6.1 to 15.5% among different age groups: it declined from 13.8 % in children aged 6-8 years to 6.1% in those aged 9-11 years, after which it increased to a peak of 15.5% in pupils aged 12-14 years and then drops to plateau at 11.4% among persons aged 15-17 years and those older than 17 years (chi-square test for linear trend:  $p > 0.05$ ). The chi-square linear trend did not show any statistical significant difference between the different age groups ( $p > 0.05$ ).

**FIGURE 2**



Anti-HCV prevalence, on the other hand depicted a non-linear trend (a quadratic trend):

It dropped nonuniformly from 27.6% among the youngest pupils (age 6-8 years) to

5.2% in those aged 12-14 years and steadily increased thereafter to 14.3% among the oldest pupils (age  $\geq$  18 years) [chi-square test for linear trend:  $p > 0.05$ ].

**Table 1 Seroprevalence of HBsAg by Age and Sex of Pupils in the Wa District.**

<u>Age</u>	<u>Male Pupils</u>	<u>Female Pupils</u>	<u>Total</u>
<u>(Years)</u>	<u>No. +ve/no. tested (%)</u>	<u>No. +ve/no. tested (%)</u>	<u>No. +ve/no. tested (%)</u>
6-8	2 / 15 (13.3)	2 / 14 (14.3)	4 / 29 (13.8)
9-11	2 / 26 (7.7)	1 / 23 (4.3)	3 / 49 (6.1)
12-14	7 / 43 (16.3)	8 / 54 (14.8)	15 / 97 (15.5)
15-17	7 / 37 (18.9)	1 / 33 (3.0)	8 / 70 (11.4)
<b>Total</b>	<b>19 / 144 (13.2)</b>	<b>15 / 136 (11.0)</b>	<b>34 / 280 (12.1)</b>

The overall minimum and maximum HBsAg seroprevalence was observed among the female pupils. Whilst the minimum seroprevalence of 3.0% was observed among females in the 15- 17 age group, the maximum seroprevalence of 25.0% was among female pupils above eighteen years. Interestingly however, a reverse situation was observed in the case of male pupils. The minimum HBsAg seroprevalence of 4.3% was seen in the  $\geq$  18 year age group whilst the maximum prevalence of 18.9% in this group was seen in the 15-17 age group.

Analysis of the HBsAg seroprevalence by sex, showed no significant difference between males and females (13.2% vs. 11.0%,  $p > 0.05$ ). However, the rate appeared to be higher in males. In addition, no significant differences in the rates of HBsAg were found among the

pupils with respect to sex in all the age groups with the exception of the 15-17 year age group.

**Table 2 Seroprevalence of anti-HCV by Age and Sex of Pupils in the Wa District.**

<u>Age</u> <u>(Years)</u>	<u>Male pupils</u> <u>No. +ve/no. tested (%)</u>	<u>Female pupils</u> <u>No. +ve/no. tested (%)</u>	<u>Total</u> <u>No. +ve/no. tested (%)</u>
6-8	4/15 (26.7)	4/14 (28.6)	8/29 (27.6)
9-11	3/26 (11.5)	2/23 (8.7)	5/49 (10.2)
12-14	2/43 (4.7)	3/54 (5.6)	5/97 (5.2)
15-17	3/37 (8.1)	4/33 (12.1)	7/70 (10.0)
≥ 18	4/23 (17.4)	1/12 (8.3)	5/35 (14.3)
<b>Total</b>	<b>16/144 (11.1)</b>	<b>14/136 (10.3)</b>	<b>30/280 (10.7)</b>

A minimum HCV seroprevalence of 5.2% was observed among the 12- 14 year age group: 4.7% for males and 5.6% for females. A maximum seroprevalence of 27.6% was seen among the 6-8 year age group: 26.7% for males and 28.6% for females. These latter rates are considerably high compared to the other age groups.

There was no statistically significant difference in the seroprevalence of HCV infection estimated by the anti-HCV among the sexes. Similarly, when the seroprevalence of males were compared to that of females, no significant difference was observed in any of the age groups.

**b) Prevalence of HBsAg and anti HCV by socio-demographic variables.**

**(i) Religion**

HBsAg prevalence differed significantly among the religions of the pupils: 18.0% among Christians and 8.4% among Moslems. Additionally, the anti-HCV were considerably high among Christians (15.0%) than among Moslems (7.8%) [ $p=0.002$ ]. The only pupil identified to belong to a religion other than those mentioned above was known to be both HBsAg and anti-HCV positive.

**(ii) Ethnicity**

HBsAg prevalence was significantly different among the various ethnic groups, with the highest rates recorded among the Dagartis and Walas [ $p=0.782$ ]. None of the pupils with Sisala origin tested positive for HBsAg or anti-HCV. Neither did those from tribes other than Dagarti, Wala and Sisala tested positive for HBsAg.

