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Research Article

ASSESSMENT OF BIOMEDICAL SOLID WASTE MANAGEMENT IN PUBLIC HEALTHCARE FACILITIES IN CAMEROON: A CASE STUDY OF NORTH, ADAMAWA, EAST AND NORTHWEST

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Abstract

Biomedical waste (BMW) is originally a health and environmental problem. The aim of this study was to analyse the biomedical solid wastes in selected public health centres in Cameroon to improve it, while respecting environmental concerns, technical and socio-cultural norms. This paper is a descriptive cross-sectional study which was conducted from 16 to 31 January 2016. Data were collected using three instruments (questionnaire, site visitation and in –depth interview). The target population were managers of the selected health facilities, heads of department, supervisors and services responsible for hospital hygiene. Data analysis was done with SPSS version 20. Chi-squared test was used to determine level of significance at $p < 0.05$ The results show that sharps waste, pathological wastes are in all services, Sorting BMW is inadequate in60.0 % of health Care facilities and the use of a non-existent colour coding system in health facilities. Safety boxes for the collection of sharps are available in 56.7% of health facilities and their effective use in65.0% of them. The transport of BMW to the central storage place is done using large seals in 87.4% of health facilities. The elimination of BMW is done in old incinerators or artisanal ovens, with significant smoke leakage in 80% of health facilities. Knowledge of the management of BMW are deemed insufficient by 62.6% of respondents and the health risks associated with DBM known by 80%.In order to enhance uniform and appropriate waste management practices in the country, there is need for capacity building at all levels and also policies and guidelines formulations

Keywords: Biomedical Waste - Management - Pollution - Risks - health facilities

INTRODUCTION

The duty of hospitals and health-care establishments is to look after the public health. Hospital is a complex institution; these establishments are vital for our live in the same way as Its can be a source of pollution for environment because of Biomedical waste generation. Pollution due to Biomedical Waste (BMW) is one of the most complex problem to solve. According to World Health Organization (WHO) Biomedical waste are total waste generated by hospitals, health-care establishments, and research facilities in the diagnosis, treatment, or immunization of human beings or animals, and other associated research and services (World Health Organization, 2005). More than three-fourth of the health-care wastes are non-hazardous while the remaining proportion is potentially hazardous. According to the WHO, 20% of total waste generated by healthcare activities are hazardous (Park, 2009). Due to the infectious nature of some clinical waste, this management constraints to use specific methods. Such management which becomes critical issue, requires an appropriate hygiene policy, sufficient and trained human resources, material and financial resources, and adequate regulations to be able to prevent, or reduce, any risk for patients, biomedical professionals and ecosystem (Hirani, 2014; Mochungong *et al.,* 2008; Patan, 2015; Patil and Pokhrel, 2005). WHO launched in 2005 the global challenge for the safety of care and proposed, as main strategy, the management of BMW in order to prevent the various risks generated (World Health Organization, 2005).

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With the growing of population, healthcare facilities and biomedical generation, we note actions by developing countries and internationals organizations about assessment in order to ameliorate the biomedical waste management (Mochungong *et al.,* 2008). Despite this, there is a still lot of confusion with the problems among the generators, operators, decision-makers and the general community about the safe management of bio-medical waste. In 2002, a World Health Organization (WHO) survey of 22 developing countries found that the proportion of health facilities that did not use the proper methods of disposing of health care waste ranged from 18% to 64% (Organization, 2002). In Africa, biomedical solid waste management in substandard (Dzekashu Lanyuy Gillian, 2017)); an inappropriate handling of infected materials from health facilities, and an inappropriate management of biomedical waste (collection, storage, treatment and disposal) is a risk not only for hospital staff, populations residents of health structures, but also municipal services that sometimes receive solid waste from these healthcare settings (Sanogo and al, 2007). Even in Cameroon, there is a lot of healthcare facilities in towns and cities which haven't handling and management documentation (Veronica Manga *et al.,* 2011) there is limited data avaible concerning generation, handling and disposal of medical solid waste (Cornelius Tsamo *et al.,* 2017). Some studies made in south-west region as (Veronica Manga *et al.,* 2011) showed that waste management in this region is in poor state and need for a particular legislation. Even in Far North Region there is no control on medical waste management practiced in healthcare centers (Cornelius Tsamo *et al.,* 2017). Another studies (Dzekashu Lanyuy Gillian, 2017; Mochungong *et al.,* 2008) made in North-west regions

