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Management of healthcare waste in the M'Sila region (Algeria)

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Résumé : Les 140 enquêtes menées auprès des différents intervenants dans la gestion des déchets de santé (publics et privés) et des collecteurs de déchets de l'Assemblée populaire communale (APC) à travers les quatorze daïras de la wilaya ont confirmé l'existence de grandes quantités de déchets de soins jetés directement dans des sites d'enfouissement incontrôlés comme s'ils étaient des ordures ordinaires en raison de l'absence de mesures répressives par les services concernés qui pourraient mettre fin à ces dépassements menaçant la santé publique, la biodiversité et l'environnement en général.

Mots clés : Déchets d'activité de soins, Environnement, Biodiversité, Santé publique.

Abstract: The 140 surveys carried out among the various stakeholders in the management of healthcare waste (public and private) and waste collectors from the Communal People's Assembly (APC) through the fourteen daïras of the wilaya Have confirmed the existence of large quantities of care waste dumped directly into uncontrolled landfills as if they were ordinary garbage due to the absence of repressive measures by the services concerned who may put an end to these overtaking threatening public health, biodiversity and the environment in general.

Keys words: Health care waste, Environment, Biodiversity, Public health.

Introduction

Health care waste (HCW) is defined as all waste from a healthcare facility, consisting of both potentially infectious waste and non-infectious waste. The infectious waste consists notably of infectious perforating objects and perforating non-infectious waste. In addition, it includes the same types of waste from minor and dispersed sources, including wastes produced in the context of home health care (Prüss et *al.*, 1999, WHO, 2005, Chartier et *al.*, 2014).

Investment in health is expensive. Therefore, minimizing the causes of disease through prevention should be a regular component of investment programs. The risk of infection posed by the waste of care activities handled without precaution is obvious to everyone and is preventable. However, so far, this issue has been too often overlooked (Rushbrook et *al.*, 2005).

The development of our public and private enterprises was accompanied by a significant waste production. African countries in general and Algeria in particular as a whole are confronted with the problems of waste management linked to care. The lack of infrastructure, combined with the absence of epidemiological data, makes hospital hygiene a public health problem with the following consequences: infectious risks, air pollution, environmental degradation and chemical risks Handling of hazardous materials.

The lack of media coverage associated with the lack of information at the regional level and the development of health facilities, the advent of private clinics, makes hospital waste production an aggressive public health problem and the environment.

At the same time, the composition of these wastes is changing from an organic profile (food waste) to complex materials (packaging, plastics, end-of-life products, etc.) that pose major risks to the environment and public health. The method used for their disposal remains to date landfill, because of its low cost compared to other sectors such as incineration or composting (Kehila, 2014).

Healthcare waste has negative effects on garbage collectors in municipalities due to the transport of hazardous products. Their incineration causes air pollution which exposes man to viral infections and contagious diseases that are sometimes fatal; especially that in these landfills there are various animals that feed garbage and also insects that could transmit diseases to humans.

In view of the many problems posed by this waste and its impact on the environment, our work raises and discusses the reality of the management of waste related to care and its impact on the environment and therefore on health in the wilaya of M ' Sila and proposes solutions applicable at different levels in order to reduce the health risks resulting from the care activities.

Material & Methods

1. Context of the study

1.1. Health Monograph of the M'sila Region

The wilaya of M'Sila covers an area of 18175 km^2, with a population of 100,859 inhabitants spread over 15 daïras, comprising 47 communes (Figure 1). It includes the following human resources: 122 medical specialists, 385 general practitioners, 108 dental surgeons, 116 midwives (Table 1).

The wilaya of M'Sila also has 29 agencies ENDIMED (National drug Distribution Company), 04 hospitals, 12 maternity hospitals, 13 laboratories, 15 sub-sectors. At the level of the private sector, there are: 04 private medical and surgical clinics, 03 medical imaging centers, 02 laboratories and 02 outpatient ENT ophthalmology clinics (DSWM, 2007).