**Table 3 Seroprevalence of HBsAg and HCV by Religion,  
Ethnicity and Sub district**

Variable	<u>HBsAg</u>		<u>Anti-HCV</u>	
	No. +ve / no. tested (%)		no. +ve / no. tested (%)	
<u>Religion:</u>				
Christians	18 / 100	(18.0)	15 / 100	(15.0)
Moslems	15 / 179	(8.4)	14 / 179	(7.8)
Others	1 / 1	(100.0)	1 / 1	(100.0)
<u>Ethnicity:</u>				
Wala	14 / 160	(8.8)	16 / 160	(10.0)
Dagarti	20 / 103	(19.4)	13 / 103	(12.6)
Sissala	0 / 4	(0.0)	0 / 4	(0.0)
Others	0 / 13	(0.0)	1 / 13	(7.7)
<u>Sub districts:</u>				
Busa	1 / 27	(3.7)	2 / 27	(7.4)
Bamahu	8 / 31	(25.8)	5 / 31	(16.1)
Cheringu/Kperisi	5 / 25	(20.0)	4 / 25	(16.0)
Kambali	8 / 74	(10.8)	9 / 74	(12.2)
Charia	1 / 10	(10.0)	2 / 10	(20.0)
Wa	11 / 113	(9.7)	8 / 113	(7.1)

The prevalence of the HBsAg serologic marker was similar for three sub districts namely Wa, Charia and Kambali ranging from 9.7 to 10.8%. Busa sub district had the lowest prevalence of 3.7%, whilst Bamahu and Cheringu/Kperisi on the other hand had the highest

prevalence of 25.8% and 20.0% respectively. There were no significant differences in the anti-HCV serologic marker for the various districts, though that of Charia appeared to stand out.

c) **Risk factors for horizontal transmission.**

α) Occupation of guardian: There was no association found between the occupations of guardian and the HBsAg and anti-HCV positivity, in the children.

β) Risky behaviours and practices: There were no statistically significant differences between HBsAg and anti-HCV positive pupils and those negative for the markers, for risky behaviours and practices –like sharing of dental cleaning materials, scratching someone’s back, blood transfusion, circumcision by traditional healers etc- that were group matched.

i) Sharing of dental cleaning materials: Four (7.2%) of the 55 seropositive pupils reported sharing their dental cleaning materials with relatives.

ii) Sharing bath towel or sponge: Sixteen (29.0%) of the seropositives had shared the same bathing towel or sponge with siblings.

iii) Sharing candies or toffees: Twenty-five point five percent (14/ 55) of the seropositives reportedly shared candies or toffees whilst eating them with their friends and relatives.

iv) Biting of fingernails and scratching the back of people: Fifty-six point four percent (56.4%) [31/ 55] of seropositives pupils had been involved in frequent

scratching of the back of friends and relatives. However, none of the pupils were fond of biting their finger nails. All of them reported using blade to trim their fingers. Concerning hair cut, 34 (61.8%) said they had their cut at the barbering shops whilst 21 (38.2%) had theirs at home.

- v) Unprotected Sex: Twenty-six of the 55 seropositives representing 47.3% had indulged in sex before. Twenty-three of these 26 representing 88.6% never used a condom during the act. The practice of unprotected sex was common (82.6%) among pupils older than 12 years.
- vi) Been bitten with teeth. Twenty-six of the 55 seropositives (47.3%) claimed they have been bitten before.
- vii) Tribal Marks: Sixty percent (33/55) of the seropositives had tribal marks: 51.5% (17/33) were Dagartis whilst 16 (48.5%) were Walas. Nine (27.3%) of these pupils had their marks reportedly made by local medicine men or women, 7 (21.2%) by guardians and others like close relatives and wanzams.
- viii) Blood transfusion and injection: Twenty-five representing 45.5% of the seropositives reported having been admitted once at the hospital. However, only 2 (8.0%) had blood transfusion. Also, 49 (89.1%) of them have had an injection before; twelve (21.8%) were injected at home, 1 (1.8%) at a drug store with an overwhelming 33 (60.0%) being injected at the hospital.

ix) *Male and Female circumcision*: Twenty-three representing 79.3% of the 29 boys that were positive for at least one of the markers had undergone circumcision: 14 (60.9%) at home by local wanzams and 7 of the 23 seropositives (30.4%) at the hospital. With respect to FGM, 7/26 representing 26.9% of the seropositive girls had undergone the practice: 5/7 or 71.4% of the procedure were carried out by the local medicine women, one representing 14.3% by a guardian and another one with same 14.3% by an old man in the community.

**d) Knowledge about HBV and HCV and risk perception**

Knowledge about hepatitis B and hepatitis C was extremely poor. Of the 280 participants, only 36 representing 12.9% knew or had heard of hepatitis B whilst only 14 (5.0%) knew or had heard of hepatitis C. Of the 36 and 14 referred to above, only 5 (1.8%) knew what the signs and symptoms of hepatitis B and C were. Jaundice was the only symptom identified by 3 pupils as a sign or symptom. Practices identified correctly by the 5 as risk behaviours were: unprotected sex (by all 5), sharing toothbrushes, unprotected sex and having tattoos/tribal marks (by only one pupil), sex without condoms and sharing blades (by 3 pupils), having tribal marks/tattoos on one's body (by only one pupil) and sharing toothbrushes/toffees/towels/blades (by only one pupil).

