

## Biomedical Waste Management in Kandahar City

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### Abstract

Biomedical wastes management is one of the most important issues in public health centers and it is a crucial issue for environmental sectors as well. Wrong and inappropriate management treat the life of human beings in Kandahar City. Currently the population of this city has exponentially increased than ever because of the immigration of many people from neighboring provinces. This research was conducted in 15 districts of Kandahar public and private health care centers to identify the current biomedical waste management in Kandahar city. The qualitative and quantitative data was collected through a questionnaire from public and private hospitals, clinics and health care centers. In addition, discarding, segregating, labeling, transporting and disposing system of biomedical waste were observed. The result showed that 65.3% newly hired biomedical waste staff not received training or instruction. Furthermore, the result indicates that 44% generated biomedical wastes are regulated by municipality and color coding is not followed accordingly. Current biomedical waste is not appropriate based on designed international standards and the criteria suggested by world health organization.

**Keywords:** Biomedical Waste; Segregation; Incineration; Municipality; Hazardous.

### 1. Introduction

Hospitals from beginning are known for the treatment of patients but most people are unaware about the adverse effects of biomedical waste and filth generated by them on human body and environment. In many countries, knowledge about the potential harm from health care waste has become more prominent to governments, medical practitioners and societies. The indiscrimination and erratic handling and disposal of waste within health care facilities are now widely recognized as source of avoidable infections. In Afghanistan especially in southwestern provinces, the people are thinking that hospitals and health treatment centers are established to cure patients but most of them are unaware that their wrong activities and waste management will adversely impact on human beings and disturb ecological system.

Biomedical waste means any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities (Mandal, 2009). Biomedical waste contains infectious waste which contains pathogens that could cause different diseases. Source of biomedical waste are hospitals, nursing homes, clinics, medical laboratories, blood banks, mortuaries, medical research and training centers biotechnology institution and animal houses. Such waste can also be generated at home when health care is being provided to a patient. Biomedical waste contains different impacts on human and environment. Simply consequently it can create air pollution, and could transmit AIDs, hepatitis, TBs and various contagious diseases. In addition, if the improper biomedical waste management accomplished in a society it can contaminate directly or indirectly the water resources. If the biomedical waste is improperly discarded with hospitals wastes, it will have a high percentage of negative impacts on scavengers, packagers and animals.

Kandahar city is second largest city in southwestern area of Afghanistan. Currently the population of this city has exponentially increased than ever because of the immigration of many people from Urozgan, Helmand, Farah, Zabul and as well from many districts of Kandahar province (Saeedi, 2019). Besides being the second largest city of Afghanistan, most of patients come for treatment to Kandahar city from neighboring provinces as well. Many main pharmaceutical agencies are located in Kandahar city which distribute their stocks from here to southern provinces of Afghanistan and likewise to Ghazni and Kabul. Merwais Hospital is one of the main public hospitals in southwest which is located in Kandahar city. Most of injured and critical patients are coming from previously mentioned provinces and as well from Ghazni. But to consider all above premiums, most of the people are unaware of proper biomedical waste management and neither have the knowledge about the adverse impacts of the biomedical waste. In Kandahar city, people and hospitals/clinics do not consider proper management of biomedical

waste seriously. This is due to their unawareness about BMW as threat and the lack of knowledge regarding negative impacts of these materials on human beings and environment.

It has observed in most public, private hospitals and clinics, that they are disposing their waste with common waste which is obviously harmful for human beings and animals directly through exposing to or indirectly through exposing contaminated environment and ecosystem. Since these wastes are harmful to our health through direct exposing. They also may lead to contamination of potable water, soils and pollutes our respiratory air. It will consequently lead to transferring various contagious diseases and hazardous items and chemical toxics. The distinct categories of health care waste are sharps, infectious waste, pathological waste, pharmaceutical waste, hazardous chemical waste, radioactive waste and non-hazardous general waste (OHW, 2014). Many studies stated that most of them are present in municipal solid waste bins and storages. Poor people scavenge foods and other items on it and children are also searching for playing items or toys, that provide more chances of infections to them, if there is any infectious pathogens and hazardous agents' materials.

