Comparison of Hospital Waste Management by Health Care Workers In Two Selected (Private And Public) Hospitals In Enugu, South East Nigeria

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Abstract: Aim: To compare the management of hospital waste by health care workers in two selected (private and public) hospitals in Enugu, South East Nigeria. Method: A total of 245 health care workers aged between 20-50years working at the Enugu state university teaching hospital (public) and Ntasi-Obi Ndi no na Afufu specialist hospital (Private), both in Enugu, were seen within the period March and August 2017. Their age, sex, duration of work in the hospital and profession were taken. Their methods of management of hospital waste were assessed using questionnaires and oral interviews. The results were compared using chi-square (X^2) test to determine if there were any significant differences. Result: Using the x^2 test , the following results were obtained; Age- X^2= 23.780, P-value=0.00; Religion- X^2= 0.6528, P-value=0.419; Duration of work in the hospital; X^2=7.718,Pvalue=0.102; Profession X^2=7.718,P-value=0.103; Categorization of hospital waste - X^2= 0.2834, P-value=0.9919; Segregation of hospital waste X^2=23.80, P-value= 0.00; Color-coding of hospital waste X^2=11.8416, P-value=0.0186; Personal protection in handling of hospital waste- X^2=16.6083, P-value=0.001; Correct disposal of hospital waste- X^2=66.173, P-value= 0.000. There was a significant difference between the age distribution of respondents (P<0.05) in the private and public hospitals while there were no significant differences between religious disposition, duration of work in the hospitals, profession and categorization of hospital waste (P>0.05). Again there were significant differences between their methods of segregation of hospital waste, color-coding of hospital waste, personal protection in handling of hospital waste and correct disposal of hospital waste. Conclusion: There was a significant difference between the management of hospital waste by health care workers in the private and public health facilities as evidenced by the segregation, color-coding, personal protection and correct disposal of hospital waste. This could be attributed to the fact that the public hospitals have more resources for the training and retraining of their health workers and they also employ staff with better skills. We advocate the availability of strong management policy guidelines, training and retraining of health care workers and provision of better facilities for hospital waste management more especially in the private health facilities. This is more indicated in this era of HIV/AIDS where poor handling of hospital waste could lead to infection by the Human Immunodeficiency -virus. [Onoh L, Natl J Integr Res Med, 2018; 9(4):55-61]

Key Words: Hospital waste management, Health care workers, Public and Private Hospitals, Enugu, South-east Nigeria

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Introduction: Health Care wastes are by-products of health care activities. The generation of hospital waste (both hazardous and non-hazardous) is an environmental risk to health care workers, the public and the environment at large. There are various estimates regarding hazardous and non-hazardous constituents of hospital waste. World Health Organization (WHO) related reports indicate that about 85% of hospital wastes are non-hazardous, 10% are infectious, (biologically hazardous) and the remaining 5% are toxic chemicals, pharmaceuticals, and radioactive wastes[1]. This estimate is not consistent for many developing countries. The proportion of hazardous waste varies from country to country; Pakistan 20%, Nigeria 26.5%, Bangladesh 36.03%, and about 50% in urban health centers in Tanzania[2]. The WHO estimates that each year there are about 8 to 16 million new cases of Hepatitis B virus infection, 2.3-4.7 million cases of Hepatitis C and 80,000 to 160,000 new cases of the Human Immunodeficiency virus due to unsafe injections and very poor waste management systems[3]. The generation of hospital waste has risen sharply in developing countries in recent years mainly as a result of rapid population which leads to increased demand for health services. Health care waste constitute serious public health problems but fortunately there are reasonable ranges of technologies available for the management of health care waste that may be appropriate for use in developing counties. WHO assessment conducted in 22developing countries showed that the proportion of health care facilities that do not use proper waste disposal methods ranges from 18% to 64% [4]. Medical waste must be separated

from municipal waste, but in many parts of Africa it tends to be collected along with the rest of the waste stream[5].

