EVALUATION OF SOLID BIOMEDICAL WASTE MANAGEMENT AT THE BARUMBU MOTHER AND CHILD HOSPITAL CENTER IN THE CITY OF KINSHASA, 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 Center (MCH).

Methods: Transversal descriptive study made from May 19 to July 19, 2023. Of the 408 questionnaires distributed to providers, 263 responses were obtained, representing a response rate of 64.5%. 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 amount of BMW per day at MCH Barumbu is 0.45 kg/bed. The sorting was not 65% suitable, lack of packaging and color code. The lack of material resources was criticized at 89%. 55.5% of accidents/injuries were recorded. The storage area was not secure. 87.45% of staff were unaware of management standards, 99.2% were aware of the health risks associated with hospital waste and 13.3% were trained. It is noted that the financial resources allocated to the management of DBMs 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, Hospital solid waste, MCH Barumbu, Kinshasa

RESUME

Objectif : Evaluer la gestion des déchets bio-médicaux (DBM) solides au Centre Hospitalier Mère et Enfant (CHME) Barumbu.

Méthodes : Etude descriptive transversale faite du 19 Mai au 19 Juillet 2023. Sur les 408 questionnaires distribués aux prestataires, 263 réponses ont été obtenues, soit un taux de réponse de 64,5%. La collecte des données était faite par questionnaire

d'enquête, observations directes et pesées journalières. L'analyse des données est faite par Epi-info 7.2.5 et le logiciel Excel 2016.

__Résultats__ : La quantité de DBM estimée en moyenne par jour au CHME Barumbu est de 0,45 kg/lit. Le tri n'était pas adapté à 65%, absence de conditionnement et code couleur. L'insuffisance des ressources matérielles était décriée à 89%. Il a été enregistré 55,5% des cas d'accidents/blessures. Le lieu d'entreposage n'était pas sécurisé. 87,45% de personnels ignoraient les normes de gestion, 99,2% connaissaient les risques sanitaires liés aux déchets hospitaliers et 13,3% étaient formés. Il est noté l'insuffisance des ressources financières allouées à la gestion des DBM.

__Conclusion__ : L'amélioration de la gestion des DBM passe inévitablement par la levée des contraintes qui nécessiterait une implication des responsables à tous les niveaux.

__Mots-clés__ : Gestion, Déchets hospitaliers solides, CHME Barumbu, Kinshasa

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.

I. STUDY ENVIRONMENT, MATERIAL AND METHODS

1.1 Study framework

This study was carried out at the Barumbu Mother and Child Hospital Center, whose mission is to ensure the care of patients at the preventive, curative, promotional and rehabilitation levels, including research and teaching.

1.2 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 within MCH Barumbu.

The sampling technique was simple random with a calculated aggregate sample size of 408. 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 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.

II. RESULTS

Table N° 01: Characteristics of health care facilitie

Parameters		Health facilitie
		MCH Barumbu
Belonging		Public
Area		78x80m²
Open spaces		Yes
Parking		Yes
Number of trees		1
Number of beds		84
New cases received/day		30±5
Target socio-professional category	Doctors	187
	Nurses	160
	Laboratory technicians	37
	Surface Technicians	21
	Pharmacists	3

The table above shows that the MCH Barumbu has a free space and a shaft for good ventilation. It has parking in front of the property. MCH Barumbu has 84 beds with a high attendance rate, an average of 30±5 new cases received per day.

The target population includes 187 doctors, 160 nurses, 37 laboratory technicians, 21 cleaners and 3 pharmacists.

Table N° 02: Distribution of respondents by vocational qualification

Occupational categories	Target Number	Number of respondents	(%)
Doctors	187	117	62,6
Nurses	160	109	68,1
Laboratory Technicians	37	14	37,8
Surface / sanitizer technicians	21	21	100
Pharmacists	3	2	66,7
Total	**408**	263	64,5

In the light of Table 02, it appears that of the 408 people planned for the survey, we received responses from 263 people, an overall participation rate of 64.5%.

Surface technicians participated 100% in the survey, followed by nurses at 68.1%, pharmacists at 66.7%, doctors at 62.6%, and laboratory technicians at 37.8%.
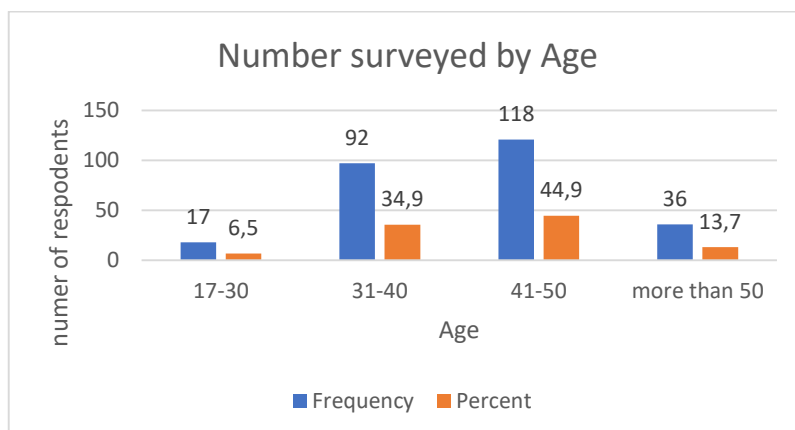
***Figure N°01**: Distribution of respondents by age group*

