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EFFECT OF MEDICAL WASTE ON HEALTH SECURITY IN ALGERIA

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Abstract :

This study aims at showing the negative effects of medical wastes on the health security through diving into the damages caused by this waste to the general health of individuals and the surrounding environment. It also seeks to shed light on health security in Algeria, and to show the country's efforts to enhance it.

It has been concluded that the increase of medical waste that we witness currently represents a real threat to health and environment safety of the country. In addition to the mismanagement of this waste, which leads to increasing its health risks.

Keywords: Medical wastes; Health security; Risks; General health.

Introduction:

In the light of the fast development that the world is witnessing in all fields; especially in the health sector, and with the emergence of new technologies used in medical treatment the expansion of medical services, the amount of medical waste has increased and its risks have doubled. As a result, it no longer threatens the humans' health only, but also the surrounding environment.

Medical waste is considered as one of the most vital issues that our societies face, particularly in the urban states as it greatly affects the health security of countries. The proper handling of this waste requires advanced technologies, modern equipment, and specific methods, starting from the source of its production and ending with its treatment and final disposal.

With the aggravation of the risks of inflammation and poisoning resulting from medical waste, and the emergence of virus diseases, and worldwide environmental troubles, the proper and safe handling of this waste has become vital on both the national and international levels of countries. Thus, it led to looking for practical solutions and protective methods, as well as setting regulations that force societies to put limits to the risks of medical waste.

Algeria, like all countries, suffers from the risks of medical waste and its negative effects on health security. Therefore, it works to find solutions to limit these effects and minimize its health risks by including medical waste management policy into the national strategy for the environment. The subject of the effect of medical waste on health security in Algeria is of great importance, considering that medical waste has become a big threat to most countries, especially after the immense increase of this waste in the light of the latest circumstances that the world has gone through; represented in the corona virus

COVID-19. Consequently, the fear of the evolution of new diseases led to the interest to manage medical waste.

This study has two aims:

- Shedding light on the reality of health security in Algeria, and showing its efforts in order to achieve the health security in the country.
- Introducing the negative effects of medical waste on public health and environment.

In the light of what has been discussed, the study question can be formulated as follows:

To what extent do medical waste affect health security in Algeria?

Under this main question, we can derive two sub questions:

- What are the health risks of medical waste?
- Does the management of medical waste represent a threat to the health security?

To answer the previous questions, the following hypotheses were formulated:

- There are very dangerous health risks to the medical wastes whether physical or psychological.
- During the steps of the management process of medical wastes, we find that the improper handling of these wastes pose a threat to the health security.

The nature of the subject imposed the descriptive and the analytical methodologies to be used to determine the negative effects of medical wastes on health, and to analyze the situation of health security in Algeria in the light of the continuous increasing of these wastes.

In order to answer the abovementioned hypothesis, the current study was divided into two chapters:

Chapter one: The conceptual framework.

Chapter two: Repercussions of medical wastes on health security.

Chapter one: Conceptual framework

Before knowing the negative effects of medical waste on health security, we firstly have to define medical waste as well as health security in Algeria.

First: Medical waste

In this section, we discuss what is meant by medical wastes, and the types of these wastes.

1/ what is meant by medical waste:

there are many definitions for this term:

It was defined by the Global Health Organization, that it all wastes resulting from health care institutions and research centers and laboratories. In addition to the wastes resulting from diverse secondary resources such as the homes health care.¹

As stated in the definition of the Environmental Protection Agency in the United States of America, it is any waste that results from a medical treatment institution, including hospitals, medical laboratories, centers or units for animal experimentations, and health clinics.²

Medical waste was also defined as all waste that result from health institutions such as hospitals, health centers, clinics, pharmacies, research centers, and laboratories; that fully or partially contains parts of the body such as blood, amputated organs, liquids, or other discharges. It also contains expired medicines, or any other unusable products, as well as surgical waste like cotton, gauze, needles, and scalpels, in addition to dirty clothes, animals' parts of experiments, dangerous radioactive materials, genotoxic drugs and all materials resulting from the treatment of patients and intended to be disposed of.³

As for the Algerian legislator, it defines medical wastes in the law n° 19/01, related to wastes management, control, and removal as follows “therapeutic activities wastes in all waste that result from examination and follow-up activities, preventative or curative treatment in both the fields of human and veterinary medicine.⁴

From the previous definitions, we can say that medical wastes are solid, liquid or gaseous wastes that result from different health activities, which can cause serious damage to the public health and/or the environment because of the toxic substances that it contains.