## 2. Research Objectives

- To review the current condition of biomedical waste management (segregating, packaging, labeling, moving, sorting, treating, and transporting) in Kandahar city.

## 3. Research Questions

- What is the current condition of biomedical waste management in Kandahar city?
- Do international standards of biomedical waste rules and principles are considered?

## 4. Literature Review

Globally growing the population, there is a great need to manage the civic amenities including waste collection and disposal. Within the municipal solid waste, biomedical waste makes a special dimension, since it is infectious and hazardous (Mandal, 2009). The biomedical waste means any solid, liquid waste material generated during the process of diagnosis, treatment and immunization of human beings and animals (Saini & et al, 2013). The biomedical waste generated in health facilities in addition to the risk for patients, doctors, nursing, staff, and personnel who are handling this waste, also pose threat to public health and environment. This biomedical waste hazard can range from gastroenteritis, respiratory and skin infections to deadly disease such as HIV/AIDS and hepatitis (Saini and et al, 2013). Beyond directly threat to human health it is a source of contamination of land and water sources. It could generate harmful gases, if the burning and incineration has been done in open and leads to atmospheric pollutions (Rao & Prabhakar, 2013).

Globally this issue has been seriously considered by scientists. This problem is present in many developing countries. In developing countries biomedical waste has not been received well attention therefor in these countries many hazardous and medical wastes are handled and disposed together with municipal waste, which is creating a great health risk to municipal workers, scavengers, children, animals, public health and environment (Aseweh & Bouwer, 2008).

To ensure that medical waste handled and treated in effective manner with least health risk and threat to hospital administrators, employees, the community and environment of hospitals, clinics; administrators must carry out comprehensive proper management activities for generation, packaging, labelling, handling transportation and disposal process (Studnicki, 1992). Health care development units are exactly made for the prevention and protection of community health. Too many sophisticated instruments have come into existence in various operations for disease treatment. Such development and advances in scientific knowledge has resulted in per capita per patient generation of wastes in health care units (Radha, 2009). In process of health care waste generated are composed of variety of wastes including hypodermic needles, scalpels, blades, surgical cottons, gloves, bandages, clothes, discarded medicines and body fluids, human tissues and organs, chemicals etc., other waste generated in health care include mercury containing instruments, PVCs plastics, Radioactive wastes and etc. these are the most sensitive environmental products and needs a serious attention which has to be monitored (Remy, 2001). According to world Health Organization statement 85% of hospital wastes are actually non-hazardous or general health care waste, whereas 10% are infectious and 5% are non-infectious but they contain hazardous waste and may pose a variety of environmental and health risks (OHW, 2011).

The major sources of health-care waste related to amount of the quantities produces; hospital, general hospital, medical ward, district hospitals, other health-care facilities, prison hospital, military medical services, laboratories and research centers, mortuary and autopsy centers, animal research testing, blood banks and blood collection services, nursing homes for the elderly and minor sources of health-care waste could be dental clinics, physician offices, and etc. (OHW, 2011). Furthermore, there is two Categories of health care waste: Hazardous

health-care waste which included; Sharps, Infectious waste, Pathological waste, Pharmaceutical waste, Cytotoxic waste, Chemical waste, Radioactive waste and Non-Hazardous or general health-care waste; Waste that does not pose any particularly biological, chemical, radioactive or physical hazards. Some of waste management that is proposed now is proper, handling, segregation, mutilation; disinfection, storage, transportation and final disposal are vital steps for safe and scientific management of biomedical waste (Acharya, 2000). Biomedical waste threatens the public health since the care foundations has been established because of inadequate management of biomedical waste as and associated with risks to healthcare workers, patients, communities and their environment (Radha, 2009).