## CHAPTER FIVE

### DISCUSSION

In this study, the seroprevalence of HBV infection estimated by HBsAg was found to be 12.1%. This places the Wa district community in the highly endemic zone. This seroprevalence is comparable to that observed in other studies carried out in Ghana (Martinson *et al.*, 1996; MOH, Document number 10, 1998), and other sub Saharan African countries (Chiaromonte *et al.* 1999; Ayoola, 1998).

The seroprevalence was highest among the 12-14 age groups. There was no steady increase in infection with age amongst the study population. However, after peaking at age 12-14, with 15.5%, there was a gradual decline in the trend until it plateaued after age 15. This finding is similar to what Martinson *et al.*, 1996 found in some rural district children in Ghana, (fig. 2). Unlike the findings in Cameroon by Chiaraonte *et al.*, in 1999, where HBV infection was found to increase with age, a non uniform trend was observed in this study suggesting that the risk of transmission or acquisition of HBV might not be uniform across age groups in children (Martinson *et al.*, 1996).

The increase in seroprevalence across age in this study supports the existence of frequent horizontal transmission of HBV in children aged 6-18 years in the absence of sexual and unrelated exposures as described by Davis *et al.*, 1989. The age-related difference observed in the HBsAg seroprevalence can be attributed to differences in the risk of acquiring HBV infection and the probability of remaining an HBsAg carrier once infected. In a Gambian study, Whittle *et al.*, (1983) noted that HBsAg persisted over long periods in children 8

years on after acquisition of the virus. This study is limited to finding only HBsAg prevalence and not when infection was acquired.

The peaks and troughs of the HBsAg trend (fig.2) strengthen the belief of a non uniform rate of infection in the age group studied.

The HBsAg seroprevalence by sex showed no statistical significant difference between the males and females. However, the rates appeared to be higher in the male than the female group. Similar results were observed in city school children in Cameroon by Chiamonte *et al* in 1991. It is possible that these moderate differences in the rates reflect more frequent high risk behaviours among the males predisposing them to horizontal of HBV. Such risk behaviours include fist fighting and other games involving very close physical contact in this age group (Martinson *et al.*, 1996). The difference in rates has also been suggested to mean that males tend to become chronic carriers more frequently than females (Chiamonte *et al.*, 1991).

Despite the difference in the rates for males and females, the insignificant difference observed in the prevalence of HBV infection for the sexes is an indication that during childhood, the risk factors involved in HBV transmission have similar impact in both sexes.

Hepatitis C (HCV) has recently emerged as a public health concern. For us in this part of the world, much emphasis has been placed on HBV to the neglect of HCV. In this study, the anti-HCV seroprevalence was 10.7%. This finding places the district within the highly

endemic region of the world (Chironna *et al.*, 2003; Maetens *et al.*, 2000; Tandor *et al.*, 1997). The finding in this study [10.7%] is much higher than that found [5.6%] in a similar study conducted among school children in Ashanti-Akim North district of Ghana in 1996 (Martinson *et al.*, 1996). The main routes of transmission of HCV infection have been identified as blood transfusions and parenteral drug abuse with sexual and household contacts representing relatively minor modes of transmission in western societies (Martinson *et al.*, 1996). However, as many as 40-50% of infections occur in the absence of specific risk factors other than socioeconomic factors (Van Damme and Vellinga 1998).

In Ghana, very few children who have had repeated blood transfusions survive to be in school at age six and over (Martinson *et al.*, 1996). Given this fact and the high anti-HCV seroprevalence in a population that is not sexually active, not active intravenous drug users and not likely to have had an unusually high number of blood transfusions strongly suggests that casual contacts and some unknown practices play important roles in the transmission of HCV in sub-Saharan Africa (Hess *et al.*, 1989; Hsu *et al.*, 1991) hence the district of study.

Generally, the prevalence of HCV infection increases with advancing age with the prevalence of anti-HCV being about 3% in the adult population, although peaks above 10% have been described (Bongiorno *et al.*, 2002). Data from this study showed that the anti-HCV seroprevalence demonstrated a non-linear or quadratic trend with age. There was thus a non-uniform drop from 27.6% among the youngest children (age 6-8) in the study to a lowest prevalence of 5.2% in those aged 12-14 years. This same age group in contrast

exhibited the highest prevalence rate with respect to HBsAg. The findings of this study sharply contrast with findings of a similar study in school children by Martinson *et al.*, 1996, where there was a trend of increasing HCV seroprevalence with age. This latter trend was thought to be consistent with literature and supported the idea that casual contact was the predominant mode of transmission in children. Given that the trend of infection declined with age, at least till 12-14 years, means that other reasons must be responsible for the observed trend.

