Asian Journal of Green Chemistry 8 (2024) 217-233

SPC

Asian Journal of Green Chemistry

AJGC Asian Journal of Green Chemistry

Original Research Article

View Article Online | View Journal

Burning or Burying Waste Increases the Risk of Cancer, Epidemics, and Environmental Issues Affecting the Atmosphere, Land, and Water

Salma Korbag*, Issa Korbag

The sciences Faculty, Benghazi University, Kufra City, Libya

ARTICLE INFORMATION

Submitted: 2023-10-14
Revised: 2023-11-12
Accepted: 2023-12-12
Manuscript ID: AJGC-2310-1453
Checked for Plagiarism: Yes
Language Editor Checked: Yes

DOI: 10.48309/ajgc.2024.420730.1453

KEYWORDS

Waste
Environment
Management
Buried or Burned
Municipalities

ABSTRACT

The growing population of Libya poses a significant environmental threat due to waste management challenges, including household, military, medical, electronic, hazardous metal landfills, heavy metal pollution, and methane emissions contributing to global warming. Waste management in Libya is poor, with incineration and landfilling leading to various diseases as cancer, respiratory, dermatological, and gastrointestinal ailments. Online surveys show a high rate of incineration (68%), followed by 23% landfilling, and while recycling rates are low or non-existent, with only 2%. Toxic metals can harm organs, water, soil, and air particles, necessitating waste management education and legislation on hazardous chemicals.

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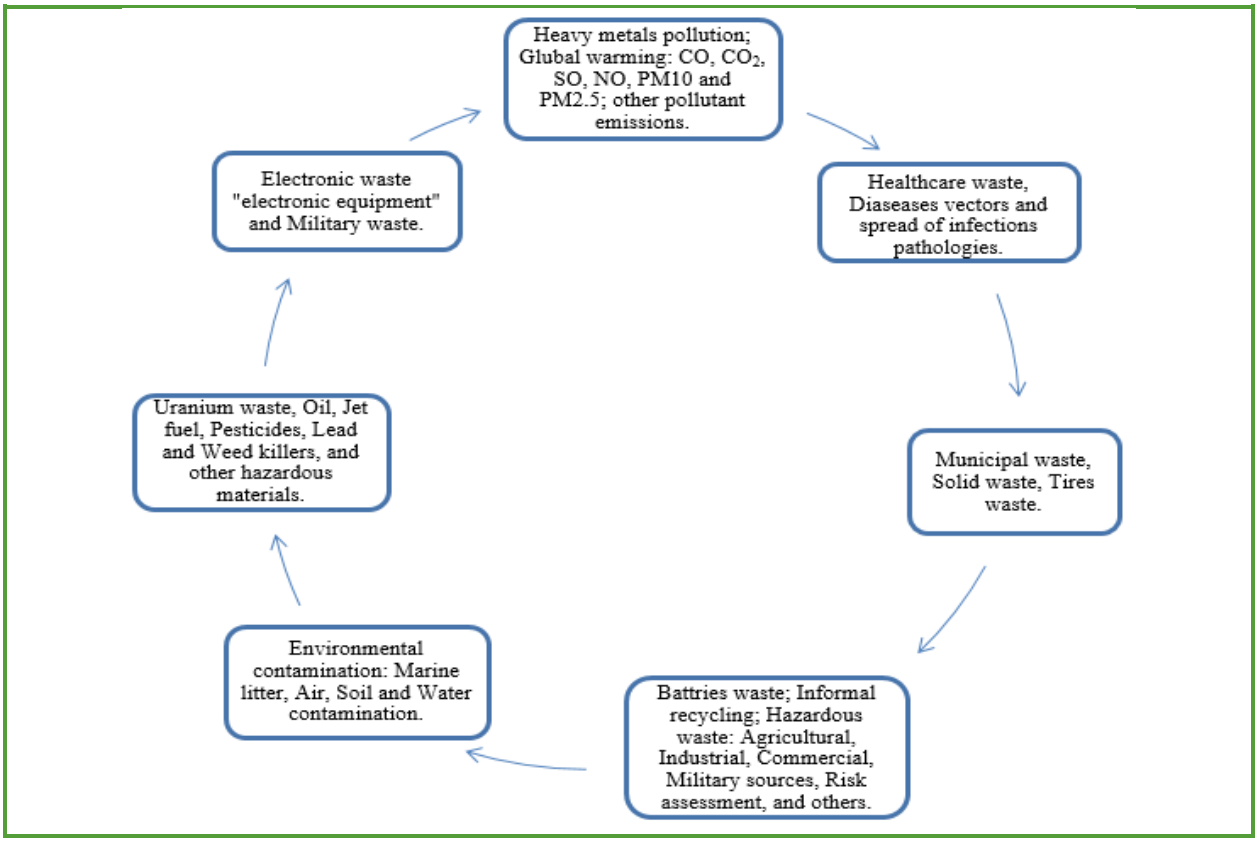
Corresponding authors, email: salma.omar46@yahoo.com, Salma84m@yahoo.com (S. Korbag).
Tel.: 0922690468.