The most important part of Hospital waste management is the segregation of medical waste and this should be performed within the premises of the hospital by healthcare workers at the point of generation. In an effort to reduce infections among health care workers and the entire community, the Ministry of Health and Social Services clearly stipulated in the Infection Prevention Control Guidelines how segregation of wastes should be carried out. Biological waste are pathological and thus should be disposed of in yellow plastic bags with biohazard symbol and sent for incineration. Household waste refers to items such as paper, plates and other waste products which are disposed of in black plastic bags and afterwards taken to municipal landfills waste sites[6.]. Furthermore, soiled linens are segregated in yellow plastic bags, sealed, and sent to the hospitals laundry in white cloth bags, while sharps are put in a safety container designed for that purpose. Blood, tissues and human parts are disposed of in red bags.

Cleaners in all instances are responsible for collecting all plastic bags from the point of collection in the wards to the hospital cages outside the wards while awaiting final disposal. Removal from the hospital is done by the local authority and private contractors. Most Healthcare workers in developing countries are not aware of the proper management of health care wastes and adequate and effective waste management facilities are absent in many health facilities. It has also been found that some health workers even earn some money by selling used syringes and other medical wastes. Most tertiary hospitals dispose of their wastes at the nearest municipal dustbins together with domestic wastes, posing a great health risk to municipal workers, the public and the environment. However segregation of waste at the point of generation is minimal. The health staff in developing countries lack knowledge about the transmission of hospital acquired infections caused by poor handling of healthcare waste due to poor attitude of staff towards hospital discipline, and improper training of staff on Healthcare waste management (HCWM). According to WHO, the correct management of health-care waste is the responsibility of the person who produces each waste item[7]. The WHO recommends the segregation of HCW preferably at the source of production and provides guidelines for the safe and sound management of medical waste in developing countries[8].

The use of instructive posters and color code bins are very important to achieve effective segregation of waste. Meanwhile, the health-care facility management is responsible for making sure there is a suitable segregation, transportation, storage and disposal system, and that all staff adheres to the correct procedures. The use of instructive posters and color code bins are very important to achieve effective segregation of waste. Hagen, Al-Humaidi. & Blake in their study of infectious waste in Saudi Arabia hospital has also reported the importance of providing instructive posters as a tool to promote effective segregation of healthcare waste[9]. The WHO in their study noted that the lack of HCW management manual and hospital policy on HCW management are likely to be responsible for a low awareness of healthcare workers on HCW management[10].

The attitude of health care workers could influence the way they manage wastes. Health care workers' negative attitude in hospitals might be triggered by poor working circumstances such as poor leadership and management, shortage of health care workers, overcrowded wards, poor communication and uncooperative behavior among some health care workers. The findings of the studies in developing countries like India suggest that the hospital waste management program cannot successfully be implemented without the willingness and cooperation of the health professionals[11]**.** It was concurred that for health care workers to have correct attitude and practice regarding hospital waste management, there should be a continuing training program along with the monitoring of those practices, so that it leads to a safe protected biohazard free environment[12]**.** A study done in Pakistan has revealed that poor safety, insufficient budget, lack of trainings, weak monitoring and supervision, and poor coordination has eventually resulted in improper waste management [13]**.**

So far there is no documented research on hospital waste management by health care workers in the health facilities in this community and that is why the study was thought necessary. The present study is aimed at comparing hospital waste management by

health care workers in two (private and public) hospitals in Enugu, South East Nigeria.

Methods: This study comprised of 245 health care workers of various categories working at Enugu State University Teaching Hospital, Parklane, (Public) and Ntasi-Obi Ndi no n'afufu hospital Trans Ekulu (private) all in Enugu State within the period March to August 2017. The studied hospitals provide general medical, surgical, pediatric, and maternity and a range of specialist services. The public hospital is among the largest and leading healthcare institutions in Enugu and was selected, using simple random sampling method out of the five (5) general hospitals owned by State government. One (1) private hospital was also selected out of the two hundred (200) private hospitals in Enugu using the same (simple random) sampling method. The selected private hospital serves the low-income, middle-income and high-income earners in Enugu State. The total population of health workers who were qualified for the study was approximately 625 out of which a sample of 245 was selected using the following formula;

S = $\frac{N}{1+N(a)^2}$

Where

S=sample size

N=Population size

a= level of significance = **0.05**

1= constant

S= $\frac{625}{1+625(0.05)2}$ **= 244.14**

Therefore minimum sample size is **245**.

