

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

Amin Gordiano Okwahi Tafeng<sup>1</sup>, Dr Jack Rosenzweig<sup>2</sup>, Linda Collazo<sup>3</sup>

Atlantic International University, Honolulu, Hawaii, Miami City, USA

**Abstract:** ***Introduction:** Hepatitis B virus (HBV) is a highly infectious virus responsible for considerable morbidity and mortality worldwide. Chronic HBV carriers can transmit HBV parentally 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 and Discussion:** 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.*

**Keywords:** Hepatitis B surface antigen (HBsAg), Hepatocellular carcinoma (HCC), HBV carrier, Horizontal transmission, Liver cirrhosis, KAP, HBV, South Sudan.

## 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 (Lukhwari 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.

## 1.1 Prevalence of HBV

### 1.1.1 Global prevalence

At the beginning of the 21<sup>st</sup> 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  $\geq 8\%$ . 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).

### 1.1.2 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).

### 1.1.3 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).

### 1.1.4 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 seroprevalence 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. Results and Discussions

### 2.1 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%.

### 2.2 Descriptive statistics

#### 2.2.1 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).

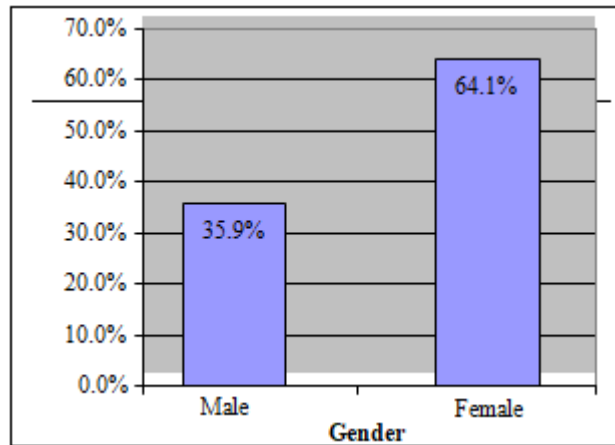


Figure 4.1: Bar chart showing distribution of gender of HCWs

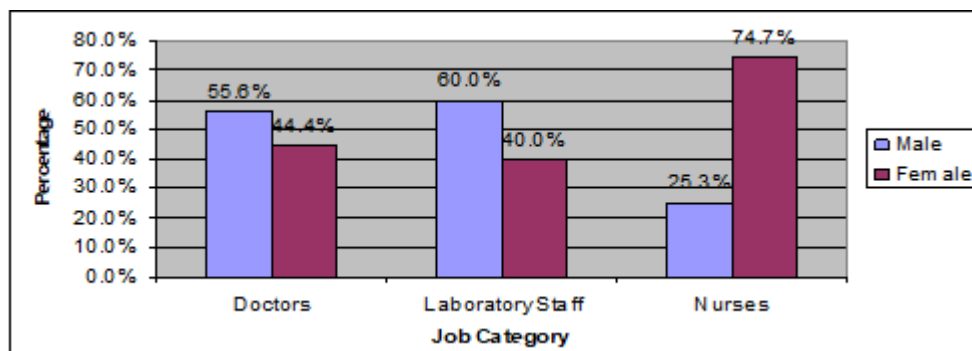


Figure 4.2: Bar chart showing gender in different job categories

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	

### 2.2.2 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	

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]

**2.2.3 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).

**2.2.4 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.

**2.2.4.1 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).

**2.2.4.2 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	%	95% CI
Negative Attitude	0	0	
Neutral Attitudes	3	2.6	0.5 - 7.3
Positive Attitude	114	97.4	92.7-99.5
Total	117	100	

**Table 4.7:** Distribution of attitudes of HCWs in different professions

Attitudes	Doctors	Laboratory	Nurses
	n (%) [95% CI]	n (%) [95% CI]	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	Agree	Don't know	Disagree	Strongly disagree
	n (%) [95% CI]	n (%) [95% CI]	n (%) [95% CI]	n (%) [95% CI]	n (%) [95% CI]
HBV Vaccination for HCWs should be for free. (positive)	94 (80.3)	23 (19.7)	0 (0.0)	0 (0.0)	0 (0.0)



statement)	[72.0-87.1]	[12.9-28.0]			
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 <i>after</i> 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	
Moderate Practices	6	5.1	1.9-10.8
Good Practices	111	94.9	89.2-98.1
Total	117		

**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 n (%) [95% CI]	NSIs and Blood & body fluid exposure n (%) [95% CI]	Protective clothing and Gloves 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 known (%)
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)