The Algerian legislation on waste from intra- and extra-hospital care activities highlights the complexity of its application to the "diffuse sector".

Article 1: To lay down the procedures for the management of waste control and treatment.

Article 2: Waste management, control and disposal shall be based on the following principles: prevention and reduction of waste production and harmfulness at source; The organization of the sorting, collection, transport and treatment of waste; Recovery of waste through reuse and recycling; The environmentally sound treatment of waste; Information and awareness of the risks posed by waste and its impact on health and the environment.

Waste from hazardous care activities that are: sharps waste such as needles, syringes, lancets, blades ...; Potentially infectious waste: buffers, dressings, gloves ...; Pathological waste, including anatomical material, should be treated as potentially infectious; Chemical waste, eg mercury from thermometers, chemical disinfectants ...; Pharmaceutical waste: unused drugs ...; The cytotoxic (wastes are university where the anticancer treatments are practiced; Radioactive waste, are produced only by the departments of nuclear medicine, cancer treatment and diagnostics as well as research structures in large hospitals.

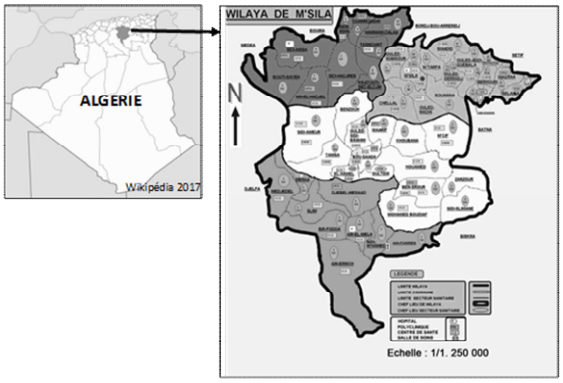

Figure 1. Health Monograph of the Wilaya of M'Sila (DSWM, 2007).

1.2. Producers of waste from health care activities in diffuse environments

The diffuse sector corresponds to all the producers of health care waste (DAS). It includes all health professionals, most often on a liberal basis, and households.

For professionals practicing on a liberal basis, they are: general practitioners and specialists, dental surgeons, midwives, pharmacists and laboratories for biology and medical analysis.

Within the framework of salaried medicine and sources, there are: nursing home services, home hospitalization, hem dialysis centers, consultation and care rooms, health insurance agencies and Health centers, nursing homes of the national educational institutions, fire and rescue centers, retirement homes, as scattered small producers.

1.3. Different methods of treatment

For the treatment of infectious waste, it can be summarized as follows: separation of needles and syringes, shredding, encapsulation, disinfection by microwaves, steam disinfection including autoclaving, disinfection by dry heat, disinfection To wet heat, chemical disinfection, incineration.

1.4. Fundamental risks associated with mismanagement of SARs

Poor management of DAS can lead to serious illnesses for health personnel, waste disposal personnel, patients and the general population. The greatest risk from infectious waste is the risk of needle-stick injuries, which can lead to hepatitis B, hepatitis C, or HIV infection. However, many other diseases can be transmitted by contact with infectious DAS.

T able 1. Health Monograph of the Wilaya of M'Sila (DSWM, 2007).

PRESENTATION OF THE WILAYA				
Surface area: 18.175 Km²				
Population: 1.008.590 inhabitants				
Number of Daïra: 15				
Number of Towns: 47				
Calling: Agro-pastoral				
HUMAN RESSOURCES				
	public	Private	Total	Ratios / Habitat
Specialist physicians	48	74	122	Jan-67
General practitioners	198	187	385	Jan-19
pharmacists	1	140	141	Jan-53
Dental surgeons	43	65	108	Jan-38
paramedical	1809	41	1850	1/545
Women	114	2	116	Jan-94
Agencies ENDIMED	29			
CARE MANAGEMENT				
Infra structure	Number	1 / clothes		
Hospitals	4	1/252147 clothing		
Bed	1165	1/865 clothes		
Dialysis centers	3	1/336197 clothing		
Polyclinics	13	1/77584 clothes		
Health Centers	thirty	1/33620 clothes		
Treatment rooms	176	1/5730 clothes		
UDS	40	1/6172 student		
Integrated rural maternity	12			
PMI	31	1/6699 women		
Laboratories	13	1/6699 clothes		
UMC hospital	4			
Point guards extra hospital	11			
Total structure extra hospitals	219	1/4605 clothes		
Number of subsectors	15			
PRIVATE SECTOR				
	Number	Beds		
Medical surgical clinics	4	97		
Medical Imaging Centers	3			
Laboratories	2			
Ambulatory clinics ophthalmic ENT	2			

