



Study of Knowledge, Attitudes and Practices among Sanitary Workers Regarding Medical Waste Management in Khartoum Locality Teaching Hospitals, 2019

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ABSTRACT

Health care waste is considered as a risk or dangerous to public health and the environment. The exposure of patients, staff, waste handlers, visitors and the community to medical waste is due to bad management practices in hospitals and health care centers. This cross sectional descriptive study was carried out in Khartoum Locality Teaching Hospitals with the aim to assess knowledge, attitudes and practices among the health sanitary workers towards medical waste management. Total 210 respondents were participated in the study; the study uses questionnaires, interviews and observations as tools for data collection. The collected data were analyzed by Software Package for Social Sciences (SPSS) and the result was presented in text, figures and tables. The study revealed that 42.4% of the respondents have excellent knowledge about hazardous waste. Nearly half, 45.2% of the respondents have excellent and very good knowledge concerning waste transmitting diseases. 95.2%, 82.9%, 66.2%, 22.8% and 53.8% have favorable attitudes towards wearing gloves, wearing an apron, wearing masks, wearing boots, wearing gloves during the work respectively. 83.3% wash their hands after the work, but only 33.3% use soap. This study showed that females were significantly more knowledgeable, having favorable attitude, and better practices towards medical waste than males. The Study recommended that the Occupational Health Department in State Ministry of Health should apply programs to encourage the health workers to use the personal protective equipment..

Keywords: Model, Nursing education, Philippines, Quality, Responsiveness

INTRODUCTION

Medical waste is a total waste which is generated from the health care facilities during the course of the health care delivery process [1]. It is generated as a result of patient diagnosis and/or treatment or the immunization of human beings or animals. Health care waste contains potentially harmful microorganisms that can infect hospital patients, health workers and the general public. The subset of medical waste that potentially could transmit an infectious disease is termed infectious waste. The following waste should be classified as infectious waste: sharps (needles, scalpels, etc.), laboratory cultures and stocks, blood and blood products, pathological wastes, and wastes generated from patients in isolation. Medical wastes can also include chemicals and other hazardous materials used in patient diagnosis and treatment. The bulk of the waste generated by most health care facilities, however, include; municipal solid waste as paper, cardboard, plastics, metals, glass, food waste, and wood. Medical waste is special concern because of the potential hazards from pathogens that may be present or from hazardous chemicals [2].

Unsafe injections were responsible for as many as 33,800 new HIV infections, 1.7 million hepatitis B infections and 315,000 hepatitis C infections, but injections with contaminated needles and syringes in low and middle-income countries have reduced substantially in recent years, partly due to efforts to reduce reuse of injection devices [3]. Hazards occur in a person who experiences one needle stick injury from a needle used on an infected source, from scavenging at waste disposal sites and during the handling and manual sorting of hazardous waste from health care facilities. These practices are common in many regions of the world, especially in low and middle-income countries. The waste handlers are at immediate risk of needle-stick injuries and exposure to toxic or infectious materials.

The goals of medical waste treatment are to reduce or eliminate the waste's hazards, and usually to make the waste unrecognizable. Treatment should render the waste safe for subsequent handling and disposal. There are several treatment methods that can accomplish these goals. Medical waste is often incinerated, an autoclave may be used to treat biomedical waste and microwave disinfection can also be employed for treatment of biomedical wastes [4].

Justification

The experiencing needle stick injury from a needle used on an infected source, the unsafe injection practices are common, especially in low and middle-income countries. These can be simply personal prevented by applying protective health measurement. The sanitary health workers are at immediate risk of needle-stick injuries and exposure to toxic or infectious materials. Khartoum teaching hospitals are the most contaminated health facilities with hazardous waste due to improper management of the medical waste.

General Objective

To assess knowledge, attitudes and practices of health, sanitary workers towards the management of medical waste in Khartoum Locality Teaching Hospitals.

