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Medical Waste Management in Primary HealthCare Centers and Private Clinics: Jenin District as a Case Study

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Dedication

To

My Wife, Parents, Brothers and Sisters

With Love and Respect

إقـــرار

أنا الموقع/ة أدناه، مقدم/ة الرسالة التي تحمل العنوان:

Medical Waste Management in Primary HealthCare Centers and Private Clinics: Jenin District As A Case Study

إدارة النفايات الطبية في مراكز الرعاية الصحية الأولية والعيادات الخاصة في محافظة جنين.

أقر بأن ما اشتملت عليه هذه الرسالة إنما هي نتاج جهدي الخاص ، باستثناء ما تمت الإشارة إليه حيثما ورد ، وان هذه الرسالة ككل، أو كجزء منها لم يقدم من قبل لنيل أية درجة علمية أو لقب علمي أو بحثي لدى أية مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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List of Abbreviations

AIDS	: Acquired Immune Deficiency Syndrome
EMS	: Emergency Medical Services
EQA	: Environmental Quality Authority
GMW	: Generated Medical Waste
GP	: General Practitioner
gr.	: gram
HCFs	: Health Care Facilities
HCW	: Health Care Waste
HCWH	: Health Care Waste without Harem
HCWM	**:** Health Care Waste Management
HIV	: Human Immunodeficiency Virus
IPCP	: Infection Prevention and Control Protocols
MCH	: Mother Child Hood
MoH	: Ministry of Health
MW	: Medical Waste
NGOs	: Non Governmental Organizations
OPD	: Out Patient Department
PHCs	: Primary Health Care Centers
Pr.C	: Private Clinics
SPSS	: Statistical Package for Social Science
THU	: Target Healthcare Units
UNRWA	: United Nations Relief and Works Agency
WHO	: World Health Organization

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Abstract

This study was carried out during the period from March to October 2007 in Jenin district, aimed to review the current situation of the management of the medical wastes (M.W.) that is generated in the primary health care centers (PHCs) and private clinics (Pr.C.).

The study showed in Jenin district lack of administration of medical waste capabilities, technical and financial ability for a good and strong management of medical wastes, and lack of joint cooperation between the governmental organizations responsible for the health sector in Jenin district as Ministry of Heath, Ministry of Local Governance, Palestinian Environmental Quality Authority and other organizations.

The study showed also that most workers in the public services sector do not follow the proper methods of transferring of medical waste, indicating urgent need for the education and training on a right basis and safe methods for the dealing process with medical wastes.

The second part of this study shows that PHCs generate an average 0.830 kg. Of medical waste per primary health care center per day, where was the average of generated medical waste of private clinic about 0.350 kg. per private clinics per day .

Therefore, the annual generation rate of MW in Jenin district from primary health care centers and private clinics could reach more than 61 tons / year of hazardous materials generated in the district.

These results indicate a clear evidence for the need for a good management of medical wastes in Jenin district that can preserve the human health and the clean environment.

Chapter One

General Introduction:

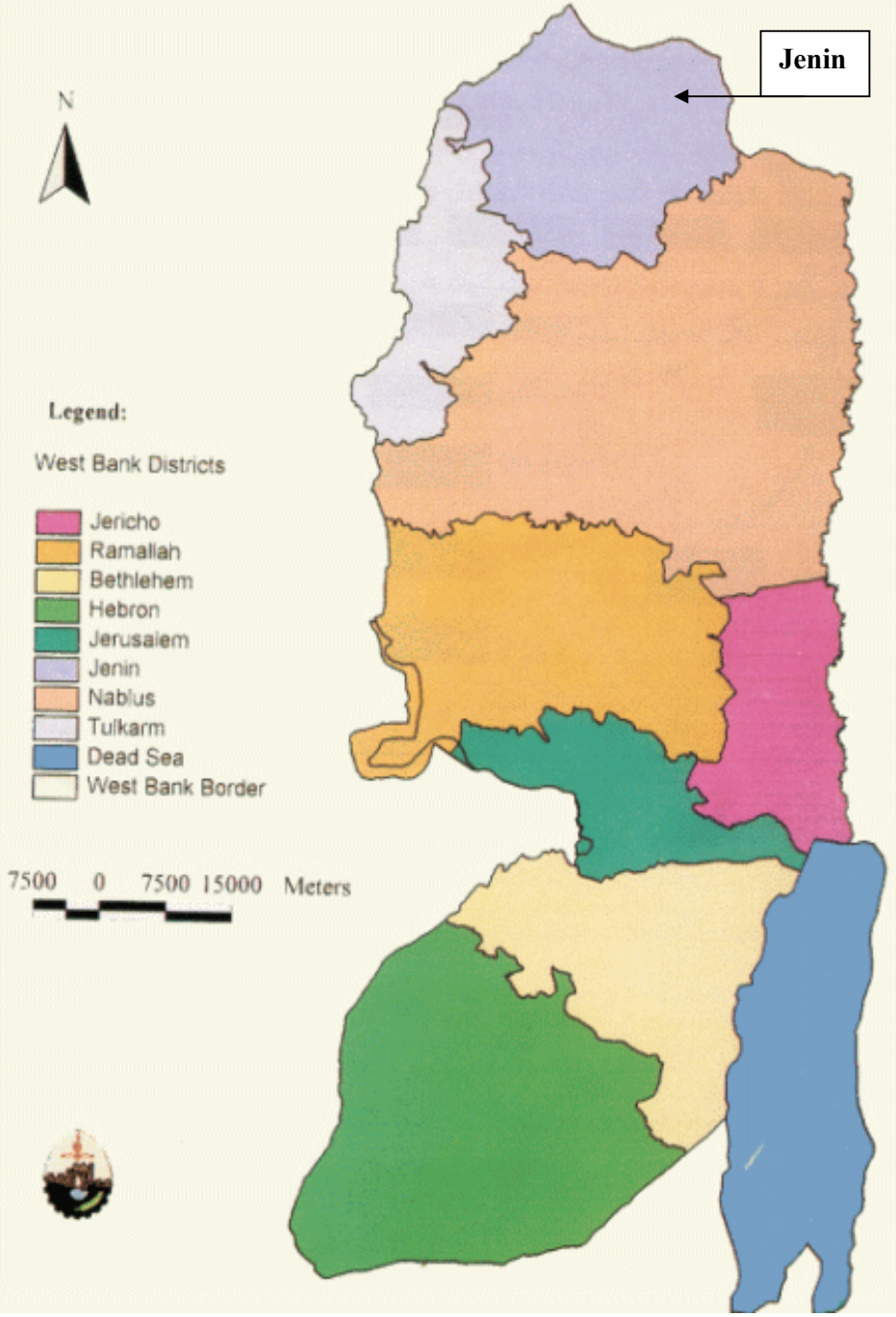
During the last 10 years, the Palestinian Authority has taken the responsibility of Palestinian health. This period witnessed an increase in health services in all rural and urban communities, without a proper medical waste management system, which resulted a growing medical waste problem. For example, in Jenin district (West Bank), there are 140 primary health care centers and 380 private clinics, most of which have no provision for safe treating and disposal methods of there medical waste. Moreover, all of the collected medical waste from these centers and clinics are dumped with municipal waste at the dump-site (Jenin Health Directorate 2/2007).

Background of Jenin district:

Location:

Jenin district is located in the northern part of the West Bank in Palestine as shown in figure 1. It is abounded by the Nablus and Tulkarem districts from the south and south east and by the 1948 cease-fire line from other directions of the district. The area of Jenin district is 592 km^2 located between 90-750 m above sea level "Applied Research Institute of Jerusalem" (ARIJ, 1996).

Because of the soil fertility and water availability Jenin district is considered as one of the best agricultural areas in Palestine (ARIJ, 1996).



[wibsite:www.theodora.com/maps]

Fig. (1): Location of Jenin district in the West Bank

Topography of Jenin district:

The topography of Jenin district can be divided into three areas:

The eastern slopes:

Located between Jordan valley and the central highland, they are characterized by steep slopes which contribute of forming young wades.

Mountain Crest:

Located from watershed line and separate the eastern and western slops, with average between 500-650m above sea level (ARIJ, 1996).

The western slops which characterized by gentle slopes with elevation range between 100-400 m above sea level (ARIJ, 1996).

Climate of Jenin District:

The climate of Jenin district is governed by its position on the eastern Mediterranean. Winter is moderate and rainy, summer is hot and dry.

- **Temperature:** in the summer, the temperature is moderate as a result of the influence of the Mediterranean winds that reach Jenin district due to the absence of the highlands between Jenin district and Mediterranean Sea. The average maximum temperature from June to August is 33.6 ^{o}C, the average minimum is 19.3 ^{o}C (ARIJ, 1996).

- **Wind** : wind direction above Jenin district is between southwest and northwest, more northerly during the summer, with daily speed about 9.2 km / h (Bait-Qad Station, site visit 2007).

- **Humidity:** relative humidity at Bait Qad weather station is 67.2% during winter, increased to average of 84% and drops to 39% on average during (khamaseen period). In summer, the mean annual humidity is 63.7% (ARIJ, 1996).

- **Precipitation**: the mean annual rain-fall in Jenin district is 528 mm. The rainy season in Jenin district starts in the middle of October to the end of April (ARIJ, 1996).

Medical Waste (MW)

Medical Waste is defined as the waste generated from health-care establishments, such as hospitals, primary healthcare centers, private clinics, research facilities , laboratories used in diagnosis, monitoring, and prevention activities (curative or palliative) drugs in the field of human and veterinary medicine including infectious hazardous materials and humane body parts (Massrouje, 2001; Silva et al, 2002).

Medical waste is a public health issue that attracts the attention all over the world (Miyazaki, Une, 2005).

In the last few decades, the generation of medical waste in Palestine, as well as many other countries, has become a serious problem and a hazardous issue that had a negative impact on human health and the environment (Miyazaki, Une, 2005).

Minor attention has been directed to its proper handling and disposal of this waste. Therefore, medical waste is considered as one of the major hazards that effect the environment and the health of human beings, since improper management of this waste may pose health hazards through

transmission of diseases, the contamination of soil and groundwater and poisonous emissions from improper burning of medical waste (Ja'al, 2003).

In the long term, medical waste not only impairs the quality of life of the community, but also affects the welfare of the entire population and the national economy (Massrouje, 2001). However, in developing countries, medical wastes have not received sufficient attention. In many countries hazardous and medical wastes are still handled and disposed of together with domestic wastes, thus creating a great health risk to municipal workers, the public and the environment (Silva et al., 2005).

In Palestine, concern about medical waste is recent and still not as strong as it should be. This may be attributed to political, social and economic reasons. This study assessed medical waste management in Jenin district in order to help identify the problems and to assist the planning of an appropriate medical waste management system.

Types and Classification of Generated Medical Waste (GMW) in Health-Care Facilities (HCFs):

Medical waste includes both non-hazardous and hazardous waste constituents.

The non-hazardous waste includes wool, kitchen wastes, etc, that does not pose any special handling problem or hazard to health or the environment. Non-hazardous waste is generated in the patients' ward areas, out-patient-department (OPD), kitchens, offices, etc.

The hazardous waste portion includes pathological, infectious sharps and chemical wastes (specific definitions of these are given below).

Hazardous wastes are normally produced in labor wards, operation theatres, laboratories, etc "World Health Organization**",** (WHO, 1999).

According to WHO the 10-25% hazardous fractions of total HCW are usually classified into the following waste groups.

Infectious waste:

All wastes suspected to contain pathogens in sufficient quantities to cause diseases to other host or person. It includes discarded materials or equipment used for the diagnosis, treatment and prevention of disease as dressings, swabs, and others. This group also includes liquid waste such as urine, blood and sputum or lung secretions (WHO, 1999).

Pathological and anatomical waste:

Pathological waste consisting in organs, tissues, body parts or fluids such as blood. Anatomical waste is a sub-group of pathological waste and consisting in recognizable human body parts (WHO, 1999; Hayashi and Shigematsu, 2000).

Hazardous pharmaceutical waste:

Pharmaceutical waste includes expired, unused, spilt and contaminated pharmaceutical products, drugs and vaccines (WHO, 1999).

Hazardous chemical waste: Chemical waste consisting of discarded chemicals (solid, liquid or gaseous) that are generated during disinfecting procedures or cleaning processes (WHO, 1999).

Waste with a high content of heavy metals:

Wastes with high contents of heavy metals are highly toxic (e.g. cadmium or mercury from thermometers or manometers). They are considered as a sub-group of chemical waste but they should be treated specifically (WHO, 1999).

Pressurized Containers:

It consist a full or emptied containers or aerosol cans with pressurized liquids, gas or powdered materials (WHO, 1999).

Sharp waste:

Sharps are items that can cause cuts or puncture wounds (needle stick injuries for instance). They are considered as highly hazardous instrument and potentially infectious waste (Hayashi and Shigematsu, 2000).

Highly infectious waste:

They include body fluids of patients with highly infectious diseases, microbial cultures and stocks of highly infectious agents from Medical Analysis Laboratories (WHO, 199).

Genotoxic / cytotoxic waste:

Genotoxic waste derives from drugs generally used in oncology or radiotherapy units that have a high hazardous mutagenic or cytotoxic effect, vomit or urine from patients treated with cytotoxic drugs or chemicals should be considered as genotoxic (WHO, 1999).

Radioactive waste:

Radioactive waste includes gas, liquids and solids contaminated with radio-nuclides whose ionizing radiations have genotoxic effects. The last four categories (7-10) are considered as highly hazardous and therefore require special attention (Kane et al, 1999).

Approximate percentage of waste type per total waste in primary health care centers: non-infectious waste, 80%, pathological Sharps waste 1%, chemical or pharmaceutical waste 3%, pressurized cylinders, broken thermometers less than 1%, and infectious waste 15**%** "Health-Care Without Harm" **(**HCWH, 2001)**.**

Primary health care centers and private clinics in Jenin district:

Primary health care centers are facilities where medical and health services are provided included care given on initial contact, with no ability to admit patient to in-patient services, which is normally opened 8 hours a day. These health cares are for treatment of acute diseases, managing chronic diseases, using prevention measures and educating and teaching programs, continuity of care (Prüss, 1999).

In Palestine, the definition of (PHC) is according to their levels of classifications and services that provide. These classifications are:

Level One MoH provide:

- Preventive services: mother and child health care, and immunization.
- Curative services: first aid (health inforum, 2005).

Level Two MoH provide:

- Preventive services: mother and child health care, and immunization.
- Curative services: General Practitioner (GP) medical care.
- Laboratory (in some clinics) (health inforum, 2005).

Level Three MoH provide:

- Preventive services: mother and child health care, immunization, family planning and dental.
- Curative services: GP and medical specialist.
- Laboratory.
- Health education (health inforum, 2005).

Level Four MoH provide:

- Preventive services: mother and child health care, immunization, family planning and dental.
- Curative services: GP and medical special care and dental care.
- Gynecology and obstetric
- Laboratory.
- Radiology.
- Health education
- Emergency Medical Services (EMS) (health inforum, 2005).

Table (1): Distribution of Primary Health-Care Centers "PHCs" in Jenin district (Jenin Health Directorate, 2/2007).