2/ Types of medical waste:

Categories of medical wastes differ according to the approved criteria for classification, and in accordance with the general classification of medical waste, 75% to 80% of the overall percentage of the produced wastes can be non-harmful.

It includes non-dangerous materials like paper, food and other waste similar to houses wastes. As for the remaining percentage of medical wastes that is about 20% to 25%, it represents dangerous waste that results from a diagnostic or a treatment of a disease, and it can cause health risks if not disposed properly.⁵

The Algerian legislation determined the types of medical waste according to two decrees:

A- The executive decree n° 84/378 setting the conditions of cleaning, and collection and treatment of solid waste⁶, this decree divided medical wastes into two types:

The first type is solid wastes that are similar to households' wastes and are produce by health institutions which is the responsibility of the Municipality to dispose of. As the legislator described it in article 12 of the decree 84/378 of unmolded waste, that resembles household waste.⁷

The second type includes waste resulting from treatment processes that the health institutions take responsibility of its disposal on its own expanses, and it is as follows:⁸

- Autopsy waste, animal corpses, and rotting garbage.
- Anything or food or contaminated substance, or an environment in which germs grow, which may cause diseases, such as things for one usage only, gypsum, or contaminated tissues.
- Liquid substances and waste resulting from autopsies.

B- The executive decree n° 03/478 setting methods of waste management for therapeutic activities⁹, this decree categorized medical waste, according to the criteria of privacy, its relevance to the therapeutic activity, the dangers it carries, and the interests resulting from it¹⁰, into three categories:¹¹

1-Waste formed of body organs: It is the waste formed of body organs resulted from surgical operating rooms and maternity halls, while article 05 contains "Waste consisting of bodily organs is described as all waste consisting of bodily organs, and waste resulting from human abduction operations resulting from surgical operating rooms and maternity halls".¹²

2- Infectious waste: Waste that contains micro particles or their toxicity that may harm human health.¹³

3- Toxic waste: represented in the following:¹⁴

- Waste, residues and materials that have expired from pharmaceutical and laboratory materials.
- Waste containing high concentrations of heavy metals.
- Acids, used oils and solvents.

Second: Health security in Algeria:

The term health security is one of the common terms at the present time, as is the case with political security, environmental security, and economic security.... Security in its broad sense affects all aspects of life.

1/ The concept of health security:

We will discuss the definition of health security and then discuss its fields.

A/ Definition of health security: in its 1994 report, the United Nations defines health security as “ensuring a minimum level of disease and preventing it”, in 2000, it defined it as “the extent to which health services are available to all at reasonable prices, in return for the ability of individuals to obtain these services, whether it is related to systems Care, prevention....”.¹⁵

As defined by the World Health Organization through the World Health Report drafted in 2007, it is “the totality of necessary activities prepared in a planned or proactive manner, directed to reduce injuries or breaches that pose a threat to the public health of the population in various regions and across various borders”.¹⁶

Accordingly, health security is a set of measures that seek to preserve human health and protect it from risks that affect its physical and psychological well-being.

B/ Areas of health security: areas of health security unite with areas of risks facing public health, and the World Health Organization has identified them as follows:¹⁷

* Malnutrition and food insecurity: It includes all diseases resulted from malnutrition, such as lack of vitamins and minerals. These threats are usually in poor countries that do not have integrated health and food policies

* Emerging and contagious diseases: They are characterized by severe infection and rapid spread, which increases their danger, they have become a major concern for countries, and the best example of these diseases is the Covid 19 epidemic.

* International crises, humanitarian emergencies and climate change: Climate change causes natural disasters such as floods, earthquakes, hurricanes, droughts.... which lead to severe damage to people and their health security.

* Chemical and radiological hazards and the danger of bioterrorism: These are the risks arising from chemical and nuclear activities that threaten human life and health.

