

Master of Science in Public Health



*Awareness, practices & occupational hazards  
among incinerator workers in tertiary care hospitals  
of Rawalpindi and Islamabad.*

By

Hira Ghazanfar

**Al-Shifa School of Public Health, PIO,**

**Al Shifa Trust Eye Hospital**

**Quaid-i-Azam University**

**Islamabad, Pakistan**

**2021-2023**

*Awareness, practices & occupational hazards among  
incinerator workers in tertiary care hospitals of  
Rawalpindi and Islamabad.*

**Hira Ghazanfar**

**362861-PIO/MSPH-2021**

Dissertation submitted in partial fulfillment of the requirement for the  
degree of:

**MASTER OF SCIENCE IN PUBLIC HEALTH 2021**

to

**Al-Shifa School of Public Health, PIO, Al Shifa Trust Eye Hospital,  
Faculty of Medicine  
Quaid-i-Azam University,  
Islamabad.**

Word Count: 13177
----------------------

## Declaration

In submitting this dissertation, I certify that I have read and understood the rules and regulations of Al-Shifa School of Public Health, PIO, and QAU regarding assessment procedures and offenses and formally declare that all work contained within this document is my own apart from properly referenced quotations.

I understand that plagiarism is the use or presentation of any work by others, whether published or not and can include the work of other candidates. I also understand that any quotation from the published or unpublished works of other persons, including other candidates, must be identified as such by being placed inside quotation marks and a full reference to their source must be provided in proper form.

This dissertation is the result of an independent investigation. Where my work is indebted to others, I have made acknowledgments. I declare that this work has not been accepted in substance for any other degree, nor is it currently being submitted in candidature for any other degree.

---

**Dr. Quratulain Waheed**  
Al-Shifa School of Public Health,  
PIO, Al Shifa Trust Eye Hospital  
Date:

---

**Hira Ghazanfar**  
QAU Registration number  
MSPH (Year)  
Date:

## DEDICATION

*To my graceful father*

*“Raja Ghazanfar”*

*A Strong and Gentle soul*

*And my beloved mother*

*“Shanaz”*

*Both taught me to trust Allah (SWT) in every*

*situation & believe in hard work*

*& always encouraged and supported me*

*Throughout my life*

## ABSTRACT

**Introduction:** Hospital waste management implies the administration of waste delivered by hospitals utilizing methods that will look at the spread of illnesses. It is evident from the previously published literature that ninety percent of occupational accidents occur because of unsafe behavior and the factor of human error. Occupational health is an important issue in Pakistan because of the high rate of associated morbidity and mortality of exposed workers. Most of the workers face a great chance of chronic health issues due to less knowledge and unsafe behavior. So, the purpose of our study is to assess the awareness and practices of occupational hazards among incinerator workers in tertiary care hospitals of Rawalpindi and Islamabad.

**Methods:** A cross-sectional study was conducted in all the major public and private tertiary care hospitals of Rawalpindi and Islamabad. Overall, 89 Incinerator workers who were directly handling the waste, and were working for more than 3 months, were part of the study. Moreover, personnel from the administration and manager Staff of incinerator workers were also included. After getting approval from the institutional ethical review committee; the incinerator workers of all the major public and private hospitals of Rawalpindi and Islamabad were approached for this study after meeting the inclusion criteria they included in the research. Data was collected by a pre-formed questionnaire comprised of three parts: demographic variables, knowledge, and practices regarding occupational hazards and operational parameters of the incineration process. Data was entered and analyzed in SPSS 21 version.

**Results:** A total of 89 participants were part of this research study. All the incinerator workers who are directly handling the waste of Public and Private hospitals in Islamabad and Rawalpindi were selected. Out of 89 participants if we talk about the age distribution then 17 (19.1 %) were between 20-30 years, 42 (47.2 %) were between 31-40 years, 26 (29.2 %) 41-50 years, and 4 (4.5 %) were 50+ years of age. Regarding the gender distribution among the data set, all the participants were males. out of 89 participants, 63 (70.8 %) were having Associate level of qualification, while 26 (29.2 %) had a bachelor's degree.

**Discussion:** An Iranian study on educational attainment found that the majority of those in the study sample (56.5%) held a bachelor's degree. However, 60 (70.8%) of the participants in our study had associate's degrees. This finding contrasts with those of other regions of Iraq, where the majority of the investigated sample had a diploma; this difference may be explained by Baghdad's abundance of universities (Jibraeel & Abdulrahman, 2022). Another research study's findings showing employees have a "Good" attitude regarding occupational dangers at work

(Mahmood M, Shahab S, Malik R, 2001) are consistent with our study's findings because it also demonstrates that the majority of incineration workers are having "excellent" level performance.

**Conclusion:** So the majority of hospital and health center staff have "excellent" attitudes and good practices with occupational dangers in their surrounding workplaces, there is still space for development in these areas. Examples of such behaviors include "prolonged standing" and "inadequate use of current facilities," as well as wearing goggles while incineration operations in the workplace were satisfactory. Age, education level, and working overtime all have an impact on how incinerator workers approach occupational dangers. Additionally, our study's incinerator workers' knowledge of workplace hazards was influenced by their age. This research's result recommends that healthcare administrators and pertinent authorities organize active, efficient programs to advance the departments already operating in healthcare facilities dedicated to the prevention of occupational hazards, promote them to senior administrative positions, and give them the resources they need to implement and uphold occupational safety legislation in their facilities following established national and international standards.

**Keywords:** Occupational Hazards; Incineration, KAP, Current practices, Health risks, Incinerators, Teaching hospitals, Populated areas, Twin Cities.

## ACKNOWLEDGMENTS

### *In the name of Allah, the most Merciful and Beneficent*

First of all, I am thankful to Allah Almighty, the most merciful and beneficent, for making the journey of my life to this point, including the completion of my thesis, which is a blessing indeed. My utmost gratitude to my thesis supervisor, **Dr. Quratulain Waheed**, without her expertise and guidance this would not have been possible. Despite his busiest and tiring routine, she had always provided me with her adroit guidance and worthy suggestions throughout this time.

I owe my supreme gratitude to my family specially my father **Raja Ghazanfar** and my mother **Shanaz** for their unconditional love and support for me. They have always supported me in every phase of my life. Whatever I am and wherever I am, is just because of the altruistic love of my parents. Their prayers have made me strong enough to face every problem and difficulty in my life.

I would also like to extend my gratitude to my friends and seniors for their support throughout my research work. I humbly thank all the people who have supported me in this regard.

# TABLE OF CONTENTS

Declaration.....	iii
Dedication.....	iv
Abstract.....	v
Acknowledgments.....	vii
List of tables.....	x
List of figures.....	xii
List of abbreviations.....	xiii
Chapter One: Introduction.....	1
Chapter Two: Literature Review.....	9
Chapter Three: Methodology.....	15
Study Design.....	15
Study Area.....	15
Duration of study.....	15
Data Sources.....	15
Study Population.....	15
Sampling technique.....	15
Inclusion and Exclusion criteria.....	16
Data Collection Techniques.....	17
Data Collection Tool.....	17
Data Analysis Plan.....	18
Ethical Consideration.....	18
Operational Definitions.....	18



Chapter Four: Results .....	20
Chapter Five: Discussion.....	47
Conclusions.....	49
Appendix A – Relative Important Index.....	56
Appendix B-- Questionnaire.....	58
Appendix C – IRB Approval Certificate .....	60
Appendix D – Consent form.....	61
Appendix E -- Budget .....	62
Appendix F -- Gantt chart.....	63

## LIST OF TABLES

Table 1: Age Distribution .....	20
Table 2: Gender Distribution .....	21
Table 3: Qualification Details of the incinerator workers .....	22
Table 4: Marital Status.....	22
Table 5: Religion of Incinerator workers.....	23
Table 6: Working Overtime .....	23
Table 7: Duty shifts of the Incinerator workers .....	24
Table 8: Place of Residence .....	24
Table 9: Years of Experience.....	25
Table 10: Descriptive Statistics for Awareness regarding Occupational hazards among incinerator workers .....	27
Table 11: Descriptive Statistics for Practices regarding Occupational hazards among incinerator workers .....	29
Table 12: Type of Incinerator .....	30
Table 13: Temperature range .....	31
Table 14: Chimney Height.....	31
Table 15: Incineration operations .....	32
Table 16: Direct Exposure in incinerator chambers .....	33
Table 17: Immunization against Hepatitis B .....	33
Table 18: Immunization against Tetanus.....	34
Table 20: Cross-tabulation between Awareness mean score and Age of the participants	36
Table 21: Cross-tabulation between Awareness mean score and Qualification.....	37
Table 22: Cross-tabulation between Awareness mean score and Marital Status.....	38

Table 23: Cross Tabulation between Awareness mean score and Religion .....	39
Table 24: Cross-tabulation between Awareness mean and Working Overtime .....	39
Table 25: Cross-tabulation between Awareness mean score and Duty Shift .....	40
Table 26: Cross-tabulation between Awareness Mean score and Years of Experience ...	41
Table 27: Cross-tabulation between Practices mean score and Age.....	42
Table 28: Cross-Tabulation between Practices mean score and Qualification.....	42
Table 29: Cross-tabulation between practices mean score and Marital status.....	43
Table 30: Cross-tabulation between practices mean score and Religion.....	44
Table 31: Cross-tabulation between practices mean score and Working overtime .....	44
Table 32: Cross-tabulation between practices mean score and Duty shift .....	45
Table 33: Cross-tabulation between practices mean score and Years of experience .....	45
Table 34a: Relative important Index for Awareness Variables .....	56

## LIST OF FIGURES

Figure 1 Single chambered Incinerator .....	4
Figure 2 Dual Chambered Incinerator .....	5
Figure 3 Multi-chambered Incinerator .....	5
Figure 4 Rotary Kiln .....	6
Figure 5 Pollutants and air emissions from Incinerator .....	7
Figure 6: Age Distribution .....	21
Figure 7: Incineration Operation.....	32
Figure 8: Direct Exposure during incineration operation .....	33
Figure 9: Immunization against Hepatitis B .....	34
Figure 10: Immunization against Tetanus.....	35

## LIST OF ABBREVIATIONS

HCP	Healthcare Professionals
BMW	Biomedical Waste
HWM	Hospital Waste Management
HIV	Human Immuno-deficiency Virus
KAP	Knowledge-Attitude and Practices
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
HCW	Health Care Workers
WHO	World Health Organization

## CHAPTER I: INTRODUCTION

Hospital waste management implies the administration of waste delivered by hospitals utilizing methods that will look at the spread of illnesses. A hospital is where irresistible and non-irresistible medical services waste is being produced because of the arrangement of clinical consideration administrations to the patients (Mahmood M, Shahab S, Malik R, 2001). This waste requires extraordinary consideration for its legitimate removal. In any case, ill-advised waste management has presented major natural dangers and is currently being accounted for as a serious public health problem around the world (Jang et al., 2006).

Biomedical waste (BMW) created by hospital waste is unsafe and irresistible if not taken care of, shipped, and discarded appropriately (Mehmood et al., 2021) . BMW could be either in a fluid or strong structure and is delivered during clinical examinations, treatment, or the course of vaccination on people and creatures. This waste is entirely different from city waste as it incorporates human body parts, utilized needles, sharp needles, research facility tests, human body squanders and liquids, microbiological societies, and lab squanders (Mehmood et al., 2021). Numerous irresistible sicknesses like hepatitis, HIV disease, tuberculosis, and intestinal fever can be spread because of the unseemly removal of this waste. Ill-treating biomedical waste is creating danger to the climate and health of the patients and medical care laborers. The isolation of waste must be made conceivable at the source. The reuse and reusing of waste ought to likewise be given serious thought (K et al., 2013; Mehmood et al., 2021; S Rasheed, S Iqbal, LA Baig, 2005).

As indicated by World Health Organization medical services waste statistics, of the aggregate sum of waste produced by medical services exercises, around 85% is a general, non-risky waste. The leftover 15% is viewed as unsafe material that might be difficult to manage, harmful, or radioactive. Consistently an expected 16 billion infusions are controlled around the world, yet not the needles and needles are all appropriately discarded subsequently (World Health Organization., 2022). Open consumption and cremation of medical services squanders can, under certain conditions, bring about the discharge of dioxins, furans, and particulate matter. Measures to guarantee the safe and ecologically sound administration of medical

services squander can keep unfriendly well-being and natural effects from such waste including the accidental arrival of the composite or organic dangers, including drug-safe microorganisms, into the climate hence safeguarding the strength of patients, well-being laborers, and the overall population (World Health Organization., 2022; Yang et al., 2009).

Treatment and removal of medical care waste might present health gambles by implication through the arrival of microorganisms and harmful toxins into the climate. Cremation of waste has been generally polished, however deficient burning or the burning of unsatisfactory materials brings about the arrival of toxins out of sight and in the age of debris buildup (World Health Organization., 2022). Burned materials containing or treated with chlorine can create dioxins and furans, which are human cancer-causing agents and have been related to a scope of unfriendly well-being impacts. Cremation of weighty metals or materials with high metal substances (specifically lead, mercury, and cadmium) can prompt the spread of harmful metals in the climate (Almuneef and Memish, 2003; Ibáñez et al., 2000).

Just current incinerators working at 850-1100 °C and fitted with exceptional gas-cleaning hardware can follow the global discharge principles for dioxins and furans.

Options in contrast to burning, for example, autoclaving, microwaving, and steam treatment coordinated with inside blending, which limits the arrangement and arrival of synthetic substances or unsafe discharges ought to be given thought in settings where there are adequate assets to work and keep up with such frameworks and discard the treated waste (Ganguly et al., 2017; Trinh et al., 2020).

