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Occupational Hazards Among Anesthesia Staff in Palestinian Governmental Hospitals in the West Bank

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Occupational Hazards Among Anesthesia Staff in Palestinian Governmental Hospitals in the West Bank

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Thesis Approval

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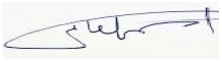
Head of the committee (supervisor): Dr. Asma Imam Signature 

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Dedication

I dedicate this thesis …

To the first teacher of all people, Prophet MOHAMMED (peace be upon him)

To my dear father and mother

To my beloved sweet family, to my wife and children who supported and encouraged me at all stages

To my friends, colleagues

To all who helped me in completing this study

With love and respect

Basher Mahmud Alamleh

Declaration

I certify that this thesis submitted for the degree of master in health policy and management, is the result of my own research, except where otherwise acknowledge, and that this thesis (or any part of the same material) has not been submitted for a higher degree to any other university or institution.

Basher Mahmud Alamleh

Signed:

Date: 3 / 8 /2021

Acknowledgment

First and foremost, all thanks to Allah for helping me every moment and during my study and capability to complete this thesis, I would like to express my gratitude and appreciation, to all who have contributed to the success of this study.

My most profound gratitude to my supervisor Dr. Asma Imam, who guides me and gives her time until the accomplishment of this study.

I sincerely hope that this study will be beneficial and helpful to the policymakers, and strategic planners to have safer anesthesia departments.

I am very grateful to all those who have contributed to the completion of this study and helped to make this research possible.

Finally, My deep thanks to my family, my parents, wife, children, and my friends for their support and encouragement which gave me the strength to continue.

Abstract

Background: Anesthesia staff exposed to many occupational hazards while being in the workplace. These risks are divided into biological, chemical, psychosocial, physical, and ergonomic risks.

Purpose: The study aims to identify the types of occupational hazards and the factors that affect these hazards among the anesthesia staff in the Palestinian governmental hospitals in the West Bank.

Methods: A descriptive-analytical cross-sectional study was conducted using a self-administered questionnaire. The Study participants consist of all anesthesia staff who works in the governmental hospitals which include operating rooms in the West Bank. Study period includes 184 workers; 161 responded to the questionnaire, with a response rate of 87%.

Results: The reported results indicate that more than half of the participants were exposed to occupational hazards at a moderate level regardless of their types (63.2%). The highest reported percentages of the type of occupational hazards the participants exposed to were the biological hazards (63.2%), followed by chemical (60.1%), physical (57.17%), psychosocial (56.49%), and ergonomic hazard (56.40%). Besides, biological and chemical hazards were among the more severe compared to other hazards (58.9%, 58.7%), respectively, followed by physical (57.17%), psychosocial (56.49%), and ergonomic hazards (56.40%). Also, the results indicate that the most prevalent occupational hazards that participants reported being exposed to was the exposure to ionizing radiation by exposure to x-ray (76.4%), followed by exposure to inhalation of anesthesia gases (70.31%), and then exposure to the fluids and blood-borne that comes out from the patients (69.94%).

The study results showed that the level of awareness and knowledge of the staff of the risk of occupational hazards was high (80.62%). However, the availability of the safety measures was at a moderate level (64.92%).

The study results found that there is no significant relationship between the means of exposure to occupational hazards, staff awareness, availability of safety measures, and (gender, marital state, primary work location, monthly income, education level, and job position) variables. In comparison, there were significant differences between the means of exposure to occupational hazards and age in favor of the age category (36 – 45). Also, it founded that there are significant differences with experience on exposure to occupational hazards and staff awareness; the categories with more years of experience were the least likely to be exposed to occupational hazards and the most aware to deal with. Besides that, it founded that there are significant differences with those having training courses in occupational health and exposure to occupational hazards, the staff that had previous training courses were less exposed to occupational hazards.

Conclusion: Based on these study findings, the researcher recommends enhancing occupational safety including infection control in all related hospital units. Besides, there is a need for preparing the anesthesia staff, whether during their formal training period or during work to protect themselves from the various occupational risks that they may be exposed to.

Keywords: occupational hazards, anesthesia staff, awareness, safety measures, biological hazards, chemical hazards, physical hazards, psychosocial hazards, ergonomic hazards.

التعرض للمخاطر المهنية لدى طاقم التخدير العاملين في المستشفيات الحكومية الفلسطينية في الضفة الغربية

اعداد: بشير محمود العمله

اشراف: الدكتورة اسمى امام

ملخص

المقدمة: يتعرض موظفو التخدير للعديد من المخاطر المهنية أثناء تواجدهم في مكان العمل. تنقسم هذه المخاطر إلى مخاطر بيولوجية وكيميائية ونفسية وجسدية ومخاطر عدم الملائمة.

الهدف من الدراسة: التعرف على هذه المخاطر المهنية والعوامل التي تؤثر عليها في قسم التخدير في المستشفيات الحكومية الفلسطينية في الضفة الغربية.

المنهجية: تم اجراء دراسة مقطعية وصفية تحليلية باستخدام استبيان ذاتي. تكونت عينة الدراسة من جميع موظفي التخدير العاملين في المستشفيات الحكومية في الضفة الغربية اثناء فترة الدراسة، وهم 184 موظفا، أجاب على الاستبيان 161 مشارك، حيث كانت نسبة الاستجابة 87٪.

النتائج: خلصت النتيجة إلى أن أكثر من نصف المشاركين تعرضوا لمخاطر مهنية بدرجة متوسطة بدون تحديد نوعها (63.2٪). وكانت أعلى النسب المئوية لأنواع التعرض للمخاطر المهنية هي المخاطر البيولوجية (63.2٪) ، تليها المخاطر الكيميائية (60.1٪) ، والبدنية (57.17٪) ، والنفسية الاجتماعية (56.49٪) ، ومخاطر عدم الملائمة (56.40٪). إلى جانب ذلك ; كانت المخاطر البيولوجية والكيميائية أكثر شدة من المخاطر الأخرى وكانت (58.9٪ ، 58.7٪) على التوالي ، تليها الجسدية (57.17٪)، والنفسية الاجتماعية (56.49٪)، ومخاطر عدم الملائمة (56.40٪). كما تشير النتائج إلى أن المخاطر المهنية الأكثر انتشارًا التي أبلغ المشاركون عن تعرضهم لها كانت نتيجة التعرض للإشعاع المؤين بالتعرض للأشعة السينية (76.4٪) ، يليه التعرض لاستنشاق غازات التخدير (70.31٪) ، و ثم يأتي التعرض

للسوائل والدم التي تخرج من المرضى (69.94٪).وأظهرت نتائج الدراسة أن مستوى وعي ومعرفة الموظفين بالسلامة المهنية كان مرتفعا (80.62٪). كما أن توافر إجراءات السلامة كان عند مستوى متوسط (64.92٪).

كما أشارت نتائج الدراسة إلى عدم وجود علاقة ذات دلالة إحصائية بين التعرض للمخاطر المهنية ، والوعي المهني للمخاطر المهنية ، وتوافر إجراءات السلامة تعزى الى متغيرات (الجنس ، الحالة الاجتماعية ، مكان العمل ، الدخل الشهري ، المستوى التعليمي ، والوظيفة). بينما كانت هناك فروق ذات دلالة إحصائية بين وسائل التعرض للمخاطر المهنية تعزى الى العمر لصالح الفئة العمرية (36-45) . كما تبين أن هنالك علاقة ذات دلالة إحصائية بين التعرض للمخاطر المهنية ، والوعي المهني للمخاطر المهنية ، وتوافر إجراءات السلامة تعزى الى متغير سنوات الخبرة، حيث كانت الفئات التي لديها سنوات خبرة أكثر هي الأقل احتمالا للتعرض للمخاطر المهنية والأكثر وعيا للتعامل معها. إلى جانب ذلك ، وجدت الدراسة أن هناك علاقة ذات دلالة إحصائية مع أولئك الذين حصلوا على دورات تدريبية في الصحة المهنية والتعرض للمخاطر المهنية ، حيث كان الموظفون الذين حصلوا على دورات تدريبية سابقة أقل تعرضًا للمخاطر المهنية.
والدورات التدريبية في مجال المخاطر المهنية.

الخلاصه: بناءً على نتائج الدراسة ، يوصي الباحث بتعزيز السلامة المهنية بما في ذلك مكافحة العدوى في جميع وحدات المستشفى ذات الصلة. إلى جانب ذلك ، هناك حاجة لإعداد طاقم التخدير سواء خلال فترة تدريبهم الرسمية أو أثناء العمل لحماية أنفسهم من مختلف المخاطر المهنية التي قد يتعرضون لها.

الكلمات المفتاحية: الأخطار المهنية ، طاقم التخدير ، الوعي المهني ، إجراءات السلامة، المخاطر البيولوجية ، المخاطر الكيميائية ، المخاطر البدنية ، المخاطر النفسية و الاجتماعية ، مخاطر عدم الملائمة.

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List of Abbreviations

COVID-19	Coronavirus Disease 2019
WHO	World Health Organization
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
ILO	International Labour Organization
HCW	Health Care Workers
PPE	Personal Protective Equipment
WFSA	World Federation Societies of Anesthesiologists
MSD	Musculoskeletal Disorders
PMOH	Palestinian Ministry of Health
COSHH	Control of Substances Hazardous to Health Regulations Committee

Chapter One

Introduction

Chapter One: Introduction

1.1. Introduction

Occupational hazards are one of the most challenging issues that could affect morbidity and mortality worldwide (Mona et al., 2019), these hazards can largely be prevented events and related to the existence of conditions or activities that may result in injuries and disturb the continuation or pursuit of an action (International Labour Organisation, 2019).

According to the International Labour Organization (ILO) estimates, over 2.3 million people yearly die from an occupational injury or disease worldwide (Lu et al., 2020). Also, 160 million people suffer from non-fatal work-related diseases (Naim, 2020); at least one person loses his/her life because of work-related accidents and illnesses in the world every 15 seconds (ILO.2013). The National Institute for Occupational Safety and Health (NIOSH) considers occupational hazards as chemical, biological, physical, and psychological factors. These factors occur when job conditions are not compatible with the staff's abilities, needs, or resources (Husain et al. 2019).

Healthcare organizations are characterized by their complex and multidimensional environments that make the worker in this field exposed to occupational hazards and injuries (Anandh et al., 2015). Health care workers are regarded as a risk group because they are exposed to different occupational hazards in the medical field and vulnerable to occupational diseases and associated high risks (Al-aslami et al, 2018).

Hospitals are one of the most critical and most severe occupational risks because of their diversity in their services and multidimensional and complex environments (Wu et al. 2018). The highest incidence of nonfatal occupational injuries occurs in hospitals about (7.5%) of all nonfatal occupational injuries around the world (OSHA, 2013). Many scheduled events affect working in the hospitals and put them at risk; they threaten healthcare workers lives, safety and well-being. Globally, it is estimated that 1 in 10 healthcare workers in hospitals experiences an actual injury every year (Mossburg et al., 2019), so health care workers in hospitals, are regarded as a risk group in terms of vulnerability to exposure to the associated risks and exposure to occupational diseases (Al-aslami et al. 2018).

The anesthesia departments in hospitals are with a higher incidence of occupational risks since there are many hazardous factors related to the staff working there (Neto et al, 2017). Many potential hazards can affect the anesthesia team; it could result from exposure to physical, chemical, biological, or physiological hazards. Moreover, the anesthesia team is exposed to infectious diseases, anesthetic gases, radiation, stress, and other risks (Ross & Hilmi, 2015).

Also, in the last period since the beginning of 2019, the world has a large-scale outbreak of the Coronavirus (Covid-19) pandemic, which in turn has a direct effect on the exposure of general medical personnel to the risk of infection as a result of close contact with patients who are carrying the virus(Wong et al., 2020). The virus has been one of the occupational risks that health workers face in the recent period. The anesthesia department is one of the fields that had a directly exposed to the risk of contracting the virus as a result of the biological risk resulting

from the aerosol transmission and direct close interaction with the respiratory system between the patient and the anesthesia team (Ti et al., 2020)

According to researcher knowledge, studies around the world related to the anesthesia team and exposure to occupational risks are limited and usually focus on a specific risk such as the effect of anesthetic gases or one type of occupational risk. Moreover, there are no founded studies that discuss the occupational hazards in anesthesia departments in the Palestinian governmental hospitals.

1.2. Problem Statement

The occupational hazards affect health care workers in the medical field; they are exposed to various risks, so these risks were under investigations by researchers worldwide. The anesthesia department is one of the medical sectors affected by occupational hazards, which acquires a particularity in dealing with high occupational hazards in terms of gases, radiation, high psychological stress, and other risks.

Also, since the beginning of 2019, a new type of biological hazard has been arising as a significant challenge to deal with in the healthcare field, especially in the anesthesia department, because of its direct exposure to the Coronavirus (Covid 19).

This study will identify these risks and study the staff awareness and protective measures taken to decrease the risk of exposure to occupational hazards.

1.3. Study Justification

Operating departments in hospitals are with a high incidence of occupational risks since there are many hazardous factors related to the staff working there (Neto & Brazilian, 2017). The Anesthesia team is exposed to many occupational hazards that affect this team and put them at risk, these risks can be classified into five main categories depending on their nature: (physical, chemical, biological, psychological, and inappropriate work environment) (Volquind et al,2013). Also, the anesthesia department is a continuous working field without interruption, which increases the incidence of exposure to hazard risks causing illnesses and injuries.

Moreover, the environment of the operation rooms is a dangerous place. It needs special requirements and measures to protect the team through an acceptable awareness and perception and ensure that arrangements are available to reduce the possibility of these risks to the minimum range.

Based on the reviewed published studies that I review, there are no founded studies that focus on the occupational hazards especially on the anesthesia staff in the Palestinian hospitals. Therefore, it is essential to identify these risks and study the hospital's readiness to protect and mitigate these risks, especially with the spread of infection with the Coronavirus pandemic and its effect among the medical staff as one of the occupational risks that also affect the anesthesia staff. The researcher hopes that this study will highlight strengths and weaknesses in the occupational health related to anesthesia departments and help decision-makers in the Palestinian Ministry of Health (PMoH) take specific and practical measures to reduce these risks.

1.4. Purpose of the study

The purpose of this study is to identify most frequent types of occupational hazards and the factors that affect the likelihood of occurrence of these hazards among the anesthesia staff. The results of this study could help increase the anesthesia team's awareness and knowledge about the occupational hazards that affect them. Also, this study could provide evidence and recommendation to PMoH and decision-makers for setting and developing policies that could protect the anesthesia team and mitigate the effect of these risks.

1.5. Objectives of the study

1- To identify the main occupational hazards that affects the anesthesia staff in the operation room.

2- To determine the awareness level of the anesthesia staff about the expected occupational hazards.

3- To detect the availability of safety measures in the operation room to reduce occupational hazards

4- To study the relationship between exposure to occupational hazards, staff awareness, availability of safety measures, and the socio-demographic factors (age, gender, marital state, primary work location, monthly income, experience, education level, and job position, training courses in occupational hazards).