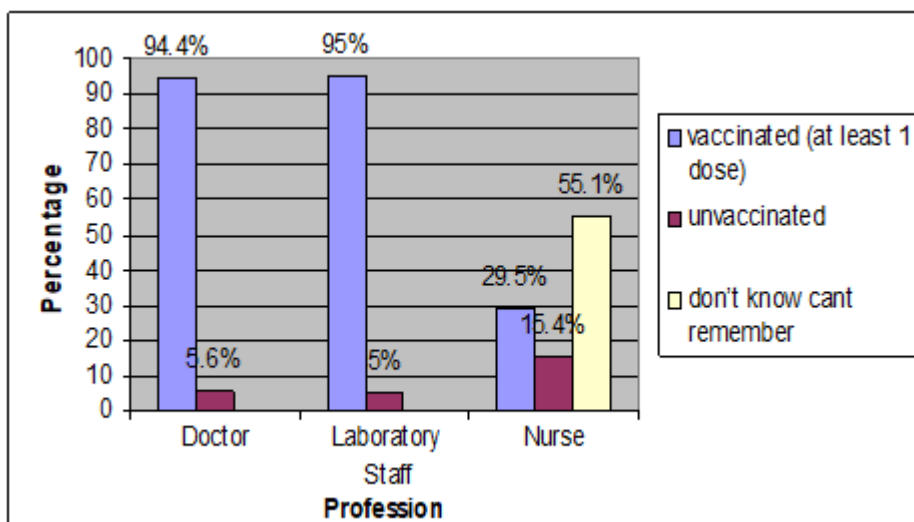


Figure 4.3: Bar Chart showing vaccination uptake of HCWs

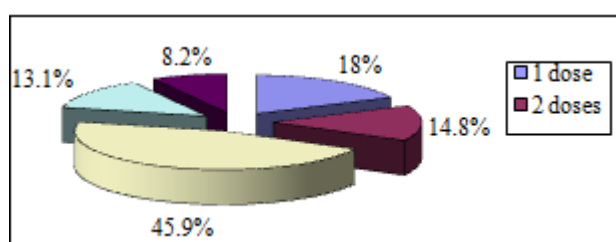


Figure 4.4: Pie chart showing doses of HB vaccine received by HCW

2.2.4.3 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.

2.2.4.4 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]
<i>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)</i>	
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]
<i>Do you place disposable sharps in sharps containers immediately after use?(n=117)</i>	
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]
<i>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)</i>	
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]

<i>Have you ever experienced blood or body fluids (e.g. amniotic fluid or liquor) splashing in your eyes or mouth? (n=115)</i>	
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]
<i>Do you wear protective clothing when handling blood or body fluids? (n=117)</i>	
Always	91 (77.8) [69.2-84.9]
Sometimes	24 (20.5) [13.6-29.0]
Never	2 (1.7) [0.2-6.0]
<i>Do you wear gloves in procedures where there is a possibility of blood or body fluid exposure? (n=117)</i>	
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	

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

Knowledge	Doctors	Laboratory	Nurses n (%)
	n (%) [95% CI]	n (%) [95% CI]	[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)

**2.2.5 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)	Un-vaccinated (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

**2.2.6 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	<b>0.002</b>
	Laboratory	19 (95.0)	1 (5.0)	148.437	8.422	2616.232	<b>0.001</b>
	Nurse*	23 (29.1)	56 (70.9)	1.0			<b>0.001</b>
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

### 3. 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.

### 4. Recommendations

Responsible authorities for Aweil State Hospital are recommended to:

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

### References

- [1] Adebamowo CA, Ajuwon A. Immunisation status and level of knowledge about hepatitis B virus infection among Nigerian surgeons. *West Afr J Med* 1997; 16(2):93-96.
- [2] Adinma ED, Ezeama C, Adinma JI, Asuzu MC. Knowledge and practice of universal precautions against blood borne pathogens amongst house officers and nurses in tertiary health institutions in Southeast Nigeria. *Niger J ClinPract*2009; 12(4):398-402.
- [3] Africa PN. Knowledge, attitudes and practices of health care workers regarding hepatitis B vaccination, in the Ekurhuleni Metro, Gauteng Province. MPH dissertation. University of Limpopo, Medunsa Campus. 2010.
- [4] Alam M. Knowledge, Attitude and Practices among healthcare workers on needle-stick injuries. *Ann Saudi Med* 2002; 22(5-6):396-399.
- [5] Allam MF, Helmy MA, Lucena RA. Serum Hepatitis: Are surgeons and obstetricians putting themselves at risk? *Education for Health* 2003; 16(3):374-377.
- [6] Allain JP, Candotti D, Soldan K, Sarkodie F, Phelps B, Giachetti C, Shyamala V, Yeboah F, Anokwa M, Owusu-Ofori S, Opare-Sem O. The risk of hepatitis B virus infection by transfusion in Kumasi, Ghana. *Transfus Med* 2003; 101(6):2419-2425.
- [7] Allain JP. Occult hepatitis B virus infection. *TransfusClinBiol* 2004; 11(1):18-25.
- [8] Anjum Q, Siddiqui H, Ahmed Y, Usman Y. Knowledge of Students regarding Hepatitis and HIV/AIDS of a private Medical University in Karachi. *JPMA* 2005; 55:285.
- [9] Askarian M, Shaghaghian S, Gillen M, Assadian O. *Arch Iranian Med* 2008; 11(5):515-521.
- [10] Azondo CC, Ehigiator O, Ojo MA. Occupational risks and hepatitis B vaccination status of dental auxiliaries in Nigeria. *Med PrincPract*2010; 19(5):364-366.