Graphical Abstract



Introduction

The biggest challenge facing government officials in developing nations is handling waste issues of all kinds, including household waste (HW), military waste (MW), electronic waste (EW), metal waste (MEW), medical waste (MMW), and others, a budget burden on the state [1-3]. Additional factors contributing to the acceleration of the increase in the rate, quantity, and quality of wastes production in rising countries include a thriving economy, urbanization, a rise in population, and an improvement in living standards [4, 5]. The environment and human health may be negatively affected by different forms of trash, depending on how they are disposed of [6]. Plastic is one of the most dangerous types of solid trash because it is devoured by both terrestrial and marine creatures and remains for a very long period [7, 8]. It is also an increasing concern both worldwide and locally. Global warming emissions (GWE) have, on the other hand, considerably damaged the environment, creating diseases and unbalances in the ecological and food systems on water, land, and air bodies [9]. Furthermore, open waste burning releases a considerable amount of toxic air pollutants that are damaging to humans and other living things, especially in developing nations [10, 11].

Heavy metals, a chemically stable substance, pose a global health risk due to their accumulation in living bodies. They can come from natural sources like erosion and volcanic activity, as well as man-made activities like mining, pigments, cosmetics, varnish, paints, leather processing, fertilizers, and metal

electroplating, fuel burning, traffic, and agriculture. The main source of toxic metals is municipal wastewater and industrial effluents, with urban population growth and industrial progress contributing to widespread contamination, affecting water quality and neurological systems [12]. Heavy metals like chromium, Cd, and Ni are produced by leather processing waste and electroplating, while mercury is released from coal burning. Heavy metals, found in water, atmosphere, and food, pose a significant threat to both the environment and humans, potentially leading to severe health issues and even death [13].

Street dust, containing silica, organic pollutants, and trace heavy metals, is a significant urban environmental issue affecting human health due to heavy metal contamination and PM_{10} emissions. Thus, dust particles can be contaminated by various factors such as anthropogenic activity, soil erosion, atmospheric deposition, road surface paint, brake pad dust; combustion exhaust, tire abrasion products, and pavement wear, affecting half of the world's population living in cities [14-21].

Pesticide contamination in fruits and vegetables compromises health benefits due to carcinogenic, mutagenic, and teratogenic effects. These chemicals are used in agriculture for field and post-harvest protection, making them a significant concern for regulation and addressing their severe toxicity [22]. Pesticides are primarily transmitted through contaminated foods, either directly treated or grown in polluted fields. Contaminated foods can cause paralysis, death, cancer [23], allergies, hypersensitivity, nerve damage, reproductive abnormalities, miosis, urination, and damage to the immune system. Prioritizing food quality and balancing risk is crucial.

The toxic by-products of wood preservatives are linked to various life-threatening diseases, including cancer, stroke, and heart disease. Environmental pollution from industrial effluent, pesticides, and solid waste disposal poses serious health risks to both biological and natural health. These hazardous compounds contaminate water, air, and soil systems, cause oxidative stress, nutritional imbalance, plant discoloration, and plant necrosis, affecting plant performance and communities. Contaminated soils accumulate in food chains, leading to biodiversity loss and a decline in soil productivity [24].

