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## The Leading Factors of Medical Waste Management Absence in Yemen

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### Abstract

**Background:** This Paper aims at analyzing and defining the reasons and factors that lead to the absence and failure of medical waste management in Yemen. This absence has a catastrophic effect by causes a wide spread of epidemics, diseases, infections, pollutions, deaths and long-range effects on the environment. And despite the lake of data, statistics and rare previous studies in this field. This paper will be a systematic study of the key factors causing this poor performance of this important Field.

**Keywords:** Medical waste management; Bio-medical waste; Occupational hazards; Hazardous waste; Healthcare hazards; Medical waste Standards.

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## Introduction

It's already a known fact that Yemen is suffering from the absence of bio-medical waste management absence. And despite of the global efforts to aid and support this field, no results has been seen! Therefore, the scholar senses his responsibility to make a diagnostic study of the factors, reasons and roots of this issue by high lighting the weaknesses in order to help guiding whom might be concerned in concentrating the efforts and recourses to solve, aid, support all related factors by its priorities. Via specifying bio-medical management main factors i.e.(legislations, specializations, cycle, design, technologies, requirements, recourses, qualifications, and enforcement). Moreover, the scholar clarifies the

weaknesses of each factor, then studies the existence of modern scientific approaches. Eventually, the scholar indicates some recommendations which he deeply believe will solve the medical waste management dilemma in Yemen permanently and strategically.

### The current Situation

Rare health care facilities -most of them from private sector- following some sort of medical waste policies, their least have functional Internal incinerators. In the other hand some big hospitals have complied with the instructions of waste segregation. Shockingly all types of waste are gathered by the funds of cleaning and improvements, and eventually dumped in the waste land field. Which means that the whole procedures and efforts are meaningless and a waste of time and resources. Such problem results in the spread

of diseases and epidemics such as Cholera. Cholera's main spreading factor– in the scholar's professional opinion – is resulted from the cholera treating centers. That is due to the poor centers' infrastructure of sewer systems (liquid waste). Ironically, were funded by WHO itself! Such issue cannot be recognized unless knowing its fundamentals as follows:

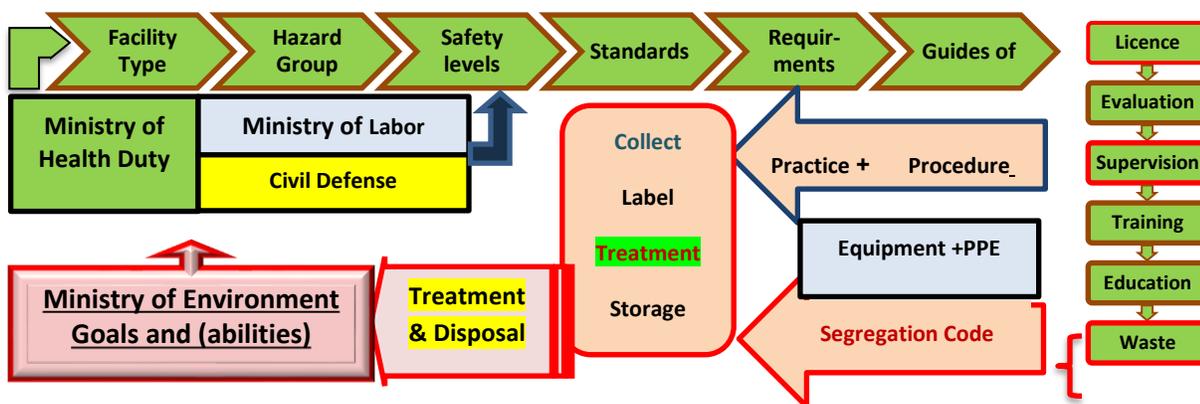
### 1. The fundamentals of medical waste management

Medical waste is defined as the highly infectious and hazardous waste which are generated from healthcare facilities that can cause severe health threatening effects on healthcare workers, general population and environment. Therefore, special