1.6. Research questions of the study

1. What are the most potential hazards that affect the anesthesia team in the operation room?
2. What are the most common types of occupational hazards that affect the anesthesia team in the operation room?
3. What is the level of awareness among anesthesia staff of the occupational health hazards?
4. What type of safety measures available to protect the anesthesia staff from potential hazards available?
5. Is there a significant at the level ($p \leq 0.05$) between exposure to occupational hazards, staff awareness, availability of safety measures, and socio-demographic factors (age, gender, marital state, primary work location, monthly income, experience, education level, and job position, training courses in occupational hazards)?

1.7. Definitions

Occupational Hazards: A work-related condition that may lead to death, disease, or disability**,** it contains five types: biological, physical, chemical, psychosocial, and ergonomic hazards.

Biological Hazard: Organic substances that form a danger or a threat to the health of the workers, it includes viruses, pathogenic microorganisms, toxins from biological sources, spores, fungi (Izadi, 2018).

Physical Hazards: External conditions or factors that existed at the sight of the work that can harm worker's health; it can be in the operation room because of radiation, electricity, heat, noise, or other things (Ulutasdemir & Tanir, 2017).

Chemical Hazards: Risks that surround using a chemical that, could be inhaled, absorbed through the skin, swallowed, or ingested (Chhabra, 2016)

Psychosocial Hazards: Conditions related to the psychological and social conditions in the workplace. These include stress, violence, fatigue, bullying, aggression, burnout, and difficulties in family relationships (Branco, 2010).

Ergonomic Hazards: Any condition that has the potential to cause harm or could be dangerous to a worker's musculoskeletal system that could result from lifting, slipping, poor light, or others (Sio et al., 2018).

Safety measures: Action, precautions, and policies taken to protect workers from such known hazards as anesthesia gases, radiations, particles and aerosols, radiation exposure, falls, cuts, puncture wounds, and other risks.(Varughese et al., 2021)

Anesthesia Physician: Physicians specializing in perioperative care, developing anesthetic plans, and the administration of anesthetics (HSS, 2021)

Anesthesia resident: Doctor who graduated from medical school and now trains in the anesthesia department on a residency program to become an anesthesiologist. **(**Wikipedia, 2021)

Anesthesia technician: is an allied healthcare worker who performs a patient care role predominantly assisting with the administration and monitoring of anesthesia and has an

extensive knowledge of anesthesia techniques, instruments, supplies and technology .(Wikipedia, 2021**)**

1.8. Summary

This chapter contains study background, study justification, problem statement, study aim and objectives, hypothesis, and research questions. Also, this chapter presents the general definitions of the study variables such as occupational hazards, Biological hazards, physical hazards, ergonomic hazards, chemical hazards, anesthesia physician, anesthesia technician, and anesthesia resident .

Chapter Two

Literature Review

Chapter Two: Literature review

2.1. Introduction

This chapter reviews the theoretical framework and represents the local, regional and international studies that investigate the aspects of the occupational hazards and the factors that relate to them, whether within the anesthesia department and other related health departments. A comprehensive search through previous master studies, internet search, books, and journals has been utilized to uncover the research work and theoretical issues related to the study concepts and variables. There are no local studies found that are similar to this proposed study. Also, the reviewed international studies focused on some aspects of this study especially targeting the anesthesia staff.

2.2. Hospitals in Palestine

The number of hospitals in Palestine during the year 2019 reached 84 hospitals, whether in the public or private sector, 52 of them are distributed in the West Bank, including East Jerusalem. this constitutes 61.9% of all hospital's in Palestine. The number of hospital beds (including neuropsychiatric hospitals) totaled 6,435 beds, with an average of 12.9 beds per 100,000 inhabitants. (MoH, annual report 2019).

The number of hospitals belonging to PMoH is 28 hospitals, with a bed capacity of 3531beds. This form contains about 54.9% of the total beds in Palestine, 15 hospitals located in the West Bank with a capacity of 1,749 beds, which forms about 49.5% of the total governmental beds.

There are 13 hospitals in the Gaza strip with 1782 beds, which form 50.5% of the total ministry of health beds (MoH, annual report 2019).

Also; there are 59 operating rooms in PMoH hospitals in the West Bank distributed over 12 hospitals (there are three hospitals without operating rooms: National Hospital, Psychiatric Hospital, and Hogo Hospital) (MoH, annual report 2018).

2.3. Occupational Injuries

The International Labor Organization (ILO) defines occupational injuries as any personal injury, disease, or death resulting from an occupational accident that had an unexpected or unplanned occurrence. Occupational injury differs from an occupational disease, related to diseases resulting from exposure over the duration of time to risk factors emerging from work activity (Encyclopedia Britannica, 2021).

The Palestinian labor law mentioned occupational injury and defines its rules in section one, chapter 1, article 1, as "an accident that happens to the employee during work, because of work, or while going to or returning from work" (Ministry of Labor, 2002; Palestinian labor law, 2000, p2). Palestinian health annual report (2019) reported that there were 1782 injured workers. Work accidents increased 8.5% compared to 2018. The report indicated that the incidence rate of injuries at work in the West Bank was 59.7 per 100,000 populations, while it reached in the Gaza Strip 57.7 per 100,000 populations. Besides, 24 reported deaths related to a work accident in 2019, with an increase of 71.7% over the year 2017 (MOH, 2019).

2.4. Occupational Diseases

Any illness is related to a particular occupation or industry. Such diseases result from different factors containing biological, chemical, physical, and psychological factors in the work environment. Occupational medicine focuses on the effect of all kinds of jobs in the health field and its effect on a worker's capacity and efficiency (Kazantzis, 2019). Occupational diseases include various disorders and diseases such as; infectious diseases, respiratory illnesses, musculoskeletal disorders (MSDs), hearing disorders, cancer, stress, and mental health disorders.

ILO in its recommendation no. 121 states that there are six occupational related diseases that arise because of exposure to a hazardous substance, or disease due to a situation in the process or occupations (International Labour Organization, 2010).

2.5. Occupational Hazards

The World Health Organization (WHO) estimates globally that the percentage of workers in the health sector represents about 13% of the total number of workers, and this percentage represents approximately 59 million workers. The World Health Organization also indicated that those workers are vulnerable to occupational accidents and may be affected by occupational injuries and diseases (WHO, 2018). According to the U.S. Bureau of Labor, the healthcare industry is second in rank after manufacturing in the number of occupational diseases and injuries sustained by their workers (Leigh, 2011). Merat (2008) defines occupational hazards as an unexpected event associated with the existence of circumstances or activities that could lead to injuries, discontinued work, or disruption of follow-up (Mérat & Mérat, 2008). Schulte et al. described occupational risks as the long and short-term dangers or hazards associated with unhealthy and

unsuitable workplace environments (Schulte et al, 2012). All healthcare workers are considered at significant risk, According to the International Labor Organization (ILO), About 6000 deaths occur every day due to work-related accidents or diseases, this means that every 15 seconds, at least one person dies because of work-related accidents and illnesses worldwide (Lebni et al, 2020). Occupational health hazards put health care workers at risk of increasing the number of morbidity and mortality, and the increased effects of work-related injuries and illness will harm HCWs. Therefore, finding the workplace's risk factors and mitigating their effect is mandatory to increase occupational health safety and improve the productivity and well-being of HCWs (Osungbemiro et al, 2016).

There are five main types of occupational hazards: biological, chemical, physical, psychosocial, and ergonomic hazards that affect the health care worker in general (Volquind et al., 2013). Anesthesia staff deal with many factors that may lead to occupational health hazards such as bloodborne and air-borne pathogens, potential drug exposures, waste anesthetic gas exposures, ergonomic factors from overload working, stress, lifting, laser beam hazards, workplace violence, and x-ray hazards (Okoth-okelloh et al., 2015). Health hazards affect anesthesia staff on daily basis since the anesthesia environment is complicated and has multiple factors that could be a source of occupational hazards (Che Huei et al., 2020).

The World Federation Societies of Anesthesiologists (WFSA)and the Brazilian Society of Anesthesiology classified the occupational hazards into five main categories (Bajwa & Kaur, 2012)and(Hakim et al., 2018):

1. **Physical hazards**. such as radiation (ionizing and non-ionizing), noise, electrical appliances, heat, ventilation, and fires.
2. **Chemical hazards**. such as exposure to anesthetic gases, respiratory allergy, and latex allergy.
3. **Biological hazards**. caused by infection with viruses, bacteria, and fungi.
4. **Psychosocial hazards**. such as stress, violence, drug addiction, burnout, and social relationship difficulty.
5. **Ergonomic hazards** such as carrying heavy weights, falling and slipping, workload, overcrowded, and lighting problems.

2.5.1. Biological hazards:

The biological hazards are substances that cause human diseases and form a threat to human health because of exposure to work associated with microbial agents such as viruses, bacteria, and fungi(Rim & Lim, 2014). There are two leading causes of biological hazards during the health workers' practice; infection through contact with patient blood and body fluids or infection through polluted air from the patient (Izadi, 2018). Most of the biological hazards can be classified as infectious or immunologically active, there are many of them, but the most common and vital is newly infected with Covid 19. Also, hepatitis B and C then comes HIV, tuberculosis, swine flu (Cohen et al., 2020). In anesthesia environment, airborne infections are commonly transmitted in closed places by inhaling infected droplet nuclei (Morgenstern, 2020). Also; blood and fluid- borne infections are transmitted in many ways; they may transmit by needle stick injury or pharyngeal secretions, securing the intravenous lines, injury during local

infiltration and regional anesthesia, injury during suturing central venous catheter, exposure to infected CSF, exposure to infected wounds, or other accidents. (Bajwa & Kaur, 2012)

2.5.1.1. COVID-19:

Coronavirus disease 2019 (COVID-19) is defined as a respiratory illness caused by a novel Coronavirus and called severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2). It was first identified in Wuhan City, Hubei Province, China (CDC, 2019). After fast spreading around the world on March 11, 2020, the WHO declared COVID-19 a global pandemic (WHO, 2020).

Coronavirus symptoms may be mild symptoms such as colds, high fever, general fatigue, headache, loss of sense of smell, taste, and dry cough. These symptoms may develop into severe acute symptoms that affect the respiratory system and cause inflammation of the lungs' alveoli, leading to swelling and fluid-filled of alveoli. This will decrease the oxygen exchange level, causing pneumonia, which may need in advanced stage to mechanical ventilation. Besides that, it may lead to defects in the work of the heart, liver, and kidneys. Many cases end in losing the life of the patient as a result (Ercolano, 2021)(Cohen et al., 2020).

The anesthesia staff is in direct contact with the patients' respiratory system during care, whether those patients were diagnosed or undiagnosed to holding Coronavirus. The anesthesia staff is expert in securing the airway and ventilation modes that force them to stay within a very close distance to the patients (Ghinai et al, 2020). World Federation Society of Anesthesiologists (WFSA) has put guidelines and instructions about how to deal with patients that infected with Covid 19 and what are the safety measures that could protect the anesthesia team like using

personal protective equipment's (PPE) including unique masks, goggles, and face shield in addition to the special clothes and gloves (Ong et al., 2020)

2.5.1.2. Hepatitis B and C:

According to the WHO, hepatitis B is a viral infection that attacks the liver and can cause both acute and chronic diseases (WHO, 2020). It is considered highly infectious that requires special attention, especially since it is estimated that the percentage of carriers of hepatitis B is 1 per 500 persons. At the same time, the majority of them are asymptomatic (Bajwa & Kaur, 2012). According to the Palestinian Ministry of Health, statistics indicate that the incidence of reported carrier's rate of infection with hepatitis B virus in the Palestinian territories is 13.3 per 100,000 populations (MoH, 2019).

Hepatitis C is an infectious disease caused by the hepatitis C virus (HCV) that primarily affects the liver. It is considered a dangerous health indicator and a leading cause of liver-related mortality worldwide. Globally estimated that there are approximately 100 million persons with serological evidence of HCV infection and that HCV causes about 700 000 deaths each year (Lanini et al., 2016). According to the Palestinian Ministry of Health, statistics indicate that the incidence of reported carrier's rate of infection with hepatitis C virus in the Palestinian territories is 2 per 100,000 populations (MoH, 2019).

Health care workers, in general, are exposed to the risk of transmitting the virus through direct - contact with the blood of an infected patient, whether by needle stick injury or by any way in

which direct contact with the patient's blood could occur. It is estimated that 0.3 ml of patient blood is sufficient to transmit the virus (Keeffe et al, 2004).

The anesthesia staff is exposed to a high rate risk of infection with hepatitis, direct contact with sharp instruments, and open wounds. Besides, there is a direct contact with fluids and secretions that come out from the patient's mouth, all of these reasons, in addition to general causes such as needle stick injury and others, make the anesthesia staff at high risk from infection with hepatitis or other blood-borne diseases (Hasak et al., 2018).

There are an effective vaccine exists to prevent the transmission of hepatitis B. All anesthesia staff should ensure that they are up to date with their immunization schedule. Also, any one of the staff in whom no antibodies are present and suspected to be exposed to hepatitis B should be immunized passively with hepatitis B immunoglobulin to protect himself/herself from the infection(Anthony & Mbbs, 2006).

2.5.2. Chemical hazards:

Many chemicals are present in hospitals' workplace fields, the using chemicals judged as significant health hazards in hospitals, and those chemicals adversely affect the health care workers causing harmful effects on them. It also could potentially be fatal to healthcare workers (Izadi, 2018). Chemicals used in hospitals in three main ways: 1) Treating patients such as anesthetic gases, aerosol medication, oncology drugs. 2) To sterilize and clean surfaces and

instruments such as phenolic, cidex, bleach, ethylene oxide. 3) Used in the laboratory department for fixation of tissue specimens such as xylene and formaldehyde (NSIOH, 2017).

Anesthesia staff exposed to too many chemical hazards whether through inhalation, skin contact, or absorption. Chemical hazards in operation rooms include exposure to anesthetic gases, antimicrobial drugs, disinfectant agents, ethylene oxide, formaldehyde, glutaraldehyde, latex, or perhaps because of exposure to polluted fumes by the electrocautery unit or laser devices (Rosenstock et al, 2005).

The harmful effects of those hazards may lead to an imbalance in the body and its functions whether, in the short or long term in many ways, it may cause harm in the liver leading to liver cirrhosis. It can cause also irritation of the respiratory airways, (causing sore throat, cough, and nasal irritation). And prolonged exposure may result in headache, asthma, and allergic hypersensitivity; it depends on the agent concentration and toxicity, respiratory index, individual susceptibility, and duration of exposure (Berry, 2009). Also, itching, redness, burning, and swelling of skin may happen due to the direct contact of latex, formaldehyde, glutaraldehyde, sterilizers, or any other harmful chemical materials. Another chemical danger occurs during the anesthesia staff's exposure to surgical smoke in operations when using electrical cautery or laser technique, this may harm the respiratory system and may lead to damage to the lungs or the respiratory tract over time (Chhabra, 2016).

2.5.2.1. Reproductive risks:

Some evidence and epidemiological studies connect chronic exposure to low doses of anesthetic gases in operating rooms and spontaneous abortion and congenital disabilities, especially with the absence of a scavenging system. On another hand, there are more epidemiological studies that suggest there is inadequate evidence proving that. (Oliveira et al., 2021). The improvement of environmental conditions has been successful in reducing the risk of abortion and congenital disabilities. In other means, procedures that have reduced anesthetic gases' airborne levels in operating rooms like using the scavenging system to get out the waste anesthesia gases and the airflow circuit inside the operation room, (Terrana et al., 1992).