The study emphasizes the importance of recycling, composting, or burning waste to increase economic output. It highlights the risks of burning, burying, and improper waste storage, and the need for proper waste management. The study suggests adopting conventional techniques in infrastructure development to address sanitation issues and reduce environmental impacts. It also emphasizes the need for public awareness of the UN's Sustainable Development Goals to reduce net waste generation by 2030 [25]. The study investigates waste accumulation in 10 Libyan cities, including Tripoli, Misurata, Benghazi, Sirte, Tobruk, Bayda, Sabha, Kufra, Zuwarah, and Marj, as depicted in Figure 1 and Table 1. This article evaluates the negative impacts of dominant waste management practices on human and environmental health in Libya cities. It presents research methodology, reviews major practices, and provides recommendations for authorities to address challenges and mitigate risks.

Experimental

Salient features of the study areas

The study focuses on large cities that have experienced garbage buildup, as depicted in Figure 1 and Table 1.

The survey was conducted in certain Libyan municipalities

A 700-participant survey in Libya aimed to raise awareness about waste burning and burying risks in municipalities. Participants aged 18-62 were randomly selected for the 44-question survey, conducted through interviews and social networking platforms. The survey aimed to establish effective waste management techniques and educate residents on waste control and reduction. Results are presented in Tables 2, 3, 4 and 5.

Interrelated variables

Researchers utilized data from the survey on respondents' ages, educational histories, and cultural competence to assess their cultural and technical waste management expertise.

Statistical analysis

The study utilized EXCEL for data analysis and assessed waste management knowledge. Respondents were divided into four groups for statistical analysis: "Yes," "No," "Unknown," and with "Other" allowing participants to express ideas and comments. The study investigated the correlation between municipal garbage increase, education, culture, ignorance of burning and burial dangers, improper storage of outdated military equipment, and disease incidence and cancer spread.

Figure 1. The geographical layout and municipalities in Libya

Table 1. A comprehensive overview of Libya's geographical areas

Municipality (cities)	Geographical area (km^2)	The daily garbage amount is approximately
Tripoli	1,507	300,000 tons
Misurata	207	≈ 510 tons
Benghazi	314	≈ 24,000 tons
Sirte	77,660	≈ 8,000 tons
Tobruk	97.18	≈ 3,000 tons
Bayda	11.43	≈ 12,000 tons
Sabha	15,330	18,000 tons
Kufra	483,510	≈ 5,000 tons
Zuwarah	2,890	400 tons
Marj	10,000	338,000 tons

Table 2. A comprehensive overview of waste awareness and waste management initiatives

The study used a 44-question questionnaire to gather opinion data on waste management methods and awareness programs

Gender: Male Female Age: Education level: Municipality:

No.	Questions	Yes (%)	No (%)	Unknown (%)	Other (%)
1	The waste types include solid, liquid, gas, electronic, and others.	71.8	7.7	12.8	7.7
2	The daily waste disposal rate is set at 20 kg per person.	15.4	38.5	33.3	12.8
3	Are there methods used to dispose of waste? If yes, please mention them?	20.5	35.9	12.8	30.8
4	Is there a designated waste yard?	64.1	33.3	2.6	-
5	The municipality does not provide a common waste collection center.	48.7	33.3	17.9	-
6	Is there a consistent process for disposing of dumped waste?	25.6	71.8	2.6	-
7	Do you have any knowledge about environmental waste management?	41	53.8	5.2	-
8	Have you ever participated in any awareness program on waste management?	23.1	74.3	2.6	-
9	Do you know the principle of characterization of waste management?	23.1	64.1	12.8	-
10	Do you know the principle of reducing household waste and wastes management?	30.8	56.4	12.8	-
11	Do you know of any household waste management educational programs supported by state, municipality, private or public institutions, local or international companies specialized in your country?	7.7	82	10.3	-
12	Have you participated in an educational and awareness program for waste management, supported by the state, municipality, or other entities?	2.6	97.4	-	-
13	Do you have knowledge of the waste management program in your school or university?	15.4	74.4	10.2	-