The graph above shows that the majority of respondents, 44.9%, belonged to the 41-50 age group.
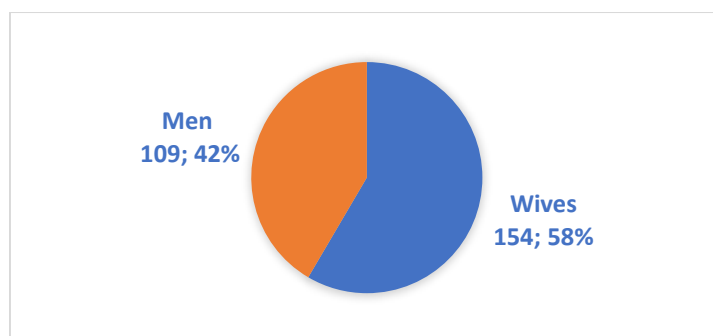

***Figure N° 02:** Distribution of respondents by gender*

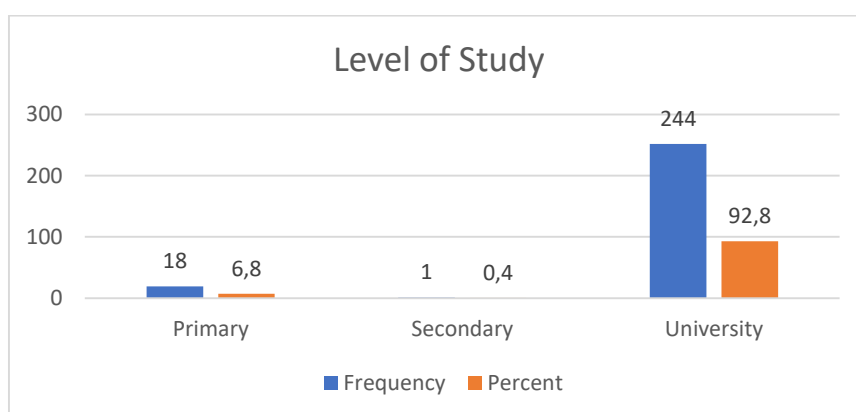In the light of this figure, women represented 58% of respondents against 42% for men.

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

An analysis of this graph shows that primary health workers represent 6.8% 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.
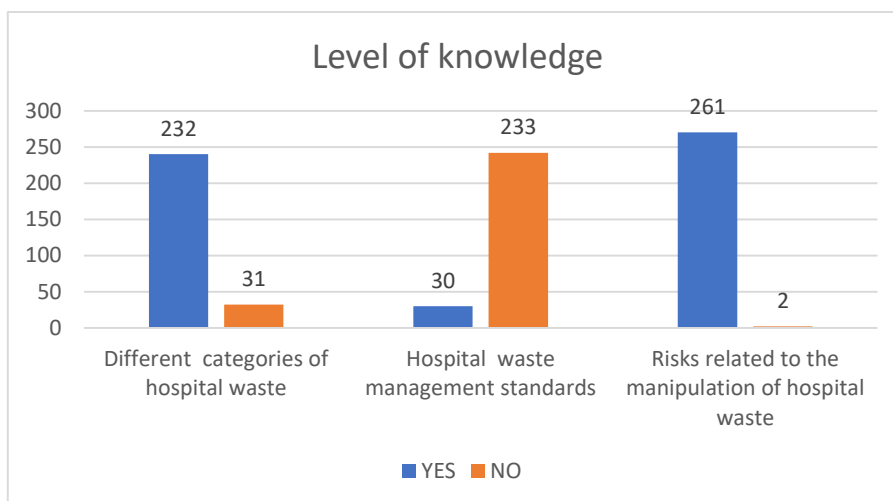