- [11] Bamigboye AP, Adesanya AT. Knowledge and Practice of Universal Precautions among Qualifying Medical and Nursing Students: A Case of ObafemiAwolowo University Teaching Hospitals Complex, ILE-IFE. *Res. J. Medicine & Med. Sci* 2006; 1(3):112-116.
- [12] Beltrami EM, Williams IT, Shapiro CN, Chamberland ME. Risk and Management of Blood-Borne Infections in HCWs. *ClinMicrobiol Rev* 2000; 13(3):385-407.
- [13] Boot HJ, van der Waaij LA, Schirm J, Kallenberg CGM, van Steenberghe J, Wolters B. Acute hepatitis in a healthcare worker: A case report of genuine vaccination failure. *J Hepatol* 2009; 50:426-431.
- [14] Bonnani P, Bonaccorsi G. Vaccination against hepatitis B in HCWs. *Vaccine* 2001; 19:2389-2394.
- [15] Boshuizen H.C, Viet A.L, Picavet H.S.J, Botterweck A, van Loon A.J.M (2005): Non-response in a survey of cardiovascular risk factors in the Dutch population: Determinants and resulting biases. *Public Health*; 120(4):297-308.
- [16] Burke S, Madan I. Contamination incidents among doctors and midwives: reasons for non-reporting and knowledge of risks. *Occup Med* 1997; 47(6): 357-360.
- [17] Burnett RJ, François G, Kew MC, Leroux-Roels G, Meheus A, Hoosen AA, Mphahlele MJ. Hepatitis B virus and human immunodeficiency virus co-infection in sub-Saharan Africa: a call for further investigation. *Liver Int* 2005; 25(2):201-213.
- [18] Byskov J, Wouters JS, Sathekge TJ, Swanepoel R. An outbreak of suspected water-borne epidemic non-A non-B hepatitis in northern Botswana with a high prevalence of hepatitis B carriers and hepatitis delta markers among patients. *Trans R Soc Trop Med Hyg* 1989; 83(1):110-116.
- [19] Centre for Disease Control and Prevention. Protection against viral hepatitis; recommendations of the immunisation practices advisory committee. *MMWR* 1990; 39:1-26.
- [20] Centre for Disease Control and Prevention. Public Health Service Inter-Agency Guidelines for Screening Donors of Blood, Plasma, Organs, Tissues, and Semen for Evidence. *MMWR* 1991; 40(RR-4):1-17.
- [21] Collins English Dictionary. 1991. 3<sup>rd</sup> edition. Glasgow. HarperCollins.
- [22] Cutter J, Jordan S. Uptake of guidelines to avoid and report exposure to blood and body fluids. *J Adv Nursing* 2004; 46(4):441-452.
- [23] Dannelun E, Tegnell A, Torner A, Giesecke J. Coverage of hepatitis B vaccination in Swedish healthcare workers. *J Hosp Infect* 2006; 63:201-204.
- [24] De Villiers HC, Nel M, Prinsloo EAM. Occupational exposure to bloodborne viruses amongst medical practitioners in Bloemfontein, South Africa. *SA Fam Pract* 2007; 49(3):14.
- [25] Djeriri k, Laurichesse H, Merle JL, Charof R, Abouyoub A, Fontana L, Benchemsi N, Elharti E, El Aouad R, Chamoux A, Beytout J. Hepatitis B in Moroccan HCWs. *Occup Med* 2008; 58(6):419-424.
- [26] El-Awady MY. Hepatitis B vaccination rates among medical personnel at Ain Shams University Hospital and obstacles to vaccine uptake. *J Egypt Public Health Assoc* 1998; 73(5-6):519-537.
- [27] Elmiyeh B, Whitaker S, James MJ, Chahal CAA, Galea A, Alshafi K. Needle stick injuries in the National Health Service: A culture of silence. *J R Soc Med* 2004; 97:326-327.
- [28] Elmiyeh B, Whitaker S, James MJ, Chahal CAA, Galea A, Alshafi K. Needle-stick injuries in the National Health Service: a culture of silence. *J R Soc Med* 2004; 97(7):326-327.
- [29] Fatusi AO, Fatusi OA, Esimai AO, Onayade AA, Ojo OS. Acceptance of hepatitis B vaccine by workers in a Nigerian teaching hospital. *East Afr Med J* 2000; 77(11):608-612.
- [30] Ferguson KJ, Waitzkin H, Beekmann SE, Doebbeling. Critical incidents of nonadherence with standard precautions guidelines among community hospital-based HCWs. *J Gen Intern Med* 2004; 19(7):726-731.
- [31] Firnhaber CS, Ive P. Hepatitis B and HIV co-infection in South Africa: just treat it! *SA J HIV Med* 2009; 10(1):10-14.
- [32] FitzSimons D, François G, De Carli G, Shouval D, Prüss-Üstün A, Puro V, Williams I, Lavanchy D, De Schryver A, Kopka A, Ncube F, Ippolito G, Van Damme P: Hepatitis B virus Hepatitis C virus and other blood borne infections in healthcare workers: guidelines for prevention and management in industrialised countries. *Occup Environ Med* 2008; 65:446-451.
- [33] François G, Dochez C, Mphahlele MJ, Burnett R, Van Hal G, Meheus A. Hepatitis B vaccination in Africa: mission accomplished? *South Afr J Epidemiol Infect* 2008; 23 (1):24-28.
- [34] Ganczak M, Milona M, Szych Z. Nurses and occupational exposures to bloodborne viruses in Poland. *Infect Control Hosp Epidemiol* 2006; 27(2):175-180.
- [35] Gessesew A, Kahsu A. Occupational exposure of health workers to blood and body fluids in six hospitals of Tigray region (August 1-30, 2006): magnitude and management. *Ethiop Med J* 2009; 47(3):213-219.
- [36] Gunson RN, Shouval D, Roggendorf M, Zaaier H, Nicholas H, Holzmann H, de Schryver A, Reynders D, Connell J, Gerlich WH, Marinho RT, Tsantoulas D, Rigopoulou E, Rosenheimm M, Vallam D, Puro V, Struwe J, Tedder R, Aitken C, Alter M, Schalm SW, Carman WF. Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections in health care workers (HCWs): guidelines for prevention of transmission of HBV and HCV from HCW to patients. *J Clin Virol* 2003; 27:213-230.
- [37] Gurubacharya DL, Mathura KC, Karki DB. Knowledge attitudes and practices among HCWs on needle stick injuries. *Kathmandu Univ Med J* 2003; 1(2):91-94.
- [38] Halpern SD, Asch DA, Shaked A, Stock P, Blumberg EA. Inadequate Hepatitis B Vaccination and Post-Exposure Evaluation among Transplant Surgeons. *Ann Surg* 2006; 244(2):305-309.
- [39] Helfgott AW, Taylor-Burton J, Garcini FJ, Eriksen NL, Grimes R. Compliance with Universal