14	Do you think school and university principals play a crucial role in implementing waste management in these institutions?	43.6	43.6	12.8	-
15	Do you have any knowledge about waste separation?	69.2	23.1	7.7	-
16	Do you think learning waste separation is important in school, university, and home?	84.6	7.7	7.7	-
17	Do you know an efficient waste management system for schools and universities?	35.9	53.8	10.3	-
18	Is the reader aware of the potential negative effects of waste management?	48.7	38.5	12.8	-
19	Do you Know the penalties for waste management violations in other countries?	35.9	56.4	7.7	-
20	Do you understand the concept of e-waste?	43.6	41	15.4	-
21	Do you have knowledge on how to properly dispose of electronic waste?	15.4	64.1	20.5	-
22	Do textbooks cover environmental topics related to household waste management?	23.1	48.7	28.2	-
23	Are you prepared to learn about environmental issues and concerns?	92.3	2.6	5.1	-
24	Are you dedicated to minimizing waste?	64.1	20.5	15.4	-
25	Do you separate solid, liquid, and gas waste at school or household?	23	74.4	2.6	-
26	Do you use kitchen waste as a fertilizer?	20.5	79.5	-	-
27	Is there a litter box located on the road side?	41	56.4	2.6	-
28	Is there a system in rubbish bins that categorizes waste based on its liquid, solid, gaseous, or electronic properties?	-	97.4	2.6	-
29	Do you dispose of your solid waste in your school, home, or on the street?	35.9	59	5.1	-
30	Do you encounter any issues with garbage on the side of the road while going to school, university, home, or work?	69.2	30.8	-	-
31	Are you familiar with vermicompost and natural compost production?	38.4	59	2.6	-
32	Do you understand the potential health risks linked to military, medical, and mineral waste?	14	-	86	-
33	Is there explores the potential correlation between cancer, epidemics, and waste from various industry such as military, medical, mineral, and agricultural?	8	-	92	-
34	Do you use burning, burying, and throwing waste in open lands, streams, seas, and rivers for disposal?	100	-	-	-
35	Do you use burning as a method for disposing of household and other waste?	99	-	-	1
36	Do you dispose of waste through burial and dumping in open lands, streams, seas, and rivers?	89	4	-	7
37	Do you recycle waste in a responsible and environmentally friendly manner?	7	80	-	13

38	What do you know the impact of methane gas on the environment and global warming?	-	100	-	-
39	What are the possible negative consequences of airborne particulate matter (PM) on ecosystems and the health of living things?	-	-	100	-
40	Are there metal and chemical pollutants found in waste pose a significant environmental threat?	100	-	-	-
41	Is there raises concerns about the potential presence of harmful substances in mothers' breast milk?	-	100	-	-
42	Are breastfed infants are exposed to harmful substances?	-	100	-	-
43	Is waste forms linked to endocrine disorders, breast and testicular cancer, and genitourinary system cancer?	11	-	89	-
44	Do you have any suggestions on waste management? If yes, please provide a specific suggestion.	7.7	51.3	20.5	20.5

Table 3. Data on waste management in specific regions

Disposal procedures	n=700 (%)
Incineration	478 (68)
Composting	13 (2)
Buried	163 (23)
Open Land	25 (4)
Dumping	5 (1)
Recycling	16 (2)

Table 4. Sociodemographic data on respondents and participating localities

Municipality	n=700	%
Tripoli	106	15
Misurata	72	10
Benghazi	125	18
Sirte	68	10
Tobruk	36	5
Bayda	25	3
Sabha	47	7
Kufra	188	27
Zuwarah	21	3
Marj	12	2
Ages (years)		
<20	33	5
20-43	178	25
44-62	489	70
Education level		
Without formal education	15	2

Secondary school	38	5
Bachelor's degree (undergraduate)	53	8
High education	594	85

Table 5. A significant correlation between sociodemographic traits

Quality : Pearson's correlation coefficient (p)	
Disposal procedures	0.500
Gender	1
Municipality	0.101
Ages (years)	0.957
Education level	0.653

Results and Discussion

Waste management is a significant environmental issue, and municipalities must provide efficient systems for the population. The amount and composition of waste in municipalities are crucial for selecting appropriate waste management systems and converting them into energy through the Waste-to-Energy (WTE) process. Large cities are most affected by waste management issues due to rapid population growth and urbanization. There are no regulations governing landfills, leading to waste being dumped in rivers, public spaces, deserted lands, roads, and alleys. Policymakers and mayors are taking responsibility for regulating waste disposal in public areas by increasing the number of uncontrolled landfills.

The UN's latest statistic reveal that Libya receives 6,077 cancer patients annually, with colon and lung cancer being the most prevalent, followed by breast cancer, bladder, prostate, lymphoma, leukemia, uterine, stomach, and brain cancer, among female cancers, breast cancer has the highest incidence. Libyan associations report high cancer rates, despite local physicians claiming the actual number of patients is far greater than officially recorded.