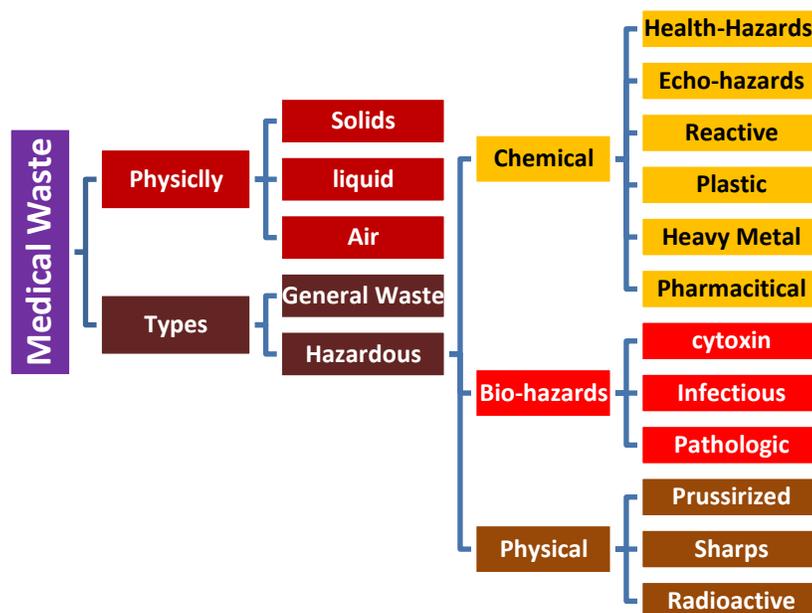
procedures need to be taking to contaminate then eliminate its risks. This can happen via following a standard protocol starting from the Point of generating through the prosses of classifying, collecting, gathering, labeling, storing, transporting, and finally treating and disposing of the waste in a safe way.

### 2. The cycle of medical waste

Each healthcare and research facility has its own waste properties according to its specialty and size. That requires careful study of the hazardous waste by preforming a risk assessment of its waste to determine the best practices to be obtained. The following figure simplifies this cycle:



**Types of Medical waste:** The following diagram describes general types of medical waste:



### Segregation codes

The hazardous medical waste must be separated from the general waste, then treated in a special way to avoid its hazards and to insure safe disposal and recycling process. In order to do that each country and state got to build its own segregation code as long as it serves their goals/needs. Therefor there isn't a global or standard

Segregation code, so it's the responsibility of each country, state even hospitals to choose its own segregation code that is designed to separate the waste according to its treatment and disposal Methods. The below is an example of the most suitable segregation code for Yemen needs according to the scholar's opinion.



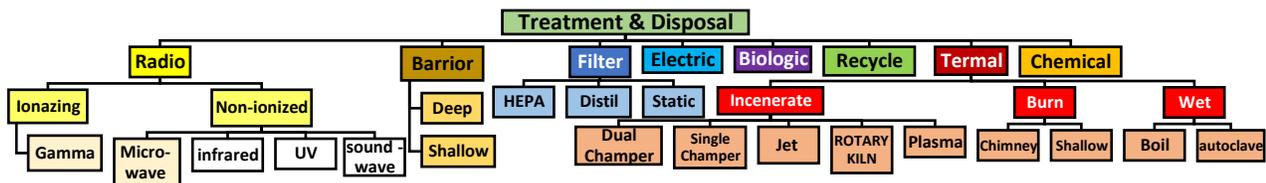
### Medical Waste Management:

The general proses of medical waste management can be understood as the following;



### Medical Waste Treatment and Disposal:

Medical waste treatment and disposal methods are subdivided into eight .The below diagram clarifies them accordingly.



### Contemporary Scientific standards:

Due to the complexity of medical waste management, Its application is co-related with many Fields as;



### Methods:

#### 1.1. Specifying, Analyzing and Rating the Main Factors of Medical Waste Management:

Throughout a systematic study of the essential requirement needed to implement medical waste management, the scholar specified (8) main factors which are:

- a. **Legislations:** the presence of legislations, treaties, standards and Laws (locally/ Internationally) imposes the implementation of medical waste management.
- b. **Specializations:** the study to present laws and regulation that specifies and organizes the roles institutions related to medical waste management.