BMW process is poor and unacceptable, in primary, secondary and tertiary care settings in 20 states of India (INCLEN, 2014). In addition, the collection and disposal of biomedical waste was not proper in Lucknow hospitals, the collection of infectious and non-infectious waste done together, more over the waste piled in corner of hospitals and burned in same (Gupta & Boojh, 2006). In another study revealed that there was no proper, systematic management of medical waste except in a few private health care establishments which were segregating their infectious wastes. In addition, it showed that some cleaners were salvaging used sharps, saline bags, blood bags and test tubes for resale or reuse (Hassan et al, 2008).

Proper management of biomedical waste directly related to awareness. Low level of knowledge is the main attribute to poor training facilities and also to low educational level of the staff. Technical and nontechnical staff Training both are very important for the proper and appropriate management of biomedical waste (Madahukmar & Ramesh, 2012). Another study showed that 26.15% were trained in BMW management and knowledge of BMW management were low, particularly in color coding of the bins 35.78%, management of needle stick injury 40.83%, storing of waste before disposal 11.47%, and transport of waste 49.54% (Krishna et al, 2018). Likewise lack of knowledge and low level of awareness regarding color coding and management was observed among qualified personnel's in hospitals (Sharma, 2010). In contrast Color coding for polythene bags are red, black, yellow and blue, which are for microbiological waste, non-infectious and non-hazardous, human anatomical waste and for sharp waste respectively (Patil & Pokhrel, 2004).

Biomedical waste can pollute our respiratory airs, potable waters. biological air pollution occurs from inside and outside the hospital premises. Nosocomial infections and occupational hazards by spores and bacteria occur within the hospital. Open area dumping biomedical wastes cause air pollution from outside and chemical air pollution cause by two major sources-open burning and incinerators which plastic and hazardous materials emit dioxins and furans and it its carcinogenic in nature (Rajan et al, 2018).

## 5. Materials and Methods

### 5.1 Field and Type of Research

The study is mixed method design and descriptive in nature. Qualitative and quantitative data was collected from all hospitals and clinics in 15 districts of Kandahar city.

### 5.2 Data Collection Procedure and Sampling Method

This study was conducted among hospitals; medical personnel included doctors, nurses, laboratory technicians, and sanitary staff. The data was collected through a questionnaire. Knowledge regarding the color coding and waste segregation at source was asked. Totally 150 sample were selected for the primary data collection and in meanwhile the collection, segregation, transportation, disposal, labeling and burning system was observed. Sampling was done by stratified random sampling.

### 5.3 Data Analysis

The data was analyzed by SPSS24 version, frequency and percentage is presented through tables and graphs.

## 6. Results

The result of collected data of biomedical waste management shows as follow, and further it asserts the newly hired biomedical waste staff has not received training or instruction, likewise, the health care centers does not have proper plan for the training.

<b>Table 1. Instruction/training to newly hired BMW staff and legislation application</b>		
Item	Yes. N (%)	No N (%)
Instruction/training to newly hired BMW staff	52 (34.7)	98 (65.3)

Legislation application for Biomedical waste Management	74 (49.3)	76 (50.7)
Manual/guideline on management of hospital waste management	113 (75.3)	37 (24.7)

Table 1 above indicates that 65.3% of newly hired biomedical waste management staff has not received any training regarding safe discarding and handling. The result shows that 34.7 % of the respondents received training and instruction while hired for BMW. The findings also indicate that almost 50.7% of hospitals do not have any legislation for biomedical waste management in their hospital, whereas only 49.3% have reported having legislation in their hospitals. Furthermore; it shows that 75.3% hospitals in Kandahar city have either manual/guideline for their waste management, while 24.7% does not have it.

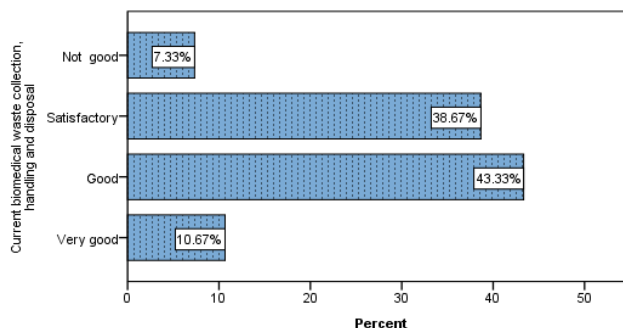


Figure 1 indicates over all biomedical waste status in health care centers that represent 10.67% of current biomedical waste collection, handling and disposal, are very good, while 43.33 % is good and 38.67% is satisfactory and 7.33% is bad.