Figure N° 04: *Distribution of respondents according to their knowledge*

This figure shows that the majority of respondents, 232 agents representing 88.2%, know the different categories of DH. However, management standards are ignored at 87.45%. Almost all respondents (261) know some risks (infectious only) related to the handling of BMW.
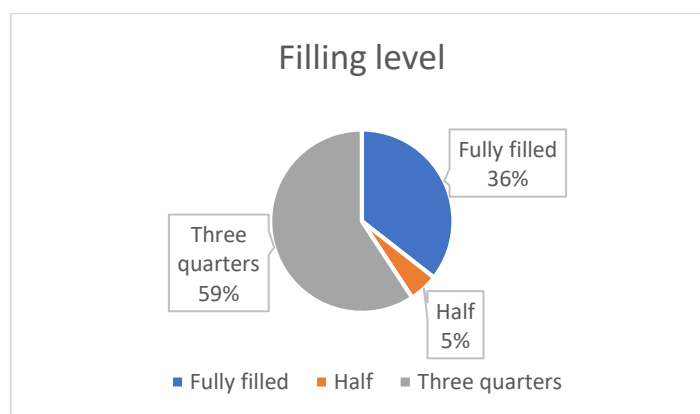

Figure N° 05: *Fill level in care services*

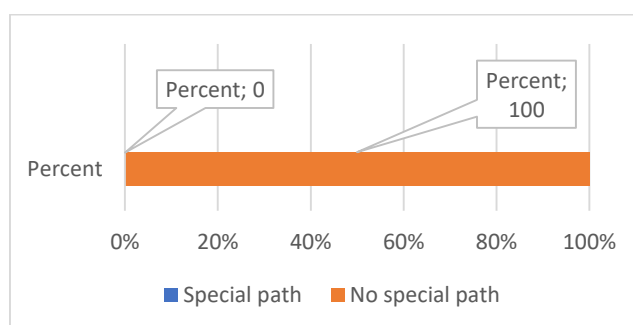Based on this figure, the bins are fully filled in 36% of cases.

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.
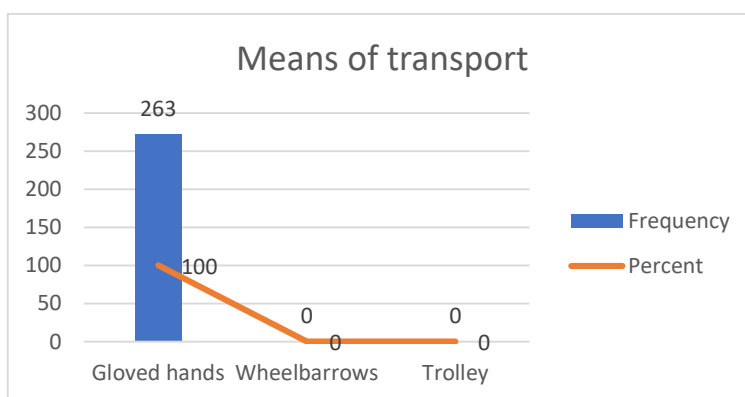

Figure N°07*: Means of transport used*

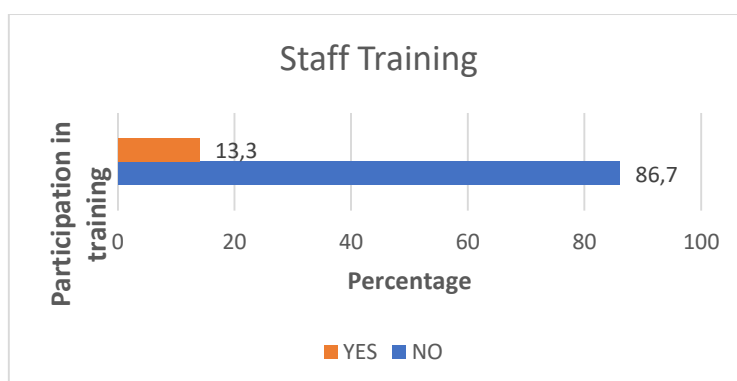All agents (100%) transport hospital waste containers with gloved hands.

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

This figure shows only 13.3% 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

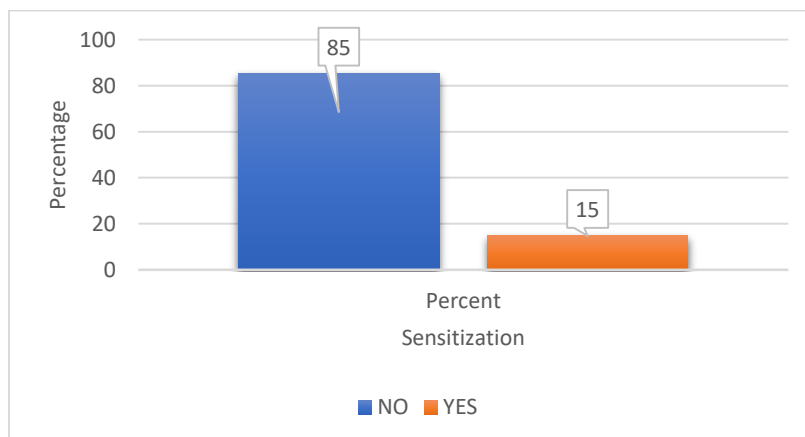have not yet established a staff training program on hospital waste management.

