Knowledge, Attitudes and Practices of Healthcare Workers regarding Hepatitis B Prevention and Control at Aweil State Hospital in South Sudan 2018.

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DECLARATION

I, **Amin Gordiano Okwahi Tafeng,** hereby declare that the work for this dissertation, unless where acknowledged, is my own. It is being submitted in Partial Fulfilment for the degree PhD in Public Health, in the Faculty of Social and Human Science at Atlantic International University Honolulu Hawaii State in United State of America.

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Dedication

I dedicate this work to my Father and Mother, Gordiano Ochongodok and Anjelina Ihatar, my wives Margret Chilliano and Grace Ifere and to all my Children.

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LIST OF ABBREVIATIONS

Anti-HBs: Hepatitis B surface antibody

Anti-HBc: Hepatitis B core antibody

AIDS: Acquired immunodeficiency syndrome

BBV: Blood-borne viruses

BBF: Blood and body fluids

CDC: Centres for Disease Control

DNA: Deoxyribonucleic acid

HBV: Hepatitis B virus

HCC: Hepatocellular carcinoma

HCV: Hepatitis C virus

HBeAg: Hepatitis B endogenous antigen

HBIgG: Hepatitis B immunoglobulin G

HBsAg: Hepatitis B surface antigen

HCW: Healthcare worker

HIV: Human immunodeficiency virus

NSI: Needle-stick injury

PEP: Post-exposure prophylaxis

UPs: Universal precautions

WHO: World Health Organisation

LIST OF OPERATIONAL DEFINITIONS

Acute hepatitis B: A newly acquired HBV infection which may or may not be symptomatic, symptoms usually appear in 1-4 months. Clinical symptoms and signs can include anorexia, malaise, nausea, vomiting, abdominal pains, and jaundice. Symptoms usually resolve in a week to a few months as the patients are cured but a few of them develop a severe life threatening form of acute hepatitis called fulminant hepatitis.

Antibody to hepatitis B surface antigen (anti-HBs): Their presence indicates protection against HBV. This may be due to a prior HBV infection from which one has recovered, or due to vaccination.

Antibody to hepatitis B core antigen (anti-HBc): The antibodies are of IgM and IgG type of which the IgM type is produced first. Presence of anti-HBc IgM in the first three to six months following infection is considered to be the best serological marker of acute infections. Anti-HBc IgM eventually declines while IgG is on the increase, the presence of high levels of anti-HBc IgM, with the presence of hepatitis B surface antigen (HBsAg) usually indicates an acute infection, while absence of anti-HBc IgM and presence of HBsAg indicates chronic infection.

Attitudes: "The way a person views something or tends to behave towards it, often in an evaluative kind of way" (Collins English Dictionary, 1991). The attitudes of healthcare workers (HCWs) in this study were measured using a 5-point Likert scale, using 9 questions. The scores ranged from +2 (strongly agree) to -2 (strongly disagree) for positive statements; and from +2 (strongly disagree) to -2 (strongly agree) for negative statements. Participants could score a maximum of 18 and a minimum of -18. The total scores for each HCW were further collapsed into categorical data to get negative, neutral and positive attitudes. Participants scoring an overall of -7 to -18 were scored as having negative attitudes; those scoring -6 to 6 as having neutral attitudes; and those scoring 7 to 18 as having positive attitudes.

Blood-borne virus: A virus that can be spread by contact with infected blood for example HIV, HBV, HCV and the viruses that cause viral haemorrhagic fevers.

Chronic HBV infection: Carriage of HBsAg for longer than six months

Hepatitis B (HB): A liver disease caused by the hepatitis B virus (HBV)

Hepatitis B endogenous antigen (HBeAg): An accessory protein produced during active replication of HBV. The presence of HBeAg is associated with increased infectivity of the individual.

Hepatitis B surface antigen (HBsAg): The outer envelope surface protein of the HBV. Testing positive for this antigen indicates that the patient is either newly infected, or is a carrier.

Hepatocellular carcinoma (HCC): This is cancer of the liver and is one of the sequelae of chronic HBV.

HBV carrier: A person with chronic HBV infection. The patient is potentially infectious.

Horizontal transmission: This refers to transmission of the HBV between people in the community other than from a mother to her child during pregnancy and immediately before or after childbirth.

Liver cirrhosis: This is an end stage liver disease characterised by replacement of liver tissue by fibrous scar tissue as well as regenerative nodules, leading to progressive loss of liver function or liver cancer.

Knowledge: In this study knowledge about HBV prevention and control was measured using 14 questions with the most appropriate response for each question based on the current literature. Each correct answer scored 1, and the wrong answer or "I don't know" scored 0, thus the knowledge score was scaled from 0 to 14. The total scores for each HCW were further collapsed into categorical data to get poor, moderate and good knowledge. HCWs scoring a total of 5 and less were taken as having poor knowledge, those scoring 6 to 10 had moderate knowledge and those scoring 11 to 14 had good knowledge regarding HBV prevention and control.

Non-responder: A person who does not produce a protective antibody response to a primary 3-dose vaccine series, with anti-HBs concentrations of <10mIU/ml measured 1 month after the last dose.

Occult HBV: The detection of HBV DNA without HBsAg with or without the presence of HBV antibodies outside the acute phase window period defines occult HBV infection.

Perinatal: Period immediately before or after birth.

Practices: In this study, the practices of re-sheathing of used needles and proper disposal of sharps were scored together and scaled from 0 to 8. HCWs scoring 0 to 2 had poor practices, those scoring 3 to 5 had moderate practices and those scoring 6 to

8 had good practices. The scores of NSIs and blood and body fluids (BBF) exposures were scaled from -2 to 2 and HCWs scoring -2 to -1 had poor practices, those scoring 0 had moderate practices and those scoring 1 to 2 had good practices. The scores of questions on use of protective garments and gloves were scaled from 0 to 4. HCWs scoring 0 had poor practices, those scoring between 0 and 1 had moderate practices and those scoring between 3 and 4 had good practices. Out of the 6 questions, 4 measured the practice of UPs and were scored together to get the UPs practice score. The scores of UPs were scaled from 0 to 12. HCWs scoring 0 to 3 had poor practices, those scoring between 4 to 7 moderate practices and those scoring from 8 to 12 good practices.

A summary practice score was then obtained and was scaled from -4 to 4. HCWs with good practices (good UPs score, no NSI, no blood and body fluid exposure, and vaccinated) were given a score of 1; moderate practices (moderate UPs score, exposed through NSI, BBF and taking PEP) were scored 0 and poor practices (poor UPs score, exposed through NSIs, BBF and not taking PEP and being unvaccinated/can't remember were given a score of -1.

Responder: A person who produces a protective antibody response to a primary 3-dose vaccine series, with anti-HBs concentrations of ≥10mIU/ml measured 1 month after the last dose.

Universal precautions: They are deliberate actions taken in healthcare settings to prevent the transmission of certain pathogens (especially BBV) from patient to patient, from patient to HCW and from HCW to patient.

Vertical transmission: This is also known as mother to child transmission and refers to the transmission of a virus immediately before or after birth during the perinatal period.

ABSTRACT

Introduction: Hepatitis B virus (HBV) is a highly infectious virus responsible for considerable morbidity and mortality world wide. Chronic HBV carriers can transmit HBV parenterally in a hospital setting putting healthcare workers (HCWs) and their patients at risk of infection.

Aim and objectives: This study aimed to investigate knowledge, attitudes and practices towards prevention and control of HBV amongst nurses, doctors and laboratory personnel. Objectives were to determine: (a) the knowledge; (b) the attitudes; (c) the practices of nurses, doctors and laboratory personnel; (d) if there are any associations between (1) knowledge and practice, and (2) attitudes and practice; (e) the predictors of HBV vaccination uptake.

Materials and Methods: This was a cross-sectional descriptive study. Self-administered questionnaires were distributed to doctors, laboratory staff and nurses at Aweil State Hospital.

Results: Two hundred questionnaires were distributed and a total of 117 were returned, giving an overall response rate of 58.5%. More doctors had good knowledge (38.9% [7/18]), followed by 20% (4/20) of laboratory staff and 11.4% (9/79) of nurses. Most staff (100% [20/20] of laboratory staff; 97.5% [77/79] of nurses; 94.4% [17/18] of doctors) had positive attitudes. More laboratory staff (100 [20/20]) displayed good practices, followed by nurses (94.9% [75/79]); and lastly doctors (88.9% [16/18]). There were no significant associations between knowledge or attitudes and practices. Vaccination was inadequate, with 50.9% (59/116) of HCWs having received at least one dose, and of these only 61% (36/59) receiving all 3 doses. Needle stick injuries occurred in 31.6% (37/117), while 33.9% (39/115) reported blood or body fluid splashes. None of the HCWs accessed PEP after exposure. Being a laboratory worker (OR: 148.4) or doctor (OR: 125.7) were the only predictors of vaccination uptake.

Conclusion:

There is need to increase knowledge of HCWs, vaccination availability, vaccination uptake, PEP, and reduce the exposures of HCWs.

CHAPTER ONE

1. INTRODUCTION

1.1. Background to the study: Hepatitis B virus (HBV) is a highly infectious blood-borne virus (BBV) responsible for acute and chronic hepatitis B (HB) infections of the liver resulting in considerable morbidity and mortality in sub- Saharan Africa. Chronic carriage of HBV in sub-Saharan countries ranges from 9-20%, and in the whole of Africa about 50 million are estimated to be lifetime carriers with an estimated 12.5 million expected to die from HBV related liver diseases (Kiire, 1996). The main route of transmission of HBV in this region is unexplained horizontal transmission in childhood, with sexual transmission in adolescents and adults being the next most important route of transmission (Kiire, 1996). However, because HBV is blood borne and healthcare workers (HCWs) handle blood and other body fluids; this puts them at considerable risk of acquiring it if prevention and control measures are not adequate in hospitals (Kiire, 1996).

In a hospital setting transmission of HBV can be from patient to patient, which presents the greatest risk, followed by patient to HCW and lastly HCW to Patient infections (Viral Hepatitis prevention board [VHPB], 2005). It is reported that around 80% of chronic HBV infections are undiagnosed and this means that infected HCWs and patients can unwittingly act as carriers putting others at risk of infection (Paul et al, 1999).

Human immunodeficiency virus (HIV) and HBV share common transmission routes and co-infection in countries highly endemic for both viruses is to be expected (Burnett et al, 2005). In South Africa, Sudan and South Sudan, HIV/HBV co-infection ranges from 4.8% to 17% (Firnhaber and Ive, 2009). HIV related immunosuppression increases the viral replication of HBV and is thought to increase efficiency of transmission of HBV, increase the risk of acute HBV infection progressing to the chronic state, and increase the risk of reactivating latent HBV infections (Firnhaber and Ive, 2009).

There is evidence that HBV is highly endemic in some parts of South Sudan, and Botswana . A mean prevalence of 13.6% of HB surface antigen (HBsAg) was found in Maun, and 47% of patients with clinical hepatitis who were tested for HBsAg, were found to be positive (Byskove et al, 1989). Also, Botswana has one of the highest HIV prevalence rates (24% in the 15-49 year olds) (Plank et al, 2010), and it has been found that 46% of the patients admitted into Botswana hospitals are HIV positive (Mwaniki, 2007).

A study conducted at Botswana Hospital found that 10.6% of HIV positive patients are HBsAg positive (Wester et al, 2006). This could however be the tip of the iceberg, since HIV positivity in hospitalised patients is associated with occult (hidden) HB infection (Lukhwareni et al, 2009). The high rate of HIV positive patients treated at the hospital is likely to result in higher than expected HBV carriers who are given care at Aweil State Hospital resulting in higher risk of exposure to HBV for HCWs.

1.2. Problem statement:

A South African study at a Johannesburg Hospital found that the majority of HCWs were not immune to HBV, and had not received any vaccination to prevent HBV infection (Vardas et al, 2002). In South Sudan there is no legislation to enforce provision of free vaccination by employers against HBV, so it is up to the individual or the employer to get vaccinated. There is thus a possibility that the majority of HCWs in South Sudan are not immune to HBV. A study on knowledge, attitudes and practices on HBV prevention and control has not been done in South Sudan, and is urgently needed to assess how well prepared HCWs are in the prevention and control of HBV in South Sudan.

1.3. Purpose of the study:

1.3.1. Research Questions: The purpose of this study was to answer the following research questions:

a. What is the knowledge of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control?

b. What are the attitudes of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control?

c. What are the practices of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control?

d. Is there any association between (1) knowledge and practice, and (2) attitudes and practice, among HCWs at Aweil State Hospital towards HBV prevention and control?

e) What are the predictors of HBV vaccination uptake at Aweil State Hospital?

1.3.2. Aim: This study aimed to investigate knowledge, attitudes and practices towards prevention and control of HBV amongst nurses, doctors and laboratory personnel at Aweil State Hospital in South Sudan.

1.3.3. Research Objectives: Specific objectives of this study included:

a. To determine the knowledge of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control

b. To determine the attitudes of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control

c. To determine the practices of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control

d. To determine if there are any associations between (1) knowledge and practice; and (2) attitudes and practice, among HCWs at Aweil State Hospital towards HBV prevention and control

e) To determine the predictors of HBV vaccination uptake at Aweil State Hospital

1.4. Justification of the study

HBV presents an occupational risk of infection for all HCWs the world over. HBV vaccine and safe working practices present an opportunity to prevent infection of HCWs at risk; however infections are still occurring in healthcare settings all around the world. A study on knowledge, attitudes and practices on HBV prevention and

control has not been done in South Sudan, and is urgently needed to assess how well prepared HCWs are in the prevention and control of HBV in South Sudan. A South African study at a Johannesburg Hospital found that the majority of HCWs were not immune to HBV, and most had not received any vaccination to prevent HB infection (Vardas et al, 2002). As is the case in South Africa, in South Sudan there is no legislation to enforce provision of free vaccination by employers against HBV, so it is up to the individual or the employer to get vaccinated. There is thus a possibility that the majority of HCWs in South Sudan are not immune to HBV. The fact that exposures may result in asymptomatic infections means that the extent of the problem may be underestimated (Fitzsimons et al, 2008).

The study findings may contribute to the review of the education curriculum of HCWs trained locally or to ongoing work place training on identified areas where knowledge is inadequate. Also, the study findings may lead to a review of work place related occupational health and safety regulations and policy such as introduction of a compulsory provision for vaccination by the employer for HCWs identified to be at risk at the employers cost, which is currently non-existent. Finally, the study may indirectly lead to safer work place practices by introduction of safer working methods where they are non-existent and monitoring of HCWs compliance to safer practices.

CHAPTER TWO

2. LITERATURE REVIEW

In this chapter a review of the literature relating to HBV and its prevention and control is presented. Firstly the public health significance of the problem is presented by a review of literature on the epidemiology of HBV, this is followed by a review of literature on aspects of HBV prevention and control, then finally a review of literature on knowledge, attitudes and practices of HCWs regarding prevention and control of HBV in other parts of the world, sub-Saharan Africa, as well as South Sudan where available.

2.1. Epidemiology of HBV

2.1.1. The causative agent

HBV is one of a group of viruses responsible for hepatitis (Samuel et al, 2009). Hepatitis is described as an inflammation of the liver and may occur following infection by HBV (Samuel et al, 2009). Infection by HBV can result in an asymptomatic infection, acute or chronic infection, and in the case of chronic infection, liver cirrhosis and hepatocellular carcinoma (HCC) (Samuel et al, 2009).

2.1.1.1. Viral characteristics

HBV is a double stranded enveloped deoxyribonucleic acid (DNA) virus belonging to the family *Hepadnaviridae* (Robotin and Mathews, 2008). The viral DNA is found inside the viral core structure together with the viral reverse transcriptase, which is an enzyme responsible for making copies of the virus upon infection (Robotin and Mathews, 2008). The viral core is surrounded by an envelope from which HBsAg originates (Robotin and Mathews, 2008).

2.1.1.2. Serological markers for diagnosing HBV

The diagnosis of HBV infection is generally made using results of serological tests, although clinical chemistry, analysis of liver enzymes and histological techniques is also useful (Robotin and Mathews, 2008). Upon HBV infection, HBV antigens and antibodies otherwise known as HBV markers are produced by the patient and can be found in patient serum (Beltrami et al, 2000). These markers of HBV infection can be detected using serological techniques; this method of diagnosis involves antibody and antigen reactions from patient serum under laboratory conditions (Beltrami et al,

2000). Serological testing using these markers can determine whether a patient is susceptible to
Infection, immune as a result of resolved infection or vaccination, or acutely infected or chronically infected (Robotin and Mathews, 2008).

Upon infection the HBsAg is shed into the patient's blood and is the first serological marker of infection to appear (Firnhaber and Ive, 2009). It is detectable between 4 to 10 weeks in an acute infection and coincides with onset of clinical symptoms (Robotin and Mathews, 2008). A chronic infection is characterised by persistent presence of HBsAg for more than 6 months (Beltrami et al, 2000). HBsAg is the test commonly used to detect acute infection and chronic carriers. A positive HBsAg test result indicates that an individual is infectious, but on its own cannot indicate whether the infection is acute or chronic (Robotin and Mathews, 2008).

Antibodies to the surface antigen (anti-HBs) indicate protection against HBV, either following resolution of infection, or successful vaccination (Beltrami et al, 2000). When anti-HBs is present alone in the blood it is associated with immunity following vaccination. When anti-HBs are present together with antibodies to the core antigen (anti-HBc), this is associated with immunity following HBV infection (Firnhaber and Ive, 2009). An anti-HBs titre of 10mlIU/ml or above is considered essential for protection against HBV infection (Beltrami et al, 2000).

