Environmental management system a scientific, analytic & descriptive study in the environmental condition of the hospitals' medical wastes to avoid pollution (A Cross-Sectional Study)

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نظام الادارة البيئي:دراسة وصفية ,تحليلية وعلمية في الوضع البيئي للنفايات الطبية في المستشفى لتجنب التلوث

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Abstract

Iraq is facing dangerous conditions in the next years because there is no real treatment for Medical Wastes and Cabbages that cause hazardous diseases. Landfilling is the oldest methods. Iraq doesn't follow EIA and ISO organizations standards. The study determines main sources of pollution in hospitals. The study aims at determining the rates and ratios of weight and bags usages in our hospitals of Wasit Health Directorate in 2010 and 2011. Drainage system is workable in the teaching hospitals using the biological and chemical treatment. There must be health training to workers, building good wastes stores according restrictions of EIA.

Keywords: Environment, EIA, Pollution, System, Recycling, ISO, Workers, Education, Treatment, Types, Drainage, Crematory and Waste Pollutants

المستخلص

يواجه العراق مواقف خطرة في السنوات القادمة بسبب عدم وجود معالجة حقيقية للنفايات الطبية والبلدية التي تسبب امراض خطرة. الطمر يتم اتباع اقدم الطرق فيها، ولا يتم اتباع المعايير العالمية لمنظمة ايزو وتقييم التاثير البيئي. حددت الدراسة المصادر الرئيسية للتلوث في المستشفيات، وتؤكد الدراسة على تحديد النسب الاكياس واوزانها المستخدمة في المستشفيات لدائرة صحة واسط للاعوام 2010-2011. يعمل نظام التصريف الصحي في المستشفيات التعليمية ويتم استخدام المعالجة الكيميائية والبيالوجية فيها. هناك حاجة الى التدريب والتثقيف الصحي للعمال، وبناء مخازن جيدة طبقا الى معايير قياس الاثر البيئي.

الكلمات المفتاحية : البيئة , منظمة (EIA) , التلوث , النظام , التدوير , منظمة (ISO) , التثقيف والتعليم , اهمية العمال , الانواع , الصرف والمحرقة .

Introduction

The concept of health is defined as: "the state which shows the human in a perfect condition in terms of body, brain, and society. It does not mean the absence of illness (disease) or disability of the normal person who could find the balanced relation between his body and the environmental conditions that surrounds him." [1]

The aim of this research is to determine the sources of pollution in healthy institutes due to their activities in presenting the medical services to stop the prevalence of epidemic and treating diseases inside and outside the healthy institutes because of draining these pollutants.

Also, this research tries to increase the awareness of the workers, who work in the field of environmental management, in dealing with all the pollutants throughout the environment from one side, and from the other to make availability of the most advanced tools and devices to achieve the goal of making healthy society and institutes.

The environment is regarded as most important element in the healthy programme in any society which plays an essential role in reducing the prevalence of disease. [2, So, the concept of health, environment and development takes such a paramount and essential position in the environmental programmers. They guarantee the health of institutes and make them healthy and highly developed.

The aims of the environmental protection

The impact of human activities on the environment does not limit to deform its types of destruction and harmlessness. So, the concept of environment protection does not stop at returning the beauty, it tries to avoid the impact of all the pollution factors that affect the health and life of the human in the first step if they are not stopped or treated well. The future of the society will be gloomy. [3]

- The Preventive Procedure: it includes preventing all types of damage that occurs or might occur.
- The Therapeutic (Curative) Procedure: it includes the management of pollution and the way of reducing the impact that is resulting from it to reach at removing their effects.

The goal of preventing pollution occurrence is as preventive methods to protect the environment by the human activity, the service or industrial activity or the institutional activities. So, we need at this point to make Environmental Impacts Assessment (EIA). This will help to avoid waste in money and efforts; so that there could not be any damages on the healthy and environmental sides.

Facts of environmental management system

To protect the environment from the risks of pollution means to guarantee the continuity of Life. [4] So, the best mean to achieve that goal is throughout implementing an active system for the environmental management.

Iraq does not work with international organization like the International Standardization Organization (ISO) to get the measurements of features of (EMS) to work on them. If we shall not follow these features (characteristics) of (ISO), we are not able to reach the environmental protection goals. ISO and EIA present the environmental policy to any institute or directorate that guarantee the prevention of pollution occurrence. [5] This policy should include a clear future insight to the goals. Also, ISO calls for making the environmental planning and implementation to reach the final goals of the environmental policy that means the practical steps. After that, ISO needs checking and corrective action for assessment and evaluation and management review for all the practical practice of the preventive process of pollution. [6]

Biological pollution

This type of pollution happens due to the existence of parasites, germs, and viruses in the food. It is happened because of the bad storage of nutrients in such unhealthy ways in unhealthy places and these places are not cleaned and antisepticised (disinfected). **[7]**

Solid pollution

This is caused by the random and unorganized bury to the environmental wastes. These soils will be polluted and could not be used for agricultural or living by the human beings.

Types of the environmental pollutants in the health institutes

The medical wastes are regarded as the most hazardous and dangerous sources for the environment and health. The wastes of health institutes are production resulted from providing the daily healthy services and include tools, devices, blood, body parts, chemical materials, drug cosmetics, medical devices, and radiation materials. The maltreatment of these wastes means that the workers and the society will encounter (exposure) to the infection of the contagious diseases. Besides, it causes the damage of the environment. [8]

Strategic principles to the programme of the medical wastes management

1.) Preventive support to the health institutes and make all the necessary requirements and preparations to deal with wastes in all its steps in such scientific methods.
2.) Working on medical wastes management and removing them to avoid their effects on the health and environment.
3.) Adopting methods that could make continuous coordination among the official institutes to remove the medical wastes.
4.) Developing human resources abilities and capacities especially in the technical information and practices to enrich their minds with useful and practical knowledge.
5.) Putting measurements and standardizations for the production processes of separation, transferring, and treating for the medical wastes.
6.) Working on choosing highly-qualified treating technicians that don't have negative effect on the health and environment. [9]

Medical wastes sources in Iraq

1) Hospitals,
2) College Hospitals,
3) Public Hospitals,
4) Local Hospitals,
5) Private Hospitals,
6) Primary Health Centres,
7) Medical Emergency Centres,
8) Pharmacies,
9) Maternal and Midwives Clinics and Centres,
10) Outpatients Clinics,
11) Renal Failure Centres,
12) First Aids Centres,
13) Blood Transfusion Centres,
14) Military Medical Centres,
15) Laboratories and Researches Centres,

16) Laboratories and Biological Centres,
17) Medical Research Centres,
18) Anatomization and Mortal Storage Centres,
19) Biological and Technical Institutes,
20) Doctors Clinics,
21) Pharmaceutical Stores.

