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State Of Play On The Management Of Solid Biomedical Waste At The Barumbu Mother And Child Hospital Center And Medical Services Center In The City Of Kinshasa In DR Congo

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Abstract

Objective: To evaluate the management of solid bio-medical waste (BMW) at the Barumbu Mother and Child Hospital (MCH) and Medical Services Center.
Methods: Transversal descriptive study made from May 19 to July 19, 2023. Of the 417 questionnaires distributed to providers, 272 responses were obtained, representing a response rate of 65.2%. Data collection was done by survey questionnaire, direct observations and daily weighing. Data analysis is done by Epi-info 7.2.5 and Excel 2016 software.
Results: The average estimated daily amounts of BMW at MCH Barumbu and Medical Services Center are 0.45 kg/bed and 0.97 kg/bed, respectively. The sorting was not suitable at 65%, lack of packaging and color code. The insufficiency of material resources was criticized at 88%. 55.5% of accidents/injuries were recorded. The storage area was not secure. 88.97% of staff were unaware of management standards, 99.3% were aware of the health risks associated with hospital waste and 13.97 were trained. It is noted that the financial resources allocated to the management of BMW are insufficient.
Conclusion: Improving the management of BMW inevitably requires the removal of constraints that would require the involvement of managers at all levels.

Keywords – Management, Solid hospital waste, Barumbu Mother and Child Hospital Center, Medical Services Center, Kinshasa.

I. INTRODUCTION

Care activities generate an increasing amount of hospital waste. Some waste from these activities does not present a particular risk and may be comparable to household waste. However, others present risks of an infectious nature, the mismanagement of which can cause serious illness to health workers, waste disposal personal, patients and the general population and pose a serious threat to the environment.

In developing countries, particularly in Sub-Saharan Africa, with limited human and financial resources available to health facilities, the situation related to the effective management of biomedical waste remains a challenge. In 2020, only 30% of health facilities in developing countries and two out of five (40%) health facilities in sub-Saharan Africa had a basic service for biomedical waste management (WHO/UNICEF JMP Report, 2020).

In DRC, 99.1% of health facilities had limited services for biomedical waste management: sharps and sharp waste are sorted and/or treated and disposed of to some extent, but not all basic service criteria (waste sorted and safely disposed of in at least three different bins and infectious waste treated and disposed of safely) are not met. And 0.1% of facilities had no services (no separate

bins for sharp and infectious waste and these are not treated and disposed of safely) for the management of biomedical waste (WHO/UNICEF JMP Report 2020).

Indeed, it is planned in DR Congo that each hospital structure has a service responsible for hospital hygiene (DRC Hygiene Code, 2015). However, the hospital waste management situation leaves much to be desired. Several grievances were reproached, the main ones being the non-application of legal and regulatory provisions on waste management (in hospitals, there are no hospital hygiene units), the ministries of public health and the ministry of the environment do not define the specific and detailed concept of responsible management of hospital solid waste from food, pharmaceuticals and chemicals; the inadequate disposal system and the non-involvement of politico-administrative authorities in waste management. (Mukamba, 2008; Kasuku, 2021).

The attention given to this study is justified in the light of the above. This analysis concerns the public and private hospitals of the city of Kinshasa, more specifically the MCH Barumbu and Medical Services Center. In this approach, it is a question here of making a State of play of hospital solid waste management and thus contribute to the improvement of the hospital environment through the rational management of biomedical waste.

II. Study Environment, Material And Methods

Study framework

This study was carried out in two health facilities, namely: Barumbu Mother and Child Hospital Center (public) and Medical services center (private). Their common missions are to ensure the care of patients at the preventive, curative, promotional and rehabilitation levels, including research and teaching.

Methodology

This is a descriptive cross-sectional study conducted for 2 months, from May 19 to July 19, 2023. The study population consisted of healthcare providers (doctors, midwives, nurses, radiology technicians, laboratory technicians, pharmacists) and hospital waste management staff at MCH Barumbu and Medical Services Center.

The sampling technique was probabilistic stratified with a calculated aggregate sample size of 417, or 37% of the target population. To collect the necessary information, it was done by the structured interview on the basis of a questionnaire and the visual observation of biomedical waste management practices using an observation grid. The quantification of solid hospital waste (sharps/sharps and contaminated), by care service, was carried out using a SALTER brand scale with a maximum capacity of 200 Kg. Household waste, radioactive waste and liquid waste are excluded from this study. The data collected were, after quality control, entered into an input mask of the Epi info version 7.2.5 software and processed using the Excel version 2016 software.