Specific Objective

- To assess knowledge of health, sanitary workers regarding medical waste management in Khartoum teaching hospitals
- To define the attitude of sanitary workers regarding medical waste management in Khartoum teaching hospitals
- To determine the practice of sanitary workers regarding medical waste management in Khartoum teaching hospitals

Literature

According to the WHO estimation, the general and hazardous waste types constituted about 85% and 15%, respectively [5]. Medical waste management is not well practiced throughout the world and very recently got its attention. Medical waste handlers play a key role in proper waste disposal as they are involved in the entire waste management processes. Optimum practice and use of personal protective measures depend on their level of knowledge and attitude about medical waste and its management. The medical waste management process comprises interrelated key stages starting from segregation, collection, storage, transportation, treatment, and end up to its final disposal. Appraisal of medical waste handlers' knowledge and their skill in proper waste management could be a fruitful exercise to quantify and minimize occupational associated risks [6].

Medical Waste Management

Medical waste should be collected in containers that are leakproof and sufficiently strong to prevent breakage during handling and National Research Council [7]. Storage refers to keeping the waste until it is treated on-site or transported off-site for treatment or disposal. Regulatory agencies may limit the time for which waste can remain in storage while, handling is the act of moving medical waste between the point of generation, accumulation areas, storage locations and on-site treatment facilities. Workers who handle medical waste must observe standard precautions. The goals of medical waste treatment are to reduce or eliminate the waste's hazards, and usually to make the waste unrecognizable. Treatment should render the waste safe for subsequent handling and disposal. There are several treatment methods that can accomplish these goals. Medical waste is often incinerated. An efficient incinerator will destroy pathogens and sharps. The source materials are not recognizable in the resulting ash. An autoclave may be used to treat medical waste. It uses steam and pressure to sterilize the waste or reduce its microbiological load to a level at which it may be safely disposed of. Many healthcare facilities routinely use an autoclave to sterilize medical supplies. Microwave disinfection can also be employed for the treatment of medical wastes. Microwave irradiation is a type of non-contact heating technologies for disinfection. Microwave chemistry is based on efficient heating of materials by microwave dielectric heating effects. When exposed to microwave frequencies, the dipoles of the water molecules present in cells re-align with the applied electric field. As the field oscillates, the dipoles attempt to realign itself with the alternating electric field and in this process, energy is lost in the form of heat through molecular friction and dielectric loss. Microwave disinfection is a recently developed technology which provides an advantage over old existing technologies of autoclaves as microwave based disinfection has less cycle time, power consumption and it requires minimal usage

of water and consumables as compared to autoclaves. For liquids and small quantities, a 1–10% solution of bleach can be used to disinfect biomedical waste. Solutions of sodium hydroxide and other chemical disinfectants may also be used, depending on the waste's characteristics. Other treatment methods include heat, alkaline digests and the use of microwaves. For autoclaves and microwave systems, a shredder may be used as a final treatment step to render the waste unrecognizable. Some autoclaves have built in shredders [4].

Health and Safety Practices for Health Care Personnel and Waste Workers

Principles: Health care waste management policies or plans should include provision for the continuous monitoring of workers' health and safety to ensure that correct handling, treatment, storage, and disposal procedures are being followed. Essential occupational health and safety measures include the following:

- Proper training of workers
- Provision of equipment and clothing for personal protection
- Establishment of an effective occupational health programme that includes immunization, post-exposure prophylactic treatment, and medical surveillance. Training in health and safety should ensure that workers know of and understand the potential risks associated with healthcare waste, the value of immunization against viral hepatitis B, and the importance of consistent use of personal protection equipment [8]

Workers' protection: The individuals responsible for management of health care waste should ensure that all risks are identified and that suitable protection from those risks is provided as; protective clothing, personal hygiene and immunization against viral hepatitis B infections and tetanus.

Diseases caused by medical waste: Medical waste, which contains a high amount of disease-causing organisms, poses a risk when handled improperly and released into the environment. These diseases include; gastro enteric, respiratory infections, ocular infection, genital infections, skin infections, anthrax, meningitis, AIDS, hemorrhagic fevers, septicemia, bacteremia, candidaemia, viral hepatitis A, B and C.

Previous studies: A study about the Assessment of Medical Waste Management in the main Hospitals was conducted in Sana'a Yemen in 5 governments and 12 private hospitals, the result showed poor awareness among waste workers regarding medical waste [9].