The National Institute for Oncology in Misurata registered a significant number of cancer patients from various regions, with Misurata leading in west, followed by Tripoli, Al-Khoms, Zliten, etc. Eastern cities like Benghazi, Al-Bayda, Al-Marj and Derna had the highest cases, with Sabha in the southwest, in southeastern Kufra, oases, and Tazirbu have the highest cancer incidence, attributed to unhealthy eating, pollution, and wars.

The study reveals that waste disposal is influenced by factors like cultural attitudes, education, and residential location, with hazardous materials, animal waste, and human waste being the main categories. Tables 2, 3, 4 and 5 present the study's findings, revealing that 64% of participants were women and 36% were men. The study found that the age range of 44-62 has the highest involvement rate (70%), followed by 20-43 (25%), and the youngest (under 20) has the lowest participation rate (5%). The study revealed that 85% of participants had higher education, 8% attended university, and 5% completed secondary school, and compared to 2% with no formal education (Figure 2). 97.4% of participants reported no information about waste from community leaders, institutions, and civil society, while only 2.6% received information. Over the past thirteen years, concerns about municipal

hygiene have increased, with respondents showing low waste management knowledge and often negative opinions, resulting in mediocre waste management. The study revealed a significant correlation between the respondents' sociodemographic traits ($p>0.05$). The study found a significant link between sociodemographic traits and waste management knowledge, with age, education, and occupation affecting public usage, particularly among those under 20. The public's resistance to recycling and waste sorting is attributed to ignorance, inadequate municipal services, financial incentives, environmental regulations, insufficient bins, and transportation costs. Factors such as geographic location, food habits, cultural norms, climate, and occupation also influence trash generation rates, along with lifestyle and economic activities. The results may be influenced by various factors. The study revealed that respondents with lower education levels had less knowledge about waste management, and none of the workforce, including public personnel, was knowledgeable about waste management. The study found that age, education level, and information source significantly influence opinions on trash management, with respondents under 20 years old showing a negative outlook and low knowledge link. The study revealed a weak correlation between environmental beliefs and behavior, primarily due to a reluctance to abandon modern amenities. The participants' attitudes towards the environment are not honest, despite their knowledge of waste management. By educating them about a modern, healthy lifestyle, they can transition from attitudes to behaviors. Despite improving their attitudes, they are hesitant to make lifestyle changes that would require sacrificing pleasure for environmental benefits. The study highlights the importance of educating local residents about waste management to improve their understanding and support for waste management regulations. The public's awareness of the problem and management objectives is crucial to reducing the effects of issues related to waste. If the problem is not addressed effectively, it could lead to increased disease incidence and mortality in the community.

The researchers advocate for sound and sustainable waste management to maintain environmental cleanliness and public health. They believe that a lack of understanding about waste management can lead to negative consequences.

The focus is on raising awareness about the potential environmental and health hazards linked to certain wastes

Municipalities' ineffective waste management policies have led to harmful effects on rivers, groundwater, and waterways, resulting in pathogens, antibiotic resistance genes, persistent organic pollutants, and heavy metals [26-28]. Contaminated water from agriculture contributes to toxic metals and organic contaminants in fresh agricultural goods. The environmental risks associated with waste disposal and landfills, including household, medical, mineral, agricultural, sewage, and military waste, have not been thoroughly assessed. This has led to the release of harmful metals from landfill debris, which often ends up in soil. Understanding environmental pollution can help identify potential risks to communities near landfills and their surrounding soil. Landfills, containing toxic metals like Cr, Co, Cu, Zn, As, Cd, Pb, Hg, and Sc, contribute to soil contamination and environmental concerns [29-34].

Libya's waste management is a technical and environmental challenge due to the large amounts produced by human activity. Only a small percentage of waste can be enzymatically

digested by bacteria due to their enzyme-releasing abilities, while the rest is destroyed through harmful methods like open landfills or incineration. Biodegradable materials are organic substances like plant and animal remains, and can also be manufactured products. Microorganisms can decompose various chemicals, including medications, radioactive isotopes, metals, hydrocarbons, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons [35, 36]; in a typical environment, these chemicals biodegrade spontaneously. Soft soil texture stabilizes heavy metals with oxidation-reduction potential (ORP). Healthy soil, including sand, silt, and clay, is influenced by decomposition and organic matter. The decline in silt and clay is strongly linked to organic matter decline. Soil depth is influenced by soil characteristics and heavy metal behavior, contributing to high levels of pollution in areas less affected by humans. Leaching from topsoil and vertical migration can impair soil piling [37, 38].