III. Results

Table N° 01: Characteristics of health care facilities

Parameters	Health facilities	
	MCH Barumbu	Medical Services Center
Belonging	Public	Private
Area	78x80m^2	35x45m^2
Open spaces	Yes	No
Parking	Yes	Yes
Number of trees	1	0
Number of beds	84	18
New cases received/day	30±5	19±3

Target socio-professional category	Doctors	187	3
	Nurses	160	3
	Laboratory technicians	37	1
	Surface Technicians	21	1
	Pharmacists	3	1

The table above shows that the MCH Barumbu has a free space and a tree for good ventilation while the Medical Services Center has none. The two health facilities have a car park in front of the establishment. The MCH Barumbu has 84 beds mounted with a high attendance rate, an average of 30±5 new cases received per day while Medical Services Center has 18 beds mounted with an average of 19±3 cases estimated per day.

It is noted that out of 190 targeted physicians (37% calculated on the mother population) in the sample, 187 were distributed to MCH Barumbu against 3 for Medical Services Center. The nurses left for 160 at MCH Barumbu and 3 for Medical Services Center. Laboratory technicians, cleaners and pharmacists split respectively into 37, 21 and 3 for MCH Barumbu against 1, 1, 1 for Medical Services Center.

Table N° 02: Distribution of respondents by vocational qualification

Occupational categories	Target workforce	Number of respondents	(%)
Doctors	190	120	63,1
Nurses	163	112	68,7
Laboratory technicians	38	15	39,8
Surface / sanitizer technicians,	22	22	100
Pharmacists	4	3	75
Total	**417**	272	65,2

In the light of Table 02, it appears that of the 417 people planned for the survey, we received responses from 272 people, i.e. an overall participation rate of 65.2%. Surface technicians participated 100% in the survey, followed by nurses at 68.7%, pharmacists at 75%, doctors at 63.1%, and laboratory technicians at 39.8%.

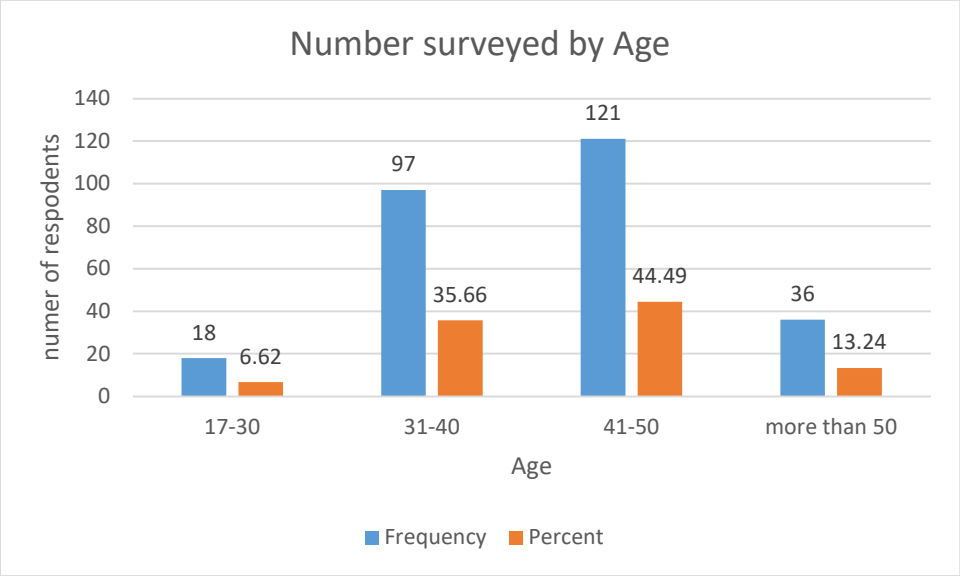

Figure N°01: Distribution of respondents by age group

The graph above shows that the majority of respondents, 44.49%, belonged to the 41-50 age group.