## **BIO-MEDICAL WASTE MANAGEMENT AND KNOWLEDGE ABOUT ITS IMPORTANCE**

The absence of mindfulness about the well-being risks connected with medical services waste, lacking preparation in legitimate waste administration, nonappearance of waste administration and removal frameworks, deficient fiscal and HR, and the low need given to the subject are the most widely recognized issues associated with medical care squander. Numerous nations either don't have fitting guidelines or don't authorize them (World Health

Organization., 2022). Hospital waste management has different implications as it influences the strength of patients as well as of medical services laborers (specialists, attendants, clean staff, and so on) and the overall population (Kalyan Reddy and Al Shammari, 2017; Rao et al., 2018). Even though there is an expanded worldwide mindfulness among well-being experts about the dangers and suitable administration strategies however the degree of mindfulness in non-industrial nations like Pakistan, and India is viewed as unsuitable. Sufficient information about the well-being peril of medical clinic squandering, legitimate procedures and techniques for taking care of the waste, and practice of security measures can go quite far toward the protected removal of dangerous emergency clinic squandering and safeguard the local area from different unfriendly impacts of the unsafe waste (Mathur et al., 2011).

## **PROCESSES USED IN THE TREATMENT OF HEALTHCARE WASTE**

Five essential cycles are utilized for the therapy of risky medical care squanders, especially sharps, irresistible and neurotic waste: warm, substance, illumination, organic, and Mechanical (used to enhance different cycles). In warm treatment processes the primary capabilities depend on intensity to obliterate microbes and it is separated into two sorts, one is high-heat warm frameworks which include ignition and additional pyrolysis of medical services squander (shrouded in this Module) and the second is low-heat warm frameworks likewise called non-consume or non-burning therapy advances (World Health Organization., 2007).

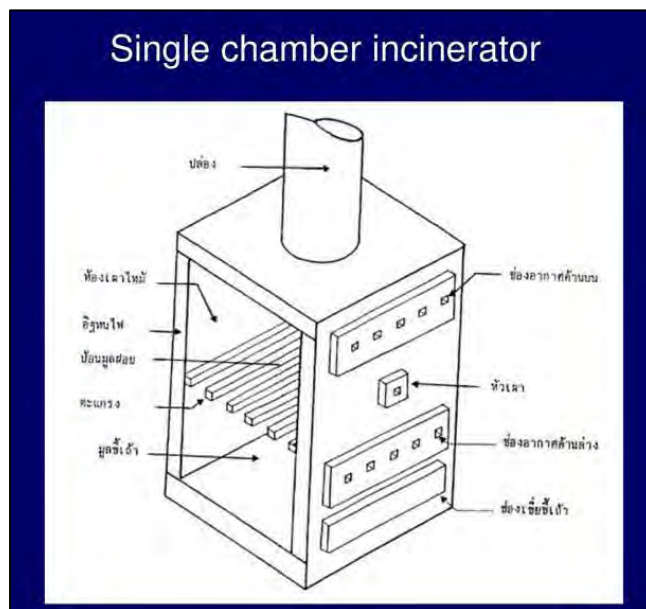
## **INCINERATION**

Incineration is a thermochemical waste change innovation that utilizes surplus oxygen to guarantee total ignition at temperatures over 900°C and these are planned fundamentally to upgrade squander consuming and heat yield while limiting outflows by leveling the oxygen and the three "Ts" — time, temperature, and disturbance. High temperature (200°C to 1000°C), dry oxidation process that lessens natural and flammable waste to inorganic, incombustible matter, bringing about a huge decline in general waste volume. The natural matter is artificially separated principally through the course of burning (Jacob et al., 2021).



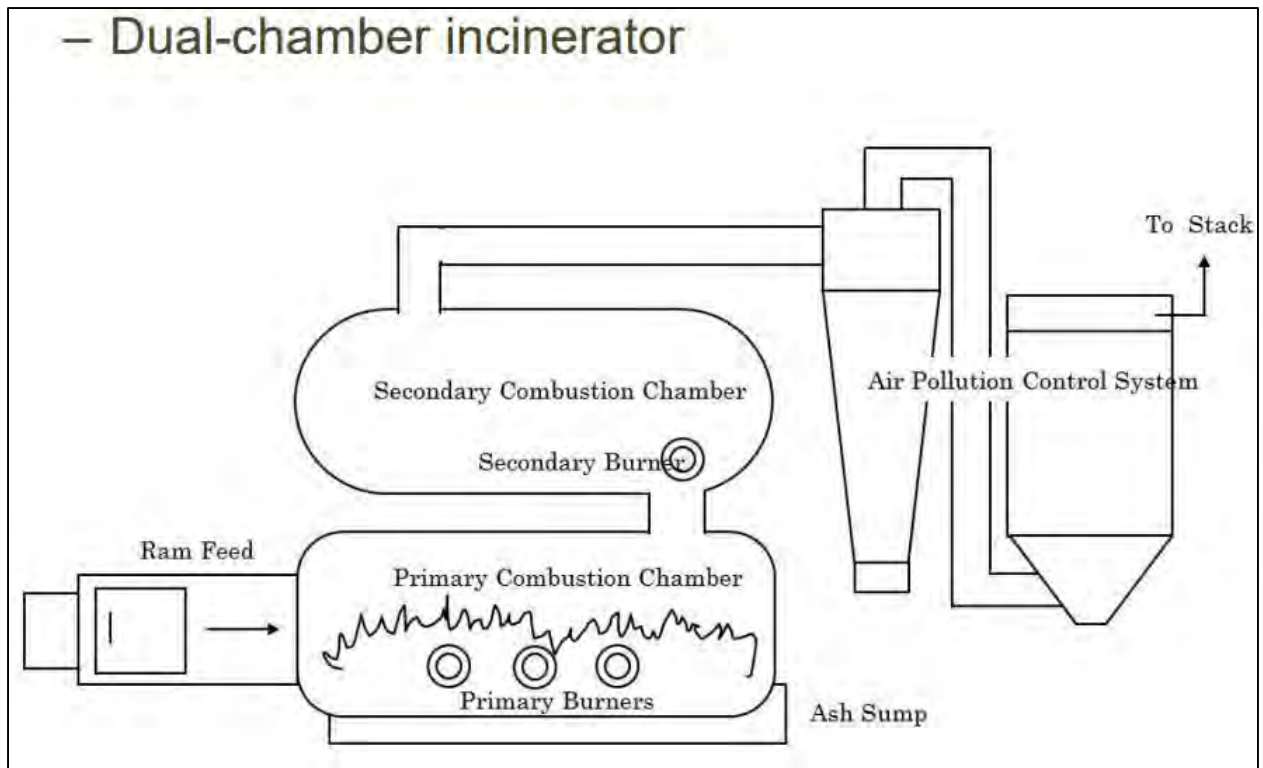
Food squanders commonly have low oxygen content, and high nitrogen, debris, and energy contents. Cremation changes the biomass into heat energy for modern cycles, and this intensity can be utilized to create steam to deliver electrical power utilizing a steam turbine or as cycle heat utilized in food handling offices. Vent gases involve limited quantities of nitrogen, carbon dioxide, and sulfur dioxide, every one of which is better utilized, when utilized effectively. The significant benefits of burning are immediate waste decrease, short home time, dormant and non-putrescible debris deposits, the strong mass of natural waste is diminished by 80%-85% and the volume by 95%-96%, which is exemplary (Jacob et al., 2021; Tesfahun et al., 2014).

**TYPES OF INCINERATORS FOR HEALTHCARE WASTE:** The range of capacities, from 10 kg/hr to over 20 tons per day, primarily defines the main types of incinerators. As illustrated below (Chartier, 2014), the historically prevalent types of incinerators include single chambers, dual-chamber, multiple-chamber, and rotary kilns.



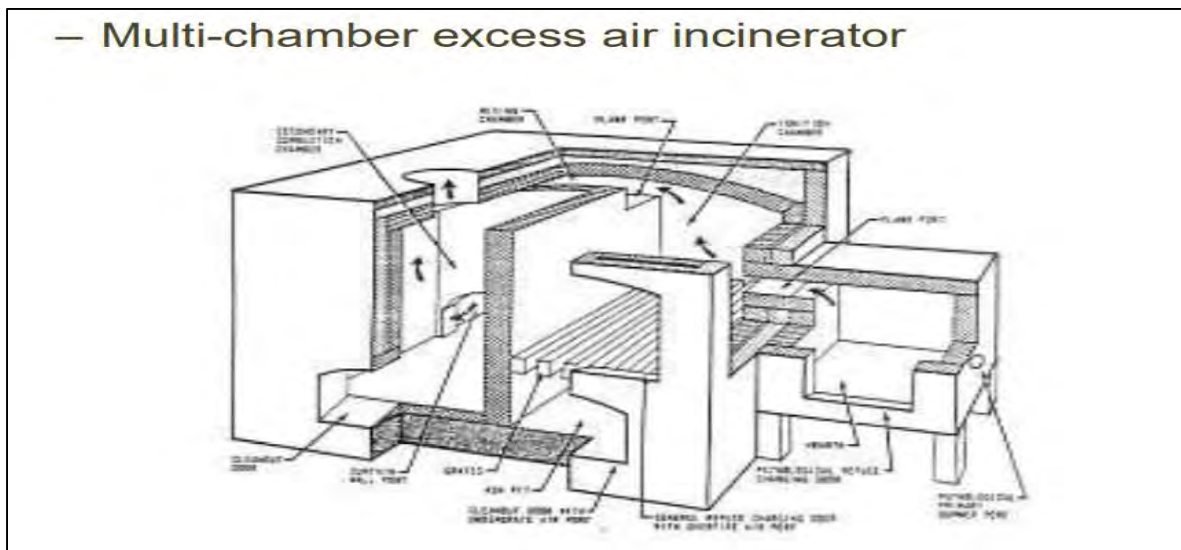
Source: Integrated Solid Waste Management by Numfon Eaktasang, Ph.D.Thammasat University (Internet)

**Figure 1** Single chambered Incinerator



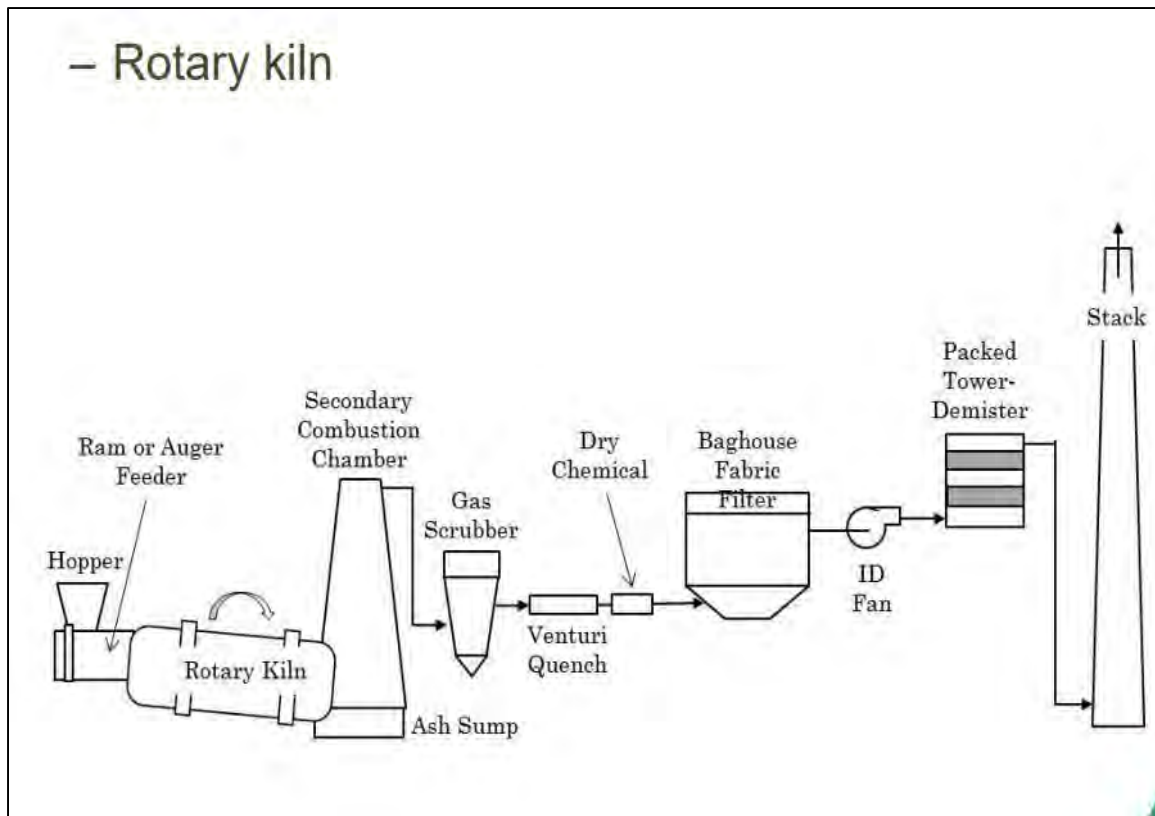
\*Source: Incineration of Healthcare Waste and the Stockholm Convention Guidelines WHO.

**Figure 2** Dual Chambered Incinerator



\*Source: Incineration of Healthcare Waste and the Stockholm Convention Guidelines WHO.