The soil in Libyan areas is unsuitable for agricultural use due to industrial waste products like batteries, glass debris, plastics, scrap metal, building debris, military waste, and landfills placed near rivers, aquifers, seas, and soils; that is both point and non-point sources contribute to the buildup and deposition of heavy metals in soil. Heavy metal pollution, including Cu, Cd, Zn, Hg, Pb, Co, and others, is primarily caused by human, agrochemical, and industrial activities such as metal use, dyes, fertilizers, pesticides, cooking utensils, batteries, vehicle emissions, waste burning, old tire burning, and construction and demolition [39-42]. Landfill waste, including incinerated items, accumulates in topsoil, absorbing minerals and organic matter. Incineration in Libya significantly contributes to heavy metal pollution, with fly ash being a significant contributor. Effective stabilization and reuse solutions are needed to address this environmental issue. The survey revealed that incineration is the most common method of garbage disposal in Libyan municipalities, accounting for 68% of all waste disposals, resulting in significant amounts of poisonous smoke in landfills; please refer to Figure 3 and Table 3 for further details.

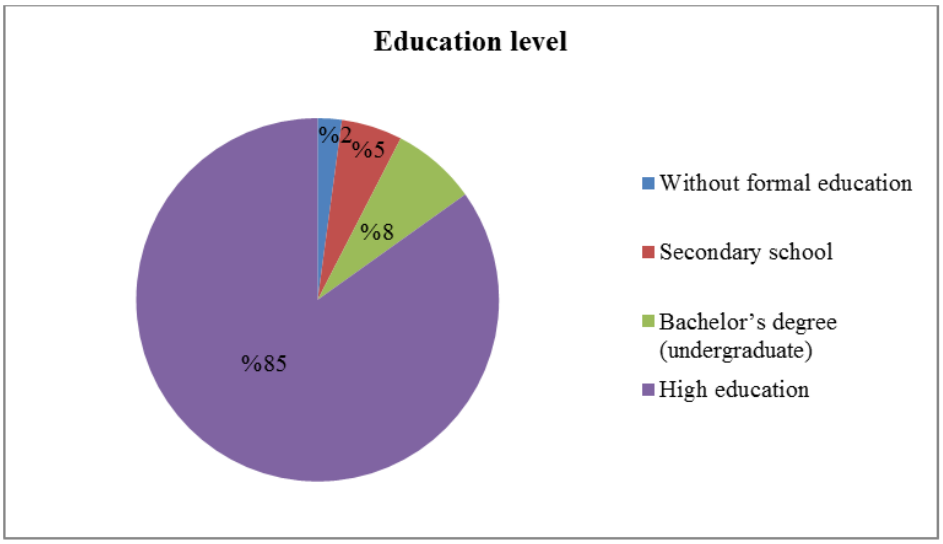


Figure 2. The participants' educational level

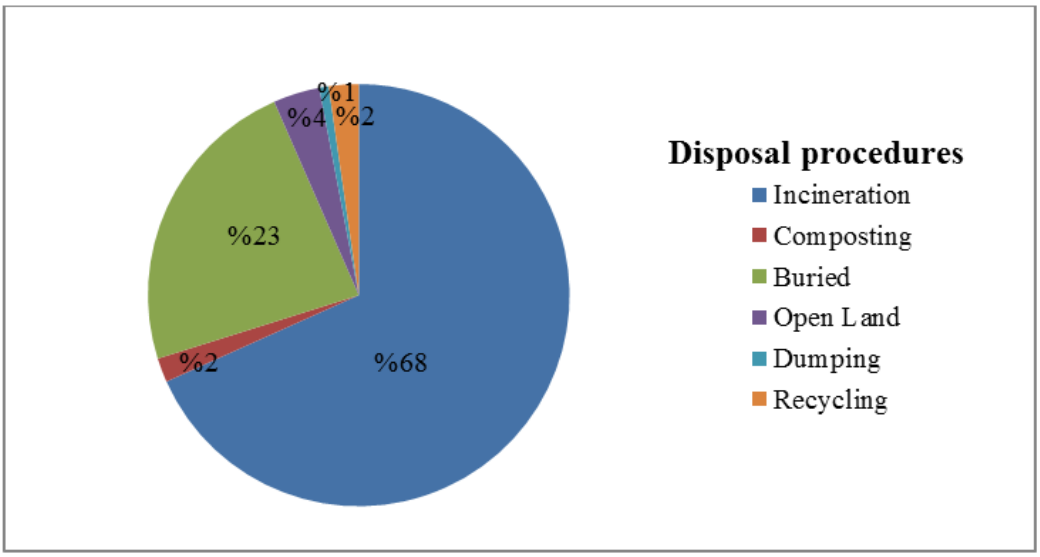


Figure 3. The proportions of waste disposal

Burning fossil fuels releases sulfur dioxide (SO_2), causing harm to ecosystems, plants, and exacerbating heart and lung issues and respiratory illnesses. The World Health Organization (WHO)'s International Agency for Research on Cancer warns that hazardous microparticles from air pollution, including SO_2, are a major cause of lung cancer deaths, gastrointestinal malignancies, and children's lung cancer due to $PM_{2.5}$ exposure [43]. Airborne particles in drinking water can lead to gastrointestinal malignancies and lung cancer in children aged 8 or younger due to exposure to $PM_{2.5}$ [44].

The study examines the impact of incineration on soil, water, environmental pollution, and the health of living organisms

Airborne particulate matter (PM) is a complex mixture of solids and aerosols, including liquid droplets, dry solid particles, and solid cores with liquid coatings. Particles vary in size, shape, and chemical content, and are controlled by particle diameter. Particles are composed of various elements including inorganic ions, metallic compounds, organic compounds, elemental carbon, and substances from the earth's crust. Inhalable particles with a diameter of 10 microns or less can have harmful effects on health, while fine particulate matter ($PM_{2.5}$) is defined as particles with a diameter of 2.5 microns or less [43].