- Precautions: Knowledge and Behaviour of Residents and Students in a Department of Obstetrics and Gynaecology. *Infect Dis ObstetGynecol* 1998; 6(3):123-128.
- [40] Hou J, Liu Z, Gu F. Epidermiology and prevention of Hepatitis B virus Infection. *Int J Med Sci*2005; 2:50-57.
- [41] Hussain S, Patrick NA, Shams R. Hepatitis B and C Prevalence and Prevention, Awareness among Healthcare workers in a Tertiary Hospital. *IJP* 2010; 8(1):16-21.
- [42] Ibekwe RC, Ibeziako N. Hepatitis B vaccination status among health workers in Enugu, Nigeria. *Niger J ClinPract*2006; 9(1):7-10.
- [43] Ibeziako SN, Ibekwe RC. Knowledge and practice of universal precautions in a tertiary health facility. *Niger J Med* 2006; 15(3):250-254.
- [44] Ismail NA, AboulFtouh AM, El Shoubary WH. Safe injection practices among HCWs, Gharbiya, Egypt. *J Egypt Public Health Assoc* 2005; 80(5-6):563-583.
- [45] Jadoon NA, Shehzad MA, Yaqoob R, Raza A, Hussain MI. Hepatitis B vaccination Status of healthcare at a tertiary care hospital in Multan. *NMJ* 2009; 1(1): 23-27.
- [46] Janjua NZ, Razaq M, Chandir S, Rozi S, Mahmood B. Poor knowledge- predictor of non-adherence to universal precautions for blood borne pathogens at first level care facilities in Pakistan. *BMC Infect Dis* 2007; 7:81.
- [47] Jayaraman S, Chalabi Z, Perel P, Guerriero C, Roberts I. The risk of transfusion-transmitted infections in sub-Saharan Africa. *Transfussion*2010; 50(2):433-442.
- [48] Jeffe DB, Mutha S, Kim LE, Evanoff BA, L'Ecuyer PB, Franser VJ. Does clinical experience affect medical students' knowledge, attitudes, and compliance with universal precautions? *Infect Control HospEpidemiol* 1998; 19(10):767-771.
- [49] Jepsen LS, Thomsen AC. Attitudes of hospital personnel to the risk of hepatitis B and vaccination: A questionnaire study. *UgeskerLaeger* 1994; 156(38):5514-5518.
- [50] Joardar GK, Chatterjee C, Sadhukhan SK, Chakraborty M, Das P, Mandal P. Needle stick Injuries among nurses involved in patient care: A study in two Medical College Hospitals of West Bengal. *Indian J Public Health* 2008; 52(3):150-152.
- [51] Kabir A, Tabatabaei SV, Khaleghi S, Agah S, Kashani AHF, Moghimi M, Kerahroodi FH, Alavian SH, Alavian SM. Knowledge, Attitudes and Practice of Iranian Medical Specialists regarding Hepatitis B and C *Hepat Mon* 2010; 10(3):176-182.
- [52] Kamolratanakul P, Ungtavorn P, Israsena S, Sakulramrung R. The influence of dissemination of information on the changes of knowledge, attitudes and acceptance of hepatitis B vaccination among hospital personnel in Chulalongkorn Hospital. *Public Health* 1994; 8(1):45-53.
- [53] Kane A, Lloyd J, Zaffran M, Simonsen L, Kane M. Transmission of hepatitis B, hepatitis C and human immunodeficiency virus through unsafe injections in the developing world: Model based regional estimates. *Bull World Health Organ* 1999; 77(10):801-807.
- [54] Kane M, Banatvala J, Da Villa G, Esteban R, Franco E, Goudeau A, Grob P, Jilg W, Rizzetto M, Van Dame P, Van Hattum J, West D, Zuckerman J. Are booster immunisations needed for lifelong hepatitis B immunity? *Lancet* 2000; 355:561-565.
- [55] Kelly S. Needle-Stick Reporting Among Surgeons. *Ann R CollSurgEngl* 2009; 91(5):443-444.
- [56] Kerr H, Stewart N, Pace A, Elsayed S. Sharps injury reporting amongst surgeons. *Ann R CollSurgEngl* 2009; 91:430-432.
- [57] Kermonde M. Unsafe injections in low-income country health settings: need for injection safety promotion to prevent the spread of blood borne viruses. *Health PromotInt* 2004; 19(1):95-103.
- [58] Kew MC. Progress towards the comprehensive control of hepatitis B in Africa: a view from South Africa. *Gut* 1996; 38(suppl2):s31-s36.
- [59] Khan N, Ahmed SM, Khalid MM, Siddiqui SH, Merchant AA. Effect of gender and age on the knowledge, attitude and practice regarding hepatitis B and C and vaccination status of hepatitis B among medical students of Karachi, Pakistan. *J Pak Med Assoc* 2010; 60(6):450-455.
- [60] Kiire CF. The epidemiology and prophylaxis of hepatitis B in sub-Saharan Africa: a view from tropical and subtropical Africa. *Gut* 1996; 38(suppl 2):s5-s12.
- [61] Klein HG, Spahn DR, Carson JL. Red blood cell transfusion in clinical practice. *The Lancet* 2007; 370(9585):415-439.
- [62] Ko NY, Yeh SH, Tsay SL, Pan SM, Feng MC, Chiang MC, Lee YW, Chang L H, Jang JF. Adherence to management after occupational exposure to blood borne pathogen among healthcare workers in Taiwan: *Am J Infect Control* 2009; 37(7):609-611.
- [63] Kotwal A Taneja DK. Healthcare workers and universal precautions: perceptions and determinants of non-compliance. *Indian J Community Med* 2010; 35:526-528.
- [64] Kosgeroglu N, Ayrand U, Vardareli E, Dicer S. Occupational exposure to hepatitis infection among Turkish nurses: frequency of needle exposure, sharps injuries and vaccination. *Epidemiol Infect* 2004; 132(1):27-33.
- [65] Laraqui O, Laraqui S, Laraqui S, Tripodi D, Ouazzani LC, Caubet A, Verger C, LaraquiCel H. Evaluation of knowledge, attitudes and practices in the healthcare setting in Morocco with regard to hepatitis B and C. *SantePublique* 2009; 21(3):271-286.
- [66] Lee DJ, Carrilo L, Flemming L. Epidemiology hepatitis B vaccine acceptance among urban paramedics and emergency medical technicians. *Am J Infect Control* 1997; 25(5):421-423.
- [67] Leliopoulou C, Waterman H, Charkrabarty S. Nurses failure to appreciate risks of infection due to needle stick accidents: a hospital based survey. *J Hosp Infect* 1999; 42:53-59.
- [68] Lukhwareni A, Burnett RJ, Selabe SG, MzileniMO and Mphahlele MJ. Increased detection of HBV DNA in HBsAg-positive and HBsAg-negative South