- c. **Designing:** the effective, strategic and well-studied approach of designing Medical Waste Policy (segregation code-projects- procedures-process- roles- management-...etc).
- d. **Technologies:** the technological abilities that determine the methods of dealing with medical waste and local integration to provide and supply its needs.
- e. **Requirements:** the required assistance for managing medical waste.
- f. **Recourses:** the recourses needed to operate and fund processors for medical waste.
- g. **Qualifications:** the technical, educational, media, general awareness and Knowledge must be obtained to ensure the efficient

participation of workers and people with medical waste management.

- h. **Enforcement:** the presence of compiling measures to insure following Medical Waste Procedures.

According to the scholar participation as a trainer and consultant in this field he has evaluated the related institutions and compared currant capabilities, structures, facilities, standards, guides staff and history against the law of establishment and regulation. For the purpose of this study the scholar indicated different colors as flags to indicate the suitability level of each factor as follows:

Colors	Red (R)	Orange (O)	Yellow(Y)	Green (G)
Evaluation	very poor	Poor	Weak	Good

**1.2. Following the contemporary Scientific Standards Evaluation:** By measuring the practice, applications, awareness, Existence Guides and Procedures of These advanced approaches, and scholar experience due to his participation in the Field as a trainer and consultant in the studied sectors.

**Previous studies:** there are no Data-statics-Reports- Resources where found in regard to the factors of medical waste in Yemen except for four studies implemented on some governmental hospitals measuring -only- Waste managements practice, and all of them conform the lack of knowledge and practice of medical waste, see

Resources: [11][12][13][14] [15][17][19]. This study is different from the previous studies by analyzing the factors that lead to this issue.

## Results and Discussion

### 1.3. Factors Analysis

**1.3.1. Legislations:** Yemen is compiled to the international law , signed Basil Stockholm, Noterdam Treaties, and complied to UNEP, ILO, OSHA, ICRC and WHO legislation specially. Therefore, Yemen had to executed medical waste management as a national law as follows:

Law	Name		Flag
20-1999	The establishing of cleaning and improvement fund	Weak +conflicting + Not Effective	R
26-1995	Environment protection law	Weak +application failure	O
39-1999	General Cleaning law	Weak + application failure	R
4-2000	Local governance law	First factor of this problem	R
9-2006	Presidential declare to transfer all Waste responsibilities from the ministry of General Project and Inhabitation to the Ministry of Local Governance.	We consider that law is the main factors led to this disastrous situation+ against the law because (law must be replaced <u>Only</u> with a law)	R
16-2004	Pollution protection of marine life	Notes about application	Y
24-1997	Civil defense law	Weak+ no executive guide	O
60-1999	Private medical and healthcare facilities law	Weak +conflicting	R
9-2007	Joining the treaty of radioactive physical protection	Ok	G
14-2006	The approval of joining Basil Treaty	Ok	G
24-1994	Vice minister declare of public clean and	Weak and old + application failure	R

Law	Name		Flag
	healthy environment and its violations		
33-2002	Water law	Weak	R
19-2002	Construction Law	Conflicting	R
<b>Main problems with National laws:</b>			
<ul style="list-style-type: none"> <li>- The changing of ministries names :( Ministry of General Works and Civilized Planning &gt; General Works and Streets) and (Ministry of supply and Commerce &gt; Commerce and Industry)</li> <li>- Old laws, conflicting, poor writing, no consideration of other laws and poor executing.</li> <li>- The Ministry of Local Governance has a big gap in the law of establishing the cleaning and improvement fund.</li> <li>- The transaction of the Fund's of cleaning responsibility from the Ministry of General Works and Civilized Planning to the Ministry of Local Governance.</li> <li>- There are conflicts of specialty between the (Ministry of General works- Civil Defense-Ministry of Health -Ministry of Local Governance-Ministry of Water and Environment- Ministry of Commerce and Industry- Ministry of Social Affairs and Labor- Ministry of Civil Duty )regarding (standardization-license- facilities design-reporting-safety- funding-inspection- evaluating- fees collection-...etc)</li> <li>- The failure to transfer the waste collection from the Funds of Cleaning and Improvement To cleaning projects.</li> <li>- There are a huge amount and conflicted authorities.</li> </ul>			
<b>Result:</b>			
<ul style="list-style-type: none"> <li>- Other studies must be established to analyze the national laws' problems.</li> <li>- Huge and conflicted Authorities must be studied and minimized.</li> <li>- The local Governance is the main Problem.</li> <li>- We suggest Establishing careful study of the Government General structure.</li> </ul>			