In the first three to six months following infection, anti-HBc of immunoglobulin type M (IgM) is found in high concentrations and is considered to be the best serological marker of acute infections. Anti-HBc IgM eventually declines while immunoglobulin type G (IgG) is on the increase (Beltrami et al, 2000). The presence of high levels of anti-HBc IgM, with the presence of HBsAg usually indicates an acute infection, while absence of anti-HBc IgM and presence of HBsAg indicates chronic infection. Low levels of anti-HBc IgM may indicate reactivation of chronic HBV (Robotin and Mathews, 2008). Anti-HBc IgG is present throughout life once exposure occurs (Robotin and Mathews, 2008). Both anti-HBc IgM and IgG do not protect against HBV (Robotin and Mathews, 2008). When the acute infection resolves anti-HBc IgG persists, while HBsAg and anti-HBc IgM become undetectable (Beltrami et al, 2000).

HB endogenous antigen (HBeAg) is an accessory protein produced during active replication of HBV. The presence of HBeAg is associated with increased infectivity of the individual (Robotin and Mathews, 2008). The production of antibodies against HBeAg (anti-HBe) and loss of production of HBeAg (which is called HBeAg seroconversion) is associated with lower HBV DNA replication. Although anti-HBe is not a protective antibody, its presence is a positive finding since it indicates loss of HBV replication and this seroconversion is used as the end point of treatment of HBeAg-positive people (Firnhaber and Ive, 2009).

2.1.2. Transmission

HBV is transmitted by contact with infected blood or body fluids such as semen and the human being is the only known natural host of HBV (Hou et al, 2005). HBV is highly infectious and transmission from one infected individual to the next one is relatively easy if appropriate precautions are not taken to prevent contact with blood or body fluids. The transmission of HBV can occur in the general population and in a healthcare setting. Globally, there are several population groups at increased risk of transmission of HBV, and these
include a) parenteral drug users, b) heterosexual men and women and homosexual men with multiple sexual partners, c) household contacts and sexual partners of HBV carriers, d) infants born to HBV- infected mothers, e) patients and staff in custodial institutions for the developmentally disabled, f) recipients of certain plasma-derived products, g) haemodialysis patients, h) HCWs who have frequent contact with blood, i) persons born in areas of high HBV endemicity and their children (Centre for Disease Control and Prevention [CDC], 1991).

Transmission can be classified as vertical if it is between an infected mother and her baby, perinatal if it is immediately before and after birth, horizontal if it is through close person to person contact, parenteral when it is via injection or other invasive medical procedures or injuries, and sexual when it is via sexual activity (Robotin and Mathews, 2008).

The main route of transmission of HBV in the general population of sub-Saharan Africa is unexplained horizontal transmission in childhood, with sexual transmission

in adolescents and adults being the next most important route of transmission (Kiire, 1996). Chronic carriage of HBV seen in Black adults in sub-Saharan Africa is primarily from early childhood (Mphahlele et al, 2002). The precise mechanism of transmission in childhood is unclear but it has been suggested that seeping wounds may play a part (Mphahlele et al, 2002). Perinatal transmission from HBeAg positive mothers to babies plays a lesser role because HBeAg is not common in Black African women of child-bearing age (Mphahlele et al, 2002).

In a hospital setting there are three main categories of HBV transmission. Patient to patient transmission presents the greatest risk, followed by patient to HCW and lastly HCW to patient infections is considered to be the least risky (Viral Hepatitis prevention board [VHPB], 2005). Unsafe injections such as contaminated multiple use anaesthetic vials and finger stick devices for measuring blood glucose have been singled out as being responsible for most patient to patient infection (FitzSimons et al, 2008). Unsafe therapeutic injections are thought to contribute to more than 21 million cases of HBV infections among patients annually world wide (FitzSimons et al, 2008). A community based study in Zambia found that nine out of ten children who were found to be HBsAg positive had a history of injections (Mphahlele et al, 2002).

Patient to HCW transmission follows after patient to patient transmission in terms of risk. With an infected source patient the risk of infection is around 30% for the HCWs (Mphahlele et al, 2002). The risk of transmission of HBV from patient to HCW depends on other factors such as the HBeAg status of the patient. The risk of HBV infection for a HCW after a needle stick injury (NSI) and in the absence of vaccination or post-exposure prophylaxis (PEP) is 37-62% if the source patient is HBeAg positive and 23-37% if the patient is HBeAg negative (FitzSimons et al, 2008). A high viral load of the HBV in the source patient, depth of injury and amount of body fluid exchanged have been found to influence the risk of infection (FitzSimons et al, 2008). It is generally accepted that a high viral load, a deep injury and a high amount of body fluid exchanged causes a greater risk of infection with HBV (FitzSimons et al, 2008). The routes of transmission from patient to HCW are most commonly needle stick or sharps injuries, followed by mucocutaneous exposure (FitzSimons et al, 2008). NSIs account for most (80%) of percutaneous exposure among HCWs (Talaat et al, 2003). Other sources of exposure include other sharp

objects such as broken glass, scalpels, and mucosal exposure after splashing of blood and other body fluids (FitzSimons et al, 2008). As a way of prevention and control, despite their status all patients should be regarded as potential sources of HBV (Moghimi et al, 2008). A few cases of HBV transmission from HCWs to patients have been documented; in the UK only 10 cases were publicised in the last decade (FitzSimons et al, 2008).

The factors which increase the risk of HBV infection for both HCWs and patients include the highly infectious nature of HBV, with HBV being 10 times more infectious than hepatitis C virus (HCV) (Beltrami et al, 2000), and 100 times more infectious than HIV (De Villiers et al, 2007). Also, HBV is able to exist in the external environment for months under appropriate conditions and this provides an opportunity for it to be transferred to the next host (De Villiers et al, 2007). For sub-Saharan HCWs the risk of HBV transmission is exacerbated by the high prevalence of HBV in the hospital population being served, and in some settings lack of availability of PEP after exposure (Moloughney, 2001).

Differences have been found in the risk of infection among different categories of HCWs, with those whose work involves high risk procedures such as surgeons being at higher risk (Moghimi et al, 2008). A lack of knowledge, negative attitudes, and poor compliance to preventative practices regarding prevention and control of HBV in the healthcare setting have been documented as contributing to the transmission of HBV (Moghimi et al, 2008).

2.1.3. Prevalence of HBV

2.1.3.1. Global prevalence

At the beginning of the 21st century it was estimated that HBV contributed to about one million HBV related deaths per year; this is because globally, of the more than two billion people infected in the past, around 387 million would have developed chronic hepatitis (Mphahlele et al, 2002). Globally there are approximately 10 million new HBV carriers every year (Mphahlele et al, 2002).

The prevalence of chronic HBV (defined as being HBsAg positive for more than 6 months) is markedly different geographically throughout the world and ranges from

0.2% to 20% (Hou et al, 2005). Chronic HBV infection can be used to divide the world into three regions according to the degree of endemicity (WHO, 2002). Areas of high endemicity can be classified as those where prevalence of chronic HB in the general population is ≥8%. This includes China, South East Asia, sub-Saharan Africa and the Middle East, most Pacific Islands, some of the Caribbean Islands and the Amazon Basin (WHO, 2002). Areas of intermediate endemicity are those where chronic HB in the general population is 2-7%; this includes Central and South America, the Mediterranean, India, Eastern and Southern Europe, the Soviet Union and Japan (WHO, 2002). Areas of low endemicity are those where chronic HB is <2%, these areas include the United States of America (USA), Canada, Western Europe and Australia (WHO, 2002).

2.1.3.2. Prevalence in sub-Saharan Africa

HBV chronic infections are endemic in the general population of sub-Saharan Africa (Mphahlele et al, 2002). Around 98% of the approximately 470 million population of sub-Saharan Africa are expected to be infected at some point in their lives (Kew, 1996). Chronic carriage of HBV in sub-Saharan countries ranges from 9-20%, and in the whole of sub-Saharan Africa about 50 million are estimated to be lifetime carriers with an estimated 12.5 million expected to die from HBV related liver diseases (Kiire, 1996). HBV induced HCC is responsible for 200 000 deaths in the black population of sub-Saharan Africa every year (Mphahlele et al, 2002).

2.1.3.3. Prevalence in southern African countries

South Africa, a country neighbouring Botswana, has areas of both intermediate and high endemicity (Mphahlele et al, 2002). HBV in South Africa is generally more prevalent in the rural areas compared to the urban areas (Mphahlele et al, 2002). A prevalence of 13.7-15.4% HBsAg carriers was also reported in Zimbabwe, another of Botswana's neighbours (Mphahlele et al, 2002). There is evidence that HBV is highly endemic in some parts of Botswana. A mean prevalence of 13.6% of HBsAg was found in Maun, and 47% of patients with clinical hepatitis who were tested for HBsAg were found to be positive (Byskove et al, 1989).

2.1.3.4. Prevalence in HCWs

A review of studies on HBV done in the USA among HCWs found high prevalence rates of 13 to 18% in some categories of HCWs such as surgeons, and up to 27% prevalence rates have been noted among dentists and oral surgeons (Beltrami et al, 2000). Some studies have found that the prevalence of HBV infection is related directly to number of years worked as a HCW and to age of the healthcare worker, meaning the older the HCW and the more the number of years worked, the greater the chance of chronic infection (Beltrami et al, 2000).

The prevalence of HBV markers in Western Europe among nurses, dentists, midwives and physicians was estimated at 10% for northern countries, 20% for middle countries, and 40% for southern Countries (Bonanni and Bonaccorsi, 2001). In Western Europe, it was estimated that 16500 new HBV
infections in HCWs occur each year, with 990 becoming chronic infections and 200 expected to die from liver cirrhosis and 40 from primary HCC (assuming HBV vaccine coverage of 40% among traditional HCWs and coverage of 25% among allied HCWs) (Bonanni and Bonaccorsi, 2001).

In sub-Saharan Africa, a study done in Uganda on the sero-prevalence and risk factors for HBV infection among HCWs found a sero-prevalence of HBV markers of 8.1% indicating current infection, and 48.1% had evidence of previous exposure to HBV (Ziraba et al, 2010).

2.2. Prevention and control of HBV in the HealthCare Setting

The prevention and control of HBV in a hospital setting involves key aspects such as screening of blood and blood products, injection safety, vaccination, PEP, use of universal precautions (UPs) and compliance of HCWs to the above mentioned. All of these components are important in their own right since it is often not practical to achieve 100% immunisation in the whole population. This is especially so in settings where HBV is highly prevalent, and there are resource and compliance limitations to infection control.

2.2.1. Screening of blood and blood products

Screening of blood and blood products contributes to the reduction of transmission of HBV for patients. For example, in the USA the routine screening of donor blood for

HBsAg reduced post transfusion HB by a third (Yap, 1990). Those who regularly use such products such as haemophiliacs, who use factor VIII, are also encouraged to be vaccinated to prevent HBV infection, as an additional safety measure since the current testing for HBV does not guarantee 100% safety of these products (Yap, 1990). The safety of blood and blood products largely depends on the quality of laboratory testing. This means quality of testing in terms of the policies and protocols, markers of HBV screened for, and training and qualifications of personnel have to be of the highest standard.

The World Health Organisation (WHO) recommends that blood and blood products should be screened for at least the HIV, HBV, HCV and syphilis as a minimum requirement (Klein et al, 2007). World wide 148 countries provided WHO with their data for screening blood, and 41 of these indicated that they couldn't screen all the donated blood for one or more of the recommended pathogens (Klein et al, 2007). The report indicated that out of the 40 countries in sub-Saharan Africa, 28 had not yet implemented national quality systems that need to be in place for effective screening of blood and blood products (Klein et al, 2007). It is important to have a fully implemented national policy of screening all blood donations for HBV. Of the literature consulted only Kenya, South Africa, Tanzania, Zambia and Zimbabwe are reported to have such policies (Mphahlele et al, 2002).

It is estimated that 3-22% of blood donors in sub- Saharan Africa are chronic carriers of HBV therefore screening of blood and blood products is critical to prevent infection of the recipients of these products (Allain et al, 2003). The WHO estimates that not more than 50% of blood donated in sub- Saharan Africa is screened for HBsAg (Allain et al, 2003). This is partly because screening is not perceived to be of primary importance or cost effective in some African countries since 50% of blood donors and recipients have had natural exposure to HBV, thus most donors are thought to not be infectious, and most recipients are thought to not be susceptible (Allain et al, 2003). Lack of funds is another contributory factor (Allain et al, 2003). According to World Health Organization (W.H.O), lack of effective screening results in 16 million new cases of HBV annually in the whole world (Klein et al, 2007). In a recent study to assess the risk of transfusion-transmitted infections in sub-Saharan Africa it was found that even if the transfusion requirements recommended by WHO

were met, transfusions alone would be responsible for 28 595 HBV infections annually in sub-Saharan Africa (Jayaraman et al, 2010).

Some African countries including South Sudan screen for HBV using HBsAg only. Detection of anti-HBc is considered by some of these countries to be of limited value since HBsAg appears first and disappears in most non- infectious cases. So for them it appears to serve a diagnostic purpose only, with little regard for the prognosis. However during resolution of infection and occult HB, HBsAg may decline to undetectable levels but the donor in both instances may be potentially infectious (WHO, 2010). Occult HBV infection is defined as the detection of HBV DNA without HBsAg, with or without the presence of HBV antibodies outside the acute phase window period (Allain et al, 2004). It has also been demonstrated that occult HB donors with anti-HBs or anti-HBc are infectious in immuno-compromised organ or bone marrow transplant patients (Allain et al, 2004). It is of value to test for anti-HBc in such situations, but it would be also necessary to distinguish between non-infectious individuals who have resolved their infections naturally and those who are potentially infectious. Because of the high cost of testing for circulating HBV DNA, it is recommended to test for a substantial amount of anti-HBs since these antibodies confer immunity to the individual. A minimum of 100mIU/ml is considered essential to guarantee safety of blood and blood products (WHO, 2010). Ideally African countries should be testing for HBsAg, anti-HBc and anti-HBs to reduce the cases of post transfusion HB.

The methods used to test for HB markers have different sensitivities and specificities and this determines the safety of blood and blood products.
The European pharmaceutical industry recommends that when manufacturing blood products the first homogeneous pool of plasma be tested for HBsAg using methods of appropriate sensitivity and specificity. A recent study evaluated these sensitivities and specificities and found that while some kits have high sensitivity when detecting HBsAg in plasma, if the plasma is from individuals with acute HBV or poor humoral immunity, serological testing may fail to detect potentially infectious plasma (Rabenau et al, 1996).

2.2.2. Injection safety

An injection by definition is the introduction of curative or prophylactic medicine into the body by way of piecing using a needle (Kermode, 2004). Injections are amongst the most common medical procedures in the healthcare setting (Kermode, 2004). An estimated 12 billion injections are given annually, 5% for immunisation and 95% for curative purposes (Kermode, 2004). A safe injection in a hospital setting can be described as an injection which does not harm the patient or HCW, or result in waste that puts other people such as cleaners at risk (Simonsen et al, 1999). Safe injection practice is part of UPs. Because of the high number of injections especially in areas of the world such as Asia and sub-Saharan Africa which also have the highest prevalence of BBVs it is very important that injections are given safely (Kane et al, 1999).

2.2.2.1. Prevalence of unsafe injections in low income countries

Unsafe injections are reportedly common in low income countries (classified by the World Bank on the basis of their 1999 gross domestic product per capita of US $755 or less) (Kermode, 2004; VHPB, 2005). Though cases of poor injection safety also occur in high income countries the numbers are much lower (Kermode, 2004). Data obtained using 19 countries which represented countries from the low income countries were used to come up with prevalence estimates of unsafe injections in low income countries. In fourteen out of these 19 countries at least 50% of the injections were considered not to be safe injections (Simonsen et al, 1999). For one country representing sub-Saharan Africa in the analysis, the data indicated that childhood immunisations were safer than curative injections, however other studies have indicated that for sub-Saharan Africa, Asia and the Middle East 31% to >90% of all childhood immunisations are unsafe (Simonsen et al, 1999).

2.2.2.2. Burden of disease caused by unsafe injections

It is estimated that unsafe injections carry a global financial cost of US$535 million per year and are associated with 1.3 million deaths and 26 million years of life lost (Kermode, 2004). It is reported that unsafe injections contribute to 30% of all HBV infections, 28% of HCC and 24% of liver cirrhosis world wide. In low income countries unsafe injections contribute to 8-16 million cases of HBV (Kermode, 2004).

2.2.2.3. Factors responsible for poor injection safety

Unsafe injections in low income countries are caused by a combination of socio-cultural, economic and structural factors.

Unnecessary injections in low income countries put the HCWs and their patients at unnecessary risk of HBV infection. In eight low income countries studied it was estimated that 25-96% of out patient visits resulted in at least one injection, and in five out of these 8 low income countries, 70-90% of the injections were deemed unnecessary (Kermode, 2004). Unnecessary or over use of injections is influenced by popular socio-cultural perceptions of injections and some economic factors. Some patients believe that if injections are not provided during consultation the treatment is not effective and will seek treatment elsewhere (Kermode, 2004). HCWs also have their perceived professional integrity to protect in the society and succumb to demands for injections which they know to be unnecessary (Kermode, 2004). Sometimes HCWs are influenced by financial incentives as additional fees can be charged for the injection (Kermode, 2004).

In low income countries financial resources affects the capacity to purchase and maintain an adequate supply of the appropriate injecting equipment and may encourage reuse of syringes and needles and improper disposal (Kermode, 2004). Limited resources in low income countries hamper efforts to put in place supportive structures such as infection control committees, quality assurance systems, occupational health and safety standards, and systems to implement, monitor and evaluate changes in practice are limited. A lack of supporting structures contributes to poor reporting and management of NSIs. Limited resources also mean opportunities for HCWs to learn about injection safety are limited (Kermode, 2004). These results in poor knowledge, negative attitudes and practices such as needle and syringe reuse, recapping and bending of needles after use, and unsafe disposal contributing to unsafe injections at the work place (Kermode, 2004). NSIs injuries are responsible for 61.5-70% of all accidental exposure cases in the hospital setting (De Villiers et al, 2007).