2.5.3. Physical hazards:

Physical hazards are defined as external conditions or factors that exist in the work's sight and can harm the worker's health. This type of risk is constantly present in the environment in operation rooms. It is responsible for many occupational diseases, such as cancers, hypertension, stress, injuries related to electrical shocks, and other diseases (Volquind et al., 2013).

The main physical risk factors that affect anesthesia staff in the operation rooms are the risks that come from ionizing and non-ionizing radiation, electrical assembly, noise, unsuitable room temperature, ventilation, vibration, and indoor pollution (Ulutasdemir & Tanir, 2017).

2.5.3.1. Ionizing and nonionizing radiation:

Ionizing radiation is considered the most crucial physical hazard in operation rooms. When exposed to x-rays during some kinds of operations in orthopedic, urology, or other operations, it affects anesthesia staff. It has carcinogenic and mutagenic impacts, and it is maybe fatal in high concentrations. Exposure to ionizing radiation could lead to cancer (particularly leukemia) during long term exposure; also, it could cause genetic and congenital abnormality, infertility, burns, and cataracts in moderate exposure concentrations. (Meydanlioglu, 2013) .Also, nonionizing radiation from laser beams or ultrasound waves is another physical risk factor for the anesthesia team. Exposure to this kind of radiation for a long time more than 8 hours, could lead to some health problems vary from headaches, eye problems, throat dryness, facial flushing, allergies, and fatigue(Walton & Rogers, 2017).

2.5.3.2. Noise:

Noise is known as one of the physical hazards that affect patients and staff for a long time. In 1859 the founder of modern nursing, Florence Nightingale, said about noise, " Unnecessary noise is the cruelest absence of care which can be inflicted either on sick or on well."(Katz, 2014). Continuous exposure to loud noise will lead to stress-related disorder, affect the behavioral mode, sleep disorder, less attention, and less concentration on the medical situation of the patient. The noise source in the operation rooms that affect anesthesia staff may be coming from the monitor alarms, ventilators, cautery, surgical saw and drills, suction apparatus, ventilation voices, and other sources. (Katz, 2014)

National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) have developed guidelines and recommendations for safe noise levels in the workplace. They found that operation rooms had a high level of noise that exceed on average 100 decibels (dBA), while the allowable exposure for an 8-h workday should be less than 85 decibels (dBA) (Fritsch, 2010).

2.5.3.3. Unsuitable room temperature:

Unsuitable room temperature (hot and cold) may influence personal performance. Recently there is focusing on normothermia in surgical patients as a quality metric, which means that temperature in operation rooms may be colder or warmer than the optimal temperature degree for staff performance depending on the operation type and patient's conditions, especially in pediatric operations (Wong et al., 2010).

A study performed to examine the room temperature variation effect on anesthesia staff found that excessive heat in the operation room climate was associated with worse self-rated performance. Besides, incredible frustration is detected between staff while there is an unsuitable temperature degree. (Hakim et al., 2018)

2.5.4. Psychosocial hazards:

Psychological hazards are among the occupational risks that workers in the health sector exposed to during the service provision. One of them is depression associated with work. It occurs because of work conditions in unstable working shift time, and patients' condition of incredibly

hopeless or complex cases (Everlin et al., 2013). Hostile relations between staff can be another source of these risks, such as violence especially verbal violence which is the most common, bullying, and sexual harassment (Izadi, 2018).

Also, social hazards lead to social disintegration due to the time disorganized and according to the mood of health workers related to patients' cases (Health & Workers, 1995). This kind of hazard could lead to isolation, aggressiveness, barriers in making friends, social life difficulties (Branco, 2010).

2.5.4.1. Work shift:

Many researchers found a negative impact on the social and psychological relationship of health care providers. Irregularity of work because of working on the shift system was associated with tense relationships and fewer friends. Also, constant night shifts lead to sleeping, eating, tension disorders, and chronic fatigue (Walton & Rogers, 2017).

2.5.5. Ergonomic hazards:

Health care workers face high physical risks while providing health services because of the nature of their work and the environmental conditions around them (Sio et al., 2018). Musculoskeletal disorders (MSD) form the most important of these risks. According to the National Institute for Occupational Safety and Health (NIOSH), many studies indicated that these disorders are primarily because of body force in raising patients or inappropriate body positions such as standing for long periods, long sitting, or uncomfortable movements. Also, the

National Institute for Occupational Safety and Health reported more than 5000 injury reports per year due to ergonomic hazards. Approximately half of these happen during the handling of patients (Ghosh, 2013).

Studies found that uncomfortable physical work might cause various body problems: back pain, lumbar discs, knee, joint problems, and nerve and tendon dysfunction. Studies indicate that about a third of sick leave taken by healthcare workers resulted from musculoskeletal disorders (Hamid et al., 2018).

The anesthesia workplace is a complex between human, machine, and the nature of the operating room environment. In other words, the more harmony and coordination between the medical staff and those in charge of managing the institution is the better the safety standards (Vaizoğlu, 2011).

2.5.6. Previous studies:

Many studies focus on the occupational hazards in the health sector and the factors that affect them. The researcher chose a variety of regional and international research that studied this topic. These studies focus on the anesthesia departments and their staff or medical departments that resemble the anesthesia and operations department's general environment.

Lebni et al (2020) carried out a cross-sectional study in Iran focused on the operating room staff to investigate factors affecting operating room personnel's occupational hazards. Results showed that the occupational hazards level effect was high, ergonomic hazards were the most important

factors according to the study while the biological hazards has a minor effect on the staff. Also, the study shows that the mean occupational hazards significantly correlated with variables (age, work experience, marital status, education, organizational position, shifts), but no significance correlation found with sex and mean occupational hazards (Lebni et al., 2020).

Al-sarraji & Hassan (2017) carried out a study conducted in Iraq to assess occupational hazards on nurses who work in the operation rooms. The study found that the effect of occupational hazards is moderate; also, the most hazardous effect on the nurses related to the biological hazards is accidental hazards. The study showed a highly significant relationship between occupational hazards and the chosen demographic factors (age, years of experience, level of education of the nurses), At the same time, there is no significant relationship with the sex variable (Al-sarraji & Hassan, 2017).

Ndejjo et al (2015) carried out a cross-sectional study to assess the occupational health hazards affecting healthcare workers. The study includes 200 participants from eight major health facilities in Kampala. The results showed that 50.0% of study participants reported that they suffered from an occupational health hazards. Among these, 39.5% experienced biological hazards, and 31.5% experienced non-biological hazards. The most common causes for hazards included not wearing the protective equipment, working overtime hours, job-related pressures, and double jobs (Ndejjo et al, 2015).

Alqam (2013) conducted a cross-sectional study to assess the exposure to occupational health hazards and safety for laboratory workers in Palestinian governmental hospitals in the West

Bank. The study showed that there is a high degree of participant knowledge about occupational hazards. Simultaneously, there is a medium degree of applying means of prevention and safety related to the work environment, also the performance information and satisfaction was medium. The study result showed that the biological hazards were the first in rank on their effect severity on the laboratory workers, followed by chemical, psychological, physical, and ergonomic hazards in order. Moreover, the result showed that there no significant differences in occupational hazards perception and knowledge, and safety measures according to age, monthly income, and years of experience variables. No significant differences in occupational hazards, safety measures according to gender, social status, while there were significant differences in perception and knowledge domain according to gender. (Alqam, 2013).

Forrester et al (2020) organized a study in Santa Clara in the USA concerned with precautions for operating room team members during the covid-19 Pandemic since covid 19 is high. The study developed an interventional platform to develop institutional algorithm guidelines to protect operating room team members during the covid-19 pandemic. The study illustrated a need to have guidelines and protocols to deal with the patients in the operation room and rationally need to utilize personal protective equipment (PPE) (Forrester et al., 2020).

Savoia et al (2020) accomplished a cross-sectional study in Italy to study the factors associated with access of anesthesia physicians and use of PPE during covid-19; it includes 516-anesthesia physicians. The study found that 13% of them reported having access to PPE all the time they call them; half of the physicians confirm that they received information about the PPE use. The

study concluded that the availability of PPE is mandatory and essential. Also, training, instructions, and staff qualification raise staff safety (Savoia et al., 2020).

Tian et al (2019) carried out a cross-sectional study in China to clarify the high infection percentage of anesthesia teams with hepatitis in hospitals and study the factors and attitudes that could be the reason for raising it. The study includes 1739 anesthesiologists. Results showed that the reason for the increase in hepatitis is due to negligence in taking vaccination with the three, failure to take safety measures, and lack of awareness in dealing with infected patients with hepatitis. The study emphasized the importance of receiving vaccinations and following safe anesthesia methods such as using gloves and double gloves when in contact with the fluids (Tian et al., 2019).

Neghab et al (2020) performed a historical cohort study in Iran to determine whether exposure of operating room personnel to inhalation anesthetics was associated with hepatotoxic or nephrotoxic changes. The study takes 52 persons exposed to anesthesia gases and another 52 people who do not expose to anesthesia gases and analyze liver and kidney functions tests, urinary concentration. Results show the occupational exposure to inhalation anesthesia gases was associated with observed clinical pre-pathologic changes in the liver and kidneys' parameters, which lead to harmful clinical results to these organs (Neghab et al., 2020).

Nankongnab et al (2020) accomplished a cross-sectional study in Thailand to evaluate occupational hazards, health conditions, and safety measures used among healthcare workers. The study includes 1128 participants from five hospitals. The result shows that health workers

are exposed to chemical, biological, and physical hazards in different ways. Anesthesia staff has the highest percentage of exposure to skin problems and needle stick injury, the highest percentage of musculoskeletal disorder and respiratory problems found in the nutrition workers staff. The study also found no adequate safety measures and protection available in the workplace (Nankongnab et al, 2020).

Rai et al (2020) conducted another cross-sectional study in Bhutan to assess the Occupational exposures to hazardous chemicals and agents among healthcare workers. It includes 370 participants working in three major hospitals. Results showed that the highest prevalence exposure was by agents causing asthma (98.7%), carcinogen agents (28.1%), ototoxic agents (7.6%), anesthetic gases (6.2%), and antineoplastic drugs (2.2%). The most common occupational exposure was latex and disinfecting agents that cause asthma and respiratory problems, and then comes formaldehyde that is a carcinogenic agent. The study emphasizes that policies and control measures have to be implemented (Rai et al, 2020).

Oliveira et al (2021) published a critical review to systematically evaluate whether exposure to anesthesia gases is related to abortion or not. Eighteen observational studies were included. The critical review found that some studies demonstrated a significant relationship between occupational exposure to anesthesia gases and recurrent spontaneous abortion. Females who work for longer periods with the absence of gas scavenging systems in operation rooms may be connected to the occurrence of abortion between female staff. On the other hand, some reviewed studies did not find significant evidence of spontaneous abortion and inhaled anesthesia gases.

The study can't be realized if there is a relationship exists between occupational exposure to anesthesia gases and the occurrence of spontaneous abortion (Oliveira et al., 2021).

Zanaty et al (2017) conducted a prospective observational study to assess the effect of occupational stress on aging among anesthesia staff through the University of Alexandria. The study was carried out in two groups; group A (183 participants) were anesthesia physicians, and Group B (183 participants) were physicians in less stressful specialties (laboratory specialties), study measurement was done by evaluating the physical health and emotional well-being. In addition, a blood sample was analyzed during working hours to compare the telomere length. The result shows that anesthesia is a stressful job. Also, biological and skin aging is evident among anesthetists who are chronically exposed to occupational stress (Zanaty et al, 2017).

Mirmohammadi et al (2009) conducted a study to assess the effect of shift work on depression in nurses. The study was conducted in Iran and includes 110 nurses divided into two groups; shift workers and non-shift workers. The frequency of depression was measured by using of Beck questionnaire to compare between the two groups. The study concluded that shift work was considered a risk factor for depression, a higher frequency of depression observed among shift workers compared to non-shift-workers (Mirmohammadi et al., 2009).

Saleh et al (2020) concluded a study to identify potential occupational hazards in the operation room and assess the occupational risk of adverse health effects among operation staff in Benha University Hospitals, Egypt. Participants reported that 84% of them were negatively affected by occupational hazards in the operation room. While 90 % were oriented in the concept of

occupational hazards. The main occupational hazards that the participants reported were radiation, nosocomial infections, blood-borne diseases, anesthesia gases, muscle pain, and latex allergy (Saleh et al., 2020).

Elewa et al (2016) conducted a study in Egyptian hospitals aimed to assess occupational risks perceived by nursing interns and prevention measures available in the ICU department. The study used a cross-sectional study and included (108) intern nurses. The result shows that the exposure to the physical hazards was the highest (65.35%), also, chemical hazards (65.4%), and biological hazards (45.7%). In concern for safety measures, the result shows that (88%) believed that there is a lack of educational programs, (80.6 %) said that there is a lack of regular medical examination, (79.6%) nurses said that there is a lack of policies and occupational safety procedures. The study advises developing the safety procedures and policies with regular supervision on their implementation and updating teaching and includes educational programs in universities about occupational risks (Elewa et al., 2016).

2.6. Safety measures

2.6.1. Introduction:

Occupational Health is defined by WHO as the support and maintenance of the highest level of physical, mental, and social well-being of workers in all careers by maintaining health, controlling risks, and the adaptation of work to people, and people to their occupations (Galam, 2018). Also, the International Labor Conference clarified occupational health and safety in general as the science of expectation, confession, estimation, and control of hazards emerging

from the workplace that could destroy the health and well-being of workers, taking into account the possible influence on the surrounding communities and the general environment (International Labor Conference, 2009). Occupational health and safety (OHS) maintains employee health, safety, and welfare in the workplace. A fundamental principle in the Occupational Health and Safety Act 2004 (the OHS Act) is that an employer must, so far as is rationally possible, provide and maintain a working environment that is safe and without health risk (Doyle, 2013).

Anesthesia staff are exposed to too many occupational hazards in the operating rooms; the employer has to provide safety and preventive measures for the staff in terms of equipment, vaccination needed, necessary staff training, or implementing the guidelines and policies for safe working ways. The following are the main risks that may affect the anesthesia staff and its safety measures(Ayo & Ayo, 2020):

2.6.2. Chronic Exposure to Anesthetic Gases:

Control of Substances Hazardous to Health Regulations committee (COSHH) published the legal limits for anesthesia gases' ecological levels as uncertainty about potential adverse health effects by inhaling these gases. The adverse effect suspected to happen like carcinogenesis, hepatotoxicity, infertility, recurrent spontaneous abortion, and mutagenesis (Braz et al, 2020). Safety measures to decrease this hazard include good anesthetic practice, an air circulation system, and an effective gas scavenging system. Despite these cautions, atmospheric pollution

will still appear in some clinical situations, such as inhalation gases during induction, mask ventilation, and open-circuit ventilation (Tankó et al., 2014)

2.6.3. Infectious Diseases:

Occupational exposure to a range of pathogens performs a significant risk to anesthesia staff. The risk of transmission is either by blood-borne pathogens, like hepatitis B, C, and human immunodeficiency virus (HIV), or by airborne pathogens like Covid 19 and tuberculosis (TB). There are multiple safety measures to decrease the chance of infection of anesthesia staff as the following (Beers, 2021):

- Take particular vaccines to prevent the transmission of hepatitis B and receive a series of three injections of hepatitis B vaccine to all the staff
- Effective washing hands technique.
- Needle precautions to prevent sticking with contaminated needles.
- Gloves are wearing during contact with wounds, body secretions, and fluids.
- Wearing a face mask during the time of operations to prevent airborne pathogen transmission.
- Commitment with proper disinfection techniques.