Type of health facility	Number
General clinics	50
Specialized clinics	21
MCH Centers	24
Village Health Rooms	15
Medical Laboratories	12
Dental Clinics	4
Family Planning	13
Mammography Unit	1

JENIN DISRICT STATISTICES:

According to the Ministry of Health (HECM, 2004). Jenin District statistics are populated about 292000 habitants with annual birth rate in (2002) is 7500 newborns. Jenin district localities are 119 communities as fallows: 15 Municipalities, 32 village councils, 47 local communities, 2 refugee camps, and 23 others.

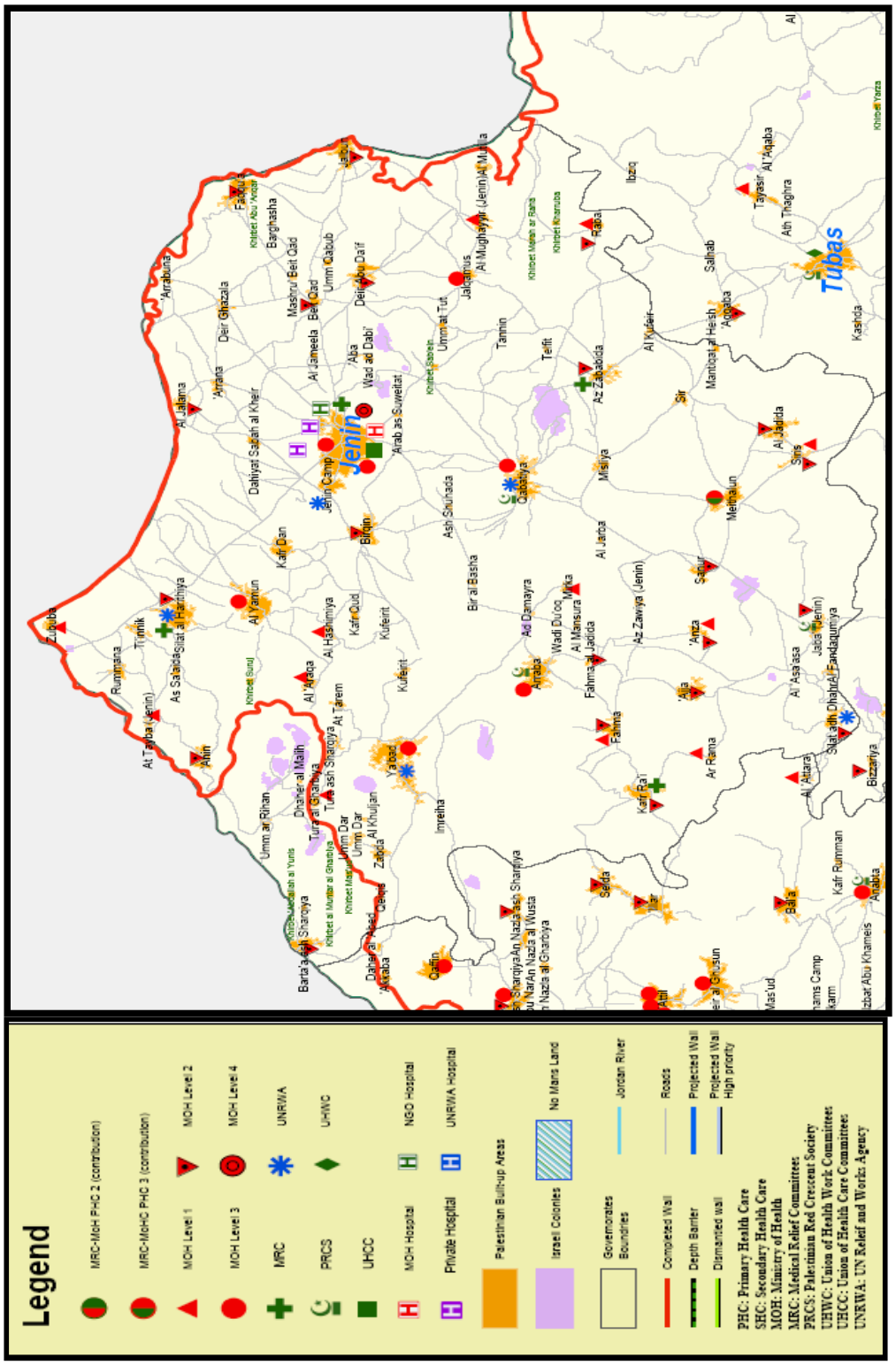


Fig. (2): Distribution of PHCs in Jenin district (Health inforum 2005).

Health Care Waste Management (HCWM):

What is Health Care Waste Management?

Health care waste management (HCWM) is a process aims to help ensuring proper hospital and health-care facilities, hygiene and safety of health care workers and communities in dealing with medical waste. It includes planning and procurement, construction, staff training and behavior, proper use of equipment, proper treatment and disposal methods of medical waste inside and outside the healthcare establishment and evaluation for the process of health care waste management (WHO, 2004).

Advantages of good Health Care Waste Management:

The need for proper HCWM has been gaining recognition slowly. It can help to control diseases (hospital acquired infections), reduce the community exposure, prevent illegal repackaging and resale of e.g. contaminated needles, reduce HIV/AIDS, sepsis, and hepatitis transmission from dirty needles and other improperly cleaned/disposed medical items, avoid negative long-term health effects, ex.: cancer from the environmental release of toxic substances such as dioxin, mercury and others (WHO, 2004).

Disadvantages of poor health care waste management:

Risks to health care workers and waste handlers:

Poor management of health-care waste can cause serious disease to health-care personnel, to waste workers, patients and to the general public. The greatest risks posed by infectious waste are accidental needle stick injuries which can cause hepatitis B, hepatitis C and HIV infection. There

are, however, other numerous diseases which could be transmitted by contact with infectious health-care wastes. During the handling of wastes, injuries occur when syringe-needles or other sharps have not been collected in rigid puncture proof containers. Inappropriate design and/or overflow of existing sharps container. Moreover, unprotected pits increase risk exposure of the health care workers, of waste handlers and of the community at large, to needle stick injuries. Best practices in health care recommend the segregation of sharps at the point of use (WHO, 2003; HCWH, 2007).

Risk to the general public:

The reuse of infectious syringes represents a major threat to public health. WHO estimated that in 2000, worldwide injections undertaken with contaminated syringes caused about 23 million infections of Hepatitis B, Hepatitis C and HIV (WHO, 2004). Such situations are very likely to happen when health-care waste is dumped on un-controlled sites where it can be easily accessed by the public: Children are particularly at risk to come in contact with infectious wastes. The contact with toxic chemicals, such as disinfectants may cause accidents when they are accessible to the public. In 2002, the results of WHO assessment conducted in 22 developing countries showed that the proportion of health care facilities that do not use proper waste disposal methods range from 18% to 64% (WHO, 2003; WHO, 2004; HCWH, 2007).

Regulated Medical Waste disposal procedures:

Before regulated medical waste is transported from health care facilities, it contained in disposable containers must be placed for storage or handling in disposable or reusable pails, cartons, drums, or portable bins. The containment system must be leak proof with tight-fitting covers, and

should be kept clean and in good repair. The containers must be conspicuously labeled with the word "infectious" or the words "Regulated Medical Waste (Blackman 1995).

Table (2): Recommended treatment technique for each type of infectious waste

Category of infectious waste	Recommended treatment technique
Isolated waste	-steam sterilization - incineration
Cultures and stocks of infectious agents associated biological.	-steam sterilization - incineration - thermal inactivation - chemical disinfection
Human blood and blood products	-steam sterilization - incineration - chemical disinfection -discharge of sanitary sewer
Pathological wastes	-steam sterilization - incineration
Body parts	-steam sterilization - incineration

(Blackman, 1996)

Proper Management of Medical Waste:

The best medical waste management practice for medical waste is to prevent and minimize the generation of waste (Jang et al, 2006).

The management of waste must be consistent from the point of generation (“cradle”) to the point of final disposal (“grave”). According to **(**WHO, 1999; WHO, 2000; WHO, 2004**)**, the path between these two points can be segmented schematically into eight steps.

Waste minimization:

This first step comes prior to the production of waste and aims at reducing as much as possible the amount of HCW that will be produced by setting up an efficient purchasing policy and having a good stock management (WHO, 1999).

HCW generation:

The point at which waste is produced.

Segregation and containerization:

The correct segregation of waste at the point of generation. The segregation must be done at the point of generation of the waste. To encourage segregation at source, (reusable) containers or baskets with liners of the correct size and thickness must be placed as close to the point of generation as possible (WHO, 2000).

They should be properly codified by color-coded (yellow or red for infectious waste) and have the international infectious waste symbol clearly marked. When they are 3/4 full, the liners must be closed with plastic cable ties or string and placed into larger containers (WHO, 2000).

Intermediate storage (in the HCF):

In order to avoid both the accumulation and decomposition of the waste, it must be collected on a regular daily basis to the area where the larger containers are kept before removal to the central storage area (WHO, 2004).

Internal transportation in the (HCF):

Transportation to the central storage area is usually performed by using a wheelie bin or trolley. Wheelie bins or trolley should be easy to load and unload, have no sharp edges that could damage waste bags or containers and they should be easy to clean. Ideally, they should be marked with the corresponding coding color (WHO, 2004).

Centralized storage in the (HCF):

The central storage area should be sized according to the volume of waste generated as well as the frequency of collection. The facility should not be situated near food stores or food preparation areas. Its access should be always limited to authorized personnel, also it should be easy to clean, have good lighting and ventilation, designed to prevent rodents, insects or birds from entering.

Storage time should not exceed than 24-48 hours especially in countries that have a warm and humid climate (WHO, 2004).

External transport:

External transport should be carried out by using dedicated vehicles. They should be free from sharp edges, easy to load and unload by hand, easy to clean and disinfect, and fully enclosed in order to prevent any spillage in the hospital premises or at the road during transportation (WHO, 2004).

The transportation should be always properly documented and all vehicles should carry a consignment note from the point of collection to the treatment facility (WHO, 2004).

Treatment and final disposal:

There are a number of different treatment methods and options to deal with medical waste including incineration, steam sterilization (sanitation), microwave sanitation, chemical disinfection, dray heat disinfection, and disinfection with superheated stem (Jang et al, 2006).

Medical Waste Regulations in Palestine:

Because of several factors of which financial, social and political factors, medical waste management in Palestine has paid little attention to the proper handling and disposal of medical wastes through the working municipalities only in Jenin district.

By the end of 1994, Palestinian authority has concentrated at the issue of medical waste management because the donor countries have offered the Palestinian authority many incinerators for treating MW in the West-Bank and Gaza Strip. But the lack of experiences and maintenance in the Palestinian territories (as in Jenin district) made the operation of these equipments insufficient and un accepted because of the emissions of smoke and smells which affect health and the environment of the area (AL-Khatib, 2003).

Many developed countries have legal provisions with regards to the proper management of medical waste. Outside of Palestine many studies have focused on the management of medical waste in countries such a Jordan, (Zghondi et al., 2005; Abdulla et al., 2007), the United States of America (Lee et al., 2004; Klangsin and Harding, 1998), United Kingdom (Tudor et al., 2005), India (Patil and Shekdar, 2001), Saudi Arabia

(Almuneef and Memish, 2003), Tanzania (Mato and Kassenga, 1997), and Iran (Askarian et al., 2004).

Medical Waste Treatment and Disposal Protocols in Palestine:

In the 2004, Palestinian Ministry of Health has developed a protocols that strengthen the health care system in Palestine, these protocols is known as (Infection Prevention and Control Protocols) (IPCP), with purpose of the proper handling of medical waste items, minimizing the spread of infection among health workers and to the local community (IPCP, 2004).

According to MoH, the proper waste disposal is to (IPCP, 2004):

- Prevent spread of infection among clinic staff who handle the waste and to the local community.
- Protect those who handle waste from accidental injury.
- Provide an aesthetically pleasing atmosphere.

In the Infection Prevention and Control Protocols (IPCP) the Ministry of Health has defined the proper needs and protocols for handling medical waste items as follows (IPCP, 2004).

Waste container tips:

- Using non-corrosive, washable containers with cover for contaminated waste.
- Placing waste containers for users.
- Prohepeting the use waste containers for any other purpose in the clinic.

- Washing all waste containers with disinfectant (0.5% chlorine solution) and rinsing with water.
- Using separated containers for combustible waste (paper, cardboard, dressing and gauze) and non-combustible waste (glass, metals and plastic).
- Using heavy working gloves when handling waste.
- Washing hands after handling waste.

Disposal and decontamination sharps (Schmidt, 1996).

Sharps disposal cautions

- Avoid recapping needles
- Do not bend or break needles prior to disposal.
- Do not remove needles prior to disposal
- Dispose of all sharps in puncture-resistant containers, such as a metal box, a heavy cardboard box, or heavy plastic bottle or jug. Never throw sharps into the trash basket.
- Wear thick, household (utility) gloves when disposing of sharps containers.

Sharps disposal containers, (Tietjen and McIntosh, 1989).

1- Use puncture-resistant containers for disposal. A sharps container can be made of easily available items such as a heavy cardboard box, a tin can with a lid, or heavy plastic bottles.

2- Place the containers in any area where sharps would be used so that workers do not have to carry used sharp items to any distance before disposal.

Keep sharps container:

- Away from children
- On surfaces where they will not be spilled on the floor
- A way from areas where sterile equipment or procedures are (Schmidt, 1996; Bossemeyer, 2003).

Steps sharps decontamination and disposal:

When possible, make sharps unusable by incinerating them in industrial incinerator. When impossible, decontaminate sharps before disposal (Tietjen and McIntosh, 1989).

1- Wear thick, household (utility) gloves.

2- The sharps container is $^{3}/_{4}$ full plug or tape it tightly closed. If the container is made of plastic, Add enough 0.5% chlorine solutions to cover the sharps before closing the container in order to reduce the risk before disposal, especially if there is no incinerator.

3- Dispose of container burying.

4- Wash hands after handling sharps containers and decontaminate and wash the gloves (Bossemeyer, 2003).

Disposal of solid medical waste:

Used dressings and other items contaminated with blood and organic materials (Bossemeyer, 2003):

1- Wear thick household (utility) gloves when handling transported waste.

2- Dispose of solid waste in non-corrosive washable containers (plastic or galvanized metal) with tight fitting covers.

3- Collect the waste containers on a regular basis and transport the combustible waste to the incinerator. (If incinerator is not available, burn or bury the waste).

4- Bury non-combustible waste.

5- Burn or bury waste immediately, before it can spread infection. Incineration is the best method to kill microorganisms.

6- Wash gloved hands before removing gloves, and decontaminates and washes gloves (bossemeyer, 2003).

Disposal of placenta:

The placenta should be dealt with like any other organic waste. In the absence of proper disposal for organic waste by either burying or burning, decontaminate the placenta with 0.5%chlorine and then place in a plastic bag before disposal (Schmidt, 1996; Bossemeyer, 2003).

Disposal of used chemical containers:

1. Rinse glass containers thoroughly with water. Glass containers may be washed with detergent, rinsed and reused.

2. For plastic containers that contained toxic substances such as glutaralehyde (such as Cidex or sporicidin), rinse three times with water and dispose by burying. Do not reuse these containers for other purposes (Bossemeyer, 2003).