reported that most lacked sufficient awareness of any environmental of public health impacts of poor clinical waste disposal and had never heard any policy. This study is undertaken in view of evaluating and assessing management of BMW in PBF and non PBF health facilities in some regions of Cameroon in order to identify current practices and areas which require improvement.

METHODOLOGY

Study location

The study has been done in four administrative regions in Cameroon; Adamawa, East, North and Norwest Regions.

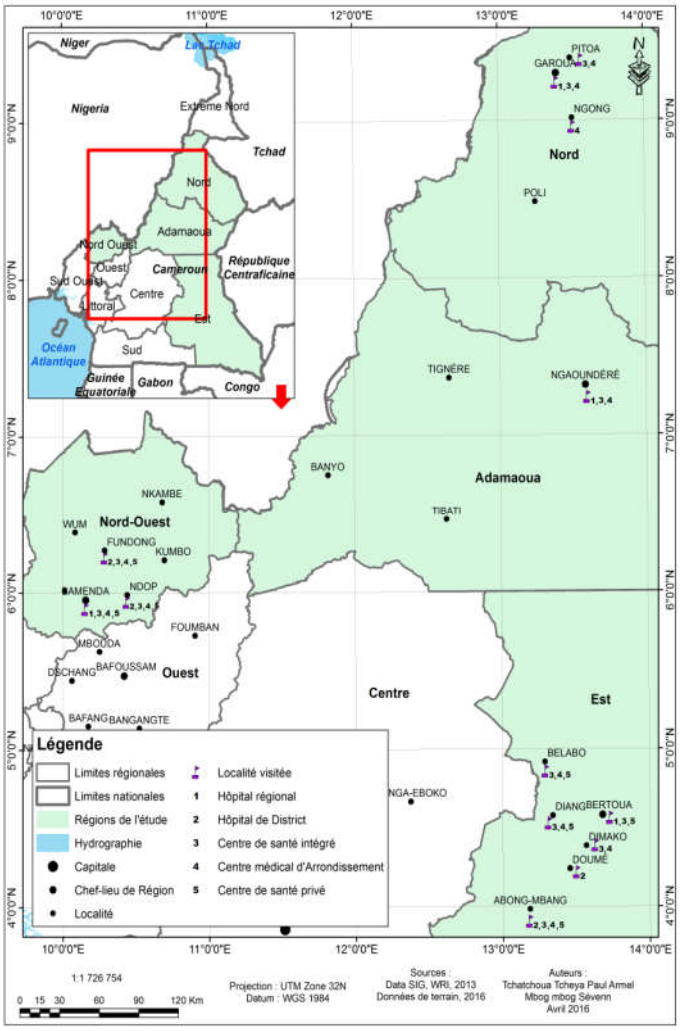

Figure 1. Map Location

The Adamawa Region borders the Centre and East regions to the south, the Northwest and West regions to the southwest, Nigeria to the west, the Central African Republic to the east, and the North Region to the north. At almost 64,000 km² in land area and a population of 1.2 millions of people, the Adamawa is the third largest of Cameroon's ten regions. The East region located at 3.9505° latitude North, 13.9144° longitude East, occupies the southeastern portion of the Republic of Cameroon. It is bordered to the east by the Central African Republic, to the south by Congo, to the north by the Adamawa Region, and to the west by the Centre and South Regions. North Region located at 8°30′ latitude North and 14°00′ longitude East makes up 66,090 km² of the northern half of The Republic of Cameroon, Its density is 37 habitants per Km^2. The Northwest Region, or North-West Region of Cameroon is part of the territory of the Southern Cameroons, found in the western highlands of Cameroon. It is bordered to the southwest by the Southwest Region, to the south by the West Region, to the east by the Adamawa Region, and to the north by the Federal Republic of Nigeria. The population density of 99.12 people per square kilometer is higher than the national average of 22.6. The provincial urban growth rate is 7.95%, higher than the national average of 5.6%, while the rural growth rate, at 1.16%, is equal to the national rate. In the North West Region, the study concerns four sub-divisions; these are 14 healthcare facilities in Fundong, Ndop, Kumbo-est and Kambè. In the Eastern region, 29 health facilities were visited in the localities of Bertoua, Dimako, Doumé, Diang, Belabo, Abong-Mbang. In the northern and Adamawa regions, we visited 17 healthcare facilities. General and assimilated Hospital, Central Hospital, Regional Hospital, District Hospital, District Medical Center and Integrated Health /Ambulatory Health Centers.

Study population

The study population included hospital managers (Director, human resources manager), heads of medical, surgical, pharmaceutical and laboratory services, service supervisors, hospital hygiene managers, healthcare staff… Health Care facilities in our study employed 3,833 workers. The administrative staff represented 6.2% of this staff, the doctors 20.7%, the pharmacists 1.9%, the nurses 43.6%, the midwives 2.7%, the nursing assistants 13.5%, hygiene agents 0.5%, surface technicians 10.5% and incinerator operators 0.4%.

