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Management of biomedical wastes in two hospitals in Mahajanga-Madagascar

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Abstract: Hospital and biomedical waste represented a health and environmental problem. Thus, a study was carried out at two hospitals, ZAFISAONA Gabriel University Hospital Center and JEAN PAUL-2 Hospital in Mahajanga, to describe the management of biomedical waste in order to formulate recommendations. Surveys were carried out among agents working in hospitals to assess the typology of waste, method of treatment and elimination, risks and accidents. Of the 100 distributed questionnaires, 88 responses were obtained, representing a response rate of 88% for the 75 questioned agents. Concerning the management of BMW and observations at the level of 41 services, sharps waste and blood and fluid waste were found in all services, except at pharmacies. During the investigation, pharmaceutical waste was found in 35 departments, infectious waste in 33 departments and anatomical waste in 12 departments. Working conditions were considered poor by 84%, personal protective equipment available in 85.3% of services, knowledge of BMW management was considered insufficient by 86.4% of questioned people and the health risks linked to BMW were known by 82%. A training strategy and staff awareness are priority areas for developing the quality of biomedical waste management in these hospitals.

Keywords: Waste, Biomedical, Management, Hospitals, Mahajanga

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1 Introduction

Health establishments are major producers of waste of various origins. The rapid population growth in Madagascar generates an increasing quantity of wastes **[6]**. Through their activities, they produce waste from healthcare activities and generate toxic pollutants in the ecosystem. Health establishments generate waste which risks causing harmful effects on health and the environment **[3]**.

Biomedical Waste (BMW) includes all waste resulting from diagnostic, monitoring, preventive, curative and palliative treatment activities in the field of human and veterinary medicine. They are produced by human health, hygiene, veterinary, medical research and teaching establishments, testing or clinical research laboratories and vaccine production or testing establishments **[7]**.

Approximately 85% of healthcare waste is comparable to household waste and is not hazardous. The 15% remaining is considered hazardous and can be infectious. Each year, an estimated 16 billion agents are infected worldwide, but not all used needles and syringes are properly disposed of. Practical injections with used needles and syringes had led to 33,800 new contaminations with the Human Immunodeficiency Virus (HIV); 1.7 million infections for hepatitis B viruses and 31,500 million infections for hepatitis C **[8]**. This situation poses risks to the health and safety of population health and environmental personnel.

The hypothesis which proposes to verify the study is that the method of management of waste from hospital centers exposes the staff and users with regard to the two study centers. This study aims to improve the management of biomedical waste in ZAFISAONA Gabriel University Hospital Center (PZaGaUHC) and the JEAN PAUL-2 Hospital (JP-2H) specifically. This will involve establishing the typology of waste and determining the risks linked to waste management. DBW management is a reality in new hospital structures in Mahajanga which deserves to be prioritized and improved.

2 Methodology

2.1 Investigations

Of 100 questionnaires distributed to hospital managers, department heads, department supervisors, hospital hygiene managers, 88 responses were obtained, representing a response rate of 88%. An interview was carried out with 75 workers directly involved in the management of BMW, namely care staff, surface technicians and incinerator operators. Surveys were carried out among staff at the two target hospitals. The termination and procedure of the activities carried out are represented by the following figure 1.