**Figure 3** Multi-chambered Incinerator

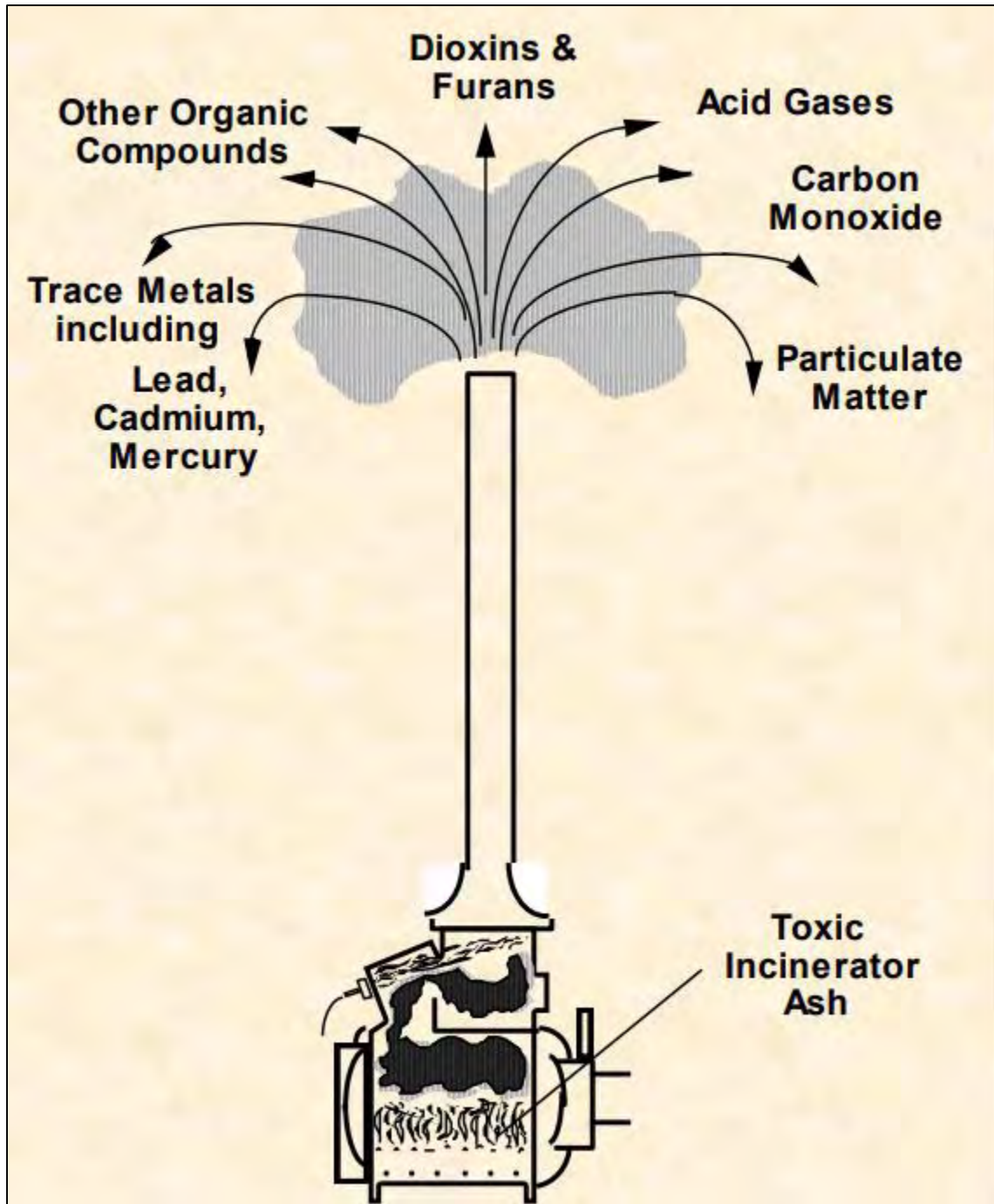


\*Source: Incineration of Healthcare Waste and the Stockholm Convention Guidelines WHO.

**Figure 4** Rotary Kiln

## POLLUTANTS AND AIR EMISSIONS FROM A MEDICAL WASTE INCINERATOR

Different sorts of synthetics in the state of air outflows and follow metals are being delivered through the incinerator. Synthetic follows like Disc, Cr, Cu, Hg, Mg, Ni, Pb, corrosive gases, HCl, SO<sub>2</sub>, NO<sub>x</sub> - dioxins, and furans, including 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), other natural mixtures like benzene, carbon tetrachloride, chlorophenols, trichloroethylene, toluene, xylenes, trichlorotrifluoroethane, polycyclic sweet-smelling hydrocarbons, vinyl chloride, etc. (World Health Organization., 2007). Moreover, carbon monoxide, particulate matter, and might be microorganisms (from incinerators with unfortunate ignition) delivered by the incinerator. In addition, base debris by and large contains, dioxins/furans - different organics - leachable metals. Base debris from clinical waste incinerators frequently bombs tests for perilous constituents (e.g., Poisonousness Trademark Leachate System) and must be treated as unsafe waste (Gonzalez et al., 2000; World Health Organization., 2007). Air outflows are displayed in the figure underneath.



\*Source: Incineration of Healthcare Waste and the Stockholm Convention Guidelines WHO.

**Figure 5** Pollutants and air emissions from Incinerator  
**RATIONALE**

It is evident from the previously published literature that ninety percent of occupational accidents occur because of unsafe behavior and the factor of human error. Occupational health is an important issue in Pakistan because of the high rate of associated morbidity and mortality of exposed workers. Most of the workers face a great chance of chronic health issues due to less knowledge and unsafe behavior. So, the purpose of our study is to assess the awareness and practices of occupational hazards among incinerator workers in tertiary care hospitals of Rawalpindi and Islamabad and also update the already present research data pool with current recommendations.

## **AIM**

To improve the level of awareness and promote safe biomedical waste management among incinerator workers in tertiary care hospitals of Rawalpindi and Islamabad

## **OBJECTIVES**

- To assess the awareness and practices of occupational hazards among Incinerator workers in tertiary care hospital Rawalpindi & Islamabad.
- To find the association between awareness and practices with demographic factors.

## CHAPTER II: LITERATURE REVIEW

Medical waste incineration includes the consumption of waste delivered by hospitals, veterinary offices, and clinical examination offices. These squander incorporate both irresistible ("red pack") clinical waste along with non-irresistible, general housekeeping squanders. The discharge factors introduced here address emanations when the two sorts of these wastes are combusted as opposed to simply irresistible squanders. Three primary sorts of incinerators are utilized: controlled air, overabundance air, and rotational furnace. Of the incinerators distinguished in this exploration study, the larger part (>95 percent) was controlled air units. A rate (<2 percent) was surplus air. The revolving furnace units will generally be bigger and regularly outfitted with air contamination control gadgets. Around 2% of the complete populace recognized in this study were viewed as outfitted with air contamination control gadgets (Chang and Hickman, 1989).

Burning has up to this point been the most favored innovation for the removal of HCW, as it likewise kills the infectivity of the squanders, which is the most dangerous clinical waste property. In any case, while possibly not accurately worked, cremation might prompt elevated degrees of weighty metal outflows. Over the most recent 10 years, the authorization of stricter outflow norms by numerous nations essentially decreased the arrival of these substances into the climate. HCW cremation is perceived as a key delivery source by the Stockholm Show. This reality is additionally affirmed by the China stock detailed in 2004. Besides, HCW cremation is accounted for to have contributed 1.18 kg/a for an all-out figure of over 10.24 kg (Yang et al., 2009).

Although treatment and removal of medical care squander diminishes chances, roundabout well-being dangers might happen through the arrival of harmful poisons into the climate through therapy or removal. The Landfills can debase drinking water on the off chance that they are not as expected developed. Besides, the burning of waste has been generally polished yet deficient cremation or the cremation of unacceptable materials brings about the arrival of toxins high up and debris buildup. Burned materials containing chlorine can produce dioxins and furans, which are human cancer-causing agents and have been related to a scope of unfriendly well-being effects (Ganguly et al., 2017). Cremation of weighty metals or materials with high metal substances (specifically lead, mercury, and cadmium) can prompt the spread of poisonous metals in the climate. Dioxins, furans, and metals are tenacious and bio-gather in the climate. Materials containing chlorine or metal ought to accordingly not to be burned. Wounds from sharps and openness to destructive substance squander and radioactive waste likewise cause well-being risks to workers in organizations producing bio-clinical waste. Legitimate administration of waste can tackle the issue of work-related threats generally. (Hayleeyesus and Cherinete, 2016; Y Babanyara, 2013)

Most populated nations like Pakistan, India, Afghanistan, China, Nigeria, and Bangladesh confront the ill-advised irresistible waste administration rehearses in the medical clinics that outcome in dangerous challenges (Khan et al., 2017). In Pakistan, there is an absence of information related to medical care waste management. In non-industrial nations, there is the absence of the execution of formal and casual local awareness programs, related to the issue of waste administration has turned into the central concern (Ali et al., 2017). The worry in regards to the clinical waste is chiefly because of pathogenic creatures and natural substances in clinic strong squanders in fundamentally higher focuses and a such bigger number of

organic entities of human beginning in strong waste proposes the presence of destructive types of infections and pathogenic microorganisms in undetected numbers. In this manner, it's ill-advised policies to handle the airborne pathogenic microbes, which antagonistically influence the emergency clinic climate and local area at large. Aside from dirtying water, air, and soil, it extensively affects human well-being because of tasteful impacts. After all, it is the main man behind this and that (Titto et al., 2012).

In another Pakistani review, it was made sense that, medical services squanders have been perceived by the natural organization in the USA as the third driving reason for dioxin air contamination and add to 10% of mercury harming in the climate from human exercises (Ashworth et al., 2014). Dioxin is known to be a deadly harmful synthetic which influences human well-being seriously and causes malignant growth, insusceptible framework problems, Diabetes Mellitus, birth imperfections and intrudes on the regenerative turn of events. This compound is among the principal air outflows delivered by the incinerators that represent a dependable risk to the incinerator laborers too (Kumar et al., 2016). It has been demonstrated the way that ordinary phases of preparation of medical services laborers could work on their acts of waste administration at their workplaces. Phases of preparation of medical services laborers are fundamental to work on their way of behaving towards clinics squander the executives (Kumar et al., 2016; Porta et al., 2009).

As per (WHO) in 2013 "As per gauges, 75 to 95 percent of bio-clinical waste is non-unsafe, while ten to 25 percent comprises dangerous waste. At the point when all types of clinical waste are joined, in any case, a wide range of clinical waste might become poisonous to people, creatures, and the climate. "Unfortunately, measurements demonstrate that around a lot of clinical waste is mixed with customary trash, especially in immature countries". There



appear to be assessed 59 million Medical services laborers (HCWs) around the world, going from direct consideration suppliers to clinical waste processors; this immense number of people is defenseless against occupational-related dangers (Anozie et al., 2017). Medical care is a high-risk industry because of the great predominance of business-related mishaps and sicknesses brought about by deficiency or rebelliousness with fundamental waste administration conventions and job-related well-being measures. Following a World Wellbeing Association (WHO) assessment, around 22 countries have roughly 64% of their emergency clinics without compelling waste disposal procedures. (Shah, 2018).

That's what another, Pakistani review proposed, medical clinic waste is produced during patient dealings and can cause harm to the health of all the personnel involved along with the patients themselves. Contingent on the range of clinic administrations squander incorporates 10-25% biohazardous material (like sharps and synthetic, irresistible, drug, radioactive, and genotoxic squander) and 75-90% non-biohazardous squander, (for example, food waste, cardboard, and bundling). It isn't really to be expected that medical clinic infectious garbage if ineffectively made due, represents a danger to adjoining networks as well as medical care suppliers, patients, and visitors. In Pakistan, as in other agricultural nations, earlier examinations have revealed the unfortunate situation of mishandling hospital waste. Concentrates on led in significant urban areas in Pakistan (i.e., Karachi, Lahore, Rawalpindi, and Islamabad) have reliably detailed botch of clinic squander concerning following isolation strategies and proper removal techniques. This is disturbing as ~0.8 million tons of waste is created every day from emergency clinics in Pakistan (Zeeshan et al., 2018).

Further, in an examination study from Bahrain and Iran, it was perceived that unsafe medical services waste has turned into an ecological worry for the majority of emerging nations

including the Realm of Bahrain. There have been a few critical deterrents confronting the Realm in managing this issue including; restricted documentation concerning age, taking care of, the board, and removal of waste. This thus blocks endeavors to design better medical care waste management (Mohamed et al., 2009). In this paper, unsafe waste administration status in the Realm has been explored through a broad review completed on chosen public and confidential medical services premises. Moreover, waste administration is required to have been drafted for the successful working of Emergency clinics and legitimate waste administration and to save incinerator laborers from encountering different occupational dangers (Bedouin et al., 2008; Mohamed et al., 2009).

Concentrates on biomarkers support this: populaces presented to emanations more than others have higher natural degrees of delivered substances. Similarly, a few examinations address different reasons, for example, the absence of consciousness of emergency clinic staff as well as the promotion ministration to implement the standards, evaluation of clinic waste disposal current practices, and issues responsible for the spread of various infectious diseases in Pakistan. Accordingly, proper waste administration is absurd without having the appropriate mindfulness and information related to waste management. It is likewise vital to follow the word related wellbeing security issues when it manages unsafe waste (Akter and Reza, 2019; Khalid et al., 2021a).

Also, one more exploration concentrates on guaranteeing that, the executives of emergency clinic squanders through burning cycles produce strong buildups, for example, base and fly remains and air contamination control deposits with high happy of weighty metals, inorganic salts, and other natural mixtures. burning offices create ignition deposits such as base and fly remains and strong waste from air contamination control (Luo et al., 2019). Base cinders are

excluded from the Rundown of Perilous Squanders laid out by the Board of the European Association. Fly cinders, particulate matter that persisted from the heater and is eliminated from the vent gas, can act naturally as a significant ecological problem (Shih et al., 2006). As per a few researchers, these chemical deposits present in different kinds of wastes pose potential harm to the environment in general. (Clavichord et al., 2019; Ibáñez et al., 2000).

## CHAPTER III: METHODOLOGY

### Study design

A cross-sectional study was conducted to know about the knowledge and practices regarding the occupational hazards amongs incinerator workers of the public and private hospitals of Rawalpindi and Islamabad.

### Study area

All the major public and private tertiary care hospitals of Rawalpindi and Islamabad

### Duration of study

The study was conducted from October 2022 to March 2023 Six months after IRB approval.