Many studies about the medical waste (management and handling) rules: Ministry of Environment Forest and Climate Change, conducted in New Delhi, India to assess the KAP among sanitary health workers, the study showed that the respondents have v. good knowledge concerning the medical waste composition [10].

A study about Dermatologic Evaluation of Street Sanitation Workers by Nayak et al., [11] stated that a significantly low incidence of the use of personal protective measures such as gloves, masks, and proper footwear was noted among only one of the 87 workers reporting the use of any adequate protective measures [11].

A study about Knowledge of Sanitary Workers regarding Biomedical Waste Management that conducted by Akoijam, and Kodi [12], revealed that most of the subjects (40%) were illiterate, 24% had a primary level of education, 28% had high school level of education, 8% had a secondary level of education [12].

A quasi-experimental study about the Effectiveness of Intensive Healthcare Waste Management Training Model among Health Professionals at teaching hospitals that conducted in Pakistan by Kumar et al. [13], stated that only 4.54% had some training before joining their job [13].

A Cross-sectional study about Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel conducted in Indian, the study showed that knowledge regarding the potential transmission of disease through biomedical waste was observed among only 27% of sanitary workers [14].

The report of the World Health Forum about Solid waste disposal in district health facilities showed that improper waste management was influenced more by the ignorance of local health personnel [15].

A study about Healthcare workers' knowledge and attitudes to glove use that conducted by Flores and Pevalin [16], showed that respondents had positive attitudes towards the use of gloves to protect against acquiring an infection, the

availability of gloves, and acting as a role model to other staff [16].

A study of Hand Hygiene Practices among Community Health Officers that conducted in Rivers State, Nigeria by Braimoh and Udeabor [17], Showed that female were significantly more knowledgeable, having favorable attitude, and better practices towards medical waste than males [17].

A study about Hand Hygiene Compliance in Intensive Care Units of tertiary care hospital that conducted in Ludhiana, India showed that (41.3%) practice hand washing with soap and water among workers of a tertiary care hospital [18].

A study that conducted in Khartoum-Sudan, aimed at assessing the current management of used needles and to suggesting suitable recommendations for an improved and safer system for needle management in Khartoum, Sudan. The study showed that the management of both healthcare and home-generated HCW in Sudan is ineffecient, as all wastes are mixed together and disposed of improperly, especially used needles. The study attributes this to many reasons, including lack of waste segregation at the source, lack of policies, failure of planning, inadequate training, lack of awareness of the hazardous nature of such kinds of waste, weak infrastructure, and a lack of suitable treatment technologies [19].

METHODOLOGY

This cross-sectional descriptive study was conducted in Khartoum teaching hospitals, Khartoum Locality with the aim to assess knowledge, attitudes and practices among health sanitary workers regarding Medical Waste Management 2019. Four teaching hospitals (Gafar Ibniof, Ibnisina, ALshabi and Dental Hospital) are chosen by simple random sampling techniques for the study, where all the health, sanitary workers (210) in these four hospitals is participating in the study. Data is collected by questionnaire, interview and observation and analyzed by Statistical Package for Social Science (SPSS), and the result presented in texts, Figures 1-10 and Tables 1-4. Approval letters were issued from the State Ministry of Health, Teaching Hospital Administration, University of Bahri and oral informed consents were obtained from the sanitary health workers to participate in the study.

RESULTS

The study revealed that 74% of respondents are female, 51.9% are illiterate, and 73.8% of the respondents' monthly income is less than 40 \$, 73.8% of the respondents are trained before working.

Table 1 Distribution of the respondents according to their knowledge concerning types of waste (n=210)

Knowledge	Frequency	Percentage (%)
Accept	10	4.8%
Good	33	15.7%
Very good	78	37.1%
Excellent	89	42.4%
Total	210	100%

Nearly half (42.4%) of the respondents have excellent knowledge, more than one third (37%) have very good knowledge, concerning types of waste (n=210).



Figure 1 Distribution of the respondents according to their knowledge concerning medical waste composition (n=210)

About 16.7% of the respondents have excellent knowledge, 42.9% have v. good knowledge, and 35.7% have good knowledge where only 4.8% have accepted knowledge concern medical waste composition.