$PM_{2.5}$ and PM_{10} are two types of air pollution, with PM2.5 comprising a smaller portion of PM_{10} due to emissions from fossil fuel combustion. PM_{10} includes dust from industrial sources, wind-blown dust from open spaces, landfill dust, agricultural dust, pollen, and bacterium leftovers, while $PM_{2.5}$ is primarily produced by fossil fuel combustion [45]. Secondary particles like SO_2 and NO_X are created in the atmosphere through chemical reactions [46, 47]; while primary particles (PM) are directly emitted by various sources such as cars, trucks, open burning, wildfires, fireplaces, woodstoves, cooking, dust from roads and construction, agricultural operations, and coal and oil-burning boilers [48]. Acid rain, a new threat, may be produced by rotting and vaporizing rubbish left on streets. Wells and springs are primary sources of drinking water, leading to high disease transmission through water. Municipal waste in large cities generates

high methane due to anaerobic reactions, causing global warming. Properly constructed landfill sites can reduce this risk by reducing contaminants and ensuring proper waste disposal. Libya's waste disposal methods, including landfills and burning, are causing respiratory, dermatological, and gastrointestinal illnesses. Uncontrolled methane gas burning ignites fires, emitting environmental pollutants like Polychlorinated dibenzo-P-dioxins (PCDDs) [49], polychlorinated dibenzofurans (PCDFs) [50-52], emits mercury, and polycyclic aromatic hydrocarbons (PAHs) [53], causing heart attacks, certain cancers, lung and neurological disorders, contributing to pollution and environmental issues. Metal contaminants in hazardous wastes, which enter groundwater and the food chain, pose a significant threat to human health, including congenital abnormalities, respiratory and heart conditions, malignancies, genetic faults, and central nervous system damage.

Untreated toxins in the environment and exposure to them in Libya may increase cancer rates, while consumption of carcinogen-tainted items may also contribute to these risks. Libya has the highest cancer prevalence, largely due to the mixing of industrial and municipal garbage, exacerbated by unclear rules and inconsistent controls. The local government lacks a plan to address this issue, and the issue is further complicated by the presence of hazardous e-waste, which includes waste from outdated electrical and electronic equipment, which can be produced or released during recycling or disposal. Hazardous waste contains chemicals like metals, aromatic and halogenated hydrocarbons, sodium sulfide, sulfhydrates, and chlorinated aromatic and nitro compounds that can harm the liver. Polyvinyl chloride (PVC), a plastic used in various industries [54], is primarily produced for domestic use and polymerized from vinyl chloride (VC). It is used in building, packaging, electrical, transportation, consumer products (as flooring, water piping, videodiscs, and credit cards), and healthcare products (as disposable intravenous bags, tubing, and bedpans are essential for providing essential medical care). Pollution sources include manufacturing, landfills, and incineration. The International Agency for Research on Cancer (IARC) suggests that exposure to 1,2-dichloropropane and VC is linked to liver cancer, along with other chemicals like arsenic, DDT [55], heptachlor, dichloromethane, and trichloroethylene [56-58]. Other risk factors include occupational exposure to vinyl chloride monomer (VCM), hepatitis B virus infection, non-Hodgkin lymphoma (NHL), Epstein-Barr virus, hepatitis C virus, and HIV type 1 [59].