1.5. Algerian legislation on waste management

Executive Decree No. 03-477 of 9 December 2003 laying down the procedures and procedures for the preparation, publication and revision of the National Special Waste Management Plan.

Executive Decree No. 03-478 of 9 December 2003 defining the procedures for the management of healthcare waste in the Official Gazette of the Republic of Algeria No. 78.

Article 1. Pursuant to the provisions of article 18 of Act No. 01-19 of 12 December 2001, the purpose of this decree is to define the procedures for the management of health care waste.

Art. 2. For the implementation of this Decree, all health care facilities shall be deemed to be health institutions, irrespective of the legal regimes applicable to them, including specialized hospitals, university hospitals, Polyclinics, clinics and basic care units, medical practices, dental surgery offices and analytical laboratories.

Art. 3. Waste treatment activities are classified into three categories: anatomical waste; Infectious waste; Toxic waste.

Art. 4. As soon as they are generated, healthcare waste is pre-collected in sachets provided for this purpose, in accordance with the provisions laid down in Articles 6, 9 and 11 of this Decree.

Art. 5. Anatomical waste is defined as anatomical waste, all human anatomical and biopsy waste originating from the operating theaters and the delivery rooms.

Art. 6. Anatomical waste must be pre-collected in green and single-use plastic bags.

Art. 7. Infectious waste is classified as infectious waste, waste containing micro-organisms or its toxins, which may affect human health.

Art. 8. Sharp, sharp, or sharp infectious wastes shall be placed in rigid, puncture-resistant containers, fitted with a closure system, free of chlorine prior to their pre-collection in the bags provided for that purpose during incineration, and containing an adequate disinfectant.

Art. 9. Infectious waste must be pre-filled in plastic bags with a minimum thickness of 0.1 mm, single-use, and yellow in color, resistant and solid and free of chlorine during incineration.

Art. 10. Toxic wastes are classified as toxic wastes, wastes consisting of: waste products and obsolete product, pharmaceutical, chemical and laboratory products; Waste containing high concentrations of heavy metals; Acids, waste oils and solvents.

Art. 11. Toxic wastes should be pre-collected in single-use, resistant and solid red plastic bags that do not release chlorine during incineration.

Art. 12. Toxic waste must be sorted, packaged and labeled under the same conditions as special waste of the same type, in accordance with the regulations in force.

Art. 13. Waste of care must be sorted at source so that it is not mixed with household waste and the like, nor mixed with one another.

Art. 14. Compaction of healthcare waste is prohibited.

Art. 15. Once two-thirds full, the pre-collection bags of healthcare waste as provided for in Articles 6,9 and 11 above shall be firmly closed and placed in

rigid containers with a lid, And shipped to the regrouping premises.

Art. 16. The containers shall be of the same color as the pre-collection bags, and shall state the nature of the waste in an easily legible manner. Once they are full, they must be transferred to the regrouping room, with a view to their removal for processing.

Art. 17. Containers used for the collection and transport of treatment waste must be cleaned and decontaminated after each use.

Art. 18. In any case, waste treatment activities must not be deposited outside the grouping premises.

Art. 19. The amalgamating premises shall be used only for the storage of health care waste. They must be ventilated, illuminated, protected from bad weather and heat, equipped with water and waste water, cleaned after each removal and periodically disinfected.