Study design

The methodology used in this work is based on direct observations, the quiz, interviews and photographs. The inventory of BMW management in health facilities was essentially based on the exploitation of the various documents, and on the consultation of the various parts project stakeholders and the health facilities visit of the North-West, East, Adamawa and North regions.

The study was carried out in four main stages as follows:

- The organization of the study with the heads of the PAISS Coordination Unit;
- Collecting and analysing various documents relating to the environmental aspects of the project: framework documents, annual activity reports, external audit reports, aide-memoires of support missions;
- Consultations with the various stakeholders in the North West, East, Adamawa and North: UCP managers, Performance Purchasing Agencies (PAAs), Regional Funds for Health Promotion (FRPS), PBF Project Focal Points (FP), Municipality, Health Division Delegate**;**
- Visits of some health facilities in the aforementioned regions, in order to identify the level of effective implementation of the PBF on the management of biomedical waste (BMW), to evaluate the impacts of biomedical waste on the environment, to propose concrete measures and actions to be taken for the management of this hazardous waste.

A letter was sent beforehand to the heads of hospital structures to obtain authorization and support in carrying out the survey.

An interview guide and an observation grid are developed for discussions with the various stakeholders and data collection in the health facilities. Following each interview, a report on the discussions was drawn up.

The data collection tools used in this study are:

- A quiz sent to the heads of structures, heads of departments, supervisors of departments and heads of hospital hygiene to assess the mechanisms for managing BMW;
- An interview guide for BMW operators (surface technicians, incinerator operators) and healthcare personnel(doctors, nurses, midwives) to assess their knowledge of the management of BMW;
- An observation grid to relate and objectify the information collected during questionnaires, interviews and observations within the departments;
- A digital camera to support observations within departments;
- A data entry form for their processing.

The parameters studied are the different categories of BMW produced, the different stages of BMW management (sorting, packaging, storage, transport, disposal), the means of protection made available to staff, the knowledge and practices of staff on management and the health risks linked to BMW. The difficulties encountered were mainly linked to the refusal of some people to participate in the survey. The data collected was entered using SPSS 20.0 software.