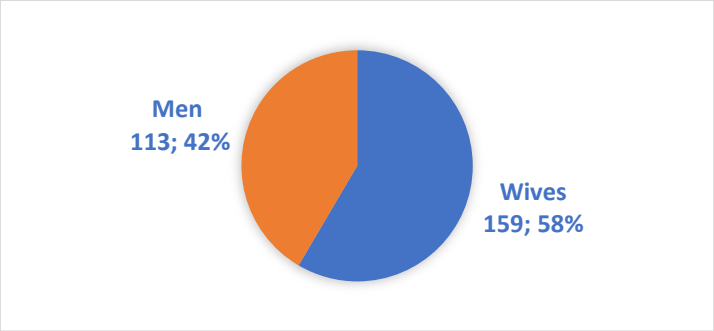

Figure N° 02: Distribution of respondents by gender

In the light of this figure, women represented 58% of respondents against 42% for men.

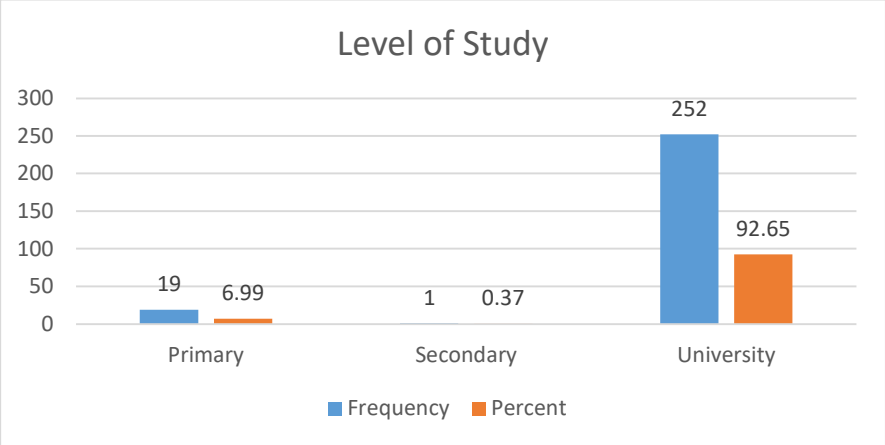

Figure N° 03: Distribution of respondents by level of education

An analysis of this graph shows that primary health workers represent 6.9% of the staff surveyed. The entire class is designated for the collection of healthcare waste in health services and transport to either the storage or destruction. These staff would be a handicap in understanding the delicacy of the sustainable management of sanitary waste.

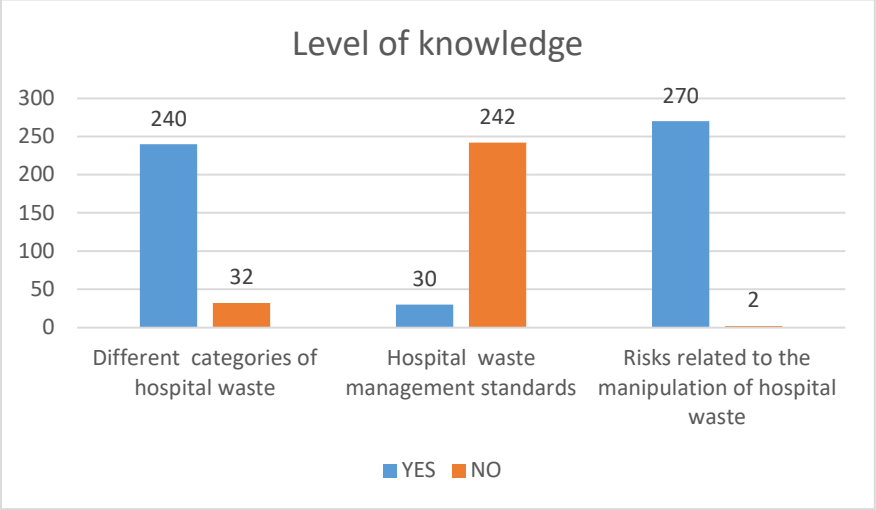

Figure N° 04: Distribution of respondents according to their knowledge

This figure shows that the majority of respondents, 240 agents representing 88.23%, know the different categories of hospital waste. However, management standards are ignored by 88.97% (240 respondents). Almost all respondents (270) are aware of some risks (infectious only) related to the handling of hospital waste.