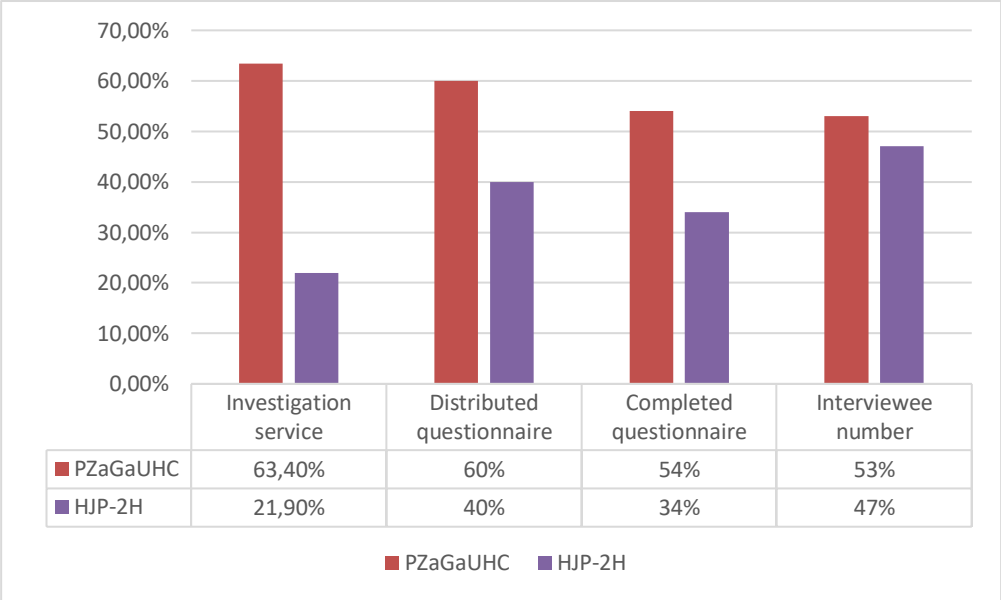


Figure 1. Distribution of survey activities of the technical department

2.2 Identification of waste management methods

A field trip was carried out within the PZAGAUHC and the JP-2H, to learn about the biomedical waste management systems practiced in these hospitals.

2.3 Data processing

Data obtained were processed and evaluated using Microsoft Excel software to facilitate understanding of the current situation of BMW rejection. The illustrations obtained facilitate the exploration of new methods of managing this waste with a view to minimizing the risks of contamination and pollution.

3 Results

3.1 Services of the technical and administrative department

The two hospitals involved in the study include 58 services including 41 services from the technical department and 17 services from the administrative department. The following table 1 summarizes the different services existing within the technical department including 7 technical platform services, 7 mother-child complex services, 6 pediatric services.

Table 1. Distribution of technical department services

Hospitals	Medecine	Emergency and resuscitation	Surgery	Technical platform	Mother child complex	Pediatrics	Total
PZAGAUHC	4	3	7	5	6	5	30
JP-2H	3	1	3	2	1	1	11
TOTAL	**7**	**4**	**10**	**7**	**7**	**6**	**41**

The following table 2 shows the different services existing within the administrative department including 11 administration services, 6 concession and management services.

Table 2. Distribution of administrative department services

Hospitals	Administrative	Concession and management	Total
PZAGAUHC	8	4	12
JP-2H	3	2	5
TOTAL	**11**	**6**	**17**

3.2. Percent of employees

The hospitals represented in Table III employed 413 workers, including 76.7% at PZAGAUHC and 23.2% at JP-2H Administrative staff represented 20.6% of this staff, teachers 1.2% and paramedics 49.9% and support staff 7%, doctors 20.6% and incinerator operators 0.7%.