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

The majority of staff (85%) 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 15% report only small briefings on hospital hygiene during morning nurses' meetings only.
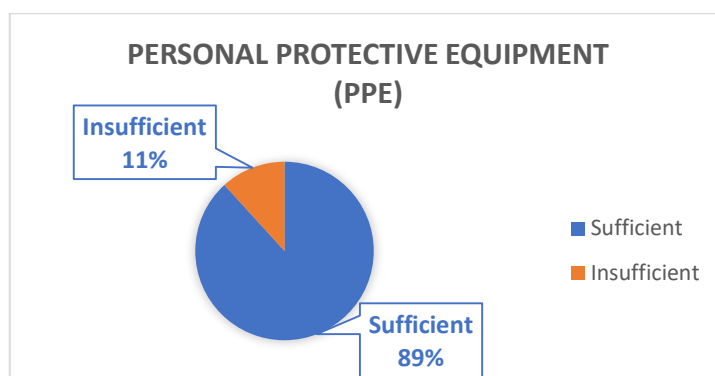

Figure N° 10: *Personal protective equipment (PPE)*

The insufficiency of personal protective equipment (PPE) is decried at 89%.
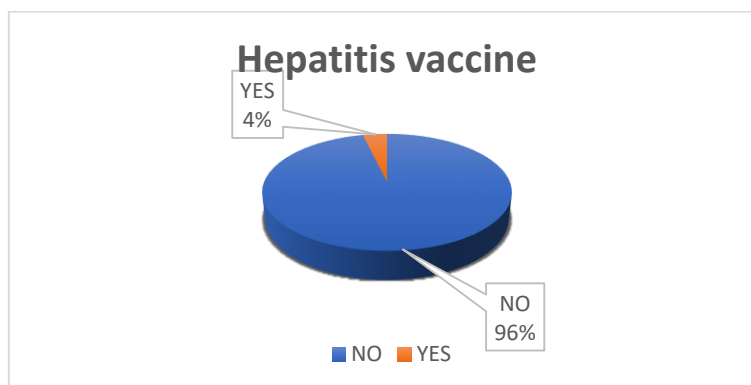
Figure N° 11: Hepatitis vaccination rate

Almost all (96%) of staff are not vaccinated against hepatitis (B, C) viruses, which are mandatory for all healthcare providers.
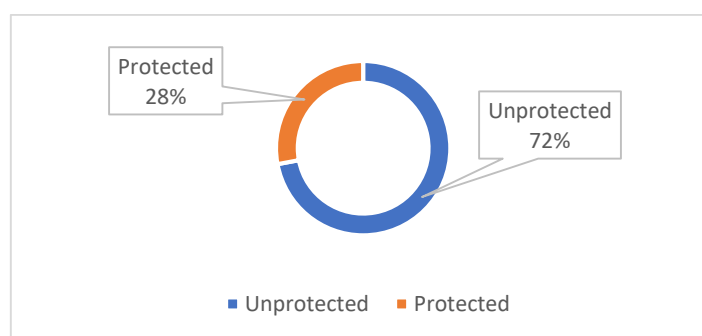
Figure N° 12: Personal opinions on personal protection

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	71
Laboratory technicians	11
Doctors	52
Surface Technicians	12
Total	**146**

Of the 263 respondents, 146 were injured during their care practices.

Financial resources: Specific budget allocation for BMW management

The chief sanitation technician surveyed admits the unavailability of sufficient financial resources declared in the budget line specifically allocated to the management of BMW.

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.

III. DISCUSSION

About the quantification of hospital waste

The daily production of solid BMW at MCH Barumbu is estimated at about 38.2 Kg/d (P value<0.05), or 0.45 Kg per bed per day (for 84 occupied beds). The amount of waste generated differs according to the services where it is collected during the investigation period (P<0,05).

Previous IARC 2011 research confirmed that the capacity of waste generated in a health care facility varies depending on each structure (ICRC, 2011). Admittedly, the average solid DBM observed by the present study is 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 et 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 87.45% 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 et 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 management of hospitals waste in health facilities, combined with the absence of a protocol that can serve as a standards-based guide available to staff. However, Articles 36 and 37 stipulate that personnel involved in the handling/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 et al (2020) at the Provincial General Reference Hospital (HPGR) in Bukavu, DR Congo: the lack of sorting of hospital waste. However, 99.2% of staff believe they are aware of the risks associated with poor waste management, a result that does not contradict that of Oleko et 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 89%, 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 BMW 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.

IV. CONCLUSION

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

- The solid biomedical waste management system at MCH Barumbu 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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