The participants are those who must have worked in the hospital for at least 6 months and may be working in any of the following areas of the hospital; medical, surgical, gynecology, theatre, blood bank, hematology, pediatrics, intensive care unit, chemical pathology, histopathology and HIV/AIDS care unit and pharmacy. After obtaining permission from the hospital authorities, a questionnaire was administered to 245 participants who were selected from the total population by the use of systematic random sampling method. The questionnaires were divided into five sections socio demographic section, assessment of appropriate waste categorization by Respondents, generation and segregation of medical wastes, color coding of medical waste and general assessment of knowledge, attitude and practice of waste management. In the process of conducting this research, a cross sectional survey research design was used. This design was chosen because it gives information about the study and also helps in achieving objectivity, efficiency and reliability within the shortest possible time.

Statistical analysis: The data was analyzed quantitatively. The completed questionnaires were checked for consistency, accuracy and completeness. Data analysis was done using SPSS version 20. To compare the different variables in the management of health care waste by health workers in the two health facilities Chi-square test was employed.

Results: During the period of this study, a total of 245 health care workers were assessed using a self-administered questionnaire. The mean ages of all respondents were 31.8, mode 29.7 and median 31.1 there was a significant difference between the method of management of hospital waste in the public and private hospitals (P=0.00). The respondents included Doctors, Nurses, Laboratory Scientists, Pharmacists and Domestic workers. The proportions of respondents in the **Private Hospital** were as follows: doctors 18%, nurses 52%, Laboratory Scientists 12%, pharmacists 10% and domestic workers 8% while in the **State Hospital** the proportion of respondents were as follows: doctors 28.6%, nurses 26.2%, Laboratory Scientists 18.6%, pharmacists 14.8% and domestic workers 11.9%. There was no significant difference (**p value =0.103**) noted in the study for the Professions in both hospitals.

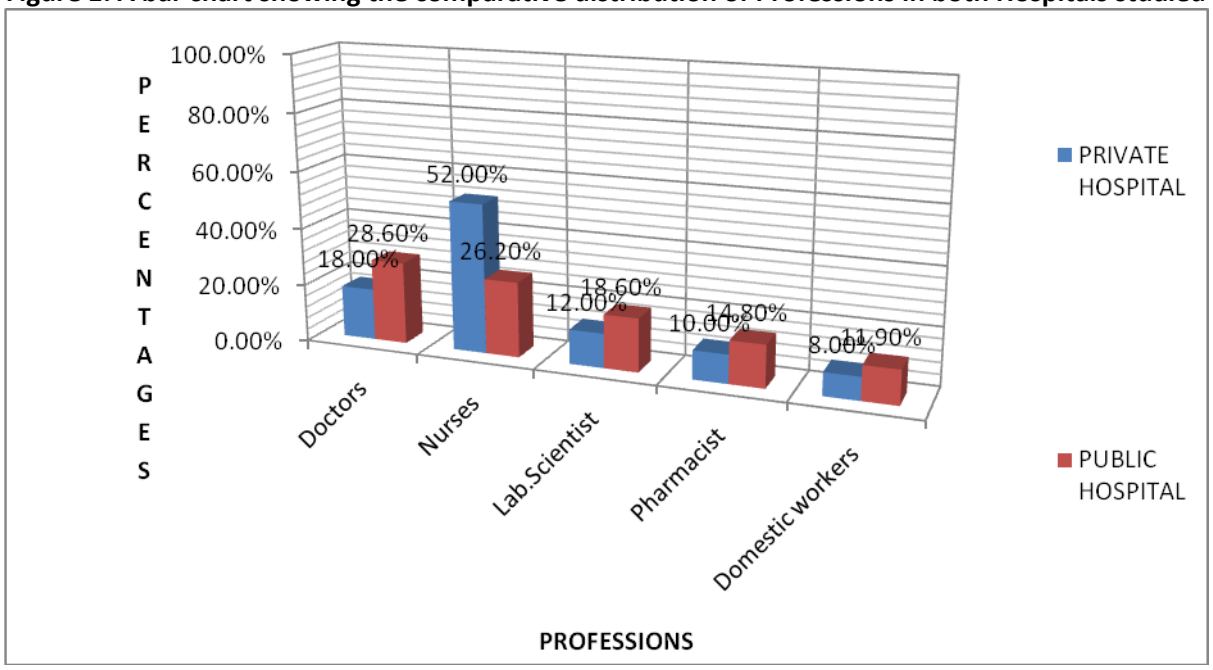
Table 1: showing respondents knowledge on categorization of medical waste