2.2.2.4. Safer injections

Attempts to make injections safer over the past number of decades include replacement of re-usable glass syringes during the 1950s and 1960s, with disposable sterile plastic syringes and disposable needles which are supposed to be disposed of

after each injection (Kermode, 2004). In low income countries disposable syringes are being reused, though there is scientific evidence that they can be contaminated through negative pressure created when the needle is removed leading to cross contamination and infection of patients (WHO, 2002). Recently the introduction of auto disable syringes aims to totally eliminate the risk of patient to patient infection because auto disable needles are rendered automatically unusable after delivering a single injection (WHO, 2002).

2.2.3. Vaccination

HBV is considered one of the most important occupational risks for HCWs and as such it is recommended that HCWs who are at risk due to frequent handling of blood and other body fluids should be vaccinated as a preventative measure (CDC, 1990). It is advisable that HCWs not vaccinated during childhood national immunisation programs are vaccinated during their professional training or early in their careers, so that they are protected before being exposed to risk when they start employment (Puro et al, 2005).

The HB vaccine has been available since the 1980s. It provides protection against HBV, both pre exposure and post exposure, post exposure meaning that it can be used as part of PEP. In pre exposure vaccination, three intramuscular doses of HB vaccine are given resulting in production of protective antibodies in >90% of healthy recipients (Varghese et al, 2003). Once vaccinated, it is recommended that HCWs should be tested for anti-HBs, to check if they have responded to the vaccine (Puro et al, 2005). Testing for anti-HBs should be done 1 to 2 months after completion of the three- dose series (Puro et al, 2005). An adequate antibody response is described as a level $\geq$10mIU/ml of anti-HBs (Puro et al, 2005). Testing of all HCWs for anti-HBs also allows for a precise selection of a PEP regimen in the event that there is an occupational exposure (Puro et al, 2005). After completion of the 3 dose series of vaccinations followed by testing that shows that a sufficient response has been mounted, the use of booster doses of HB vaccine is now not considered necessary even if anti-HBs levels become low or undetectable as memory immune cells have been demonstrated to be still capable of initiating an adequate immune response (Puro et al, 2005).

About 5-10% of the adult population will fail to respond to the standard vaccine and risk factors for non-response have been identified as male sex, old age, cigarette smoking, obesity, immunodeficiency, renal failure, intragluteal vaccine administration (buttocks), chronic diseases, celiac disease and certain human leukocyte antigen haplotypes (Puro et al, 2005). For non-responders who are HBsAg negative and anti-HBc negative, a fourth dose should be given and they should be evaluated 1-2 months later for antibodies; if still negative, a fifth and sixth dose should be given and a further evaluation 1-2 months later (Puro et al, 2005). About 40-70% of non-responders may seroconvert after administering up to three more doses of vaccine (Bonanni et al, 2001). HCWs who fail to respond completely should be alerted of their risk, and precautions to be taken including the need for HBIgG upon exposure (Bonanni et al, 2001).

Universal vaccination programs should be a priority for governments, since they are the most effective at reducing the prevalence of HBV infection. For HCWs, a high prevalence of HBV in the general population seeking healthcare at various stages throughout their lives is one of the major risk factors for infection. Universal vaccination would prevent childhood and sexually transmitted infections, thereby bringing down the HBV prevalence in the general population. Also, donor blood and blood products have been demonstrated to be less than 100% free of HBV, and universal vaccination programmes would reduce the prevalence of HBV in blood donors, making these products safer to use, which is of particular importance for those who use these products continuously, such as haemophiliacs.

In the USA the number of new HBV infections resulting from transmission from patients to HCWs fell from 10 000 in 1983 to around 400 in 2002, after the introduction of universal immunisation programmes against HBV, optimal immunisation coverage in HCWS, together with PEP and observation of UPs (FitzSimons et al, 2008). By 2000/2001 Botswana alongside Gambia, Mauritius, South Africa, Swaziland and Zimbabwe had incorporated HB vaccination into the national immunisation programme (Mphahlele et al, 2002). Most of the countries in sub-Saharan Africa started their immunisation programmes late and as such the effect in the fall of HBV prevalence is yet to be experienced and as such other methods of prevention and control still remain pivotal (Mphahlele et al, 2002).

2.2.4. Post Exposure Protocols (PEP)

In the healthcare setting exposures to HBV do occur regardless of the various preventive measures available and PEP offers an opportunity to prevent infection in unprotected HCWs. HCWs should have knowledge regarding the post exposure protocol. It is the responsibility of the employer to provide both the HB vaccine (for both pre and post exposure prevention) and HBIgG, as well as a protocol for prompt reporting, evaluation, and follow up of occupational exposures that place workers at risk of infection (Puro et al, 2005). Upon exposure of the HCW, HBV PEP in brief is based mainly on active immunisation with HB vaccine and passive immunisation with HBIgG (Puro et al, 2005). However, firstly the exposure site must be treated immediately, which generally involves reducing the dosage of the exposure through bleeding and washing with clean water or saline and soap depending on the site (Puro et al, 2005). After this follows risk assessment through determining the immune status of the HCW, identifying the source patient and informing them of the incident and seeking consent for testing for HBV (Puro et al, 2005). Post exposure management of an occupational exposure to HBV differs according to the susceptibility and sero status of the exposed HCW, as well as the HBV status of the source. In cases where HCWs are known to be susceptible and the HBV status of the source is positive or unknown, PEP with HBV vaccine and HBIgG has to be started as soon as possible, with and the first dose of vaccine being administered preferably within 24 hours and no later than one week. The value of PEP beyond 7 days is not clear, and the longer the gap between exposure and start of PEP, the higher the risk of infection. Also, the next 2 doses of vaccine must be administered according to the schedule of the vaccine being used (Puro et al, 2005). The chance of seroconversion can be reduced by 90% with this PEP (Puro et al, 2005).

2.2.5. **Universal Precautions (Ups) in the HealthCare Setting.**

Universal Precautions are a set of guidelines developed by the Centre for Disease Control (CDC) in 1987 to help prevent infections in HCWs and patients in the hospital setting (Gunson et al, 2003). These guidelines highlight that blood and body fluids (BBF) are the most important sources of HBV, HIV, HCV and other blood

borne pathogens, and infection control should be focussed on the prevention of exposures to blood and other body fluids (Beltrami et al, 2000). These precautions emphasise that preventing exposure to blood and other body fluids is as important as prevention through vaccination, since there are no vaccines for HIV, HCV, and other blood borne pathogens (Sandoh et al, 2006).

Identification of patients infected with BBVs cannot be reliably made through taking medical history and physical examination of the patient, and as such UPs are recommended to be used for all patients (Sandoh et al, 2006). Thus the core premise of UPs is that all patients should be treated as potentially infectious regardless of their status, therefore all blood and body fluids should be regarded as infectious. All the other elements of UPs arise from this core premise. Hands must always be disinfected after contact with a patient, barrier precautions such as gloves must be used where possible, and the HCW should avoid recapping of needles and should dispose of sharps safely (Gunson et al, 2003). Compliance with UPs also means using personal protective equipment such as fluid resistant gowns, and face masks, goggles, and double gloves to reduce exposure in exposure-prone procedures such as surgery, and covered shoes in the hospital working environment (Phillips et al, 2007).

The practice of UPs is poor in the developing world, which is supported by the fact that the developing world records the highest number of NSIs, some of which could have been prevented though UPs (Sandoh et al, 2006). The WHO estimates that 40% of cases of HBV infections amongst HCWs are a result of NSIs (Sandoh et al, 2006). Possible reasons for failure to comply with UPs may be lack of an enabling environment, such as sharps containers or personal protective equipment in the resource poor developing world. Another reason may be lack of knowledge or a lack of continuous work place education (Kermonde, 2004).

2.3. Studies on the prevention and control of HBV in the healthcare setting

For the effective prevention and control of HBV in the healthcare setting it is very important that HCWs have good knowledge regarding the risk of contracting HBV. They are supposed to know about the availability and usefulness of the HBV vaccine, PEP and UPs. Most importantly they should put into practice their knowledge and adhere to safe practices such as pre-exposure vaccination, UPs including safe

injection practices, and PEP if they happen to be accidentally exposed. Literature on HBV knowledge, attitudes and practices was reviewed around the globe, with very little information from sub-Saharan Africa and will be presented in this section.

2.3.1. Knowledge about the prevention and control of HBV

2.3.1.1. Knowledge about the risk of contracting HBV

Several studies from around the globe have found that knowledge about the risk of contracting HBV is generally low amongst HCWs, and it also differs according to their different jobs (Moghimi et al, 2008; Stein et al, 2003; Ibekwe and Ibeziako, 2006; Jeffe et al, 1998). For example, in a study on Iranian surgeons, it was found that most (77.9%) of them underestimated the risk of seroconversion after exposure from a patient infected with HBV (Moghimi et al, 2008). Similarly, a study conducted in Birmingham in the United Kingdom (UK) found that the overall knowledge of risk of transmission of HBV from HBeAg positive patients to a non-immune HCW for both doctors and nurses was low, 50.3% of the nurses had good knowledge compared to only 32% of the doctors who had good knowledge concerning the risk of transmission of HBV from HBeAg positive patients to a non-immune HCW (Stein et al, 2003). These findings are supported by a Nigerian study which found that only 54% of the HCWs knew that their job exposed them to an increased risk of contracting HBV (Ibekwe and Ibeziako, 2006). While clinical experience would be expected to increase knowledge about risk, a USA study found that more preclinical students than clinical students knew that non-vaccinated HCWs are more at risk of HBV infection from needle stick injuries with $P<0.001$ (Jeffe et al, 1998). A possible explanation for this anomaly could be that knowledge about risk was still fresh in the minds of the pre-clinical students, whereas their older colleagues may already have forgotten what they had learned during their pre-clinical years.

2.3.1.2. Knowledge about the vaccine for HBV

Knowledge about the existence of a vaccine to prevent HBV has been found to be high amongst HCWs from around the globe. For example, this was known by 100% of Saudi Arabian dental workers (Paul et al, 1999); 98% of Moroccan Laboratory technicians, nurses, midwives, physicians, surgeons and anaesthetists (Djeriri et al, 2008); 85.1% of Pakistani medical students (Khan et al, 2010); 83.7% of dental and 95.4% of medical students in India (Tibdewal et al, 2009); and 77.2% of Nigerian

nurses, physicians, laboratory workers, pharmacists and other cadres (Samuel et al, 2009). However, there is also an indication that HCWs may not know other details such as efficacy and duration of protection (Paul et al, 1999; El-Awaday, 1998). For example, out of 96 Saudi Arabian dental workers who were vaccinated 54 had their antibody titre checked and almost half (48.2%) of them didn't know or didn't bother to check if they had sero-converted (Paul et al, 1999). These findings are supported by findings from an Egyptian study which revealed that 38% of junior doctors and nurses didn't know the effectiveness of the vaccine and 47% were not sure about the duration of protection against HBV (El-Awady, 1998).

2.3.1.3. Knowledge about PEP for HBV

Several studies reviewed from around the globe have found knowledge about PEP to vary, with most HCWs knowing about PEP and most HCW not knowing about PEP in different settings. For example, most didn't know about PEP as only 41.1% of Ethiopian HCWs knew that they have to wash their skin immediately; and 51.5% knew that they have to flush their eyes immediately with clean water or saline, when there is contact with blood or body fluids (Gessessew and Kahsu, 2009). Also, 76.3% of Iranian medical students did not have any knowledge of PEP for HBV (Khan et al, 2010). This stands in contrast with a UK study where 87% of UK doctors and 84% of UK midwives knew that following exposure, they have to check their ant-HBs and they could be vaccinated or given HBIgG. Also, 74% of the doctors and 58% of the midwives knew that testing the source patient of the contamination incident for HBV and HBC was necessary and 62% of the doctors and 60% of the midwives knew that NSIs and other contamination incidents were documented for medico-legal reasons and for the purposes of compensation (Burke and Madan, 1997).

2.3.1.4. Knowledge about UPs to prevent exposure to HBV

Several studies reviewed from around the globe have found knowledge about UPs to vary, with most HCWs knowing about UPs and most HCW not knowing about UPs in different settings. For example, most (97%) Nigerian doctors and 92% of Nigerian nurses (Adinma et al, 2009); 90% of Iranian ancillary staff, nurses, operating room staff, laboratory technicians and medical students (Motamed et al, 2006)); 81% of Indian doctors, nurses, laboratory technologists, O.T assistants and supportive staff (Shah et al, 2010); nearly 100% of residents and medical students in an America study

(Helfgot et al, 1998); 90% nurses, 88% doctors and 70% medical technologists in a Jamaican study (Vaz et al, 2010); 61% of Saudi Arabian nurses and paramedic staff (Alam, 2002); and 66% of Nepalese nurses and paramedic staff (Gurubacharya et al, 2003) had knowledge about UPs. In contrast, only 34.2% of Nigerian nurses had knowledge of UPs (Ofili et al, 2003) and 50% of nurses and paramedic staff in Saudi Arabia had adequate knowledge of new needle devises and safety features (Alam, 2002)

2.3.2. Attitudes towards the prevention and control of HBV

2.3.2.1. Attitudes towards the risk of contracting HBV

Several studies reviewed from around the globe have found both negative and positive attitudes among HCWs towards the risk of contracting HBV (De Villiers et al, 2007; Azondo et al, 2010; Utomi, 2005; Leliopoulou et al, 1999; Tibdewal et al, 2009). For example, while 68.9% of patients in South Africa were tested for HIV, only 10.9% were tested for HBV after a doctor had been exposed to their body fluids (De Villiers et al, 2007). Also, while 65.3% of the doctors tested themselves for HIV, only 21.7% tested for HBV after exposure, despite the fact that HBV is at least 100 times more infectious than HIV (De Villiers et al, 2007). This shows that there might be a negative attitude about the risk of infection from HBV, with doctors not realising that they are at a high risk of infection after exposure to HBV. Similar negative attitudes were found when 74.7% of Nigerian dental auxiliary workers; and 28.1% of Nigerian dentist perceived HCWs as being at a greater risk from HIV compared to HBV (Azondo et al, 2010; Utomi, 2005). Similarly, 49% of UK nurses with high risk jobs believed a NSI with a needle contaminated with infected blood was an unlikely source of infection despite the fact that all NSIs with infected blood should always be viewed as likely sources of infection and 67% of the nurses with high risk jobs disagreed with the statement that nurses are at higher risk of exposure to HIV/HBV than the other HCWs (Leliopoulou et al, 1999).

In contrast other studies found positive attitudes towards the risk of contracting HBV. For example, 70% of Nigerian dentists perceived HBV as the greatest hazard in the dental environment (Utomi, 2005). Similarly, 55.1% of dental and 74.3% of medical students in India either agreed or strongly agreed that they worry about being infected with HBV by their patients and in the same study, 67% of dental students and 82.5%

of medical students either agreed or strongly agreed that they can safely treat patients infected with HBV, indicating a positive attitude towards the risk of infection, as it is possible to safely treat patients if one first appreciates the risk and uses the appropriate precautions (Tibdewal et al, 2009).

2.3.2.2. Attitudes towards the vaccine for HBV

Several studies reviewed around the globe have found positive and negative attitudes towards the HBV vaccine amongst HCWs (Topuridze et al, 2009; Djeriri et al, 2008; Fatusi et al, 2000; Sofola, 2008; Okeke et al, 2008; Jepsen and Thomsen, 1991; Lee et al, 1997). Attitudes were positive towards the HBV vaccine in 54% of Georgian nurses and physicians who said they would recommend the vaccine to other HCWs (Topuridze et al, 2009). Similarly, 81% of Moroccan nurses, technicians, doctors, anaesthetist, surgeons, nursing auxiliaries and midwives stated that vaccination should be made mandatory for the same position they held, 55% of them were willing to pay for vaccination without any firm idea of the price and 100% would have preferred being vaccinated before paramedic and medical school (Djeriri et al, 2008).

Several other studies found negative attitudes to the HBV vaccine. For example, a Nigerian study found that clinical staff had the lowest compliance of 39.7% nurses and 40.3% doctors completing HBV vaccination compared to non-clinical workers, most of the hospital workers who completed HBV vaccination were (76.3%) medical records personnel and (69.5%) engineering staff. This indicated the possibility of negative attitudes towards the HBV vaccine by clinical staff as they are supposed to be more knowledgeable and expected to have the highest compliance (Fatusi et al, 2000). Similarly, 54% of unvaccinated clinical students and dental staff in a Nigerian study gave reasons of not taking up the vaccine suggesting that they were complacent and thus may not have appreciated the importance of the vaccine (Sofola and Uti, 2008). In other studies, 34.7% of the unvaccinated Nigerian medical students had never given HBV vaccination a thought (Okeke et al, 2008); 13.3% of unvaccinated Danish doctors, nurses and laboratory technicians feared the secondary effects of the vaccine (although it has proven safety), some perceived the risk of blood exposure as low and some had not thought about it (Jepsen and Thomsen, 1991); and out of the 22% of unvaccinated American paramedics, 26% feared contracting HBV from the vaccination and 20% didn't have time to get vaccinated (Lee et al, 1997).

2.3.2.3. Attitudes towards PEP for HBV

Several studies reviewed around the globe have found negative attitudes mainly related to lack of reporting of occupational injuries, an important aspect of post exposure management for HBV. For example, exposures were not reported by 42% of the 51% American trainee surgeons who sustained work related injuries (Makary et al, 2007); and 64% of the 91% of UK doctors and 29% of the 54% of UK midwives who sustained work related injuries because of a lack of time (Burke and Madan, 1997). This indicated negative attitudes towards reporting to access PEP as time may not be weighed to be very important compared to the possibility of an infection with HBV or other BBVs. In other studies, 38% of the 74% Polish nurses experiencing NSIs didn't report because they thought the source patient was not infected (Ganczak et al, 2006); 39.3% of the 51.7% UK surgeons didn't report sharps injuries because they thought the patient was of low risk (Kerr et al, 2009); 7.3% of South African student nurses didn't report NSIs because 41.1% feared the HIV test and 13.6% had fear for the preservation of confidentiality (Zungu et al, 2008); and 51% of NSIs were not reported by American trainee surgeons because 6% didn't want to know the results of tests after reporting and 28% didn't think reporting was of any use (Makary et al, 2007).