**Table 2. Who regulate(s) wastes generated at health care facilities?**

	Frequency	Percent
Municipality	66	44
Private	68	45.3
Do not know	16	10.7
<b>Total</b>	<b>150</b>	<b>100.0</b>

In term of who regulates generated wastes in health care facilities, hospitals, and clinics. Table 2 indicates that 44% collection is being done by Kandahar municipality, 45.3% are by private and 10.7% respondents do not have knowledge of their waste transportation source.

**Table 3. Color coding segregation of biomedical waste**

Items	Yes N (%)	No N (%)	Cannot Say N (%)	Missing
Do you know about color coding segregation of biomedical waste?	82(54.7)	68 (45.3)	0 (0)	0
Do you follow color coding of biomedical waste?	67 (44.7)	32 (21)	12 (8)	39 (26)

Table 3 indicates that 54.7% of workers in health centers are familiar with color coding of biomedical waste segregation, whereas 45.3% don't know about color coding of waste segregation. Furthermore, while asked about whether they are following color coding or not, the respondents' response shows that only 44.7% of people

are following color coding in health centers, while 21% are not following color coding. In addition, 8% did not express their view about color coding and 26% left this option. It seemed that remained neutral.

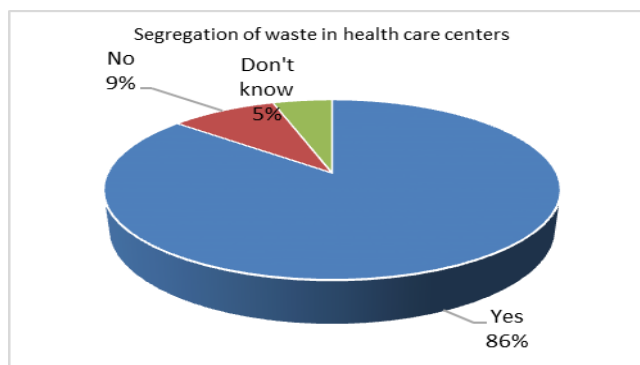


Figure 2 above shows that 86% respondents reported that the segregation is being done, whereas 9% of them said segregation is not being done and 5% of them replied that they don't know. Moreover, it indicates that they are not segregating their wastes in health care centers.

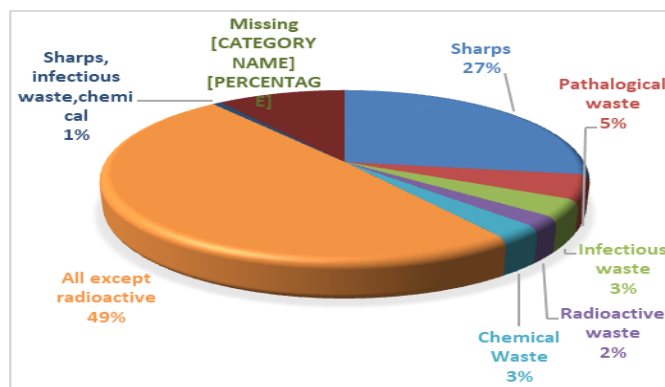


Figure 3 shows that 49% of people are segregating all type of waste from each other except radioactive, 5% pathological waste, 3% infectious waste and 3% chemical waste, 1% sharps, infectious and chemical wastes and 10% did not select any of these.