Most acute HCV infections are largely asymptomatic, resulting in chronic infections with seroconversion (Martinson *et al.*, 1996). Is it the case that most of the children seroconverted hence the decline? At age 12 years and above however, the anti-seroprevalence increased with age possibly indicating that thereafter, the causal contact responsible for most of HCV transmission is predominant among this age group. Though difficult to single out factors that may be responsible for this increase, it would be a worthwhile exercise investigating for these factors that influence HCV seroprevalence in the study area.

Unlike in many endemic areas, the prevalence by school age 6-8 years has been observed to be high [27.6%] in this study. This high exposure may possibly be due to factors that act in the preschool environment such as intrafamilial spread, spread among children living in the same household or compound as result of the intense social activities in this population. In this study the impact of vertical transmission was not assessed. No significant difference was observed between males and females. Similar observations were made in a study in

Ashanti-Akim district of Ghana (Martinson *et al.*, 1996) and in Cameroonian school children (Ngatchu *et al.*, 1992).

Horizontal transmission especially of HBV has been associated with age (Viel *et al.*, 1995), socioeconomic conditions (Furusyo *et al.*, 1998) and risky behaviours (Martinson *et al.*, 1998) such as sharing of both towels, chewing gum, partially eaten candies or dental cleaning materials as well as biting fingernails in conjunction with scratching the backs of carriers (Martinson *et al.*, 1998). Improvements in socioeconomic conditions have led to decreasing exposure to HBV infection (Martinson *et al.*, 1998).

In determining the significance of the various risk factors associated with the transmission of HBV and HCV, the exposure of the seropositives to these risk factors was compared to that of the seronegatives. For all the risk factors considered, there were no significant differences between the two groups with respect to their exposures to the risk factors considered. One is tempted to infer that the risk factors considered in this study do not have an impact on the transmission among the pupils enrolled. However, inferences from this study need to be made with caution since it is difficult to establish causal pathways from cross sectional studies like this one.

Despite the insignificance of the risk factors considered amongst the pupils, it must be emphasized that most of these behaviours are deeply entrenched amongst the communities in the district because of cultural practices, family networks and interpersonal relationships and the low socioeconomic status of the district.

Among the cultural practices are scarification (making of tribal marks), circumcision by local wanzams, FGM and household eating habits. Harsh prevailing economic conditions in the district have affected water availability and supply and lead to individuals especially children compromise their personal hygiene. Poor personal hygiene is one of the health challenges of the district (DHMT, 2005). The level of care for children in this community is so poor that 3 out of every 5 children in the district have one skin infection or the other. Given the poor personal hygiene, the interactive nature of children and their skin infections for example place them at very high risk for horizontal transmission.

In considering the relationship between the prevalence of HBV and HCV with other socio-demographic variables, it was observed that there was significant difference between the two major religious groupings. 18.0% of Christians as against 8.4% of Moslems were positive for HBsAg. The prevalence of anti-HCV was equally high in Christians (15.0%) than in Moslems (7.8%). Literature considered for this study did not reveal any study comparing these two religions in respect of HBV and HCV infection. Within the study area, sociocultural practices such as eating from the same bowl in groups, tribal marks cuts across all religious groups. However, Christians unlike Moslems drink alcohol especially the locally brewed “pito” Drinking “pito” is a practice done in groups within the community where a pot of the locally brewed beer is shared using one or the same calabash. Children present at these “functions” are not left out of tasting the “pito” This practice of sharing the same drinking cup or bowl may therefore constitute the transmission route of the virus.

Prevalence for both HBsAg and anti-HCV was highest among the Dagartis than any other ethnic group. It is difficult to pin-point any particular practice peculiar or limited to the Dagartis that make them more vulnerable to HBV and HCV infections than any other group except for not prevented from taking in alcohol. Majority of Dagartis are Christians thus it is almost certain that it is this same population that was referred to above when religious affiliation was considered. Whether this community sharing of calabashes is the route of transmission is debatable and worth investigating.

Most of the data on HBV and HCV prevalence in children were obtained from rural populations (Chiaromonte *et al.*, 1991; Martinson *et al.*, 1996). In a Cameroon study, Chiaromonte *et al.*, 1996, found that children in suburban schools had higher prevalence of any marker compared to city school children. Also in this study, respondents from Bamahu and Cheringu subdistricts had the highest prevalence rates of 25.8% and 20.0% respectively for HBsAg (Table 3). In respect of anti-HCV, Charia had the highest prevalence of 20.0% followed by Bamahu and Cheringu with 16.0% each. All these subdistricts are essentially rural communities. The findings are thus consistent with earlier publications. Possible explanations for this trend may be due to the following: poor access to water resulting in very poor or compromised personal hygiene, greater interaction among children in the rural setting compared to children in the city, economic deprivation reducing access to care and poor general sanitation.

The knowledge of the pupils were extremely poor. Of the 36 pupils representing (12.9%) and the 14 pupils representing (5%) who had knowledge of HBV and HCV infections

respectively, only 5 (1.8%) knew what the symptom(s) of hepatitis were. The implications for this level of knowledge are grave. For an area of high endemicity, aside immunization, the most important preventive strategy is knowledge gained through education. To be able to avoid risky behaviours associated with an infection depends on how much knowledge a pupil or an individual has about the infection and how it is transmitted. This way lifestyles can be modified thus prevent infection. Many prevalence studies among the incarcerated have shown that both HBV and HCV can occur as co-infections or be simultaneously acquired by those who engage in risky practices such as intravenous drug use. In Cote d'Ivoire, co-infections (HIV/HBV and/or HIV/HCV) have been shown to occur in pregnant women (Rouet *et al.*, 2004).