**1.3.2. Specializations:** according to the Yemeni Law the responsibility of medical waste is organized as follows:

**a. Waste treatment:** to execute the following activities by the Ministry of water and Environment/Local Governance – Funds of Cleaning and Improvements.

Activity	Status	Flag
Collecting medical waste from healthcare facilities.	Poor +As a general waste only	R
Specialized department for hazardous waste	Only in the ministry + unqualified staff + corruption + frozen	R
Specialized sectors for treatment and disposal	No	R
Transporting medical waste.	As a general waste only	R
Medical waste Treatment.	All waste is dumped	R
Waste disposal and recycling.	All waste are dumped	R
Service's fees collecting.	Yes, but as general waste	R
Violations detecting and fines imposition	Poor	R
Supervision of healthcare facilities infrastructures specially sewer systems	No	R
Supervision of healthcare facilities internal treatment of medical waste.	No	R
<p>The Funds and Ministry of Water and Environment which- basically- don't have any requirements, plants, trained staff or specialized sector of medical waste treatment. In the other hand, the scholar discovered that many funds received a lot of support and aid of bio-medical waste as: treatment equipment's, PPE, transportation trucks, incinerators, fuels and training, thus corruption in the funds extremely high. see [15]</p> <p><b>*Notice:</b> Funds workers open the Medical waste bags to search of any saleable things And polluting all other waste which eliminating the goals of segregation.</p>		

**b. Medical Waste Management:** executing the following facilities by the Ministry of Public Health- healthcare facilities.

Activities	Status	Flag
Specialized Department of medical waste	Yes+ new+ poor staff	Y
Guide of medical waste	Yes + poor quality	O
Supervision of Healthcare facilities infrastructures especially medical safety systems.	No + There is no standard	R
Supervision of Healthcare facilities in the field of complying of Policies, standards, procedures, Requirements, qualifications, Reports, especially Medical waste management & Infection control processes.	Poor & corrupted+ only in private big hospitals	R
Issuing License of work to Healthcare facilities After checking the meeting the essential standard & Quality Evaluation & performance rating.	NO There is no standard	R
Guiding, Training, Supporting, and Developing Healthcare facilities and Medical staff.	Poor & corrupted	R
Ensuring that Healthcare facilities are comply with the specified Segregation code and its procedures.	Poor & corrupted+ only in private big hospitals	R
Ensuring that Healthcare facilities internal disinfection and cleaning Effectiveness and quality.	Poor & corrupted	R
Ensuring that Healthcare facilities provides the suitable Personal Protective Equipment and safety equipment to its staff.	No	R
Executing surprise and regular Inspections of staff qualifications and capabilities.	Poor & corrupted+ only in private big hospitals	R
Ensuring Biological safety and security Level's standards & requirements are applied.	No There is no standards	R
Database	No	R
<p>The ministry of public Health- that received the lion share of funding and NGO support- established a general department for Medical waste and issued many guides (which are weak in my professional opinion), thus the absence of standard healthcare requirements and the high corruption in the ministry (in all levels of its hierarchy) Results to the waste of recourses.</p> <p>During my searches I found that all medical and Health educational institutes and colleges does not have any curriculums of infection control or medical waste management! Which indicates the ignorance of Healthcare personals in this field</p> <p>Poor commitment and Performance of Healthcare owners' staff (Medical-Technical-Administrative) because of Poor Enforcement and Law awareness of this field See [11][12][13][14].</p>		