- African HIV/AIDS patients enrolling for highly active antiretroviral therapy at a tertiary hospital. *J Med Virol* 2009; 81(3):406-412.
- [69] MacGrane J, Staines A. Nursing staff knowledge of the hepatitis B virus including attitudes and acceptance of hepatitis B vaccination: development of an effective program. *AAOHN* 2003; 51(8):347-352.
- [70] Makary MA, Al-Attar A, Holzmüller CG, Sexton JB, Syin D, Gilson MM, Sulkowski MS, Pronovost PJ. Needle stick injuries among surgeons in training. *N Engl J Med* 2007; 356:2693-2699.
- [71] Mengal H, Howteerakul N, Suwannapong N, Rajatanum T. Factors relating to acceptance of hepatitis B vaccination by nursing students in a Tertiary Hospital, Pakistan. *J Health Popul Nutr* 2008; 26(1):46-53.
- [72] Ministry of Health Botswana. Caring for Health workers: A National Strategy for Botswana. 2006. <http://www.hiv.gov.bw/uploads/Caring%20for%20Health%20Workers,%20A%20National%20Strategy%20for%20Botswana%20NA%20Report.pdf>. Accessed 13/03/2011
- [73] Ministry of Health Botswana. Report of the Auditor General on Clinical waste Management at Referral Hospitals, Princess Marina, Nyangabwe and Lobatse Mental Hospital, 2007. [http://www.environmental-auditing.org/Portals/0/AuditFiles/ENG\\_Full\\_Botswana\\_waste\\_report.pdf](http://www.environmental-auditing.org/Portals/0/AuditFiles/ENG_Full_Botswana_waste_report.pdf). Accessed 13/03/2011.
- [74] Moghimi M, Marashi AS, Kabir A, Taghipour HR, Faghihi-Kashani AH, Ghoddoosi I, Alavian SM. Knowledge, Attitude, and Practice of Iranian Surgeons About Blood-Borne Diseases. *J Surg Res* 2008; 151(1):80-84.
- [75] Moloughney BW. Transmission and post exposure management of blood borne virus infections in the healthcare setting: Where are we now? *CMAJ* 2001; 165(4):445-451.
- [76] Motamed N, BabaMahmoodi F, Khalilian A, Peykanheirati M, Nozari M. Knowledge and practice of healthcare workers and medical students towards universal precautions in hospitals in Mazandaran Province. *East Mediterr Health J* 2006; 12(5):653-661.
- [77] Mphahlele MJ, Francois G, Kew M, van Damme P, Hoosen AA, Meheus A. Epidemiology and control of hepatitis B: Implications for Eastern and Southern Africa. *SAJEI* 2002; 17(1,2):12-17.
- [78] Muralidhar S, Singh PK, Jain RK, Malhotra M, Bala M. Needle stick injuries among health care workers in a tertiary care hospital of India. *Indian J Med Res* 2010; 131:405-410.
- [79] Mwaniki NK. Needle-stick injuries among HCWs in Botswana public hospitals, 4<sup>th</sup> IAS Conference on HIV Pathogenesis, Treatment and Prevention 22-25 July 2007 Sydney, Australia.
- [80] Norsayani MY, Hassim IN. Study on the Incidence of Needle Stick Injury and the Factors Associated with this Problem among Medical Students. *J Occup Health* 2003; 45:172-178.
- [81] Okaro AO, Eze CU, Ohagwu CC. Awareness, Knowledge, Attitude and Practice of Blood and Body Fluid Precautions among Radiographers in Enugu, Nigeria. *African J of Basic & Appl Sci* 2009; 2(1-2):11-17.