### Data sources

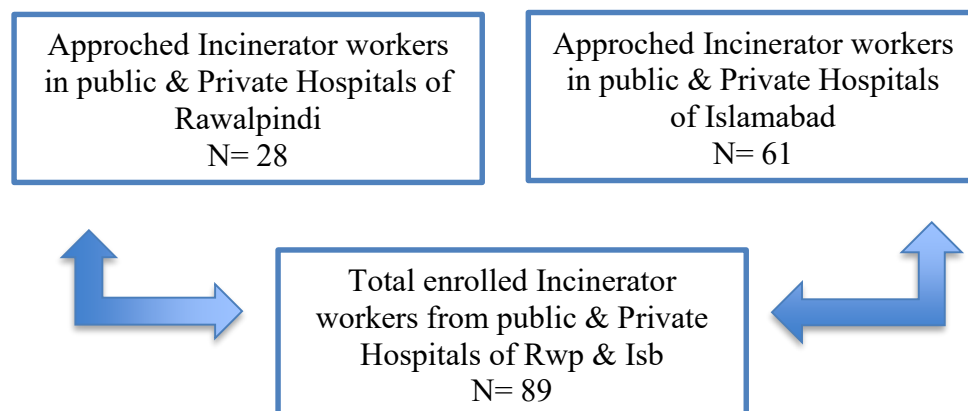
A Questionnaire was used to collect the data from incinerator workers of the public and private tertiary care hospitals of Rawalpindi and Islamabad.

### Study population

All the incinerator workers of public and private tertiary care hospitals of Rawalpindi and Islamabad.

### Sampling technique

Covineince sampling



## **Sample size calculation**

The sample size was calculated by using the WHO sample size calculator by taking after assuming a 9 % of margin of error with a 95 % of confidence interval the sample size was of 89 participants”.

$$n = (Z^2 * p * (1 - p)) / (E^2)$$

Where:

- n is the required sample size
- Z is the Z-score corresponding to the desired level of confidence (e.g., for a 95% confidence level, Z would be 1.96)
- p is the estimated prevalence or proportion of the characteristic of interest in the population (as the exact prevalence was unknown so it was assumed as 50% of response distribution)
- E is the desired level of precision or margin of error (0.09)

$$N= 80$$

After adding the assumed percentage of response failure final sample was N=89

## **Inclusion and Exclusion criteria**

### **Inclusion:**

- Incinerator workers who are directly handling the waste.
- Those who are working for more than 3 months
- Admin and Manager Staff of incinerator workers.

### **Exclusion:**

- Those who were on leave at the time of data collection

- Who have started working for less than 3 months in their respective hospitals
- Who were having psychological or emotional disorders

### **Data collection techniques**

After getting approval from the institutional ethical review committee; the incinerator workers of all the major public and private hospitals of Rawalpindi and Islamabad were included in this study after meeting the inclusion criteria. “All risks and benefits will be discussed with patients and after explaining the purpose of the study a formal written and verbal informed consent was taken. After inclusion, patient codes, addresses, and detailed history, for demographic information like name, age, education, details about working shifts, place of residence, and years of experience were noted on the pre-designed proforma. Quantitative data was collected through an adopted questionnaire. Before starting the formal data collection pilot testing was done to check the reliability of the questionnaire tool for knowledge and practices related to occupational hazards among incinerator workers and our Cronbach’s alpha was 0.608 Data were collected by the principal investigator. The quantitative tool will be respondent centered and assist with any query and questions. The face-to-face approach was used to fill the questions, Thereafter, the assessment was completed by the principal investigator.

### **Data collection tool**

- Data was collected through a pre-designed Questionnaire.
- Face-to-face interview.
- The data collection tool comprised two parts:

1) Demographic

2) Knowledge and Practices for occupational hazards among incinerator workers

### **Pilot Testing**

Pilot testing was performed before starting the formal data collection procedure by including 10% of the actual sample size. Performa was tested for any future changes; no major changes

were done after pilot testing. Data from pilot testing was not included in the final analysis. Pilot testing showed that reliability of 0.608 (35 items) (Annexure-B).

### **Data analysis plan**

Data were evaluated by the recent version of the Statistical package for social sciences software. Furthermore, cross-tabulation was performed for qualitative data by applying “The Chi-square test. P-value  $\leq 0.05$  would be considered statistically significant. A confidence level of 95% was used for the study. Data were expressed in number, percentage, proportions, and standard deviation. Tables and charts were used to present data. Confounding was controlled through stratification. The relative important index (RII) was also calculated to ascertain the importance given by the participants to the questions related to the awareness regarding occupational hazards among incinerator workers.

### **Ethical Consideration**

1. Permission was obtained from the heads of concerned departments.
2. Data were used for research purposes only.
3. Participants were informed about the purpose of the study
4. Information of participants was kept confidential.
5. A written consent form was signed by the participants (attached in the appendix).

### **OPERATIONAL DEFINITIONS**

#### **1. OCCUPATIONAL HAZARDS:**

“Workplace accidents are risks connected with certain jobs. Occupational risks are classified into five categories by the Occupational Safety and Health Administration (OSHA): physical safety hazards, chemical hazards, biological hazards, physical hazards, and ergonomic risk factors.”

## **2. KNOWLEDGE**

“The knowledge that is obtained while carrying out operations. In context of this research knowledge about occupational hazards among incinerator workers refers to the understanding and awareness demonstrated by these workers regarding the potential risks and dangers associated with their work, including the ability to identify and assess specific hazards, knowledge of appropriate safety measures and procedures, and comprehension of the potential health effects and risks involved in their job tasks ”

## **3. PRACTICE**

“The actual application or use of a theory, belief, or method. In context of this research Practices about occupational hazards among incinerator workers refer to the specific actions, procedures, and protocols followed by incinerator workers to minimize or mitigate the risks and dangers associated with their work environment.”



## CHAPTER IV: RESULTS

### A. DESCRIPTIVE STATISTICS

#### 1. DEMOGRAPHICS OF THE PARTICIPANTS:

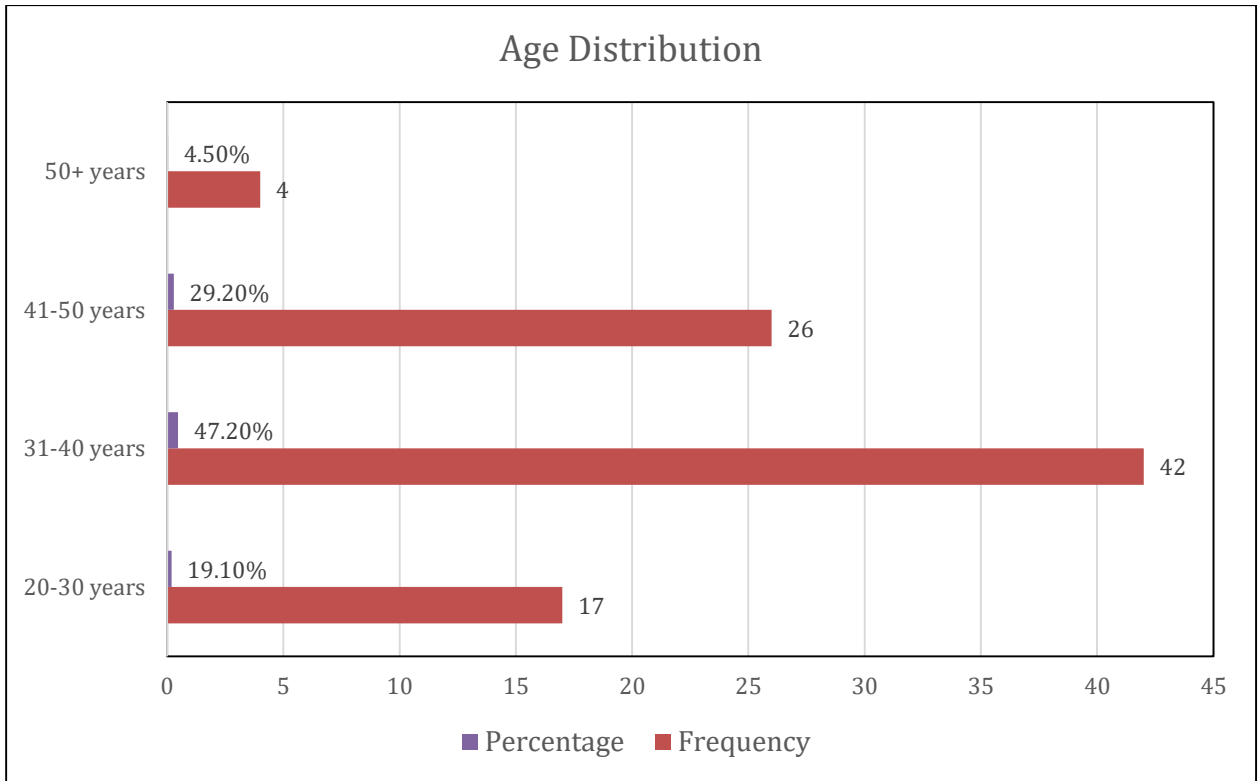
A total of 89 participants were part of this research study. All the incinerator workers who are directly handling the waste of Public and Private hospitals in Islamabad and Rawalpindi were selected. Moreover, participants who were working for more than 3 months were approached for the data collection, incinerator workers were included. Details regarding the demographic variables are mentioned below:

##### a. Age Distribution of the participants:

Out of 89 participants if we talk about the age distribution then 17 (19.1 %) were between 20-30 years, 42 (47.2 %) were between 31-40 years, 26 (29.2 %) 41-50 years, and 4 (4.5 %) were 50+ years of age as mentioned in Table 1 and Figure 1.

**Table 1: Age Distribution**

	<b>Age Distribution</b>	<b>Frequency</b>	<b>Percent</b>
1	<b>20-30 Years</b>	17	19.1 %
2	<b>31-40 Years</b>	42	47.2 %
3	<b>41-50 Years</b>	26	29.2 %
4	<b>50+ Years</b>	4	4.5 %
	<b>Total</b>	<b>89</b>	<b>100 %</b>



**Figure 6: Age Distribution**

**b. Gender Distribution:**

Regarding the gender distribution among the data set, all the participants were males as mentioned in Table 2.

**Table 2: Gender Distribution**

Gender Distribution		Frequency	Percent
1	Male	89	100 %

**c. Qualification:**

Regarding the qualification, three categories like Associate level, bachelor, or any other degrees were made for the data collection. Thus, out of 89 participants, 63 (70.8 %) were having Associate level of qualification, while 26 (29.2 %) had a bachelor's degree. As mentioned in Table 3.

**Table 3: Qualification Details of the incinerator workers**

Qualification details		Frequency	Percent
1	Associate	63	70.8 %
2	Bachelor	26	29.2 %
	Total	89	100 %

**d. Marital Status:**

Among 89 participants 76 (85.4 %) were married among the incinerator workers while 13 (14.6 %) were unmarried. As mentioned in Table 4.

**Table 4: Marital Status**

Marital Status		Frequency	Percent
1	Married	76	85.4 %
2	Un-married	13	14.6 %
	Total	89	100 %

### e. Religion

Out of 89 participants 63 (70.8 %) were Muslim while, 26 (29.2 %) were non-Muslim incinerator workers as mentioned in Table 5.

However, when the participants were asked about working overtime from the incinerator workers then out of 89 participants 26 (29.2 %) said yes, that they are working overtime while 63 (70.8 %) said No. As mentioned in Table 6.

**Table 5: Religion of Incinerator workers**

		Frequency	Percent
1	Muslim	63	70.8 %
2	Non-Muslim	26	29.2 %
	Total	89	100 %

**Table 6: Working Overtime**

Working Overtime		Frequency	Percent
1	Yes	26	29.2 %
2	No	63	70.8 %
	Total	89	100 %

### f. Duty Shift

Out of 89 participants, 71 (79.8 %) were performing their official duties in the morning shift. While 18 (20.2 %) were working the evening shift at the public and private hospitals of Islamabad and Rawalpindi. As mentioned in Table 7.

**Table 7: Duty shifts of the Incinerator workers**

<b>Duty Shift</b>		<b>Frequency</b>	<b>Percent</b>
<b>1</b>	<b>Morning</b>	71	79.8 %
<b>2</b>	<b>Evening</b>	18	20.2 %
	<b>Total</b>	<b>89</b>	<b>100 %</b>

**g. Place of Residence**

Regarding the place of residence, the participants were given two options in the questionnaire and which were urban and rural settings, but in this research, all the participants 89 (100 %) were from the urban settings only. As mentioned in Table 8.

**Table 8: Place of Residence**

<b>Place of Residence</b>		<b>Frequency</b>	<b>Percent</b>
<b>1</b>	<b>Urban</b>	89	100 %

**h. Years of Professional Experience**

Regarding the question related to the professional years of experience of the participants, Out of 89 participants 28 (31.5 %) were having less than five years of professional experience, 44 (49.4 %) were having professional experience between five to ten years and 17 (19.1 %) were having professional experience of more than ten years. As mentioned in Table. 9

**Table 9: Years of Experience**

Years of experience		Frequency	Percent
1	Less than five years	28	31.5 %
2	Five to Ten years	44	49.4 %
3	More than ten years	17	19.1 %
	<b>Total</b>	<b>89</b>	<b>100 %</b>

## **2. DESCRIPTIVE RESULTS OF AWARENESS REGARDING OCCUPATIONAL HAZARDS AMONG INCINERATORS WORKERS**

To assess our first objective of this research, which was; to assess the knowledge and practices regarding occupational hazards among incinerator workers there were a total of eight questions to assess their knowledge. The first question was about the use of special safety receptacles to store used needles and for that, out of 89 participants 78(87.6 %) said always, 11(12.4 %) said sometimes. The second question was about the knowledge related to the safety measures and their compliance then out of 89 participants 65(73%) said yes, they are aware and use it always, 23(25.8%) said sometimes while 1(1.1 %) said never.

Moreover, regarding the question related to the knowledge about calling a qualified electrician for testing and repairment in case of need, the out of 89 participants 75(84.3%) said always while 14(15.7%) said sometimes they do that. The fourth question was whether the incinerator workers are aware enough or not about the protection measures to keep themselves safe from

radiation like wearing gowns etc. then out of 89 participants 68(76.4%) said they always do that, 20(22.5%) said sometimes while 1(1.1%) said never.

Furthermore, the question regarding the knowledge about the correct posture during performing procedures out of 89 workers, 65(73%) said yes, they are aware and always take care of it, while 24(27%) said sometimes they take care of the correct postures during performing various procedures. Regarding the following infection prevention and control precautions regarding blood, body fluids and tissues that are infectious, out of 89 participants 71(79.8%) said yes they always follow the precautions, 17(19.1%) said sometimes while 1(1.1%) said never in this regard. When the participants were asked a question regarding washing hands immediately after removing gloves then out of 89 workers, 72(80.9%) said always do that. While 17(19.1%) said sometimes. As mentioned in Table 11.