RESULTS

Global observations and quiz analysis

We obtained 130 Answers of the 150 quiz administered to hospital managers, department heads, department supervisors and hospital hygiene officials, representing a response rate of 75.3%.Observations on the management of BMW were carried out in all the services: Sharp and pungent waste and that of blood and fluids were found in all services except pharmacies, pharmaceutical waste in 56 services, infectious waste in 49 services and anatomical waste in 11 services. The household waste were cardboard, paper, plastic bags and pouches, empty mineral water bottles and leftover food. Infectious wastes included microbiological culture slides, culture tubes and culture media. The anatomical waste found are umbilical cords, placentas, foetuses, anatomical pieces and teeth. The pharmaceutical waste included empty vials of fluids, antibiotics and various drugs. The other types of waste produced were radiological films, solutions for fixing and developing radiological films, laboratory dyes, amalgams and medical thermometers. The most commonly found wastes were sharp and pungent wastes, followed by blood and fluid wastes, pharmaceutical wastes, infectious wastes and anatomical wastes. Knowledge of BMW management was considered insufficient by 62.6% of those interviewed and the health risks associated with BMW known by 80% of them in all health Care facilities.

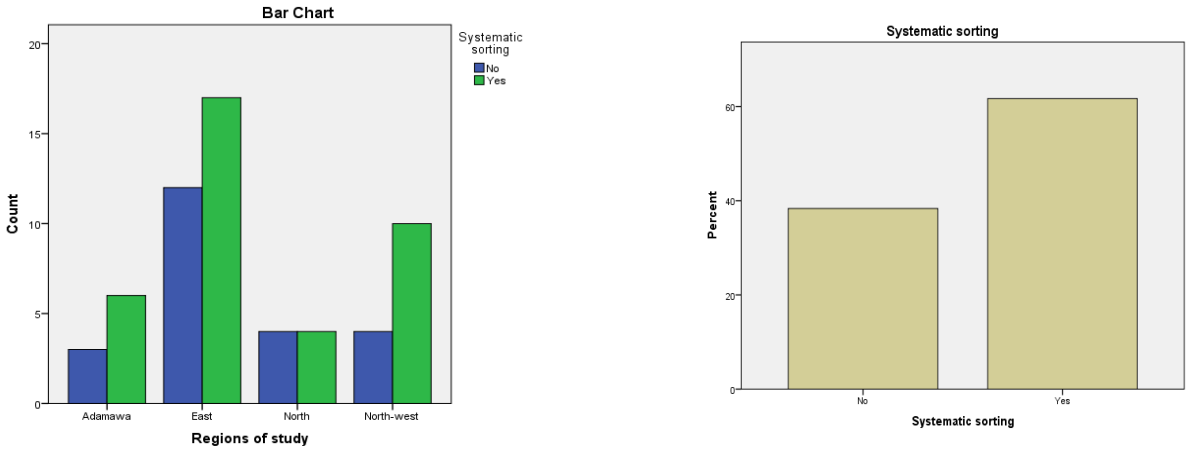

Figure 2. Systematic sorting per regions at the left and global sorting at the right