	Private hospital	Percentage (private)	State hospital	Percentage (state)	X^2	P value
General waste	45	90.0	180	85.7		
Infectious	5	10.0	16	7.6		
Pathological	0	0.0	4	1.9		
Radioactive	0	0.0	0	0.0	0.2834	0.9919
Sharps	0	0.0	4	1.9		
Pharmaceutical	0	0.0	6	2.9		
Chemical	0	0.0				

90% of respondents in the Private Hospital had a knowledge of what constitutes general waste and 10% infectious waste while in the State Hospital 85.7% had knowledge of general waste, 7.6% infectious waste, 1.9% pathological waste, 1.9% sharps and 2.9% pharmaceutical waste. There was no significant difference (p value =0.991) noted in this category for both Hospitals in this study (See table 1).

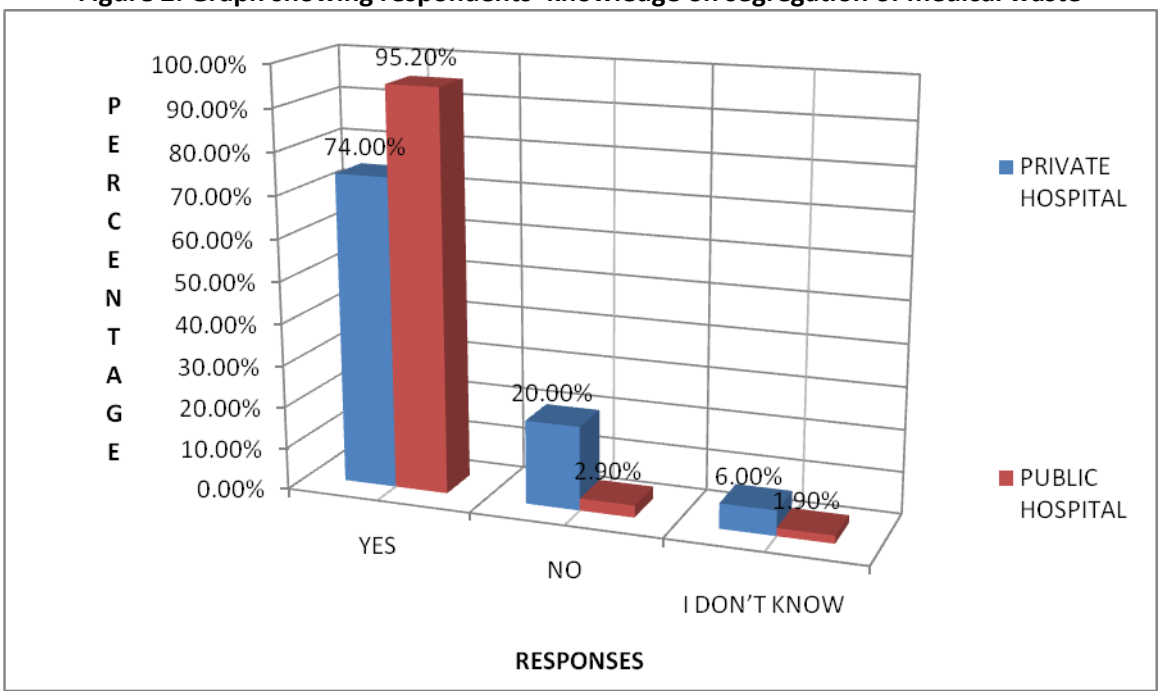
Next the respondents were assessed on whether or not medical waste should be segregated and the result is shown below;