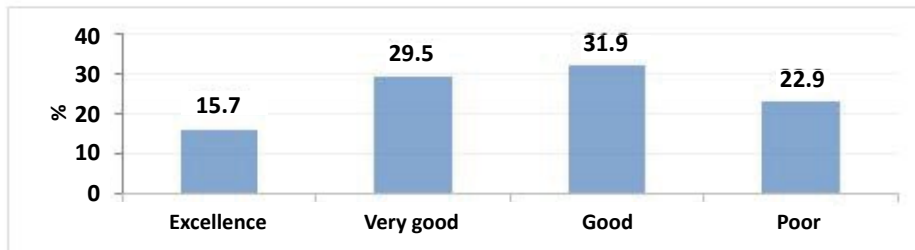


Figure 2 Distribution of the respondents according to their knowledge concerning waste transmitting diseases

Nearly half 45.2% of the respondents has excellent and very good knowledge concerning waste transmitting diseases (n=210).

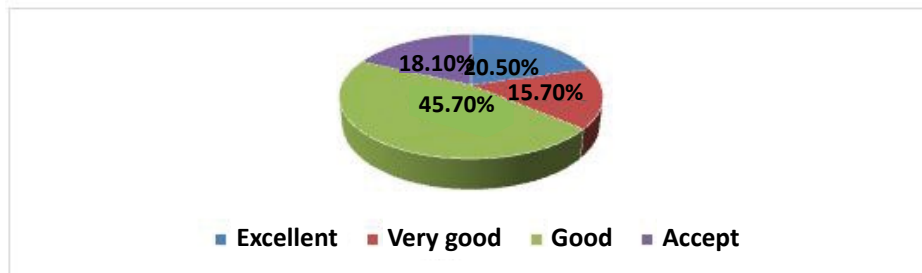


Figure 3 Distribution of the respondents according to their knowledge concerning the safety measurement

About 1/5 of the respondents have excellent knowledge, 15.7% have v. good knowledge, 45.7%, have good knowledge where only 18.1% have poor knowledge concerning the safety measurement (n=210)

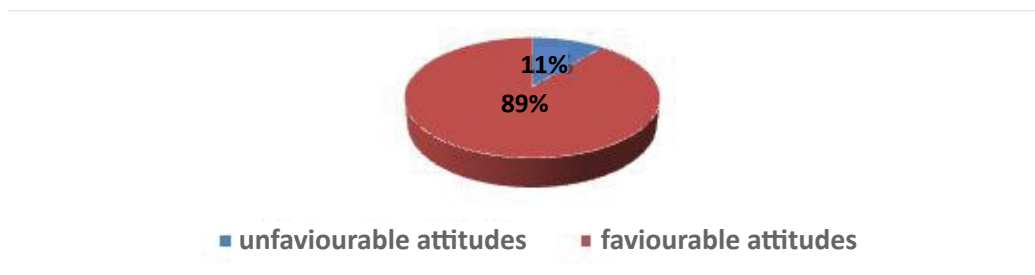


Figure 4 Distribution of the respondents according to their attitudes towards wearing apron during the work

The majority 89% have favorable attitudes towards wearing apron during the work (n=210).

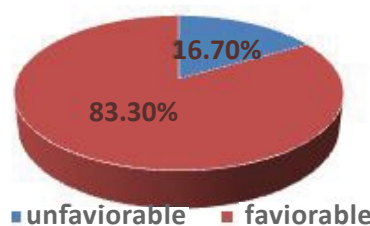


Figure 5 Distribution of the respondents according to their attitudes concerning wearing boots during the work

The majority 83% have favorable attitudes towards wearing boots during the work (n=210).