2.6.4. Latex Allergy:

Latex allergy is associated mainly with using gloves containing latex; it could be developed by repeated latex exposure. The allergy may differ from one person to another depending on the response rate from irritant contact dermatitis and could cause anaphylactic shock. Following the

safety measures could reduce this risk; washing hands after contact with latex-containing products, use latex-free products are the essential precautions (Stinkens et al., 2019).

2.6.5. Radiation:

Anesthesia staff are exposed to ionizing radiation from X-rays from laser in the operation rooms. Exposing to repeated doses of x-ray may lead to harmful health adverse results such as carcinogenesis, and mutagenesis. The safety measures could reduce the prevalence of these risks, and it is mandatory for all the anesthesia staff that working with the operation needs to use X-ray. The most important measures are maximizing the distance and using suitable protection equipment such as lead aprons, thyroid shields, and lead glass (Whitney et al., 2019).

Also, exposure to non-ionizing radiation from laser beam may cause adverse events; it could be through either direct exposure or reflection. Repeated exposure may lead to burns to the cornea and retina, damage of the optic nerve, and cataract formation. The safest measure to decrease harm is to wear protective eyewear to filter out harmful radiations (Whitney et al., 2019).

2.6.6. Stress and fatigue:

Stress is an unavoidable factor during professional life; it can lead to adverse health effects on both the psychological and physical side. Besides, it can lead to decreased job satisfaction, weakness of decision-making, and even suicide. Fatigue also could lead to a sleep disorder,

reduced attention, poor memory, prolonged reaction time, disrupted communications, and adverse health effects like hypovolemia and hypoglycemia (Boyd, 2019).

OSH considered many strategies that could protect health care workers from the side effect of these personal hazards, it includes improve personal, environmental, and equipment design like regulation of working hours, syringe labeling policies, comfortable conditions, and paying good salaries to the staff (Meydanlioglu, 2013)

2.6.7. Previous studies:

Many studies and research study the factors that help reduce the actual impact of various occupational risks by searching for the availability and effectiveness of protection methods and reducing these risks. The researcher has selected a number of these various studies focusing on protection in the anesthesia departments and sections close to the same environment.

Zewde (2020) performed a cross-sectional study in Ethiopia to assess safety measures practice among health care workers in Jugol Hospital. The study found that (73.6%) of participants did not wash their hands after medical procedures, while (57.4%) did not wear a gown at the workplace. Besides, the study illustrated that the overall prevalence of occupational hazards was high (60.1%). Expose to physical and biological hazards were the most hazardous factors that affect the HCW (58.1%) and (52.7%), while (31.8%) and (34.5%) of HCW were suffered by chemical and ergonomic hazards, respectively (Zewde, 2020).

Mérat et al (2008) conducted a critical review to evaluate the occupational hazards associated with the practice of anesthesia and evaluate the preventing measures developing related to these hazards. The study found that multiple precautions were adopted to mitigate the occupational hazards that affect anesthesia staff; Blood exposure precautions such as using the protected material, single-use disposables, and adhere to a better observance of safety rules. Anesthesia gases risk precautions such as scavenging system, closed-circuit for anesthesia, and operating room's ventilation system. The latex allergy precautions, such as replacing it with other materials, Ionizing radiation precautions are better control because a very specific rule is implemented. The study also concluded that the operating room environment includes risks of fire, electrification, and explosion. In addition, other risks are identified as serious hazards but it is difficult to evaluate such as burnout, drug addiction, and violence (Mérat and Mérat, 2008).

Meydanlioglu (2013) conducted a review study in Turkey that aims to study the effectiveness and impact of the regulations, laws, and procedures for health professionals' safety measures that have been approved special units for occupational health and safety in private and public hospitals in Turkey in 2012. The study concluded that they still have defects in number, equipment, personnel and services, and applications between institutions in different regions. Also, there is a failure to follow and apply the safety policies and procedures that have been approved by the occupational safety and health committees (Meydanlioglu, 2013).

Darkwa et al (2017) studied the perception of anesthesia providers on exposure to inhalational anesthetics in Ghana hospitals. The study found that (90.1%) of the participants know that they are exposed to inhalational anesthetics. All participants say that the scavenging systems are

poorly functioning. The majority of the participants know that chronic exposure to anesthesia gases could lead to teratogenicity (77.5%) and hepatotoxicity (67.6%). The study concludes that the anesthesia staff has good knowledge about the risk of exposure to inhalational anesthesia gases, but there are low safety measures implemented to reduce the risk effect (Darkwa et al., 2017).

Atusingwize et al (2019) perform a study to investigate the status of occupational safety and health (OSH) policies and related implementation challenges in Uganda. Results found that the existing occupational safety and health laws were largely outdated compared to workplaces' current needs. Also, the results discovered gaps in the legal framework, poor organization, low public awareness, and insufficient human capacity, transparency, and accountability (Atusingwize et al, 2019).

Boiano and Steege (2016) conduct a study to assess the implementation of the safety measures and work practice controls for mitigation of occupational exposure to waste anesthetic gases. It includes anesthesia staff participants working in different hospitals in Ohio (1,783 nurse anesthetists, 1,104 physician anesthesiologists, and 100 anesthesiologist assistants). About 97% of participants reported that there are available effective scavenging systems in the hospitals. However, commitment to other recommended practices was lacking to different degrees. It differed among those administering anesthetics to pediatric or adult patients, such as using high (fresh gas) flow anesthesia, starting anesthetic gas flow before use of mask or airway mask, and using fill adaptor piece to fill vaporizers. Also, participants reported that hospitals lacked safe

handling policies (19%) and inadequate hazard awareness training (18%) (Boiano and Steege, 2016).

2.7. Awareness and knowledge

2.7.1. Introduction:

The health care place should be safe without any adverse events that could affect the patients or the staff. On the other hand, the health environment is fraught with various risks that require taking all necessary measures to reduce the risk of exposure to occupational injury. In other words, health care workers should have a good knowledge and awareness about these risks in daily practice to protect themselves. Besides, the hospital's liability is to provide proper and safe conditions for the exercise of the HCW (Elbilgahy et al., 2019).

The operation room is one of the most significant and dangerous places in the health care field. since there are various potential hazards in this small closed area, whether it was a result of inhaling anesthesia gases and chemical agents, infectious agents, ionizing radiation, noise pollution, or other potential risks (Barash et al.,2004). The anesthesia team could affect by the potential risk hazards on a daily basis. According to this situation, the team must be aware of all the risks around them and their consequences (Melo et al., 2014).

2.7.2. Previous studies:

Kim et al (2018) perform a cross-sectional study conducted in Brazil to assess 158 anesthesiologists who work in tertiary hospitals. The study found that there is a lack of

knowledge about the significant issues and prevention measures on anesthesia physicians' occupational health. There is a lack of knowledge in preventing occupational accidents to a high degree (74.6% did not know how to react in case of a fire in the operation room, and 42.7% failed to identify and use the personal protective equipment). Besides, the study found there is a high rate of lack of practice of preventive measures (30.3% washed their hands before dealing with every patient, 52.5% did not use gloves during intravenous manipulations, while 88.6% used protective equipment during exposure to ionizing radiation) (Kim et al., 2018).

Whitney et al (2019) conducted a study to assess the radiation safety perceptions and practices among pediatric anesthesiologists exposed to ionizing radiation from x-rays daily. The study found that almost none of the participants had ever taken radiation safety training, received personal radiation dose records, information of their radiation exposure, or defined what the yearly safe range of millirem was. Also, the study found that anesthesiologists do not routinely use the strategies designed to limit the risk of exposure (Whitney et al., 2019).

Melo et al (2014) perform a study aimed to evaluate the knowledge of anesthesiologists in Recife on various occupational hazards. The study found that 3.7% read the committee's available manual on hospital infection control, 40% think that the technical director is responsible for securing proper working conditions, only 43.83% knew that there is no effective post-exposure prophylaxis to the hepatitis infection. The study confirms that there is insufficient knowledge of occupational hazards and safety measures between anesthesiologists. The researcher suggested implementing educational training to build a good knowledge about hazards and to be aware of institutions and professionals' rights and duties (Melo et al., 2014).

Al-Sallamy et al (2018) studied the awareness of healthcare workers (HCWs) about physical hazards in Tanta University hospital. A cross-sectional model was applied through an interview questionnaire distributed to 401 participants to assess the awareness about six types of physical hazards (radiation, noise, electric hazards, temperature, lighting, and fire). Results showed that most of the physicians were aware of the level of noise and its dangerous effect, while most of the health care workers reported that there is a lack of hearing protection devices. Most of the nurses and workers also reported that they did not receive any emergency training or evacuation training. Also, most of the health workers claimed that they do not receive any training on radiation protection safety when they start to work (Al-Sallamy et al, 2018).

Elbilgahy et al (2019) conducted a study concerning in knowledge and awareness of the health care team. The study uses a quasi-experimental design using one group (pre-test & post-test measures) to evaluate the effect of implementing occupational safety nursing guidelines for pediatric nurses, study shows that half of the nurses had low-level knowledge before guidelines implementation, after the implementation, there was statistically significantly different, also study concluded that the hazards associated with nursing profession were higher and critical before implementing of the guidelines (Elbilgahy et al., 2019).

Ahmed (2014) accomplished a study aimed to identify the occupational hazards knowledge and Practice Safety Measures of the west bank health care workers in Palestine. The study concludes that perception and knowledge of occupational hazards among HCW have scored very high, and safety climate scored high. Occupational hazards risk ranked in this study depending on its effect shows that the biological hazard is the first to effect on the nurses followed by ergonomic

physiological then chemical and physical hazards. The study also shows that the satisfaction level among nurses showed a high score, while a very high degree registered at the domain of needed safety measures (Ahmed, 2014).

A study performed on assesses the knowledge, attitude, and practices among HCW on needle stick injuries revealed that 61% and 4% of health care workers respectively were unaware of the fact that hepatitis C and hepatitis B can be delivered by needle-stick injuries. 74% informed that they had a history of needle-stick injuries, and only 21% tell about the injuries to the hospital authority. Only 66% were aware of Worldwide Precaution Standards. And said that the knowledge of HCW about the risk associated with needle-stick injuries and the use of safety measures was incompetent. (Gurubacharya et al., 2003).

2.8. Summary

This chapter outlines the study literature from previous researchers in the field. Studies regarding the anesthesia staff's occupational hazards the similar HCW are presented. The literature review includes studies about occupational hazards and staff awareness including local, regional, and international literature.

Chapter Three

Conceptual Framework

Chapter Three: Conceptual Framework

3.1. Introduction

The conceptual framework model was constructed and adopted after reviewing the related literature about the occupational hazards and staff awareness among health care providers in general and anesthesia teams in specific way. Exposure to occupational hazards which consist of many types (chemical, biological, physical, psychosocial, and ergonometric), is the study dependent variable. In contrast, the factors affecting occupational hazards were the independent variable which includes knowledge and awareness on occupational hazards, available safety measures, and socio-demographic factor, as shown in figure (3-1).

3.2. Operational Definitions

In this study, the operational definitions are as follows:

- **Occupational hazards:** A working condition that can lead to illness, disability, or death to anesthesia staff during the work period in the operation room. It consists of five types :
- **Biological hazards:** Risk happens due to exposure to infection due to the transmission of organic substances including viruses, pathogenic microorganisms, bacteria, fungi during contact with the patients and their secretion. (Statement 12 to 15)
- **Chemical hazards:** Risks due to using a chemical considered harmful to anesthesia staff, it could be inhaled, absorbed through the skin, swallowed, or ingested, it may be due to gases, latex, sterilizers, and other things. (Statement 16 to 19)

- **Physical hazards:** Hazards from various sources affect anesthesia staff such as radiation, electrical hazards from various electrical and electronic appliances, noise pollution of various alarms and monitoring gadgets, bright lights, and temperature changes in the operation rooms. (Statement 20 to 23)
- **Psychosocial hazards:** Conditions related to the psychological and social situation in the workplace that affects anesthesia staff. These include stress, violence, fatigue, bullying, aggression, burnout, and difficulties in family relationships. (Statement 24 to 27)
- **Ergonomic hazards:** Risks affect anesthesia staff due to hazards due to inadequate environment, such as lighting, operating table height, sliding floors, and others. (Statement 28 to 31)
- **Awareness of Occupational hazards:** Information that the anesthesia staff possessed regarding various occupational risks in all its types, how to deal with and manage, know the preventive measures, and know-how to follow-up after exposure measured using a self-organized questionnaire. (Statement 37 to 46)
- **Safety measures:** Action taken to protect the anesthesia team from occupational risks such as anesthesia gases and vapors, aerosols, radiation exposure, falls, cuts, puncture wounds, stress, and other risks. (Statement 47 to 60)

The independent factors are summarized as follows:

1. Awareness and knowledge of the staff of occupational hazards. (Related statement in the questionnaire from 37 to 46)
2. Safety measures: Concern in the regulations of the facility organization, measures, and policies of the hospital, which prevent or reduce the effect of the hazard. (Related statement in the questionnaire from 47 to 60)

3. Age. (Related statement in questionnaire number 1)
4. Gender. (Related statement in questionnaire number 2)
5. Marital status. (Related statement in questionnaire number 3)
6. Primary work location. (Related statement in questionnaire number 4)
7. Monthly income. (Related statement in questionnaire number 5)
8. Experience. (Related statement in questionnaire number 6)
9. Education level. (Related statement in questionnaire number 7)
10. Job position. (Related statement in questionnaire number 8)
11. Training courses. (Related statement in questionnaire number 9)

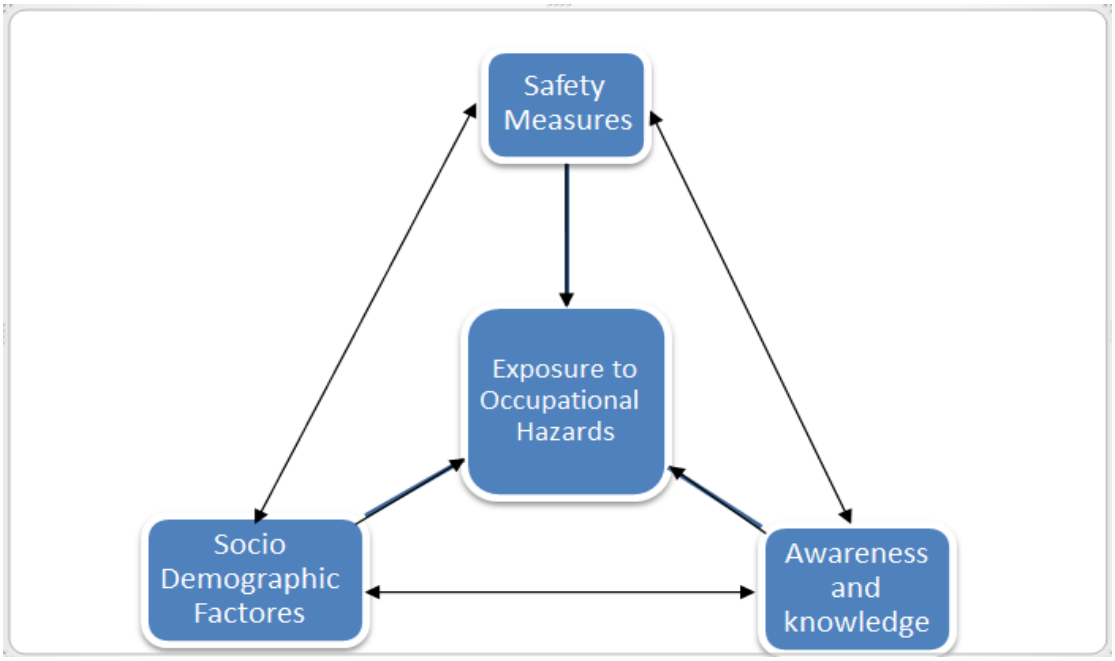

Figure 1: Conceptual Framework(The factors that influence exposure to occupational hazards)

3.3. Summary

In summary, the chapter shows the conceptual framework that was constructed after reviewing the previous studies and has a general look at the anesthesia environment. The chapter also includes the operational definitions of the main concepts that appear in the conceptual framework and match them to the related statements in the questionnaire; the independent variables are also listed with the related statements in the questionnaire. This chapter is the basis for data analysis as well as the discussion and the conclusion.