**c. Ministry of labor and social affairs: by executing those activities:**

Activities	Status	Flag
<b>Note:</b> also, civil services Law	No standards	R
Issuing License of work to Healthcare facilities After checking the meeting the essential standard & Quality Evaluation & performance rating.	No standards + not enforced + corruption	R
Guide for Occupational safety	no	R
Issuing Health and fitness of the New employees.	No standards + not enforced	R
Executing surprise and regular Inspections on Healthcare facilities to ensure its commitment with labor Law Specially the providence of suitable Personal Protective Equipment, annual staff Health check, occupational hazards and limitations, Exposure safety, and General safety equipment.	No + no standard+ no qualified staff + corruption	R
Investigation of occupational: injuries, accidents, diseases, complains.	No + no standard+ no qualified staff + corruption	R
Gathering labor data and analyzing it.	No	R
Ministry of labor and social affairs is totally absence and lake of motivation, qualified staff, high corruption rate and had no role at all in any field (Paralyzed institute).		

**d. Ministry of internal affairs- civil defense authority** by executing those activities:

Activities	Status	Flag
Issuing License of work to Healthcare facilities After checking the meeting the essential Requirements.	No + no standard+ no qualified staff + corruption	R
Ensuring Biological and Chemical safety and security Level's standards & requirements are applied.	No + no standard+ no qualified staff + corruption	R
Executing surprise and regular Inspections on Healthcare facilities to ensure its commitment with emergency management requirements.	No + no qualified staff + corruption	R
Supervision of hazardous waste safe Transportation, Treatment, disposal.	No + no qualified staff	R
Managing any argent or wide emergencies, and investigating its causes.	Poor + no qualified staff	R
Investigation of accident: injuries, accidents, diseases, complains	No + no qualified staff	R
Managing any argent or wide emergencies, and investigating its causes.	No + no qualified staff	R
Civil Defense Authority has no idea of its role in this field also it have not any qualified personals, beside that corruption rate is high. See [15].		

**1.3.3. Design:** It's important to carefully study the strategy of medical waste management at all its stages, as it will be the first step of planning activities, during our analyzes we have found these results:

- a. The ministry of Health – independently Created segregation code Described in the National Training Guide for Infection control and Prevention (NTM-IPC-2019) see[16] , specifying 5 Segregation codes. The following are our opinion about it:
  - Internationally Wrong colored codes Ex. Blue indicates to Radioactive Waste?!
  - Obvious no cooperation with Ministry of Environment or others.
  - No code for Plastic Waste!.
  - The guide jumps to Fire Treatment and disposal practices.
- b. No reference of the other related authorities.
- c. The ministry of Health assumes Healthcare facilities Got to Treat Medical waste internally! Which is illogical and inexecutable.
- d. The ministry of Health considers Medical waste management is it's Responsibility!
- e. There are no Guide or standard followed of Private Healthcare Facilities requirements.
- f. There are no Guide or standard followed of Governmental Healthcare Facilities Evaluation or any activities of Evaluation.

**1.3.4. Technologies:** Medical waste management requires a technological capability to Be executed effectively and efficiently there for a

Technological assessment must be carried to determine the available & suitable Methods of Medical waste Treatment and Disposal, such as:

- a. Centralization or de- Centralization of Medical waste Treatment.
- b. Treatment, Recycling, Disposal Methods of variant types of hazardous waste.
- c. Capability of managing any levels of accidents.
- d. The local integration ability of supplement.
  - e. the ability to get benefits of Treated waste.

Activities	Status	Flag
International fund and Project	(Wasted+ Corruption)	R
Government fund and Project	No (+Corruption)	R
Facilities	Poor	R
Equipment	Poor	R
Tools	Poor	R
Financial Sustainability	Poor	R
Investing opportunities	Low	R

**1.3.5. Requirements:** efficient Medical waste management demands the existence of many requirements, such as, Treatment plants and Equipment's, disposal locations, storage warehouse...etc. all that must be analyze to determent which strategy will be held of:

Activities	Status	Flag
International fund and Project	(Wasted+ Corruption)	R
Government fund and Project	No (+Corruption)	R
Facilities	Poor	R
Equipment	Poor	R
Tools	Poor	R
Financial Sustainability	Poor	R
Investing opportunities	Low	R

**1.3.6. Recourses:** currently Yemen unable to obtain any resources required to establish or funding Medical water projects and Practices in both governmental or Private sectors, also Healthcare facilities and people can't handle the costs of it, therefore a feasibility study must be accomplished aims to seek the most economical strategy will be choosing ,also a financing study is needed to search funding and supportive aid. All that might be organized in one condition which is solving corruption in the public sectors. Either than that any efforts will be vaporized.