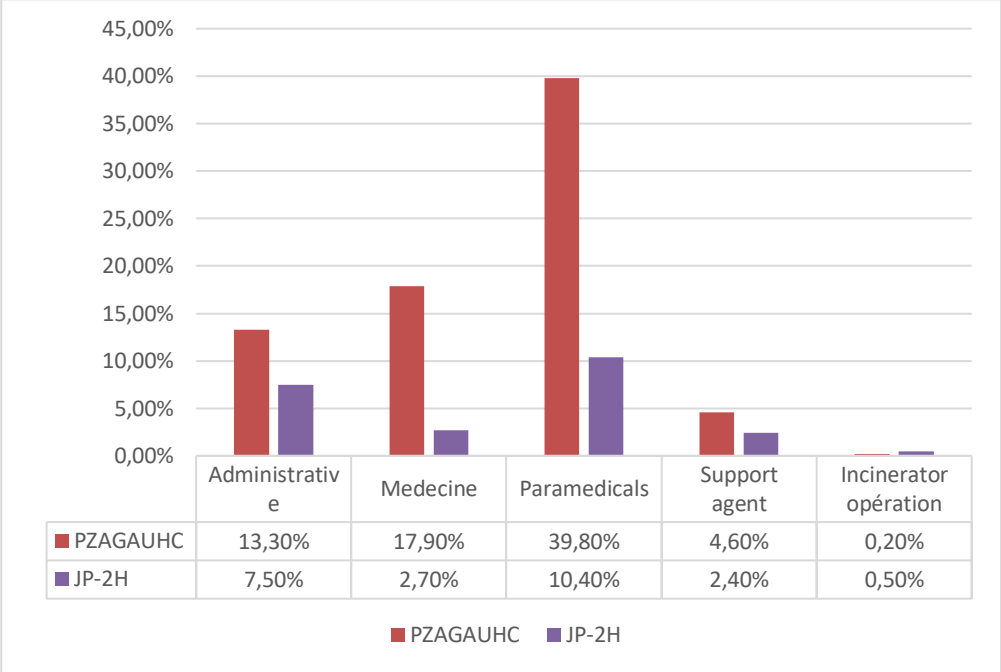


Figure 2. Distribution of employee numbers

3.3. Waste management

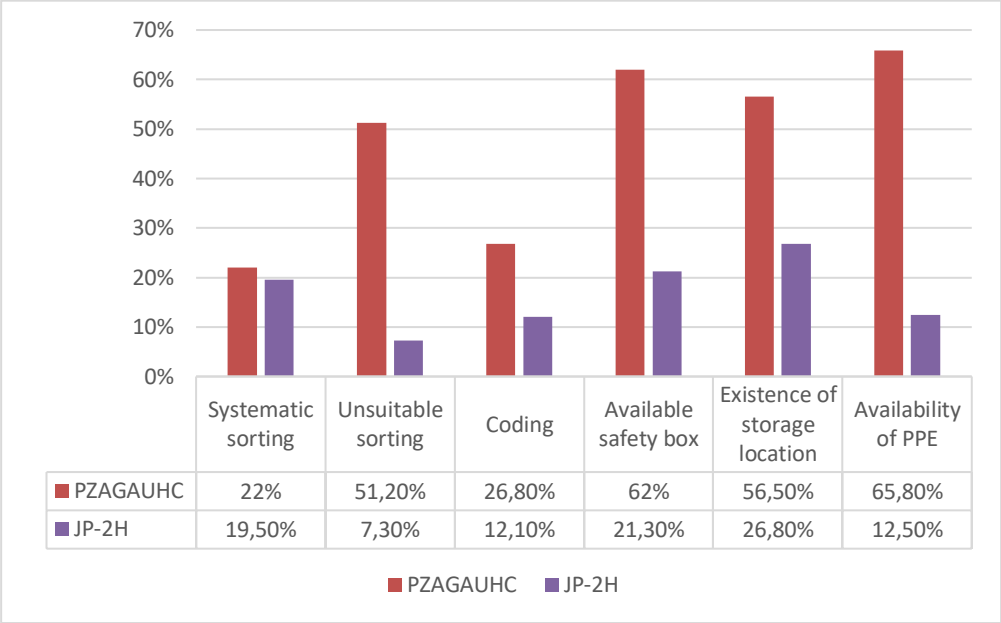
Sorting was systematic in 41.5% of the entire service of two hospitals, or 22% of the services of the PZAGAUHC, in 19.5% at JP-2H. Inadequate sorting concerned 51.2% of PZAGAUHC services and 7.8% of those at JP-2H. The color coding system for the different categories of waste was used in (39%) of all services: red for infectious waste, green and blue for general waste, anatomical waste was packaged in black plastic bags.

DBW collection was daily in two hospitals except Saturday and Sunday for PZAGAUHC. A secure storage location existed in 82.9% (n: 34) of sources while the central storage location was unsecured at the JP-2H. Fluid waste was diluted in bleach and discharged into the sewer system. At PZAGAUHC, infectious waste storage is installed next to the incinerator.

The incinerators used at the two hospitals were homemade with a single chamber to treat waste. This incinerator is in very poor condition and does not meet incineration standards. The combustion of waste allows the generation of a lot of smoke. The ashes are collected and buried near the processing site. For waste considered household waste, most of it is burned in a pit

near the incineration site. Working conditions were considered bad by 84% (n=63) of workers interviewed and good by 16% (n=12).