2.3.2.4. Attitudes towards UPs to prevent exposure to HBV

Several studies reviewed around the globe have found that HCWs have some negative attitudes towards UPs (Ferguson et al, 2004; Williams et al, 1994; Cutter and Jordan, 2004; and Helfgot et al, 1998). For example, 22% (N=304) of American physicians, nurses and laboratory workers felt that stopping patient care to use UPs put the patient at risk; 20% (N= 267) felt that UPs interfered with patient care; 14% (N=186) personally judged that UPs were not warranted in certain situations despite the requirements saying UPs were needed; 14% (N=186) didn't not anticipate exposure; 11% (N=144) said they were in a hurry because of work challenges and time; and 4% (N=58) thought that the patient didn't pose a risk to them (Ferguson et al, 2004). Another study found negative attitude related to self assessment of risk by HCWs despite the fact that UPs are supposed to be used universally. In that study, 63.3% of UK surgeons, theatre nurses and midwives admitted to making judgements on

nationality, lifestyle or sexual orientation when making decisions about using protective clothing (Cutter and Jordan, 2004).

2.3.3. Practices regarding the prevention and control of HBV

2.3.3.1. Occupational exposures and uptake of PEP for HBV

Studies reviewed globally showed that occupational exposure of HCWs occurs through mainly NSIs and uptake of PEP by HCWs is less than adequate. This supports WHO estimates that 40% of cases of HBV infections amongst HCWs are a result of NSIs (Sandoh et al, 2006). In Nigeria for example, 53.7% of HCWs had NSIs and none of them received PEP (Ibekwe and Ibeziako, 2006); only 4% of Kenyan HCWs sustaining NSIs accessed PEP (Taegtmeyer et al, 2008); 33% of the 567 exposed Taiwanese HCWs accessed PEP management (Ko et al, 2009); 27.3% (N=94) American surgeons sustained NSIs and only (5) 35.7% of (14) 14.9% inadequately vaccinated who sustained NSIs accessed PEP (Halpern et al, 2006); 23% of Pakistani medical students were exposed to HBV risk factors and 30.8% consulted for PEP (Khan et al, 2010); 140 nurses in West Bengal had NSIs and only 5% received HB vaccine and 2.1% HBIgG as PEP (Joardar et al, 2008); and 21.7% of the 73.9% exposed South African doctors were tested for HBV infection and only 8.7% received the HBV PEP (Devilliers et al, 2007).

2.3.3.2. Vaccination uptake for HBV prevention

For an individual to be considered fully protected from HBV through vaccination they have to get 3 doses of HB vaccine (complete vaccination). Several studies reviewed around the world have found high and low complete vaccination uptake amongst HCWs. Complete vaccination of HCWs was found among 77.5% of American transplant surgeons (Halpern et al, 2006); 81% American physicians, 71.1% of American phlebotomists and 70.9% American nurses aides and/or other patient care cadres (Simard et al, 2007); 85.7% specialists, dental surgery assistants, general dentist and hygienists in Saudi Arabia (Paul et al, 1999); 81.1% of dentists, general practitioners, paraclinicians, surgeons and interns in Iran (Kabir et al, 2010); 70.6% of Pakistani medical students (Khan et al, 2010); 89.9% of Malaysian medical students (Norsayani and Hassim, 2003); and 84% of Saudi nurses, laboratory technicians, operation theatre staff, dental technicians, vaccinators (Alam, 2002).

This stands in contrast with some studies which indicated poor vaccination uptake by HCWs. For example, only 39% of surgeons in sub-Saharan Africa (Phillips et al, 2007); 47.4% of Moroccan nurses, assistants and supporting staff (Laraqui et al, 2009); 40% of Swedish nurses, nurse assistants, physicians, ambulance staff, laboratory workers and other staff (Dannetun et al, 2006); 3.7% of the 22.4% Nigerian HCWs who had received HB vaccination (Ibekwe and Ibeziako, 2006); 55.9% of Indian dental and medical students (Tibdewal et al, 2009); 48.1% of Nigerian dentist (Utomi, 2005); 37.2% of Pakistani nursing students (Mengal et al, 2008); and 37.9% of Nigerian medical students (Sofola et al, 2007) had all completed the three dose HBV vaccine series. In a South African study, only 30.6% of nurses, doctors, general assistants/cleaners and administration staff had protective anti-HBs, however only 21.2% of HCWs remembered being vaccinated, so presumably some of the HCWs may have obtained their anti-HBs from past infection (Vardas et al, 2002).

2.3.3.3. Compliance to UPs to prevent exposures to HBV

The studies reviewed around the world have found that nurses had better compliance to UPs than other HCWs. For example, 86% of UK Nurses said they treat each patient as if they are infected with HBV compared to 41% for the doctors (Stein et al, 2003). Nurses were found to perform better at washing hands before and after patient contact, wearing gloves and avoiding recapping needles (Stein et al, 2003). Similarly 58.2% of Nigerian nurses said they never recapped needles compared to only 28.3% for the doctors, 41.3% for auxiliary nurses and 52.2% for laboratory scientists and domestic staff (Sadoh et al, 2006).

The practice of recapping of needles was found to be still common in healthcare settings. For example, 31.9% of Nigerian nurses, auxiliary nurses, doctors, laboratory scientists and domestic staff (Sadoh et al, 2006); and 47.3% of Moroccan nurses, nurse assistants and supporting staff (Laraqui et al, 2009) recapped used needles. While in another Nigerian study, only 32.9% of HCWs didn't recap needles (Ibeziako and Ibekwe, 2006).

The use of gloves was found to vary with some studies finding high usage of gloves and some finding low usage of gloves among HCWs. For example, gloves were always used by 63.8% of Nigerian nurses, auxiliary nurses, doctors, laboratory

scientists and domestic staff (Sadoh et al, 2006); 86.6% of Nigerian HCWs (Ibeziako and Ibekwe, 2006); and 97.5% of Nigerian dentists (Utomi, 2005). In contrast other studies found low usage of gloves. For example, 27% of Saudi Arabian nurses and paramedics wore gloves all the time and (Alam et al, 2002); 24.4% of Moroccan nurses, nurse assistants and supporting staff wore gloves when performing invasive procedures (Laraqui et al, 2009); out of 61.3% of Iranian dentists, general practitioners, paraclinicians, surgeons and interns who did surgical procedures, 24% often, and none always, used double gloves (Kabir et al, 2010); and 29.9% of UK surgeons always double-gloved (Kerr et al, 2009)

The use of gowns was found to vary from moderate to low use. For example, 63.8% of Nigerian nurses, auxiliary nurses, doctors, laboratory scientists and domestic staff wore gowns and aprons during surgery and deliveries (Sadoh et al, 2006); and 61.3% of Nigerian dentists used gowns (Utomi, 2005). In contrast only 35% of surgeons in sub-Saharan Africa had been wearing a gown at the time of exposure (Phillips et al, 2007).

The use of eye protection was found to be low in most settings. For example, eye protection was used by 16.3% of Nigerian nurses, auxiliary nurses, doctors, laboratory scientists and domestic staff (Sadoh et al, 2006); 29% of surgeons in sub Saharan Africa (Phillips et al, 2007); 23.1% of Nigerian dentist (Utomi, 2005); 43.8% Iranian dentists, general practitioners, paraclinicians, surgeons and interns who did surgical procedures (Kabir et al, 2010); and 32.9% of UK surgeons (Kerr et al, 2009).

The washing and disinfection of hands was found to vary from high, moderate to low. For example, 94.6% of Nigerian nurses, auxiliary nurses, doctors, laboratory scientists and domestic staff washed their hands after contact with patients (Sadoh et al, 2006); 63% of Moroccan nurses, nurse's assistants and supporting staff correctly disinfected their hands (Laraqui et al, 2009); and 43.9% of Nigerian HCWs practiced appropriate hand washing (Ibeziako and Ibekwe, 2006).

2.4. Conclusion

The literature reviewed confirms that HBV is indeed a global public health problem, especially in low income countries where HBV is highly endemic, including

Botswana. In these countries there are also challenges of adequate screening of blood and blood products, vaccination coverage, access to PEP, compliance with UPs and access to safer injection technologies, over which HCWs in some instances have little control. However, good HBV-related knowledge, attitudes and practices would go a long way in limiting infection with HBV at the work place.

The literature reveals consistent information supporting the importance of appropriate HBV knowledge, attitudes and practices of HCWs. For example, new HBV infections in the USA resulting from transmission from patients to HCWs fell after the introduction of immunisation programmes for HCWs, together with PEP and observation of UPs against HBV (FitzSimons et al, 2008). The WHO estimates that 40% of cases of HBV infections amongst HCWs are a result of NSIs partly because of the failure of practicing UPs (Sandoh et al, 2006).

The literature review revealed several gaps in the knowledge, attitudes and practices of HCWs regarding HBV prevention and control. Knowledge of the risk of HBV infection, PEP and UPs is inadequate in some settings. Most HCWs know about the HBV vaccine but others don't know about the vaccine's efficacy or duration of protection. Some HCWs have negative attitudes towards the risk of infection, HBV vaccine, PEP and UPs. Complete vaccination of HCWs is still inadequate in almost all settings as the ideal target is 100% immunisation of at risk HCWs. Compliance with UPs is inadequate in some settings with differences in compliance between different professions. Occupational exposures still occur at unacceptablely high rates around the world and some HCWs still don't access PEP after exposure. It is not unreasonable to think that a lack of knowledge, negative attitudes and poor HBV infection control practices resulting in occupational exposures, play a significant role in the transmission of HBV at the work place. A study on knowledge, attitudes and practices of HCWs in South Sudan regarding HBV prevention and control is thus important in order to identify the gaps that need to be addressed such as those found in the other studies reviewed in this chapter.

CHAPTER THREE

3. METHODOLOGY

3.1. Study design

A cross sectional study design, using a structured questionnaire with closed ended questions to collect data from HCWs, was used for this study.

3.2. Study setting and population

Aweil State Hospital is the only government referral hospital located in Aweil Town, the capital city of Aweil State (NBG). It services a population of approximately 1,111510 cover a land 30543 square kilometre area. The study population consists of approximately 90 doctors, 372 nurses and 65 laboratory staff.

3.3. Study sample and sampling method

The sample was calculated using Epi Info version 3.5.1 (CDC, 2008). This software required assumptions to be filled in, and the sample size was calculated automatically. The following assumptions were used based on the exposure being knowledge about HBV prevention and control, and the outcome being vaccination against HBV: (1) 75% of respondents had good knowledge about HBV prevention and control (Samuel et al, 2009); (2) the frequency of vaccination (1-3 doses) in the unexposed (i.e. those with poor knowledge) was 70.6% (Mengal et al, 2008); and (3) the frequency of vaccination (1-3 doses) amongst the exposed (i.e. those with good knowledge) was 90.7% (Mengal et al, 2008). The sample size was calculated to be 169 but 200 was used in this study. A sampling frame was obtained from the Aweil State Hospital administration which keeps a list of all health personnel practicing at the hospital. The sampling frame consisted of 103 laboratory personnel, 107 doctors and 441 Nurses. A stratified random sampling technique was used to ensure proportional representation of nurses (74% i.e. 148), doctors (13% i.e. 26) and laboratory workers (13% i.e. 26) in the final sample. Simple random sampling was used within each stratum to recruit the number required for each stratum (i.e. doctors, laboratory staff and nurses) using Microsoft Excel (Microsoft Office, 2010). A list of names of the staff members

belonging to that stratum was listed in column A of the Excel spread sheet. Then a list of random numbers was generated in column B and column A was sorted according to B in descending order. Thus the first 26 generated for doctors, 26 generated for laboratory workers, and 148 generated for nurses, were randomly selected in this way. Whenever a HCW refused to participate they were excluded and the next participant on the list approached until the required sample size was reached.

Inclusion criteria – All consenting doctors and nurses who were working directly with patients, such as in wards and operating theatres, performing tasks which exposed them to the risk of acquiring HBV; all consenting laboratory staff who were involved in handling patient samples such as blood, and other body fluids

Exclusion criteria- Any staff with duties which didn't put them at risk of acquiring HBV, such as those in management positions who didn't come into contact with patients or their body fluids.

3.4. Data Collection

Data was collected using an anonymous self administered questionnaire (See Annex 1). A total of 8 paid study assistants were used for distribution of the questionnaires to selected HCWs and collection of the questionnaires. The assistants were given basic training on data collection which involved explaining the importance of the survey, importance of respondents participation, voluntary nature of the study, the concept of random selection and its importance, how respondents benefit, approximate time it takes to fill in the questionnaire time and confidentiality. All the questions were explained to the research assistants so that they could be in a position to explain what the question meant to the respondents who may have had difficulty understanding the question. The research assistants were also told to encourage the respondents to fill in all applicable questions to reduce missing data.

The researcher and the assistants then divided the selected participants among themselves, with each individual being given specific wards that they were responsible for. The researcher and the research assistants made appointments with the selected HCW booked through the head of the ward or section that made sure the selected HCW got the questionnaire if they happened to be absent when the researcher or the assistants visited the ward or section. Those who consented had the questionnaire given to them. The questionnaires were collected from the participants

at their workstations at a time arranged with them or they simply left them with the head of section. The participants were reminded verbally five times to complete and return the questionnaire after which it was assumed the participant was unwilling and another participant sought as replacement.

3.5. Data analysis

In this study knowledge about HBV prevention and control was measured using 14 questions. Each correct answer scored 1, and the wrong answer or "I don't know" scored 0, thus the knowledge score was scaled from 0 to 14. The total scores for each HCW were further collapsed into categorical data to get poor, moderate and good knowledge. HCWs scoring a total of 5 and less were taken as having poor knowledge, those scoring 6 to 10 had moderate knowledge and those scoring 11 to 14 had good knowledge regarding HBV prevention and control.

The attitudes of healthcare workers were measured using a 5-point Likert scale, using 9 questions. The scores ranged from +2 (strongly agree) to -2 (strongly disagree) for positive statements; and from +2 (strongly disagree) to -2 (strongly agree) for negative statements. Participants could score a maximum of 18 and a minimum of -18. The total scores for each HCW were further collapsed into categorical data to get negative, neutral and positive attitudes. Participants scoring an overall of -7 to -18 were scored as having negative attitudes; those scoring -6 to 6 as having neutral attitudes; and those scoring 7 to 18 as having positive attitudes.

Different scales were used for individual practice questions, in order to get a clearer picture, questions using the same scale were scored together, the practice of UPs using 4 questions on UPs was scored and lastly an overall score of practice was done. The practices of re-sheathing of used needles and proper disposal of sharps were scored together. The same was done for NSIs and BBF exposures and for questions on the use of protective clothing and gloves. The total scores for each HCW were further collapsed into categorical data in order to get poor, moderate and good practices. The scores for practices of re-sheathing of used needles and proper disposal of sharps were scaled from 0 to 8. HCWs scoring 0 to 2 had poor practices, those scoring 3 to 5 had moderate practices and those scoring 6 to 8 had good practices. The scores of NSIs and BBF exposures were scaled from -2 to 2 and HCWs scoring -2 to -1 had poor

practices, those scoring 0 had moderate practices and those scoring 1 to 2 had good practices. The scores of questions on use of protective garments and gloves were scaled from 0 to 4. HCWs scoring 0 had poor practices, those scoring between 0 and 1 had moderate practices and those scoring between 3 and 4 had good practices. Out of the 6 questions, 4 measured UPs and were scored together to get the UPs practice score. The scores of UPs were scaled from 0 to 12. HCWs scoring 0 to 3 had poor practices, those scoring between 4 to 7 moderate practices and those scoring from 8 to 12 good practices.

A summary practice score was obtained and was scaled was from -4 to 4. HCWs with good practices (good UPs score, no NSI, no blood and body fluid exposure, and vaccinated) were given a score of 1; moderate practices (moderate UPs score, exposed through NSI, BBF and taking PEP) were scored 0 and poor practices (poor UPs score, exposed through NSIs, BBF and not taking PEP and being unvaccinated/can't remember were given a score of -1. HCWs scoring -4 to -2 had poor overall practices, those scoring between -1 and 1 had moderate practices and those with 2 to4 had good overall practices of HBV prevention and control.

Descriptive statistics were calculated for the first 3 objectives, using SPSS version 13.0. Frequency distributions of categorical variables (occupation, gender, vaccination practices) were calculated. For continuous data (age, knowledge, attitude and UPs practice scores), measures of central tendency and dispersion were calculated. These were presented in tables, graphs, pie charts, using SPSS version 13.0 and Microsoft Excel 2010. For the fourth objective, knowledge, attitudes and practices were collapsed into dichotomous data and the odds ratios and chi-square p-values were calculated to measure associations between (1) knowledge and practice and (2) attitudes and practice. For the final objective, a binary logistic regression analysis was done with the dependent variable being vaccination and independent variables being knowledge, attitudes, profession and demographics. For each categorical variable a baseline category was chosen and the remaining categories contrasted with the baseline. Data was analysed using SPSS version 13.0. For any of the predictor variables to be considered significant, the magnitude of the estimated odds ratio should have differed significantly from 1, the 95% confidence interval for the odds

ratio should not have contained 1 and the P-value should have been smaller than 0.05 since the test was done at the 5% level of significance.

3.6. Reliability and validity

The reliability of the self-developed questionnaire was assessed by administering it to a small sample of 20 HCWs twice and measuring the reliability ratio. The validity of the questionnaire was assessed on its content by sending it to an experienced researcher for assessment, and pre-tested on a small sample of 20 non-eligible participants (i.e. those who were in management positions) selected from the hospital. The objectives of the exercise was explained to them that they were meant to assist in detecting the clarity of questions, usability and logistics of administration and the necessary adjustments were done using this information. The participants used for reliability and validity checks were excluded from the final research since they had been sensitised to the research questions and some of them did not meet the inclusion criteria.