**Table 10: Descriptive Statistics for Awareness regarding Occupational hazards among incinerator workers**

Items	Response	N	%
1. Do you use of special safety receptacles to store used needles	Always	78	87.6 %
	Sometimes	11	12.4 %
	Never	-	-
2. Do you comply with all safety instructions	Always	65	73 %
	Sometimes	23	25.8 %
	Never	1	1.1 %
3. Do you call a qualified electrician to test and repair faulty or suspect equipment	Always	75	84.3 %
	Sometimes	14	15.7 %
	Never	-	-
4. Do you wear a radiation protective gown when exposed to radiation	Always	68	76.4 %
	Sometimes	20	22.5 %
	Never	1	1.1 %
5. Do you know about the correct body posture during procedures	Always	65	73 %
	Sometimes	24	27 %
	Never	-	-
6. Do you follow infection prevention and control precautions regarding blood, body fluids and tissues are infectious	Always	71	79.8 %
	Sometimes	17	19.1 %
	Never	1	1.1 %
7. Do you know the importance of washing hands immediately after removing gloves	Always	72	80.9 %
	Sometimes	17	19.1 %
	Never	-	-



### **3. DESCRIPTIVE RESULTS OF PRACTICES REGARDING OCCUPATIONAL HAZARDS AMONG INCINERATORS WORKERS**

For the assessment of practices regarding occupational hazards among incinerator workers, there was total of ten questions to assess their practices in this regard. The first question was about consulting an occupational safety specialist for the safe handling of heavy patients and for that out of 89 participants 50 (56.2%) said yes, they always consult an occupational safety specialist, 38 (42.7%) said sometimes while 1(1.1%) said Never. The second question which was about the presence and use of adequate protective aids and equipment then out of 89 participants 70 (78.7%) said they always use them, 17(19.1%) said sometimes. While, 2(2.2%) said never. Similarly, regarding the prolonged standing out of 89 participants 16 (18%) said they have to always experience long-standing during performing procedures, 49 (55.1%) said sometimes. While 24(27%) said they have never faced this.

Moreover, when the participants were asked about the inadequate use of modern facilities then out of 89 participants 32(36%) said yes it always happens, 46(51.7%) said sometimes. While, 11(12.4%) said never. Regarding the washing of hands with bactericidal agents 28(31.5%) said that they always do that, 60 (67.5%) said sometimes. While 1 (1.1%) said never. For the questions regarding wearing gloves, gowns, caps, masks and goggles out of 89 participants 82(92.1%), 75(84.3%), 78(87.6%), 83(93.3%), and 13(14.6%) said always, respectively. While, 7(7.9%), 14(15.7%), 11(12.4%), 5(5.6%) and 37(41.6%) said sometimes, respectively. However, regarding wearing of masks and goggles 1(1.1%) and 39(43.8%) said that they never use it, respectively. As mentioned in Table 12.

**Table 11: Descriptive Statistics for Practices regarding Occupational hazards among incinerator workers**

Items	Response	N	Percent
<b>1. Consult an occupational safety specialist for the safe handling of heavy patients</b>	Always	50	56.2 %
	Sometimes	38	42.7 %
	Never	1	1.1 %
<b>2. Ensure the presence of adequate protective aids and equipment</b>	Always	70	78.7 %
	Sometimes	17	19.1 %
	Never	2	2.2 %
<b>3. You face prolonged standing</b>	Always	16	18 %
	Sometimes	49	55.1 %
	Never	24	27 %
<b>4. Inadequate use of modern facilities</b>	Always	32	36 %
	Sometimes	46	51.7 %
	Never	11	12.4 %
<b>5. Hand washing with bactericidal agent</b>	Always	28	31.5 %
	Sometimes	60	67.4 %
	Never	1	1.1 %
<b>6. Wear gloves</b>	Always	82	92.1 %
	Sometimes	7	7.9 %
	Never	-	-
<b>7. Wear gowns (apron)</b>	Always	75	84.3 %
	Sometimes	14	15.7 %
	Never	-	-
<b>8. Wear Caps</b>	Always	78	87.6 %
	Sometimes	11	12.4 %
	Never	-	-
<b>9. Wear mask</b>	Always	83	93.3 %
	Sometimes	5	5.6 %
	Never	1	1.1 %
<b>10. Wear goggles</b>	Always	13	14.6 %
	Sometimes	37	41.6 %
	Never	39	43.8 %

#### 4. OPERATIONAL PARAMETERS OF THE INCINERATOR WORKERS

##### a. Type of Incinerator

Regarding the type of incinerators 89 participants from 19 different public and private hospitals in Islamabad and Rawalpindi replied that 9 (10.1 %) incinerators were single-chambered, 76 (85.4 %) were double-chambered and 4 (4.5 %) incinerators were multi-chambered. As mentioned in Table 13.

**Table 12: Type of Incinerator**

		Frequency	Percent
1	Single chamber	9	10.1 %
	Double chamber	76	85.4 %
2	Multi-chamber	4	4.5 %
3	Total	89	100 %

##### b. Temperature range of an incinerator

For the temperature ranges of the incinerators, 67 (75.3 %) were between the ranges of 800-1200 C, while 22 (24.7 %) were up to 800-1200 C. As mentioned in Table 14.

**Table 13: Temperature range**

		<b>Frequency</b>	<b>Percent</b>
<b>1</b>	<b>Less than 800-1200 C</b>	67	75.3 %
<b>2</b>	<b>up to 800-1200 C</b>	22	24.7 %
	<b>Total</b>	<b>89</b>	<b>100 %</b>

**c. Chimney Height**

Regarding the chimney height of the incinerators out of 89 participants 19 (21.3 %) replied that the height of the chimney is less than 4 M, 64 (71.9%) up to 4 M and 6 (6.7%) opted for the other options. As mentioned in Table 15.

**Table 14: Chimney Height**

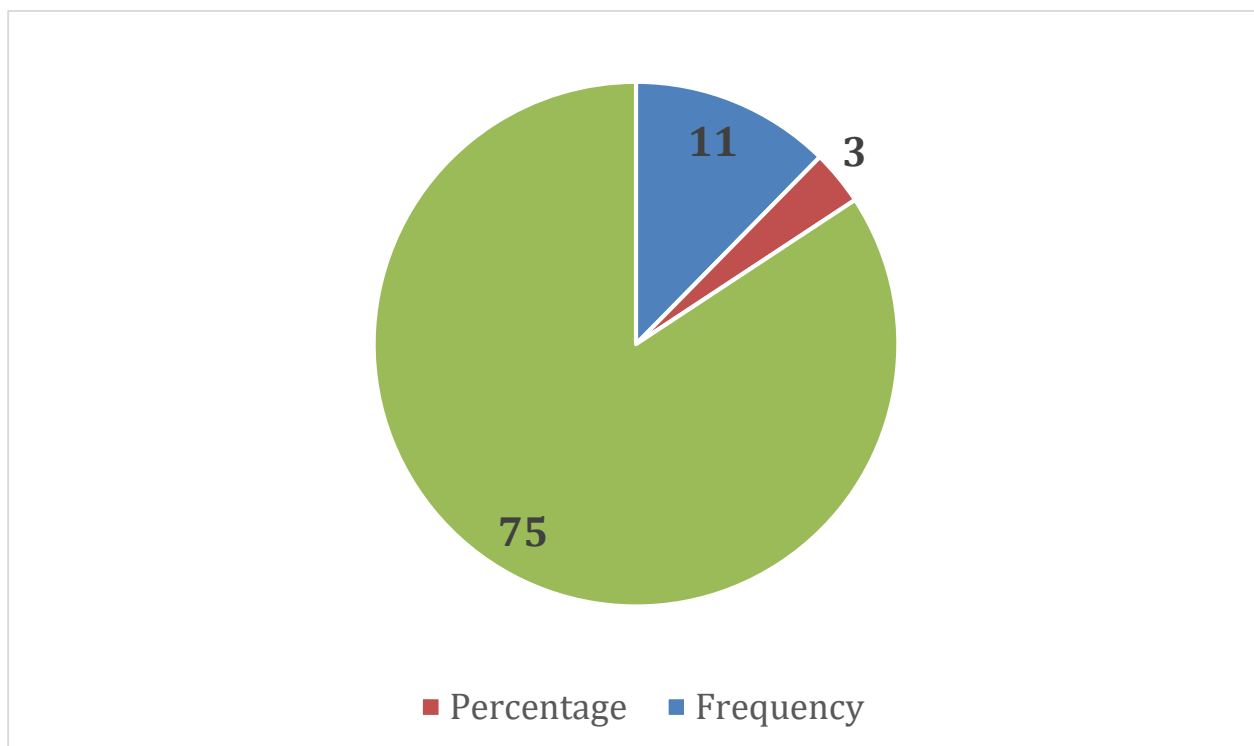
		<b>Frequency</b>	<b>Percent</b>
<b>1</b>	<b>Less than 4 M</b>	19	21.3 %
<b>2</b>	<b>up to 4 M</b>	64	71.9 %
<b>3</b>	<b>Others</b>	6	6.7 %
	<b>Total</b>	<b>89</b>	<b>100 %</b>

**d. Incineration Operation**

Moreover, when the participants were asked about the operations of incineration operations out of 89 incinerator workers 11 (12.4 %) said that they have manual incineration operations, while 3 (3.4 %) replied automatic incineration operations and 75 (84.3 %) said both manual and automatic incineration operations are present. As mentioned in table 16.

**Table 15: Incineration operations**

		Frequency	Percent
1	Manual	11	12.4 %
	Automatic	3	3.4 %
2	Both	75	84.3 %
3	Total	89	100 %



**Figure 7: Incineration Operation**

**e. Direct Exposure time during the handling of waste in the incinerator chamber.**

**less than**

Regarding the question related to the direct exposure time during the handling of waste in the incinerator chamber, out of 89 participants, 87 (97.8 %) said they face direct exposure for less than 15 minutes, while 2 (2.2 %) replied 30 mins of exposure.

As mentioned in Table 17.

**Table 16: Direct Exposure in incinerator chambers**

		<b>Frequency</b>	<b>Percent</b>
<b>1</b>	<b>Less than 15 mins</b>	87	97.8 %
	<b>30 mins</b>	2	2.2 %
<b>2</b>	<b>Total</b>	<b>89</b>	<b>100 %</b>

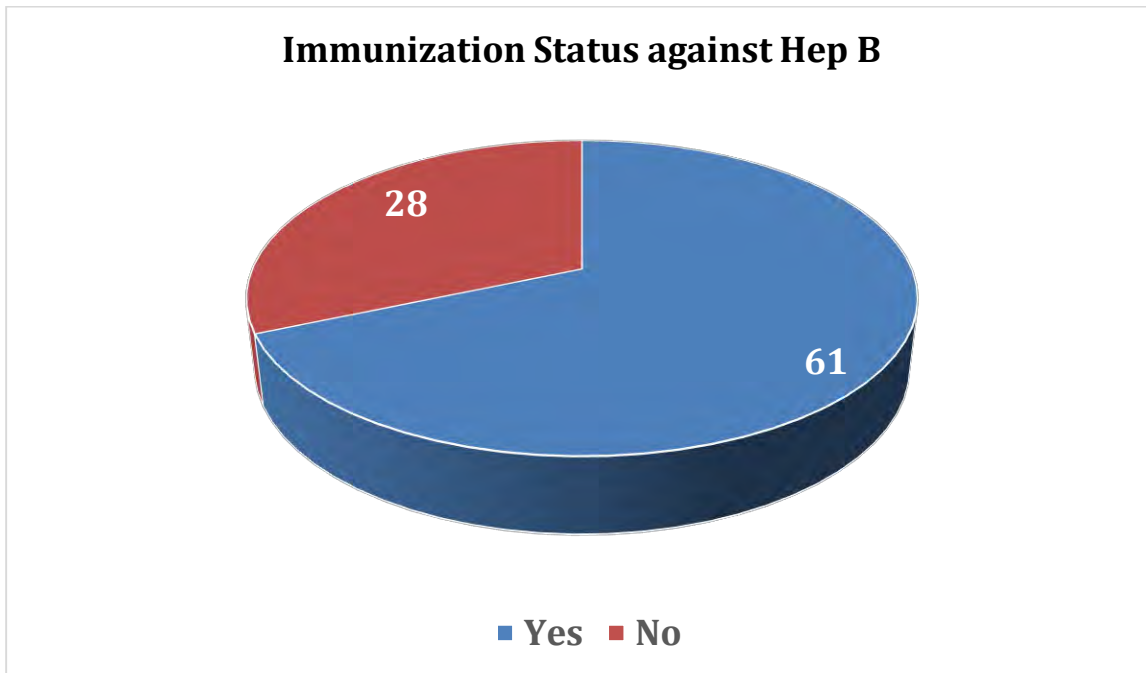
**Figure 8: Direct Exposure during incineration operation**

**f. Immunization against Hepatitis B**

Out of 89 participants, 61 (68.5 %) were immunized against Hepatitis B and 28 (31.5 %) were not immunized against Hepatitis B. As mentioned in Table 18. Moreover, out of 89 participants, 64 (71.9 %) were immunized against Tetanus while, 25 (28.1 %) were not immunized against Tetanus. As mentioned in Table 19.