- [82] Okeke EN, Ladep NG, Aqaba EI, Malu AO. Hepatitis B vaccination status and needle stick injuries among medical students in a Nigerian university. *Niger J Med* 2008; 17(3):330-332.
- [83] Paul T, Maktabi A, Almas K, Saeed S. Hepatitis B awareness and attitudes amongst dental healthcare workers in Riyadh, Saudi Arabia. *Odontostomatol Trop* 1999; 22(86):9-12.
- [84] Phillips EK, Owusu-Ofori A, Jagger J. Blood Borne Pathogen Exposure Risk among Surgeons In sub-Saharan Africa. *Infect Control HospEpidemiol* 2007; 28:1334-1336.
- [85] Plank RM, Makhema J, Kebaabetswe P, Hussein F, Lesetedi C, Halperin D, Bassil B, Shapiro R, Lockman S. Acceptability of Infant Male Circumcision as Part of HIV Prevention and Male Reproductive Health Efforts in Gaborone, Botswana, and Surrounding Areas. *AIDS Behav* 2010; 14(5):1198-1202.
- [86] Puro V, De Carli G, Cicalini S, Soldani F, Balslev U, Begovac, Boaventura L, Martí MC, Navarrete MJH, Kammerlander R, Larsen C, Lot F, Lunding S, Marcus U, Payne L, Pereira AA, Thomas T, Ippolito G. European recommendations for the management of HCWS occupationally exposed to hepatitis B virus and hepatitis C virus. *Eurosurveillance* 2005; 10(10).
- [87] Rabenau H, Schutz R, Berger A, Doerr HW, Weber B. How accurate is serologic testing of plasma pools for hepatitis B virus surface antigen, anti-human immunodeficiency virus 1 and 2, and anti-hepatitis C virus? *InfusionstherTransfusionmed* 1996; 23(3):124-130.
- [88] Rampal L, Zakaria R, Sook LW, Zain AM. Needle Stick and Sharps Injuries and Factors Associated Among Health Care Workers in a Malaysian Hospital. *Eur J SocSci* 2010; 13(3):354-362.
- [89] Razi A, Rehman R, Naz S, Ghafoor F, Khan MAU. Knowledge attitudes and practices of University students regarding hepatitis B and C. *JABS* 2010; 5(4):38-43.
- [90] Robotin M, Mathews G. All you wanted to know about hepatitis B: A guide for primary care givers. 1<sup>st</sup> ed. Australia. Australasian Society for HIV Medicine, the Cancer council, 2008.
- [91] Sadoh WE, Fawole AO, Sadoh AE, Oladimeji AO, Sotiloye OS. Practice of Universal Precautions among healthcare. *J Natl Med Assoc* 2006; 98(5):722-726.
- [92] Saini R, Saini S, Sugandha RS. Knowledge and awareness of hepatitis B infection among students of Rural Dental college, Maharashtra, India. *Ann Nigerian Med* 2010; 4:18-20.
- [93] Salehi AS, Garner P. Occupational injury history and universal precautions awareness: a survey in Kabul hospital staff. *BMC Infect Dis* 2010; 10:19.
- [94] Samuel SO, Aderibigbe SA, Salami TAT, Babatunde OA. Health worker's knowledge, attitudes and behaviour towards hepatitis B infection in Southern Nigeria. *Int J Med Sci* 2009; 1(10):418-424.
- [95] Satekge MM. Knowledge, attitudes and practices of health care workers regarding the prevention of HBV infections, in final year student nurses in Gauteng