Figure 1: A bar chart showing the comparative distribution of Professions in both Hospitals studied



The respondents were assessed on their knowledge of the categorization of waste. The respondents were expected to categorize different wastes as either general waste, infectious, pathological, radioactive, sharps, pharmaceutical or chemical. The table below shows the result;

Figure 2: Graph showing respondents' knowledge on segregation of medical waste

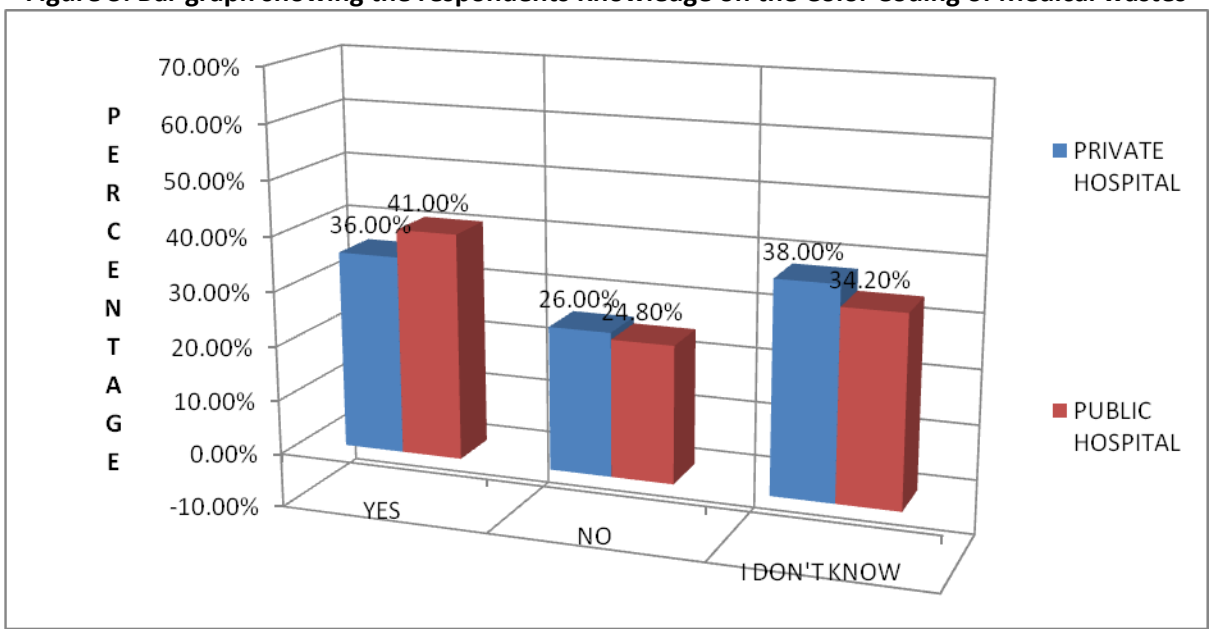


74% of respondents in the Private Hospital said YES, 20% said NO and 6% said "I DON'T KNOW" while in the State Hospital, 95.2% said YES, 2.9% said NO and 1.9% said "I DON'T KNOW". There was a significant difference (p value =0.000) in this category in both hospitals.

There was a significant difference (p value =0.000) in this category in both hospitals (See figure 2).

The participants were asked if medical waste should be color-coded and the results are shown in the graph below.