Breast milk from women may contain harmful substances like dioxins, heavy metals, organic chlorinated substances, pesticides, PCBs [60-64], VC, 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD) [65], beta-hexachlorocyclohexane (β-HCH) insecticide, hexachlorobenzene (HCB) insecticide [66], dieldrin pesticides, aldrin pesticides, tetrachloroethylene, trichloroethylene, polychlorophenols, and sodium salts, which can interact synergistic manner with risk factors like B hepatitis virus. Breastfed infants are exposed to harmful substances like HCB, linked to bladder cancer, found in soil and wastewater treatment, and used in various industries. The IARC has classified various substances, including cigarette smoke, arsenic, aluminum, auramine, magenta, rubber, and paint, as associated with bladder cancer, along with benzo(a)pyrene (BaP). Hazardous waste sites significantly contribute to endocrine disorders (EDCs) and breast, testicles, and genitourinary cancers, with molecular links between EDCs and testicular and breast cancers [67, 68]. Auto

mechanics' occupational exposure to endocrine-disrupting chemicals, including oils, petroleum solvents, alkylphenolic compounds, dioxins, ethylene oxide, polychlorinated biphenyls, and volatile organic compounds as benzene, toluene, ethyl benzene, benzene derivatives, xylene, etc. has been linked to male breast cancer. Testicular cancer is linked to EDC exposure, a hormonal imbalance caused by contaminated milk during early fetal development and puberty, emphasizing the significance of environmental factors [69].

The study explores the effects of military and war remnants on the environment and health

Since 2011, military weapons have been illegally stored and sold in homes, farms, and markets, violating international environmental protection and pollution reduction laws during social gatherings and civil wars [70, 71]. Military surplus weapons and ammunition storage communities face increased explosion risks due to fire, human error, lightning strikes, propellant instability, or sabotage [72].

Small arms and light weapon (SALW) stocks are considered less dangerous than explosives. Proper disposal of weapons and ammunition is crucial to prevent safety risks from long-term storage, as the ecosystem could be harmed by heavy weaponry supplies, and poor maintenance in underground fuel storage tanks can lead to leaks. Libya's heavy weapons inventory is challenging to determine, with metallurgical concerns arising from the need for alloying steel with metals as chromium, cobalt, manganese, nickel, niobium, and other metals for effective Rolled Homogeneous Armor (RHA). High-grade steel, particularly low-alloy steel, can pose environmental and health risks when leaking into the environment [73, 74] and it are crucial to consider these concerns before using explosive charges. The environmental risks [75, 76] associated with fuels, lubricants, isotopes, battery acids, and hydraulic fluids must be also addressed. The study reveals that waste collection in Libyan cities, particularly in informal settlements, is not regular. To address this, the government and organizations are encouraged to adopt a national environmental labeling system and promote community education on biodegradable waste.

Conclusion

Waste management is a significant environmental issue, particularly in large cities with rapid population growth and urbanization. Factors like cultural attitudes, education, and residential location influence waste disposal. Increased public awareness can improve waste management; reduce disease risk, and lower costs, benefiting the environment, society, economy, and health.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the article and agreed to be responsible for all the aspects of this work.

Orcid

Salma Korbag
https://orcid.org/0000-0001-7493-0698

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How to cite this manuscript: Salma Korbag*, Issa Korbag. Burning or Burying Waste Increases the Risk of Cancer, Epidemics, and Environmental Issues Affecting the Atmosphere, Land, and Water. *Asian Journal of Green Chemistry*, 8(3) 2024, 217-233.
DOI: 10.48309/ajgc.2024.420730.1453