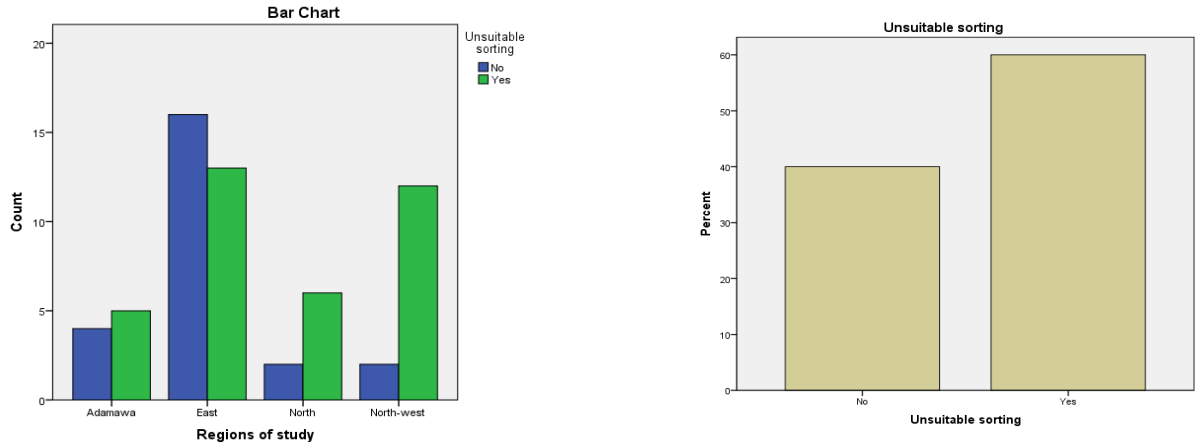

Figure 3. Unsuitable Sortingper regions at the left and global unsuitable sorting at the right

Systematic sorting

Sorting was systematic in 61.7% of all Health Care Facilities, that is, in 58.6% in the East, in 71.4% in the North-West, in 66.6% in Adamawa, in 50.0% in the North (Figure 2,Figure 3). The sorting of DBM was unsuitable (absence of separation of DBM and DAOM) in 53.5% of Health Care Facilities. This unsuitable sorting concerned 16.3% SCI, respectively 12.8% of those CMA, 10.5% of those of the Regional Hospital and 1.1% of those of the Central Hospital.

Color coding

The color coding system for the different categories of waste was nonexistent in all health Care facilities. However, this coding system was not used in autoclavable when liquid BMWs were diluted in bleach. The color coding system is not effective in any s (use of red for anatomical waste, orange for animal waste and yellow for blood and fluid waste, prickly and sharp waste and waste laboratories).

Use and avaibility of safety boxes

Safety boxes for the collection of sharps were available in 56.7% of Health Care Facilities, however the use of these boxes was only effective in 65.0% of the Health Care facilities (Figure 4, Figure 5).

With the exception of the Garoua Regional Hospital, these safety boxes are filled on board with overflows in other hospitals where plastic bottles or bins were used for the collection of sharp waste. However, anatomical waste was packaged in plastic bags placed in plastic bins with lids at all Health Care facilities, except at the level of CMA or SCI where they were thrown into open pits. The BMW of activities of care at risk of infection were packaged in bags.

Figure 6. Plastic bottles filled with unsorted biomedical waste

Personal protective equipment

Personal protective equipment (PPE) was available in 58.0% of health care facilities with protective rubber gloves in all these services, masks in 74.3% them, aprons in 25.6% and boots in 15.4% (Figure 7).