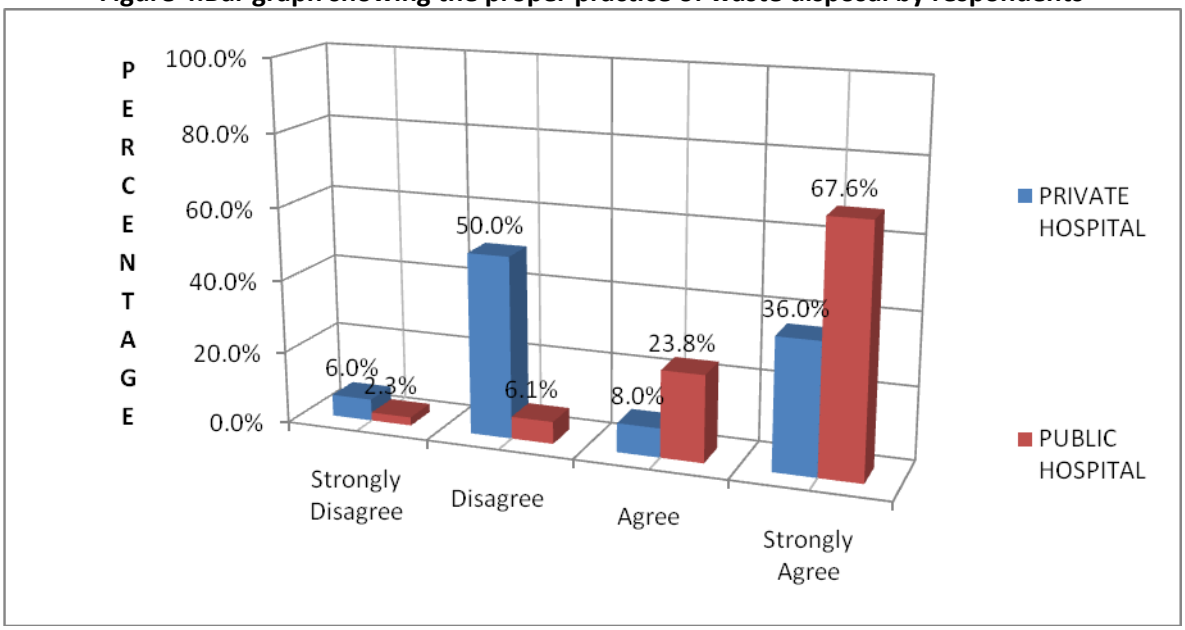
Figure 3: Bar graph showing the respondents Knowledge on the Color Coding of Medical wastes



36% of respondents in the Private Hospital said YES, 26% said NO and 38% said "I DON'T KNOW" while in the State Hospital, 34.3% of the respondents said YES, 24.8% said NO and 41% said "I DON'T KNOW". There was no significant difference (p value =0.805) in this category in both hospitals.

Next was the general assessment of the respondents' practice of correct waste disposal. When the participants were asked if they dispose medical waste with the correct plastic bags, 6% of the respondents in the Private Hospital strongly disagreed, 50% disagreed, 8% agreed and 36% strongly agreed while 2.3% of respondents in the Public Hospital strongly disagreed, 6.1% disagreed, 23.8% agreed and 67.6% strongly agreed. There was a significant difference (p value <0.05) in this category in both hospitals. See the figure below;

Figure 4.Bar graph showing the proper practice of waste disposal by respondents



Discussion: In the present study, there was a significant difference (P Value < 0.05) in the age distribution of respondents in the Public and Private Hospitals. This finding is because people work for shorter periods in Private hospitals due to poor salary and conditions of service. Most of the skilled labors migrate from the private hospitals to the public hospitals when they secure employment there. The study is in line with various studies by Kumar, R., Shaikh, B.T., Somrongthong, R & Chapman, R.Sin a descriptive study carried out in two Tertiary hospitals in Pakistan [13].