**Table 4. Color coding awareness and practice**

Item	Red	Black	Yellow	Blue/white	Don't know
Color code for biomedical waste to be autoclaved and disinfected is	38 (25.3)	38(25.3)	11(7.3)	38(25.3)	25(16.7)
Color code for disposal of normal waste from hospital/clinics	13 (8.7)	45(30)	27(18)	39 (26)	26 (17.3)

Table 4 shows the selection code for biomedical waste to be autoclaved, 25.3% selected red bag, 25.3% black bag, 7.3% yellow bag, and 25.3% blue/white bags. Furthermore, result indicates that people does not follow, international procedure and rules for the safe management. It is indicated by 8.7% of the respondents reported that they throwing their normal waste in red bags, 30% in black bags, 18% in yellow bags 26 % in blue/white bags and 17.3% does not have awareness about color coding.

**Table 5. Safe management effort and container labelling**

Option	Agree	Disagree	Cannot Comment
Safe management efforts increase financial burden on management	62.9	14.2	22.9
It is important to label container before filling	57.1	40	2.9

Table 5 shows the view of respondents about safe management efforts by the hospitals and health care centers increase the financial burden, the 62.9% indicated that it increases the financial of hospitals and 14.2% are disagree with this comments. In addition, it shows that 57.1% respondents agreed with labeling of containers before filling while, 40 % disagreed with labeling before filling the containers and furthermore, 2.9% neither agreed nor disagreed with this comments.

**Table 6. Concern and awareness of needle sticky injury**

No.	Items	Answers		
		Yes N(%)	No N(%)	Don't know/ Not concerned
	Is needle stick injury a concern?	136 (90.7)	5 (3.3)	9 (6)
	Are you aware of consequences of Needle-stick injury	128(85.3)	13(8.7)	9(6)
	Do you segregate hazardous and non-hazardous items?	110 (73.3)	13(18.7)	27 (8)

Table 6 shows that 9% respondents reported that the needle stick injury is not a concern, it shows that they are careless with the needle stick injury and furthermore 14% are unaware about consequence of needle stick injury. Moreover, 14.3% of them reported that health care says, needle stick injury is not a concerned. In term of hazardous and non-hazardous the result shows that 73% are segregating, while 18% are not segregating their hazardous and non-hazardous wastes.

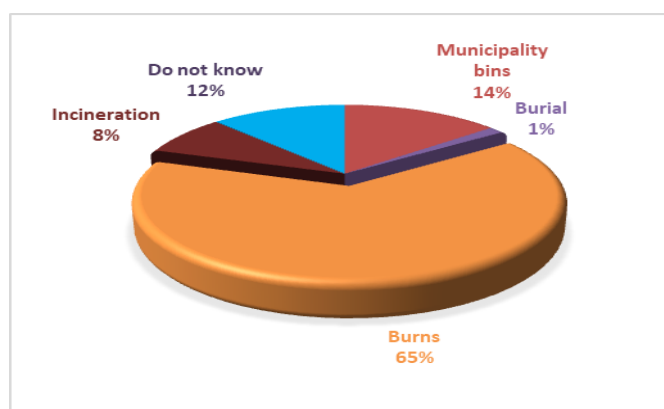


Figure 4 shows that expired medicines according to, 14% of respondents are thrown in municipality bins, 65% burns, 8% incinerating, and 12% replied that they don't know, 1% respondents are burring their waste.

**Table 7. Where do you discard your BMW?**

	Frequency	Percent
Municipality bins	46	30.7
Private contractor	18	12.0
Open area	1	.7
Incineration	84	56.0
Do not know	1	.7
<b>Total</b>	<b>150</b>	<b>100.0</b>

Table 7 shows that 30.7% Health care centers are discarding their waste in Municipal bins, 12% are giving to contractor and their contractors are discarding in municipal bins, 56% are incinerating in their hospitals, or nearby area.

**Table 8. Based on biomedical waste management and handling, should not be stored beyond?**

	Frequency	Percent
12 Hours	80	53.3
24 Hours	26	17.3
48 Hours	17	11.3
72 Hours	23	15.3
96 Hours	4	2.7
<b>Total</b>	<b>150</b>	<b>100.0</b>

Table 8 shows that 53.3% Health care centers storing their waste for 12 hours, 17.3% of them for 24 hours, 11.3% for 48 hours, 15.3% for 72 hours and even 2.7% storing their biomedical waste for 96 hours or more then this duration.