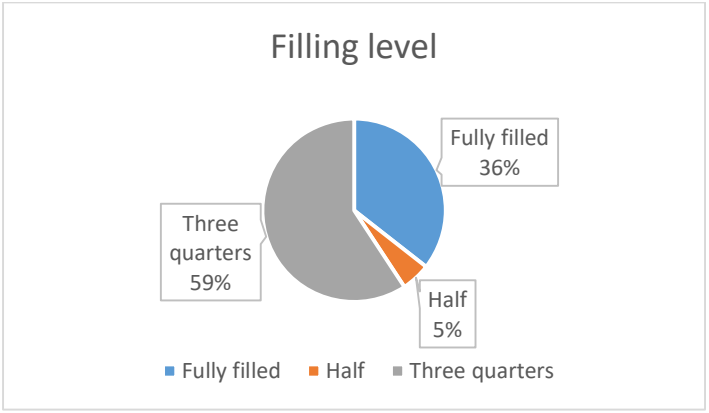

Figure N° 05: Fill level in care services

Based on this figure, the bins are fully filled in 36% of cases.

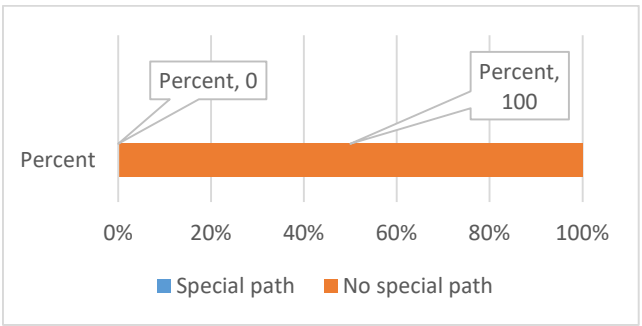

Figure N° 06: Path taken for the transport of hospital waste

This figure shows that there is no special route that is used for the safe transport of hospital waste to storage.

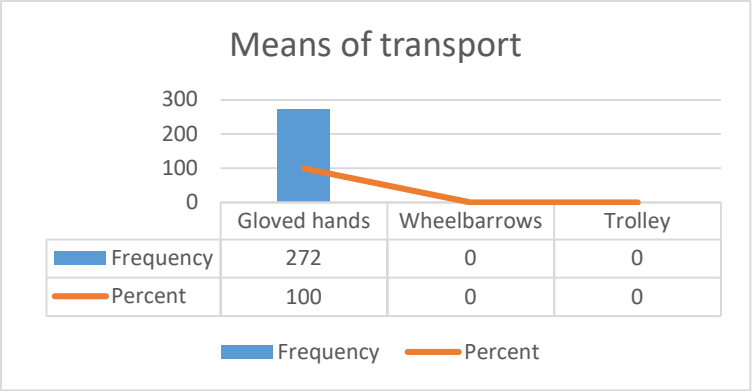

Figure N°07: Means of transport used

All agents (100%) transport hospital waste containers with gloved hands.

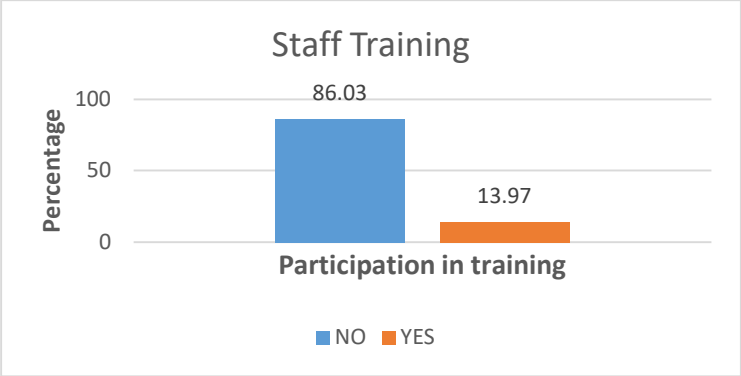

Figure N°08: Staff participation in hospital waste management training

This figure shows only 13.97% of staff having received training on hospital waste management, and in 100% of cases it was a program outside the health facility that everyone had the opportunity to follow. The two health facilities have not yet established a staff training program on hospital waste management.