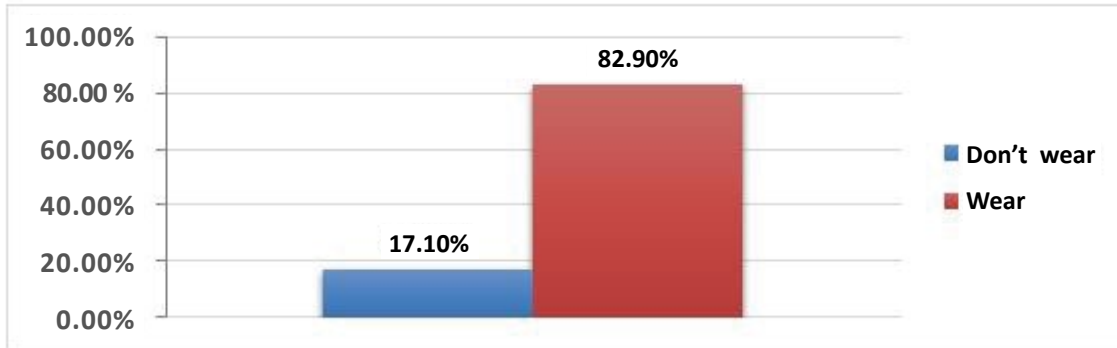


Figure 6 Distribution of the respondents according to their practices concerning wearing apron during the work

The majority of the respondents, 82.9% wear apron during the work (n=210).

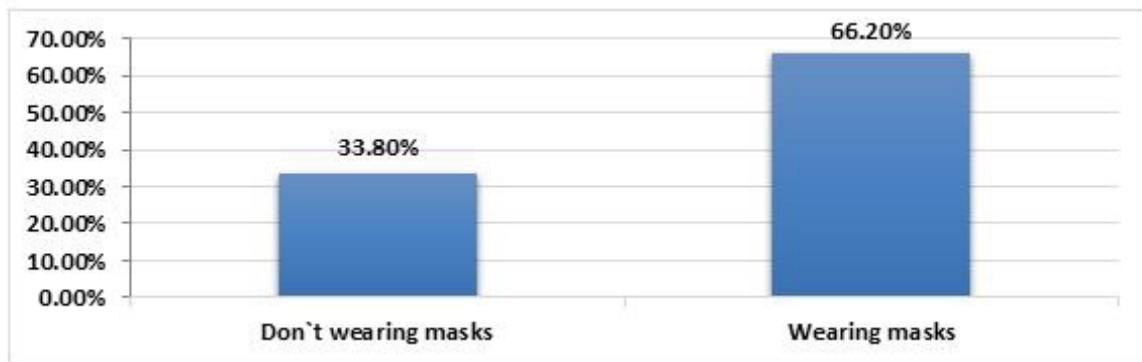


Figure 7 Distribution of the respondents according to their practices concerning wearing masks during the work

About two third of the respondents, 66.2% wear masks during the work (n=210).

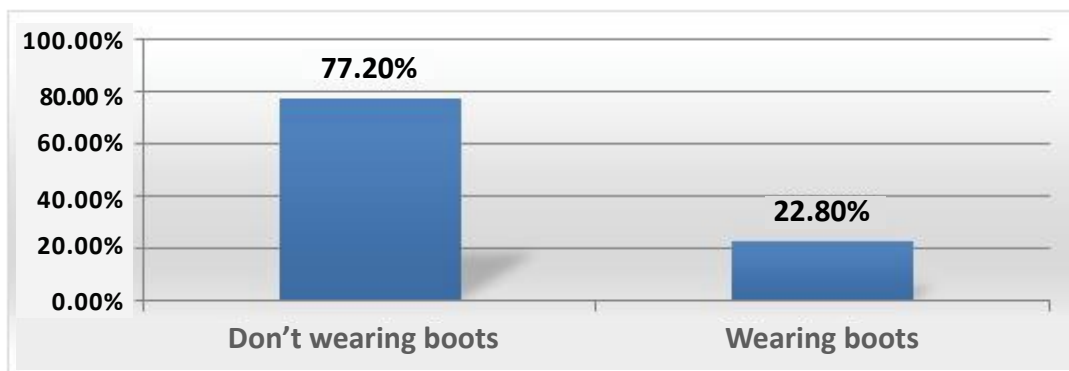


Figure 8 Distribution of the respondents according to their practices concerning wearing boots during the work

Only 22.8% of the respondents wear boots during the work (n=210).