## 7. Discussion

The result shows that newly hired biomedical waste staff was not trained, and furthermore this was also presented that majority did not have any legislation for biomedical waste management, which was also observed by the researchers, and segregation was not considered according to the role even, the different color buckets was exist. Whether the BMW staff did not have awareness regarding segregation, or they authority managers not stick to the role, the segregation was not done properly. Still majority of biomedical wastes were generated by clinics/hospitals in health care centers are regulated by municipalities, even observations showed that biomedical wastes that can carry disease and transmit parasites were present in municipal bins. This problem also presents in many developing countries which many hazardous and medical wastes are handled and disposed along with municipal waste (Aseweh, 2008). Different disease and parasites can easily transmit to scavengers and poor children who are searching food and material in these bins. In term of color coding the result shows that majority did not know about the standard color coding and various colors were selected for biomedical and normal wastes. In most private and public health care centers, two or three colors bucket were present, but neither of them considering color coding, the observations showed that normal wastes were thrown in in biomedical waste buckets in contrast biomedical wastes were present in common waste buckets. Moreover, in most of the public and private health care centers standard safety boxes were present but it seemed that in most private hospitals and clinics these are not used for needle of syringes. Its present may only for the purpose of showing them to external reviewer only that they have it in their hospitals or clinics. There was no data gathered through this research to prove that they were using clear and white polythene bags but instead all governmental and private hospitals were using black bags for all type of wastes, whether it is normal or biomedical or sharp and needles. It seemed that one color for all type of wastes makes difficult for transporter, who cannot differentiate whether it is sharps/ blades, pathological wastes, infections wastes, radioactive wastes or normal waste. If wastes are sharps and needle, they could puncture the bags and stick into the body of transporter even they are not using anti-sticky coat as well. The chance of disease transmitting through this is very high. In addition, majority were agreed with the comment that safe management efforts by the hospital increase the financial burden, therefore they fully attentive to this issue. The result showed that biomedical wastes stored over than 48 hours during the summer, whereas it should be stored less than 24 hours (Singh & Kaur, 2011).

From one side it could be expel awful odors from other side the waste could be suitable place for microorganism propagations; insects and vectors eggs laying and hatching.

## 8. Conclusion

The observation which has been done from various public and private hospitals, clinics and health care centers, almost majority of public clinics and hospitals which is being supported by Baran Organization following the same procedures and three different colors buckets black, red and yellow was present. In addition, all color buckets have black bags for waste collections; furthermore guideline was stuck on wall or on buckets where that area was selected. Mostly safety box existed for needle and sharps materials, but in many places it was not used at all. A place is being selected for burning the materials inside the clinics, which were not far from bedrooms. Beyond that a deep well was used for tissues and anatomical part of the body in public hospitals and clinics but this case was not for private hospitals and clinics. In some private clinics different colors buckets existed but they were not following the role, even some private hospitals throwing their biomedical waste in municipality bins. Collections were different in various health care centers some clinics collecting their biomedical waste, by bags other were using handcart to a common collection site or to burning side.

Except Merwaise Public hospital none of the incineration was standard and the distances were not selected appropriately. In most private hospitals/clinics the burning site were inside or on the top ceiling which located in densely populated area, anyhow burning plastics in such sites emit dioxin and furans which are; Lowering of body immune system, cause allergic in respiratory disease, reducing fertility, reducing thyroid function, wasting body-mass and Increase mortality (Verma & Srivastava, 2000) more over its carcinogenic and are harm full for the residents living around particularly for the children. Storage and disposal is not the only problem in health sectors of Kandahar city, but improper segregation, packaging and labeling of different items based on international standards are not followed. Private health centers and laboratories and other pharmaceuticals centers are the major part which generate biomedical waste in Kandahar city and have weak management system overall. Improper medical waste management is alarming in Kandahar city and pose various threats to public health.