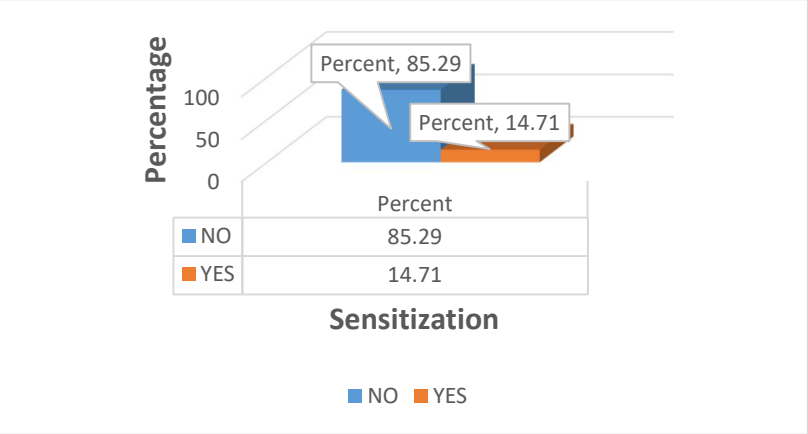

Figure N° 09: Existence of awareness days on the management of hospital waste and risks

The majority of staff (85.29%) affirm the non-existence of awareness days organized for all agents, patients and nurses, on the hospital waste management and the risks related to mismanagement. The 14.71% report only small briefings on hospital hygiene during morning nurses' meetings only.

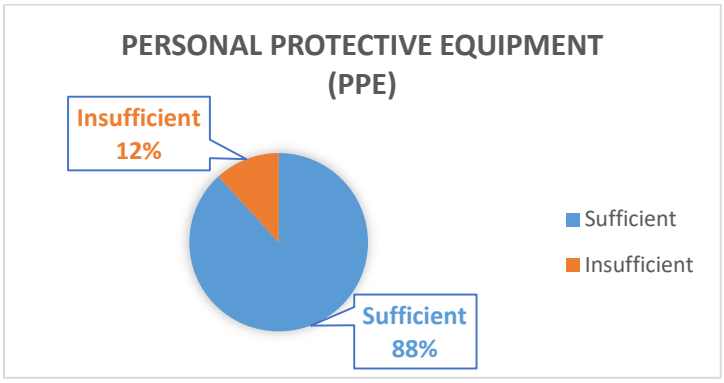

Figure N° 10: Personal protective equipment (PPE)

The insufficiency of personal protective equipment (PPE) is decried at 88%.

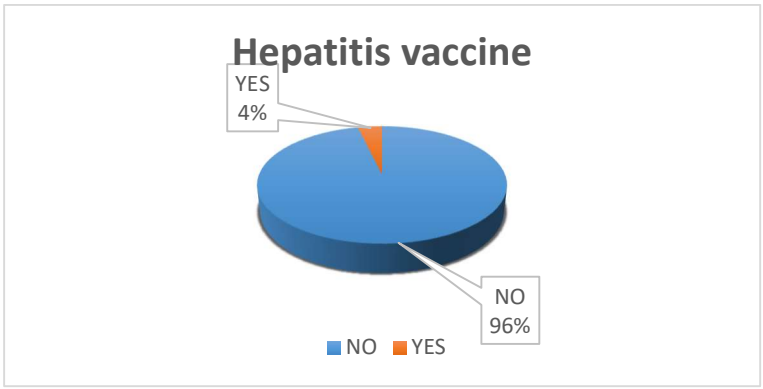

Figure N° 11: Hepatitis vaccination rate

Almost all (96%) of staff are not vaccinated against hepatitis (B, C) viruses, which are mandatory for all healthcare providers.

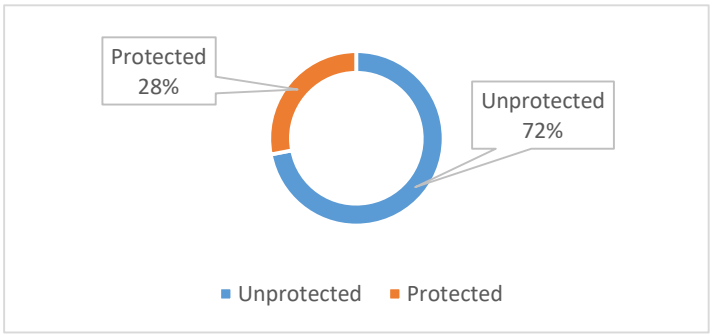

Figure N° 12: Personal opinions on personal protection

The majority of respondents (72%) think they are not well protected.