## CHAPTER SIX

### CONCLUSIONS AND RECOMMENDATION

#### **Conclusions**

Despite the limitations of this study, there is no doubt that it has important public health implications for the district. The serosurvey has demonstrated a high prevalence of hepatitis B and C virus infections among school children in the Wa district. Though not significantly associated with seropositivity, specific risky behaviours like scarification (making tribal marks), circumcision by local wanzams, FGM and the sharing of bath towels and sponges, chewing gums and partially eaten toffees, dental cleaning materials, were shown to be highly prevalent in this population. As emphasized by Martinson *et al.*, 1998, these behaviours may be surrogate markers of other unrecognized forms of interpersonal contact that result in transmission of HBV and HCV.

#### **Recommendations**

Effective screening and vaccination programmes with health education and socio economic development are recommended preventive strategies for HBV and HCV infection in the Wa district. In this regard, it is recommended that at the;

#### **National and Regional Level**

The Regional Health administration together with the EPI national office initiates an urgent mandatory regional population screening and subsequent vaccination for all who will test negative for HBsAg. Mindful of the cost and limited budget, this exercise can be limited to children in school and out of school.

### **Regional and District level**

- The DHMT through the community health outreaches must ensure that all newborns assess the pentavalent vaccination schedules fully.
- The DHMT in collaboration with the school health programme of the Ministry of Education incorporate a comprehensive educational programme on HBV and HCV infections in school's health syllabus.
- Organize the local wanzams into associations so that members can be thought why and how to sterilize the instruments they use in their profession.
- Enforce the ban on FGM and discourage scarification in the district.
- Provide at least one bore hole (as source of water) for each community in the bid to improve on personal hygiene and reduce the numerous skin infections.
- The DHMT through its community health outreaches should discourage communal eating, sharing of spoons whilst eating and sharing of same calabash during communal drinking of "pito"

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## APPENDIX A

### The sub-districts of Wa

- BAMAHAU
- BUSA
- CHARIA
- CHERINGU (KPERESI)
- KAMBALI
- WA MUNICIPALITY

## APPENDIX B

### List of Primary and J.S.S by Sub-districts

#### Primary School Distribution

##### BAMAHAU sub-district

- |                              |                             |
|------------------------------|-----------------------------|
| 1. Danku E.A. primary school | 4. Dapuaha L.A. primary     |
| 2. Sing L.A. Primary         | 5. *Piisi Catholic primary* |
| 3. *Boli L .A. primary*      | 6. Bamahu L.A. primary      |

**Total number of schools = 6**

##### BUSA sub-district

- |                         |                               |
|-------------------------|-------------------------------|
| 1. Busa L.A. primary    | 3. Jonga-Tabiase L.A. primary |
| 2. *Biihe L.A. primary* | 4. *Jonga E.A primary*        |

**Total number of schools = 4**

**CHERINGU (KPERISI) sub-district**

- |                           |                            |
|---------------------------|----------------------------|
| 1. *Kperisi L.A. primary* | 4. *Sagu Catholic primary* |
| 2. Konjiahi L.A. primary  | 5. Kadoli E.A. primary     |
| 3. Nyagli L.A. primary    |                            |

**Total number of schools = 5**

**CHARIA sub-district**

- |                                |                                  |
|--------------------------------|----------------------------------|
| 1. Charia Catholic primary "A" | 2. *Charia Catholic primary "B"* |
|--------------------------------|----------------------------------|

**Total number of schools = 2**

Legend: - \* Refer to appendix C

**KAMBALI sub-district**

- |                                   |                                  |
|-----------------------------------|----------------------------------|
| 1. *Dignafuro E.A. primary*       | 8. *Nakori L.A. primary*         |
| 2. Kpongu E.A. primary            | 9. *Chansa L.A. primary*         |
| 3. *St. Andrews Catholic primary* | 10. Tampieni L.A. primary        |
| 4. *T.I. Ahmadiyya primary "A"*   | 11. Bishop Catholic primary      |
| 5. T.I. Ahmadiyya primary "B"     | 12. St. Cecilia Catholic primary |
| 6. Kambali E.A. primary           | 13. Nako primary                 |
| 7. Mangu Methodist primary        |                                  |

**Total number of schools = 13**

**WA sub- district**

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| 1. Adabiyat L.A. primary          | 13. Tendamba L.A. primary          |
| 2. *N.J.A. Demonstration primary* | 14. Kabanya E.A. primary           |
| 3. St. Paul's Methodist           | 15. *S.D.A. primary*               |
| 4. *Nuniya E.A. primary*          | 16. *St. Aiden's Anglican primary* |
| 5. Huriya E.A. primary            | 17. Wa School for the Blind        |
| 6. Fallahia E.A. primary 'A'      | 18. *Jujeidayiri primary 'B'*      |
| 7. Fallahia E.A. primary 'B'      | 19. St. John's Catholic primary    |
| 8. Fongo L.A. primary             | 20. *Wa Municipal Model primary*   |
| 9. Fongo E.A. primary             | 21. *Wa Deaf primary*              |
| 10. Dobile Presby primary         | 22. Wa school for the Deaf (EMH)   |
| 11. Limanyiri Model primary       | 23. *Shakarfatu E.A. primary*      |
| 12. Jujeidayiri primary 'A'       |                                    |

**Total number of schools = 23**

Legend: - \* Refer to appendix C.