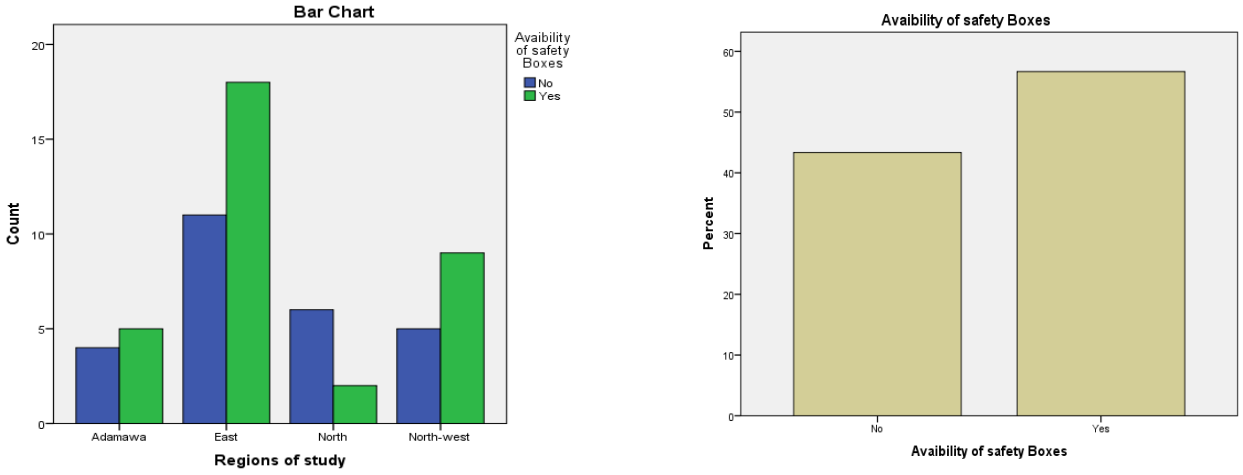

Figure 4. Avaibility of Safety Boxes per Regions at the left and global avaibility at the right

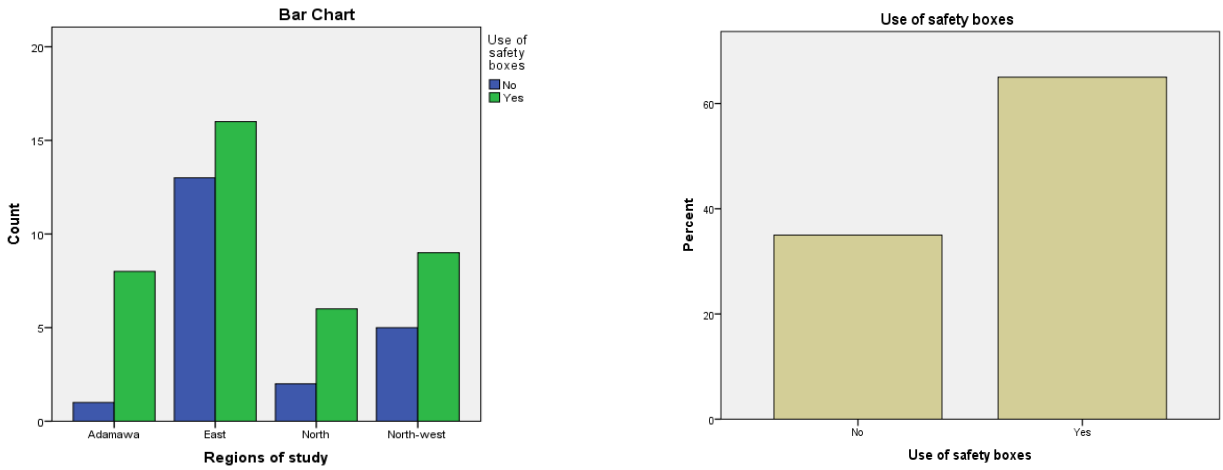

Figure 5. Use of Safety Boxes per Regions at the left and global use at the right