The literature shows several independent factors associated with occupational hazards among anesthesia staff in Palestinian governmental hospitals in the West Bank, which are divided into Patient demographics including age, gender, marital state, primary work location, monthly income, experience, education level, job position, and training courses. These factors were used to build this study's conceptual framework. This chapter is the basis for analysis in future studies as well as the discussion and conclusion.

Chapter Four

Methodology

Chapter Four: Methodology

4.1. Introduction

This chapter discusses the study methodology, which consists of the study design, study setting, eligibility (inclusion criteria, exclusion criteria), and period of the study. Moreover, the population and sampling, study tool, validity and reliability of the study tool and data collection method, pilot study, ethical consideration, and data analyses will be presented too.

4.2. Study design

The study adopted a quantitative, analytic, descriptive, Cross-sectional approach to achieve the study's aims. The source of data was from the primary sources, using a self-administered questionnaire. A cross-section study is carried out quickly and provides a 'snapshot' of the outcome and the associated characteristics. It is also comparatively inexpensive and takes up little period to perform (Levin, 2006).

4.3. Study Setting

The study was carried out in the governmental hospitals in the West Bank. All governmental hospitals that have operating rooms were included in the study (12 hospitals). Table (4.1) presents the hospital distribution by the governorates of the West Bank (MOH, 2019).

Table 4.8: Distribution of Targeted Governmental Hospitals in the West Bank

No	Governorate	Hospital
1	Ramallah	Palestine Medical Complex
2	Nablus	Rafidia Hospital
3	Hebron	Alia Hospital
4		(Abu Al Hassan Qassem Hospital) Yatta
5		Al Mohtasib hospital
6	Jenin	Khalil Suleiman Hospital
7	Beit Jala	Al Hussein Hospital
8	Tulkarem	Thabit Thabit Hospital
9	Jericho	Jericho Hospital
10	Qalqilia	Darweesh Nazal Hospital
11	Salfit	Yasser Arafat Hospital
12	Tobas	Turkish hospital

4.4. Period of the study

The study was conducted in two semesters as planned. The first semester from September to December 2020 was for preparing the proposal. The second semester period lasted from January 2021 to June 2021 for developing the questionnaire, data collection, data analysis, and writing thesis.

4.5. Population and sampling

The target population of the study is the total number of anesthesia staff working in 12 governmental hospitals which have operating rooms in the West Bank is (185). The sample of the study includes all 185 anesthesia staff. The distribution of the anesthesia staff in the governmental hospitals which include operating rooms according to MoH as presented in table (4.2) (MOH,2019).

Table 4.9: Distribution of Anesthesia Team in Govremental Hospitals Included

Hospital	Anesthesia team			
	Number of physicians	Number of resident doctors	Number of anesthesia technicians	Total
Palestine Medical Complex	7	9	21	37
Rafidia Hospital	5	7	16	28
Alia Hospital	4	1	17	22
(Abu Al Hassan Kassem Hospital) Yatta	1	1	8	10
Al Muhtaseb hospital	1	1	6	8
Khalil Sulaiman	4	5	10	19
Al Hussein Hospital)	3	0	9	12
Thabit Thabit Hospital	2	2	10	14
Jericho Hospital	2	0	6	8

Darweesh Nazal Hospital	3	0	7	10
Yasser Arafat Hospital	3	0	6	9
Turkish hospital	2	0	6	8
Total	**40**	**31**	**114**	**185**

4.6. Eligibility

4.6.1. Inclusion criteria:

All of the anesthesia staff who formally employed for more than one year in the governmental hospitals' operating departments were included in the study.

4.6.2. Exclusion criteria:

- Any practitioners with less than 1-year expert in the anesthesia department were excluding.
- Volunteers and students were excluded.

4.7. Data Collection

After receiving PMOH approval and permission to conduct the study in governmental hospitals, all anesthesia teams in the operating room were invited to participate in the study by sending the informed consent and link to access the questionnaire using computer-assisted technique by the Google on line form. This procedure of data collection was used because of the outbreak of the Coronavirus and adherence to safety rules. In order to ensure access to the targeted participants;

participants addresses (email, whatsup) were taken from the heads of the anesthesia departments in the hospitals and the questionnaire was sent to them directly.

4.8. Study Tool

The study adopted a structured, self-administered questionnaire after reviewing the previous literature, then distributed it to all anesthesia staff which included and met inclusion criteria (Annex 1) shows the questionnaire in the Arabic language, in contrast (Annex 2) shows it in the English language with the score criteria.

The questionnaire consisted of the following parts:

- The first part: includes socio-demographic characteristics of anesthesia staff.
- The second part: consists of data related to exposure to main occupational hazards and their severity. Five-points Likert scale was used for measuring exposure to occupational hazards: (1) To a very little extent, (2) To a little extent, (3) Neutral, (4) To a large extent, (5) To a very large extent.
- The measure of severity consisting of five degrees according to the severity: (1) The least severity, (5) The highest severity.
- The Third part: includes statements about awareness level and knowledge of anesthesia staff on occupational hazards. Five-points Likert scale used for this part: (1)Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree

- The fourth part: consists of statements about preventive and safety measures that could decrease the risk. Five-points Likert scale used for preventive and safety measures consists of: (1) To a very little extent, (2) To a little extent, (3) Neutral, (4) To a large extent, (5) To a very large extent.

- The fifth part: consists of a list of diseases and health problems related to occupational hazards that could affect the anesthesia team.

Table 4.10: Domains and Statements of the Questionaire

No.	Domain	No. of statements
1	Exposure to occupational hazards	20 (4 statements . for each type of hazards)
	Severity	5
2	Anesthesia staff awareness level and knowledge	10
3	Preventive and safety measures	14
4	Diseases and health problems related to occupational hazards	7

4.9. Tool Correction

For getting the question's purpose, means, standard deviations (SD), percentages, and response degree for each item were operated. The items percentages were set at the following level after reviewing similar studies; (Alqam, 2013 & Ahmed, 2014):

- More than 80.0% very High
- From 70.0-79.9% High
- From 60.0-69.9% Moderate
- From 50.0-59.9% Low
- Less than 50.0% very Low

4.10. Validity

A Letter was sent to eight experts in anesthesia field and academic field (annex 3) to validate the constructed tool, and to ensure its relevance, clarity, and compliance. The letter includes also the designed questionnaire in Arabic and English, study title, and objectives of the study. The purpose of consulting experts is to get their expertise opinions; some of them are expert and working in the anesthesia field in the private sector, and others working on the academic research. They contributed to changes and modifications to the tool and all were incorporated in the final version.

4.11. Pilot study

To check the feasibility and to improve the study's design, a pilot study was conducted before beginning the actual data collection, data collected by using a Google form. Abu Al-Hassan Qassem Hospital and Al-Mohtaseb Hospital were chosen because they got all the categories of the anesthesia staff, It includes 26 participants of anesthesia staff.

The pilot study sample was included in the study since there were no modifications to the questionnaire introduced.

4.12. Reliability

The researcher used Cronbach's alpha test to find the constructed questionnaire's stability and find each domain's stability. The results are shown in table (4.4)

Table 4.11: Reliability of the tool

Domain	No. of statements	Domain stability (Alpha coefficient)
Domain one: Exposure to occupational hazards	20	0.84
Domain two: Occupational hazards awareness and knowledge	10	0.73
Domain three: Preventive and safety measures	14	0.78
General stability of the questionnaire		**0.75**

It is clear from the table (4.4) that the general stability coefficient for the study domains is high as the value of alpha reached (0.75) for the entire statements of the questionnaire, while the stability of the domains ranged between (0.73) as a minimum value and (0.84) as a maximum value.

4.13. Internal consistency reliability

The validity of the internal consistency of the questionnaire was verified by calculating the Pearson correlation coefficient between the degrees of each statement of the three domains statements and the total score of the domain.

Table 4-12:Internal Consistency of the First Domain Statements

First Domain Statements	Statement order	Pearson Correlation Coefficient	Significance Value
1	12	0.413*	0.036
2	13	0.486*	0.012
3	14	0.714**	0.001
4	15	0.571**	0.002
5	16	0.667**	0.001
6	17	0.291	0.150
7	18	0.670**	0.001
8	19	0.529**	0.005
9	20	0.474*	0.014
10	21	0.286	0.156
11	22	0.658**	0.001
12	23	0.294	0.136
13	24	0.530**	0.005
14	25	0.474*	0.014

15	26	0.329	0.100
16	27	0.488*	0.011
17	28	0.641**	0.001
18	29	0.641**	0.001
19	30	0.671**	0.001
20	31	0.389*	0.049

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Table (4.5) shows that all the correlation coefficients of Pearson between the statements of the first domain and the total score of the first domain are directly related. The minimum value of the correlation coefficients was recorded (0.291) at level (0.150) while the value of the upper limit was (0.714) at a significant level of (0.001).

Accordingly, all statements of the first domain are internally consistent with the domain to which they belong, which proves the sincerity of the first domains' internal consistency.

Also, the following table (4.6) shows the correlation coefficients between each statement of the second domain statements and the total score of the domain:

Table 4-13: Internal Consistency of the Seconed Domains

Second Domain Statements	Statements order	Pearson Correlation Coefficient	Significance Value
1	37	0.528**	0.006
2	38	0.633**	0.001
3	39	0.776**	0.001
4	40	0.355	0.075
5	41	0.692**	0.001

6	42	0.464*	0.017
7	43	0.392*	0.048
8	44	0.618**	0.001
9	45	0.523**	0.006
10	46	0.728**	0.001

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Table (4.6) shows that all the correlation coefficients of Pearson between the statements of the second domain and the total score of the second domain are directly related. The minimum value of the correlation coefficients was recorded (0.355) at level (0.075), while the value of the upper limit was (0.776) at a significant level of (0.001).

Accordingly, most statements of the second domain are internally consistent with the domain to which they belong, which proves the sincerity of the second domain's internal consistency.

Also, the following table (4.7) shows the correlation coefficients between each statement of the third domain statements and the total score of the domain:

Table 4-14: Internal Consistency of the Third Domains

Third Domain Statements	Statement order	Pearson Correlation Coefficient	Significance Value
1	47	0.391*	0.049
2	48	0.502**	0.009
3	49	0.672**	0.001
4	50	0.397*	0.045
5	51	0.392*	0.048

6	52	0.616**	0.001
7	53	0.322	0.109
8	54	0.576**	0.002
9	55	0.582**	0.002
10	56	0.441*	0.024
11	57	0.657**	0.001
12	58	0.514**	0.007
13	59	0.534**	0.005
14	60	0.718**	0.001

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Table (4.7) shows that all the correlation coefficients of Pearson between the statements of the third domain and the total score of the third domain are directly related. The minimum value of the correlation coefficients was recorded (0.322) at level (0.109), while the value of the upper limit was (0.718) at a significant level of (0.001).

Accordingly, all statements of the third domain are internally consistent statements

4.14. Data analysis

After data collection, the questionnaire was coded and entered into the computer and analyzed using SPSS (Statistical Package for Social Sciences) version 23. The researcher used the following:

- Cronbach's alpha and spearman correlation test used to test the validity and reliability of the questionnaire.
- Descriptive statistics (means, frequencies, standard deviation, and percentage).

- Inferential statistics (Independent sample (t) test and One-Way ANOVA) for comparison between variables

4.15. Ethical Consideration and permission

An official letter of approval to conduct the study was obtained from Al Quds University-School of public health after discussing the proposal with the ethical committee (annex 4). Also, an official letter of approval was obtained from PMOH to conduct the study at MOH hospitals in the West Bank (Annex 5).

Besides, informed consent in Arabic with straightforward and simple language attached to the questionnaire to clarify the study's purpose and to confirm confidentiality and anonymity (Annex 6)**.**

4.16. Limitations of the study

The following are the limitations faced by the researcher when conducting the study:

- Time limitation: Distributing the questionnaire to the participants required some time because the nature of work on the shift system makes it difficult for communicating with the respective anesthesia staff.
- The difficulty for some of the staff in using computer-assisted technology to fill out the questionnaire: As there are part of the staff how are old age, they have little experience dealing with technology software and don't know how to deal with the questionnaire filling.

- Emergency plans and safety measures followed due to the Corona pandemic, the most important of which was dividing the staff into more than one team to work at different periods.
- Lack of related local studies and literature about occupational hazards at governmental hospitals.

4.17. Summary

The chapter discussed the study methodology, which consists of the study design, study setting, eligibility, and period of the study. Moreover, the chapter discusses the population and sampling, study tool, validity and reliability of the study tool, data collection method, pilot study, ethical consideration, data analyses, and limitations of the study presented too.

Chapter Five

Results of the study

Chapter Five: Results of the study

5.1. Introduction

This chapter contains the statistical analysis of data results obtained through the questionnaire, as it clarifies the socio-demographic factors, identifying the exposure to the occupational hazards, the level of severity of the hazards, occupational awareness of occupational risks, preventive and safety measures, and the result of research questions. The number of respondents was 161 out of 185 with a response rate of 87%. Twenty-five of anesthesia staff (13%) didn't respond to the study questionnaire; some of them refused to participate, and the others were on vacations (yearly vacation, maternity leave, sick leave).