**Table 17: Immunization against Hepatitis B**

		Frequency	Percent
1	Yes	61	68.5 %
	No	28	31.5 %
2	Total	89	100 %

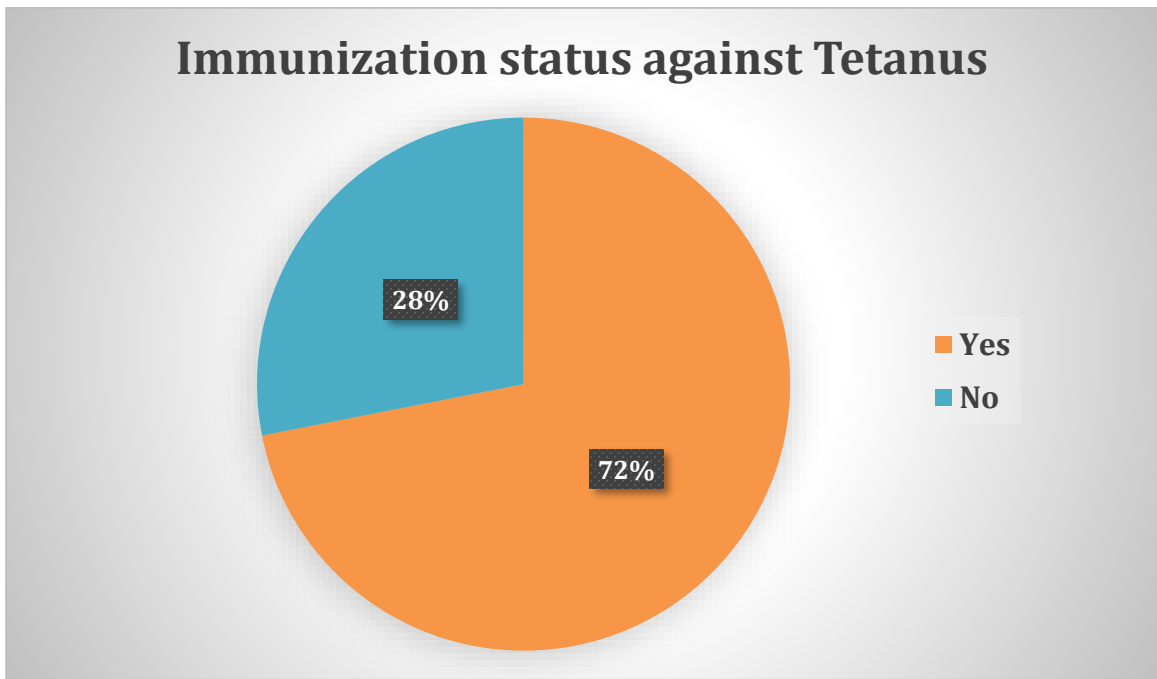


**Figure 9: Immunization against Hepatitis B**

**g. Immunization against Tetanus**

**Table 18: Immunization against Tetanus**

		Frequency	Percent
1	Yes	64	71.9 %
	No	25	28.1 %
2	Total	89	100 %



**Figure 10: Immunization against Tetanus**



## **INFERENCEAL STATISTICS**

For inferential statistics, all the variables related to the knowledge and practices regarding occupational hazards among incinerator workers were computed and two new variables were formed with the name of mean awareness score and mean practices score in the SPSS. To interpret the values, the awareness mean score was divided into three categories (Less than 2.00 = Average, between 2.00 - 2.50 = Good, and more than 2.50 = Excellent), and the same criteria were followed for the interpretation of practices mean score (Less than 2.00 = Less than satisfactory, between 2.00 – 2.50 = Satisfactory and More than 2.50 = More than satisfactory). After that, a cross-tabulation was performed on these two variables with the demographic parameters by applying the chi-square test to assess the second objective of our research study which was; to assess the association of the level of awareness and practices with the demographic factors of incinerator workers. A P-value less than or equal to 0.05 was assumed as statistically significant.

### **I. Association of Age with the awareness regarding occupational hazards among incinerator workers**

After doing the cross-tabulation between the awareness mean score and age of the participants by applying the chi-square test, there were 17(19.1%) participants were between 20-30 years, 42(47.2%) between 31-40 years, 26(29.2%) between 41-50 years and 4(4.5%) were of 50 years and more. The awareness levels are also mentioned below. There was a statistically significant association was found between the awareness score and the age of the participant as the p-value was 0.03. as mentioned in Table 21.

#### **Table 19: Cross-tabulation between Awareness mean score and Age of the participants**

	Age	N	Percent	Mean and SD	Awareness Level	P-value
<b>Awareness Score mean</b>	20-30 Years	17	19.1%	2.76 ± 0.18	Excellent	0.03*
	31-40 Years	42	47.2 %	2.80 ± 0.19	Excellent	
	41-50 Years	26	29.2 %	2.87 ± 0.17	Excellent	
	50+ Years	4	4.5 %	2.75 ± 0.17	Excellent	

**II. Association of Qualification with the awareness regarding occupational hazards among incinerator workers**

After the cross-tabulation between the awareness mean score and qualification of the incinerator workers by applying the chi-square test, there were 63 (70.8%) workers had associate-level of degrees while 26 (29.2%) were having Bachelor's degrees. The awareness level was excellent among both categories but there was no statistically significant association was found between the awareness and qualification of the participants (P-value=0.54). As mentioned in Table 22.

**Table 20: Cross-tabulation between Awareness mean score and Qualification**

	Qualification	N	Percent	Mean and SD	Awareness Level	P-value
Awareness Score mean	Associate	63	70.8 %	2.80 ± 0.18	Excellent	0.54
	Bachelor	26	29.2 %	2.83 ± 0.19	Excellent	

### III. Association of Marital Status with the awareness regarding occupational hazards among incinerator workers

After the cross-tabulation between the awareness mean score and marital status of the incinerator workers by applying the chi-square test, out of 89 participants 76 (85.4%) workers were married while 13 (14.6%) were not married. The awareness level was excellent among both categories but there was no statistically significant association was found between the awareness and qualification of the participants (P=0.06). As mentioned in Table 23

**Table 21: Cross-tabulation between Awareness mean score and Marital Status**

	Marital Status	N	Percent	Mean and SD	Awareness Level	P-value
Awareness Score mean	Married	76	85.4 %	2.82 ± 0.18	Excellent	0.06
	Un-Married	13	14.6 %	2.75 ± 0.20	Excellent	

### IV. Association of Religion with the awareness regarding occupational hazards among incinerator workers

After the cross-tabulation between the awareness mean score and religion of the incinerator workers by applying the chi-square test, out of 89 participants 63 (70.8%) workers were Muslim while, 26 (29.2%) were non-Muslim. The awareness level was excellent among both categories and there was highly statistically significant association was found between the awareness and religion of the participants (P=value 0.01). As mentioned in Table 24.

**Table 22: Cross Tabulation between Awareness mean score and Religion**

	Religion	N	Percent	Mean and SD	Awareness Level	P-value
Awareness Score mean	Muslim	63	70.8 %	2.83 ± 0.19	Excellent	0.01*
	Non-Muslim	26	29.2 %	2.77 ± 0.15	Excellent	

**V. Association of working overtime with the awareness regarding occupational hazards among incinerator workers**

After the cross-tabulation between the awareness mean score and working overtime was done by applying the chi-square test, out of 89 participants 26 (29.2%) workers said yes while, 63 (70.8%) said no. The awareness level was excellent among both categories but there was no statistically significant association was found between awareness and working overtime (P=value 0.37). As mentioned in Table 25

**Table 23: Cross-tabulation between Awareness mean and Working Overtime**

	<b>Working overtime</b>	<b>N</b>	<b>Percent</b>	<b>Mean and SD</b>	<b>Awareness Level</b>	<b>P-value</b>
<b>Awareness Score mean</b>	Yes	26	29.2 %	2.86 ± 0.18	Excellent	0.37
	No	63	70.8 %	2.79 ± 0.18	Excellent	

**VI. Association of Duty shift with the awareness regarding occupational hazards among incinerator workers**

After the cross-tabulation between awareness mean score and duty shift was done by applying the chi-square test, out of 89 participants 71 (80%) workers said they work in morning shift while, 18 (20%) said their shift is evening. The awareness level was excellent among both categories but there was no statistically significant association was found between the awareness and duty shift of the workers (P=value 0.44). As mentioned in Table 26

**Table 24: Cross-tabulation between Awareness mean score and Duty Shift**

	<b>Duty Shift</b>	<b>N</b>	<b>Percent</b>	<b>Mean and SD</b>	<b>Awareness Level</b>	<b>P-value</b>
<b>Awareness Score mean</b>	Morning	71	80 %	2.82 ± 0.18	Excellent	0.44
	Evening	18	20 %	2.77 ± 0.19	Excellent	

**VII. Association of Years of experience with the awareness regarding occupational hazards among incinerator workers**

After the cross-tabulation between awareness mean score and years of experience of the incinerator workers was done by applying the chi-square test, out of 89 participants 28 (31.4%) workers were having less than five years of experience, 44 (49.4%) were having five to ten years of experience while 17(19.2%) were having more than ten years of experience. The awareness level was excellent among all three categories and there was highly statistically significant association was found between the awareness and the years of experience of the workers (P=0.00). As mentioned in Table 27.

**Table 25: Cross-tabulation between Awareness Mean score and Years of Experience**

	<b>Years of Experience</b>	<b>N</b>	<b>Percent</b>	<b>Mean and SD</b>	<b>Awareness Level</b>	<b>P-value</b>
<b>Awareness Score mean</b>	Less than 5 years	28	31.4 %	2.81 ± 0.15	Excellent	0.00*
	Five to ten years	44	49.4 %	2.80 ± 0.20	Excellent	
	More than ten years	17	19.2 %	2.83 ± 0.17	Excellent	

**I. Association of Age with the practice level regarding occupational hazards among incinerator workers**

After doing the cross-tabulation between the practice mean score and age of the participants by applying the chi-square test, there were 17(19.1%) participants were between 20-30 years, 42(47.2%) between 31-40 years, 26(29.2%) between 41-50 years and 4(4.5%) were of 50 years and more. The practice levels among all four categories were satisfactory but there was

no statistically significant association was found between the practice score and the age of the participant as the p-value was 0.41. as mentioned in Table 28.

**Table 26: Cross-tabulation between Practices mean score and Age**

	Age	N	Percent	Mean and SD	Practices Level	P-value
<b>Practices Score mean</b>	20-30 Years	17	19.1%	2.50 ± 0.16	Satisfactory	0.41
	31-40 Years	42	47.2 %	2.49 ± 0.25	Satisfactory	
	41-50 Years	26	29.2 %	2.52 ± 0.18	More than Satisfactory	
	50+ Years	4	4.5 %	2.42 ± 0.30	Satisfactory	

## II. Association of Qualification with the Practice level regarding occupational hazards among incinerator workers

After the cross-tabulation between the practice's mean score and the qualification of the incinerator workers by applying the chi-square test, there were 63 (70.8%) workers had associate-level of degrees while 26 (29.2%) were having Bachelor's degrees. The practice level was satisfactory among both categories with a highly statistically significant association found between the practices score and qualification of the participants (P-value=0.02). As mentioned in Table 29.

**Table 27: Cross-Tabulation between Practices mean score and Qualification**

	Qualification	N	Percent	Mean and SD	Practice Level	P-value
<b>Practices Score mean</b>	Associate	63	70.8 %	2.50 ± 0.24	Satisfactory	0.02*
	Bachelor	26	29.2 %	2.50 ± 0.13	Satisfactory	

### III. Association of Marital Status with the Practices regarding occupational hazards among incinerator workers

After the cross-tabulation between awareness practices mean score and marital status of the incinerator workers by applying the chi-square test, out of 89 participants 76 (85.4%) workers were married while, 13 (14.6%) were not married. The practice level was satisfactory among both categories but there was no statistically significant association was found between the practices and qualification of the participants (P=value 0.46). As mentioned in Table 30.

**Table 28: Cross-tabulation between practices mean score and Marital status**

	<b>Marital Status</b>	<b>N</b>	<b>Percent</b>	<b>Mean and SD</b>	<b>Practice level</b>	<b>P-value</b>
<b>Practices Score mean</b>	Married	76	85.4 %	2.50 ± 0.22	Satisfactory	0.46
	Un-Married	13	14.6 %	2.46 ± 0.17	Satisfactory	

### IV. Association of Religion with the Practices regarding occupational hazards among incinerator workers

After the cross-tabulation between practices mean score and religion of the incinerator workers by applying the chi-square test, out of 89 participants 63 (70.8%) workers were Muslim while, 26 (29.2%) were non-Muslim. The practice level was satisfactory among both



categories and there was no statistically significant association was found between the practices and religion of the participants (P=0.65). As mentioned in Table 31.

**Table 29: Cross-tabulation between practices mean score and Religion**

	Religion	N	Percent	Mean and SD	Practice Level	P-value
Practices Score mean	Muslim	63	70.8 %	2.50 ± 0.22	Satisfactory	0.65
	Non-Muslim	26	29.2 %	2.48 ± 0.20	Satisfactory	

**V. Association of working overtime with the Practices regarding occupational hazards among incinerator workers**

After the cross-tabulation between practice mean score and working overtime, was done by applying the chi-square test, out of 89 participants 26 (29.2%) workers said yes while, 63 (70.8%) said no. The practice level was satisfactory among both categories with a highly statistically significant association found between the practice score and working overtime (P=0.002). As mentioned in Table 32.

**Table 30: Cross-tabulation between practices mean score and Working overtime**

	Working overtime	N	Percent	Mean and SD	Practice Level	P-value
Practices Score mean	Yes	26	29.2 %	2.48 ± 0.16	Satisfactory	0.002*
	No	63	70.8 %	2.51 ± 0.24	Satisfactory	

**VI. Association of Duty shift with the Practices regarding occupational hazards among incinerator workers**

After the cross-tabulation between practice mean score and duty shift was done by applying the chi-square test, out of 89 participants 71 (80%) workers said they work in morning shift

while, 18 (20%) said their shift is evening. The practice level was satisfactory among both categories but there was no statistically significant association was found between the practices and duty shift of the workers (P=value 0.85). As mentioned in Table 33.

**Table 31: Cross-tabulation between practices mean score and Duty shift**

	Duty Shift	N	Percent	Mean and SD	Practice Level	P-value
Practices Score mean	Morning	71	80 %	2.50 ± 0.22	Satisfactory	0.85
	Evening	18	20 %	2.51 ± 0.22	Satisfactory	

## VII. Association of Years of experience with the Practices regarding occupational hazards among incinerator workers

After the cross-tabulation between practice, mean score, and years of experience of the incinerator workers was done by applying the chi-square test, out of 89 participants 28 (31.4%) workers were having less than five years of experience, 44 (49.4%) were having five to ten years of experience while 17(19.2%) were having more than ten years of experience. The practice level was satisfactory among all three categories but there was no statistically significant association was found between the practices and the years of experience of the workers (P=value 0.76). As mentioned in Table 34.