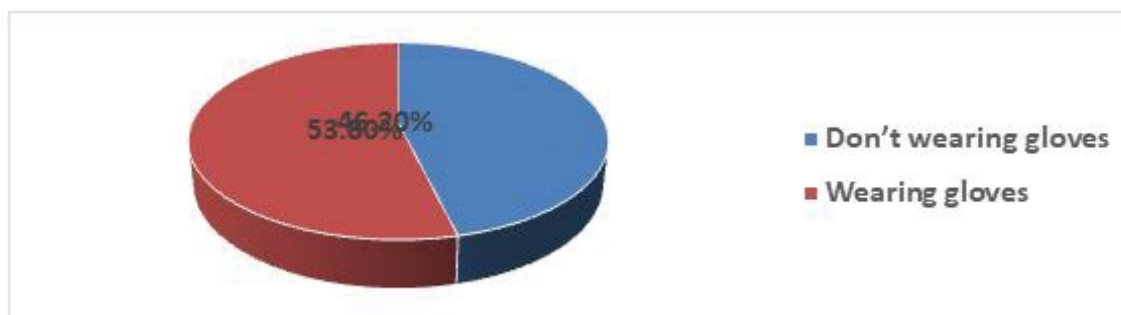


Figure 9 Distribution of the respondents according to their practices concerning wearing gloves during the work
 More than half, 53.8% of the respondents wear gloves during the work (n=210).

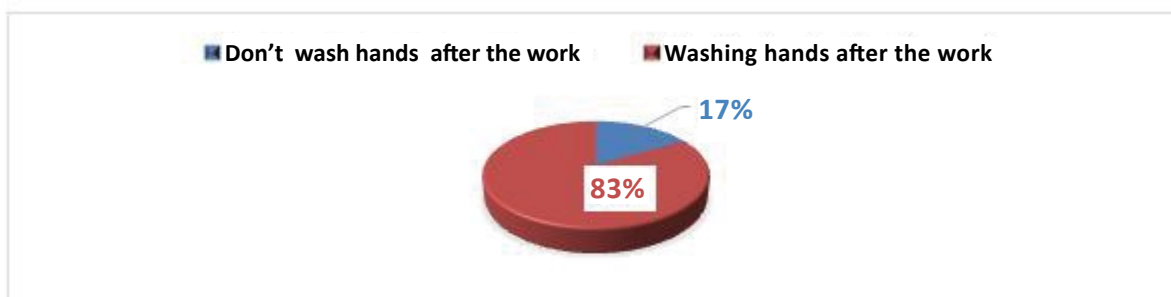


Figure 10 Distribution of the respondents according to their practices concerning hand washing after the work

The majority (83.3%) of the respondents wash their hands after the work

Table 2 Association between the respondents' level of education and practice of wearing the boots during the work

Level of education		Do you wear boots during the work?		Total
		Wearing boots	Don't wear boots	
Illiterate	No.	0	109	109
	%	0.00%	68.10%	51.90%
Religion school	No.	0	2	2
	%	0.00%	1.30%	1.00%
Primary	No.	38	49	87
	%	76.00%	30.60%	41.40%
Secondary	No.	12	0	12
	%	24.00%	0.00%	5.70%
Total	No.	50	160	210
	%	100.00%	100.00%	100.00%

There is a significant association between the respondents' level of education and their practice of wearing boots during work at $\chi^2=92.0$; $p=0.000$.

Table 3 Association between the respondents' level of education and practice of washing hands with soap

Level of education		Do you wash your hand with soaps		Total
		I use soap	I do not use soap	
Illiterate	No.	9	100	109
	%	12.90%	71.40%	51.90%

Religion school	No.	2	0	2
	%	2.90%	0.00%	1.00%
Primary	No.	59	28	87
	%	84.30%	20.00%	41.40%
Secondary	No.	0	12	12
	%	0.00%	8.60%	5.70%
Total	No.	70	140	210
	%	100.00%	100.00%	100.00%

There is a significant association between the respondents' level of education and their practice of washing hands with soaps at $\chi^2=92.0$; $p=0.000$.