Table N° 03: Distribution of respondents by injury/incident

Respondents	Injury/incident case
Nurses	73
Laboratory technicians	12
Doctors	54
Surface Technicians	12
Total	**151**

Of the 272 respondents, 151 were injured during their care practices.

Financial resources: Specific budget allocation for BMW management

At CHME Barumbu, the chief sanitation technician surveyed admits the unavailability of sufficient financial resources declared in the budget line specifically allocated to the management of BMW. This reality is identical to that noted at the Medical Services Center.

Quantification of hospital waste generated

Table N° 04: Daily quantification of BMW in Kg/day for MCH Barumbu

Services	Obs	Total	Average	Median	Mode
Operating theatre	7	30,5	4,36±0,47	4	4
Laboratory	7	42,5	6,07±1,17	6,5	7
Internal Med	7	34	4,86±0,85	5	5
Pédiatrics	7	51,5	7,36±1,25	8	8
Post partum	7	31	4,43±0,45	4,5	4
Labour/delivery room	7	34	4,86±0,38	5	4,5
Emergencies	7	44	6,28±0,81	6	6

N=38,2 **P value**= 0,02905

The amount of waste generated differs according to the services where it is collected during the investigation period P<0,05. Waste from the paediatric ward being the most produced. The total biomedical waste is 38.2 kg/day.

Table N° 05: Daily quantification of BMW in Kg/day for Medical Services Center

Services	Obs	Total	Average	Median	Mode
G-O/Childbirth	7	17	2,43±1,71	3	3
Laboratory	7	33	4,71±0,57	5	5
Hospital room	7	28,5	4,07±0,73	4	4
Emergencies	7	45	6,43±1,43	7	7

N=17,6 **P value**= 0,03984

The amount of waste generated differs according to the services where it is collected during the investigation period P<0,05. Waste from Emergencies being the most produced. The total biomedical waste is 17.6 kg/day.

IV. DISCUSSION

About the quantification of hospital waste

The daily production of solid BMW for MCH Barumbu and Medical Services Center are respectively estimated to be approximately 38.2 Kg/d (P value<0.05), or 0.45 Kg per bed per day (for 84 occupied beds); and 17.6 Kg/d (P value<0.05) or 0.97 Kg per bed occupied per day (for 18 mounted beds). The amount of waste generated differs according to the services where it is collected during our investigation period (P<0,05).

Previous CIRC 2011 research confirmed that the capacity of waste generated in a health care facility varies depending on each structure (ICRC, 2011). Admittedly, the solid BMW averages observed by the present study are less than or equal to that found at the Provincial General Reference Hospital of Bukavu (0.86 Kg/bed/day) (MWISA, 2020).

At the end of the study carried out by Wanduma and al. (2018) in Kinshasa, DR Congo, it was noted an average quantity of solid hospital waste of 3.83kg/bed/day with an estimated household waste production of about 70%.

About knowledge, practices, training and awareness in BMW management

The analysis of the results identified 88.97% of health workers in health facilities (including 100% of surface technicians) completely ignoring the standards that govern the management of solid hospital waste according to national policy and WHO. This does not contradict the result of the survey conducted by Oleko and al in Kisangani, DR Congo (2018): the level of knowledge of staff on the management of solid hospital waste is insufficient at 61.6%. And that of TAGUINE, Algeria (2018), which revealed a high ignorance rate of 100%. This situation is due to the total absence of a continuous training and awareness program for staff on the hospital waste management in the two health facilities, combined with the lack of a protocol that can serve as a standards-based guide available to staff. However, articles 36 and 37 stipulate that personal involved in the handling of biomedical waste must receive practical training and be supervised. All staff and users must be regularly made aware of the risks associated with biomedical waste.

This would also explain why the results obtained indicate non-compliance with sorting during observations in almost all services and the overflow of waste in bins due to lack of compliance with the filling level (in 36% of cases). This corroborates the observations made by Kasuku (2021) in four hospitals in the city of Kinshasa and by Mwisa and al (2020) at the General Provincial Reference Hospital (HPGR) in Bukavu, DR Congo: the lack of sorting of hospital waste. However, 99.3% of staff believe they are aware of the risks associated with poor waste management, a result that does not contradict that of Oleko and al (2018) estimated at 84.7% in four hospitals in Kisangani, DR Congo.