Duties and Responsibilities of each members of Medical Waste Management System

The responsibilities of various functionaries of the all team of Medical Waste Management systems are given below (Christen, 1996):

Project Director

- The project director will be the head of the Medical Waste Management System in the state.
- The project director will be responsible for making the policies and laying down guidelines for the medical waste management system in the state and provide budgetary support.
- The Project Director will be responsible for monitoring the system at the state level and would take corrective actions if required.

Additional Project Director

- Additional project director will assist the project director
- He will be directly responsible for planning, implementation, co-ordination and monitoring of waste management activities under the guidance of the project director
- He will be responsible for co-ordination with the other departments

- He will develop the monitoring plan and reporting system (Christen, 1996).

Deputy Director (Medical)

· The Deputy Director (Medical) will be responsible for the Waste Management System in the district.

· The Deputy Director (Medical) will be responsible for making the policies and laying down guidelines for the health sector facilities Waste Management System in the district and provide funds.

· The Deputy Director (Medical) will be responsible for monitoring the system at the district level and would take corrective actions if required.

Chief Medical Officers (CMO) /Superintendents

- Forming a waste management team.
- Designating the Medical Officer (Environmental Health) from within the health sector
- Allocating financial resources and manpower.
- Ensuring that monitoring procedures are carried out.
- Ensuring adequate training of key staff members

Waste Management Team (in small health care facilities):

- Medical Superintendent
- Medical Officer (Environmental Health)
- Nursing Superintendent/Asst. Nursing Superintendent (Christen, 1996).

Medical Officer (Environmental Health)

- Directly report to the Head of the facility.
- Ensuring the availability and continuous supply of waste disposal bags and chemical disinfectants.
- Ensuring the availability of resources e.g. Needle Syringes destroyers, waste collection containers (Christen, 1996).

Infection Control Officer (ICO)

- Giving advises and liaises with Medical Officer (Environmental Health) a bout the control of infection.
- Monitoring standards of Waste Management.
- Identifying the training needs of all categories of staff.
- Organizing training programmes for all the categories of the staff

(Christen, 1996).

Nursing Superintendent

- Responsible for continuous monitoring of Waste Management System through out the health care unit.
- Shall liaise with departmental heads, Medical Officer (Environmental Health) and Infection Control Officer (Christen, 1996).
- **Role of Doctors and Paramedical Staff in Waste management**

Doctors

- Always wear aprons properly buttoned while examining patients**.**
- Stick to the golden rules of good hand washing.
- Do not dispose dressing in patients bins.
- Ask for color coded bags.
- Ensure all plastics and gloves are cut and put in bleach.
- Ensure all used needles and syringes are destroyed by using needle and syringe cutters.
- Ensure compliance during ward visits
- Encourage patients and attendants to help following segregation practices (WHO, 1997).

Nurses

- Identify the problem
- Focus on segregation of

1. Sharps
2. Plastics
3. General waste
4. Infected Waste

- Ensure all gloves and plastic are cut and put in bleach
- Ensure the use of needle and syringe cutters. Avoid injury from sharps and take care of spill.
- Ensure worker education
  - Personal protection
  - Education of patients
  - Reporting of accidents (WHO, 1997).

Sanitary Workers should:

- ❖ Understand the risk and importance of segregation that it is in their own interest
- ❖ Use of protective coats e.g. gloves, aprons, masks etc.
- ❖ Not walk bare foot while handling waste.
- ❖ Do wet mopping.
- ❖ Wash hands properly after handling waste.
- ❖ Wash hands before eating and drinking.
- ❖ Not eat or drink near wastage dump (Christen, 1996).

The aim of this study is to investigate the current situation of medical waste management practices in primary health care centers and private clinics in Jenin district.

Study Objectives:

1- Reviewing the current status of medical waste management practices in primary health care centers and private clinics in Jenin district.

2- Identifying the health effects of existing medical waste management practices on workers inside primary health care centers and private clinics in Jenin district.

3- Physical characterization (determination of quantities, composition, and density) of medical waste generated inside primary health care centers and private clinics in Jenin district.

4- Recommending solutions for proper management system, the duties and responsibility of each member of medical waste management system.

Chapter 2

Methodology

Methodology:

This study was carried out in primary health care centers and private clinics in Jenin district during February 2006- April 2007 depended on different methods for data collection:

Conducting questionnaire and interviews:

The main questionnaire has been developed for medical stuff (doctors, nurses, laboratory technicians). The questionnaire aimed at gathering information about the generation, segregation, collection, internal and external storage, transportation, treatment and disposal of medical waste in primary health care centers and private clinics in Jenin district. Total number of primary health care centers in Jenin district is 78 centers distributed between three parties, 47 for the Ministry of Health; 26 for Non Governmental Organizations (NGOs) and 5 for the United Nations Refugees Work Agencies (UNRWA), (HECM, 2004). Data has been collected from 100 workers in primary health care centers and 100 workers from private clinics located in Jenin district through site visits, additionally; special questions related to medical waste management have been prepared for key personnel in charge of aspects related to medical waste in the (Ministry of Health, Environmental Quality Authority and Jenin Municipality). Also some other questions have been prepared for the workers responsible for the cleaning in the primary health care centers and private clinics and municipality workers.

The questionnaire consisting of 6 parts for focusing and gathering information mainly at several issues as generation of medical waste, collection, internal and external storage, transportation, treatment and final

disposal of medical waste in primary health care centers and private clinics in Jenin district.

The key persons, the cleaners and sanitary workers were personally interviewed during March / April-2007 in order to gather additional information about the current practices in the medical waste management in Jenin district.

Analysis of data was performed by the use of Statistical Package for Social Science (SPSS) version 12. Descriptive statistics such as means and ranges was computed. Appropriate tests of significance were performed to determine the relationship between socio-demographic variables and the variables related to knowledge, and practice regarding management of medical waste.

Experimental and field work:

Experimental and field work in which separation, collection and measuring of MW generated in targeted healthcare establishment in Jenin district were conducted. Samples of study has been taken to be 30 primary health care centers and 30 private clinics distributed allover Jenin district were tested for determination of waste components as shown in Table 3.

Classification of medical waste:

Table (3): Types and classification of medical waste

Waste category	Components
Tissue and pathological waste	Tissues of human or animal pathological wastes, including tissues, organs, blood, pus, body parts and fluids that are removed during autopsy or surgery, culture and stocks of infectious agents from test or examination, culture dishes, discarded blood fluids and containers
Absorbent cotton Items	(e.g. cotton pads, bandages, disposable diapers, or bedding) saturated or stained with human or animal blood, pus, discharge, or secretion
Discarded medical plastics	Disposable syringe, IV bag, blood bag or waste taken from blood dialysis, or other plastic components
Waste sharps	Discarded sharps, hypodermic needles, syringes, surgical blades and blood lancets
Waste mixed with infectious waste	Wastes that are not classified into the above categories but mixed or in contact with them.

(Jang et al., 2006)

The method used for the separation of medical waste was by hand sorting using special table made from metal. The main aim of experimental work was to measure and characterize the medical waste generated in Jenin district. In order to obtain exact quantities of solid medical waste, two types of waste collection baskets and special plastic covered boxes were distributed to the primary health care centers and private clinics. The first type was specified for medical waste and the other type was specified for sharp waste. The empty weight and the dimensions of used basket and the boxes (safety boxes) have been recorded before collection. Special sheets for volume and weight of medical waste recording were prepared. In these sheets, the solid waste was divided into five parts (according to the

classifications of medical waste including sharp waste). These sheets were divided into 7 intervals.

Data was collected day after day from 30 primary health care centers and 30 private clinics with total of three working days for each type of health care unit.

Special plastic yellow waste bags were distributed for each clinic and primary healthcare centers in order to be used in the study.

Special arrangements with the workers in the primary health care centers and private clinics targeted in the study were made at the beginning of each 6 days of weighing.

Fig. (3&4): Workers during separation of medical waste (Jenin 2007).

Fig. (5&6): Used materials in the Experimental study (Jenin 2007).

The methods were followed in the measurement of medical waste samples were as follows:

1. Determination of the weight and volume of empty baskets and boxes

   - Baskets weight (215 gr.) volume of 11 liters
   - Sharp boxes weigh (50 gr.) volume of 1 liter

2. Determination of gross weight of each sample waste using the weighing balance (digital balance) from 1gr.- 5 kg

3. Determination of volume of the waste in the clinic and calculating the density

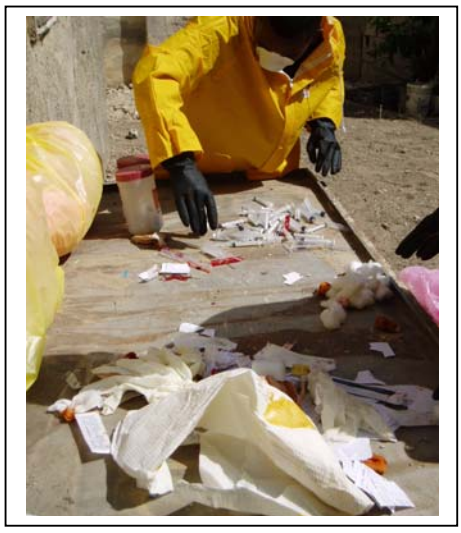


Fig. (7): Hand sorting for Tissue and Pathological waste (Jenin 2007).

4. Picking the waste on the screen table for sorting operation so as to remove the selected materials and empty them in a plastic baskets for each type:

- Absorbent cotton.
- Discarded medical plastics.
- Waste sharps.
- Waste mixed with infectious waste.

1. Determination of the volume and the weight of each type.
2. Determination of the percentage of each type in the sample.
3. Repeating this procedure for 30 samples then analyzing the results.
4. The procedure was followed by the measurement of samples of wastes on different sampling days and at different waste sources during the whole study period. And the waste generation rates were computed.
5. All wastes generated by primary healthcare centers and private clinics are considered medical waste. An estimated 10–15% of wastes are considered ‘‘infectious’’ (HWH, 2001).

Fig. (8): International symbol of medical waste (HCWH, 2007)

Other facilities were used in segregations and sorting the waste, gloves, facemasks and special clothes for personal protection. Labels with biohazard wastes sign were used for each boxes and bags.

Analyses of data was performed by the use of Statistical Package for Social Science (SPSS) version 12. Descriptive statistics such as means and ranges have been computed. Appropriate tests of significance performed to determine the relationship between socio-demographic variables and the variables related to knowledge and health worker awareness, and practice regarding management of medical waste.

Chapter 3

Results and Discussion

Medical Waste Management

102 PHCs were surveyed representing 60% of a total targeted health units (THU), while the number of private clinics surveyed was (68) representing 40% of the samples as shown in Table 4.

Table (4): Distribution and types of health care units.

Type of health care units	Frequency	Valid Percent
PHCs.	102	60.0
Private clinics	68	40.0
Total	170	100.0

Table 5 shows the distribution of workers in studied healthcare centers and private clinics in Jenin district. Table 5 shows that (41) healthcare units from the total (THU) (24.1%) have 5-10 workers, while 20 health care units (11.8%) have 3-5 workers. And that result shows the multiplicity of the offered health services in the government PHCs. Also the spread of a large number of PHCs with many services in the rural areas.

Table (5): Distribution of workers in studied healthcare units in Jenin district.

Number of workers in health unit	Frequency	Valid Percent
1	36	21.2
2	36	21.2
3-4	20	11.8
5-10	41	24.1
>10	37	21.8
Total	170	100.0

The work nature (type or kind of work) in the healthcare units is shown in Table (6), which shows that 152 workers are in the field of medical professions (89.4 %) and the number of the workers in the public services were only 18 workers (10.6%), which shows severe decrease in the

number of the workers in public services at all health sector and that was due to the flowing reasons:

1- Service workers are not available in all PHCs. and Pr.C in a remote area or rural health rooms.

2- Since health department take the responsibility of public services in some remote clinics, nurses or other health workers in these units take the job and the duties of general services workers.

3- Many of the private clinics depend and hire one person to clean many clinics, specially the clinics in the form of centers for private medical service.

Table (6): Distribution type of work of respondent in HCU.

Type of work in health unit	Frequency	Percent
Medical work	152	89.4
General services*	18	10.6
Total	170	100.0

* General services workers: cleaners, house keepers, waste collectors…etc

Table 7 shows survey responses to the question "Do you have written instructions how to deal with the medical wastes or not?" (83) Persons answered (Yes) (48.8 %) while 87 that answered (No) (50.2 %).

More over there are significant relations between the type of health units (PHCs. or Pr.C) and the responses to the question " Do you have written instructions how to deal with the medical wastes or not?", as can be seen in table 7, (67.6%) of PHCs. have written instructions while only 20.6 % of Pr.C. have those instructions.

Table (7): The relation between type of health care unit and having a written instructions and regulation how to deal with MW

Type of health care unit		Do you have written instructions how to deal with the medical wastes or not?		Total
		Yes	No	
	PHCs	69	33	102
		67.6%	32.4%	100.0%
	Pr.C	14	54	68
		20.6%	79.4%	100.0%
Total		83	87	170
		48.8%	51.2%	100.0%

(Chi-square (36.161) with degree of freedom (1) and a p- value (0.00))

The results on answers to the question about the source of these instructions for those who answered (Yes) are shown in Table 8. It was found that 55 persons (67.9 %) confirmed that the source of these instructions is the Palestinian Ministry of Health, and only 2 persons who answered this question confirmed that there is a personal diligence and other scientific sources for getting such instructions, and these results show a number of important points:

1. The Palestinian Ministry of Health has written instructions about the generation of medical wastes administration inside PHCs.

2. All PHCs belonging to the MoH approved these instructions.

3. Also, the non generalization of these instructions is noticed at all working private clinics in the district, and some of the PHC in the district.

Table (8): Frequency and Percentages of source of (MWM) instructions

Source of this instructions (if instructions are available)	Frequency	Valid Percent
Ministry of Health	55	67.9
Scientific Resources	6	7.4
Management	15	18.5
Scientific Resources and Management	2	2.5
I don't know	3	3.7
Total	81	100.0
Missing System	89	
Total	170	

4. The non presence of supervision tool and a follow-up of the Ministry of Health concern with the management of the medical wastes and generalize these instructions to the private health sector in the district.

These results show that the Palestinian Ministry of Health (PMH) dose not generalizes the special required laws and procedures for safe management of production medical waste at health care centers and private clinics. These procedures should be generalized at each public and first aid centers, without any exceptions. Also, the implementation of these laws and procedures should be considered as one of the necessary conditions for practicing the medical work. Moreover, the required equipments and special tools for separation and collecting the medical waste in the health care units must be available under proper conditions so as to meet the WHO conditions.

Production of the medical waste inside health care centers and private clinics:

The results of answers on the questions related to the production of the medical wastes in the health units of Jenin district are shown in table 10. All these units produce medical wastes not only by all their kinds but also

by different ratios between these kinds. According to the study results, we find that all the medical centers produce medical waste vary due to the following:

- The kind of services given at these centers.
- The preference of the citizen on the medical services and his dependence on them as a result of:

1. Low expenses for the medical insurance holders in comparable with the private medical sector.
2. Increase the number of persons who attend these centers for medical services.