Art. 20. The grouping premises must be closed and arched in order to prevent access by unauthorized persons. An inscription mentioning the use of the premises shall be affixed, in an apparent manner, to the door.

Art. 21. The duration of storage of health care waste at the collection premises, prior to their removal for treatment, shall not exceed twenty-four hours (24 hours) for establishments.

Résultats et discussions

1. Survey of municipalities

Table 2. Collection of DAS by APC.

Commons	Collection of DAS in extra-hospital settings		A project to collect DAS from health professionals		Organization of a Selective Collection of SARs Produced by Health Professionals on a Liberal basis		A project for Selective Collection of SARs	
	Yes	No	Yes	No	Yes	No	Yes	No
Bou saâda	X			X		X		X
Ouled Sidi Brahim		X	X			X	X	
Ben Srour		X		X		X		X
Ain El M elh		X		X		X	X	X
El khoubana	X		X		X		X	
Sidi Ameur	X			X		X		X
Medjedel	X		X		X			X
M'sila	X			X		X	X	
Ain El H adjel		X		X		X		X
Ouled Derradj		X		X		X		X
Magra		X		X		X		X
Hammam El Dalaà		X	X		X		X	
Sidi Aissa	X		X		X		X	
Chellal		X	X		X	X		X

The only institution responsible for collecting all types of waste, including hospital "DAS" is the APC "commune" (Table 2).

The results of the survey on DAS collection activities in the wilaya of M'Sila show an absence of: a DAS collection activity in an extra-hospital setting, health professionals practicing on a liberal basis; Contract between the CPA and the health professionals practicing on a liberal basis; Organization of selective collection of DAS; Sorting of DAS; Specific collection "random pick-up"; Of a specific site to store them and to treat them before and after the collection "disinfection, sterilization and incineration".

The uncontrolled "public" wild dump but in the future, there will be a project for a controlled dump. Pick-up of the SARs with household waste is done by a truck with bucket and they will be dumped to the garbage dump.

2. Survey of health professionals working in extra-hospital settings.

The rate of elimination of SARs by the specific pathway is low but increasing. There are differences in behavior across occupations; The practice of sharp-cutting-sharp sorting is marked and growing; The collection of DAS is not regulated and the answer to the questionnaires is not always communicated.

For the sorting of health care waste: 84% sort the DAS.

For the elimination of the "sharp-cutting-sharp" SAR: 47% in household garbage; 39% in plastic or glass bottles; 27% of this waste goes to the incinerator of the hospital or is incinerated in a pit in an isolated area and 13% put in a specific container (Figures 2 and 3).

3. Survey of Health Professionals in Hospitals

Intermediate storage areas for DAS: an intermediate storage room outside the service next to the incinerator.

The types of waste from hospital services are: placenta, organ and cyst part, flasks, pipette, test tube, tubing, syringe, Petri dish, blood bag ...

A washing and disinfection zone for the equipment: a washing area for rolling stock and waste production areas.

There are three waste production areas in the various health sectors in the M'Sila region: hospital services, cooking and administration (Table 3).

The danger continues outside the hospital if the waste is not transported and disposed of properly. This is a major risk for any person responsible for the transport, treatment and disposal of hospital waste. The same applies to the population living around the waste management facilities. For this reason, the correct treatment of special wastes arising from care activities is of great importance and must take into account all risks and aspects.

Figure 2. The incineration of Ain El Melh.

Figure 3. Storage of "sharp-sharp-cutting" SARs in plastic containers and bottles.

Table 3. Types of waste from Ain El Melh Hospital (240 beds and 07 services).