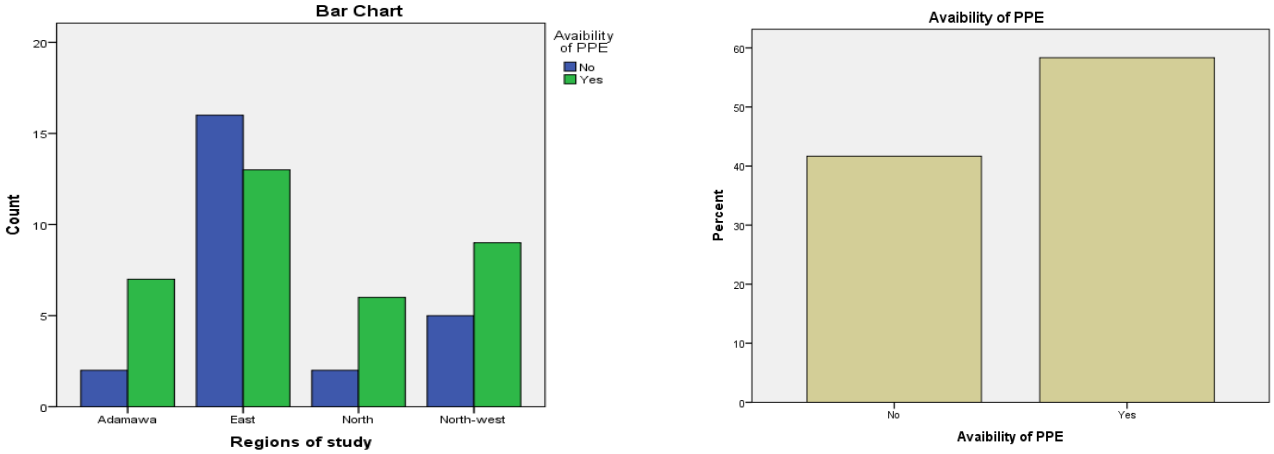

Figure 7. Avaibility of PPE

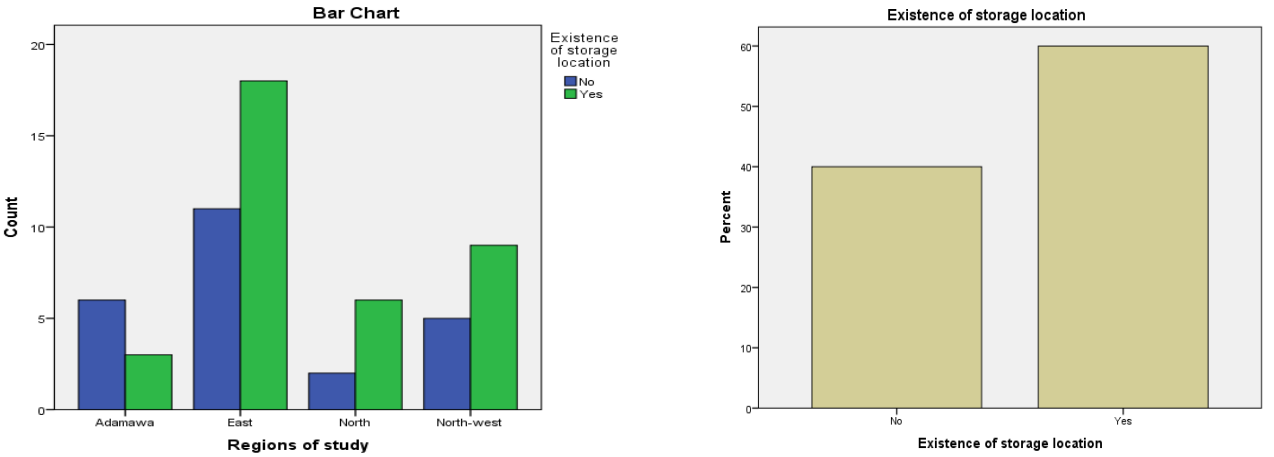

Figure 8. Central storage location with mixed BMW

Existence of secure storage location

The collection of BMW was daily in all hospitals, except at the level of SCI where it is carried out every Tuesday and Friday with routing of BMW. A secure storage site existed in 60.0% of the services, while the central storage site was unsecured, in the open with BMWs strewn on the ground at all hospitals except at the hospital level Garoua Central Hospital in North Region (Figure 9).

Figure 9. Existence of storage location

The transport of BMW within the departments was done by manual handling in 55.8% of the departments, using wheelbarrows used to transport patients in 22.1%. Transport to the central storage location was done by trolleys in 67.4% of services and by cartons in 33.7%.