3.7. Bias

The research may have had volunteer bias, where the response may have been greater in subjects who had higher knowledge, attitudes and practices compared to those with lower knowledge, attitudes and practices. To minimise non-response, the questionnaire was made anonymous, and the consent form was completed and collected before the questionnaire was handed to the participants. There was also likely to be recall bias as respondents had to recall past experiences to answer the questions in the questionnaire. To reduce the errors introduced by both types of bias, random sampling was used and the sample size was increased.

3.8. Ethical considerations

Ethical clearance for this study was given by the Medical Research Ethics Committee, the Research Committee of Aweil State Hospital, and also the Research Committee of the Ministry of Health Aweil State South Sudan. There was a separate participant consent form (see annex 2) on which was stated the summary of the research project (title, scope, aims and purpose), benefits to society and study participants. The consent form clearly stated the voluntary nature of the research indicating that

participants are free to decline to participate. The questionnaire did not capture the participants' identification particulars, thus ensuring anonymity.

CHAPTER FOUR

4. RESULTS

4.1 Response rate

Two hundred questionnaires were distributed and a total of 117 were returned, giving an overall response rate of 58.5%. From nurses, 79 of 148 questionnaires were returned, giving a response rate of 53.4%; 18 of 26 questionnaires were returned from doctors, giving a response of 69.2%; and 20 of 26 were returned from laboratory staff, giving a response rate of 76.9%.

4.2 Descriptive statistics

4.2.1 Socio-demographic characteristics of the respondents

The final study sample was comprised of 15.4% doctors, 17.1% laboratory staff and 65.5% nurses. The majority of the HCWs were: female (64.1% [75/117]); between the ages of 20-40 years (69.2% [81/117]; had worked for 10 years or less (63.2% [74/117]) (see fig 4.1, fig 4.2, table 4.1, and table 4.2). The ages of the respondents ranged from 22 to 51 years, with a mean age of 31.5 years (SD= 6.956) (n=93), modes of 27 and 28 and median of 29. Some participants (20.5% [24/117]) declined to mention their ages (see table 4.1).

Fig 4.1: Bar chart showing distribution of gender of HCWs

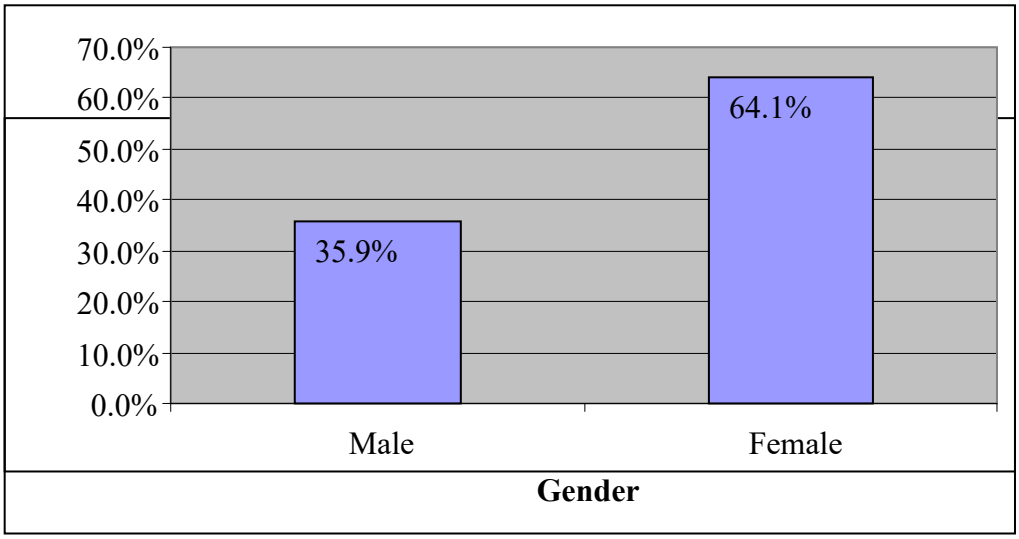


Fig 4.2: Bar chart showing gender in different job categories

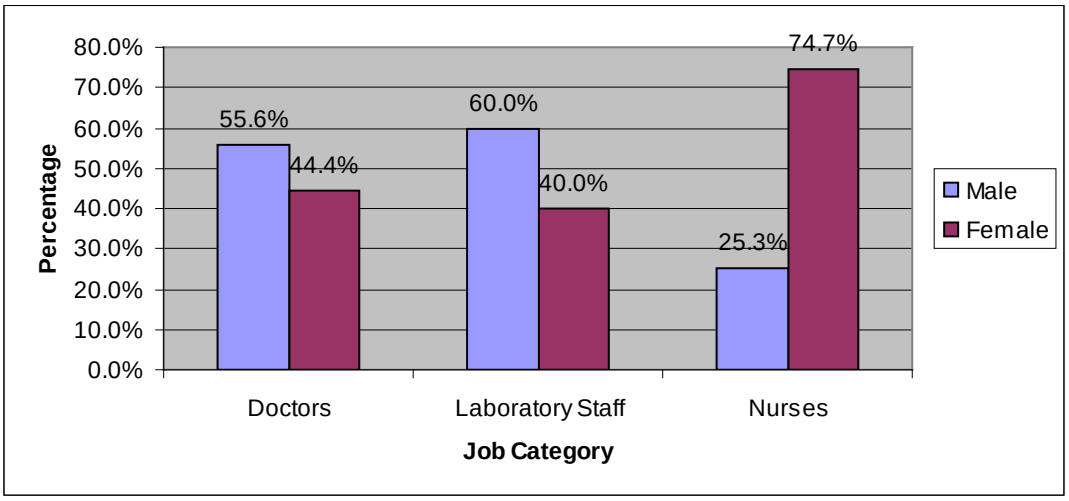


Table 4.1: Frequency distribution of age of HCWs

Age	Frequency	%	95% confidence interval (CI)
20 – 30yrs	53	45.3	36.1 - 54.8
31 – 40yrs	28	23.9	16.5 - 32.7
41 – 50yrs	11	9.4	4.8 - 16.2
> 50yrs	1	0.9	0.0 - 4.7
No answer	24	20.5	13.6 - 29.0
Total	117	100.0	

Table 4.2: Frequency distribution of years employed as HCWs

Years employed as HCW	Frequency	%	95% CI
≤ 10 yrs	74	63.2	53.8 - 72.0
10-19 yrs	25	21.4	14.3 - 29.9
20-29 yrs	11	9.4	4.8 - 16.2
>30 yrs	7	6.0	2.4 -11-9
Total	117	100.0	

4.2.2 Knowledge about the prevention and control of HBV

The first objective of this research was to determine the knowledge of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control. The potential range of knowledge scores was from 0 to 14 but the actual scores from the survey ranged from 3 to 13 with a mean of 7.94 (SD=2.31), median of 8 and a mode of 9. The majority of HCWs (66.7% [78/117] had moderate knowledge (see table 4.3). More doctors had good knowledge (38.9% [7/18]); followed by laboratory staff (20% [4/20]; and nurses (11.4% [9/79]) (see table 4.4).

Table 4.3: Frequency distribution of knowledge of HCWs

Knowledge	Frequency	%	95% CI
Poor knowledge	19	16.2	10.1 - 24.2
Moderate Knowledge	78	66.7	57.4 - 75.1
Good Knowledge	20	17.1	10.8 - 25.2
Total	117	100.0	

Table 4.4: Frequency distribution of knowledge in different professions

Knowledge	Doctors n (%) [95%CI]	Laboratory n (%) [95% CI]	Nurses n (%) [95% CI]
Poor Knowledge	1 (05.6) [0.1 - 27.3]	2 (10) [1.2 - 31.7]	16 (20.3) [12.0-30.8]
Moderate Knowledge	10 (55.6) [30.8-78.5]	14 (70) [45.7-88.1]	54 (68.4) [56.9-78.4]
Good Knowledge	7 (38.9) [17.3-64.3]	4 (20) [5.7 - 43.7]	9 (11.4) [5.3 - 20.5]
Total	18 (100)	20 (100)	79 (100.0)

Table 4.5: Frequency distribution of answers to knowledge questions (the correct answer is in brackets) (n=117)

Knowledge Questions	Correct N (%) [95% CI]	Incorrect / don't know n (%) [95% CI]
UPs should be used only with known HBV PTs (No)	107 (91.5) [84.8-95.8]	10 8.5) [4.2-15.2]
Consuming spoilt/old rotten food can result in hepatitis B virus infection (No)	70 (59.8) [50.4-68.8]	47 (40.2) [31.2-49.6]
Needles should be recapped/bent after use (No)	91 (77.8) [69.2-84.9]	26 (22.2) [15.1-30.8]
Hepatitis B can be transmitted as a nosocomial infection (Yes)	72 (61.5) [52.1-70.4]	45 (38.5) [29.6-47.9]
After HB vaccination HB, it's not necessary to confirm immunity against HB (No)	73 (62.4) [53.0-71.2]	44 (37.6) [28.8-47.0]
About 90% of vaccinated adults and children achieve 100% protection against HBV (Yes)	48 (41.0) [32.0-50.5]	69 (59.0) [49.5-68.0]
Hepatitis B virus is about 100 times more infectious than HIV (Yes)	62 (53.0) [43.5-62.3]	55 (47.0) [37.7-56.5]
A titre of at least 10mIU/ml of antibodies against hepatitis B is considered essential for protection against hepatitis B virus (Yes)	26 (22.2) [15.1-30.8]	91 (77.8) [69.2-84.9]
After exposure to HBV receiving the first dose of hepatitis B vaccine and hepatitis B immunoglobulin within a week can reduce chances of infection (Yes)	56 (47.9) [38.5-57.3]	61 (52.1) [42.7-61.5]
Once a patient has been vaccinated against hepatitis B they should not be considered as a possible source of hepatitis B (No)	79 (67.5) [58.2-75.9]	38 (32.5) [24.1-41.8]
A person who has been vaccinated or recovered from previous hepatitis B infection, can infect others (Yes)	45 (38.5) [29.6-47.9]	72 (61.5) [52.1-70.4]
Three doses of hepatitis B vaccine are required for complete vaccination (Yes)	89 (76.1) [67.3-83.5]	28 (23.9) [16.5-32.7]
The duration of protection after successful vaccination is at least 15 years (Yes)	36 (30.8) [22.6-40.0]	81 (69.2) [60.0-77.4]
Hepatitis B virus can be sexually transmitted (Yes)	75 (64.1) [54.7-72.8]	42 (35.9) [27.2-45.3]

4.2.3 Attitudes of HCWs towards the prevention and control of HBV

The second research objective was to determine the attitudes of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control. In this survey, attitude scores ranged from 1 to 18 with a mean of 12.10 (SD=3.03), median of 12 and mode of 14. The majority of HCWs (97.4% [114/117]), had positive

attitudes (see table 4.6). More laboratory staff (100% [20/20]) had positive attitudes; followed by nurses (97.5% [77/79]); and doctors (94.4% [17/18] (see table 4.7).

4.2.4 Practices of HCWs regarding prevention of HBV

The third objective was to determine the practices of nurses, doctors and laboratory personnel at Aweil State Hospital regarding HBV prevention and control.

4.2.4.1 Universal precautions

Universal Precautions (Ups) practices had a mean score of 10.37 (SD=1.695), the scores ranged from 6 to 12, with a median of 11 and a mode of 12. The majority of HCWs (94.9% [111/117]) had good UPs practices (see table 4.9). More laboratory staff had good UPs practices (100% [20/20]); followed by nurses (94.9% [75/79]); and lastly doctors (88.9% [16/18]) (see table 4.10). Responses for used needle re-sheathing and sharps disposal practices had a mean score of 6.7 (SD=1.52), the scores ranged 2 to 8, with a median of 7 and a mode 8. The majority of HCWs (79.5% [93/117]) had good UPs practices regarding avoidance of re-sheathing and proper sharps disposal (see table 4.11). More nurses had good UPs practices (84.8% [67/79]); followed by doctors (72.2% [13/18]); and lastly laboratory staff (65% [13/20]) in this regard (see table 4.12). NSI and blood and body fluid exposure practices had a mean score of 0.56 (SD=1.49), the scores ranged from -2 to 2, with a median of 0 and a mode of 2. The majority of HCWs (51.3% [60/117]) had moderate to poor practices in this regard (see table 4.11). More laboratory workers (75% [15/20]) had good NSI and blood and body fluid practices; followed by doctors (44.4% [8/18]); and lastly nurses (43% [34/79]) (see table 4.12). Protective garment and glove use practices of HCWs had a mean score of 3.64 (SD=0.622), the scores ranged from 1 to 4, with a median of 4 and mode of 4. The majority of HCWs (93.2 % [109/117]) had good UPs practices in this regard (see table 4.11). More laboratory staff (100% [20/20]) had good protective garment and glove use practices; followed by nurses (94.9% [75/79]) and doctors (77.8% [14/18]) (see table 4.12).

4.2.4.2 Vaccination

Of the HCWs, 50.9% (59/116) said they had received at least one dose of the vaccine and most laboratory workers had at least one dose (95% 19/20) compared to the other HCWs (see fig 4.3). Of those who had at least one dose of the vaccine, 61% (36/59) received the complete 3 dose series. HCWs that had the complete 3 dose series

included 66.7% (12/18) of doctors, 65% (13/20) of laboratory staff and 13.9% of (11/79) nurses. Of the HCWs who had at least 1 dose, testing for anti-HBs was done by 18.6% (11/59). Most HCWs who received at least one dose were not tested (81.4% [48/59]). Vaccination uptake of at least 1 dose was the least: in the 31-40 age group (46.4% [13/28]); among nurses (29.1% [23/79]); among females (46.7% [35/75]); among those who had worked for 20-29 years (27.3% [3/11]); HCWs with moderate knowledge (46.2% [36/78]); and moderate attitudes (33.3% [1/3]) (see table 4.13).

Table 4.6: Distribution of attitudes of HCWs

Attitude	Frequency	Percent	95% CI
Negative Attitude	0	0.0	
Neutral Attitudes	3	2.6	0.5 - 7.3
Positive Attitude	114	97.4	92.7-99.5
Total	117	100.0	

Table 4.7: Distribution of attitudes of HCWs in different professions

Attitudes	Doctors n (%) [95% CI]	Laboratory n (%) [95% CI]	Nurses n (%) [95% CI]
Negative	0 (0.0)	0 (0.0)	0 (0.0)
Neutral	1 (5.6) [0.1 - 27.3]	0 (0.0) [0.0-16.8]	2 (2.5) [0.3-8.8]
Positive	17 (94.4) [72.7-99.9]	20 (100) [100-100]	77 (97.5) [91.2-99.7]
Total	18 (100.0)	20 (100.0)	79 (100.0)

Table 4.8: Distribution of answers to attitude questions (n=117)

Attitude Questions	Strongly agree n (%) [95% CI]	Agree n (%) [95% CI]	Don't know n (%) [95% CI]	Disagree n (%) [95% CI]	Strongly disagree n (%) [95% CI]
HBV Vaccination for HCWs should be for free. (positive statement)	94 (80.3) [72.0-87.1]	23 (19.7) [12.9-28.0]	0 (0.0)	0 (0.0)	0 (0.0)
HBV vaccination too expensive for me to purchase; if it is not free I will not purchase it. (negative statement)	22 (18.8) [12.2-27.1]	28 (23.9) [16.5-32.7]	20 (17.1) [10.8 - 25.2]	30 (25.6) [18.0-34.5]	17 (14.5) [8.7-22.2]
I don't trust vaccinations (negative statement)	1 (0.9) [0.0-4.7]	14 (12.0) [6.7-19.3]	5 (4.3) [1.4-9.7]	51 (43.6) [34.4-53.1]	46 (39.3) [30.4-48.8]
Vaccination is against my religion / traditional beliefs (negative statement)	1 (0.9) [0.0-4.7]	0 (0.0)	5 (4.3) [1.4-9.7]	33 (28.2) [20.3-37.3]	78 (66.7) [57.4-75.1]
Every patient should be treated as they are carrying a BBV. (positive statement)	67 (57.3) [47.8-66.4]	37 (31.6) [23.3-40.9]	3 (2.6) [0.5-7.3]	5 (4.3) [1.4-9.7]	5 (4.3) [1.4-9.7]
It is important to wash your hands *after* any contact with each patient (positive statement)	95 (81.2) [72.9-87.8]	21 (17.9) [11.5-26.1]	1 (0.9) [0.0-4.7]	0 (0.0)	0 (0.0)
I am not at risk for hepatitis B because I am always careful when examining patients and taking specimens (negative statement)	3 (2.6) [0.5-7.3]	6 (5.1) [1.9-10.8]	6 (5.1) [1.9-10.8]	52 (44.4) [35.3-53.9]	50 (42.7) [33.6-52.2]
I am not at risk for HBV because I am a healthy person (negative statement)	0 (0.0)	2 (1.7) [0.2-6.0]	2 (1.7) [0.2-6.0]	37 (31.6) [23.3-40.9]	76 (65.0) [55.6-73.5]
My job puts me at risk of HBV infection (positive statement)	94 (80.3) [72.0-87.1]	21 (17.9) [11.5-26.1]	0 (0.0)	0 (0.0)	2 (1.7) [0.2-6.0]

Table 4.9: UPs practices of HCWs

Practices	Frequency	Percent	95% CI
Poor Practices	0	0.0	
Moderate Practices	6	5.1	1.9-10.8
Good Practices	111	94.9	89.2-98.1
Total	117	100.0	

Table 4.10: UPs practices of HCWs in different job categories

Practices	Doctors n (%) [95% CI]	Laboratory n (%) [95% CI]	Nurses n (%) [95% CI]
Poor Practices	0 (0.0)	0 (0.0)	0 (0.0)
Moderate Practices	2 (11.1) [1.4-34.7]	0 (0.0) [0.0-16.8]	4 (5.1) [1.4-12.5]
Good Practices	16 (88.9) [65.3-98.6]	20 (100) [100-100]	75 (94.9) [87.5-98.6]
Total	18 (100.0)	20 (100.0)	79 (100.0)