It is noticed that sharp medical waste production represents the highest ratio among the produced medical wastes in all targeted healthcare units with a ratio 76.5 % of a total targeted group. While the healthcare unit's production of the medical wastes from heavy metals represents the lower ratio (3%) of a total THU. Also, 4.2 %, of healthcare units produce radioactive materials. These results are attributed to several reasons:

- The widespread PHCs. in Jenin district offers for the population services as daily treatment, clinical examination and applying nursing care and the vaccination.
- The decrease of using tools which contain heavy metals like mercury and cadmium in private clinics and primary health care centers.

- The non presence of radiology and X-ray services except in centers specialize in the private sector and the hospitals in the governmental sector.

We can conclude from the previous results of the study that all of the medical centers produce medical waste that have dangerous impact on the public health and on the environment, and these materials should be treated with a safe methods in order to eliminate there negative effects throughout following several methods and procedures in separation and gathering these stuffs inside the health units. These procedures include the following:

Table (9): Production of the medical wastes in the healthcare units

Type of Medical Waste		Frequency	Valid Percent
Infectious Waste	always	72	42.9
	some times	79	47.0
	Never	19	10.1
	Total	170	100.0
Pathological Waste	always	33	19.6
	some times	65	38.7
	Never	72	41.7
	Total	170	100.0
Sharp Waste	always	127	76.5
	some times	34	20.5
	Never	9	5.0
	Total	170	100.0
Pharmaceutical Waste	always	34	20.7
	some times	84	51.3
	Never	50	28
	Total	170	100.0
Radio-Active Waste	always	7	4.2
	some times	59	35.1
	Never	104	60.7
	Total	170	100.0
Liquid Waste	always	41	24.3
	some times	86	50.3
	Never	43	24.4
	Total	170	100.0
Heavy metal Waste	always	5	3.0
	some times	57	33.5
	Never	108	63.3
	Total	170	100.0

1. Providing the special separation requirements and equipments for these wastes. These special equipments must meet the needs of the WHO classifications in which the separation should be done regarding to the colors and particular warning signs.

2. Providing safe boxes for separation of sharp medical waste.
3. Providing special locations which meet the healthy and environmental needs inside the medical units fitting all kinds of medical waste.
4. Training the workers on the safe and proper ways for separating and gathering the medical waste throughout using a trusted methods and equipments by the WHO.

When we study the effect of type of health care unit as independent variable on production of Radio-Active waste, as an independent variable, the study shows that only 4% of total PHCs and 4.5% of total Pr.C produce Radio-Active Waste. That means the type of health care unit has a significant effect on production of Radio-Active waste as shown in Table 10. Only a few of large PHCs (level four) and some of private clinics produce Radio-Active waste.

Table (10): Cross tabulation between the production of radioactive waste and type of healthcare unit (numbers and percentages).

Type of health care unit		**Is the healthcare unite produce Radioactive waste?**			**Total**
		Always	Sometimes	Never	
	PHCs	4 (4.0%)	23 (22.8%)	74 (73.3%)	101 (100.0%)
	Pr.C	3 (4.5)	36 (53.7%)	28 (41.8%)	67 (100.0%)
Total		7 (4.2%)	59 (35.1%)	102 (60.7%)	168 (100.0%)

(Chi-square (17.592) with degree of freedom (2) level of significant (0.00))

Separation of medical waste inside health units:

As shown in Table 11, (85.9 %) of respondents have their complete readiness for the participation in the operation of separation of medical wastes inside healthcare unit, that's due to their awareness and understanding of the hazard of GMW, and its effect on health and environment of the human, also separation GMW leads to minimize and reduce the quantities of generated medical wastes from the source, that's lead to reduce the cost of disposing and treating infectious and hazardous medical waste.

At the question about the separation of sharp waste, answers show that (72.8 %) of the respondents say (yes) about the separation of sharp waste from the other generated medical wastes which takes place in the healthcare units.

In which there is the use of special vessels with specifications and environmental conditions as (Safety Boxes) used in all government healthcare centers and some private clinics.

This results due to the following reasons:

1. The safe WHO requirements for separation are not available according to the workers.
2. The absence of proper regulations and suitable systems which impose the safe dealing with these materials.
3. The lack of good environmental locations which are suitable for collecting the produced medical waste inside the medical units.

Table (11): Frequency and percentages for answers on questions related to separation process.

Questions		Frequency	Valid Percent
Are you ready for the separation and collection of M W in a health and safe way?	always	146	85.9
	some times	17	10.0
	Never	7	4.1
	Total	170	100.0
Are the sharp MW (as injections scalpels and other) put in special containers in the health unit?	always	123	72.8
	some times	32	18.9
	Never	15	8.3
	Total	170	100.0
Do you have a site inside the health unit specified for collecting of medical waste?	always	50	29.8
	some times	41	24.4
	Never	79	45.8
	Total	170	100.0
Is the site for storage MW in your health unit is isolated within safe environment?	always	47	28.0
	some times	36	21.4
	Never	87	50.6
	Total	170	100.0

The cross tabulation between the type of health unit and the use of a special containers for sharp collecting is shown in Table 12. That 84.3% of PHCs use special containers for sharp waste collection, while only 3.9% of PHCs don't use special containers for sharp waste collection process. These results due to the reason that the Palestinian Ministry of Health is the only one who is responsible for providing these supplies like safe boxes used for the separation of the sharp waste. However, these supplies are not available in the local markets for the private clinics. This causes the use of plastic bottles used for water and beverages

Table (12): Cross tabulation between separation of sharp waste and type of healthcare unit (numbers and percentages).

Type of health care unit		Do the sharp MW are separated in special containers in your healthcare units?			Total
		Always	Sometimes	Never	
	PHCs	86 (84.3%)	12 (11.8%)	4 (3.9%)	102 (100.0%)
	Pr.C	37 (55.2%)	20 (29.9%)	41 (61.2%)	67 (100.0%)
Total		123 (72.8%)	32 (18.9%)	14 (8.3%)	169 (100.0%)

(Chi-square (17.598) with degree of freedom (2) level of significant (0.00) value)

Other significant relationship was found about the regulations that enforce the segregation of MW. 27.5% of total PHCs. declare that they don't have such regulations, while 70.6% of targeted Pr.C answer that they don't have any of these regulations, as shows in table 13. This indicates that the majorities of the health sector workers are not announced or generalized about the proper systems to deal with the medical waste, particularly, the special clinics workers in addition the absence of an executive controlling board who shoulders the responsibility of managing the medical waste in Jenin district. This shows the weakness of cooperation and coordination between the responsible foundations.

Table (13): Answers about question "Are there regulations in your HCU that force the segregation of MW?"

Type of health care unit		Are there in your health establishment regulations that force the segregation of MW?		Total
		No	Yes	
	PHCs	28	74	102
		(27.5%)	(72.5%)	(100.0%)
	Pr.C	48	20	68
		(70.6%)	(29.4%)	(100.0%)
Total		76	94	170
		(44.7%)	(55.3%)	(100%)

(Chi-square (30.713) with degree of freedom (1) and a *p*- value (0.00))

Regarding the provision of facilities and recourses related to the separation process of medical waste, there is a significant relations with the type of health unit. Only 38.0% of PHCs. and 16.2% of Pr.C have the requirements and needs related to the separation process. That means only 29.2% of total targeted healthcare units have these needs as shown in table 14.

This result was due to the reason that these equipments and tools are not available in the local markets when demanded, in addition to the lack of awareness about the use of these equipments in disposing of the hazardous medical waste. This process will eliminate their effects on the workers, public health, and on the local environment.

Table (14): Relation between type of healthcare units and the provision of requirements for separation process.

Type of health care unit		Does the provision of requirements and needs related to the separation process of medical waste existing in the health unit?			Total
		Always	Sometimes	Never	
	PHCs	38 (38.0%)	39 (39.0%)	23 (23.0%)	100 (100.0%)
	Pr.C	11 (16.2%)	22 (32.4%)	35 (51.5%)	68 (100.0%)
Total		49 (29.2%)	61 (36.3%)	58 (34.5%)	168 (100.0%)

Chi-square (16.605) with degree of freedom (2) and a *p*- value (0.00)

Also the study showed that (45.8 %) of the targeted healthcare units in this study that have a sites with suitable environmental and health conditions for collection, separation, and storage of GMW before its transfer, does not exist in their healthcare units.

We deduce from the results and the previous answers that:

1- The majority of workers in the health sector is aware and has knowledge about the importance of the separation of the medical wastes inside the healthcare unit and they have the complete readiness for the separation process. But part of them did not have the necessary experience. Also the lack of tools for the process.

2- The provision of the necessary tools (as cartoon and plastic boxes) , laws presence of the systems and the internal regulations in healthcare centers of the Palestinian Ministry of Health help in the provision of the necessary climate and prepare the suitable atmospheres for the operation, such conditions are unavailable at the private medical sector in Jenin district.

3- The non presence of supervision and mechanisms to follow-up of the separation process of the medical wastes in the private sector. On other hand we find such conditions available for the separation of the sharp medical wastes only in governmental sector.

4- The raising of awareness by training courses and the provision of the necessary tools in the governmental sector has helped for a real separation process for sharp wastes only.

According to the question results related to the presence of a site for collecting the medical wastes inside health unit with environmental conditions, we found that (50.6 %) answered (No) and that can be attributed to the following reasons.

- Most PHCs. related to the Palestinian Ministry of Health is rented in old buildings from the Ministry of Health and which do not meet the health and environmental conditions.
- The non inclusion of such conditions in the license requirements for the private clinics.

Collection of generated medical waste

In this part of study, the collection mechanisms used in Jenin Governate have been discussed and evaluated. Several questions have been put in order to explain the used procedures in collecting the medical waste. Similarity, if these procedures meet the environmental and healthy needs. The results are shown in Table 15.

Table (15): Frequency and percentages to the answers of questions related to collection process inside healthcare units

Questions		Frequency	Percent
Do you have a site inside the health unit specified for collecting of medical waste?	always	146	85.9
	some times	17	10.0
	Never	7	4.1
	Total	170	100.0
Do the collection site in the unit within the Env. Condition with ventilation, distant from the visitors, children and closable, easy to be cleaned and maintenanced?	always	123	72.8
	some times	32	18.9
	Never	15	8.3
	Total	170	100.0
Does the collection of the medical waste take place everyday by the end of workday?	always	47	28.0
	some times	36	21.4
	Never	87	50.6
	Total	170	100.0
Do the workers in the collection process have an experience in this field?	always	50	29.8
	some times	41	24.4
	Never	79	45.8
	Total	170	100.0

Analysis of results related to the collection process show that 55.7% answered by (there is no) to a site with environmental conditions for collecting the medical wastes inside the health unit. At the question "does the collection of the medical wastes take place everyday by the end of workday?" as shown in Table 16, only (49.4%) answered by (sometimes) while (40%) of respondent answered that (yes).

The transfer of the medical wastes takes place everyday outside the healthcare unit, with a significant relation to the type of health units.

Table (16): Relation between type of healthcare units and the question does the collection of the medical waste take place everyday with the end of workday

Type of health care unit		Does the collection of the medical waste take place everyday with the end of workday			Total
		Always	Sometimes	Never	
	PHCs	51 (50.0%)	39 (38.2%)	12 (11.8%)	102 (100.0%)
	Pr.C	17 (20.0%)	45 (66.2%)	6 (8.8%)	68 (100.0%)
Total		68 (40.0%)	84 (49.4%)	18 (10.6%)	170 (100.0%)

Chi-square (13.155) with degree of freedom (2) level of significant (0.01) value

About the results to question, "Do the workers in the collection process have an experience in their field work?" 55.9% of the total respondent belief that the workers in this field do not have the adequate experience or the safe operation methods, for safe management of collection process. A significant relation to the type of health unit waste also found as shows in Table 16.

That was related to the non presence of administration specialized to the medical wastes that is concerned with the training and the qualification of the workers in the collection operations related to the medical wastes. Also the non desire of the big number of workers who in need to work do not work in this field for social considerations (according to their belief). It is noticed that majority of workers in this field have a high level of simplicity believes that their training and their qualification for this field of work will not double their mental or physical abilities.

About the relation between type of healthcare units and the question "Does the collection of the medical waste take place everyday with the end of workday?",(41.8%) answered that never collection of the medical waste

take place everyday with the end of workday. While, only (20.0%) of respondent have been answered by always for the same question as shown in Table 17.

We conclude from these results that majority of primary health care centers and the private clinics do not collect the medical wastes at the end of the workday and that may be due to the next reasons.

1. The non presence of services workers in all of the health units.
2. The non approval of municipalities responsible for the collection of wastes in Jenin governorate by specific time in day committing transferring the medical wastes to the centers of the final disposing sites.
3. And there is economic factor, saving in the consumption of requirements and tools related to the separation process like "Safety Boxes", its prefer to be disposing after a fullness of 2/3 of its volume of sharps wastes.

Table (17): Relation between type of healthcare units and the question "Does the collection of the medical waste take place everyday with the end of workday?"

Type of health care unit		Does the collection of the medical waste take place everyday with the end of workday			Total
		Always	Sometimes	Never	
	PHCs	28 (27.5%)	28 (27.5%)	22 (22.2%)	99 (100.0%)
	Pr.C	6 (8.8%)	13 (19.1%)	47 (71.2%)	66 (100.0%)
Total		34 (20.0%)	41 (24.1%)	69 (41.8%)	165 (100.0%)

With Chi-square (13.560) with degree of freedom (2) and a *p*- value (0.01)

Transfer requirements inside and outside the health unit

Transportation and education about medical wastes are shared by medical -related facilities and municipal governments in Jenin district.

A number of difficulties are being faced at many levels regarding the implementation of the safe and effective management methods for medical waste materials. However, the cooperation of all persons concerned, including workers in medical-related facilities, municipal governments and the Palestinian Environmental Quality Authority, is needed in order to establish improved rules, regulations and methods for the collection and transportation of medical waste materials (Interview Eng. Daragmeh, 4/2007).

Table 18 shows the Frequency and Percentages results for transfer requirements inside and outside the health unit. At the question "do you have an automatically system in the operation of the transfer of MW from your health center and private clinic to the dump site?"

The result shows that 50.9% of the respondents said that the automatic dealing with the medical wastes does not exist. On the other hand we find that the lack of a special administration of the medical remains that can provision the requirements and the tools which are necessary for the optimum dealing with the medical remains.

Table (18): Relation between type of health care unit and the question "Do you have an automatically system in the operation of the transfer of MW from your health center and private clinic to the dump site?"

Type of health care unit		Do you have an automatic system in the operation of the transfer of the MW from your HCFs (private clinic) to the dump site?			Total
		Always	Sometimes	Never	
	PHCs	27 (27.3%)	35 (35.4%)	37 (37.4%)	99 (100.0%)
	Pr.C	7 (10.9%)	11 (17.2%)	46 (71.9%)	64 (100.0%)
Total		34 (20.9%)	46 (28.2%)	83 (50.9%)	163 (100.0%)

Chi-square (18.605) with degree of freedom (2) level of significant (0.000) value.