**Distribution of J.S.S.**

**Busa sub district**

- |                       |                     |
|-----------------------|---------------------|
| 1. *Busa L.A. J.S.S.* | 3. Jonga E.A. J.S.S |
| 2. Biihee L.A. J.S.S. |                     |

**Total number of schools = 3**

**Cheringu (Kperisi)**

- |                          |                      |
|--------------------------|----------------------|
| 1. *Kperisi L.A. J.S.S.* | 3. Nyagli L.A. J.S.S |
| 2. Sagu Catholic J.S.S.  |                      |

**Total number of schools = 3**

**Bamahu**

- |                       |                          |
|-----------------------|--------------------------|
| 1. Sing L.A. J.S.S.   | 3. Piisi Catholic J.S.S. |
| 2. *Boli L.A. J.S.S.* | 4. *Bamahu E.A. J.S.S.*  |

**Total number of schools = 4**

**Charia**

- |                             |                                    |
|-----------------------------|------------------------------------|
| 1. *Charia Catholic J.S.S.* | <b>Total number of schools = 1</b> |
|-----------------------------|------------------------------------|

**Kambali**

- |                                  |                           |
|----------------------------------|---------------------------|
| 1. Kpongu E.A. J.S.S.            | 6. *Tampieni L.A. J.S.S.* |
| 2. *St. Cecilia Catholic J.S.S.* | 7. S.D.A. J.S.S.          |
| 3. *Kambali E.A. J.S.S.*         | 8. Bishop's J.S.S.        |
| 4. Mangu Methodist E.A. J.S.S.   | 9. Nakore L.A. J.S.S.     |
| 5. Shakarfatu E.A. J.S.S.        |                           |

**Total number of schools = 9**

**Wa**

- |                                   |                               |
|-----------------------------------|-------------------------------|
| 1. *Adabiyat L.A. J.S.S.*         | 10. Dobile Presby J.S.S.      |
| 2. St. Paul's Methodist J.S.S.    | 11. Jujeidayiri J.S.S.        |
| 3. Wa School for the Blind J.S.S. | 12. Limanyiri Model J.S.S.    |
| 4. Huriya E.A. J.S.S.             | 13. *Wa Catholic J.S.S.*      |
| 5. Nuriya E.A. J.S.S.             | 14. Wa Municipal Model J.S.S. |
| 6. Tendamba L.A. J.S.S.           | 15. *Fogo L.A. J.S.S.*        |

- |                         |                                 |
|-------------------------|---------------------------------|
| 7. Kabanye E.A J.S.S.   | 16. St. Andrews Catholic J.S.S. |
| 8. Fallahia E.A. J.S.S. | 17. *T.I. Ahmadiyya J.S.S.*     |
| 9. *Fongo E.A. J.S.S.*  | 18. *Wa Deaf J.S.S.*            |

**Total number of Schools = 18**

Legend: - \* Refer to Appendix C

## APPENDIX C

### List of selected schools

**From the list of Appendix A,**

Total number of primary schools = 53

Total number of Junior Sec Sch. = 38

Total number of schools = 91

#### Distribution of Primary schools per sub – district.

1. Bamahu = 6	4. Charia = 2
2. Busa = 4	5. Kambali = 13
3. Cheringu = 5	6. Wa = 23

#### Distribution of Junior Secondary Schools per sub-district.

1. Bamahu = 4	4. Charia = 1
2. Busa = 3	5. Kambali = 9
3. Cheringu = 3	6. Wa = 18

Proportion of Primary schools to the total number of schools =  $53/91 = 0.6$

Proportion of J. S. S. schools to the total number of schools =  $38/91 = 0.4$

Sample Size for the study = 280

Total number of pupils to be drawn from Primary schools is given as;  
 Primary school proportion multiplied by Sample size ( $0.6 * 280$ ) = 168

Total number of J. S. S. pupils that would be required for the study;  
 Proportion of J. S. S. multiplied by Sample size ( $0.4 * 280$ ) = 112.