- Province. MPH dissertation. University of Limpopo, Medunsa Campus. 2010.
- [96] Shah R, Mehta HK, Fancy M, Nayak S, Donga BN. Knowledge and awareness regarding needle-stick injuries among healthcare workers in tertiary care hospital in Ahmedabad, Gujarat. *National Journal of Community Medicine* 2010; 1(2).
- [97] Sheikh NH, Hasnain S, Majrooh A, Tariq M, Maqbool H. Status Of Hepatitis B Vaccination Among The HCWS Of a Tertiary Hospital, Lahore. *Biomedica* 2007; 23:17-20.
- [98] Siddique K, Mirza S, Tauqir SF, Anwar I, Malik AZ. Knowledge attitude and practices regarding needle stick injuries amongst healthcare providers. *Pak Journal Surg* 2008; 24(4).
- [99] Simard EP, Miller JT, George PA, Wasley A, Alter MJ, Bell BP, Finelli L. Vaccination coverage levels among HCWs in the United States, 2002-2003. *Infect Control HospEpidemiol* 2007; 28:783-790.
- [100] Simonsen L, Kane A, Lloyd J, Zaffran M, Kane M. Unsafe injections in the developing world and transmission of blood borne pathogens: a review. *Bull World Health Organ* 1999; 77(10):789-800.
- [101] Sofola OO, Folayan MO, Denloye OO, Okeigbemen SA. Occupational exposure to bloodborne pathogens and management of exposure incidents in Nigerian dental schools. *J Dent Educ* 2007; 71(6):832-837.
- [102] Sofola OO, Uti OG. Hepatitis B virus infection and prevention in the dental clinic: knowledge and factors determining vaccine uptake in a Nigerian dental teaching hospital. *Nig Q J HospMed* 2008; 18(3):145-148.
- [103] Stein AD, Makarawo TP, Ahmad AFR. A survey of doctors' nurses' knowledge, attitudes and compliance with infection control guidelines in Birmingham teaching hospitals. *J HospInfect* 2003; 54:68-73.
- [104] Taegtmeier M, Suckling RM, Nguku PM, Meredith C, Kibaru J, Chakaya JM, Muchela H, Gilks CF. Working with risk: occupational safety issues among healthcare workers in Kenya. *AIDS Care* 2008; 20(3):304-310.
- [105] Talaat M, Kandeel A, El-Shoubary W, Bodenschatz C, Khairy I, Oun S, Mahoney FJ. Occupational exposure to needle stick injuries and hepatitis B vaccination coverage among healthcare workers in Egypt. *AJIC* 2003; 31(8):469-474.
- [106] Tetali S, Choudhury PL. Occupational exposure to sharps and splash: Risk among healthcare providers in three tertiary hospitals in Southern India. *Indian J Occup Environ Med* 2006; 10:35-40.
- [107] Thomas WJC, Murray JRD. The Incidence and Reporting Rates of Needle-Stick Injury amongst UK Surgeons. *Ann R CollSurgEngl* 2009; 91(1):12-17.
- [108] Tibdewal H, Barad P, Kumar S. Comparing Dental and Medical student's knowledge and attitudes toward Hepatitis B and C and HIV patients in India-A cross sectional study. *J Int Oral Health* 2009; 1:20-32.
- [109] Topuridze M, Butsashvili M, Kamkamidze G, Kajaia M, Morse D, McNutt LA. Barriers to hepatitis B vaccine coverage among healthcare workers in the Republic of Georgia: An International perspective. *Infect Control HospEpidemiol* 2020; 31(2):158-164.
- [110] Uti OG, Sofola OO. Hepatitis B virus infection and prevention in the dental clinic: knowledge and factors determining vaccine uptake in a Nigerian dental teaching hospital. *Nig Q J Hosp Med* 2008; 18(3):145-148.
- [111] Utomi IL. Attitudes of Nigerian Dentists towards hepatitis B vaccination and use of barrier techniques. *WAJM* 2005; 24(3):223-226.