Also, we found that the results of the question about the collection of the medical wastes carried out by a special vehicle that differs from that related to the municipal solid waste. The results show that 73.0 % answered by (No), and this result also shows the weakness of capabilities of the institutions, specially the working municipalities in the district which is responsible for collection and transfer of the medical wastes and the generated municipal solid wastes in the cities and towns as shown in Table 18. The results shown in Table 19 as frequency and percentages of answers of respondent, 59% of the total respondent declare that they are never informing the responsible persons or institution about the content of GMW in there healthcare units. A significant relation was found in these results with the type of healthcare unit represented in table 21. This indicates the weakness of common cooperation and coordination between the institutions responsible managing and disposing of the medical waste, particularly, Palestinian Ministry of Health and municipalities in Jenin district

Table (19): results on questions related to the collection of the medical wastes**.**

Questions		Frequency	Valid Percent
Do you have an automatically system in the operation of the transfer of the medical wastes from your health center (private clinic) to the dump site.	always	34	20.9
	some time	46	28.2
	Never	90	50.9
	Total	170	100.0
Does the collection of the medical remains carried out by a private vehicle that differs from that related to the municipal solid waste (Domestic waste)?	always	20	12.3
	some time	26	14.7
	Never	124	73.0
	Total	170	100.0
Are you informed in a written way, (the municipalities, cleaners) who officially responsible for disposing of the medical wastes about the content of these wastes?	always	27	16.7
	some time	39	24.3
	Never	104	59.0
	Total	170	100.0

A significant relation about treating GMW inside health units could be found in Table 20, only 27.5% of all respondents treat the GMW inside healthcare units. That results show the un commitment of workers in the regulations of treating infectious GMW and the shortages of needed equipments for this purpose.

Table (20): Distribution answers about treating GMW inside health units

Type of health care unit	Are you treating the generated infectious medical wastes in the health unit from your side?				Total
		Always	Sometimes	Never	
	PHCs	34	32	29	59
		(35.8%)	(33.7%)	(30.5%)	(100.0%)
	Pr.C	10	14	41	65
		(15.4%)	(21.5%)	(63.1%)	(100.0%)
Total		44	46	70	160
		(27.5%)	(28.8%)	(43.8%)	(100.0%)

Chi-square (17.170) with degree of freedom (2) and a *p*- value (0.000)

About the question. "Are you informed in a written way, (municipalities, cleaners) who officially responsible for disposing of the medical wastes about the content of these wastes?" as shown in Table 21. Only, 16.7% of respondents declare that they informed the cleaners about the content of the GMW, while 58.6%never informed in a written way the cleaners or the municipalities about the content of the GMW. The results show the lack of cooperation between the responsible parties of the management of generated medical waste in Jenin district.

Table (21): Results of answers are they informing municipalities or not

Type of health care unit	**Are you informing in a written way, (municipalities, and cleaners) by the content of these wastes?**				Total
		Always	Sometimes	Never	
	PHCs	21	29	46	96
		(21.9%)	(30.2%)	(47.9%)	(100.0%)
	Pr.C	6	10	49	66
		(9.1%)	(15.2%)	(74.2%)	(100.0%)
Total		27	39	95	162
		(16.7%)	(24.1%)	(58.6%)	(100.0%)

(Chi-square (13.595) with degree of freedom (3) and a *p*- value (0.04))

Table 22 shows that only 25.7% of all workers in the collecting team of medical waste always have a knowledge about the hazard of some of the medical wastes, while 35.3% of all workers never know and aware about the hazard of the medical waste that they deal with.

That results show the need for awareness and training for workers in the field of collection and transportation of medical wastes. Also, medical waste workers are persons who do not have adequate qualifications for training.

Table (22): The relation between type of health care unit and answers about the collecting team of the medical waste if they are aware and have knowledge about the hazard of the medical wastes.

Type of health care unit		The collecting teams of the medical waste are they aware and have knowledge about the hazard of some of medical wastes?			Total
		Always	Sometimes	Never	
	PHCs	27	49	24	100
		(27.0%)	(49.0%)	(24.0%)	(100.0%)
	Pr.C	16	16	35	67
		(23.9%)	(23.9%)	(52.2%)	(100.0%)
Total		43	65	59	167
		(25.7%)	(38.9%)	(35.3%)	(100.0%)

(Chi-square (15.711) with degree of freedom (2) and a *p*- value (0.00))

The Palestinian society considers waste collecting inferior to human status; consequently, these careers are occupied some times by non-qualified workers who suffered from mental weakness.

The safety requirements and the occupational safety

In the fifth part of the questionnaire, as seen in table 23, the questions focus on the security and the occupational safety of the workers in the health sector and the workers in the public services. It is found that 21% of the individuals are disposing of the medical wastes once weekly, while it was

found that the patrol of collecting and disposing of the GMW in some of these units 6 times weekly is 17.2 %.

The question "Are the workers or the collectors of GMW taking a consideration in the conditions of the vocational safety by wearing their protective clothes?" The answers showed that 65.9 % of the workers do not consider the conditions of the vocational safety, whereas, 35.3 % of them do not have a knowledge about the seriousness of some of the medical wastes. These results lead us to the importance of the awareness rising at the workers in collection field and the transfer of the medical wastes. Also the results showed that the provision of requirements of this category is in the maximum importance.

The results in Table 23 show that 59.6 % of the containers do not carry any special warning signals, whereas, 18.1 % of them are bearing warning signals on safety boxes that used in the collection of the sharp medical waste only. And at the question "do see the necessity of laws imposition committing the dealing with the medical wastes?", the results show that 94.6 % of the responsive confirmed the necessity of the imposition of such laws while 1.8 % that answered the lack of necessity for the imposition of such laws, and these results show that the kinship is very high from the workers in this field in need to the imposition of these laws and that will keep for them their health and will prevent the spread of diseases and epidemics and will preserve the environment as defines the responsibility of all workers in this field .

Table (23): Frequency and Percentages results for safety requirements

Questions		Frequency	Percent
The team of collection of the medical waste considers the conditions of the occupational safety and wears the preventive clothes?	always	23	13.8
	some times	37	20.4
	Never	167	65.9
	Total	170	100.0
The team of the collection of the medical waste aware and have a knowledge about the hazard of some of the medical wastes	always	43	25.7
	some times	65	38.9
	Never	62	35.3
	Total	170	100.0
Is there warning signs at the containers and the places of the collection of the medical wastes?	always	30	18.1
	some times	41	22.3
	Never	99	59.6
	Total	170	100.0
Do you see the necessity of regulations and laws related to the medical wastes?	always	158	94.6
	some times	8	3.6
	Never	4	1.8
	Total	170	100.0
Do you see the necessity of an executive authority presence and legal for the application of laws related to the medical wastes?	always	154	92.2
	some times	9	5.4
	Never	7	2.4
	Total	170	100.0
Do you are considered the education and training of the workers in the field of the treatment of the medical wastes a dire need ؟	always	150	89.3
	some times	17	10.1
	Never	3	0.6
	Total	170	100.0
Are you receive a vaccination anti hepatitis (B)?	always	144	86.2
	some times	26	13.8
	Total	170	100.0

Table 23 shows that the answer results about question whether there is a necessity of an executive authority presence and legal for the application of laws committing the dealing with the medical remains? It is found that 92.2% answered by blessings for the presence of an executive authority while 2.4% believe that it is no necessity for such authority as at all 89.3 % believe that the education and training the workers are in the

field of the treatment of the medical remains a desire need while 0.6 % showed their non importance. And these results show the importance of raising awareness and the knowledge to the workers in this field and also the responsive understanding for the importance of practical training and scientific methods to the workers in this field.

About warning signals on containers and places of the collection of medical wastes, only 18.1% declare that there is a warning signals at containers and special places specified for medical waste ,while 59.6% say that their is no signals. These results could be explain that only the used safety boxes in PHCs. have a warning signals, as shown in table (24).

Table (24): Relation between type of health care unit and are there a warning signal or not on containers and places that used in collection medical waste?

Type of health care unit		Are there a warning signal on containers and places of the collection of medical wastes?			Total
		Always	Sometimes	Never	
	PHCs	21	32	46	99
		(21.2%)	(32.3%)	(46.5%)	(100.0%)
	Pr.C	9	5	53	67
		(13.4%)	(7.5%)	(79.1%)	(100.0%)
Total		30	37	99	166
		(18.1%)	(22.3%)	(59.6%)	(100.0%)

Chi-square (19.556) with degree of freedom (2) and a *p*- value (0.00)

In Table 23 it is found that only 86.2% from the respondents have received vaccine anti viral hepatitis B, while 74.9 % of them have not receive any other vaccinations and this raises from the possibility of the spread of realization and infection among the workers in both sectors health and the public services and their families which cause in the spread of the contagious and infectious diseases in the society.

Since 2004, the Palestinian ministry of health has released with the cooperation and support of NGOs funded by USAID **Infection Prevention and Control protocols** which included a set of rules and regulations about the proper handling and management of medical waste disposal. Since that time, only the establishment and facilities of ministry of health have begin to separate the sharps generated from other medical waste by using safety boxes in primary health care centers and have disposed it without any considerations for other types of medical waste and their health effect on the populations and the environment by disposing the waste in municipal dumpsites with other domestic and municipal waste.

Requirements for final disposal of the medical wastes

Table 25 shows the results related to the requirements for final disposal of the medical wastes. 39.2 % do not believe in the presence of sites specified for disposing of the medical wastes while the rest who believe in the presence of sites of disposing of the medical wastes are 29.5 % and that returns to several important reasons:

1. All who live in the cities and the towns in Jenin district know that the produced medical wastes in the private clinics and the healthcare centers are being transferred with the domestic (municipal) wastes and disposing of in the same dump site and could be treated either with the open burning or with the burial.

2. Some health centers in the small villages disposing of the produced medical wastes in specified sites, some of them are disposing GMW in the relatively distant hanger, caves and some of them carrying out their burning

operation in a special hole. Some of health-care workers who are disposing of MW in abandoned wells.

Table (25): The requirements of the final disposal for the medical wastes

Questions		Frequency	Valid Percent
Are there special sites specified for disposing of the medical wastes?	always	49	29.5
	some times	52	31.3
	Never	60	39.2
	Total	170	100.0
Do you use treatment ways and specific measures before you dispose hazardous medical wastes?	always	43	21.0
	some time	61	37.7
	Never	75	41.4
	Total	170	100.0
Do you use the burning operations in the disposing sites with the use of a special incinerator for medical waste	always	39	24.1
	some time	32	19.8
	Never	99	56.2
	Total	170	100.0
Are the education and training process for the workers in the field of disposing of the medical wastes considered a desire need?	always	156	94.5
	some time	9	4.2
	Never	5	1.2
	Total	170	100.0

For this reason we find that a ratio from those who believe in the presence of sites specified for disposing of the medical wastes is high relatively in spite of the lack of any specified site approved from the Ministry of Health or Palestinian Environmental Quality Authority or from the working municipalities in Jenin district.

Table 25 shows that 41.4 % of the targeted respondents do not carry out any measures or treatment operation before disposing of the GMW, while only 21.0 % of total respondents carry out some of these measures. This could be found only in the government primary health care centers.

Also from Table (25) its clear that 56.2 % of respondents do not believe in the presence of special incinerator related to the final disposing of medical wastes, while 24.1 % believes that the medical wastes disposing of it should take place in the disposal sites in a special incinerator with the knowledge that there is no presence is to any of a working medical incinerator in Jenin district.

About the importance of education and training on safe operation for the workers in the field of collecting and disposing of the medical waste, the majority of 95.4 % who have been interviewed have given their approval for the importance of training and education, while 1.2% from them answered that the training and the education of the workers do not form a desire need in the operation of disposing medical wastes, this is shown in table 26. Maine goal of Training personnel or education programs about the handling and management of medical wastes, is the decrease the infection among the clinic personnel and protection against medical waste hazards, e.g., Hepatitis B and C, AIDS. The recent rise in the incidence of such diseases as AIDS and Hepatitis B and C opens up the possibility of infection of personnel handling these wastes and risks to public health arising from the transport of infectious and hazardous waste (Almuneef and Memish, 2003).

In the final disposable process of MW, a significant relation was found in the use burning operations in the disposal sites with the use of a special incinerator for medical waste, as shown in Table 25.

With the knowledge that many of the primary healthcare centers in the villages far from the municipality services, they are the responsible for the final disposal of their GMW at clinics. Many of these centers dispose off the generated wastes by non safe ways, where it became clear that many of them throw these waste in the abandoned wells and the distant caves. And some of them burn the GMW in a relatively close hole from the health centers. And therefore, it was found that 24.1 % only they answered (yes) for the question "Do you use burning operations in the disposal sites with the use of special incinerator for medical waste?" Considering that the barrel represents for them a tool related to burning medical wastes, while 56.2 % answered (no) for the same question as shown in Table 26.

Table (26): Relation between type of health care unit and the use of burning operations in the drainage sites by using special incinerator

Type of health care unit		Do you use burning operations in the disposal sites with the use of special incinerator for medical waste?			Total
		Always	Sometimes	Never	
	PHCs	35	21	43	99
		(35.4%)	(21.2%)	(43.4%)	(100.0%)
	Pr.C	4	11	48	63
		(6.3%)	(17.5%)	(76.2%)	(100.0%)
Total		39	32	91	162
		(24.1%)	(19.8%)	(56.2%)	(100.0%)

Chi-square (21.082) with degree of freedom (2) and a *p*- value (0.00)

Rates of Generated Medical Waste in Primary Health Care Centers in Jenin District

Through the field study for identifying weight, volume, density of the generated medical waste in Jenin district at the primary health care centers and the private clinics, many important results were noticed in this study.

The study has been completed in May 2007 by taking specimens from 30 primary health care centers distributed throughout Jenin Governorate for three un successive days from the primary health care centers; the results are shown in table 27.

The study showed that the average generation rate of medical waste for 30 primary health care centers in Jenin Governorate was 24.949 kg /day. The daily average of generation per center was 0.831 kg /day, so, the average total generation for the whole centers daily was:

140 PHCs × 0.831 kg/ day = 116.34 kg /day

And the number of yearly work days for these centers are (260 work days). We could find that the generation rate of the primary health care centers from medical waste in Jenin district may reach to 30.248 tons / year, assimilate as 612.5 m^3 /year of hazard medical waste. If we noticed that the density of GMW in Jenin district for PHCs was 49.383 kg/m^3.

Table (28): Generation rates, weight, volume and density of medical waste for 30 primary health care centers.