Medical wastes types

Normal medical wastes: these are not hazardous on the workers. They represent (75 – 90 %) of the wastes' ratio. They could be papers, cabbages, food remains, … etc.

Dangerous medical wastes: these present (10 – 25 %) of the wastes' ratio that are produced and resulted from the hospitals. They cause healthy risks which include contagious diseases, poisonous genes, and radiation and sharp materials.

Contagious wastes: they cause contagious diseases like viruses, bacteria, parasites, and mycosis. They resulted from cultures and the materials that are used in the dissolution of diseases in the laboratory. Also, they come from the wastes of isolated patients in the Contagious Diseases Unit. Besides, the wastes of the used materials in cleaning and treating the patients. [10]

Pathological wastes: these wastes related to the body of the patients or the amputated parts.

Acute wastes: these are the tools that are used to cut or prick in the human body like injectors (syringes), lancets (scalpels) which are used in the surgical operations.

Chemical wastes: these are the gas, liquid, and solid wastes that are resulted from the experimental, treating, and diagnostic activities or from the cleaning and disinfecting works that are accomplished inside the institute. They are hazardous, dangerous, poisonous, quick burning, and quick radiation.

Drugs wastes: these are the primary materials, drugs, and cosmetics that are expired or are not suitable to the usage because of their features. These are not used for a long period of time and regarded as pharmaceutical industrial remains. [11]

Health directorate managers must do the following:

1.) Prepare workers to be responsible on medical wastes management.
2.) Ensure workers' training methods in dealing with medical wastes.
3.) Availability of protection tools and materials that are necessary for personal protection.
4.) Availability of different bag types and ensuring and guaranteeing the best way of using them.

Medical wastes separation

Putting the contagious medical wastes in yellow plastic containers or bags in condition that they are strong, combustible, and infiltrated. [12]

Putting undamaged medical wastes in black plastic bags.

Putting infectious medical wastes in yellow plastic bags or container.

Putting chemical cure wastes in blue plastic bags.

Putting radiation wastes in lead containers

Medical wastes removal

Wearing strong and sturdy cloves.
Pouring wastes in the drainers.
Pouring water in such a good and continuous way to guarantee the removal of effects.
Removing the pollution and contamination on the cloves after careful washing of hands. [13]

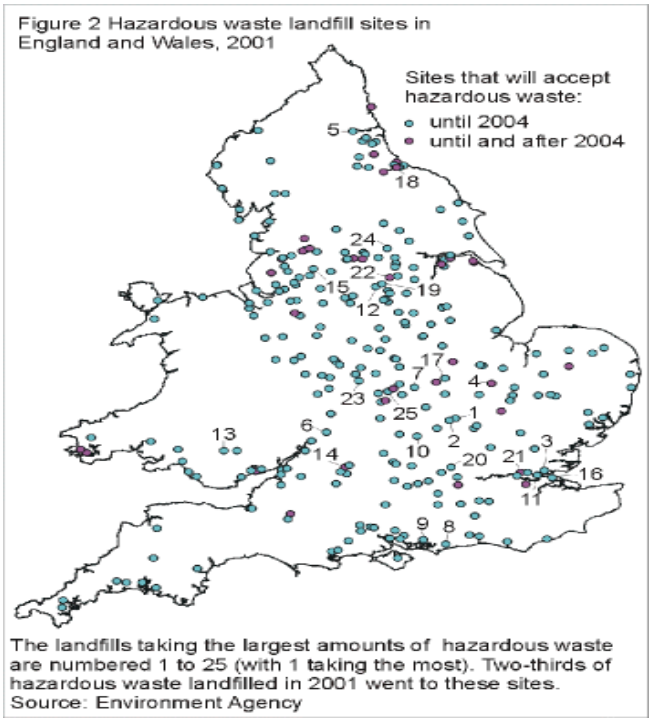
Medical wastes transferring and gathering

Gathering the medical wastes in one place or site.
Tight closing for bags when they are filled.
Putting identification cards and sticking them on the bag or container.
Gathering the medical wastes by wagons
or containers, and that is called internal transferring by special carriages.
Weighing the bags and the weight should not exceed (12 Km). [14]
Specifying vehicles for transferring medical wastes outside the healthy institute.
Cleaning the transferring vehicles by water and disinfections.

Good wastes storage

The medical wastes should be stored in the Central Storage Room (CSR). The procedures of storage in CSR are as follow:

1) The place must be separated from other departments and sections in the hospitals.
2) The ground floor must be constructed from solid material that could be easily cleaned and disinfected.
3) The height of walls must not be exceeding (1, 5 M). [15]
4) Good sources of water, lights, and ventilation CSR.
5) Easiness to the entrance of workers and vehicles.
6) Protection from sunlight and paying attention to climate changes and atmosphere.
7) Killing insects and avoiding animals or birds to be close to CSR.
8) Availability of antiseptics.
9) Storage time in CSR must no exceed on (48 hr) in winter and (24 hr) in summer. [16]
10) There must be clear marks.
11) Preferable to arrange bags or containers.
12) Cleaning storage containers.
13) Putting cautious (alarming) marks.



Medical wastes treatment ways [17]

Double Chamber Incinerators
Contagious,
Acute,
Anatomies,
Chemical cure or treatment.