DISCUSSION

We can note a small proportion of anatomical waste in our study, this can be explained by cultural and religious reasons. In fact, in the Adamawa and North regions, the population is essentially Muslim; among Muslims, anatomical waste such as limbs or segments of limbs is often recovered by families to be buried in a cemetery. The sorting of DBM is unsuitable in the majority of health facilities surveyed, except at Garoua Central Hospital where only 5.5% of services are concerned. The same lack of use of the coding system in 100% of hospital formations obeys the same explanations provided in the field of sorting. This coding, by allowing the identification and separation of BMWs, significantly reduces the amount of waste requiring special treatment and the cost of this treatment (Bidias, 2013). A 2008 study by MINSANTE proposed a sorting system in three categories with a separation of household waste, sharp and sharp waste, and infectious waste (Minsante, 2007). Despite their availability in 56.7 % of the Health Care Facilities visited, safety boxes are only used in half of them (65.0%). This average use, the observation of boxes filled on board with overflows and the use of bottles or trash cans in plastic for the collection emphasize the absence or non-compliance with the instructions by the staff and especially the existence of breaks in the supply of this material (Manga, 2009). The transport of BMWs within the departments and to the central storage place constitutes a risky stage because it is carried out by manual handling or using

cartons and wheelbarrows. Indeed, this transport should follow a circuit far from the areas frequented by patients and visitors and be carried out with the maximum safety using adjustable sanitary carts. This type of cart should be easy to load, unload, clean and be inexpensively produced by local crafts (MINSANTE, 2007). A similar study on the management of BMW in Jamot hospital and in the Biyem Assi Health District in the Center region of Cameroon also showed risky transport conditions with the use of trolleys and garbage cans carried on the back or the head (Bidias, 2013).The disastrous situation noted in the collection and transport of BMWs generates occupational risks (work accident, occupational disease, premature wear at work) and infectious risks for patients, visitors and animals. Even if the storage of hazardous waste requires special conditions, namely secure premises, locked, easy to clean, well lit, ventilated and forbidden to anyone outside the service, in our study, storage places do not exist in all structures, with however a noted security. Incineration by old models of incinerators is the most used mode of treatment of risky waste in our structures, except at the Garoua Central Hospital where we burn in an electric. During incineration activities, emanations charged with heavy metals, harmful gases and organochlorine particles are released which pollute the air and generate risks of environmental degradation, contamination of water and soil and intoxication of populations and animals (DENIS, 1998; Patil and Pokhrel, 2005). PPE is available in 58.0% of services only. According to the WHO, more than 100,000 cases of infections linked to healthcare procedures are observed each year in England, while in developing countries these cases are increased by 2 to 20. Similarly, the handling of sanitary waste infected with HIV is responsible for 0.2% of cases of transmission worldwide according to statistics dated 2010 (Manga, 2009) Working conditions, considered poor by 81.3% of the workers questioned, generate stress, a factor which aggravates the risks linked to BMW, and a climate of insecurity which is a source of social conflict (Mbengue, 1999; Sanogo *et al.,* 2007). The low level of knowledge on BMW management, noted in 62.6% of the Health Care facilities surveyed, this may require the implementation of the Hospital Hygiene Committee and training in the management of BMW in health facilities. This training must be adapted to the reality experienced at each hospital level, but above all based on the correction of risky behavior and the judicious use of existing equipment. Likewise, awareness-raising must be carried out in the direction of hospital officials for the effective application of legislation and the creation of occupational health services, essential structures for knowledge and prevention of occupational risks (Daoudi, 2008; Maton, 1999).

Conclusion

Occupational safety is a prime concern. Being a recent field of interest, the level of knowledge on this concept is insufficient and needs to be increased to raise awareness of the environmental aspects. The defective management of BMW is a reality at the level of hospital structures in Cameroon where dysfunctions are noted at all stages. This situation poses risks to the health and safety of health personnel, patients, populations and environmental degradation. The answer to this faulty management lies in the effective application of legislation on BMW management, occupational medicine, the adoption of suitable and feasible BMW management programs and the training of staff. In light of this study, we recommend strengthening the legislative and regulatory framework, the implementation of the system for the storage, treatment and management of hazardous waste and reduction of waste at source and control of the treatment process;

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