2/ The reality of health security in Algeria:

Health services are considered one of the most important human requirements, and this is what made it occupy a prominent place in the interests of everyone, and Algeria, like other countries, sought to improve health services and develop their quality levels by following well-studied methods and mechanisms, including:

* Health expenditure: The state devotes significant sums of money to improve the health situation in the country, but despite this high expenditure on health care requirements, the citizen remains dissatisfied with the health services provided, and this is due to the absence of management, while most of the expenditures are directed to equipment at the expense of training and rehabilitation of Human resources.¹⁸

* Issuing a new health law: related to Law N° 11/18¹⁹, which emphasized ensuring the protection and prevention of people's health. The most important provisions of this law are:²⁰

- Creating a new contractual system with
- Evaluating and expanding free treatment.
- Erasing geographical differences in the field of therapy enabling.
- The permanent availability of effective medicines that are safe and of quality.
- Setting a national information system that particularly includes the electronic medical file and files of institution activities management.

* Relying on mixed hospitals: Algeria has created a new structure, which is mixed hospitals under the presidential decree 18/114²¹, and it is a hospital of civil and

military nature in management and benefit. It provides diagnostic services and emergencies, and has been created in order to repair the health system.²²

* Creating a national agency for health security: the national agency of health security has been created under the presidential decree n° 20/158²³, it is a public institution of a special nature with moral personality and financial independence. This agency has the task of scientific advisor for the president of the republic in the field of health security and repairing the national public health system. It also aims at forming a direct relation between security, national stability, and public health.²⁴

Through all these procedures, Algeria works to construct appropriate legal, administrative, and institutional capacities to build an effective health system that is able to achieve health security of the country.

Chapter two: Repercussions of medical waste on health security.

The process of medical waste management produces many risks whether on public health or on the environment. Medical waste, due to its privacy, forms a threat to health security; so we are going to discuss what follows: the impact of medical waste management stages on health security, then dive into the threat of medical waste on public health.

First: Impact of medical waste management stages on health security:

The process of medical waste management goes through specific procedures due to its privacy, starting from the stage of sorting, collection, and transportation; going through the treatment stage, ending on the disposal stage. Resulting from each stage of the management stages certain risks.

1/ Sorting, collecting, and transporting waste:

a- Sorting medical waste: this stage helps to reduce the quantity of dangerous waste that requires treatment, so it leads to reducing the treatment cost. The sorting process is done using bins and bags of special colors according to the type of the waste and the method it is treated. The sorting has to be done at the source so it does not get mixed with households' waste.²⁵

The Algerian legislator has put some procedures that have to be followed to limit the risks of medical waste, in articles 13 and 14 of the executive decree, it has been prohibited to stack medical waste, and obligated to sort it at the source of its production so it does not get mixed with other waste. There is also a text in article 12 to obligate the sorting of toxic waste, wrapping it and putting a card to identify it.²⁶

b- Collection and storage of medical waste: following the sorting stage, collecting waste is done according to certain conditions and procedures, like making sure that the bags are securely closed, put in covered bins of different colors according to each type, and identified by a card that shows the nature of the waste, then sent to storage. The bins used should be cleaned thoroughly after each usage.²⁷

As for the storage of medical waste, collection houses are specialized places to store waste until its treatment, and it has to follow certain conditions:²⁸

- It must have the appropriate lighting and ventilation.
- It must be far from heat and weather fluctuations.
- It must have access to water and an outlet for dirty water.
- It must be guarded and entered only by permitted individuals.
- It must be cleaned after every waste lifting process, and cleansed regularly.

As for the storage period, it must not exceed the legal duration as storing medical waste for long periods creates a threat to individuals' health, which put the responsible in question.

The Algerian legislator has ordered the storage of medical waste in articles 18 to 21 of the executive decree n° 03/478 related to therapeutics activities waste management, and it emphasized the legal conditions of the proper storage of medical health.