Burning
Chemical Disinfection
Acute,
Amputation,
Remains.
Thermal Treatment
Contagious,
Acute,
Amputation.
Microwave Irradiation
Contagious,
Acute.
Encapsulation
Chemical,
Medicinal,
Acute.
Inertization
Medicinal,
Ashes.
Recycling
Deep Well Disposal
Composting
Filtration
Geological Isolation
Dry Heat Sterilisation Steam Sterilisation

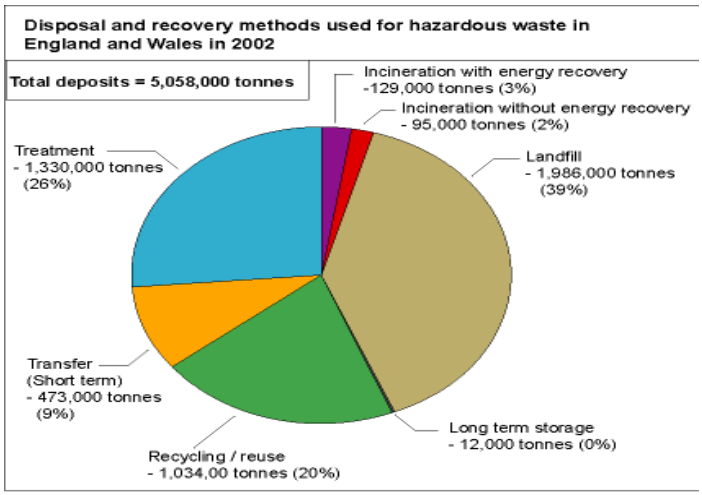


Figure (1): shows Wastes Treatment in England & Wales in 2002

Medical Wastes Treatment Ways [17]

International studies show that the solid wastes' ratio is (92%); whereas the liquid wastes' ratio is (8%). [18]

In Europe, (60%) of wastes are removed by landfill way, and in England and Wales (39%) of hazardous wastes are removed by landfill way as it is shown in figures (2). [19]

Liquid medical wastes sources in hospitals

1.) Most of liquid medical wastes are resulted from washing laboratories tools / microbiology.
2.) Tissues tests operations for diagnosis.
3.) Medication (drugs) usage for CA diseases treatment (cytotoxic drugs).
4.) Blood liquid.
5.) Routine washing remains (wastes) for workers' clothes.
6.) Liquid wastes like diuresis, feces (stools) for the laboratory exams.
7.) Blood samples.
8.) Peritoneal and heamodialysis.
9.) Food preparation remains and food cooking wastes to patients.
10.) Patients shower (bath). [20]
11. Liquid medical wastes treatment in Health Institutes
12.) Separation of liquid medical wastes from solid wastes and connect their drainage process in the same septic waster after analysizing and monitoring their chemical and biological components in the environmental monitoring devices. Then, they are moved to be finally treated before being drained to the river water.
13.) We need to follow the hypochlorite treatment process for the liquid medical wastes treatment of the Health Institutes before being drained to the septic water of the hospital.
14.) The disinfectants of laboratories include blood liquid containers, blood samples checking for analysis, and they need to be put in locked containers and disinfected by autoclave device and finally go to the septic water of the hospital. [21]

Environmental classification for pollution sources [22]

Type (A)

It includes the big agricultural and industrial projects.

Type (B)

It includes the agricultural and industrial sources.

Type (C)

It includes the remained humanitarian activities.

Landfill (bury) of the Wastes

This means the way that wastes are removed whether they are solid or domestic or industrial which are not hazardous.

The landfill (bury) site must be outside the border of the town in a distance of (4 Km) within the wind direction, and (2 km) in the other direction. [23]

It is preferred to choose low lands near normal stone excavator.

In case, there are no low lands, the agricultural lands are used as substitution; but the lands must not be used and tunnels are dug.

It is not allowed to landfill (bury) in sites of high underground water rate.

The site should be far from the highway or Public Street in a distance of (1 Km) at least.
The landfill (bury) area must be fenced by trees.
Availability of suitable roads is to transfer wastes to the specific or determined sites to help car drivers reaching the site easily.Periodic monitoring from Environmental Improvement and Protection Department (EIPD) in Baghdad and other provinces to see the way of bury in the sites.
The sites of bury (landfills) must be left for at least (20 yr) and then they could be used as squares. [24]

Incinerations types

Pyrolytic incineration with an efficient gas cleaning.
Single chamber with dust reduction.
Rotary Kilns incinerators.
Drum or Brick incinerator.
Mobile Incinerators.

An environmental impact assessment

It is an assessment of the possible or negative impact on the environmental, social, and economic aspects.
The purposes of (EIA) are:
To ensure consideration of decision makers about the project of (EIA).
To ensure the process of identifying, predicting, evaluating, and mitigating the biological, social, and other relevant effects.
To ensure predetermined environmental outcomes.
EIA began to be used in the 1960s as part of a rational decision making process. EIA was made legislation in the US in the National Environmental Policy Act (NEPA) in 1969. [25]
There are various methods available to carry out EIAs, they are: Industrial Products: it means that product environmental life cycle analysis is used for identifying and measuring the impact on the environment of industrial products. Genetically Modified Plants: there are specific methods available to perform EIAs of genetically modified plants. Fuzzy Arithmetic: EIA methods need specific parameters and available to be measured to estimate values of impact indicators. [26]
Environmental Impact Assessment in Countries
Australia The history of EIA in Australia is linked to the enactment of the U.S. National Environment Policy Act (NEPA) in 1970. [27]

China

The Environmental Impact Assessment requires project construction with civil penalty. China's state reinforced the laws of penalties in terms of developing the environment, society, and health.

Egypt

EIA is implemented in Egypt under the umbrella of the Ministry of State for environmental affairs.
The purpose of EIA is to ensure the protection and conservative of the environmental and natural resources including human health aspects against uncontrolled development.
EIA is an important tool in the integrated environmental management approach.