Number of pupils to be drawn from each sub-district Primary schools:

**For Bamahu;**

Number of primary schools = 6

Number of pupils =  $\frac{6 \times 168}{53} = 19$

**For Busa;**

Number of primary schools = 4

Number of pupils =  $\frac{4 \times 168}{53} = 13$

**For Cheringu;**

Number of primary schools = 5

Number of pupils =  $\frac{5 \times 168}{53} = 16.0$

**For Charia;**

Number of primary schools = 2

Number of pupils =  $2/53 \times 168 = 6.0$

**For Kambali;**

Number of primary schools = 13

Number of pupils =  $13/53 \times 168 = 41.0$

**For Wa;**

Number of primary schools = 23

Number of pupils =  $23/53 \times 168 = 73$

**Number of J. S. S. pupils to be drawn from each sub-district.**

**For Bamahu;**

Number of J. S. S. = 4

Number of pupils =  $4/38 \times 112 = 11.79 = 12$

**For Busa;**

Number of J. S. S. = 3

Number of pupils =  $3/112 = 8.84 = 9$

**For Cheringu;**

Number of J. S. S. = 3

Number of pupils =  $3/38 \times 112 = 9$

**For Charia;**

Number of J.S.S. = 1

Number of pupils =  $1/38 \times 112 = 3$

**For Kambali;**

Number of J. S. S =9

Number of =  $9/38 \times 112 = 26$

**For Wa;**

Number of J.S.S. = 18

Number of pupils =  $18/38 \times 112 = 53.0$

**Selection of Respondents' Schools**

Given that Ten (10) pupils were randomly selected from a chosen school, meant that within the Bamahu sub district for example, the Nineteen (19) pupils needed from the Primary School would come from Two (2) out of the Six (6) primary schools. These Two (2) schools were chosen or drawn at random from the list of 6.

Given that Ten (10) Pupils were randomly selected from each randomly chosen school, the following will be the distribution of schools from each sub-district;

Schools	Bamahu	Busa	Charia
Primary	2*(out of 6)	2*(out of 4)	1*(out of 2)
J. S. S.	2*(out of 4)	1*(out of 3)	1*(out of 1)
Schools	Cheringu	Kambali	Wa
Primary	2*(out of 5)	5*(out of 13)	8*(out of 23)
J. S. S.	1*(out of 3)	3*(out of 9)	6*(out of 18)

KEY: - \* Schools (randomly selected) from which pupils were enrolled for the study.

## **APPENDIX D**

### **CONSENT FORM**

#### **CONSENT TO COLLECT BLOOD SAMPLES FOR RESEARCH USE**

There is evidence and anxiety among Health authorities on the increasing number of HBV and HCV infection among citizens of the region. There is also evidence about the adverse outcome of getting infected with the above viruses. Transmission of these viruses however, varies depending on the kind of risk you expose yourself too. What we do not know is whether this is a real big problem as we are being made to believe. We want know the extent to which these infections exist among our children and school kids.

We will take from you about a teaspoonful of blood. A trained laboratory technician will insert a needle into the vein in one of your arms and draw some blood. This may cause pain, discomfort, and bruising at the site of needle insertion. Your blood sample will be tested for HBV and HCV. We will let you know if we detect any of these viruses in your sample and will advice you on what to do. For those who will test positive for HBsAg (surface antigen for hepatitis B virus) and anti-HCV, they will be referred to the Wa Central Hospital through the DHMT for further follow up and management.

We will also ask you a few questions. The information you give us will be used only for this study and will not be used in any way that will harm you. Your participation and your test results will remain confidential. Your blood samples will be labeled with a code and not your name. Your name will also not be identified in reporting the study results. If you have any questions concerning this study, you may contact Anthony Avege through the

DHMT at the Wa district health directorate. Your participation in this study is voluntary. You are free to withdraw from this study at any time.

-----

I the undersigned, voluntarily agree to participate in this study by donating my blood sample. The risk and benefits have been explained to me, and I am aware that every effort will be made to ensure my confidentiality.

.....  
**Name & Signature of the Participating pupils' parent**

.....  
**Date:**

.....  
**Name of Investigator**

.....  
**Date:**

## APPENDIX E

### QUESTIONNAIRE

Topic: Prevalence of Hepatitis B & C virus Infection and Possible Risk

Factors Associated with Transmission among School Children in Wa District.

Name & Sig. of Research assistant: .....

Date of Interview: .....

Name of Pupil's school: .....

Name of pupil: .....

Pupil's code: .....

Name of community:.....

Name & Signature of Head teacher: .....

#### Socio-demographic factors

1. Age ; (a) 6-8 (b) 9-11 (c) 12-14 (d) 15-17 (e)  $\geq 18$  years
2. Sex : (a) M (b) F
3. Occupation of Guardian- **(Male)** (a) Farming (b) Petty trading (c) Formal employment (d) Unemployed (e) Others (specify) (f) N/A
4. Occupation of Guardian- **(Female)** (a) Farming (b) Petty trading (c) Formal employment (d) Unemployed (e) Others (specify) (f) N/A
5. Class of pupil (a) P1 (b) P2 (c) P3 (d) P4 (e) P5 (f) P6 (g) JSS 1 (h) JSS2 (I) JSS3
6. What is your Ethnicity? (a) Wala (b) Dagati (c) Sisala (d) Others (please specify)
7. What is your religious affiliation? (a) Christian (b) Moslem (c) Traditional Religion (e) Others (please specify)