Designation	Quantity Kg/month	Method of disposal	Receiving environment
Placentas	121	Incineration	Hospital Incinerator
Part of organ and cyst	13.2	Incineration	
Pipettes	6.6	Incineration	
Test tube	12.1	Incineration	
Tubing	13.2	Incineration	
Syringes	14.3	Incineration	
Petri dishes	6.6	Incineration	
Gloves	2.2	Incineration	
Sponges	11	Incineration	
Movies / Radio	1.1	Evacuation	Dump
Dressings	11	Incineration	
Cotton	11	Incineration	
Anesthesia bottles	7.7	Incineration	
plaster bandages	5.5	Evacuation	
Paper and other	300	Evacuation	
Developer and fixer	80	Evacuation	Waste

4. The management of expired or unused medicines (MNU)

Unused or expired medicines also constitute a source of water contamination by discharging into wastewater via sinks or toilets or discharge into the domestic waste stream (soil and water contamination). The factors generating MNU are multiple: stop or modification of the treatment, unsuitable conditioning, variability of the observance of the treatment by the patient ...

The question of the management of unused or expired medicines has arisen in terms of safety (prevention of the risk of ingestion / contamination by mistake, especially for children) before constituting an environmental concern (Bussy, 2014).

In the M'sila region, surveys were carried out on 02 ENDIMED pharmacies and 25 private pharmacies. These surveys show that:

- Wastes in pharmacies are represented by obsolete medicines and pharmaceuticals.

- For ENDIMED pharmacies, expired medicines are stored in the back of the pharmacy and then the ENDIMED department of Sétif takes charge of their disposal.

- The expired medicines are incinerated either in a pit provided by the municipal hygiene department or in the incinerator of the hospital.

Conclusion

Human activity is mainly directed towards the production of health goods and services. Waste, which does not naturally integrate into this activity, has long been neglected. Their uncontrolled and uncontrolled proliferation, apart from these profitable recycling activities, was carried out to the detriment of the natural environment with ultimately a negative impact on human health and the environment.

It is essential that those responsible for the management of healthcare waste should have a better understanding of all the factors that contribute to optimum safety.

It is therefore necessary to redefine a good hospital waste management strategy in order to reduce health risks.

This study proposes simple hygienic solutions that can be used to minimize health risks due to wastes resulting from healthcare activities.

The disposal of waste from the health care facility must be given special attention. First of all, we must appoint a "waste manager" who will know the situation perfectly and propose solutions to be put in place.

Here are some steps to follow to organize the waste circuit: to know the waste circuits in each department, in all its details: sorting, conditioning, storage, collection and treatment to highlight the interests and the points to be modified; To know as precisely as possible the flows of the various waste by a weighing campaign of 2 to 3 weeks; Prospect the different companies to know their products and services; Find out if other institutions do not have the same problems, solve them together, especially treatment, and train and inform staff.

It is very important to propose the creation of private waste management companies (collection, transport, treatment ...) managed by engineers and masters in ecology and environment.

The identification by management of the problem of health care waste should inevitably be followed by the development of an action plan. This should not be a

Once the diagnosis of the prevailing situation has been made. To be effective, a good

Action plan should present the following points.

• Identify the problem and the risks that are not resolved

• Agree on sensible (and sustainable) actions to be taken

• Evaluate available resources, even if they are small

• Assigning duties and responsibilities to everyone (who does what and when?)

• Specify how progress will be monitored and recognized successes

• Indicate the quality control/supervision procedures of the health care plan/management system for monitoring progress, verifying improvements and identifying gaps and needs (Rushbrook and Zghondi. 2005, Chartier et *al*., 2014).

The treatment and disposal of biodegradable pathological waste is a critical issue for many health facilities. There are five basic processes for the treatment of hazardous components in healthcare waste, in particular sharps, infectious and pathological objects: thermal, chemical, irradiation, biological and mechanical.

Awareness-raising among hospital managers surveyed for effective implementation of biomedical waste management legislation, occupational medicine, adoption and implementation of appropriate, feasible and regularly assessed biomedical waste management programs. Appropriate and continuing training of health professionals to hope for a lasting change in risk behaviors and the creation of a culture of prevention of occupational risks (Ndiaye et *al*., 2012).

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