Table 4.11: Distribution of UPs practices of HCWs

Practices	Re-sheathing and sharps disposal	NSIs and Blood & body fluid exposure	Protective clothing and Gloves
	n (%) [95% CI]	n (%) [95% CI]	n (%) [95% CI]
Poor	1(0.9) [0.0-4.7]	27 (23.1) [15.8-31.8]	0 (0.0)
Moderate	23 (19.7) [12.9-28.0]	33 (28.2) [20.3-37.3]	8 (6.8) [3.0-13.0]
Good	93 (79.5) [71.0-86.4]	57 (48.7) [39.4-58.1]	109 (93.2) [87.0-97.0]
Total	117 (100.0)	117 (100.0)	117 (100.0)

Table 4.12: Distribution of UPs practices of HCWs according to profession

UP practices	Scores	Doctors n (%) [95% CI]	Laboratory n (%) [95% CI]	Nurses n (%) [95% CI]
Re-sheathing and sharps disposal	Poor	0 (0.0) [0.0-18.5]	0 (0.0) [0.0-16.8]	1 (1.3) [0.0-6.9]
	Moderate	5 (27.8) [9.7-53.5]	7 (35.0) [15.4-59.2]	11 (13.9) [7.2-23.5]
	Good	13 (72.2) [46.5-90.3]	13 (65.0) [40.8-84.6]	67 (84.8) [75.0-91.9]
NSIs and Blood & body fluid exposure	Poor	7 (38.9) [17.3-64.3]	2 (10.0) [1.2-31.7]	18 (22.8) [14.1-33.6]
	Moderate	3 (16.7) [3.6-41.4]	3 (15.0) [3.2-37.9]	27 (34.2) [23.9-45.7]
	Good	8 (44.4) [21.5-69.2]	15 (75.0) [50.9-91.3]	34 (43.0) [31.9-54.7]
Protective clothing and Gloves	Poor	0 (0.0)	0 (0.0)	0 (0.0)
	Moderate	4 (22.2) [6.4-47.6]	0 (0.0)	4.0(5.1) [1.4-12.5]
	Good	14 (77.8) [52.4-93.6]	20(100) [100-100]	75(94.9) [87.5-98.6]

Table 4.13: Vaccination uptake for different categorical variables

Variables		**Vaccinated n (%)**	**Unvaccinated / don't know n (%)**
Age (n=93)	20-30	31 (58.5)	22 (41.5)
	31-40	13 (46.4)	15 (53.6)
	41-50	6 (54.5)	5 (45.5)
	>50	1 (100)	0 (0.0)
Profession (n=117)	Doctor	17 (94.4)	1 (5.6)
	Laboratory	19 (95.0)	1 (5.0)
	Nurse	23 (29.1)	56 (70.9)
Gender (n=117)	Male	24 (57.1)	18 (42.9)
	Female	35 (46.7)	40 (53.3)
Years of work as HCW (n=117)	<10	42 (56.8)	32 (43.2)
	10-19	10 (40)	15 (60.0)
	20-29	3 (27.3)	8 (72.7)
	>30	4(57.1)	3 (42.9)
Knowledge (n=117)	Poor	10 (52.6)	9 (47.4)
	Moderate	36 (46.2)	42 (53.8)
	Good	13 (65)	7 (35.0)
Attitudes (n=117)	Poor	0 (0.0)	0 (0.0)
	Moderate	1 (33.3)	2 (66.7)
	Good	58 (50.9)	56 (49.1)

Fig 4.3: Bar Chart showing vaccination uptake of HCWs

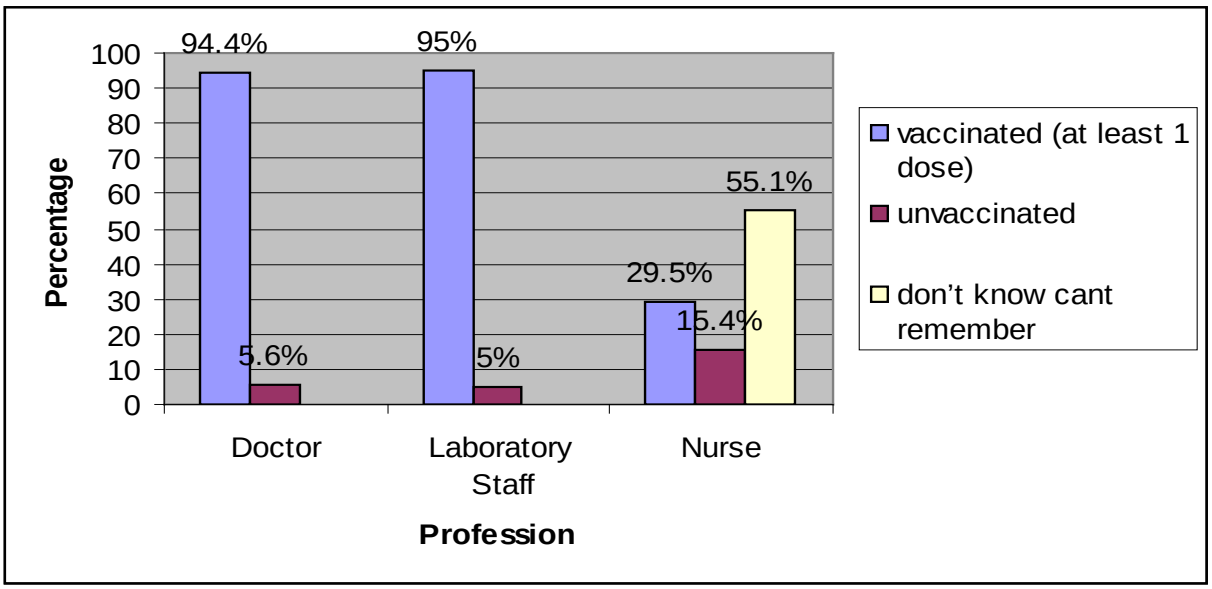
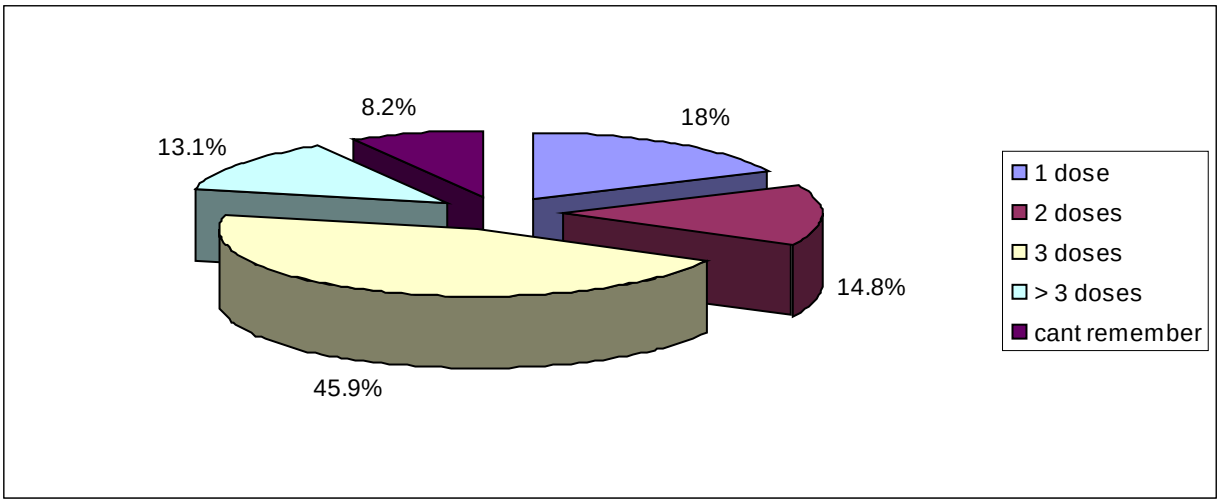


Fig 4.4: Pie chart showing doses of HB vaccine received by HCWs



4.2.4.3 Occupational exposures and PEP

NSIs occurred in 31.6% (37/117) of the HCWs (see table 4.14). Most NSIs occurred once in 51.4% (19/37) HCWs who had them (see table 4.15). Almost half (48.6% [18/37]) reported them; 45.9% (17/37) didn't report; and 5.4% (2/37) couldn't remember reporting. The source patient was tested for HBV in only 8.1% (3/37) of the cases; in 91.9% (34/37) of the cases the patient was not tested. The source patient who was tested for HBV was positive in 33.3% (1/3) of those who tested and negative in 66.6% (2/3) of those who tested; none of the HCWs said they received PEP for HBV after sustaining a NSI.

All 3 HCWs who had their source patients tested after exposure had received some HB vaccine doses before, 66.7% (2/3) had received 2 doses of the vaccine and 33.3% (1/3) had more than 3 doses, after receiving the vaccine doses all three were not tested for anti-HBs. Out of the 34 who didn't test their source patients, 41.2% (14/34) had received some HB vaccine doses; 2.9% (1/34) had 1 dose; 8.8% (3/34) had 2 doses; and 23.5% (8/34) had 3 doses, and 5.8% (2/34) had >3 doses. Only 5.8% (2/34) had tested for anti-HBs and were protected. The rest 35.3% (12/34) didn't check for anti-HBs. The other 50% (17/34) who didn't test their source patients were not vaccinated and the remaining 8.8% (3/34) didn't respond to the question.

Blood or body fluid splashes in the eyes or mouth occurred in 33.9% (39/115) of the HCWs (see table 4.14). In those exposed to blood and body fluid splashes, these occurred once in 41% (16/39) and 2-5 times in 41% (16/39) (see table 4.15). These exposures were reported by 23.1% (9/39) of the HCWs; not reported by 71.8% (28/39) of the HCWs and 5.1% (2/39) couldn't remember reporting. None of the HCWs said the source patient was tested for HBV; 38.5% (15/39) said the source was not tested; and 61.5% (24/39) didn't know. None of the HCWs said they received PEP after exposure, 79.5 (31/39) knew they didn't receive PEP and 20.5% (8/39) didn't know.

Out of the 39 HCWs who didn't test the source patients after exposure, 30.7% (12/39) had received HB vaccine doses: 12.8% (5/39) had a single dose; 5.1% (2/39) had 2 doses; 2.6% (1/39) had 3 doses and 10.3% (4/39) had 3 doses. Only 2.6% (1/39) tested for anti-HBs and was protected. Of the other HCWs who didn't test their source patients 53.8% (21/39) were unvaccinated. The other 6 didn't respond to the question.

4.2.4.4 Overall practice

The majority of HCWs had good overall practice regarding HBV prevention and control (65.5% [77/117]). More laboratory workers (95% [19/20]); followed by doctors (88.9% [16/18]); and nurses (53.2% [42/79]) had overall good practices.

Table 4.14: Distribution of UPs practice answers

UPs	n (%) [95% CI]
Do you re-sheath needles manually (i.e. using the cap in one hand to cover the used needle held in the other hand) following taking blood? (n=111)	
Always	8 (7.2) [3.2-13.7]
Almost Always	1 (1.0) [0.0-4.9]
Sometimes	24 (21.6) [14.4-30.4]
Almost Never	14 (12.6) [7.1-20.3]
Never	64 (57.7) [47.9-67.0]
Do you place disposable sharps in sharps containers immediately after use?(n=117)	
Always	92 (78.6) [70.1-85.7]
Almost Always	18 (15.4) [9.4-23.2]
Sometimes	6 (5.1) [1.9-10.8]
Almost Never	0 (0.0)
Never	1 (0.9) [0.0-4.7]
Have you ever had a needle stick/ sharps injury with a used needle or other sharp instrument that had been used on a patient during your working lifetime? (n=117)	
Yes	37 (31.6) [23.3-40.9]
No	77 (65.8) [56.5-74.3]
Can't remember	3 (2.6) [0.5-7.3]
Have you ever experienced blood or body fluids (e.g. amniotic fluid or liquor) splashing in your eyes or mouth? (n=115)	
Yes	39 (33.9) [25.3-43.3]
No	65 (56.5) [47.0-65.7]
Can't remember	11 (9.6) [4.9-16.5]
Do you wear protective clothing when handling blood or body fluids? (n=117)	
Always	91 (77.8) [69.2-84.9]
Sometimes	24 (20.5) [13.6-29.0]
Never	2 (1.7) [0.2-6.0]
Do you wear gloves in procedures where there is a possibility of blood or body fluid exposure? (n=117)	
Always	110 (94.0) [88.1-97.6]
Sometimes	6 (5.1) [1.9-10.8]
Never	1 (0.9) [0.0-4.7]

Table 4.15: Distribution of exposures in HCWs (n=78)

Exposure type	Frequency of Exposure	n (%)	95% CI
NSI	Never	0 (0.0)	
	Once	19 (54.3)	36.6-71.2
	2-5 times	15 (42.9)	26.3-60.6
	6-10 times	0 (0.0)	
	11-20 times	1 (2.9)	01-14.9
	>20	0 (0.0)	
Blood Body Fluid splashes	Never	1 (2.6)	0.1-13.8
	Once	16 (42.1)	26.3-59.2
	2-5 times	16 (42.1)	26.3-59.2
	6-10 times	3 (7.9)	1.7-21.4
	11-20 times	2 (5.3)	0.6-17.7
	>20	0 (0.0)	

Table 4.16: Distribution of overall practices of HCWs

Attitude	Frequency	Percent	95% CI
Poor Practices	10	8.5	4.2-15.2
Moderate Practices	30	25.5	18.0-34.5
Good Practices	77	65.8	56.5-74.3
Total	117	100.0	

Table 4.17: Distribution of overall practices of HCWs according to profession

Knowledge	Doctors n (%) [95% CI]	Laboratory n (%) [95% CI]	Nurses n (%) [95% CI]
Poor Practices	0(0.0)	0(0.0)	10 (12.7) [6.2-22.0]
Moderate Practices	2 (11.1) [1.4-34.7]	1 (5.0) [0.1-24.9]	27 (34.2) [23.9-45.7]
Good Practices	16 (88.9) [65.3-98.6]	19 (95.0) [75.1-99.9]	42 (53.2) [41.6-64.5]
Total	18 (100.0)	20 (100.0)	79 (100.0)

4. 2.5: Associations between knowledge, attitudes and practices

The fourth objective was to determine if there are any associations between (1) knowledge and practice, and (2) attitudes and practice among HCWs at Aweil State Hospital towards HBV prevention and control. Knowledge, attitudes, vaccination, UPs and exposure practices were collapsed into dichotomous data as shown in table 4.18, 4.19, 4.20 and 4.21 and odds ratios were calculated to measure associations and chi squared p-values were calculated to determine the statistical significance of any associations found. There was no statistically significant association between the dichotomous variables knowledge and attitudes and the dichotomous variables vaccination, UPs practice, NSI practice, and blood and body fluid practice (see tables 4.18, 4.19, 4. 20 and 4.21).

Table 4.18: Associations of knowledge and attitudes with vaccination

Vaccination status		**Vaccinated (n=59)**	**Unvaccinated (n=58)**	**OR (95% CI)**	**Chi-square p-value**
Knowledge	Good	13	7	2.1(0.8-5.6)	0.152
	Mod/poor	46	51		
Attitude	Good	58	56	2.1(0.2-23.5)	0.619*
	Mod/poor	1	2		

*Fishers Exact used.

Table 4.19: Associations of knowledge and attitudes with UPs practice

UPs practices		**Good (n=111)**	**Moderate/Poor (n=6)**	**OR (95% CI)**	**Chi-square p-value**
Knowledge	Good	20	0	undefined	0.588*
	Mod/poor	91	6		
Attitude	Good	109	5	10.9 (0.8-141.3)	0.147*
	Mod/poor	2	1		

*Fishers exact test used.

Table 4.20: Associations of knowledge and attitudes with NSI practice

Exposure to NSIs		Unexposed (n=80)	Exposed, no PEP (n=37)	OR (95% CI)	Chi-square p-value
Knowledge	Good	15	5	1.5 (0.5-4.4)	0.484
	Mod/poor	65	32		
Attitude	Good	78	36	1.1(0.1-12.3)	1.000*
	Mod/poor	2	1		

*Fishers exact test used

Table 4.21: Associations of knowledge and attitudes with BBF exposure

BBF exposures		Unexposed (n=78)	Exposed, no PEP (n=39)	OR (95% CI)	Chi=square p-value
Knowledge	Good	14	6	1.2 (0.4-3.4)	0.728
	Mod/poor	64	33		
Attitude	Good	76	38	1(0.1-11.4)	0.743*
	Mod/poor	2	1		

*Fishers exact test used

4. 2.6 Binary logistics regression

The fifth objective was to determine the predictors of HBV vaccination uptake at Aweil State Hospital. Vaccination was defined as one or more vaccination doses and was the dependent variable. Knowledge, attitudes, profession, gender, age and years of work as a HCW were the explanatory or predictor variables. The age category >50 was included into the 41 to 51 age group since there was only one individual and it didn't make sense to find odds of one individual. The results show that being a laboratory worker was the best predictor (OR: 148.4) of vaccination uptake, followed by being a doctor (OR: 125.7), after controlling for all the other independent variables (see table 4.22).