India

EIA studies need a significant amount of primary and secondary environmental data. EIA experience in India indicates that the lack of timely availability of reliable and authentic environmental data has been a major bottle neck in achieving the full benefits of EIA. There is no single organization in India to collect the data. [28]

New Zealand

EIA is usually referred to as Assessment of Environmental Effects (AEE). The first use of EIA is in 1979 called Environmental Protection and Enhancement Procedures. This had no legal force and only related to the activities of government departments. When the Resource Management Act was passed in 1991, an EIA was required as part of a resource consent application. Environmental Impact Reports, as follow: summary, introduction, structure, background, purpose and need for action, proposed action, decision framework, public involvement, issues, alternatives, including the proposed action, alternatives, mitigation common to all alternatives, comparison of alternatives, environmental consequences, consultation and coordination.

Results

In January 2010, the medical wastes weight is high in all hospitals and the highest ratio reached (19100), and the number of bags that were used (1200) bag per-month; due to the bed usage in September in 2010 is (65%) in Al-Zahra Teaching Hospital that has capacity of (400) beds.

We have the drainage system in all hospitals; but it is not working in most of hospitals in our Directorate except Al-Zahra Teaching Hospital. The treatment type is either chemical or biological, and they are not used in accurate and precise or scientific methods due to we see lack of information and knowledge in workers and supervisors experiences and qualifications. Their skills are not promising and well-nourished with practice and tools. Inferences of that, we don't have the scientific and environmental treatment in our hospitals.

Besides, the crematory is not working in 2010 in Al-Kut, Fayros, Al-Swara, Al-Karama hospitals. Also, Al-Namanya, Al-Swara, Fayros, Jalal hospitals don't have drainage system in 2010.

Bed capacity number in each hospital is fixed; but usage is different that means medical wastes and bag numbers are also different, even though there is no crematory or drainage system and real and scientific treatments. There is no real separation for the wastes and cabbages, they are mingled and mixed together in the same bags, and their removal must have special halls, rooms, cars and vehicles, devices, coaches and clothes, etc.

It is clearly shown that there is an increase in the ratio of the medical wastes weight especially in the months of the year 2011: May, June, July, August, September, November, October and December that indicates the highest degree of weightreaches (14360) in December and the lowest weight reaches (9664). This is a significant indication of the high ratios of the medical wastes that are produced and they represent the outcome of our hospitals. The incidence is that the Teaching Hospitals are producing very high rates of wastes that will be the major causes of pollutions and pollutants.

Concerning the total number of the medical wastes bags in 2011, we have found that the ratio is very high in the last three months of the year: November (12420), October (12586) and December (14360).

It is really a very indicative reference for the medical wastes of our hospitals. This also reflects that medical wastes will be treated in the old and poor methods that mean the pollutants will be transferred to many areas; and the prevalence is distributed and the risk factor will be high and uncontrolled. We are doing a study of undetermined scope of the pollution risk due to there is no EIA in Iraq.

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We have highest ratios in the medical wastes in 2010, especially in the months of January reached (10.49) and February reached (11.17). Where as, the highest ratios in 2011 are in the months of November (19.38), October (19.64) and December (22.41). It is significant and indicative due to the unplanned methods of gathering, separation, isolation and transferring. Shortage of awareness and devices to treat the medical wastes. There is no clear system of EIA.

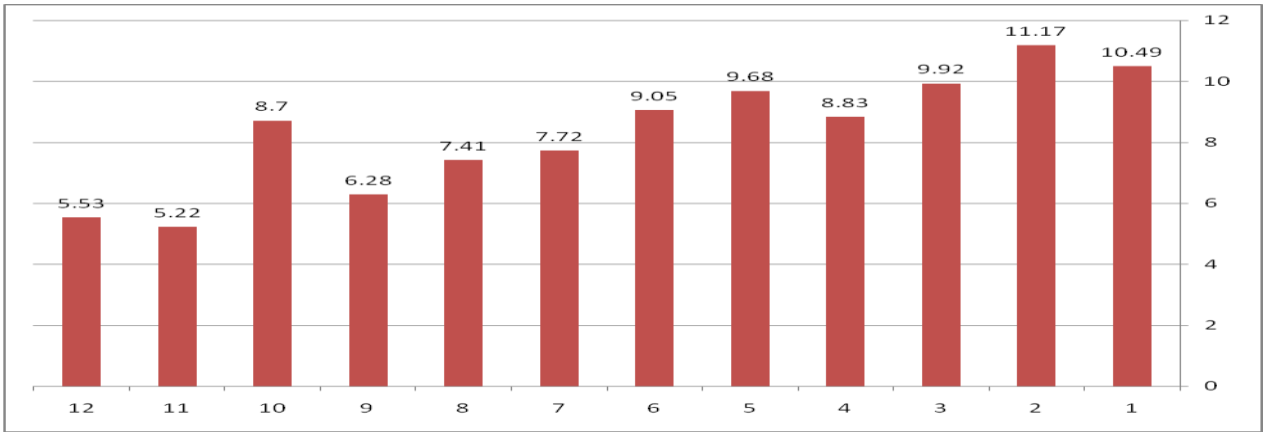
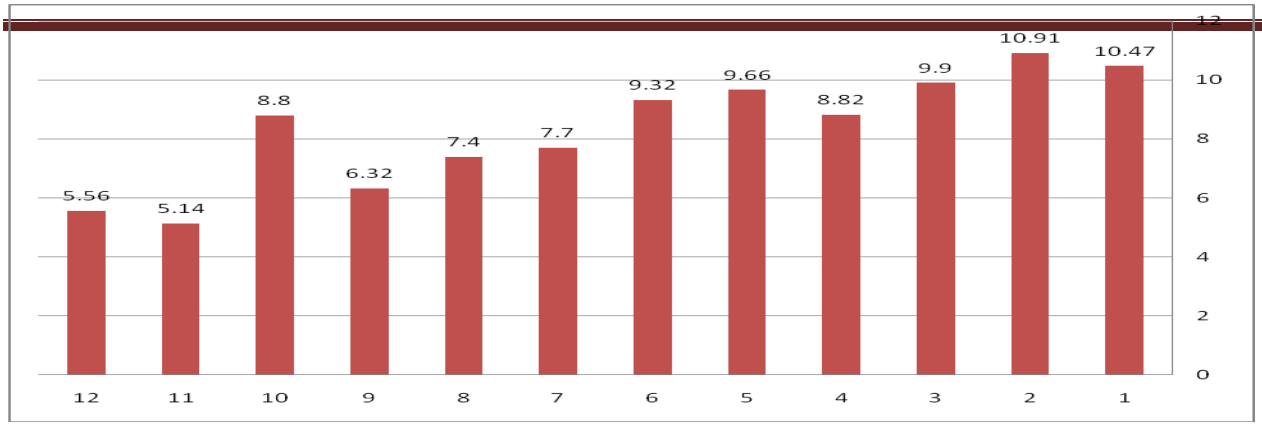