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## References

- Acharya, D. B., & Meeta, S. (2000). The book of Hospital Waste. *Management. Minerva Press, New Delhi*, 15-47.
- Aseweh Abor, P., & Bouwer, A. (2008). Medical waste management practices in a Southern African hospital. *International journal of health care quality assurance*. 21(4), 356-364.
- Gupta, S., & Boojh, R. (2006). Report: biomedical waste management practices at Balrampur Hospital, Lucknow, India. *Waste Management & Research*. 24(6), 584-591.
- Hassan, M. Manzurul, Ahmed Shafiul Azam, Rahman K Anisur, & Biswas Tarit Kanti. (2008). Pattern of medical waste management: existing scenario in Daka City, Bangladesh. *BMC public health*. 8(36),2-10.
- Hassan, M. Manzurul, Ahmed Shafiul Azam, Rahman K Anisur, & Biswas Tarit Kanti. (2008). Pattern of medical waste management: existing scenario in Daka City, Bangladesh. *BMC public health*. 8(36): 2-10.
- Inclen, P. E. N. I., & New, D. (2014). Bio-medical waste management: situational analysis & predictors of performances in 25 districts across 20 Indian States. *The Indian journal of medical research*. 139(1), 141.
- Krishna, C., Nisar, J., Iyengar, K., & Das, S. R. (2018). Awareness about Biomedical Waste Management among Hospital Staff in a Tertiary Care Hospital in Tumkur. *Indian Journal*
- Madhukumar, Suwaran and G Ramesh. (2012). Study about awareness and practices about health care waste management among hospital staff in a medical college hospital, Bangalore. *International Journal of Basic Medical Science*. 3(1),7-11.
- Mandal, Shailendra Kumar, and Dutta Joydeep. (2009). Integrated Bio-medical waste management plan for Panta City. *India Journal*.6 (2). 1-25.
- OHW. (2011). Safe management of wastes from health-care activities 2nd Ed. Edited by Y. chartier et al.
- OHW. (2014). Safe management of wastes from health-care activities 2nd Ed. Edited by Y. chartier et al.
- Patil, Gayathri, and Pokhrel Kamala. (2004). Biomedical waste management in an Indian hospital: a case study. *Waste management*. 25,592-599.



- Radha, K. V. (2009). A case study of biomedical waste management in Hospitals. *Global journal of health science*. 1(1)
- Rajan, R., Robin, D. T., & Vandananarani, M. (2018). biomedical waste management in Ayurveda hospitals–current practices & future prospectives. *Journal of Ayurveda and integrative medicine*.
- Rao, L. N., & Prabhakar G. (2013). Waste minimization in chemical process industries – A review article. *J. Chem. Biol. Phys. Sci.* 3(2), 1594-1601.
- Remy, L. (2001). Managing Hospital Waste is a Big Nasty Deal. Great Western Pacific Costal Post, 26.
- Saeedi, K. H. (2019). Municipal solid waste management analysis in Kandahar city. *Octa Journal of Environmental Research*. 7(1),010-018
- Saini, Rajiv, Pithon Matheus Melo, Singh Hardev K. and Popoff Daniela Veloso. (2013). Knowledge of biomedical waste management among the students of Rural Dental college, Maharashtra, India. *JP journal*-10029-1034.
- Sharma, Shalini. (2010). Awareness about Bio-Medical Waste Management Amount Health care personnel of some important medical centers in Agra. *International journal of Environment science and Dev.*1(3). 251-2555.
- Singh, A., & Kaur, S. (2011). Biomedical waste management in dental office. *Baba Farid University Dental Journal*. 2(2), 120-3.
- Studnicki, J. (1992). The management of hospital medical waste; How to increase efficiency through a medical waste audit. *Hsop*. 70. 11-20.
- Verma, L. K., & Srivastava, J. N. (2000). Dioxins and furans; and hospital waste incineration. *Medical journal, Armed Forces India*. 56(1), 53.

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