Table 4.22: Binary logistics output for vaccination and explanatory variables

Explanatory variable		Vaccinated	Unvaccinated	OR	95% CI		P value
					Upper	Lower	
Age	20-30	31 (58.5)	22 (41.5)	7.071	0.455	109.889	0.162
	31-40*	13 (46.4)	15 (53.6)	1.0			0.359
	41-51	7 (58.3)	5 (45.5)	0.523	0.021	12.869	0.691
Profession	Doctor	17 (94.4)	1 (5.6)	125.746	5.721	2763.666	**0.002**
	Laboratory	19 (95.0)	1 (5.0)	148.437	8.422	2616.232	**0.001**
	Nurse*	23 (29.1)	56 (70.9)	1.0			**0.001**
Gender	Male	24 (57.1)	18 (42.9)	0.442	0.094	2.071	0.300
	Female*	35 (46.7)	40 (53.3)	1.0			
Years worked as HCW	<10	42 (56.8)	32 (43.2)	0.565	0.006	53.414	0.806
	10-19	10 (40.0)	15 (60.0)	1.655	0.029	93.530	0.807
	20-29*	3 (27.3)	8 (72.7)	1.0			0.748
	>30	4(57.1)	3 (42.9)	6.805	0.112	412.257	0.360
Knowledge	Poor	10 (52.6)	9 (47.4)	2.687	0.648	11.147	0.173
	Moderate*	36 (46.2)	42 (53.8)	1.0			0.372
	Good	13 (65.0)	7 (35.0)	.903	0.151	5.414	0.911
Attitudes	Poor	0 (0.0)	0 (0.0)				
	Moderate*	1 (33.3)	2 (66.7)	1.0			
	Good	58 (50.9)	56 (49.1)	1.908	0.063	57.886	0.711

*Denotes the category chosen as baseline

P values in bold are statistically significant

CHAPTER FOUR

5. Discussion of the results

5.1. Introduction

This study investigated the knowledge, attitudes and practices of HCWs at Aweil State Hospital regarding HBV prevention and control. In this chapter, a discussion of the findings of the survey is presented. The discussion covers the knowledge, attitude and practice findings of HCWs; associations between 1) knowledge and practice, and (2) attitudes and practice; and lastly predictors of HBV vaccination uptake of HCWs at Aweil State Hospital.

5.2. Response rate

There was an overall response rate of 58.5%. The response rate was considered to be acceptable since a response rate of 75% using a questionnaire is considered to be extremely good (Williams, 2003). A lower response from nurses (53.4%) reduced the overall response rate since doctors had a response of 69.2% and laboratory staff had a response rate of 76.9%. A lower response rate from nurses (42.2% ([54/128]) working in the Ekurhuleni Metro was also found in another South African study (Africa, 2010). In contrast, a higher response rate (84.3% ([253/300]) was obtained from nurses working in the Tshwane Metro in Gauteng, South Africa (Burnett et al, 2011). A possible explanation for the low response from nurses in this study may be that most nurses are over-worked and found it difficult to find time to complete the questionnaire. At one time the hospital was said to operate at 200% capacity, with a patient nurse ratio of 30 patients to one nurse (Botswana Ministry of Health, 2006). The number of hours worked by survey respondents and knowledge of the subject has been found to influence non-response of survey participants (Boshuizen et al, 2005). It is also plausible that the nurses who did not respond had poor knowledge of the subject. Also, laboratory scientists and doctor's questionnaires were collected by the researcher; it is possible that since the participants knew the researcher more as compared to the nurses through more frequent contact with the microbiology laboratory at Aweil State Hospital, it was easier to get their cooperation.

5.3 Knowledge about the prevention and control of HBV

The majority of HCWs in this study (66.7%) had moderate knowledge with only 17.1% having good knowledge. A similar study done in Gauteng on 311 final years student nurses found that 87.6% had good knowledge regarding HBV prevention (Satekge, 2010). A possible explanation is that knowledge about HBV prevention was still fresh in the minds of students. More doctors (38.9%) had good knowledge, followed by 20.0% of laboratory staff, and 11.4% of nurses. This stands in contrast with a Jamaican study which found that more nurses (90% [45/50]), followed by doctors (88% ([44/50]), and laboratory technologists (70% ([35/50]) were considered to be very knowledgeable about the prevention and control of HBV through UPs (Vaz et al, 2010). Considering that all types of HCWs are included when the hospital does educational workshops, it may not be unreasonable to think that the differences in knowledge of HCWs may be a result of differences in the training curriculum of doctors, laboratory scientists and nurses.

5.3.1. Knowledge about the risk of contracting HBV

The fact that HBV can be acquired as a nosocomial infection was known by 61.5% (72/117) of the HCWs which is higher than in Iran where only 44.9% (160/356) of medical specialists knew that HBV can be transmitted from patient to patient, HCW to patient and vice versa (Kabir et al, 2010). However, in this study 64.1% (75/117) of HCWs knew that HBV can be sexually transmitted, which is less than in a study on Indian dental students where 92% (92/100) of them had this knowledge (Saini et al, 2010). Presumably knowledge was still fresh in the minds of students, compared to the HCWs in this study. Also, only 53% (62/117) of HCWs in this study knew that HBV is about 100 times more infectious than HIV, in contrast with 82% (97/118) of Irish nurses (McGrane and Staines, 2003). Knowledge of risk is important for the HCW as this encourages use of UPs, vaccination, and the uptake of PEP after exposure. A study on South African doctors who had experienced occupational exposures illustrates this important point. In that study, 68.9% of the source patients were tested for HIV, but only 10.9% were tested for HBV after a doctor had been exposed to their body fluids (De Villiers et al, 2007). Also, while 65.3% of the doctors tested themselves for HIV, only 21.7% tested for HBV after exposure, despite the fact that HBV is at least 100 times more infectious than HIV (De Villiers et al, 2007). A

lack of knowledge about the risk of HBV infection from occupational exposures might be responsible for the practices of these doctors.

5.3.2. Knowledge about the HB vaccine

Only 38.5% of HCWs in this study knew that a person who has been vaccinated or recovered from previous HBV infection can infect others, which is lower than in South African HCWs where 50.9% (82/161) had this kind of knowledge (Africa, 2010). In this study, 30.8% (36/117) knew that the duration of protection after successful vaccination is at least 15 years which is almost the same as in a South African study where 30.4% (49/161) had that knowledge (Africa, 2010). Only 41% (48/117) of HCWs in this study knew that about 90% of vaccinated adults and children achieve 100% protection against HBV which is lower than in a South African study where 52.2% (84/16) had this knowledge (Africa, 2010). Only 22.2% (26/117) of the HCWs knew that a titre of at least 10mlU/ml of antibodies against HBV is considered essential for protection against HBV which is consistent with the South African study where 23.0% (37/161) had this knowledge (Africa, 2010). Most HCWs (76.1%) knew that 3 doses of HB vaccine are required for complete vaccination; and 62.4% of the HCWs knew that after vaccination it is necessary to confirm immunity against HBV. However, most didn't know the titre considered to be protective, consequently non responders may not take any further action after vaccination since they would consider themselves protected. Knowledge about the vaccine is important since it can increase uptake of the vaccine. A study on nurses in Bangkok illustrated this point. In that study, after dissemination of information, plasma derived vaccine uptake increased from 56.9% to 77.7% (p=0.000) (Kamolratanakul et al, 1994). More education is needed on efficacy and duration of protection the HB vaccine.

5.3.3. Knowledge about PEP for HBV

The knowledge of PEP for exposures to HBV was low, with only 47.9% (56/117) of the HCWs knowing that after exposure to HBV receiving the first dose of HB vaccine and HBIgG within a week can reduce chances of infection. This is consistent with an Indian study were only 39% (167/428) of residents, nursing staff, nursing students, laboratory staff and laboratory students knew about PEP to be taken after sustaining a NSI (Muralidhar et al, 2010). Knowledge about PEP and the importance of time to achieve prevention of infection can act as an incentive for HCWs to quickly report

their exposure and access PEP. The lack of PEP knowledge in this study may partly explain why only 48.6% (18/37) of those sustaining NSIs, and 23.1% (9/39) of those sustaining blood and body fluid splashes, reported their exposures. This is consistent with a study on Saudi Arabian nurses and paramedics in which out of the 52 (74%) HCWs who had NSI, 48 (93%) never reported them to get PEP because they didn't know the importance of PEP (Alam, 2002). There is obviously a need to improve the knowledge of HCWs about PEP.

5.3.4. Knowledge about UPs to prevent exposure to HBV

Most of the HCWs had good knowledge about UPs in this study. The majority (91.5%) knew that UPs should be used with all patients regardless of the HBV status of the patient. This was higher than in UK HCWs, where 86% (123/143) of nurses said they treat each patient as if they have a BBV (Stein et al, 2003). Most HCWs (77.8% ([91/117]) knew that needles are not supposed to be bent or recapped prior to their disposal, in contrast to only 33.9% (117/345) of medical assistant officers, nurses and medical laboratory technicians in Malaysia (Rampal et al, 2010), and 37.5% (9/24) of radiographers in Nigeria (Okaro et al, 2009). Knowledge of UPs is expected to influence UPs practices in order to protect the HCW from parenteral, mucus membrane and non-intact skin exposure to blood borne pathogens. The good knowledge of UPs by most HCWs in this study is consistent with their practice scores for UPs as all HCWs (doctors, nurses and laboratory staff) had high scores for UPs.

5.4. Attitudes towards the prevention and control of HBV

The majority 97.4% (114/117) of HCWs had positive attitudes. This is higher than in a South African study where 66% (64/97) of nursing students had positive attitudes (Satekge, 2010).

5.4.1. Attitudes towards the risk of contracting HBV

Attitudes towards the risk of contracting HBV were positive for most HCWs. Most HCWs (87.2% [102/117]) either disagreed or strongly disagreed with negative statements regarding them not being at risk, and 80.3% strongly agreed and 17.9% agreed that their job puts them at risk of HBV. This is consistent with a Pakistani study in which 93.1% of doctors, nurses, final year medical students, operating theatre staff, laboratory technicians and sanitary workers regarded their job as putting them at risk

for HBV (Jadoon et al 2009). Positive attitudes towards the risk of HBV have been found to influence adherence to UPs, a study on Iranian doctors and nurses found that carelessness was considered as the second most common reason for NSIs by 38% of the HCWs (Zafar et al, 2008).

5.4.2. Attitudes towards the vaccine for HBV

Attitudes towards the vaccine by HCWs were positive as 94.9% (111/117) of them either strongly disagreed or disagreed to the statement "vaccination is against my religion" and 82.9% (97/117) either strongly disagreed or disagreed to the statement "I don't trust vaccinations". However, 42.7% of HCWs had a negative attitude towards paying for the vaccine themselves. This finding supports another finding in this study that 100% of the HCWs either strongly agreed or agreed that the HB vaccine should be free for all. This finding stands in contrast with that found in Pakistan, where a higher proportion (87.5%) of HCWs bearing the cost of vaccination managed to complete the 3 dose series, than 70.9% of the HCWs who had the vaccine for free (Hussain et al, 2010). This suggests a more positive attitude towards the vaccine in those willing to bear the cost of the vaccine than those who had it for free. The vaccine is not always available at Aweil State Hospital and when the hospital does vaccination campaigns for HCW it is for free and this should remain to be the case.

5.4.3. Attitudes towards UPs to prevent exposure to HBV

Most HCWs had positive attitudes towards UPs. The majority (99.1%) either strongly agreed or agreed to the statement "It is important to wash your hands after any contact with each patient" and 88.9% either strongly agreed or agreed that "every patient should be treated as if they are carrying a BBV". The 8.6% who had negative attitudes towards UPs in this study were less than in a UK study on trainee surgeons, where 20% of the surgeons who had NSIs believed that UPs would not have prevented the injury (Makary et al, 2007). The positive attitudes towards UPs in this study are consistent with the practices of HCWs since most of them had good practices of UPs.

5.5. Practices towards the prevention and control of HBV

The majority (65.5%) of HCWs had good overall practice regarding HBV prevention and control. More laboratory workers (95%), followed by 88.8% of doctors, and 53.2% of nurses had overall good practices. The nurses in this study had lower practices 53.2% (42/79) than in a South African study where 79% (245/310) of nursing students had good practices of HBV prevention and control (Satekge, 2010).

5.5.1. Occupational exposures and uptake of PEP for HBV

Just over half (51.3% [60/117]) of HCWs had moderate to poor practices leading to NSI and BBF exposures. More laboratory workers (75%) had good practices which avoided NSI and BBF exposures; followed by 44.4% of doctors, and 43.0% of nurses. Of the exposures, slightly less NSIs (31.6%) occurred than BBF exposures (33.9%). In this study, 31.6% (37/117) of the HCWs had NSIs during their careers, but only 48.6% (18/37) reported. The proportion of HCWs sustaining NSIs in this study is lower than in a UK study in which 57% (158/279) of UK doctors and nurses sustained NSIs in their careers, but the reporting is almost the same since 51% (80/158) reported in that study (Elmiyeh et al, 2004). It would appear there is a problem with accessing PEP at the hospital since some do report but none ever said they received PEP. This contrasts with an Iranian study on medical specialists, where nearly all the cases of NSIs were treated with either HBV vaccine or HBIgG (Kabir et al, 2010). Lack of reporting by HCWs especially surgeons is well documented, some studies estimate that around 80% of surgeons never or rarely report NSIs (Kabir et al, 2010). All NSIs should be reported, benefits to the HCW include counselling, access to PEP, and the possibility of secondary transmission to patients and sexual partners is eliminated. There are also legal aspects to reporting, thus the event needs to be documented in order to establish a causal link between exposure and a subsequent complication claimed by the HCW (Makary et al, 2007). A lack of reporting may lead to denial of such claims, and the HCW will not be compensated (Makary et al, 2007). In this study, 91.9% (34/37) of the HCWs didn't check the HBV status of the source patient and this is higher than 77.7% of Nigerian surgeons who didn't do so (Adebamowo and Ajuwon, 1997). Amongst those who checked in this study, 66.7% (2/3) were not completely vaccinated and at risk since they had received 2 doses of the vaccine and 33.3% (1/3) had more than 3 doses and didn't check for anti-HBs after vaccination and may be at risk. In this study, 50% (17/34) who had NSI and didn't test their

source patients were not vaccinated and were therefore at risk of infection, this is much higher than in Turkey where 27.7% (125/452) of nurses with NSIs were not vaccinated (Kosgeroglu et al, 2004). Out of the 34 who didn't test their source patients 41.2% (14/34) were vaccinated; 2.9% (1/34) had 1 dose and; 8.8% (3/34) had 2 doses and were at risk. The others, 23.5% (8/34) had 3 doses; and 5.8% (2/34) had >3 doses. Only 5.8% (2/34) had tested for anti-HBs and were protected. The rest 35.3% (12/34) didn't check for anti-HBs. Out of all the HCWs who had NSI only 5.4% (2/37) who checked for ant-HBs and said they were protected can be said to be protected from HBV. There is clearly a problem which needs to be addressed, firstly by ensuring protection through vaccination, testing for anti-HBs after vaccination, reducing exposures, testing of source patients and making sure HCWs access PEP as and when exposures happen.

BBF exposures occurred in 33.9% (39/115) of the HCWs, this is lower than 93.3% (98/105) mucocutaneous exposures reported for surgeons and 68.9% (155/225) for nurses in India (Tetali and Choudhury, 2006). Only 23.1% (9/39) of the exposed reported but none of the exposed HCWs said the source patient was tested for HBV and none of the HCWs said they received PEP after exposure. Again, it would appear there may be a problem with accessing PEP because among those who reported not a single HCW accessed PEP. Reporting in this study was higher than in Iran where 7.8% of the surgeons reported exposures to the eye and mucosa by HBV positive patients (Moghimi et al, 2008); and 3.7% of medical specialists in Iran reported exposure to the eye and mucosa (Kabir et al, 2010). Most of the HCWs who didn't test the source patients after exposure may have been inadequately protected, because out of the 39 HCWs who didn't test, only 30.7% (12/39) were vaccinated; 12.8% (5/39) with a single dose; 5.1% (2/39) with 2 doses; 2.6% (1/39) with more than 3 doses and 10.3% (4/39) with 3 doses. Only 2.6% (1/39) tested for anti-HBs and was protected. In contrast, 94.7% HCWs in an Iranian study were completely vaccinated and 60% of the HCWs tested after vaccination and 83.8% had adequate anti-HBs levels such that even after exposure more of them would be protected (Kabir et al, 2010). Out of the other HCWs who didn't test their source patients 53.8% (21/39) were unvaccinated and were therefore at risk. There is need for further investigation to establish the reasons why HCWs are not accessing PEP. HCWs need to be made more aware on the need for vaccination, checking anti-HBs after vaccination, use of

UPs, and importance of PEP. Other supportive work place measures such as introduction of safer technology such as needleless IV systems and auto disable syringes may go a long way in reducing exposures and infection after exposure (Gurubacharya et al, 2003).

5.5.2. Vaccination uptake for HBV prevention

Vaccination uptake was less than adequate in this study, with only 50.9% (59/116) having received at least one dose, and of these only 61% (36/59) receiving the complete 3 dose series. More doctors (66.7%) completed the 3 dose series followed by 65% of laboratory staff and 13.9% of nurses. Complete vaccination in this study 31% (36/116) is much lower than in Pakistan where 60% of doctors, nurses and paramedic staff were completely vaccinated (Sheikh, 2007).

Testing for anti-HBs was done by 18.6% (11/59) of those who had at least one dose of the vaccine. This finding is in agreement with other studies. Only 12.6% of vaccinated Pakistani doctors, final year medical students, nurses, operating theatre staff, laboratory technicians and sanitary workers (Jadoon et al, 2009); and only 10% 6/59 of vaccinated HCWs in Saudi Arabia (Alam, 2002) checked for anti-HBs after vaccination with HB vaccine (Alam, 2002). HCWs have to check the antibody titre at least one month after vaccination, and those negative for HBsAg and ant-HBc should be considered as non-responders and given booster doses to make sure they are protected (Kabir et al, 2010). It makes sense to conclude that there may be lower completely immunised HCWs from the vaccine itself than the 31% who reportedly took the 3 doses of the HBV since in practice there is an estimated 10% non-response to the vaccine especially in the older age groups in some populations (Boot et al, 2009; Bonanni and Bonaccorsi, 2001). This is mitigated by immunity through natural infection, but still there may be HCWs at risk of HBV infection and the situation needs to be urgently addressed especially for the nurses.