Figure (1): Medical Wastes Weight Total Ratio Per-Month for Hospitals in 2010



Figure(2):Wastes Bags Usage Total No. Ratio Per-Month for Hospitals in 2010

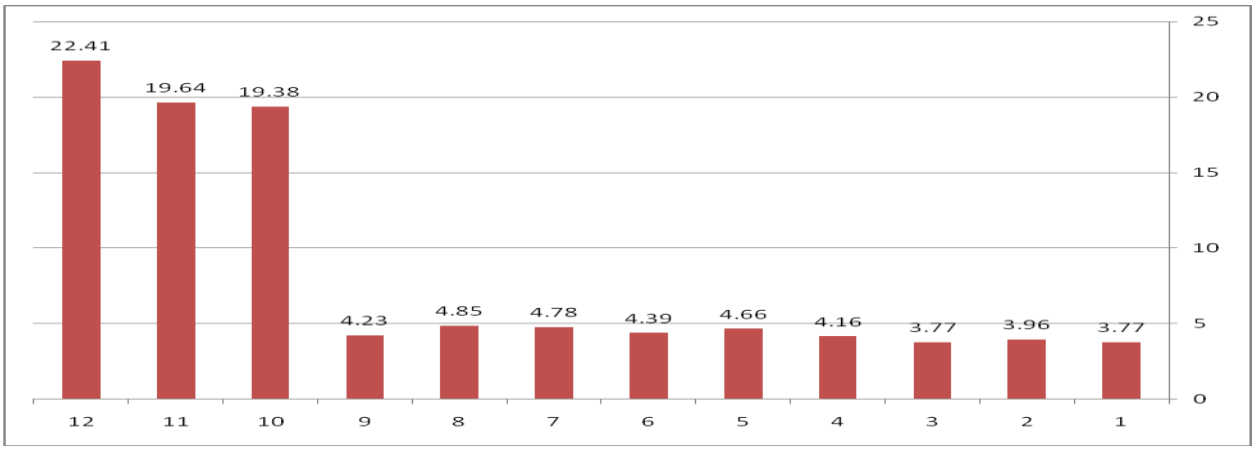


Figure (3): Medical Wastes Weight Total Ratio Per-Month for Hospitals in 2011

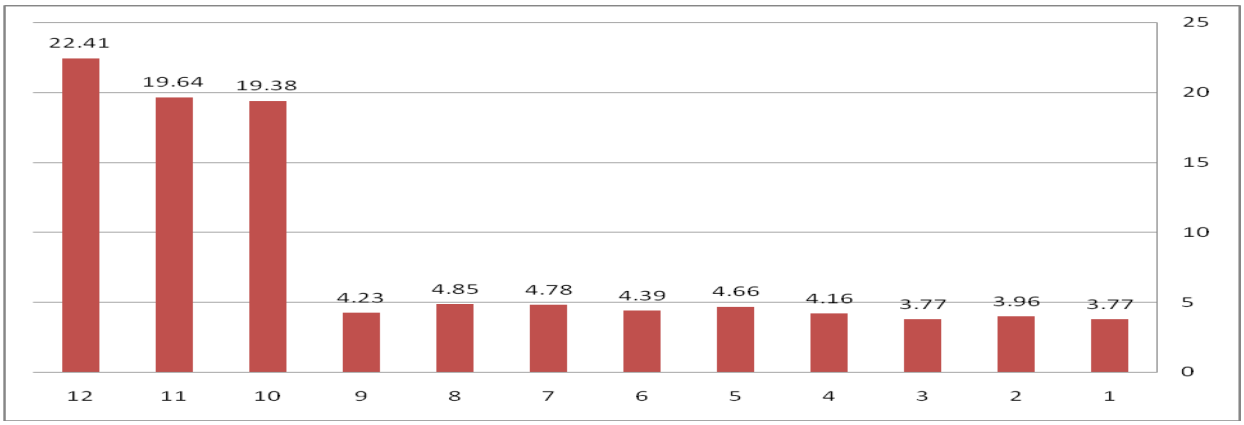


Figure (4):Wastes Bags Usage Total No. Ratio Per-Month for Hospitals in 2011

Discussion

We have mentioned the sources of pollution and the pollutants elements due to the bad treatment of medical wastes and lack of knowledge of the environmental information especially in hospitals. Besides, Iraq is not working according to International Standardization Organization (ISO) to get the measurements of the features and characteristics of (ISO), and the Environmental Management System (ESM). The environmental planning and implementation mean to reach the final goals of the environmental policy.Thereafter, the research presents the medical wastes types and the waste pollutants in the health institutes. The study determines the medical wastes sources in Iraq. Also, the study shows the Environmental Classification for Pollution Sources (ECPS) in the community (society). The types of incinerations are used in treatment of medical and other wastes and cabbages have advantages and disadvantages.

There is no real separation for the medical wastes in our hospitals and the ratios of medical wastes in 2010 are very high and risky due to the following points:

-The drainages system is not workable;

-The medical wastes weight and bags are very high in usages and numbers that force us to think about building a small Environmental Treatment Company (ETC) to get all the wastes recycling and reproducing to benefits from our medical and healthy institutes' wastes and cabbages. The (ETC) should be related to Ministry of Health / Technical Affairs Directorate / Environmental Department.