DAY		Waste component					Total generation rate for mixed MW
		Sharp waste	**Waste mix with infectious**	**Discarded medical plastic**	**Absorbent cotton**	**Tissues and pathologic waste al**	
First Day	Weight (kg.)	11.522	5.471	4.456	3.119	0.766	(25.334) Kg/day
	Volume (m^3)	0.111	0.261	0.176	0.171	0.011	(0.730) m^3/day
	Density (kg/m^3)	103.8	20.961	25.318	18.239	69.636	(47.590) kg/m^3
	Total No. of patients = 878						
Second Day	Weight (kg.)	10.922	5.659	4.685	2.924	0.556	(24.734) kg/day
	Volume (m3)	0.108	0.275	0.191	0.107	0.007	(0.688) m^3/day
	Density (kg/m^3)	101.1	20.578	24.528	27.327	79.428	(50.592) kg/ m^3
	Total No. of patients= 796						
Third Day	Weight (kg.)	11.723	5.256	3.978	3.091	0.723	(24.771) kg/day
	Volume (m^3)	0.114	0.245	0.152	0.114	0.010	(0.635) m^3/ day
	Density ($kg./m^3$)	102.8	21.453	26.171	27.114	72.300	(49.947) kg /m^3
	Total No. of patients= 822						
Average for three days	Average daily generation weight (kg.)	11.389	5.462	4.373	3.044.	0.681	(24.949) kg / day
	Waste volume(m^3)	0.111	0.260	0.173	0.130	0.009	(0.683) m^3/day
	Density ($kg./m^3$)	102.566	20.997	25.339	24.226	73.788	(49.383) kg /m^3
	Waste weight (gr. /pat.).	13.6	6.57	5.26	3.66	0.81	29.9 (gr./ pat. /day)
	Average No of patients = 832						

Medical Waste Generation Rates

Quantitative analysis

The centers are a general public facility which serves a large number of patients from Jenin district. They accommodate large number of patients compared with the other health sector in the study which has a significant effect on generation rate.

The study also showed the volume of each type of generated medical waste at primary health care centers independently, and the results as shown in table 28. The maximum average rate for generated waste volume was been waste mixed with infections with average of (0.260 m^3/day, for 30 PHCs), and this due to various reasons, the most important are:

1- The largeness of its volume compared with its weight.

2- The content of other kinds of medical waste is not mentioned in the study.

While the minimum volume of GMW in Jenin district was tissues and pathological waste as the average generation rate was 0.009 m^3/day, for total THU), and this goes back to the decrease of volume and largeness of weight for this generated waste. The whole tissues and pathological waste are considered the least generating waste at primary health care centers as those centers in all their categories are considered presenters for the daily services of lab testing, following up, diagnosing and daily care only.

The study showed that generation average weight at primary health care centers of the sharp waste was the highest of all kinds in the study

included. It reached to 11.389 kg/day, for total THU with average of 0.379 kg / healthcare center/day as illustrated in table 28.

$$11.389 \div 30 = 0.379 \text{ kg/day/healthcare centre}$$

Table (28): Weight of GMW (kg /PHC /day) for each type

Weight of GMW. in kg /PHC / day	Waste component					Generation Rate
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathological waste	
First day	0.384	0.182	0.148	0.103	0.026	0.843
Second day	0.364	0.188	0.156	0.097	0.019	0.824
Third day	0.390	0.175	0.132	0.103	0.024	0.824
Average	0.379	0.182	0.145	0.101	0.023	0.830

From table 27, the weight, volume and density for each sort of the medical waste generated at primary health care centers can be known. The result showed that the highest density was for the sharp medical waste at average of 102.566 kg/m$^{3)}$ while waste mix with infections was the least density as it reached 20.997 kg/m^3 as illustrated in table 29.

Table (29): density for each categories of GMW (kg. / m^3)

Density for each categories of G.M.W. in kg / m^3	Waste component					Density of mixed medical waste/ m^3
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathological waste	
First day	103.8	20.961	25.318	18.239	69.636	47.590 (kg/m^3)
Second day	101.1	20.578	24.528	27.327	79.428	50.592 (kg/m^3)
Third day	102.8	21.453	26.171	27.114	72.300	49.947 (kg /m^3)
Average	102.566	20.997	25.339	24.226	73.788	49.383 (kg /m^3)

Also the study showed that the average generation per patient of medical waste in PHC in each visit was 30 gr. /patient) and it was found that the highest rate of waste was the sharp medical waste with average of 13.6 g/patient/day, generated at the health centers as illustrated in table 30.

Table (30): Weight of generated MW in gr. /patient /day

Weight of generated MW. in gr. / patient / day	Waste component					Generation Rate in gr.
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathologica waste l	
First day	13.1	6.2	5	3.5	0.0087	28.8
Second day	13.7	7.1	5.8	3.6	0.0069	31
Third day	14.2	6.3	4.8	3.7	0.0088	30
Average	13.6	6.5	5.2	3.6	0.008	30

But the average volume of waste generated at primary health care centers has been dealt with on the basis of measuring volume in liter. The results showed that the average of medical waste volume generated at the primary health care centers was 22.766 Lt. / PHC/day, and it was found that the higher volume of generated waste in these centers are waste mixed with infectious with average of 8.6 lt. /PHC/day, as shown in table 31, and these results due to two basic reasons which are:

1- Largeness of volume compared with weight for this type of waste.

2- The content of other kinds of medical waste is not mentioned in the study.

Also the study showed (as illustrated in table 31) that waste volume generated of discarded medical plastic reached to 5.8 lt./PHC/day.

Table (31): Volume of GMW at 30 PHCs / Lt. / day.

Volume of GMW	Waste component					Generation Rate
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathological waste	
First day	3.7	8.7	5.9	5.7	0.346	24.364
Second day	3.6	9.2	6.4	3.6	0.262	23.062
Third day	3.8	8.2	5.1	3.8	0.366	21.266
Average	3.7	8.7	5.8	4.4	0.324	22.891

This is considered the second high volume of the medical waste generated due to various reasons, the most important are:

1- The spread of plastic materials used widely in the medical scope, especially those used once like plastic syringes and gloves.

2- The large volume of plastic materials compared with their weight

3- The addition of volume and weight of plastic bags used in the study.

Discarded medical plastic as all other kinds of generated medical waste in the study, do not compressed with any pressure for these materials.

Average weight percentage distribution of generated MW in primary health care centers, 45% of daily generation weight is for the sharp waste as a maximum, while tissues and pathological waste takes only 3% of total weight of the daily generated MW as a minimum as shown in figure 9. Also, figure 10 shows the average volume percentage distribution of generated MW in primary health care centers, 39% of daily generation volume is for waste mix with infectious as a maximum, while tissues and pathological waste takes only 1% of total generated volume of the daily generated MW as a minimum.

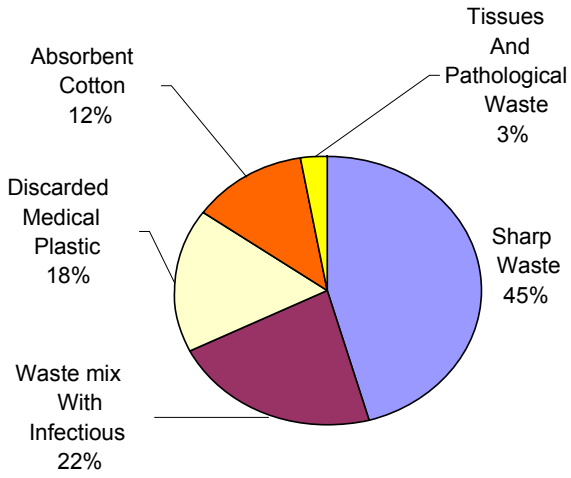


Fig. (9): Average weight percentage distribution of generated MW in primary health care centers.

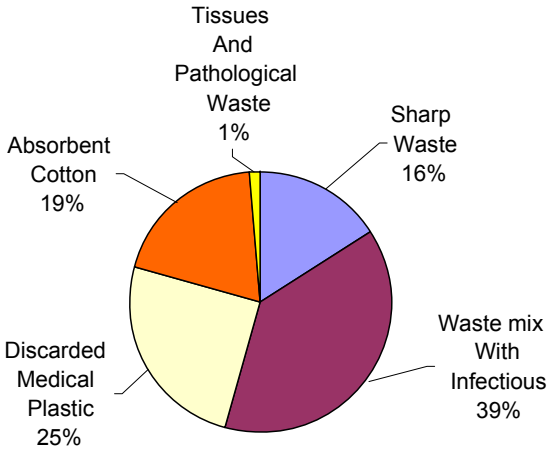


Fig. (10): Average volume percentage distribution of generated MW in primary health care centers.

Rates of Generated Medical Waste in Private Clinics in Jenin District

This field study relied on the study of medical waste reality in Jenin Governorate. The study of the medical waste qualities generated at private clinic is considered the second part of the field work for knowing the volume, weight and density of the generated medical waste, as the private sector occupies a great part of the medical services presented to all citizens in the governorate.

Table 33 shows the average of the private clinics generation targeted in this field of study from weight, volume and density of each kind on the extent of field of studied days, in addition to the number of patients who visited those clinics on that days, that may help in quantifying volume and sort of the waste generated for every patient daily knowing that the number of clinics which the study included were 30 private clinics distributed at all medical specialties The particularity of these clinic and centers differ from the other public medical clinics, where the study analyze their generation to the dangerous medical waste, that need special study.

Table 32 shows the volume of waste generated in kilogram for 30 clinics of all kinds of medical waste. The study showed that the average of private clinics generation of medical waste in all sorts was (0.350 kg/private clinic/ day). The generation of these clinics from discarded medical plastic was the highest of all sorts of the study. This result goes back to a basic reason where plastic materials are widely using in health sectors. Also adding the plastic bags used in integrated processes, that will show the generated plastic medical waste was the highest volume within the sorts included in the study as illustrated in tables 33,34 and 35.

Table (32): Total rates of generated MW at 30 private clinics /day in Jenin district .

DAY		Waste component					Total generation rate for mixed MW
		Sharp waste	**Waste mix with infectious**	**Discarded medical plastic**	**Absorbent cotton**	**Tissues and pathologic waste al**	
First Day	Weight kg./day	3.225	2.985	3.670	1.852	0.415	12.147 (kg /day)
	Volume (m^3/day)	0.045	0.146	0.162	0.065	0.0064	0.4244 (m^3 /day)
	Density (kg/m^3)	71.666	20.445	22.654	28.492	64.843	41.620 (kg / m^3)
	patients No.= 471						
Second Day	weight (kg/ day)	3.266	2.969	3.504	1.715	0.733	12.187 (kg /day)
	volume (m^3/day)	0.046	0.143	0.147	0.057	0.010	0.403 (m^3 /day)
	Density (kg/m^3)	71.0	20.762	23.836	30.087	73.300	43.797 (kg / m^3)
	patients No.= 457						
Third Day	weight (kg /day)	3.110	2.716	3.578	1.759	0.469	11.632 (kg / day)
	Volume (m^3/day)	0.044	0.128	0.206	0.075	0.007	0.460 (m^3 /day)
	Density (kg/m^3)	70.681	21.218	17.368	23.453	67.00	39.944 (kg / m^3)
	patients No.= 423						
Average for three days	Average daily generation weight (kg/day)	3.200	2.890	3.584	1.775	0.539	11.988 (kg / day)
	waste volume (m^3 / day)	0.045	0.139	0.172	0.066	0.008	0.430 (m^3/ day)
	Density (kg/m^3)	71.100	20.808	21.286	27.344	68.381	41.783 (kg /$m^{3)}$
	Waste weight(gr./ pat./day)	0.007	0.006	0.008	0.004	0.001	26.5 (gr./Pat/day)
	patients No.= 450						

As it is noticed that there an effect on the results weight, volume, and density of generated sharp wastes for private clinics in the study. The use of charges related to the separation of the sharp wastes by their specifications was also has its affect in the results of generated discarded medical plastic waste in volume and density, as shown in the Table (35).

Table (33): Total generation rate in (kg. / Private clinic / day).

Generation rate in (kg. /private clinic /day)	Waste component					Generat -ion Rate
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathologic waste al	
First day	0.107	0.099	0.122	0.061	0.013	0.404
Second day	0.108	0.098	0.116	0.057	0.024	0.406
Third day	0.103	0.090	0.119	0.058	0.015	0.387
Average	0.320	0.288	0.358	0.177	0.053	0.399

Table (34): Total generation rate (gr. / patient /private clinic/day).

Generation rate in gr./ patient / day	Waste component					Generat -ion rate
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathologica waste l	
First day	0.007	0.007	0.008	0.004	0.0009	0.027
Second day	0.007	0.006	0.007	0.003	0.001	0.024
Third day	0.007	0.006	0.008	0.004	0.001	0.026
Average	0.007	0.006	0.008	0.004	0.001	0.026

As shown in figure 11, the average weight percentage distribution of GMW in private clinics in Jenin district was 34**%** of daily generation weight is for the discarded medical plastic as a maximum generated waste, while tissues and pathological waste takes only 5% of total weight of the daily generated MW as a minimum. Also, figure 12 shows the average volume percentage distribution of generated MW in private clinics as 43% of daily generation volume is discarded medical plastic as a maximum, while tissues and pathological waste takes only 2% of total generated

volume of the daily generated MW as a minimum, other observation were recorded for the volume of generated sharp waste in private clinics, only 3% of total volume of generated medical waste of private clinics in Jenin district.

Table (35): Density for each category of GMW in private clinics (kg /m^3)

Density in kg./m^3	Waste component					Generat -ion rate
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathologica waste l	
First day	71.666	20.445	22.654	28.492	64.843	41.620
Second day	70.000	20.762	23.836	30.087	73.300	43.797
Third day	70.681	21.218	17.368	23.456	67.000	39.944
Average	71.100	20.808	21.286	27.344	68.381	41.789

Table (36): Generation rate (Lt /30 private clinic /day)

Lt. /private clinics /day	Waste component					Generation rate
	Sharp waste	Waste mix with infectious	Discarded medical plastic	Absorbent cotton	Tissues and pathologica waste l	
First day	1.500	4.866	5.400	2.166	0.213	14.145
Sec. day	1.530	4.766	4.900	1.900	0.333	13.429
Third day	1.460	4.266	6.866	2.500	0.233	15.325
Average	1.496	4.632	5.722	2.188	0.259	14.299

The results showed a great contrast between the medical wastes resulted at the primary health care centers and private clinics in all scopes.

The generation of primary health care centers from medical was double in the quantity generated at private clinics. Another contrast was found among waste generated of the primary health centers which showed the quantities weight generated, and this goes back to the following reasons:

1- Coverage of the primary health centers to a great number of population assemblages in the governorate.

2- The great citizen's dependence on the primary health care centers for receiving the required medical services.

3- Variousness of the medical services presented at the primary health care center.

4- Upholding the public health sector (primary health care centers) with a number of the medical specialties like orthopedic surgeons gynecology, delivery doctors, pediatrics, and other medical specialties.

5- Lack of financial cost related to these services because their fees are considered symbolic to the citizen in comparison with public sector.

6- Primary health care centers offer immunization program reliable from the Palestinian Ministry of health, and it is the sole side and credited in this scope for the Palestinian Citizen.