Concerning material resources

Articles 34 and 35 of the Hygiene and Sanitation Code (DRC) stipulate: "Biomedical producers and operators must have appropriate equipment: personal protective equipment for personnel in contact with biomedical waste, packaging equipment, transport equipment, treatment equipment, disposal equipment. Compliance with hygiene rules is essential throughout the chain.

However, analysis of the results indicates a lack of materials necessary to ensure safe packaging, collection and transport. This deficiency, decried at 88%, logically led all surface technicians to declare that they are not protected and this would be the major cause of 55.5% of the cases of incidents or injuries recorded during the investigation. In 2021, Kasuku reports in his study conducted in four establishments in Kinshasa, DR Congo, that waste was transported by hand in non-standardized and unprotected bins (gloves, boots, glasses...). And even at the end of the study carried out by Oleko et al (2018) in Kisangani (DR Congo), it is noted that 73.3% of the transport of BMW was done manually, working conditions were considered poor by 84.7% of staff surveyed and PPE was available in only 49.1% of services. On their side, Ndiaye and al in Dakar, Senegal (2012) reported that working conditions were considered poor by 81.3% of workers surveyed.

In addition to this, the transport does not follow any special path fixed and the place of storage is not secured, as the waste is stored in the open air. This corroborates the observations of Oleko and al (2018) which reveal an open-pit central storage site for BMW. Article 29 of the Hygiene and Sanitation Code (DRC) emphasizes this subject by stipulating that the transport of biomedical waste on the production site and outside the production site to an external treatment center is done under conditions that ensure the protection of people and the environment. Transportation takes place during periods of low traffic.

On vaccination status

This study shows that almost all (96%) of staff are not vaccinated against hepatitis B and C viruses. In Congo Brazza, the same study reported that the vaccination status of hospital staff was relatively incomplete, only 44.29% of staff were vaccinated (BERTIN, 2015). However, Article 36 of the Code of Hygiene and Sanitation (DRC, 2015) requires that personnel involved in the handling of biomedical waste be vaccinated against hepatitis B, tetanus and other diseases targeted by the Ministry of Public Health.

With regard to disposal

The incineration site is located behind and in direct contact with the premises of the services, with the consequences related to air pollution by smoke; This represents a huge danger to public health and the environment. According to articles 3 and 6 of the framework law on waste management of 22 November 2006 in Morocco, health facilities are major producers of DBM and are required "to ensure or have ensured its disposal under conditions likely to avoid harmful effects on the soil, fauna and flora". In DR Congo, articles 23 and 32 of the hygiene code stipulate: "Biomedical waste, including anatomical waste, must be destroyed by incineration. Non-anatomical waste must be incinerated, disinfected, commoditised or landfilled taking into account its impact on the environment. Regardless of the type of incinerator chosen, the activity related to incineration must be subject to an environmental, social and appropriate monitoring impact assessment."

On the budget allocation

It was noted that sufficient financial resources allocated to the management of BMW were unavailable. This result corroborates that of Ndumba and al. (2023) on BMW in health facilicies in the Kintambo Health Zone in Kinshasa: the lack of financial resources would be one of the causes of the dysfunction of the BMW management system. This observation also emerges from the study carried out in Cameroon by MBOG et al. (2020).

These results confirm that the management of waste from healthcare is encountering difficulties in all hospitals in the DRC, in general, and those in the city-province of Kinshasa, in particular.

V. CONCLUSION

The results obtained in this study lead to the following conclusion:

- The solid biomedical waste management system at MCH Barumbu and Medical Services Center is a major danger to public health and the environment;
- The lack of training and awareness-raising of health personnel, staff responsible for collection, patients and accompanying persons, as well as the unavailability of sufficient material and financial resources, are at the root of this situation;

In view of the shortcomings and difficulties encountered in the solid hospital waste management, and with a view to improvement, the following recommendations are made:

- ✓ The Congolese government to explicitly and correctly legislate laws on roles, responsibilities and processes for biomedical waste management;
- ✓ Promote nationwide continuing education and awareness sessions on solid biomedical waste management;
- ✓ Provide a specific and sufficient budget for the management of solid hospital waste in each health care facility;
- ✓ Strengthen the health establishment with high-performance, adapted and sufficient materials and equipment for the management of biomedical waste;

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