Table 4 Association between the sex of the respondents and the practice of wearing gloves during work

Sex		Does you wear the gloves during the work		Total
		Wearing	Do not wearing	
Male	No.	0	55	55
	%	0.00%	56.70%	26.20%
Female	No.	113	42	155
	%	100.00%	43.30%	73.80%
Total	No.	113	97	210
	%	100.00%	100.00%	100.00%

There is a significant association between the sex of the respondents and the practice of wearing gloves during work at $\chi^2=86.8$; $p=0.000$. Females were wearing gloves during work more than males.

DISCUSSION

This study indicated that more than half (51.9%) of sanitary workers are illiterates. This finding agreed with the study that conducted by Akoijam, and Kodi, they revealed that most of the subjects (40%) were illiterate [12]. The study indicated that two thirds of the respondents are trained before working. This finding disagreed with a study conducted by Kumar et al., [13] in Pakistan who stated that only 4.54% had some training before joining their job [13]. Furthermore, the study indicated that nearly half (42.4%) of the respondents have excellent knowledge regarding types of medical waste. This may be due to the trained of workers before work. But this finding disagreed to a study that conducted in 5 governments and 12 private hospitals in Sana'a, Yemen, which showed poor awareness among waste workers regarding medical waste [9]. The present study showed that nearly half, 45.2% of the respondents have excellent and very good knowledge concerning waste transmitting diseases. This agreed with study that conducted by Mathur et al., [14] which showed that knowledge regarding the potential transmission of disease through medical waste was observed among 27% of sanitary workers [14].

The study showed that there was excellent knowledge 20.5%, v. good knowledge, 15.7%, good knowledge 45.7%, where only 18.1% have poor knowledge concerning the safety protective measurement. This agreed with a report, which showing that improper waste management was influenced more by the ignorance of local health personnel [15]. This study showed favorable attitudes towards wearing gloves during the work. This agreed with the finding, which showed that respondents had positive attitudes towards the use of gloves to protect against acquiring an infection, the availability of gloves, and acting as a role model to other staff [16]. Most of the respondents, 58.6% have favorable attitudes towards wearing masks during the work. Wearing mask is important. This supported by the statement that "a significantly low incidence of use of personal protective measures such as gloves, masks, and proper footwear was noted among only one of the 87 workers reporting the use of any adequate protective measures" [11].

The current study showed that only one third 33.3% of the respondents use soap for hand wash, while only 9% use Dettol in hand wash after the work. This finding indicated that more than half of the respondents did not wash their hands with soap or Dettol after work which exposed them to risk of transmission of infectious diseases. The compliance to the WHO guidelines regarding adequate hand hygiene was lower in this study (91% for hand washing with

soap and water and 64% for alcohol based rubs) than the study done in Ludhiana (41.3%) among workers of a tertiary care hospital [18].

The study showed that there is a significant association between the respondents' level of education on one hand and their knowledge concerning types of medical waste, wearing boots, wearing gloves during work, washing hands with soaps on the other hand at ($p=0.000$). This is natural, due to the role of education in raising knowledge and promoting practices of sanitary workers compared to illiteracy ones. These findings agreed with the study about Assessment of Knowledge, Attitude, and Practice about Biomedical Waste Management and Associated Factors among the Health-care Professionals that conducted in Debre Markos Town, Northwest Ethiopia by Deress et al., [20] who found association between education level and knowledge, attitudes, practices regarding medical waste and practice of washing hands with soaps ($p=.000$) [20]. This study showed that females were significantly more knowledgeable, having favorable attitude, and better practices towards medical waste than males. This finding agreed with the study of Hand Hygiene Practices among Community Health Officers that conducted in Rivers State, Nigeria [17].

CONCLUSION

The majority (74%) of sanitary health workers are females with low level of education 51.9% are illiterate, low salary 73.8% of their income is less than 40 \$ and low level of socioeconomic status. Nevertheless, 42.4% have excellent knowledge about the hazard of the waste, the majority 95.2% have favorable attitudes towards wearing gloves during the work, but their behaviors and practices are inconsistent with their knowledge and attitudes, only one third 33.3% of the respondents use soap for hand washes after the work.