**Risk factors**

8. What do you use in cleaning your teeth at home? (a) toothbrush (b) chewing stick (c) Others (specify)
9. Do you use the same toothbrush with your brothers and sisters? (a) Yes (b) No
10. Do you share the same chewing stick with your brothers or sisters? (a) Yes (b) No (c) Not applicable
11. Do you share the same bathing towel or sponge with your brothers or sisters? (a) Yes (b) No
12. Do you share candies or toffees **whilst eating it** with your friends or brothers/sisters? (a) Yes (b) No
13. How many of you eat from the same bowl at home? (a) Alone (b) 2-3 (c)  $\geq 3$
14. How many of you eat from the same plate at school? (a) Alone (b) 2-3 (c)  $\geq 3$
15. How do you trim or with what do you cut your finger nails? (a) Bite them with teeth (b) Use blades.
16. Do you often scratch the back of your friends, sister(s) or brother(s) with your finger nails? (a) Yes (b) No.
17. Do you share blades or sharp knives with friends, brothers/sisters at school or at home when you want to trim your finger or toe nails? (a) Yes (b) No.
18. Who cuts your hair (shaves your head) for you? (a) Guardian (b) Barber (c) Friend
19. Where do you regularly have your hair cut? (a) At home (b) Barbering shop
20. What is normally used to cut (shave) your hair? (a) Blades & comb (b) Scissors (c) "Machine"
21. Have you been bitten (with the teeth) at school or at home while at play before? (a) Yes (b) No (c) don't know
22. Have you ever been or are you in a sexual relation ("Do you know a man/woman")? (a) Yes (b) No.
23. Have you seen a condom before? (a) Yes (b) No **If (b) No go to Q 25.**
24. Have you used it b4 or do you use it when you have sex? (a) Yes (b) No (c) N/A

25. Do you have a tribal mark/ tattoo on your body? (a) Yes (b) No

• **Please Observe for Tribal Marks, Tattoos and Body piercing and tick for**

(a) Presence (b) Absence.

26. If tribal mark is present ask who made the tribal mark/tattoo on the body?

(a) Guardian (b) Local medicine man/woman (c) Don't know (d) others (specify)  
(e) N/A

27. Have you been on admission at the hospital before? (a) Yes (b) No (c) Don't know

**If No or Don't know go to Q 29.**

28. If yes, were you "given" blood while on admission? (a) Yes (b) No

(c) Don't know/remember (d) N/A

29. Have you been given injection before? (a) Yes (b) No (c) don't know

**if No or don't know go to Q 32 or 36.**

30. If yes where was the injection given? (a) Home (b) Health center/ Hospital (c) Drug store (d) others (specify)

31. If yes, who gave the injection? (a) Local medicine man/woman (b) Family member

(c) Nurse (d) Drug peddler (e) Friend (f) others (specify)

**For males (boys) only**

32. Is circumcision practiced in your community? (a) Yes (b) No (c) N/A

33. Where is circumcision done in the community? (a) Home (b) Hospital/ Health center  
(c) N/A

34. Have you undergone such a practice? (a) Yes (b) No (c) N/A

35. Where were you circumcised? (a) Home by local wanzams (b) Hospital

(c) Don't know (d) Others (specify) (e) N/A

**For females (girls) only**

36. Is female circumcision (Female Genital Mutilation) practiced in your community?

(a) Yes (b) No (c) don't know (d) N/A **If No or Don't know go to Q 39.**

37. If yes, have you undergone such a practice before? (a) Yes (b) No (c) Don't know

38. Who carries out female circumcision within the community? (a) Local medicine woman

(b) Guardian (c) others (specify) (d) N/A

**Knowledge on Hepatitis B & C**

39. Have you heard of Hepatitis before? (a) Yes (b) No

40. If yes, what is it? (a) A "disease" (b) An animal (c) A worm (d) N/A

41. Have you heard of the disease called Hepatitis B? (a) Yes (b) No

42. Have you heard of the disease called Hepatitis C? (a) Yes (b) No

43. Do you know some signs and symptoms of Hepatitis B virus or Hepatitis C virus infection? (a) Yes (b) No (c) don't know (d) N/A

44. Please mention some of the signs and symptoms you know of?

(a) Fever (b) Jaundice (c) Dark urine (d) Eye infection (e) N/A

45. What practices can possibly make an individual get Hepatitis B and Hepatitis C virus infections (a) Sex without condoms (b) taking "bad" blood (c) Having circumcision at home/female circumcision

(d) Having a tribal mark/ Tattoos on your body (e) Sharing tooth brushes/toffees /towels/blades (f) N/A

Please indicate your view on the personal hygiene of the pupil and community:

Pupil- (a) good (b) fair (c) poor

Community- (a) good (b) fair (c) poor

**Please advice pupil to avoid sharing of toothbrushes, blades, being injected by unqualified health personnel and having tattoos made on their body. They should maintain good personal hygiene always.**

**Please don't forget to express your thanks!**