-There must be inside treatment for our medical wastes and food and cabbages which means that the crematories are activated.

-The prevalence and incidence of medical wastes pollutions are not fixed in one area; but it is spread and transferred among sites of Wasit Province. But the ratio of waste bags that are used in 2011 is so high and risky. So, the numbers are significant and variables are so indicative in terms of capacity of hospital and bed usage in them.

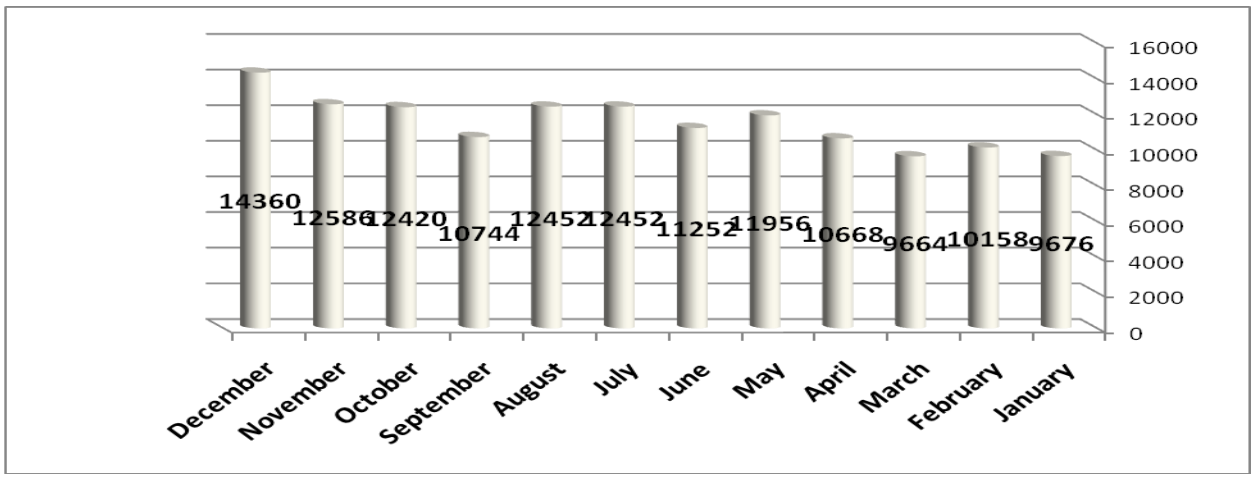


Figure (5): Medical Wastes Weight Total of Hospitals Per-Month in Kg. in 2011

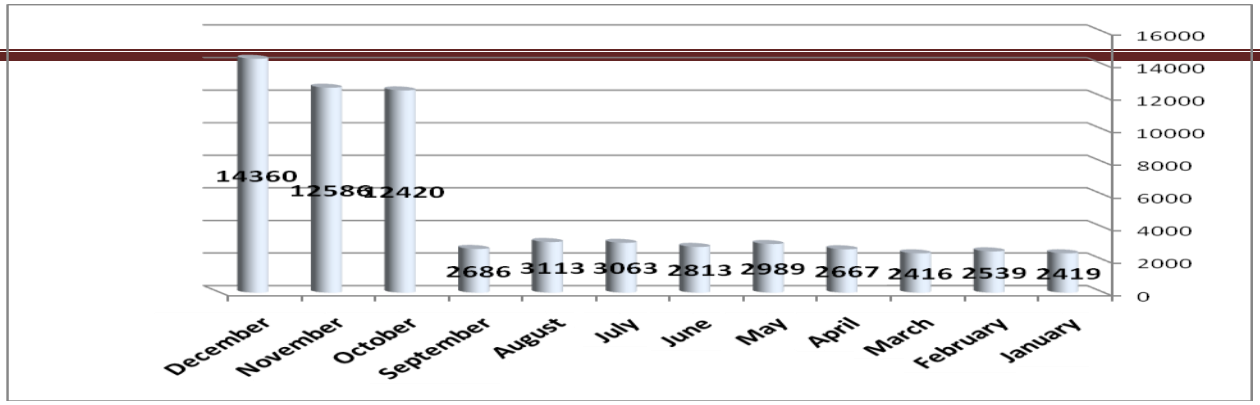
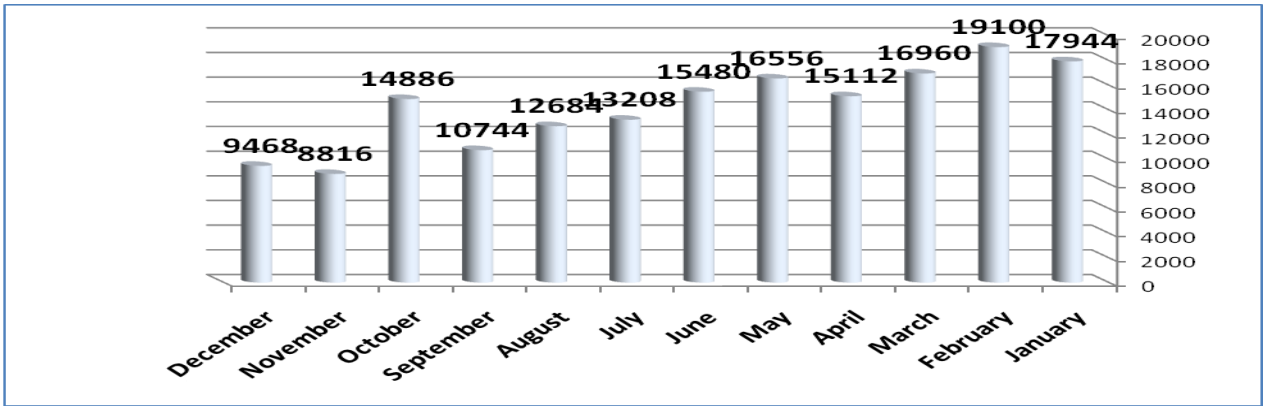