Recommendations

The study has stated the following recommendations; The Occupational Health Department in State Ministry of Health should encourage the sanitary health workers to use personal protective equipment. The Health Promotion Department in State Ministry of Health should encourage the sanitary health workers to use soap and Dettol for hand washing. Teaching hospital administrations should adopt health education and training program for the sanitary health workers towards medical waste management.

DECLARATIONS

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

- [1] Sudeep, C. B., et al. "KAP study to assess biomedical waste management in a dental college in south India." *World Journal of Pharmaceutical Sciences*, Vol. 6, 2017, pp. 1788-94.
- [2] Pruss-Ustun, Annette, and W. K. Townend. *Safe management of wastes from health-care activities*. World Health Organization, 1999.
- [3] Pepin, Jacques, et al. "Evolution of the global burden of viral infections from unsafe medical injections, 2000-2010." *PloS One*, Vol. 9, No. 6, 2014, p. e99677.
- [4] Bondtech Corporation, 2018. <https://bondtech.com/>
- [5] Chartier, Yves, ed. *Safe management of wastes from health-care activities*. World Health Organization, 2014.
- [6] Shivalli, Siddharudha, and H. Sowmyashree. "Occupational exposure to infection: A study on healthcare waste handlers of a tertiary care hospital in South India." *The Journal of the Association of Physicians of India*, Vol. 63, No. 11, 2015, pp. 24-27.
- [7] National Research Council Recommendations Concerning Chemical Hygiene in Laboratories. United States Department of Labor, 2013.

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- [8] American Society of Hospital Pharmacy. Procedures for Handling Cytotoxic and Hazardous Drugs, 1983.
- [9] Al Emad, A. A. "Assessment of medical waste management in the main hospitals in Yemen." *Eastern Mediterranean Health Journal*, Vol. 17, No. 10, 2011, pp. 730-37.
- [10] Government of India. Bio-Medical Waste (Management and Handling) Rules. In: Ministry of Environment Forest and Climate Change, editor. 2016 ed. New Delhi: Gazette of India, Extraordinary, 2016, pp. 1-37.
- [11] Nayak, Sudhir, et al. "Dermatologic evaluation of street sanitation workers." *Indian Journal of Dermatology*, Vol. 58, No. 3, 2013, p. 246.
- [12] Akoijam, Sangita Devi, and Malar Kodi. "Knowledge of sanitary workers regarding bio medical waste management." *i-Manager's Journal on Nursing*, Vol. 4, No. 2, 2014, p. 21.
- [13] Kumar, R., Somrongthong, R., and Shaikh, B. T. "Effectiveness of intensive healthcare waste management training model among health professionals at teaching hospitals of Pakistan: A quasi-experimental study." *BMC Health Services Research*, Vol. 15, No. 1, 2015, p. 81.
- [14] Mathur, Vanesh, et al. "Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study." *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive and Social Medicine*, Vol. 36, No. 2, 2011, pp. 143-45.
- [15] Halbwachs, H. "Solid waste disposal in district health facilities." *World Health Forum*, Vol. 15, No. 4, 1994, pp. 363-67.
- [16] Flores, Ashley, and David J. Pevalin. "Healthcare workers' knowledge and attitudes to glove use." *British Journal of Infection Control*, Vol. 7, No. 5, 2006, pp. 18-22.
- [17] Braimoh, O. B., and S. E. Udeabor. "Hand hygiene practices among community health officers in Rivers State, Nigeria." *African Health Sciences*, Vol. 13, No. 2, 2013, pp. 507-11.
- [18] Sharma, Sarit, et al. "Hand hygiene compliance in the intensive care units of a tertiary care hospital." *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive and Social Medicine*, Vol. 36, No. 3, 2011, pp. 217-21.
- [19] Hassan, Ahmed Ali, Terry Tudor, and Mentore Vaccari. "Healthcare waste management: A case study from Sudan." *Environments*, Vol. 5, No. 8, 2018, p. 89.
- [20] Deress, Teshiwal, et al. "Assessment of knowledge, attitude, and practice about biomedical waste management and associated factors among the healthcare professionals at Debre Markos Town healthcare facilities, Northwest Ethiopia." *Journal of Environmental and Public Health*, 2018, pp. 1-10.