**Table 32: Cross-tabulation between practices mean score and Years of experience**

	Years of Experience	N	Percent	Mean and SD	Practice Level	P-value
Practices Score mean	Less than 5 years	28	31.4 %	2.54 ± 0.18	Satisfactory	0.76
	Five to ten years	44	49.4 %	2.47 ± 0.23	Satisfactory	
	More than ten years	17	19.2 %	2.50 ± 0.23	Satisfactory	

## CHAPTER V: DISCUSSION

An Iranian study on educational attainment found that the majority of those in the study sample (56.5%) had a bachelor's degree. However, 60 (70.8%) of the participants in our study had associate's degrees. This finding contrasts with that of other regions of Iraq, where the majority of the analyzed sample had a diploma; this difference may be explained by Baghdad's abundance of colleges (Jibraeel & Abdulrahman, 2022). Another research study's findings that employees have a "Good" attitude toward occupational hazards at work (Mahmood M, Shahab S, Malik R, 2001) are consistent with our study's findings because it also demonstrates that the majority of incinerator workers are having "excellent" level of performance.

Additionally, a study by Hasan S. M. et al. (2022) noted staff members' practices regarding workplace diseases. hazards that are all around them in healthcare facilities are "Good" practices, which is consistent with the findings of our study that the majority of incinerator workers' practices were satisfactory regarding the

In addition, it was discovered in a different study that, aside from wearing gloves, the identified staff/waste handler and staff did not use all of the necessary PPE (i.e., plastic gloves, face mask, apron, protective shoes, and shades); such staff handled and transported the waste without realizing the high risks in case of injury and accidentally coming into contact with disease-causing pathogens (Khalid et al., 2021). However, in our study, it was observed that all the workers handling hospital waste were aware of the importance of using PPE Like gloves by (92%), gowns by (84%), caps by (87%), and masks by (83%) in our study. However, in contrast to previous findings (Camacho-Ortiz et al., 2013), 14.6% of participants

said they always wear goggles while 43.8% said they never do. According to a study conducted in Karachi among healthcare professionals, 20% of a medical center's sweepers were infected with hepatitis B as a result of improper disposal of hospital waste (S Rasheed, S Iqbal, LA Baig, 2005). The importance of PPE for waste handlers when handling potentially dangerous waste, particularly sharps, blood, and blood-contaminated fluids, has been highlighted by similar results that have been reported in numerous studies (Ali et al., 2016). But according to the results of our study, of the 89 participants, 61 (68.5%) had received a Hepatitis B vaccination, while 28 (31.5%) had not.

## CONCLUSIONS

While the majority of hospital and health center staff have "excellent" attitudes and good practices with occupational dangers in their surrounding workplaces, there is still space for development in these areas. Examples of such behaviors include "prolonged standing" and "inadequate use of current facilities," as well as wearing goggles while incineration operations in the workplace were satisfactory. Age, education level, and working overtime all have an impact on how incinerator workers approach occupational dangers. Additionally, our study's incinerator workers' knowledge of workplace hazards was influenced by their age.

## WAY FORWARD

This result recommends that healthcare administrators and pertinent authorities organize active, efficient programs to advance the departments already operating in healthcare facilities dedicated to the prevention of occupational hazards, promote them to senior administrative positions, and give them the resources they need to implement and uphold occupational safety legislation in their facilities following established national and international standards.

Few of the recommendations are mentioned below:

- Incinerator workers should not be overburdened with extra work extending the shift hours as it will ultimately reduce their quality of work and increase the stress levels.
- Health managers should ensure the vaccinations of all sanitary workers against vaccine preventable diseases like hepatitis B etc.
- Our study shows that the knowledge level was good but, proper refresher courses and trainings should be conducted to keep the incinerator workers motivated and updated with the advanced knowledge.
- Health managers should ensure the adequate stock of PPEs for the incinerator workers.
- Most of the incinerator workers were found to be having satisfactory attitudes while handling incineration processes but there should be plenty of practical seminars conducted as an ongoing activity to improve the staff's attitudes and practices regarding occupational dangers.
- Proper guidelines should be displayed at the workplace in local languages as well and workers should be encouraged to follow them.

- There should be a prompt response for the needle prick injuries and for other emergencies as well.
- All the health facilities should follow and implement the occupational safety regulations and these should be as per national and international standards.

## REFERENCES

- Akter, K. S., & Reza, S. M. S. (2019). Awareness on medical waste management and occupational health safety among the employees related to medical services at upazila level in Bangladesh. *Journal of Environmental Treatment Techniques*, 7(3), 282–288.
- Ali, M., Wang, W., & Chaudhry, N. (2016). Management of wastes from hospitals: A case study in Pakistan. *Waste Manag Res*, 34(1), 87–90.  
<https://doi.org/10.1177/0734242x15616474>
- Ali, M., Wang, W., Chaudhry, N., Geng, Y., & Ashraf, U. (2017). Assessing knowledge, performance, and efficiency for hospital waste management—a comparison of government and private hospitals in Pakistan. *Environ Monit Assess*, 189(4), 181.  
<https://doi.org/10.1007/s10661-017-5903-9>
- Almuneef, M., & Memish, Z. A. (2003). Effective medical waste management: it can be done. *Am J Infect Control*, 31(3), 188–192. <https://doi.org/10.1067/mic.2003.43>
- Anozie, O. B., Lawani, L. O., Eze, J. N., Mamah, E. J., Onoh, R. C., Ogah, E. O., Umezurike, D. A., & Anozie, R. O. (2017). Knowledge, Attitude and Practice of Healthcare Managers to Medical Waste Management and Occupational Safety Practices: Findings from Southeast Nigeria. *Journal of Clinical and Diagnostic Research : JCDR*, 11(3), IC01. <https://doi.org/10.7860/JCDR/2017/24230.9527>
- Arab, M., Baghbari, R. A., Tajvar, M., Pourreza, A., Omrani, G., & Mahmoudi, M. (2008). Report: the assessment of hospital waste management: a case study in Tehran. *Waste Manag Res*, 26(3), 304–308. <https://doi.org/10.1177/0734242x08093598>
- Ashworth, D. C., Elliott, P., & Toledano, M. B. (2014). Waste incineration and adverse birth and neonatal outcomes: a systematic review. *Environ Int*, 69, 120–132.  
<https://doi.org/10.1016/j.envint.2014.04.003>
- Aziz, T. A., Amin, R. R. H., Ahmed, Z. A., Sleman, H. J., & Aziz, B. H. (2021). Occupational Toxicity and Health Hazards of the Healthcare Providers at Healthcare Facilities in Sulaimani City, Iraq. *Iraqi Journal of Pharmaceutical Sciences*, 30(2), 41–49.  
<https://doi.org/10.31351/vol30iss2pp41-49>
- Aziz, T. A., Amin, R. R. H., Ahmed, Z. A., Sleman, H. J., & Aziz, B. H. (2021). Occupational Toxicity and Health Hazards of the Healthcare Providers at Healthcare Facilities in Sulaimani City, Iraq. *Iraqi Journal of Pharmaceutical Sciences*, 30(2), 41–49.  
<https://doi.org/10.31351/vol30iss2pp41-49>
- Camacho-Ortiz, A., Díaz-Rodríguez, X., Rodríguez-López, J. M., Martínez-Palomares, M., Palomares-De La Rosa, A., & Garza-Gonzalez, E. (2013). A 5-year surveillance of occupational exposure to bloodborne pathogens in a university teaching hospital in Monterrey, Mexico. *American Journal of Infection Control*, 41(9), e85–e88.  
<https://doi.org/10.1016/j.ajic.2013.01.008>



- Chang, D. P., & Hickman, D. (1989). Biomedical waste incineration. *Japca*, 39(4), 416.
- Chartier, Y. (2014). *Safe management of wastes from health-care activities: World Health Organization*.
- Clavier, K. A., Watts, B., Liu, Y., Ferraro, C. C., & Townsend, T. G. (2019). Risk and performance assessment of cement made using municipal solid waste incinerator bottom ash as a cement kiln feed. *Resources, Conservation and Recycling*, 146, 270–279. <https://doi.org/10.1016/j.resconrec.2019.03.047>
- Ganguly, R., Vasistha, P., & Gupta, A. (2017). *Design of an incinerator to treat combined biomedical wastes generated from four major hospitals in Chandigarh and Shimla City, India*.
- Gonzalez, C. A., Bleda, M. J., Kogevinas, M., Gadea, E., Huici, A., Bosch, A., & Ergo, O. P. (2000). Biomonitoring study of people living near or working at a municipal solid-waste incinerator before and after two years of operation. *Arch Environ Health*, 55(4), 259–267. <https://doi.org/10.1080/00039890009603416>
- Hasan S M, Hassoun S M, & Ali L H. (2022). Attitudes and Practices regarding Occupational Hazards among a Sample of Medical and Paramedical Staff in Baghdad Governorate. *Health Education and Health Promotion*, 10(2), 385–393.
- Hasan S M, Hassoun S M, & Ali L H. (2022). Attitudes and Practices regarding Occupational Hazards among a Sample of Medical and Paramedical Staff in Baghdad Governorate. *Health Education and Health Promotion*, 10(2), 385–393.
- Hayleeyesus, S. F., & Cherinete, W. (2016). Healthcare waste generation and management in public healthcare facilities in Adama, Ethiopia. *J Health Pollut*, 6(10), 64–73. <https://doi.org/10.5696/2156-9614-6-10.64>
- Ibáñez, R., Andrés, A., Viguri, J. R., Ortiz, I., & Irabien, J. A. (2000). Characterisation and management of incinerator wastes. *Journal of Hazardous Materials*, 79(3), 215–227. [https://doi.org/10.1016/S0304-3894\(00\)00268-5](https://doi.org/10.1016/S0304-3894(00)00268-5)
- Jacob, S., Nithianandam, S., Rastogi, S., Sakhuja, S., & Sri Laxma Alankar, S. N. (2021). Handling and treatment strategies of biomedical wastes and biosolids contaminated with SARS-CoV-2 in waste environment. In *Environmental and Health Management of Novel Coronavirus Disease (COVID-19)*. Elsevier Inc. <https://doi.org/10.1016/B978-0-323-85780-2.00012-3>
- Jang, Y. C., Lee, C., Yoon, O. S., & Kim, H. (2006). Medical waste management in Korea. *Journal of Environmental Management*, 80(2), 107–115. <https://doi.org/10.1016/J.JENVMAN.2005.08.018>

- Jibraeel, O. A., & Abdulrahman, M. A. (2022). occupational hazards among healthcare workers of governmental hospitals in duhok governorate. *Journal of Pharmaceutical Negative Results*, 13(3), 371–376. <https://doi.org/10.47750/pnr.2022.13.03.057>
- Jibraeel, O. A., & Abdulrahman, M. A. (2022). occupational hazards among healthcare workers of governmental hospitals in duhok governorate. *Journal of Pharmaceutical Negative Results*, 13(3), 371–376. <https://doi.org/10.47750/pnr.2022.13.03.057>
- K, G., FC, G., PD, S., MN, B., M, N., van den Berg M, & RE, N. (2013). Health consequences of exposure to e-waste: a systematic review. *The Lancet. Global Health*, 1(6), e350-61.
- Kalyan Reddy, L. V., & Al Shammari, F. (2017). Evaluation of biomedical waste management in primary health care centres in Saudi Arabia: a knowledge, attitudes and practices study. *EMHJ*, 23(9), 637–641. <https://doi.org/10.26719/2017.23.9.637>
- Khalid, S., Haq, N., Sabiha, Z. ul A., Latif, A., Khan, M. A., Iqbal, J., & Yousaf, N. (2021). Current practices of waste management in teaching hospitals and presence of incinerators in densely populated areas. *BMC Public Health*, 21(1). <https://doi.org/10.1186/s12889-021-11389-1>
- Khalid, S., Haq, N., Sabiha, Z. ul A., Latif, A., Khan, M. A., Iqbal, J., & Yousaf, N. (2021a). Current practices of waste management in teaching hospitals and presence of incinerators in densely populated areas. *BMC Public Health*, 21(1). <https://doi.org/10.1186/s12889-021-11389-1>
- Khalid, S., Haq, N., Sabiha, Z. ul A., Latif, A., Khan, M. A., Iqbal, J., & Yousaf, N. (2021b). Current practices of waste management in teaching hospitals and presence of incinerators in densely populated areas. *BMC Public Health*, 21(1). <https://doi.org/10.1186/s12889-021-11389-1>
- Khan, M. J., Hamza, M. A., Zafar, B., Mehmod, R., & Mushtaq, S. (2017). Knowledge, attitude and practices of health care staff regarding hospital waste handling in tertiary care hospitals of Muzaffarabad, AJK, Pakistan. *Int J Sci Reports*, 3(7), 220. <https://doi.org/10.18203/issn.2454-2156.intjsci rep20173094>
- Kumar, R., Somrongthong, R., & Ahmed, J. (2016). Impact of waste management training intervention on knowledge, attitude and practices of teaching hospital workers in Pakistan. *Pakistan Journal of Medical Sciences*, 32(3), 705–710. <https://doi.org/10.12669/pjms.323.9903>
- Luo, H., Cheng, Y., He, D., & Yang, E. H. (2019). Review of leaching behavior of municipal solid waste incineration (MSWI) ash. *Science of the Total Environment*, 668, 90–103. <https://doi.org/10.1016/j.scitotenv.2019.03.004>