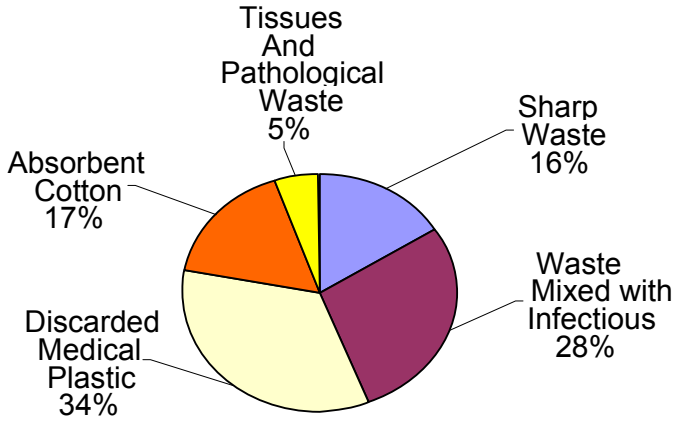


Fig (11): Average weight percentage distribution of GMW in private clinics in Jenin district

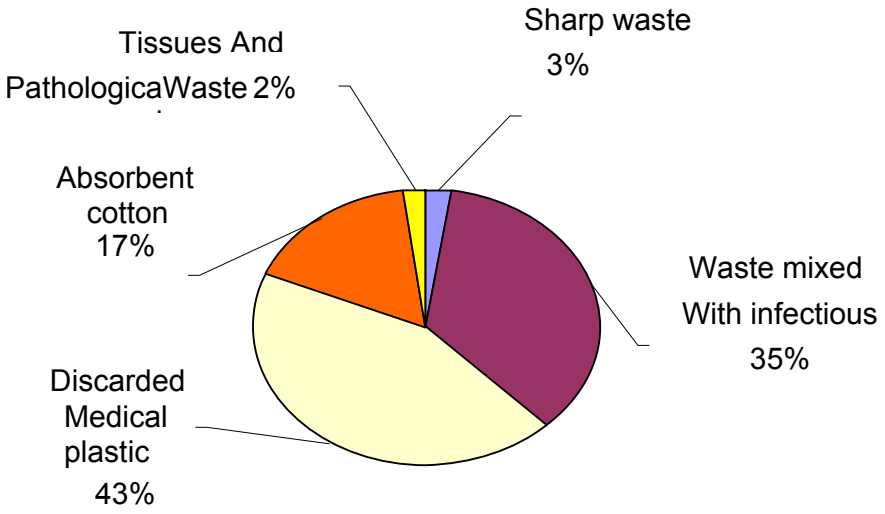


Fig. (12): Average volume percentage distribution of GMW in private clinics in Jenin district

Quantity of generated medical waste in Jenin district

One of the results of this study was identifying the subtotal of weight, volume and density of GMW from PHC and Pr.C. in Jenin district, and the results as shown in study that the subtotal weight of GMW in Jenin district was 61867 kg /year as 1369 m^3 / year as subtotal volume of GMW in Jenin district.

Table (37): Final results and rates of generated waste in PHCs and Pr.C in Jenin district

Results of study of generated waste in PHCs and Pr.C in Jenin district	PHC	Pr. C
Weight of GMW in kg/health unit/day	0.831	0.399
Number of Health Units.	140	254
Number of working days.	260	312
Density of generated waste in kg. /m^3.	49	42
Total weight of GMW in kg. /year.	30248	31619
Total volume of GMW in m^3 /year.	617	752
Subtotal weight of GMW in Jenin district.	61867 kg./year	
Subtotal volume of GMW in Jenin district.	1369 m^3 / year	

According to the results of study, we found that the rate of GMW in Jenin districted from PHCs and Pr.C. was (61867 kg /year) with a total volume of (1580 m^3/ year). As we consider the GMW from these health care units as a hazardous waste, we know that they will have a negative effect on human and environment if not treated and disposed in a safe way.

While the number of private clinics and government primary health care centers throughout Jenin district (as one of the Palestinian authority's districts) is constantly increasing, this leads to an increase in quantity of medical waste which is disposing improperly.

Although the MoH has developed regulations aimed at ensuring an appropriate handling and processing of Medical Waste, there is still a need for a medical waste management strategy that should be based on integrated waste management options.

To compare our results with other similar studies in the National or International levels, in the study (Medical Waste Management in Korea. 2006), the quantities of medical waste produced by general hospitals in Daejeon Metropolitan City in Korea based on a survey conducted during this study. It was found that the generation rates of medical waste in the hospitals ranged from 0.14 to 0.49 kg/bed/day, assuming 100% bed-occupancy (Jang et al., 2006). In teaching hospitals in Europe the generation rates were 3.9 kg/bed/day in Norway, 4.4 kg/bed/day in Spain, 3.3 kg/bed/day in UK and France, while in maternity hospitals generation rates were 3.5 kg/bed/day in Spain, and 3 kg/bed/day in UK. It will be noted that the rates in both are approximately same (WHO2003).

With regard to medical laboratories and healthcare clinics (private and governmental), the generation rates are determined based on the average number of patients performed per day, thus the generation rates are expressed as kg/patent /day. Waste generation rates for governmental healthcare centers and laboratories were found to be 0.065, 0.053 and 0.055 kg/patient/day for Princess Basma Hospital, Princess Rahma Hospital and Central Irbid Laboratories. Respectively. However, for private health facilities, the rates were 0.034–0.102 kg/patient/day (A. Bdour et al.2006).

Such a strategy would be needed then to be supplemented with the appropriate policy guidance and enforcement at both national and regional levels. "To achieve this, policy makers and health care sectors administrators require both technical assistance and financial support" (Abdullah et al., 2007).

Chapter 4

Conclusions and Recommendations

Conclusions

The study showed a great defect and clear weakness of safe and effective management for medical waste at the primary health care centers and private clinics, equally as the process of disposing of medical wastes at all stages does not correspond with the World Health Organization (WHO) and the right administration for disposing of the medical wastes. The study also showed presence of clear defect in welfare and responsibility bearing by the related healthcare organizations in Jenin Governorate. There were also great defect and lack of technical and financial resources required for operating special management concerning medical waste, and the urgent need for training workers who are working at the sector of medical waste management in the healthcare centers, private clinics and the municipalities' workers.

During the study the following notes were recorded for Jenin district**:**

Solid wastes generated at all primary health care centers and private clinics in Jenin city are collected by a municipality of Jenin at the beginning of each shift from 8:00 a.m. to 2:00 p.m. They are collected by employees in each department, packaged in colored plastic bags (mainly black bags). Which are used to collect infectious, non-infectious, general and pathological wastes (all together -for example; blood fluids, blood fluid products, and operating theater wastes dippers, paper) (Interview with M. Abu Sroor 2007/4).

In other localities in Jenin district as towns and villages ,MoH has been organize the collecting of sharp waste from the primary healthcare centers only to bee disposed of in special incinerator in Jericho(once weekly) or to be buried in the municipal dumpsite in Jenin city. While the

GMW from other health facilities is collected with municipal or village soled waste in daily program (Interview Dr. Tafakji 4/2007).

Some of these components need to be incinerated and the other is to be disposed with the general domestic waste which is carried to be transported to on-site storage containers each with a capacity of 1000 Lt) (Interview M .Abu Sroor 2007/4).

Jenin Municipality workers collect the solid wastes from the on-site storage containers every day at 8:00 a.m. and transport them along with general domestic wastes to an open dump site at Qapatia town 5 km outside of Jenin city.

Sharps and needles are collected in closed carton boxes which considered as safety boxes of (capacity of 5 Lt), only in MoH care centers. When these boxes are filled, they are sent to the same dumpsite by the MoH. Workers to be burned in an open area and buried immediately in the same dumpsite. (Interview Dr Tafakji 4/2007)

Also, wastes from private clinics are collected daily by municipality workers at 8:00p.m. by hand without any protective cloth or special gloves. Some of these clinics use plastic items such as bottles for collecting sharp waste.

However, it has been reported that segregated wastes are mixed together by laborers as they collect wastes for external storage, or that municipal workers mix the different types of wastes together during collection.

A review of available data for the management practices at all PHCs and Pr.C. shows the following:

In terms of generation hazard Medical Waste

The study describe and show that all served PHCs and private clinics in Jenin district generate infectious and hazardous waste with different rate and components that need special treatments and disposable methods for each type as described in WHO regulations and methods.

In terms of segregation and collection procedures

- None of the MoH or private medical sector has adequate information about the quantities and composition of their waste.
- Poor segregation and classification procedures of the generated waste are noticed at all surveyed health care establishments and medical centers.
- Healthcare waste is still being dumped and mixed with domestic waste which is collected, transported and disposed in a similar manner as the general municipal solid waste.

In terms of labor safety

Very few or there is no evidence that the health care sectors of PHCs or PC. Provide the following essential requirements for the safety of employees:

- A protective and safety clothes for people who handling the wastes.
- Color-coded bags or their usage.
- Internal waste storage facilities before transporting to dump sites.
- Disinfection or autoclave facilities for disposables and reusable for pre treating certain types of wastes.
- Special handling facilities for radioactive waste.
- Special hazardous waste storage containers.

In terms of transportation, storage and disposal facilities

- All wastes are collected manually by workers and then transported to the on-site storage area by using uncovered trolleys. This practice exposes visitors and patients to possible contamination.
- On-site storage containers at all clinics have poor conditions due to the location and situation.

These containers are placed near the main street within the health facilities buildings

The current handling and management of MW in Jenin district is in the basics and minimum upon the increasing of the health services that provided to the public from various and different directions. Since the Palestinian authority has taken the responsibility for the health sector of Palestinian people. Also, the weakness of clearing responsibility between the parties and the partners of medical waste management administration or authority in Jenin district. Besides the political, economical, and social conditions that affect the Palestinian life, all together form the key points that affect the good and effective medical waste management system in Jenin district.

Recommendation:

These recommendations that can contribute to raising the efficiency of the work of the medical wastes administration in the governorate came as a result to the study that shows many disadvantages in management of medical wastes in primary health care centers and private clinics in Jenin district.

1- Focus on segregation

As a result of this failure to establish and follow segregation protocols and infrastructure in PHC and Pr.C in Jenin district, the waste leaving healthcare facilities, as a whole is both potentially infectious and potentially hazardous. No matter what final strategy for treatment and disposal of wastes is selected, it is critical that wastes are segregated (preferably at the point of generation) prior to treatment and disposal. This most important step must be taken to safeguard the occupational health of health care workers.

2- Focus on sharp waste management

Proper segregation of these materials in rigid, puncture proof containers which are then monitored for safe treatment and disposal is the highest priority for medical waste management in primary healthcare centers and private clinics in Jenin district.

3- Focus on reduction generated hazardous waste

For example, healthcare waste management would benefit from a policy of a phase out of mercury-based products. Digital and electronic technology is available to replace mercury-based diagnostic tools.

4- Ensure worker safety through education, training and proper personal protective equipments.

Proper education and training must be offered to all workers from doctors to ward boys, to laborers and rag pickers to ensure an understanding of the risks that wastes pose, how to protect themselves, and how to manage wastes (especially how to properly segregate).

Education and training programs must be developed which speak to each population in Jenin district in a way that will best meet the needs and build understanding and change behavior in that population regards safe dealing with generated medical waste.

5- Develop an infrastructure for safe disposal of GMW in Jenin district.

Improper disposal of all wastes, municipal solid waste, hazardous wastes, industrial wastes, human wastes, etc. poses a major health hazard in Jenin district. The development of sanitary landfills (as Zahra Alfenjan sanitary land fill) in Jenin district makes an opportunity for the ultimate safe disposal of medical wastes which cannot be otherwise recycled.

6- Develop and activate cooperation

Activating the role of ministries and organizations concerned in management and disposal of medical wastes in Jenin district as the Ministry of Health, Ministry of Local Governance, Palestinian Environment Quality Authority and Municipalities in the district. By a tournament contributes to a develop and facilitate work of the medical waste administration, which give each part from these authorities a

complete responsibility and wide authorities in application of the regulations and the systems related to the administration of the medical wastes in Jenin governorate

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INTERVIWES

1- **Mohammad Abu Sroor** Director of health department in Jenin municipality. 4/2007

2- **Dr. Mohammad tafakji**. Director of Jenin health department (Ministry of Health) 4/2007.

3- **Eng. Bashar Daragmeh-** Director of Jenin environmental health department 4/2007.

4- **Beat- Qad station, Jenin.** Site visit / May 2007, a station for Environmental and agricultural studies.

Appendices

Appendix (A)

Fig. 13: Methods and tools used in the experimental part of the study in Jenin district 2007.

Fig. (17): The used safety boxes in the study which is special for sharp waste disposing (Jenin Health Directorate 2/2007).

Fig. (18): Unused incinerator (Italian Donation) in the field near the waste water treatment plant in Jenin city 2007 (M .Abu Sroor 2007/4).

Appendix (B)

Number of Private Medical & paramedical Centers in Jenin district.

Centers	**Number**
Pharmacies	107
Laboratories	18
General & specialized Clinics	220
Physiotherapy Centers	5
Dental Clinics	130

(HECM2004)

Number and distribution of Non Governmental Medical Centers in Jenin district.

Health Provider	**No.**	**Location**
Red Crescent Society	4	Arrabeh, Jaba'a, Tubas
Palestinian Medical Relief Society	4	Maithaloun, Zababdeh, Silat Al Harthia,
Patient's Friends Society	1	Jenin
Health Work Committees	2	Tubas, Alyamoon
Total	11	

(HECM2004)

Appendix (C)

جامعة النجاح الوطنية **كلية الدراسات العليا**		

بسم الله الرحمن الرحيم

أخي الفاضل... أختي الفاضلة...

تحية طيبة وبعد ،
يقوم الباحث بإجراء دراسة لمتطلب رسالة الماجستير(الأطروحة) في تخصص "العلوم البيئية" بعنوان

إدارة المخلفات الطبية
في مراكز الرعاية الصحية الأولية والعيادات الخاصة/محافظة جنين

حيث قسمت هذه الاستبانة إلى ستة مجالات: إنتاج المخلفات الطبية، عمليات فصل المخلفات الطبية ومعالجتها داخل الوحدة الصحية ، عمليات النقل داخل وخارج الوحدة الصحية إلى موقع التصريف، ، متطلبات الأمن والسلامة المهنية ومتطلبات المعالجة والتخلص النهائي للمخلفات الطبية ، يرجى التكرم بتعبئة الاستمارة بكل دقة وموضوعية ؛ حيث ستعتمد نتائج هذه الدراسة على رأيكم السديد على اعتبار أنكم الأكثر علماً ودرايةً بأهمية دراسة هذا الموضوع والأكثر خبرة في الطرق الأمثل في التعامل معها .
ومن الجدير بالذكر أن هذه الدراسة لن تستخدم إلا لأغراض البحث العلمي .

شاكرين لكم تعاونكم

الباحث
مجدي أبو عواد

الجزء الأول:

معلومات أولية

V1	نوع الوحدة الصحية أ) مركز رعاية أولية ب) عيادة خاصة
V2	عدد العاملين بالوحدة الصحية . (ـــ)
V3	طبيعة العمل في الوحدة الصحية أ)مهن طبية ب) خدمات عامة
V4	هل توجد لديكم تعليمات مكتوبة حول كيفية التعامل مع النفايات الطبية ؟ أ) نعم ب) لا
V5	إذا كان الجواب نعم فمن هو مصدر هذه التعليمات ؟ .....
V6	كم تقدر/ ين كمية النفايات الناتجة يوميا لديكم بالكيلوغرام ؟ .....