As for the period of time for storing medical health from its production until its disposal, it durates between 72 hours in temperate climate, and 48 hours in warm climate.²⁹

c- Transporting medical waste is about the total processes of shipping, unloading, and transporting waste. As found in article 02 of the executive decree n° 04/409 that specifies the methods of transporting special dangerous waste.³⁰ The transportation process must be done by carts and containers that are easy to load and unload, easy to clean, and doesn't have sharp edges so it does not cause damage to the waste bags. The transporter of medical waste must also hold "movement document", that is like a permit to transport waste.³¹

2/ Treatment and disposal of medical waste:

A-Treating medical waste is a stage of changing or modifying waste before the final disposal, by sterilizing and disinfecting until it can be handled safely.³²

The most used ways in treating medical waste are:³³

- Automatic burning.
- Steam disinfection.
- Microwaves radioactive disinfection.
- Chemical disinfection.

Articles 22, 23, 24, 25, and 31 of the decree 03/478 set the methods of treating different kinds of medical waste, as treating waste that consist of body parts is done through removing the infection by adding chemical substances then burying it.³⁴

As for toxic waste, its treatment needs special ways, mostly done by burying, landfill, backfill, chemical treatment, and treatment by steam.³⁵

Whereas infectious waste undergoes incineration, which is the safe cremation of waste, and it is done inside health institutions or in incineration facilities specialized in treating medical waste. These facilities are qualified legally and submitted to the required authorizations.³⁶

B-The final disposal of waste: all waste whether treated or not are directed to the process of the final disposal, through the following methods:

- Backfilling: burial or land filling, this method is used for biological waste but it must follow environmental conditions and specific descriptions. Biological waste are preferred to be in the bottom layer. The depth of the hole must not be less than two meters from the surface, and there has to be an insulated layer in the bottom to forbid the pollution of underground water.³⁷
- Incineration: is a dry oxidation process under a hot temperature that turns combustible organic waste to non organic substances, resulting to diminish the mass and weight of waste. This method is used to get rid of non recyclable waste. The incineration facilities have been developed to be conforming to safety and security standards. The incineration process is done usually outside of the health institutions to avoid any emissions and to preserve safety of individuals.³⁸
- Cremation: it is the most common method; it depends on transforming the components of waste into ash using high temperature. Nevertheless, this method requires continuous and strict supervision as running the incinerators must be done by qualified and trained technicians, but this method has many environmental dangers.³⁹

Second: Threats of medical waste on public health:

Medical waste is constantly increasing, because despite the benefits of using products for one time only and being non infectious, it massively increases the amounts of waste.⁴⁰ From this increase, the risks resulting also get bigger.

As for people most at risk from the dangers of medical waste, all people in contact with the therapeutic activities waste are at risk of negative effects of these wastes, whether they are inside the therapeutic institutions or outside of it. They can be categorized into the following groups:⁴¹

- Doctors, nurses, health care helpers, and maintenance employees at hospitals.
- Patients inside health institutions and those taking home care services.
- Visitors of health care institutions.
- Employees in services related to health institutions like laundry, waste care.
- Employees in the field of transporting medical waste.
- Employees in treatment facilities and disposal of medical waste.

Considering the chemical toxic substances and other infectious substances such as viruses and bacteria that medical waste contains, it forms a true danger to human health.⁴²

In the following section, we are going to discuss types of health risks that threaten humans as a result of medical waste. They are both: physical and psychological damages.

1/ Physical health:

Medical waste contains many risks that differ in sizes, and they are as follows:

a- Risks resulting from infectious and sharp wastes

Infectious and sharp wastes may contain different micro living creatures that cause diseases, which some of stay active for long periods of time, and these creatures may cause infection to the person at risk through various ways, like through holes, or severe fraction to the skin, or mucous membranes, or through injuries and cuts in the skin, or through breathing or swallowing.⁴³

Among the most common infectious diseases, we find:

- 1- Liver inflammation “B”, loss of immunity “AIDS”. According to the international health organization, in one month of 2004, there was a diagnostic of:⁴⁴
 - 21 million infections with liver inflammation “B” virus.
 - 02 million infections with liver inflammation “C” virus.
 - 260000 infections with immunity loss “AIDS” virus.
- 2- Reproductive system diseases: that result from wastes and samples contaminated with genital secretions of injured people with viruses and bacteria.⁴⁵
- 3- Tuberculosis, Measles, Cholera, Yellow Fever, and other infectious diseases that transfer by direct or indirect contact with contaminated discharges of lungs secretions and saliva of patients.⁴⁶
- 4- Transmitting diseases from insects and mice as they carry microbes from waste collecting containers inside and outside of health institutions. Among these diseases are: conjunctivitis disease and intestinal diseases. In the United Nations report, more than 90% of the patients’ cases in the developing countries hospitals are because the transmission of microbes through parasites, insects, mice, and cockroaches...⁴⁷

b- Risks resulting from chemical and pharmaceuticals waste:

The amounts of chemical and pharmaceuticals waste differ, it may decrease at times, and increase when the expired or unwanted pharmaceuticals substances are disposed of. They are dangerous remnants that may cause poisoning, as a result of absorbing chemical substances by the skin or mucous membranes, or through swallowing.⁴⁸ Disinfecting substances are considered the most important wastes of the type, as they are highly interactive, and have a capacity of creating secondary components of high toxicity.⁴⁹

Some pharmaceuticals remnants have destroying effects to the environment, like antibiotics remnants, and medicines used to treat cancerous diseases. In addition to being incendiary, flammable, and explosive components, they are also capable of making mutations and malformations to the living creatures.⁵⁰

c- Risks resulting from genotoxic wastes:

Health care employees and genotoxic waste disposal responsible are considered the most at risk to these wastes. Risks are related to toxicity of the substance and the duration of time they are exposed to, the exposure to these toxic wastes can happen during preparation or treatment of special

drugs and chemicals. They can transmit through inhaling dust or spray, or absorbing through the skin or by eating drugs' genotoxic-contaminated food. It can also transmit by direct contact with secretions and fluids of patients receiving chemo therapy, or through bacteria, viruses and fungal infections.⁵¹

The toxicity of medicines used in chemotherapy is very high; most of it has an effect on cells' DNA. Experiments have proved the ability of these substances to formulate cancerous tumors and abnormal malformations. Many of these drugs are irritant and have effects of direct contact with skin or eyes, in addition to causing nausea, headache and skin irritation.⁵²

2/ Psychological health:

The increasing and stacking of medical waste in health institutions reflects the image of the deterioration of therapeutic services that the institution offer, through the absence of cleaning which increase the psychological fears of patients and society.⁵³

The stacking of medical waste ruins the image of cities and the surrounding environment, in addition to the spread of unpleasant odors and harmful insects. It also hurts individuals' visions by seeing the stacks of waste, which negatively affects stability and psychological relief of people.

Moreover, these medical wastes generate a psychological and emotional disturbance because of peoples' sensibility towards sensitive sceneries like blood, dirty bands, and human parts. Therefore, any uncovered medical tool, even if not contaminated, is considered dangerous.⁵⁴

Concluding from what perceives that medical wastes have numerous health risks, it is a real threat to the health security.

Conclusion

Throughout this study, it is clear that medical waste has a great impact on health security in Algeria, as it is classified worldwide from the special dangerous wastes because of its many risks. Despite all the efforts that Algeria has put into this field, it still suffers from the lack of medical waste management, which negatively affects the health security of the country.

This study has determined a number of conclusions:

- ✓ The growing of medical waste types that we currently witness creates a real threat to the health and environment security.
- ✓ Despite the efforts made in order to repair the national health system, health security still suffer from many weaknesses sourcing from the absence of management.
- ✓ The safe management of medical waste must be considered in all stages of waste administration, starting from the source, then safely treating of these wastes, ending by the safe disposal to limit its health risks.
- ✓ Risks of medical waste are numerous and have dangerous effects on human health, and the category most at risk is the workers who have direct contact with it.

Some of the recommendations that can be suggested in this light are:

- Trying to rationalize the medical waste by minimizing its production at the source, and also depending on recyclable substances.
- The health security system must be reconsidered by spreading health awareness among individuals, reordering the health spending priorities, and promoting and developing the technological capacities.
- Being up to date with the latest developments in the field of medical waste treatment techniques, and working to utilize alternative methods for incineration (disinfection).
- Sensitizing and making employees in health institutions aware of how dangerous medical waste is, and their obligation to stick to safety measures during work.

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