Knowledge about waste segregation is important for all health care workers as lack of knowledge about waste segregation may jeopardize infection control in the health facilities. From our study there was a significant difference (p < 0.05) between the knowledge of HCWs on medical waste segregation. This discrepancy in knowledge could be attributed to the fact that the Public Hospital which is government-sponsored had more funds at their disposal to create awareness about the importance and techniques involves in waste categorization and segregation.

This is in keeping with the research done by Hagen, D.L., Al-Humaidi, F. & Blake, and M.A. on Infectious waste surveys in Saudi Arabia. In their study[9], there was a higher knowledge on segregation of medical waste in the Public Hospital unlike the Private Hospital suggesting the same discrepancy in fund allocation to both hospitals.

There was no significant difference on the knowledge of categorization of waste in both hospitals which signifies that majority of our respondents knew that wastes should be categorized and this is in congruence with the study conducted by WHO in 1999[3]. This may suggest that the protocols put in place by WHO for good awareness of proper disposal of SHARP wastes were properly adhered to in the Hospitals studied.

Regarding color coding of generated biomedical waste it could be deduced from this study that the Knowledge and Practice of color coding was lacking amongst the health workers in both Public and Private Hospitals and this may be attributed to lack of training of the staff and lack of funds to procure the appropriate color coded waste bin for the collection waste at their point of generation. The above findings from this study regarding color coding is in keeping with the study by WHO (1996) [10] which noted that the lack of HCW management manual and hospital policy on HCW management are likely to be responsible for a low awareness of health workers on HCW management.

Regarding the correct handling of health care waste by health care workers i.e. waste segregation and disposal at the two hospitals, the respondents were asked to rank themselves the way they segregate wastes by ticking a box to best indicate their rating. On average, HCWs that strongly agreed that they always put wastes in the correct plastic bags were 52%. The percentage of HCWs that strongly agreed that safe disposal is of utmost importance for preventing infection transmission 70.3%.

For this study, the main outcome of interest was that higher percentage of HCWs 70.3% strongly agreed on this statement and that was a good indication that they know how to prevent infections. This was followed by a high percentage of HCWs who strongly agreed that wearing personal protective equipment reduces the risk of contacting infection. While those who strongly agreed that waste disposal is a team work and not a hospital management responsibility were also many. This study finding is in agreement with findings of another study conducted in Nepal, India by Sah R.C. who researched on some of the statements such as; safe waste disposal should be a priority, waste disposal is teamwork not a hospital responsibility, and that disposal of waste is a financial burden on the hospital[14]. The similarities in these results could be attributed to the fact that both studies were done in developing countries where Government policies and funding are almost inexistent with regards to HCWM. It was also quite interesting to note that majority of the workers (50%) in the Private Hospital did not always put the wastes in the correct plastic bags unlike majority of their counterparts (67.2%) in the Public Hospital who strongly agreed to always disposing their wastes in the correct plastic bags as could be shown by a P value < **0.05**which suggests a significant difference in the attitude of HCWs in both Hospitals. This difference could be attributed to the fact that majority of these workers in the Public hospitals are more qualified and thus have a better understanding of the importance of proper disposal of wastes in the right waste bags as also noted by a study by Prashant and Subramanian in Kothamangalam, India.

Unfortunately, hospital waste management is not yet carried out with a satisfactory degree of safety by the staff in many parts of the globe especially in the underdeveloped world as noted in a study by Taru P. Kuvaraga in a Palirenjatwa hospital in Zimbabwe[14].

Conclusion: Healthcare services are aimed at preventing potential human health risks and environmental hazards as well as improving wellbeing. In the process, however, wastes that are potentially harmful are generated. Poor management of these healthcare wastes exposes the health workers, patients, waste handlers and the general public to health risks. From the just concluded research it was noted that there was an appreciable level of knowledge amongst HCW towards HCWM, though the attitude and practice of these workers were poor in both Hospitals. It is therefore advocated that there should be repeated training, re-training of HCWs on hospital waste management and provision of financial and other material resources to enable the HCWs handle the hospital waste effectively.

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