Waste Personal Protective Equipment (PPE) was available in 85.3% (n=35) with rubber protective gloves in all these services, masks in 82.8% (n=29) of them, table in 42.8% (n=15) and boxes in 28.6% (n=16). Knowledge about the management of BMW was considered insufficient by 86.4% (n= 76) of those questioned and the health risks linked to BMW were known by 82% (n= 7) of them. The following figure 3 shows the BMW management systems in the two hospitals.



	Systematic sorting	Unsuitable sorting	Coding	Available safety box	Existence of storage location	Availability of PPE
PZAGAUHC	22%	51,20%	26,80%	62%	56,50%	65,80%
JP-2H	19,50%	7,30%	12,10%	21,30%	26,80%	12,50%

Figure 3. Available management systems

3.4. Recommendations

The management of medical waste constitutes a real public health concern due to the exposure of users of the healthcare system, healthcare personnel and, more generally, communities to specific health and environmental risks. The results made it possible to build a certain number of convictions and to formulate recommendations, namely:

- Provide adequate equipment and materials in sufficient numbers,
- Strengthen human resources and the BMW and hospital hygiene management unit,
- Implement of a periodic training program on BMW management by relevant staff,
- Use recent, environmentally friendly BMW treatment and elimination techniques.

4 Discussion

The problems related to the management of biomedical waste at PZAGAUHC and JP-2H are very numerous, the causes are due to lack of awareness; Insufficient financial resources and insufficient material resources, two main categories of waste have been distinguished, namely Health Care Waste (HCW) and waste comparable to household waste **[2].**

Contaminated waste is mixed with household waste in the same container, because staff are not trained in waste management **[7].** This deficit in strengthening the capacity of the staff of PZAGAUHC and JP-2H in Mahajanga explains the failures observed in the management of

hospital waste, the absence of use of the coding system in 61% of hospital services follows the same explanations provided in the area of sorting. This coding, by allowing the identification and separation of BMW, significantly reduces the quantity of waste requiring special treatment and the cost of this treatment **[5].**

A total lack of storage space was noted at JP-2H and the bins are placed in the veranda. The storage location exists in PZAGAUHC, a secure shelter for the storage of infectious waste is installed next to the incinerator which is used for waste treatment, the ground is cemented and the area is fenced, it does not have a warning sign security and it is not secured by a locking system to prevent unauthorized access, water source available near the temporary storage area. The treatment of BMW produced by the establishments studied, incinerator as a treatment method at PZAGAUHC, open burning of those JP-2H ; in view of the results of the study; the situation which prevails in the health facility is justified by the lack of institutional experience relating to the management of hospital waste.

The waste being dumped in the open air and burned five days later could produce pathogenic germs which will infect hospital staff and workers **[4]**. The lack of waste treatment equipment, poor sorting of waste and unsuitable transport of waste were the origin of this risk **[1]**. The surveys carried out in the two Mahajanga hospitals showed that the risk of HIV infection, AIDS, and the risks of hepatitis B and C infection were the most convincing. The high amount of sharps waste produced in medicine and surgery demonstrates the highest incidence of infections.

5. Conclusion

In Madagascar, there is no legislation on the management of DBM but the urban commune of Antananarivo of May 30, 2000 in its decree No. 391/CUA/CAB relating to the management of hospital waste, article 2 stipulates that each establishment is responsible for the elimination solid risk waste (sharps) contaminated or liquid it produces. Biomedical waste must be treated with more attention in order to avoid many diseases associated with poor practice.

PZAGAUHC and JP-2H services produce a lot of waste which can be dangerous for health and the environment; some of these wastes like sharp/pungent waste; Infected blood has a higher risk of infection than other types of waste. This study reveals the faulty management of healthcare waste with harmful effects on the health of healthcare personnel due to the risk of handling on the one hand and on the environment on the other hand with a release of pathogens and toxic pollutants through waste disposal methods waste.

Work remains to be done for the continuation of the study: trying to valorize the BMW, studying the possibility of incineration with energy recovery for the cogeneration system and launching a project to install a waste treatment site from hospitals in the Mahajanga town.

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