5.2. Socio-demographic factors

Table 5.1: Distribution of respondents by age, gender, marital status

Variable		N	%
Age/years	less than 26	10	6.2
	26-35	91	56.5
	36-45	42	26.1
	More than 45	18	11.2
	Total	**161**	**100.0**
Gender	Males	125	77.6
	Females	36	22.4
	Total	**161**	**100.0**
Marital status	Married	132	82.0
	Single	26	16.1

	Other (Widowed, divorced)	3	1.9
	Total	**161**	**100.0**

Table (5.1) shows that the highest percentage of anesthesia staff age (56.5%) was between (26 – 35) years old, 26.1% of the respondents were between (36-45) years in age, 11.2% were more than 45 years of age, and 6.2% were less than 26 which is the youngest group. Also, males form the majority of the respondents (77.6%), while females formed (22.4%). On the other hand, the table shows that the majority (82%) of the respondents are married, and (16.1%) are single.

Table 5.2: Distribution of respondents by monthly income, experience, educational level

Variable		**N**	**%**
Monthly income /shekels	Less than 3500	45	28.0
	3501 – 4500	58	36.0
	4501 – 5500	21	13.0
	More than 5500	37	23.0
	Total	**161**	**100.0**
Experience/years	From 1 – 5	56	34.8
	From 6 – 10	39	24.2
	From 11 – 15	44	27.3
	More than 15	22	13.7
	Total	**161**	**100.0**
Educational level	Diploma degree in Anesthesia	90	55.9

	Bachelor degree in Anesthesia	18	11.2
	Master/High diploma degree in Anesthesia	7	4.3
	Anesthesia Resident doctor	21	13.0
	Anesthesia Physician	25	15.5
	Total	**161**	**100.0**

Table (5.2) shows that the highest number of participants (36%) has a monthly income between (3501–4500 shekels). Also, 28% have monthly income less than 3500 shekels, 23% of the participants have monthly income of more than 5500 shekels, and 13% have a monthly income between (4501-5500 shekels). Also, the table shows that the highest number of the anesthesia staff (34.8%) had work experience (1–5) years, while 27.3% (11-15) years, 24.2% (6-10) years, and 13.7% had experience of more than 15 years. On the other side, the highest percentage of the study respondents had a diploma degree in anesthesia (55.9%), and only 15.5% of the respondents were anesthesia physicians, while13% of them were anesthesia resident doctors.

Table 5.3: Distribution of respondents by governorates, job position, training courses in occupational health, and when the last course was

Variable		**N**	**%**
Governorates	Ramallah	37	23.0
	Nablus	17	10.6
	Bethlehem	10	6.2
	Hebron	36	22.4

	Qalqilya	8	5.0
	Jericho	9	5.6
	Tubas	9	5.6
	Salfit	6	3.7
	Jenin	17	10.5
	Tulkarm	12	7.5
	Total	**161**	**100.0**
Job Position	Head of Department	22	13.7
	Division Head	3	1.9
	Practitioners	136	84.5
	Total	**161**	**100.0**
Training courses in occupational health	Yes	19	11.8
	No	142	88.2
	Total	**161**	**100.0**
Last course	One year ago,	5	26.32
	Two years ago,	4	21.05
	Three years ago,	5	26.31
	Four years and more	5	26.32
	Total	**19**	**100**

Table (5.3) shows that the respondents were distributed in different governorates, the largest numbers of the respondents were from Ramallah (23%), and then (22.4%) were from Hebron,

around (10.5%) were from Nablus and Jenin, and the rest were from the other governorates of the targeted respondents (Tulkarm, Bethlehem, Qalqilya, Jericho, Tubas, Salfit). On the other hand, around 84% of the respondents were practitioners, 13.7% occupied heads of departments, and 1.9% of them occupied heads of divisions. Also, table (5.3) showed that the majority of the anesthesia staff (88.2%) hadn't received any training courses in the field of occupational health, which indicates that the continuing education component in the field is deficient. Also, the table indicates that the period elapsed since the last training related to occupational risks was approximately distributed over several years within the last four years.

5.3. Identifying the exposure to the occupational hazards

5.3.1. Exposure to biological hazard:

Table 5-4: Exposure to biological hazard

N	statement	Mean	Std. Deviation	Percent	Estimation level
1	Usually, I am exposed to the fluids that come out of the patient during my work (blood, saliva, vomits…)	3.497	1.1243	69.94	Moderate
2	I had previously been acupunctured from the patient's needles during my work.	2.435	1.2082	48.7	Low
3	During my work, I exposed to an aerosol that comes out of the patient during period of sleeping or recovery.	3.286	1.2269	65.72	Moderate
14	While working, usually I am exposed to polluted air from the patient at close range.	3.422	1.1600	68.44	Moderate
Total score of Biological hazard		**3.1599**	**.97610**	**63.198**	**Moderate**

The results in table (5.4) shows the exposure status of the biological hazards among anesthesia staff, which is at a moderate level. The highest response was obtained for the first paragraph "Usually I am exposed to the fluids that come out of the patient during my work (blood, saliva, vomits…) with a mean of (3.497) and percent of (69.94%). While the lowest responses were for the second paragraph "I had previously been acupunctured from the patient's needles during my work" with a mean of (2.435) and percent of (48.7%), where the percentage of responses for all the domain was (63.198%) and mean of (3.1599).

5.3.2. Exposure to chemical hazard:

Table 5-5: Exposure to chemical hazard

N	statement	Mean	Std. Deviation	Percent	Estimation level
11	I have to inhale anesthetic gases while working	3.516	1.3606	70.31	High
12	My hands show allergy after using the gloves during work.	2.944	1.5135	58.88	Moderate
13	My eyes are sensitive to chemicals agents that use in operation department (cidex, formaldehyde, sterilizers).	2.932	1.4103	58.63	Moderate
14	I have an allergy to using some types of sterilizers	2.621	1.3273	52.42	Moderate
Total score of Chemical hazard		**3.0031**	**1.09258**	**60.06**	**Moderate**

The results in the table (5.5) shows the exposure status of the chemical hazards among anesthesia staff, which is at a moderate level, The highest response was for the first paragraph "I have to inhale anesthetic gases while working" with a mean of (3.516) and percent of (70.31). While the lowest responses were for the fourth paragraph "I have an allergy to using some types of

sterilizers" with a mean of (2.621) and percent of (52.42%), where the percentages of responses for all domain was (60.06%) and mean of (3.0031).

5.3.3. Exposure to physical hazard:

Table 5-6: Exposure to physical hazard

N	statement	Mean	Std. Deviation	percent	Estimation level
1	I usually exposed to x-ray in some types of operations from the c-arm machine in operations during my work	3.82	1.2242	76.40	High
2	I am disturbed by the loud sounds of the devices inside the operating room during working	2.94	1.1415	58.88	Moderate
3	While working, there is a possibility of exposure to electric shock	2.20	1.0555	44.10	Low
4	Usually, the temperature set in operating rooms is not suitable for me	2.47	1.0310	49.32	Low
Total score of Physical hazard		**2.86**	**0.72283**	**57.17**	**Moderate**

The results in the table (5.6) shows the exposure status of the physical hazards among anesthesia staff, which is at a moderate level, The highest response was for the first paragraph "I usually exposed to x-ray in some types of operations from the c-arm machine in operations during my work" with a mean of (3.82) and percent of (76.40%), and the lowest responses were for the third paragraph "While working, there is a possibility of exposure to electric shock" with a mean of (2.20) and percent of (44.10%), where the percentages of responses for the all domain was (57.17%) and mean of (2.86).

5.3.4. Exposure to psychosocial hazard:

Table 5-7: Exposure top psychosocial hazard

N	statement	Mean	Std. Deviation	percent	Estimation level
1	My work is getting me tired and exhausted	3.44	1.1771	68.82	Moderate
2	I feel psychologically disturbed as a result of the work schedule in my work.	2.98	1.3179	59.50	Moderate
3	I am exposed to verbal violence in my workplace (Insulting, annoying words ...)	2.05	1.1662	41.00	Low
4	My social relationships with my external community have been negatively affected due to the nature of my work.	2.83	1.3098	56.64	Moderate
Total score of Psychosocial hazard		**2.82**	**.94532**	**56.49**	**Moderate**

The results in the table (5.7) shows the exposure status of the psychosocial hazards among anesthesia staff, which is at a moderate level, The highest response was for the first paragraph "My work is getting me tired and exhausted" with a mean of (3.44) and percent of (68.82), and the lowest responses were for the third paragraph "I am exposed to verbal violence in my workplace (Insulting, annoying words.." with a mean of (2.05) and percent of (41.00%), where the percentages of responses for the all domain was (56.64%) and mean of (2.82).

5.3.5. Exposure to ergonomic hazard:

Table 5-8: Exposure to ergonomic hazard

N	statement	Mean	Std. Deviation	percent	Estimation level
11	I complain of pain in the back and joints due to the nature of my work.	3.40	1.2668	68.08	Moderate

12	The floor of the operating rooms leads to sliding and falling.	2.47	1.1128	49.44	Low
13	Anesthesia workspace size is too small and overcrowded	2.90	1.1576	58.02	Moderate
14	The lighting level is not enough inside the operating room.	2.50	1.2151	50.06	Moderate
Total score of Ergonomic Hazard		**2.82**	**.84281**	**56.40**	**Moderate**

The results in table (5.8) shows the exposure status of the ergonomic hazards among anesthesia staff, which is at a moderate level, The highest response was for the first paragraph “I complain of pain in the back and joints due to the nature of my work", with a mean of (3.40) and percent of (68.08), and the lowest responses were for the second paragraph “The floor of the operating rooms leads to sliding and falling..” with the mean of (2.47) and percent of (49.44%), where the percentages of responses for the all domain was (56.40%) and mean of (2.82).

5.3.6. Analyzing the response of all domains:

After reviewing the most important sites of exposure to the various types of occupational risks, we can compare these types of risks according to the exposure as shown in figure (5.1)

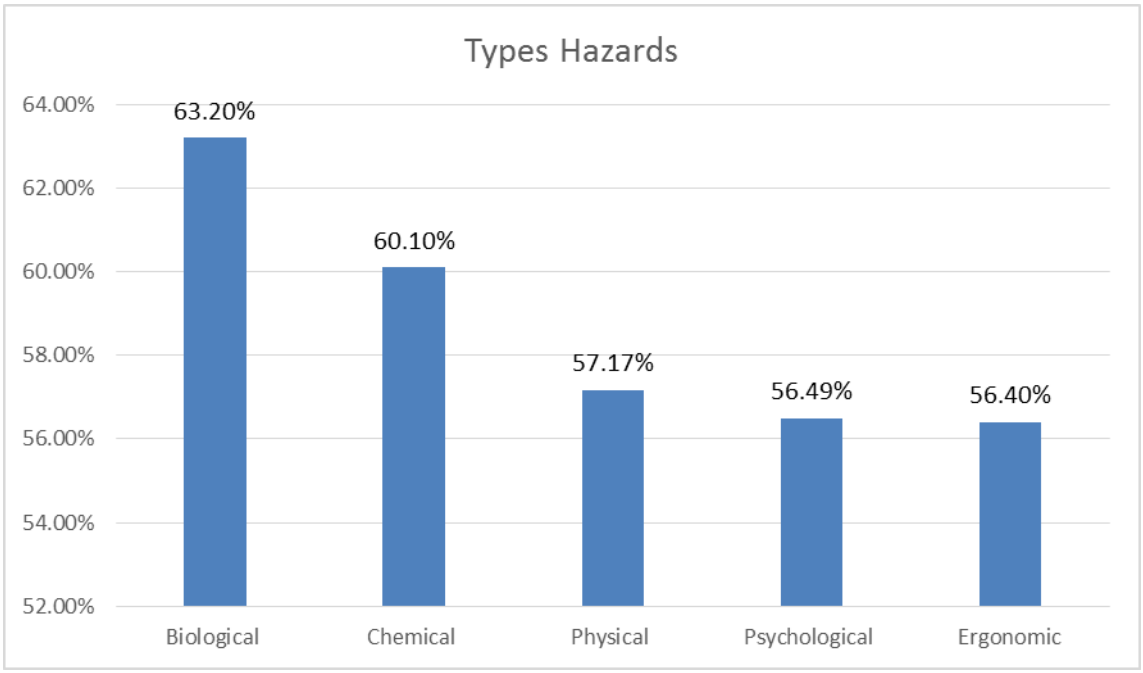

Figure 2: Exposure to occupational hazards

Figure 2 shows that the biological and chemical hazards have the highest percentages of occupational hazards that the anesthesia staff exposed to, with 63.20% of the respondents were exposed to biological hazards, and 60.06% exposed to chemical hazards. 57.17% exposed to physical hazards; 56.49% exposed to psychological hazards, and, 56.40% exposed to ergonomic hazard which was the lowest.

Also, exposure to occupational hazards in relation to the positive responses of the participants was in agreement with the above results and rates of exposure to hazard types. They ranged between moderate to very low, as the highest percentage of those who said that they were actually exposed to biological hazards was (60%) and the least percentage was for ergonomic hazards (46 %). (Annex 7).

5.4. The level of severity of the hazards

The response of the participants related to the severity of exposure to occupational risks as shown in figure (5.2).

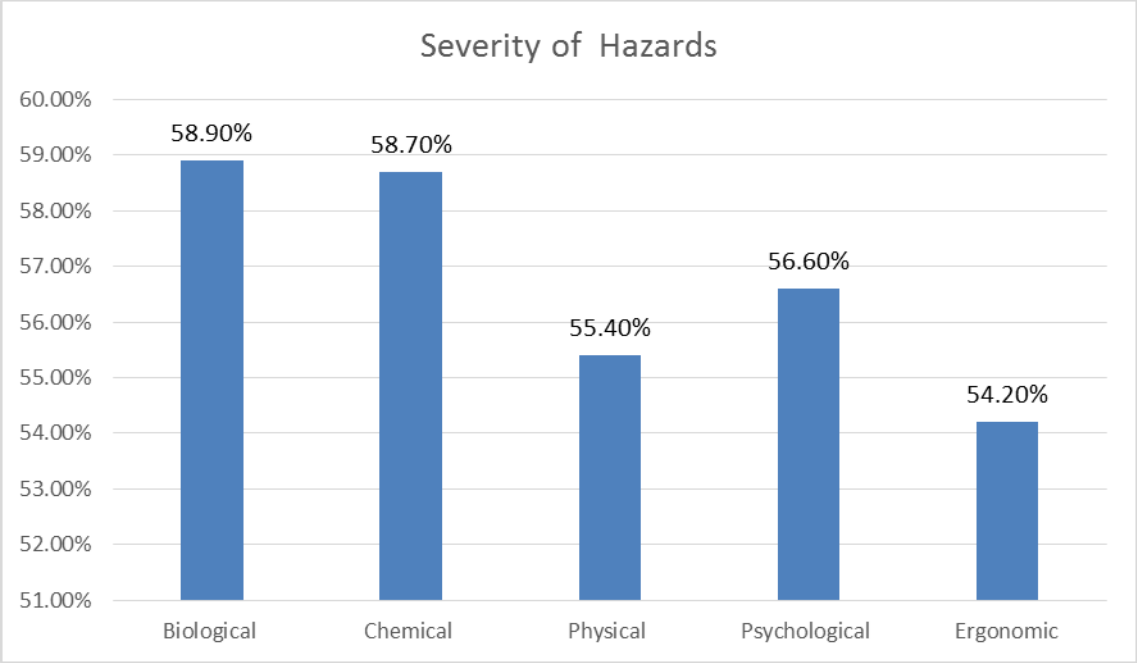

Figure 3: Perception of respondents of the severity of occupational hazards

The occupational hazards that participants were exposed to severe biological and chemical hazards as shown in figure 3, with biological hazards 58.9%%; chemical hazards 58,7%, psychological hazards 56.6%%, physical hazards 55,4%, and ergonomic hazards 55,6%. Biological and chemical hazards have the highest percentages due to the nature of the anesthesia environment. Also, the lowest percentages refer to ergonomic and psychological hazards as shown in the figure.