Figure (6): Wastes Bags Usage Total No. of Hospitals Per-Month in 2011



Figure(7):Medical Wastes Weight Total of Hospitals Per-Month in Kg. in 2011

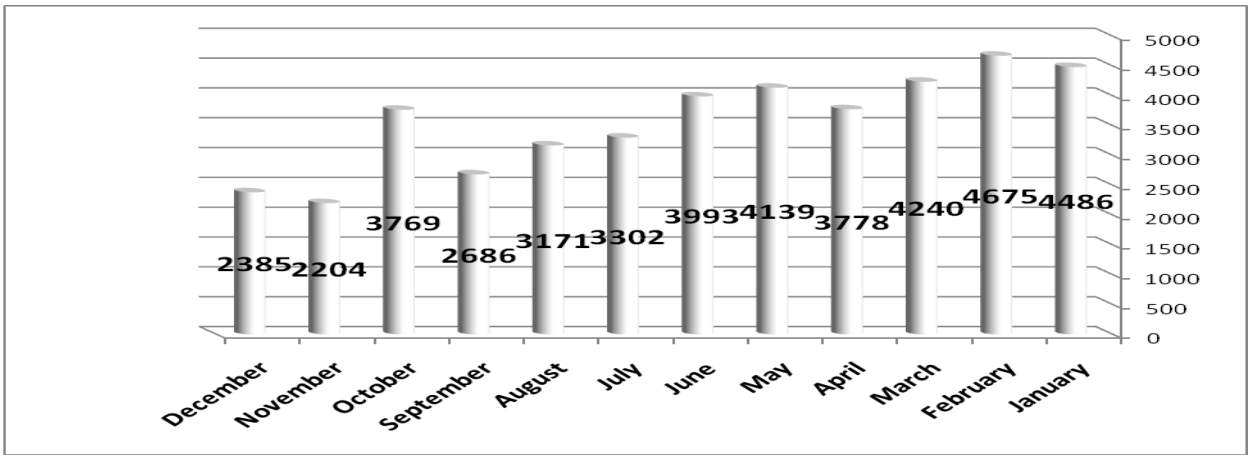


Figure (8): Wastes Bags Usage Total No. of Hospitals Per-Month in 2011

Conclusions

There is real and urgent need to take care of the issue of environment inside and outside our health institutes; so that there will not be epidemic disease caused by pollution or pollutants of the medical wastes that are collected and gathered from the hospitals. Real usage of the treatment, separation, collection, classification and landfilling are unproductive.

Besides, there is no real usage and treatment inside hospitals due to the drainage system in most of our hospitals is unworkable. Workers are not trained well and they have no skills and knowledge of the instructions and restrictions of the (EIA) and (ISO). In other words, there are no real preventive and protective procedures in terms of inside treatment by using incinerations. To protect the environment from risks of pollution means to guarantee the continuity of life of the community.

There is no real and paramount works concerning the training of workers, supervisors, and those who are responsible on the issue of environment in Wasit Health Directorate due to medical wastes are regarded as the most hazardous and dangerous sources for the environment and health.

The study infers that we, Wasit Health Directorate, must start to build good wastes stores according to the restrictions and proceedings of (CSR) and (EIA). The high ratios of medical wastes weight of hospitals in Wasit Health Directorate are because of that there is no systematic and real procedures that deal with the issue of environment and health. As well as, the wastes bags numbers that are so high in both years especially in teaching hospitals in terms of risk, prevalence, incidence, and distribution factors. The cross-sectional study is indicative and significant due to it shows the place, time, and effect. There is no real treatment for medical wastes inside hospitals. There is no workable incinerators due to some are workable and others are broken down. The drainage system is not working in most hospitals of Wasit health Directorate. Workers are not trained well and they have no skills and knowledge of the instructions and restrictions of the (EIA) and (ISO). The study infers that we, Wasit Health Directorate, must start to build good wastes stores according to the restrictions and proceedings of (CSR) and (EIA). The high ratios of medical wastes weight of hospitals in Wasit Health Directorate are because of that there is no systematic and real procedures that deal with the issue of environment and health. we need to open a small factory inside one of our teaching hospitals to take benefits from our wastes and cabbages. Training for workers and make availability of vehicles and stores are essential in each hospital .Drainage system is workable in Al-Zahra and Al-Karama Teaching Hospitals. They use biological and chemical treatment. Crematories are workable in some months and broken down in most of the two years months. Eventually, we need to open a small factory inside one of our teaching hospitals to take benefits from our wastes and cabbages.

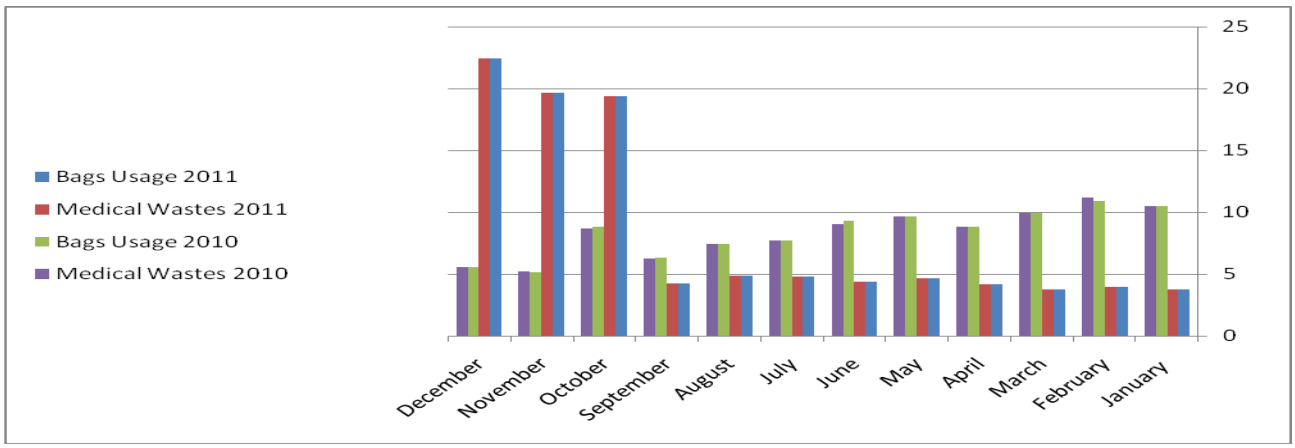


Figure (9): Total Numbers of Medical Wastes Weight and Bags Usages in (2010-2011)