5.5.3. Compliance to UPs to prevent exposures to HBV

The majority (79.5%) of HCWs had overall good UPs practices regarding avoidance of resheathing and proper sharps disposal. More nurses (84.8%) had good UPs practices, followed by 72.2% of doctors, and 65.0% of laboratory staff in this regard. The majority (93.2%) of HCWs had good UPs practices of protective garment and

glove use. All (100%) laboratory staff had good protective garment and glove use practices, followed by 94.9% of nurses, and 77.8% of doctors. In this study, 57.7% never recapped which is comparable to 60% of Indian doctors and higher than for Indian nurses 38% who never recapped (Kotowal and Taneja, 2010). In this study, 78.6% always placed sharps in sharps containers, and this is lower than in India where 90% of doctors and 88% of nurses properly disposed of sharps (Kotowal and Taneja, 2010). In this study 94% always used gloves and this is higher than in India where 90% of the doctors and 80% of the nurses used gloves (Kotowal and Taneja, 2010); and in Nigeria where 73.7% of medical students and 7.7% of nursing students always used gloves (Bamigboye and Adesanya, 2006). There is evidence that compliance with UPs reduces risk and protects HCWs (Kotwal and Taneja, 2010). In this study most HCWs complied with UPs but still had some NSI and blood and body fluid exposures indicating the possibility of social desirability bias influencing their self-reported practices.

5.5.4 Association

The association between the dichotomous variables knowledge and attitudes and the dichotomous variables vaccination, UPs practice, NSI practice, and blood and body fluid practice was found not to be statistically significant using the chi squared test. This implies that good knowledge for example didn't translate into good UPs practice. This may have been a result of the low response rate; a higher response may have been able to detect statistical significance.

5.5.5 Predictors of vaccination uptake

Being a laboratory worker was the best predictor (OR: 148.4) of vaccination uptake, followed by being a doctor (OR: 125.7) when all the other variables were under consideration. Some HCWs, 20.5% (24/117) declined to give their ages, and this made it difficult to establish any relationship between age and vaccination. Knowledge was found not to be a significant predictor of vaccination and this was consistent with the lack of association found between knowledge and vaccination. This is consistent with a South African study where knowledge was found not to be a significant predictor of vaccination among nurses and doctors (Africa, 2010). Attitude was not found to be a significant predictor of vaccination and this was consistent with lack of association between found between attitude and vaccination. This finding

stands in contrast with that found in the above mentioned South African study where positive attitude was found to be a significant predictor of vaccination (OR=1.13; p=0.007) (Africa, 2010). This could be explained by the fact that the HB vaccine is not always available at Aweil State Hospital, so even if HCWs may want to be vaccinated, they are not always offered vaccination.

5.5.6 Limitations to the study

The study relied on self reported practice. This may be influenced by social desirability bias such that it may be different from the observed practice, thus compromising the external validity of the study. It was not possible to verify whether the HCWs completed the questionnaire without assistance either from colleagues or other sources such as the internet which is freely available at the hospital, since some were left to do it on their own. There is a possibility of non-response bias such that non-responders may have had less knowledge when compared to responders and thus would not be interested in participating and the result would mainly be a profile of the respondents. The questionnaire itself was long and may have contributed to reducing the response rate which may have made associations non-significant. The low response rate may have contributed towards the lack of associations in the fourth objective.

5.6. Conclusions

It can be concluded that knowledge of HBV prevention and control was moderate to poor. Areas where HCWs had knowledge deficiencies were PEP, and HB vaccine efficacy and duration of protection. There was no association that could be established between knowledge and attitudes and vaccination, UPs practice, NSI practice, and BBF practices. Most had HCWs had positive attitudes but were sensitive to buying HBV vaccine for themselves. Most HCWs had reportedly good UPs practices which are not supported by exposure experiences. Profession was the only significant predictor of vaccination and vaccination of nurses was far less than adequate when compared to doctors and laboratory staff. There was a problem with accessing PEP among HCWs at the institution and most patients are not tested after HCW are being exposed.

5.7. Recommendations

Responsible authorities for Aweil State Hospital are recommended to:

- Disseminate knowledge of the HBV vaccine, and PEP.
- Increase vaccination uptake of HCWs in particular nurses.
- look into ways of making anti-HBs testing available after vaccination of HCWs and follow of HCWs to increase adherence to ant-HBs testing
- Strengthen supervision of workers on good practices so that they adhere to using UPs incorporated in standard operating procedures
- Offer safer injection devices
- Maintain a steady supply of free HB vaccine
- Look into how PEP can be accessed by workers though all hours of the day, including testing of source patients

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APPENDICES

ANNEX 1: QUESTIONNAIRE

A Questionnaire for PhD in Public Health to study Knowledge, Attitude and Practices towards Hepatitis B Prevention and Control at Aweil State Hospital South Sudan.

Please fill in the questionnaire where applicable by ticking (✓) or placing an X on your choice, if you make a mistake, scratch out the incorrect selection and place a ✓ or an X in the box you want to select.

1. Socio-demographic characteristics:

Age in years ( )

Gender:

a) Male ( ) b) Female ( )

Profession

a) Nurse ( ) b) Doctor ( ) c) Laboratory Technologist ( )

Years as a Healthcare Worker

a) <10 ( ) b) 10 – 19 ( ) c) 20 – 29 ( ) d) >30 ( )

2. Knowledge of Hepatitis B Prevention

1) Universal Precautions (infectious disease control techniques such as hand washing, use of gloves and other barriers, and aseptic techniques) should be used only when dealing with known hepatitis B virus positive patients.

a) True ( ) b) False ( ) c) Don`t Know ( )

2) Consuming spoilt/old rotten food can result in hepatitis B virus infection

a) True ( ) b) False ( ) c) Don`t Know ( )

3) Needles should be recapped / bent after use.

a) True ( ) b) False ( ) c) Don`t Know ( )

4) Hepatitis B can be transmitted as a nosocomial infection.

a) True ( ) b) False ( ) c) Don`t Know ( )

5) After vaccination for hepatitis B, it is not necessary to have a blood test to confirm immunity against hepatitis B.

a) True ( ) b) False ( ) c) Don`t Know ( )

6) About 90% of adults and children who are vaccinated achieve 100% protection against hepatitis B virus.

a) True ( ) b) False ( ) c) Don`t Know ( )

7) Hepatitis B virus is about 100 times more infectious than HIV

a) True ( ) b) False ( ) c) Don`t Know ( )

8) A titre of at least 10mIU/ml of antibodies against hepatitis B is considered essential for protection against hepatitis B virus.

a) True ( ) b) False ( ) c) Don`t Know ( )

9) After exposure to HBV receiving the first dose of hepatitis B vaccine and hepatitis B immunoglobulin within a week can reduce chances of infection.

a) True ( ) b) False ( ) c) Don`t Know ( )

10) Once a patient has been vaccinated against hepatitis B they should not be considered as a possible source of hepatitis B.

a) True ( ) b) False ( ) c) Don`t Know ( )

11) A person who has been vaccinated or recovered from previous hepatitis B infection can infect others.

a) True ( ) b) False ( ) c) Don`t Know ( )

12) Three doses of hepatitis B vaccine are required for complete vaccination.

a) True ( ) b) False ( ) c) Don`t Know ( )

13) The duration of protection after successful vaccination is at least 15 years

a) True ( ) b) False ( ) c) Don`t Know ( )

14) Hepatitis B virus can be sexually transmitted

a) True ( ) b) False ( ) c) Don`t Know ( )

3. Attitudes towards Hepatitis B Prevention

Please place an X or ✓ in only one response box that most closely reflects your opinion:

15) Vaccination against HBV should be made available to all healthcare workers for free.

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

16) Hepatitis B vaccination is too expensive for me to purchase; if it is not free I will not purchase it.

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

17) I do not trust vaccinations

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

18) Vaccination is against my religion / traditional beliefs

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

19) Every patient should be treated as if they are carrying a blood borne pathogen.

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

20) It is important to wash your hands *after* any contact with each patient.

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

21) I am not at risk for hepatitis B because I am always careful when examining patients and taking specimens

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

22) I am not at risk for HBV because I am a healthy person

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

23) My job puts me at risk of HBV infection

a) Strongly Agree ( ) b) Agree ( ) c) Don`t know ( ) d) Disagree ( ) e) Strongly disagree ( )

4. Practice Questions

24) Have you ever been vaccinated against HBV?

a) Yes ( ) b) No ( ) c) Can`t Remember ( )

(If the answer is No to question 24 please go to question 28)

25) If you answered yes to Q24 how many doses did you receive?

a) 1 dose ( ) b) 2 doses ( ) c) 3 doses ( ) d) >3 doses ( ) e) Can`t Remember ( )

26) If you answered yes to question 24 did you get tested afterwards to establish if you have hepatitis B antibodies?

a) Tested ( ) b) Not tested ( ) c) Don`t know ( )

27) If you were tested for hepatitis B antibodies, are you protected against hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t know ( )

28) Do you recapping needles *manually* (i.e. using the cap in one hand to cover the used needle held in the other hand) following taking blood?

a) Always ( ) b) Almost always ( ) c) Sometimes ( ) d) Almost Never ( ) e) Never ( )

29) Do you place disposable sharps in sharps containers *immediately* after use?

a) Always ( ) b) Almost always ( ) c) Sometimes ( ) d) Almost Never ( ) e) Never ( )

30) Have you ever had a needle stick/ sharps injury with a used needle or other sharp instrument that had been used on a patient during your working lifetime?

a) Yes ( ) b) No ( ) c) Can`t Remember ( )

(Please go to Q36 if you answered No to Q30)

31) If you answered yes to Q 30 How many times have you experienced a needle sticks or sharps injury involving a needle or sharp instrument that had been used on a patient?

a) Never ( ) b) Once ( ) c) 2-5 ( ) d) 6-10 ( ) e) 11-20 ( ) f) >20 ( )

32) If you answered yes to Q 30, did you report it?

a) Yes ( ) b) No ( ) c) Can`t Remember ( )

33) If you answered yes to Q30, was the source patient tested for hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t Know ( )

34) If you answered yes to Q33, was the source patient positive for hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t Know ( )

35) If you answered yes to Q 30, did you receive post exposure prophylaxis for hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t Know ( )

36) Have you ever experienced blood or body fluids (e.g. amniotic fluid or liquor) splashing in your eyes or mouth?

a) Yes ( ) b) No ( ) c) Can`t Remember ( )

(Please go to Q42 if you answered No to Q36)

37) If you answered yes to Q 36, How many times in the last year have you experienced blood or body fluids (e.g. amniotic fluid or liquor) splashing in your eyes or mouth?

a) Never ( ) b) Once ( ) c) 2-5 ( ) d) 6-10 ( ) e) 11-20 ( ) f) >20 ( )

38) If you answered yes to Q 36, did you report it?

a) Yes ( ) b) No ( ) c) Can`t Remember ( )

39) If you answered yes to Q36, was the source patient tested for hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t Know ( )

40) If you answered yes to Q39, was the source patient positive for hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t Know ( )

41) If you answered yes to Q 36, did you receive post exposure prophylaxis for hepatitis B?

a) Yes ( ) b) No ( ) c) Don`t Know ( )

42) Do you wear protective clothing when handling blood or body fluids?

a) Always ( ) b) Sometimes ( ) c) Never ( )

43) Do you wear gloves in procedures where there is a possibility of blood or body fluid exposure?

a) Always ( ) b) Sometimes ( ) c) Never ( )

Thank You Very Much for Your Time!

ANNEX 2: CONSENT FORM

ATLANTIC INTERNATION UNIVERSITY CONSENT FORM

Name of Study

Knowledge, attitudes and practices of healthcare workers regarding hepatitis B prevention and control at the Aweil State Hospital in South Sudan,

.....……

Introduction

Knowledge attitudes and practices of healthcare workers regarding prevention and control of hepatitis B in a hospital setting is important to study as this is an environment where healthcare workers and patients are at a high risk of infection with hepatitis B virus. A study to assess the knowledge, attitudes and practices of healthcare workers has not been done at Aweil State Hospital in South Sudan and is needed as a matter of urgency to reveal the strengths and weaknesses of current prevention and control and prescribe the way forward in terms of possibilities for improvements.

Purpose of the study

This study aims to investigate knowledge, attitudes and practices towards prevention and control of hepatitis B amongst nurses, doctors and laboratory personnel at Aweil State Hospital in South Sudan. The expected results will be on the extent of knowledge, the attitudes and practices of healthcare worker towards the prevention and control of hepatitis B, and also the various associations which may exist in the knowledge and practice, attitudes and practice, and types of occupation and practice, among healthcare workers at Aweil State Hospital towards hepatitis B prevention and control.

Research Objectives:

a. To determine the knowledge of nurses, doctors and laboratory personnel at Aweil State Hospital regarding hepatitis B prevention and control

b. To determine the attitudes of nurses, doctors and laboratory personnel at Aweil State Hospital regarding hepatitis B prevention and control

c. To determine the practices of nurses, doctors and laboratory personnel at Aweil State Hospital regarding hepatitis B prevention and control

d. To determine if there are any associations between (1) knowledge and practice, (2) attitudes and practice, and (3) types of occupation and practice, among healthcare workers at Aweil State Hospital towards hepatitis B virus prevention and control.

Eligibility Criteria

Inclusion criteria – All consenting doctors and nurses who work directly with patients, such as in wards and operating theatres, performing tasks which expose them to the risk of acquiring HBV; all consenting laboratory staff involved in handling patient samples such as blood, and other body fluids

Exclusion criteria- Any staff with duties which don't put them at risk of acquiring HBV, such as those in management positions who do not come into contact with patients or their body fluids.

Study Procedure

This is a cross sectional study (non experimental), where data is collected by a self administered questionnaire from 200 consenting research participants after approval of the study by the Hospital authorities at Aweil State Hospital and the Health Research Unit at Ministry of Health. Randomly selected participants will be approached at work and asked to take part in the study. The study aim, objectives and protection of privacy will be explained to them, and those who agree to participate will have a consent form offered to them to read. Those who consent will have to sign the consent form, and the questionnaire will then be given to them to complete on their own. The study is expected to last around six months from the time it begins.

Alternative Procedures

Not applicable, since no intervention is being offered in this study

Blood tests

No blood will be collected

Risks and/or discomfort

Discomfort which is anticipated can be from disclosure of information that may be deemed as bad practice, a lack of knowledge or bad attitudes.

Handling of Research Related Injury

This will not be applicable in this study, as no injuries are anticipated

Benefits

The information generated by this study may improve occupational safety of healthcare workers regarding risk of exposure to hepatitis B. The safety of patients at the Hospital may be improved if it is found that the current prevention and control mechanisms are not of the desired standard. Areas in need of improvement through training may be identified.

New information

Not applicable since this is not an experimental study and no intervention is being offered.

Costs to Subjects and Compensation
The study will be at no cost to the study participants and there is no compensation available to the study participants

Voluntary Participation
Participation is voluntary and potential study participants have a right not to participate and refusal to participate will involve no penalty or loss of benefits to which the subjects are otherwise entitled to.

Right to Withdraw
The study participants have a right to withdraw at any point in time with no consequences to the subject.

Privacy, Anonymity and Confidentiality

All the steps will be taken to guarantee the privacy of participants, the consent forms and questionnaires will be collected separately such that it will not be possible to link the study participant to the questionnaire, the consent forms and questionnaires will be filed separately in lockable cabinet which only the researcher has access to. The information gathered will be disclosed only to persons directly related to the study such as study supervisor. The results of the study will be made known to Aweil State Hospital Institutional Review Board, Health Research Unit Ministry of Health and Atlantic International University

Future use of Information
The information obtained may be used only for research and educational purposes only in the future

Storage of specimen
There will be no specimen collected in this research

Who to contact
For information on the rights of the participants, injuries and other questions in the research participants may contact

Mr Simon Malou - +211954223593
Director General Ministry of Health Aweil State-NBG

The Researcher:
Amin Gordiano Okwahi Tafeng
+211955149213; +211915078119

Statement by participant

I have read the information on the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.

I understand that participation in this study is completely voluntary and that I may withdraw from it at any time and without supplying reasons.

I know that this study has been approved by the Medical Research and Ethics (MREC), Aweil State Hospital Research and Ethics Committee and Health Research Unit Ministry of Health Aweil State-South Sudan. I am fully aware that the results of this Study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this study.

Name of volunteer Signature of volunteer

Place. Date. Witness

Statement by the Researcher

I provided verbal and written information regarding this study.
I agree to answer any future questions concerning the study as best as I am able.
I will adhere to the approved protocol.

Researcher Name:

Amin Gordiano Okwahi Tafeng

Signature Date: 20th March 2018 Place: NBG Aweil South Sudan

ANNEX 3: PERMISSION LETTER

Atlantic International University
Faculty of social and Human Sciences
1st January 2018

Aweil State Hospital Director
Northern Bahr el Gazal State
South Sudan

Dear Sir/Madam

RE: APPLICATION TO CONDUCT RESEARCH

I am studying for a PhD of Public Health course at the Atlantic International University Faculty of Social and Human Science in Hawaii State-USA. I wish to apply for permission to conduct research at Aweil State Hospital. I am required to submit a research report as part of the course. I would like to conduct a research study on the knowledge, attitudes and practices of healthcare workers (doctors, nurses and laboratory staff) regarding hepatitis B prevention and control.

I have already been granted approval from the University and the Health Research Unit Ministry of Health Aweil State and have attached the relevant letters of approval. The participation of the healthcare workers is voluntary and informed consent will be obtained from the participants. The questionnaire used will be anonymous. Confidentiality of all the records obtained whilst in this study will be maintained.
Results of the research study may be published, but names will not be used. If you have any questions concerning the research study, please call me at +211955149213 or Mr. Simon Malou who is supervising this study at +211954223593.

I would be grateful to be given the opportunity to conduct this study in the hospital

Yours Sincerely

Amin Gordiano Okwahi Tafeng