5.5. Respondents 'awareness of occupational risks

Table 5-9: Respondents 'awareness of occupational risks

No.	statement	Mean	Std. Deviation	percentage	Estimation level
1	I am aware of the occupational hazards at work.	4.24	.71165	84.72	Very high
2	I know how to avoid occupational hazards.	3.91	.74491	78.26	high
3	I know about preventive measures to be taken at work risks.	4.02	.82517	80.37	Very high
4	There is a transparent process for reporting accidents that occur during work.	3.56	1.08883	71.18	high
5	I can provide information to those around me about occupational risks in my workplace.	3.98	.82517	79.63	High
6	I'm committed to wearing the gloves while dealing with the patient	4.23	.72671	84.60	Very high
7	I sterilize my hands using sterilizers or wash my hands after dealing with each patient	4.20	.88614	83.98	Very high
8	Adhere to wearing protective clothing to x-ray if radiation is used	3.88	.95366	77.52	High
9	I am aware of the symptoms that appear on patients carrying the Covid-19 virus while they were in the operation department	4.17	.83842	83.35	Very high
10	I know what to do with a suspected Covid-19 patient.	4.13	.85973	82.61	Very high
Total score of occupational awareness		**4.03**	**.52729**	**80.62**	**high**

The result in table (5.9) shows that the status of occupational awareness among anesthesia staff was very high on items (1, 3, 6, 7, 9, 10), where the percentages of responses are respectively (84.72%, 80.3%, 84.60%, 83.98%, 83.35%, 82.61%). Also, the responses were high for items (2, 4, 5, 8). The total score of the occupational risk awareness domain is high where the percentage

of responses was (80.62%). This indicates that there is a good knowledge in general, to deal with various hazards.

On the other hand, the result of participant answers who agree that they have a good level of awareness and knowledge about occupational hazards types (positive responses) ranged from very high to moderates level, statement "I am aware of the occupational hazards at work" scored the highest percentage (91%). However statement "There is a transparent process for reporting accidents that occur during work" scored was at moderate level (61%), the total domain score of the level of staff awareness who agreed was (80%).(Annex 8).

5.6. Preventive and safety measures

Table 5-10: Respondents Preventive and safety measures

No	statement	Mean	Std. Deviation	percentage	Estimation level
1	All incidents or accidents reported immediately and appropriate action is taken to prevent further occurrences	3.09	1.2062	61.74	Moderate
2	There are written procedures for dealing with each type of risk	2.94	1.2077	58.76	Moderate
3	There is an active anesthetic gas drainage system attached to anesthesia device	2.92	1.3828	58.39	Moderate
4	Central ventilation system in operating rooms is available	3.11	1.3086	62.24	Moderate
5	There is concern from the infection control committee in the hospital for the safety of the anesthesia team	2.60	1.1634	52.05	Moderate
6	The infection control team follow up the anesthesia staff's vaccination schedule for hepatitis	2.51	1.2355	50.19	Moderate
7	The sharp box is always available	4.24	.9339	84.84	Very high

8	Special clothing is available to protect against radiation when used in operations	3.41	1.3485	68.20	Moderate
9	A showering bath is available inside the operating department when needed	2.92	1.4873	58.39	Moderate
10	Hand sanitizers are available all the time	3.78	1.0764	75.65	High
11	adequate number of the team are available to do the work	3.16	1.1984	63.23	Moderate
12	Gloves and masks are available all the time	3.65	1.0797	73.04	High
13	Special clothing is available to deal with patients expected to be infected with Covid- 19 virus	3.57	1.1711	71.43	High
14	There are special procedures for dealing with patients who are expected to carry the Covid-19 virus	3.54	1.1672	70.81	High
Total score of safety measures domain		**3.25**	**.77274**	**64.92**	**Moderate**

The result in the table (5.10) shows that the safety measures domain scored very high on item (7), with the percentage of responses (84.84%). Also, high on items (10,12,13,14), and moderate in items (1,2,3,4,5,6,8,9,11). The total score of the safety measures domain was at a moderate level, where the percentage of responses scored (64.92%). This indicates that there should be more focus on availability and implementing safety measures in order to reduce the risk of occupational hazards.

Also, the responses of the participants who agree that there is a good preventive measures (positive responses) ranged from high to low level ; participants who agree that the sharp boxes are always available was the highest (84%), however participants said that the infection control team follow up the anesthesia staff's vaccination schedule for hepatitis was at low level (25%). (Annex 9)

5.7. Diseases and health problems related to occupational hazards

Table 5-11: Health problems related to occupational hazards

No	statement	Yes (Percent)	No (Percent)
1	Infection with Covid 19	38.5%	61.5%
2	Hepatitis	2.5%	97.5%
3	Lumber disk	28.6%	71.4%
4	Allergy due to the use of sterilizers or gloves	63.4%	36.6%
5	Headache as a result of inhaling anesthetic gases	82.0%	18%
6	(For married women): repeated abortions without a specific reason	11.29%	88.71%

The result in the table (5.11) shows the percentage of the affected staff with health problems related to occupational hazards. Item number 5 "Headache as a result of inhaling anesthetic gases" got the highest percentage (82.0%) while item (4) "Allergy due to the use of sterilizers or gloves", scored (63.4%) of those who answered (Yes). Also, (38.5%) of all responders answered (Yes) on item (1) "Infection with Covid 19". Finally, for items (2,3,6) "Hepatitis, Lumber disk, and repeated abortions without a specific reason for married women" the responders say that they had a low effect, where the scored percentage with (Yes) were (2.5%, 28.6%, and 11.29%) respectively.

5.8. Result of research questions

In order to answer the research questions of the study about if there are significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, availability of safety measures, according to (age, gender, marital state, primary work location, monthly

income, experience, education level, job position, training courses in occupational hazards) variables., Two independent sample t-test and One way ANOVA test have been used and the following tables show the results.

Table 5-12: Frequencies, means, and standards deviations of occupational hazards, staff awareness, and availability of safety measures according to age variable.

Domain	Age/years	N	Mean	Std. Deviation
Exposure to occupational hazards	less than 26	10	2.6300	.45350
	26-35	91	2.8747	.77026
	36-45	42	3.2024	.57008
	More than 45	18	2.7694	.65308
	Total	161	2.9332	.70966
Staff awareness	less than 26	10	4.2900	.57436
	26-35	91	3.9857	.53241
	36-45	42	3.9643	.51268
	More than 45	18	4.2722	.42951
	Total	161	4.0311	.52729
Availability of safety measures	less than 26	10	3.2071	.66620
	26-35	91	3.2190	.82923
	36-45	42	3.1463	.69860
	More than 45	18	3.6389	.61224
	Total	161	3.2462	.77274

Table 5-13: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to age variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	4.756*	3	1.585	3.283	.022
	Within Groups	75.823	157	.483		
	Total	80.580	160			
Staff awareness	Between Groups	2.092	3	.697	2.582	.055
	Within Groups	42.393	157	.270		
	Total	44.485	160			
Availability of safety measures	Between Groups	3.278	3	1.093	1.859	.139
	Within Groups	92.262	157	.588		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.13) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of staff awareness, and availability of safety measures, due to the age variable. However, the results show that there were significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards. So, The LSD test results indicate that there are differences in the means of participants 'responses for the exposure to occupational hazards between age group (36-45) and other age groups in favor of (36-45) as shown in Table (5.14).

Table 5-14: The results of LSD test for differences in the means of response for the exposure to occupational hazards according to age variable

Domain	Age/years	N (Interval)	Mean Difference (A-N)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Exposure to	less than	26-35	-.24473	.23152	.292	-.7020	.2126

occupational hazards	26	36-45	-.57238*	.24453	.021	-1.0554	-.0894
		More than 45	-.13944	.27409	.612	-.6808	.4019
	26-35	less than 26	.24473	.23152	.292	-.2126	.7020
		36-45	-.32766*	.12964	.012	-.5837	-.0716
		More than 45	.10528	.17927	.558	-.2488	.4594
	36-45	less than 26	.57238*	.24453	.021	.0894	1.0554
		26-35	.32766*	.12964	.012	.0716	.5837
		More than 45	.43294*	.19578	.028	.0462	.8196
	More than 45	less than 26	.13944	.27409	.612	-.4019	.6808
		26-35	-.10528	.17927	.558	-.4594	.2488
		36-45	-.43294*	.19578	.028	-.8196	-.0462

*The mean difference is significant at the 0.05 level

Table 5-15: Results of t-test for occupational hazards, staff awareness, and availability of safety measures according to gender

Domain	Gender	N	Mean	Std. Deviation	F	Df	Sig. (2-tailed)
Exposure to occupational hazards	Male	125	2.9628	.69	.985	159	.326
	Female	36	2.8306	.76			
Staff awareness	Male	125	4.0432	.51	.543	159	.588
	Female	36	3.9889	.57			
Availability of Safety measures	Male	125	3.2680	.76	.665	159	.507
	Female	36	3.1706	.79			

*. The mean difference is significant at the 0.05 level.

Table (5.15) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to gender variables.

Table 5-16: Frequencies, means, and standards deviations of occupational hazards, staff awareness, and availability of safety measures according to marital status variable

Domain	Marital status	N	Mean	Std. Deviation
Exposure to occupational hazards	Married	132	3.0049	.69795
	Single	26	2.5000	.60992
	other (Widowed, divorced)	3	3.5333	.64291
	Total	161	2.9332	.70966
Staff awareness	Married	132	4.0333	.52198
	Single	26	4.0346	.57823
	Other (Widowed, divorced)	3	3.9000	.43589
	Total	161	4.0311	.52729
Availability of safety measures	Married	132	3.2251	.75078
	Single	26	3.4615	.83256
	Other (Widowed, divorced)	3	2.3095	.48620
	Total	161	3.2462	.77274

Table 5-17: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to Marital status variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to	Between Groups	6.639	2	1.319	7.093	.161

occupational hazards	Within Groups	73.941	158	.468		
	Total	80.580	160			
Staff awareness	Between Groups	.053	2	.026	.093	.911
	Within Groups	44.432	158	.281		
	Total	44.485	160			
Safety measures	Between Groups	3.896	2	1.948	3.359	.237
	Within Groups	91.643	158	.580		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.17) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to marital status variable.

Table 5-18: Frequencies, means, and standards deviations of occupational hazards, staff awareness, and availability of safety measures according to governorate variable.

Domain	Governorate	N	Mean	Std. Deviation
Exposure to occupational hazards	Ramallah	37	2.8041	.71796
	Nablus	17	2.9353	.90843
	Bethlehem	10	2.8100	.65439
	Hebron	36	3.0917	.56562
	Qalqilya	8	3.1250	.83238
	Jericho	9	2.5333	.35355
	Tubas	9	2.8278	.96989
	Salfit	6	3.0833	.57329
	Jenin	17	2.9059	.73163

	Tulkarm	12	3.1708	.72940
Staff awareness	Total	161	2.9332	.70966
	Ramallah	37	4.0432	.54393
	Nablus	17	3.8059	.48150
	Bethlehem	10	4.2800	.50947
	Hebron	36	3.8917	.51123
	Qalqilya	8	3.9875	.30443
	Jericho	9	4.2222	.38333
	Tubas	9	4.1556	.74012
	Salfit	6	4.0000	.36332
	Jenin	17	4.2529	.55240
Availability of safety measures	Tulkarm	12	4.0167	.55405
	Total	161	4.0311	.52729
	Ramallah	37	3.5502	.79715
	Nablus	17	3.1891	.87625
	Bethlehem	10	3.1143	.63994
	Hebron	36	3.0536	.61832
	Qalqilya	8	3.2411	.83206
	Jericho	9	3.2619	.64976
	Tubas	9	3.4762	1.12259
	Salfit	6	2.5595	.47038

Table 5-19: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to Governorate variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	4.332	9	.481	.953	.481
	Within Groups	76.248	151	.505		
	Total	80.580	160			
Staff awareness	Between Groups	3.515	9	.391	1.440	.176
	Within Groups	40.969	151	.271		
	Total	44.485	160			
Availability of safety measures	Between Groups	9.179	9	1.020	1.783	.076
	Within Groups	86.361	151	.572		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.19) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to governorate variable.

Table 5-20: Frequencies, means, and standards deviations of occupational hazards, staff awareness, and availability of safety measures according to monthly income variable

Domain	Age/years	N	Mean	Std. Deviation
Exposure to occupational hazards	Less than 3500	45	2.9600	.73102
	3501 – 4500	58	2.8216	.77624
	4501 – 5500	21	2.8976	.65009
	More than 5500	37	3.0959	.58942
	Total	161	2.9332	.70966

Staff awareness	Less than 3500	45	4.0711	.55540
	3501 – 4500	58	4.0586	.51437
	4501 – 5500	21	3.9238	.46573
	More than 5500	37	4.0000	.55528
	Total	161	4.0311	.52729
Availability of safety measures	Less than	45	3.0921	.71924
	3501 – 4500	58	3.3042	.87293
	4501 – 5500	21	3.1633	.75496
	More than 5500	37	3.3900	.66189
	Total	161	3.2462	.77274

Table 5-21: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to monthly income variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	1.762	3	.587	1.170	.323
	Within Groups	78.818	157	.502		
	Total	80.580	160			
Staff awareness	Between Groups	.393	3	.131	.467	.706
	Within Groups	44.091	157	.281		
	Total	44.485	160			
Availability of Safety measures	Between Groups	2.173	3	.724	1.218	.305
	Within Groups	93.367	157	.595		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.21) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to the monthly income variable.