- [112] Varghese GM, Abraham OC, Mathai D. Post-exposure prophylaxis for blood borne viral infections in healthcare workers. *Postgrad Med J* 2003; 79:324-328.
- [113] Van Damme P, Kane M, Meheus A. Integration of hepatitis B vaccination into national immunisation programmes. *BMJ* 1997; 314(7086).
- [114] Vardas E, Ross MH, Sharp G, McAnerney J, Sim J. Viral hepatitis in South African healthcare at increased risk of occupational exposure to blood-borne viruses. *J Hosp Infect* 2002; 50(1):6-12.
- [115] Vaz K, McGrowder D, Alexander-Lindo R, Gordon L, Brown P, Irving R. Knowledge, Awareness and Compliance with Universal Precautions among healthcare workers at the University of West Indies, Jamaica. *IJOEM* 2010; 1(4).
- [116] Viral Hepatitis. *Viral Hepatitis Prevention Board* 2005; 1(14).
- [117] Wester CW, Bussmann H, Moyo S, Avalos A, Gaolathe T, Ndwapi N, Essex M, MacGregor RR, Marlink RG. Serological Evidence of HIV-Associated Infection among HIV-1-Infected Adults in Botswana. *Clin Infect Dis* 2006; 43(12):1612-1615.
- [118] Williams A. How to write and analyse a questionnaire. *J Orthod* 2003; 30(3):245-252.
- [119] Williams CO, Campbell S, Hendry K, Collier P. Variables influencing worker compliance with universal precautions in the emergency department. *Am J Infect Control* 1994; 22(3):177-178.
- [120] World Health Organisation. "First do no harm" Introducing auto disposable syringes and ensuring injection safety in immunisation systems of developing countries. <http://www.who.int/vaccines-documents/DocsPDF02/www704.pdf>. Accessed 05/03/2011
- [121] World Health Organisation. Hepatitis Department of Communicable Diseases Surveillance and Response. 2002. [http://www.who.int/csr/disease/hepatitis/HepatitisB\\_who.cdscsrlyo2002\\_2.pdf](http://www.who.int/csr/disease/hepatitis/HepatitisB_who.cdscsrlyo2002_2.pdf). Accessed 05/03/2011
- [122] World Health Organisation. Screening Donated Blood for Transfusion Transmissible Infections. 2010. <http://www.who.int/bloodsafety/ScreeningDonatedBloodforTransfusion.pdf>. Accessed 05/03/2011
- [123] Yap PL. Transfusion transmitted viral infections-recent developments in blood donor screening. *Postgrad Med J* 1990; 66:906-909.
- [124] Zafar A, Aslam N, Nasir N, Meraj R, Mehraj V. Knowledge, attitudes and practices of health care workers regarding needle stick injuries at a tertiary care hospital in Pakistan. *J Pak Med Assoc* 2008; 58(2):57-60.
- [125] Ziraba AK, Bwogi J, Namale A, Wainaina CW, Mayanja-Kizza H. Sero-prevalence and risk factors for hepatitis B virus infection among HCWs in a



tertiary hospital in Uganda. *BMC Infect Dis* 2010; 10:191.

- [126] Zungu LI, Sengane ML, Setswe KG. Knowledge and experiences of needle prick injuries among nursing students at a university in Gauteng, South Africa. *SA FamPract* 2008; 50(5):48.

## Author Profile

**Amin Gordiano Okwahi Tafeng** earned the BSc, MSc. &PhD degrees in Public Health from Upper Nile University, Gezira and AIU University. During 2006-2011, He works at Ministry of Health, University of Bahri, Kampala and Gezira University, 2012-2020. Now associate professor at Kampala University –South Sudan.

**Dr. Jack Rosenzweig- PhD** Advisor Atlantic International University Faculty of Social and Human Studies- Honolulu, Hawaii, Miami City.

**Linda Collazo-** Tutor; Atlantic International University Faculty of Social and Human Studies- Honolulu, Hawaii, Miami City.