Activities	Status	Flag
International fund and Project OCHA, WHO, EU, SIDA, UNDP, WORLD BANK, JICA, GIZ, USAID, MCU, NICEF, ICRC, UNEP	(Wasted+ Corruption)	R
Government fund and Project	No (+Corruption)	R
Economical	Poor	R
Political	Poor	R
Governance	Poor	R

**1.3.7. Qualifications:** any project of medical waste management must be associated with Human Resource capabilities building and public awareness, because of that there is a need to extinguish these major projects.

Activities	Status	Flag
Medical and Health Education curriculums	No	R
Chemical and Biology Education curriculums	No [15]	R
Engineering and Environment curriculums	No	R
Training activates	Poor- Rare	Y
Consultant and Experts	Rare- unsupported	O
Public awareness & Media activates	No	R
Development and Research centers	No	R

**1.3.8. Enforcement:** due to the Weakness of governmental sector ( and its absence in southern Yemen) and the disability to issue any Laws due to-the political situation- and high corruption of the executive and legal institution.

It's hard to Enforce medical waste practice al over the country but this factor is temporary and we hope it- eventually- will be fixed

Activities	Status	Flag
Existing laws	Poor	R
Ability of Developing new law	No ability (political)	R
Application abilities	Poor +corruption	R

**Evaluating the Following contemporary Scientific standards:**

Chemical safety and security	Biohazard safety and security	Occupation al safety and Health	Infection Control	Medical Quality and Standards	Epidimic and Disease Quirantine	Paicant Safety	Risk & Emargancy Managment	Hazardous Substance Transportin g
No Standards Guids or Training	No Standards Guids or Training	No Standards Guids or Training	Weak Standards Guids or Training	No Standards Guids or Training	Poor Guids or Training	Poor Standards Guids or Training	No Standards Guids or Training	No Standards Guids or Training

### 1.1. General Results of the Factors:

Figures	Current Application	Previous studies	legislations	Specializations	Cycle of Design	Design	Technologies	Requirements	Recourses	Qualifications	Enforcement	Scientific standards
Rate	Bad	Bad	Bad	Bad	Bad	Bad	Bad	Bad	Poor	Bad	Bad	Poor

### Conclusion

- Current Extreme absence of medical waste management in Yemen, and all efforts aims to the solid waste only, and total ignorance of liquid and air waste requirements.
- Medical waste must be corrected as an environmental figure and specialization.
- Total absence of statics, rare researches, absence of interest & care on this field.
- Catastrophic Absence of standardization, and poor Guides preparation.
- The conflict of spatialization between public sectors must be solved.
- The corruption in the governmental sector is the major challenge.
- Obvious uncleared study of the priorates of the NGO's And Even form WHO.
- I guarantee that No results will be accomplished despite of the huge support.
- According to my estimation Yemen will continue suffers of Epidemic and Diseases. And It will become a diseased and infectious zone that which will thread the whole world.

### Decision

- An argent need to eliminate corruption in the public sector.
- An argent need for establishing full and wide Need assessment project, followed with a strategic plan to build the Infrastructure needed for waste management in Yemen.
- It's important to develop Developmental and Educational sector.
- The NGO's must follow a systematic approach to select the Priorities of it's activates.
- I highly suspecting NGO's corruption also I demand an investigation of its activities led to mass wasting of funds and lake of evaluation of executed projects throughout 3 decades.