- Mahmood M, Shahab S, Malik R, A. W. (2001). A Study of Waste Generation, Collection and Disposal in a Tertiary Care Hospital in Pakistan. *Pakistan J. Med. Res.*, 40(1), 1–6.
- Mahmood M, Shahab S, Malik R, A. W. (2001). A Study of Waste Generation, Collection and Disposal in a Tertiary Care Hospital in Pakistan. *Pakistan J. Med. Res.*, 40(1), 1–6.
- Mathur, V., Dwivedi, S., Hassan, M. A., & Misra, R. P. (2011). Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel: A Cross-sectional Study. *Indian Journal of Community Medicine : Official Publication of Indian Association of Preventive & Social Medicine*, 36(2), 143. <https://doi.org/10.4103/0970-0218.84135>
- Mehmood, Z., Malik, N., Shabbir, N., & Mehmood, S. (2021). Hazard Awareness & Practices of Biomedical Waste Management among healthcare Staff in Apex Hospitals: A Case Study in District Faisalabad. *Journal of Business and Social Review in Emerging Economies*, 7(1), 57–62.
- Mohamed, L. F., Ebrahim, S. A., & Al-Thukair, A. A. (2009). Hazardous healthcare waste management in the Kingdom of Bahrain. *Waste Manag*, 29(8), 2404–2409. <https://doi.org/10.1016/j.wasman.2009.02.015>
- Porta, D., Milani, S., Lazzarino, A. I., Perucci, C. A., & Forastiere, F. (2009). Systematic review of epidemiological studies on health effects associated with management of solid waste. *Environ Health*, 8(1), 60. <https://doi.org/10.1186/1476-069x-8-60>
- Rao, D., Dhakshaini, M. R., Kurthukoti, A., & Doddawad, V. G. (2018). Biomedical waste management: A study on assessment of knowledge, attitude and practices among health care professionals in a tertiary care teaching hospital. *Biomedical and Pharmacology Journal*, 11(3), 1737–1743. <https://doi.org/10.13005/BPJ/1543>
- S Rasheed, S Iqbal, LA Baig, K. M. (2005). Hospital waste management in the Teaching hospitals of Karachi. *J Pak Med Assoc*, 55(1), 192.
- S Rasheed, S Iqbal, LA Baig, K. M. (2005). Hospital waste management in the Teaching hospitals of Karachi. *J Pak Med Assoc*, 55(1), 192.
- Shah, I. (2018). Knowledge, attitude and practice of hospital staff regarding the solid waste management in Hayatabad Medical Complex Peshawar. *Advances in Basic Medical Sciences*, 2(2). <https://abms.kmu.edu.pk/index.php/abms/article/view/49>
- Shih, T. S., Chen, H. L., Wu, Y. L., Lin, Y. C., & Lee, C. C. (2006). Exposure assessment of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) in temporary municipal-waste-incinerator maintenance workers before and after annual

maintenance. *Chemosphere*, 64(9), 1444–1449.  
<https://doi.org/10.1016/J.CHEMOSPHERE.2006.01.014>

Tesfahun, E., Kumie, A., Legesse, W., Kloos, H., & Beyene, A. (2014). Assessment of composition and generation rate of healthcare wastes in selected public and private hospitals of Ethiopia. *Waste Manag Res*, 32(3), 215–220.  
<https://doi.org/10.1177/0734242x14521683>

Titto, E., Savino, A., & Townend, W. (2012). *Healthcare waste management: the current issues in developing countries*. SAGE Publications Sage UK.

Trinh, V. T., Van, H. T., Pham, Q. H., Trinh, M. V., & Bui, H. M. (2020). Treatment of medical solid waste using an air flow controlled incinerator. *Pol J Chem Technol*, 22(1), 29–34. <https://doi.org/10.2478/pjct-2020-0005>

World Health Organization. (2007). Incineration of Healthcare Waste and the Stockholm Convention Guidelines Module Overview. In *Global Healthcare waste project*.

World Health Organization. (2022). *Health-care waste*. WHO.  
<https://www.who.int/news-room/fact-sheets/detail/health-care-waste>

Y Babanyara, D. I. T. G. A. B. M. A. (2013). Poor medical waste management (MWM) practices and its risks to human health and the environment: a literature review. *Int J Environ Ealth Sci Eng*, 11(7), 1–8.

Yang, C., Peijun, L., Lupi, C., Yangzhao, S., Diandou, X., Qian, F., & Shasha, F. (2009). Sustainable management measures for healthcare waste in China. *Waste Management*, 29(1), 1996–2004. <https://doi.org/10.1016/j.wasman.2008.11.031>

Zeeshan, M. F., Al Ibad, A., Aziz, A., Subhani, A., Shah, A., Khan, T., Ullah, H., & Qazi, U. (2018). Practice and enforcement of national Hospital Waste Management 2005 rules in Pakistan. *Eastern Mediterranean Health Journal = La Revue de Sante de La Mediterranee Orientale = Al-Majallah al-Sihhiyah Li-Sharq al-Mutawassit*, 24(5), 443–450. <https://doi.org/10.26719/2018.24.5.443>

## APPENDIX-A: RELATIVE IMPORTANT INDEX

### RELATIVE IMPORTANCE INDEX (RII) FOR VARIABLES RELATED TO AWARENESS REGARDING OCCUPATIONAL HAZARDS AMONG INCINERATOR WORKERS

Relative important index ranges between zero to one. The higher the value we get the greater the importance given to that question.

**Table 33a: Relative important Index for Awareness Variables**

Question Items	Always (3)	Sometimes (2)	Never (1)	Total	Total (N)	A*N	RII	Ranks
Do you use special safety receptacles to store used needles?	78	11	0	256	89	267	0.95	<b>1<sup>st</sup> (Highest Importance was given)</b>
Do you Comply with all safety instructions?	65	23	1	242	89	267	0.90	<b>6<sup>th</sup> (Least Importance was given)</b>
Do you call a qualified electrician to test and repair faulty or suspect equipment?	75	14	0	253	89	267	0.94	<b>2<sup>nd</sup></b>
Do you wear a radiation protective gown when exposed to radiation?	68	20	1	245	89	267	0.91	<b>5<sup>th</sup></b>
Do you know about correct body posture during procedures?	65	24	0	243	89	267	0.91	<b>5<sup>th</sup></b>
Do you follow infection prevention and control precautions regarding blood, body fluids and tissues are infectious?	71	17	1	245	89	267	0.92	<b>4<sup>th</sup></b>
Do you wash hands immediately after removing gloves?	72	17	0	250	89	267	0.93	<b>3<sup>rd</sup></b>

**Table 35b: Relative Important Index for Practices Variables**

Question Items	Always (3)	Sometimes (2)	Never (1)	Total	Total (N)	A*N	RII	Ranks
Consult an occupational safety specialist for the safe handling of heavy patients	50	38	1	227	89	267	0.85	5 <sup>th</sup>
Ensure the presence of adequate protective aids and equipment	70	17	2	246	89	267	0.92	4 <sup>th</sup>
You face prolonged standing	16	49	24	170	89	267	0.63	8 <sup>th</sup>
Inadequate use of modern facilities	32	46	11	199	89	267	0.74	7 <sup>th</sup>
Hand washing with bactericidal agent	28	60	1	205	89	267	0.76	6 <sup>th</sup>
Wear gloves	82	7	0	260	89	267	0.97	1 <sup>st</sup> (Highest Importance was given)
Wear gowns (apron)	75	14	0	253	89	267	0.94	3 <sup>rd</sup>
Wear Caps	78	11	0	256	89	267	0.95	2 <sup>nd</sup>
Wear mask	83	5	1	260	89	267	0.97	1 <sup>st</sup> (Highest Importance was given)
Wear goggles	13	37	39	152	89	267	0.56	9 <sup>th</sup> (Least Importance was given)

## APPENDIX- B – Questionnaire

Awareness and Practices of Occupational Hazards Among Incinerator Workers Questionnaire				
<b>Part 1: Demographic Information</b>				
1	<b>Gender</b>		Male	Female
2	<b>Age</b>	20-30 years	31-40 years	41-50 years 50+ years
3	<b>Qualification</b>	Associate degree	Bachelor	Master
4	<b>What is your marital status?</b>	Married	Unmarried	Divorced or widowed
5	<b>Religion</b>	Muslim		Non-Muslim
6	<b>Working overtime</b>	Yes		No
7	<b>Duty shift</b>	Morning		Evening
8	<b>Place of residence</b>	Urban		Rural
9	<b>Years of experience with this job</b>	less than 5	5-10	More than 10
	<b><u>Part 2: Awareness and practices regarding occupational hazards.</u></b>	Never	Sometime	Always
10	<b>Do you Follow appropriate procedures in handling and disposing of sharp instruments or needles.</b>			
11	<b>Do you Use special safety receptacles to store used needles .</b>			
12	<b>Do you Comply with all safety instructions.</b>			
13	<b>Do you Call a qualified electrician to test and repair faulty or suspect equipment</b>			
14	<b>Do you Wear a radiation protective gown when exposed to radiation.</b>			
15	<b>Do you know about the Correct body posture during procedures</b>			
16	<b>Do you Follow infection control precautions regarding blood, body fluids and tissue are infectious</b>			
17	<b>Do you Wash hands immediately after removing gloves</b>			
18	<b>Consult an occupational safety specialist for the safe handling of heavy patients</b>			
19	<b>The presence of adequate protective aids and equipment</b>			
20	<b>Face Prolonged standing</b>			
21	<b>Inadequate use of modern facilities</b>			
22	<b>Hand washing with a bactericidal agent</b>			
23	<b>Wear Gloves</b>			

24	<b>Wear Gowns (apron)</b>			
25	<b>Wear Caps</b>			
26	<b>Wear Masks</b>			
27	<b>Wear goggles'</b>			

	<b><u>Part 3: Operational parameter of the incinerator Workers ...</u></b>			
28	<b>Type of incinerator</b>	Single Chamber	Double chamber	Multi chamber
29	<b>Temperature range</b>	800-1200 C	up to 800-1200	Others
30	<b>Chimney height</b>	Less than 4m	up to 4m	Others
31	<b>Incineration operation</b>	Manual	Automatic	Both
32	<b>Direct Exposure time during the handling waste in incinerator chamber. less than</b>	Less than 30 mints	1hour	More than 2 hour
33	<b>immunization against: hepatitis B</b>	Yes	No	
34	<b>immunization against: tetanus</b>	Yes	No	

THANK YOU



## Appendix C – IRB APPROVAL CERTIFICATE



**AL-SHIFA SCHOOL OF PUBLIC HEALTH  
PAKISTAN INSTITUTE OF OPHTHALMOLOGY  
AL-SHIFA TRUST, RAWALPINDI**

MSPH-IRB/14-16  
27<sup>th</sup> Sep, 2022

### **TO WHOM IT MAY CONCERN**

This is to certify that **Hira Ghazanfar** D/O **Ghazanfar Ali** is a student of Master of Science in Public Health (MSPH) final semester at Al-Shifa School of Public Health, PIO, Al-Shifa Trust Rawalpindi. He/she has to conduct a research project as part of curriculum & compulsory requirement for the award of degree by the Quaid-i-Azam University, Islamabad. His/her research topic which has already been approved by the Institutional Review Board (IRB) is “**Awareness, practices and Occupational Hazards among incinerator workers in tertiary care Hospitals of Rawalpindi and Islamabad**”.

Please provide his/her necessary help and support in completion of the research project. Thank you.

Sincerely,

**Dr. Ayesha Babar Kawish  
Head  
Al-Shifa School of Public Health, PIO  
Al-Shifa Trust, Rawalpindi**

AL-SHIFA TRUST, JEHLUM ROAD, RAWALPINDI – PAKISTAN  
Tel: +92-51-5487820-472 Fax: +92-51-5487827  
Email: [info@alshifaeye.org](mailto:info@alshifaeye.org) Web Site: [www.alshifaeye.org](http://www.alshifaeye.org)

## Appendix D – Consent Form

Title of research project : Awareness and Practices of Occupational Hazards Among Incinerator workers in Tertiary care hospital ,Rawalpindi

Principle investigator : Hira Ghazanfar


### RESERCH CONSENT FORM

This is to inform that you are invited to participate in this research project. The study is to assess Awareness and Practices of Occupational Hazards Among Incinerator workers of holy family hospital Rawalpindi. Information from this study will give an idea of awareness and Practices of Occupational Hazards Among Incinerator workers .

If you agree to participate in this study, you will fill questionnaire according to your knowledge about occupational hazards .This will be a short survey and should take no more than 15-20 minutes to complete .You will not receive any monetary compensation for participation in this study. You are free to quite any time. All data from this study will kept confidential. Participation in this research study is volountary.If you are willing to participate in this study, kindly sign on this consent form.

If you have question regarding this research or if you have research related inquiry, either now or any time in the future, please contact Hira ghazanfar at [hiraghazanfar036@gmail.com](mailto:hiraghazanfar036@gmail.com) .If you want to know more about your rights as a research participants, you can contact the institute review board (IRB) of Al-shifa trust eye hospital of public health Rawalpindi at [soap@alshifaeye.org](mailto:soap@alshifaeye.org) or 051-5487821


I have read and understand the information in this form and I have decided that I will participate in this research project as describe above. I understand I can withdraw at anytime.

  
Signature of study participants

1-02-2023  
Date

I confirmed that individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Name of Researcher/person taking the consent :Hira ghazanfar

signature of researcher /person taking the consent 

Date: 1-02-23

## APPENDIX-E: BUDGET

Budget item	Transport	Stationery and internet	Printing	Publishing
Pilot testing	500 Rs/-	5000 Rs/-	5000 Rs/-	-
Data collection	10,000 Rs/-	7,000 Rs/-	-	-
Thesis writeup	1,000 Rs/-	5,000 Rs/-	8,000 Rs/-	8,000 Rs/-
Total expenditure	16,000 Rs/-	17,000 Rs/-	13,000 Rs/-	8,000 Rs/-
Grand total	54,000 Rs/-			

## APPENDIX-F: GANTT CHART

Activities	OCT 2022	NOV 2022	DEC 2022	JAN 2023	FEB 2023	MAR 2023
Literature Search						
Synopsis writing & IRB Approval						
Pilot Testing						
Data Collection						
Data Analysis						
Thesis Write up						
Thesis Defense						