الجزء الثاني

الفصل الأول: إنتاج المخلفات داخل مراكز الرعاية الصحية والعيادات الخاصة

V7	تنتج الوحدة مخلفات طبية معدية 1- دائما 2- أحيانا 3- لا يوجد
V8	تنتج الوحدة مخلفات باثولوجية (أنسجة ، بقايا بشرية،..) 1-دائما 2- أحيانا 3- لا يوجد
V9	تنتج الوحدة مخلفات طبية حادة (إبر حقن ، مشارط ،..) 1- دائما 2- أحيانا 3- لا يوجد
V10	تنتج الوحدة مخلفات صيدلانية (أدوية منتهية الصلاحية ، مواد كيماوية تستخدم في العلاج ،...) 1-دائما 2- أحيانا 3-لا يوجد
V11	تنتج الوحدة مخلفات مواد مشعة (صور أشعة ،..) 1-دائما 2- أحيانا 3- لا يوجد
V12	تنتج الوحدة مخلفات سائلة (الدم، سوائل الجسم الأخرى..) 1-دائما 2- أحيانا 3- لا يوجد
V13	تنتج الوحدة مخلفات تحوي معادن ثقيلة (الزئبق في ميزان الحرارة ، الكادميوم الناتج عن البطاريات ، الرصاص الناتج عن أقسام الأشعة والتشخيص ،..) 1-دائما 2- أحيانا 3- لا يوجد

الفصل الثاني:

فصل المخلفات الطبية داخل الوحدة الطبية

V14 ☐	هل يوجد قوانين وأنظمة في مؤسستكم تلزم بفصل المخلفات الطبية وجمعها بشكل مستقل 1- نعم 2- لا يوجد
V15 ☐	هل يوجد رقابة داخلية في مؤسستكم لمتابعة وتنفيذ القوانين والأنظمة الخاصة بالمخلفات الطبية 1- دائما 2- أحيانا 3- لا يوجد
V16 ☐	هل يتم توفير المستلزمات الخاصة بعملية الفصل داخل الوحدة الصحية ؟ 1- دائما 2- أحيانا 3- لا
V17 ☐	هل لديك الاستعداد لتطبيق عمليات الفصل والجمع بشكل صحي آمــن 1- دائما 2- أحيانا 3- لا
V18 ☐	هل توضع المخلفات الطبية الحادة كالإبر والمشارط وغيرها في حاويات خاصة في مؤسستكم 1- دائما 2- أحيانا 3- لا
V19 ☐	يتم التخلص من المخلفات الباثولوجية في مؤسستكم (أنسجة، بقايا بشرية،.) ضمن المخلفات الطبية 1- دائما 2- أحيانا 3- لا
V20 ☐	يتم التخلص من مخلفات الأدوية منتهية الصلاحية وبقايا المواد الكيماوية المستخدمة في العلاج في مؤسستكم في حاويات خاصة 1-دائما 2- أحيانا 3- لا يوجد
V21 ☐	حاويات وأكياس الجمع للمخلفات الطبية في مؤسستكم ضمن مواصفات صحية وبيئية ملائمة 1-دائما 2- أحيانا 3- لا يوجد
V22 ☐	موقع جمع المخلفات الطبية في مؤسستكم معزول ضمن المواصفات الصحية والبيئية 1- دائما 2- أحيانا 3- لا يوجد

الفصل الثالث:

جمع المخلفات الطبية داخل الوحدة الطبية

V23 ☐	هل يوجد موقع داخل الوحدة الصحية مخصص لتجميع المخلفات الطبية 1- دائما 2- أحيانا 3- لا يوجد
V24 ☐	هل موقع التجميع في الوحدة ضمن المواصفات البيئية (ذو تهوية, بعيد عن متناول الزوار والأطفال, محكم الإغلاق, قابل للتنظيف والصيانة...) 1- دائما 2- أحيانا 3- لا
V25 ☐	هل يتم جمع المخلفات الطبية يوميا بانتهاء يوم العمل 1- دائما 2- أحيانا 3- لا
V26 ☐	هل يتم نقل المخلفات الطبية يومية خارج المركز الصحي أو العيادة 1- دائما 2-أحيانا 3- لا
V27 ☐	هل يقوم بعمليات الجمع عمال ذوي خبرة في هذا المجال ؟ 1- دائما 2- أحيانا 3- لا

الفصل الرابع:

متطلبات النقل داخل وخارج الوحدة الصحية

V28 ☐	هل تقوم مؤسستكم بنقل المخلفات الطبية من المراكز الصحية (العيادات الخاصة) إلي مواقع التصريف 1- دائما 2- أحيانا 3- لا
V29 ☐	هل يتم التعامل بشكل آلي في عملية نقل المخلفات الطبية من مركزكم الصحي (العيادة الخاصة)إلي موقع التصريف 1- دائما 2- أحيانا 3- لا يوجد
V30 ☐	تتم عمليات التجميع والنقل للنفايات الطبية بأوقات محددة داخل الوحدة الصحية أو العيادة إلى مواقع التصريف 1- دائما 2- أحيانا 3- لا يوجد
V31 ☐	هل يتم جمع المحلفات الطبية بمركبة خاصة تختلف عن تلك الخاصة بالمخلفات المنزلية (العادية) 1- دائما 2- أحيانا 3- لا
V32 ☐	يتم معالجة المخلفات الطبية المعدية المنتجة في الوحدة الصحية من قبل مؤسستكم 1- دائما 2- أحيانا 3- لا
V33 ☐	هل يتم إعلام الجهات (البلديات, أو عمال النظافة) المسئولة عن التخلص من المخلفات الطبية بمحتوى هذه المخلفات كتابيا 1- دائما 2- أحيانا 3- لا يوجد

الفصل الخامس

متطلبات الأمن والسلامة المهنية

V34 ☐	ما هي دورية التخلص من المخلفات الطبية من مركز الرعاية (العيادة الخاصة) لديكم في الأسبوع 1- مرة واحدة في الأسبوع 2- مرتان في الأسبوع 3- ثلاث مرات في الأسبوع 4- أربع مرات في الأسبوع 5- خمس مرات في الأسبوع 6- ست مرات في الأسبوع 7- أكثر من 6 مرات في الأسبوع
V35 ☐	يتم نقل المخلفات الطبية يومياً خارج مؤسستكم؟ 1- دائما 2- أحيانا 3- لا يوجد
V36 ☐	فريق جمع المخلفات الطبية يراعي شروط السلامة المهنية ويرتدي الملابس الوقائية 1- دائما 2- أحيانا 3- لا
V37 ☐	فريق جمع المخلفات الطبية على علم ودراية بخطورة بعض المخلفات الطبية؟ 1-دائما 2- أحيانا 3- لا
V38 ☐	هناك إشارات تحذيرية خاصة للحاويات وأماكن جمع المخلفات الطبية 1-دائما 2-أحيانا 3- لا

V39 ☐	هل ترى ضرورة فرض قوانين ملزمة للتعامل مع المخلفات الطبية 1- دائما 2- أحيانا 3- لا يوجد

V40	هل ترى ضرورة وجود سلطة تنفيذية وقانونية لتطبيق القوانين الملزمة للتعامل مع المخلفات الطبية 1–دائما 2- أحيانا 3- لا يوجد
V41	هل تعتبر عملية توعية وتدريب العاملين في مجال معالجة المخلفات الطبية ضرورة ملـــحّة 1–دائما 2- أحيانا 3- لا يوجد
V42	هل تلقيت طعومات خاصة بالتهاب الكبد الفيروسي ب ؟ 1– نعم 2– لا
V43	هل تلقيت إيه طعومات أخرى ؟ 1– نعم 2– لا
V44	إذا كان الجواب نعم فما هي هذه الطعومات ؟ اذكرها .....

الفصل السادس:

متطلبات التخلص النهائي من المخلفات الطبية

V45	هل يوجد مواقع مخصصة للتخلص من المخلفات الطبية 1- دائما 2- أحيانا 3- لا يوجد
V46	هل يتم استخدام طرق معالجة وإجراءات محددة قبل التخلص من المخلفات الطبية الخطرة ؟ 1- دائما 2- أحيانا 3- لا يوجد
V47	هل يتم التخلص اليومي والتعامل المباشر مع هذه المخلفات في مواقع التصريف ؟ 1- دائما 2- أحيانا 3- لا يوجد
V48	هل تستخدم عمليات الحرق في مواقع التصريف باستخدام (محرقة خاصة) 1- دائما 2- أحيانا 3- لا يوجد
V49	هل يتم التعامل مع المخلفات الطبية بشكل يدوي من قبل العاملين بمواقع التصريف 1- دائما 2- أحيانا 3- لا يوجد
V50	هل تعتبر عملية توعية وتدريب العاملين في مجال التخلص من المخلفات الطبية ضرورة ملـــحّة؟ 1- دائما 2- أحيانا 3-لا يوجد

V 51 ما هي اقتراحاتكم لتحسين وضع إدارة النفايات الطبية في مركزكم (عيادتكم) ؟

.....

V 52 ما هي اقتراحاتكم لتحسين وضع إدارة النفايات الطبية خارج مركزكم (عيادتكم) ؟

.....

V53 ما هي اقتراحاتكم لتحسين وضع السلامة المهنية للعاملين في مركزكم أو (عيادتكم) فيما يخص النفايات الطبية

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انتهى

شكرًا لحسن تعاونكم

V39	هل ترى ضرورة فرض قوانين ملزمة للتعامل مع المخلفات الطبية 1- دائما 2- أحيانا 3- لا يوجد

V40	هل ترى ضرورة وجود سلطة تنفيذية وقانونية لتطبيق القوانين الملزمة للتعامل مع المخلفات الطبية 1–دائما 2- أحيانا 3- لا يوجد
V41	هل تعتبر عملية توعية وتدريب العاملين في مجال معالجة المخلفات الطبية ضرورة ملـــحّة 1–دائما 2- أحيانا 3- لا يوجد
V42	هل تلقيت طعومات خاصة بالتهاب الكبد الفيروسي ب ؟ 1– نعم 2– لا
V43	هل تلقيت إيه طعومات أخرى ؟ 1– نعم 2– لا
V44	إذا كان الجواب نعم فما هي هذه الطعومات ؟ اذكرها .....

الفصل السادس:

متطلبات التخلص النهائي من المخلفات الطبية

V45	هل يوجد مواقع مخصصة للتخلص من المخلفات الطبية 1- دائما 2- أحيانا 3- لا يوجد
V46	هل يتم استخدام طرق معالجة وإجراءات محددة قبل التخلص من المخلفات الطبية الخطرة ؟ 1- دائما 2- أحيانا 3- لا يوجد
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V49	هل يتم التعامل مع المخلفات الطبية بشكل يدوي من قبل العاملين بمواقع التصريف 1- دائما 2- أحيانا 3- لا يوجد
V50	هل تعتبر عملية توعية وتدريب العاملين في مجال التخلص من المخلفات الطبية ضرورة ملـــحّة؟ 1- دائما 2- أحيانا 3-لا يوجد

V 51 ما هي اقتراحاتكم لتحسين وضع إدارة النفايات الطبية في مركزكم (عيادتكم) ؟

.....

V 52 ما هي اقتراحاتكم لتحسين وضع إدارة النفايات الطبية خارج مركزكم (عيادتكم) ؟

.....

V53 ما هي اقتراحاتكم لتحسين وضع السلامة المهنية للعاملين في مركزكم أو (عيادتكم) فيما يخص النفايات الطبية

.....

انتهى

شكرًا لحسن تعاونكم

Medical Waste Management in Primary Health Care Centers and Privet Clinics/ Jenin District as a Case Study
Quantities the types of Medical Waste

Type and Number of clinic primary Private			Discarded medical plastic	Absorbent cotton	Tissues	Sharp waste	Waste mix with infectious	Pathological waste	Total sample weight	Total sample volume
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								
Sample No. / / 2007	Sharp Box	Bag. 1								
		Bag.2								

Medical Waste Management in Primary Health Care Centers and Privet Clinics/ Jenin District as a Case Study

Sample No	Type and Number of clinic( )				Sharp waste	Waste mix with infectious	Pathological waste	Discarded medical plastic	Absorbent cotton	Tissues	Total sample weight	Total sample Volume
	Volume De.	No.	private	primary								
sample1	/											
sample2	/											
sample3	/											
sample4	/											
sample5	/											
sample6	/											
sample7	/											
sample8	/											
sample9	/											
sample10	/											
sample11	/											
sample12	/											
sample13	/											
sample14	/											
sample15	/											

Samples are collected in date (/ / 2007)

جامعة النجاح الوطنية
كلية الدراسات العليا

إدارة النفايات الطبية في مراكز الرعاية الصحية الأولية والعيادات الخاصة في محافظة جنين

إعداد
مجدي قاسم جميل أبو عواد

إشراف
د. حسان عرفات
د. عصام احمد الخطيب

قدمت هذه الأطروحة استكمالا لمتطلبات درجة الماجستير في العلوم البيئية بكليـــة الدراســـات العليا في جامعة النجاح الوطنية في نابلس ، فلسطين.

2008

إدارة النفايات الطبية في مراكز الرعاية الصحية الأولية
والعيادات الخاصة في محافظة جنين

إعداد
مجدي قاسم جميل أبو عواد
إشراف
د.حسان عرفات
د. عصام احمد الخطيب

الملخص

أنجزت هذه الدراسة خلال الفترة الواقعة بين شهري آذار و تشرين أول 2007 في محافظة جنين، من أجل تقيم واقع إدارة المخلفات الطبية في مراكز الرعاية الصحية الأولية والعيادات الخاصة، وتحديد حجم النفايات الطبية المنتجة في محافظة جنين. أظهرت الدراسة عدد من النتائج أهمها: ضعف حضور إدارة النفايات الطبية في المحافظة، شح ألإمكانيات والمقومات المادية والفنية اللازمة لإدارة صحيحة للنفايات الطبية، ضعف التعاون المشترك بين المؤسسات ذات العلاقة الحكومية وغير الحكومية المسئولة عن القطاع الصحي في المحافظة مثل (وزارة الصحة الفلسطينية، والحكم المحلي، وسلطة جودة البيئة الفلسطينية).

كذلك أظهرت الدراسة أن أكثر العاملين في قطاع الخدمات العامة(المراسلين وعمال النظافة) ليس لديهم فكرة عن أسس التعامل السليم والنقل المناسب للنفايات الطبية، مع حاجتهم الماسة للتوعية والتدريب على الأسس السليمة والآمنة للتعامل مع النفايات الطبية.

كما اشتملت الدراسة على معرفة حجم النفايات الطبية المنتجة من مراكز الرعاية الصحية الأولية والعيادات الخاصة في محافظة جنين ونوعها ووزنها، ووجد أن إنتاج المراكز الصحية من المخلفات الطبية يبلغ (0.831)كيلو غرام / مركز رعاية صحي أولي/ يوم ، في حين أن إنتاج العيادات الصحية الخاصة من النفايات الطبية بلغ (0.350) كيلوغرام /عيادة خاصة /يوم.

بلغ معدل إنتاج مراكز الرعاية الصحية الأولية والعيادات الخاصة للنفايات الطبية في محافظة جنين 62 طن تقريبا سنويا من النفايات الطبية. تقدم هذه النتائج الدليل الواضح على أهمية وجود إدارة مناسبة للنفايات الطبية في محافظة جنين؛ لتحافظ على صحة الإنسان والبيئة.