### Recommendations:

- All who might be concerned must carefully study this research, and support its followed activities which the author is willing to execute (specially by UN and NGO's) and support Translating and publishing this research.
- A total and comprehensive strategic study and plan must be established by an independent committee of local & foreign experts working under UN supervision to solve this issue in all of its variant factors especially legal and speciality factors.
- It's an argent matter to support establishing and support an independent, Health and safety specialized Research and Development center.
- An argent need to execute a national annual scientific conference for Medical waste management in Yemen to search and develop this important figure (as soon as possible).

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### References

- Yemeni Laws.
- Wikipedia: Health in Yemen.
- UNICEF (Yemen) website: [www.unicef.org](http://www.unicef.org).
- World Health Organization (Yemen report 2020)- website: [www.who.org](http://www.who.org)
- World bank Report of Yemen 2020- [www.worldbank.org](http://www.worldbank.org).
- Ministry of Public Health & Population- Yemen Website : [www.moh.gov.ye](http://www.moh.gov.ye).
- Healthcare facilities Evaluation tool- [www.moh.gov.ye](http://www.moh.gov.ye).
- Public hospitals standards-[www.moh.gov.ye](http://www.moh.gov.ye).
- Health cluster Yemen- Bulletin April- may 2020.
- CERC- Environmental and social management framework -Yemen Emergency Health and Nutrition Project.

11. Al-Emad, A. A. (2011). Assessment of medical waste management in the main hospitals in Yemen. *Eastern Mediterranean Health Journal*, 17 (10):730-737.
12. Alwabr, G. M. A., Al-Mikhlaifi, A. S., Al-Hakimi, S. A., Dughish, M. A. (2016b). Determination of medical waste composition in hospitals of Sana'a city, Yemen. *J. Appl. Sci. Environ. Manage.*, 20 (2): 343– 347.
13. Alwabr, G. M. A., Al-Mikhlaifi, A. S., Al-Hakimi, S. A., &Dughish, M. A. (2016a). Identification of bacteria and fungi in the solid waste generated in hospitals of Sana'a city, Yemen. *Current Life Sciences*, 2 (3): 67-71.
14. Al-Awar MAS Nagi, AM. The Perception of Mothers on Malaria, Toxoplasmosis and Their Pathological Consequences in The Mother and Baby at Hajjah Saudi Hospital, Yemen. *Al-Razi Univ J Med Sci* 2021; 5(2): 12-19.
15. Alwabr, G. M. A , Ahmed S. Al-Mikhlaifi , Saif A. Al-Hakimi , Munira A. Dughish. (2017). Risk assessment of the current handling of medical waste in hospital of Sana'a city, *International Journal of Science and Technology* ISSN 2454-5880 YEMEN-DOI-<https://dx.doi.org/10.20319/Mijst.2017.31.0109>
16. Al-Sohpany Shehab – Encoded Safety Instruction- 2021
17. National Training Guide for Infection control and Prevention (NTM-IPC-2019).
18. Modhesh Mohamad. Medical waste in Taiz city in Yemen and its effects to humans and environment 2019. Taiz university. *Educational & Humanitarian studies magazine* (folder 4-no 4), ISSN(2617-5908).
19. Emergency waste assessment-Yemen-UNDP- August 2015- guide.
20. Aljobani Nawal. The relation of medical waste in Occupational Safety & Health for the workers of public Hospitals- Capital city.(2018) master degree- Andalus University.
21. Al-Awar MAS, Salih EMA, Ismailovich DC. Role of Catha Edulis (Khat) in Free Radicals Formation in Vivo and in Vitro Study. *London Journal of Research in Science: Natural and Formal*, 2017; 17 (1): 37-41.
22. Al-Awar MSA, Al-Eryan MAY. Effect of the ethanolic extract of Catha edulis leaves on the electrical activity of some brain centers of male rabbits. *International Biological and Biomedical Journal*, 2017; 3 (3): 133-137
23. Nabil S. Shwtar NS, Hekmat M.M. Tantawy HMM, Saleh NEH and Al-Awar MSA. Oil pollution in Lake Timsah, detection and bioremediation through rearing of Mugil cephalus and Tilapia zillii. *Al-Razi Univ J Med Sci* 2020; 4(2): 1-24.