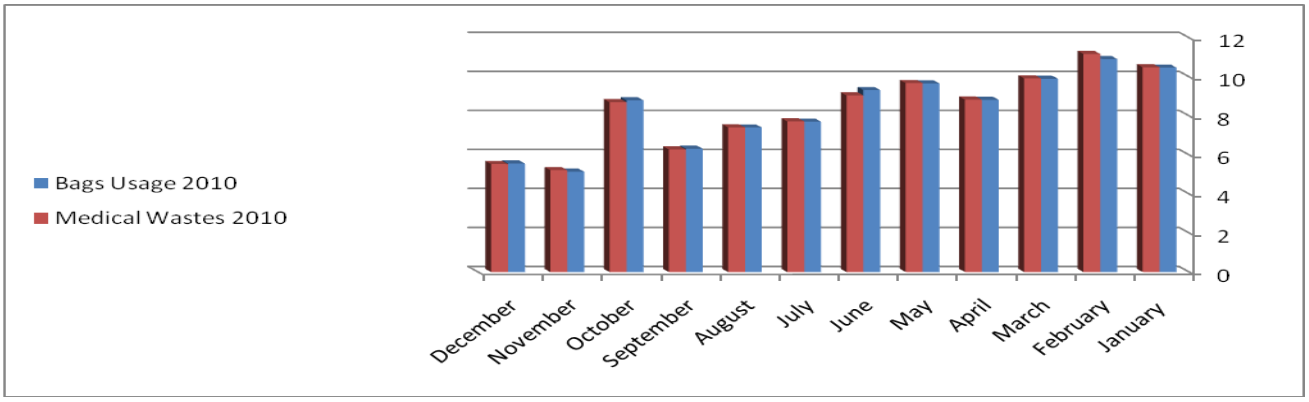


Figure (10):Bags Usage and Medical Wastes Weight in 2010

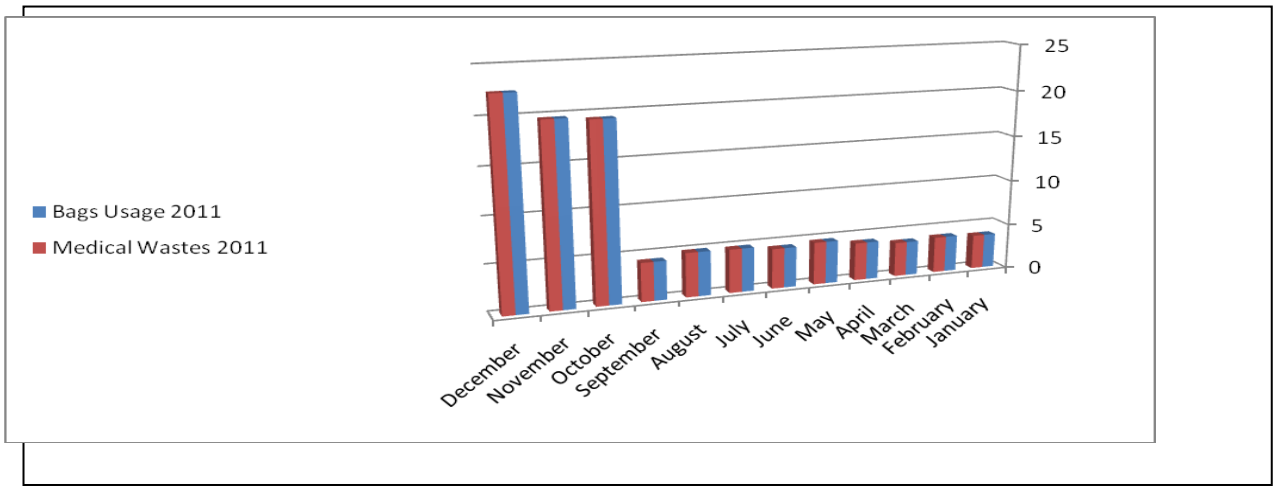


Figure (11): Bags Usage and Medical Wastes Weight in 2011

Recommendations

A. Background information: the following are the requirements: (1) Test of the awareness of the healthcare staff of the hospital generated waste. (2) Review of the items of medical supplies used by the hospital. (3) Determination of the weight of the generated hospital waste. (4) Review of policy and procedure on the handling of healthcare waste and lists of items designated as hazardous healthcare or other types of waste. (5) Assessment of the number, location, condition, proper color coding and content of the means of collection. (6) Mapping and inspection of the storage areas and the route of transportation.
B. Identification of Problems: The following are the possible problems envisaged: (1) Change of contracted housekeepers and/or environmental cleaning services. (2) Lack of awareness of healthcare staff. (3) Inaccurate disposal of waste items in the designated receptacles. (4) Failed means of collection, transporting or storage. (5) Injuries resulting from inaccurate disposal of hazardous healthcare waste items such as needles and glassware.
C. Interventions: The following actions are recommended: (1) Launching of educational and orientation campaign. (2) Amendment of the policy and procedure on the handling of healthcare waste. (3) Modification of the means of collection, transportation systems and storage areas in accordance with the setting and layout of the hospital. (4) Appointment of

B. inspectors to oversee the handling of waste. (5) Establishment of management plans for individual departments with the

C. active participation of the departmental chiefs, head nurses or chief technicians. (6) Establishment of contingency plans to deal with spills of hazardous healthcare waste and the possible failure of the final treatment method.
D. Monitoring: The following measures are suggested: (1) Regular inspection of the means of collection, transportation and storage. (2) Feed-back from the departments. (3) Assessment of the weight of healthcare waste. (4) Re-testing the awareness of the healthcare staff of the generation of waste in hospitals. (5) Auditing the upgraded management.

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