Table 5-22: Frequencies, means, and standards deviations of occupational hazards, staff awareness, and availability of safety measures according to experience level variable

Domain	Experience level	N	Mean	Std. Deviation
Exposure to occupational hazards	From 1 – 5	56	2.5705	.71426
	From 6 – 10	39	3.1359	.53520
	From 11 – 15	44	3.2216	.67586
	More than 15	22	2.9205	.66774
	Total	161	2.9332	.70966
Staff awareness	From 1 – 5	56	4.1429	.50699
	From 6 – 10	39	3.7462	.52257
	From 11 – 15	44	4.0841	.55151
	More than 15	22	4.1455	.35285
	Total	161	4.0311	.52729
Availability of safety measures	From 1 – 5	56	3.4464	.70976
	From 6 – 10	39	2.9963	.83925
	From 11 – 15	44	3.1721	.76036
	More than 15	22	3.3279	.72832
	Total	161	3.2462	.77274

Table 5-23: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to experience level variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	12.631	3	4.210	9.728	.000
	Within Groups	67.949	157	.433		
	Total	80.580	160			
Staff awareness	Between Groups	4.277	3	1.426	5.567	.001
	Within Groups	40.207	157	.256		
	Total	44.485	160			
Availability of safety measures	Between Groups	5.069	3	1.690	2.932	.035
	Within Groups	90.471	157	.576		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.23) indicates that there are significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to years of experience variable. So, The LSD test results indicate that there are differences in the means of participants 'responses for the exposure to occupational hazards between the experience level group (1 - 5) and the other groups in favor of (1 - 5) as shown in table (5.24). Also, the LSD test results indicate that there are differences in the means of participants 'responses for the staff awareness between the experience level group (more than 15) and the other groups in favor of (more than 15) as shown in table (5.24).

Table 5-24: the results of LSD test for differences in the means of response for the occupational hazards, staff awareness, and availability of safety measures according to the experience level variable

Domain	Experience level(E)	N (Interval)	Mean Difference (E-N)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Exposure to occupational hazards	From 1 – 5	From 6 – 10	-.56536	.13721	.000	-.8364	-.2944
		From 11 – 15	-.65106	.13253	.000	-.9128	-.3893
		More than 15	-.34992	.16553	.036	-.6769	-.0230
	From 6 – 10	From 1 – 5	.56536	.13721	.000	.2944	.8364
		From 11 – 15	-.08569	.14468	.555	-.3715	.2001
		More than 15	.21544	.17541	.221	-.1310	.5619
	From 11– 15	From 1 – 5	.65106	.13253	.000	.3893	.9128
		From 6 – 10	.08569	.14468	.555	-.2001	.3715
		More than 15	.30114	.17178	.082	-.0382	.6404
	More than 15	From 1 – 5	.34992	.16553	.036	.0230	.6769
		From 6 – 10	-.21544	.17541	.221	-.5619	.1310
		From 11 – 15	-.30114	.17178	.082	-.6404	.0382
Staff awareness	From 1 – 5	From 6 – 10	.39670	.10555	.051	.1882	.6052
		From 11 – 15	.05877	.10195	.565	-.1426	.2601
		More than 15	-.00260	.12733	.048	-.2541	.2489
	From 6 – 10	From 1 – 5	-.39670	.10555	.051	-.6052	-.1882
		From 11 – 15	-.33794	.11130	.003	-.5578	-.1181
		More than 15	-.39930	.13494	.004	-.6658	-.1328
	From 11– 15	From 1 – 5	-.05877	.10195	.565	-.2601	.1426

		From 6 – 10	.33794	.11130	.003	.1181	.5578
		More than 15	-.06136	.13214	.023	-.3224	.1996
	More than 15	From 1 – 5	.00260	.12733	.048	-.2489	.2541
		From 6 – 10	.39930	.13494	.004	.1328	.6658
		From 11 – 15	.06136	.13214	.023	-.1996	.3224
Availability of safety measures	From 1 – 5	From 6 – 10	.45009	.15832	.005	.1374	.7628
		From 11 – 15	.27435	.15293	.075	-.0277	.5764
		More than 15	.11851	.19101	.536	-.2588	.4958
	From 6 - 10	From 1 – 5	-.45009	.15832	.005	-.7628	-.1374
		From 11 – 15	-.17574	.16695	.294	-.5055	.1540
		More than 15	-.33159	.20241	.103	-.7314	.0682
	From 11 - 15	From 1 – 5	-.27435	.15293	.075	-.5764	.0277
		From 6 – 10	.17574	.16695	.294	-.1540	.5055
		More than 15	-.15584	.19822	.433	-.5474	.2357
	More than 15	From 1 – 5	-.118 51	.19101	.536	-.4958	.2588
		From 6 – 10	.33159	.20241	.103	-.0682	.7314
		From 11 – 15	.15584	.19822	.433	-.2357	.5474

Table 5-25: Frequencies, means, and standards deviations of occupational hazards staff awareness, and availability of safety measures according to the level of education variable

Domain	Level of Education	N	Mean	Std. Deviation
Exposure to occupational hazards	Diploma degree in Anesthesia	90	2.9911	.75142
	Bachelor degree in Anesthesia	18	2.5667	.66884
	Master/High diploma degree in Anesthesia	7	3.1000	.48734
	Bachelor Degree in Medicine	21	2.8119	.66444
	Specialist Doctor	25	3.0440	.61021
	Total	161	2.9332	.70966
Staff awareness	Diploma degree in Anesthesia	90	4.0689	.51378
	Bachelor degree in Anesthesia	18	3.9889	.58500
	Master/High diploma degree in Anesthesia	7	4.2143	.33877
	Bachelor Degree in Medicine	21	3.8429	.51144
	Specialist Doctor	25	4.0320	.58146
	Total	161	4.0311	.52729
Availability of safety measures	Diploma degree in Anesthesia	90	3.1373	.79527
	Bachelor degree in Anesthesia	18	3.4563	.96242
	Master/High diploma degree in Anesthesia	7	3.6224	.69829
	Bachelor Degree in Medicine	21	3.3435	.66379
	Specialist Doctor	25	3.3000	.60010

	Total	161	3.2462	.77274

Table 5-26: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to the level of education variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	3.531	4	.883	1.787	.134
	Within Groups	77.049	156	.494		
	Total	80.580	160			
Staff awareness	Between Groups	1.140	4	.285	1.025	.396
	Within Groups	43.345	156	.278		
	Total	44.485	160			
Availability of safety measures	Between Groups	3.124	4	.781	1.319	.265
	Within Groups	92.415	156	.592		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.26) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to the level of education variable.

Table 5-27: Frequencies, means, and standards deviations of occupational hazards, staff awareness, and availability of safety measures according to job position variable

Domain	Job position	N	Mean	Std. Deviation
Exposure to occupational hazards	Head of the Department	22	2.9818	.54216
	Division Head	3	2.2833	1.09697
	Practitioners	136	2.9397	.72355

	Total	161	2.9332	.70966
Staff awareness	Head of the Department	22	4.2455	.40559
	Division Head	3	4.3667	.20817
	Practitioners	136	3.9890	.53991
	Total	161	4.0311	.52729
Availability of safety measures	Head of the Department	22	3.4545	.64514
	Division Head	3	3.7143	.99232
	Practitioners	136	3.2022	.78389
	Total	161	3.2462	.77274

Table 5-28: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to the type position variable

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	1.325	2	.662	1.320	.270
	Within Groups	79.255	158	.502		
	Total	80.580	160			
Staff awareness	Between Groups	1.590	2	.795	2.928	.056
	Within Groups	42.895	158	.271		
	Total	44.485	160			
Availability of safety measures	Between Groups	1.876	2	.938	1.582	.209
	Within Groups	93.664	158	.593		
	Total	95.540	160			

*. The mean difference is significant at the 0.05 level.

Table (5.28) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to type of job position variables.

Table 5-29: Results of t-test for occupational hazards, staff awareness, and availability of safety measures according to training courses in occupational hazards

Domain	Training courses	N	Mean	Std. Deviation	F	df	Sig. (2-tailed)
Exposure to occupational hazards	YES	19	2.5947	.65678	-2.241	159	.026
	NO	142	2.9785	.70634			
Staff awareness	YES	19	4.3789	.41039	3.146	159	.002
	NO	142	3.9845	.52488			
Availability of safety measures	YES	19	3.6692	.62416	2.585	159	.011
	NO	142	3.1896	.77494			

*. The mean difference is significant at the 0.05 level.

Table (5.29) indicates that there are significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to attending a course in occupational hazards at (0.05) significance level.

Table 5-30: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to period of years since completing the last training course in occupational hazards.

Domain	Last training course	N	Mean	Std. Deviation
Exposure to occupational hazards	One year ago,	5	2.3500	.31225
	Two Years ago,	4	2.7625	.77177
	Three Years Ago,	5	2.2100	.66276
	Four Years and more	5	2.8900	.56943

	Total	**19**	**2.5421**	**.61311**
Staff awareness	One year ago,	5	4.4400	.37148
	Two Years ago,	4	4.4500	.12910
	Three Years Ago,	5	4.3600	.45056
	Four Years and more	5	4.2600	.59833
	Total	**19**	**4.3737**	**.40530**
Availability of safety measures	One year ago,	5	3.3143	.37661
	Two Years ago,	4	3.6607	.37514
	Three Years Ago,	5	4.2143	.19562
	Four Years and more	5	3.7000	.80717
	Total	**19**	**3.7256**	**.56808**

Table 5-31: Results of One-Way ANOVA Test for occupational hazards, staff awareness, and availability of safety measures according to period in years since completing the last course in occupational hazards.

Domain	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Exposure to occupational hazards	Between Groups	1.535	3	.512	1.468	.263
	Within Groups	5.231	15	.349		
	Total	6.766	18			
Staff awareness	Between Groups	.111	3	.037	.195	.898
	Within Groups	2.846	15	.190		
	Total	2.957	18			
Availability of safety measures	Between Groups	2.060	3	.687	2.748	.079
	Within Groups	3.749	15	.250		
	Total	5.809	18			

Table (5.31) indicates that there are no significant differences at the level ($p \leq 0.05$) in the means of exposure to occupational hazards, staff awareness, and availability of safety measures, due to period of years since completing the last course variable.

Chapter Six

Discussion, Conclusion, and Recommendations

Chapter Six: Discussion, Conclusion, and Recommendations

6.1. Introduction

This chapter includes a discussion of the study findings in relation to the previous studies including the exposure to occupational hazards, staff awareness and knowledge, and availability of safety measures in the anesthesia department. The chapter ends with a conclusion and recommendations.

6.2. Socio-demographic factors

About 88.8% of participants were below 45 years old, which indicates that most of the participants are young, as shown in table (5.1). The reason may be the increase in hospitals and operating rooms in recent years, which requires increasing in the number of staff. Both males and females represented the sample; Male form 77.6%, while females form 22.4%. It could be due to the nature of the job in the anesthesia department which needs high efforts; males can work under pressure in operation rooms more than females so it could be that number of males more than females.

Also, 82% of the respondents were married, while 16.1% were single. On other hand, ages over 25 years old constitute around 94% percent of the respondents, this finding is compatible with the Palestinian Central Bureau of Statistics indicators which indicates that the average age of marriage in Palestine is 25.3 years for men and 20.7 years for women. (PCBS, 2021)

The participants were distributed according to their place of work in the various governorates. The staff's most considerable presence was in Ramallah and Hebron (23%, 22.4%), the difference in the distribution of staff numbers may due to hospitals' size and the number of operating rooms that they got, this could affect the number of the anesthesia staff available.(MoH,2019)

Monthly income shows that 72% of the participants have more than 3500 (shekels), which means that the staff has a good monthly income comparing to the minimum wage in Palestine which equals (1,450) shekels according to the Palestinian Cabinet Resolution No. 11 of 2012.

The level of experience of the employees showed that the anesthesia staff has a variety of years of experiences, as there is a distribution in the number of staff in terms of years of experience, and this indicates that there are a need and continuous employment of those staff over the past years. Also, in terms of qualification and education level, the data showed that most of the anesthesia staff were anesthesia assistants (71.4%), In comparison, the percentage of anesthesia residents doctors and anesthesia physician was low (13%, 15.5%), this indicates that this may be due to the lack of available specialist doctors, as well as the need for anesthesia technicians.

The results showed that the majority of the anesthesia staff doesn't have any training courses in occupational health before (88.2%). Also, most of those who had training courses (74.7%) took it before at least two years ago. This may due to a lack of training and developing competencies for staff in the anesthesia departments within occupational health.

6.3. Discussion of the research question of the study

1. The most potential hazards that affect the anesthesia team in the operation room

The study showed that various potential risks affect the anesthesia staff. The first in rank according to the responders was the exposure to ionizing radiation by x-ray machine ,followed by exposure to inhalation of anesthesia gases , and then comes the exposure to the fluids and blood-borne that comes out from the patients . On the other hand, the exposure to verbal violence in the workplace scored the lowest risk.

The results are mainly congruent with Saleh et al., (2020) study findings of the occupational risk of adverse health effects among operation staff in Benha University Hospitals. The study found that the participants reported the main occupational hazards are radiation, nosocomial infections, blood-borne diseases, anesthesia gases, muscle pain, and latex allergy. The results were inconsistent with Nankongnab et al, (2020) study, which found that the anesthesia staff has the highest exposure to skin problems and needle stick injury.

The researcher thinks that the high level of radiation exposure risk is due to a lack of protective gowns from radiation (68.2%) in PMoH hospitals. Besides, none of the respondents mentioned that he had taken radiation safety training. Also, the researcher, due to the respondent's high score about the exposure to inhalation anesthesia gases since the anesthesia gases is widely used for the induction and maintenance of anesthesia during surgery (Steffey et al.,2015). While, the availability of scavenging systems to drainage waste gases is at a moderate level (58.39%), which could mean that it is absent or not active in some hospitals or operating rooms.

2. **The common type of occupational hazards that affect the anesthesia team in the operation room**

More than half of the participants were exposed to an occupational hazard at a moderate level despite the type of hazards. Around 63% of the participants have been exposed to biological hazards, which were the first in rank, then 60.1% mentioned that they are exposed to chemical hazards, while 56.40% exposed to ergonomic hazards. According to the findings, the biological and chemical hazards have a more severe effect than the other risks according to the respondent's opinions, while the ergonomic hazards are the last in the rank of severity with .

The findings of this study are congruent with the study of Al-sarraji & Hassan(2017), which found that the effect of occupational hazards on operation room nurses are moderate; besides, the most hazardous effect on the nurses related to the biological hazards. Also, this study's results were consistent with the study of Ndejjo et al, (2015), which showed that 50.0% of study participants reported that they suffered from an occupational health hazard; among these, 39.5% experienced biological hazards as the more severe hazard type effect. Besides, Alqam,(2013) study results match with the current study, which showed that half of the participants were exposed to hazard regardless of the type of hazards. The biological hazard was the first in rank on its effect severity on the laboratory workers, followed by chemical, psychological, physical, and ergonomic hazards in order. Finally, the current study findings are incompatible with the results of the study conducted by Lebni et al., (2020) that showed that the occupational hazards level effect was high, while the ergonomic hazards were the most critical factors and the biological hazards were almost negligible effects on the staff.

The researcher attributes the current results to the operations department's nature, as it is a closed department that facilitates the transmission of various infections through the movement of air inside it. Also, the closed department increases the possibility of exposure to inhalation of air mixed with the waste anesthetic gases from the patient or anesthesia machine(Neghab et al., 2020). In addition, the nature of work in the anesthesia department increases the risk of exposure to fluids and patient blood, which is more significant than in other departments(Kim et al., 2018).

3. Anesthesia team awareness level of the occupational health hazards

The total degree of the domain of awareness and knowledge, which has a percentage of (80.62%) indicates that there is a high degree of awareness and knowledge of the staff on occupational safety issues. The positive responses of the participants also indicate that they have a high level of awareness.

The results of the current study match the results of Ahmed, (2014) study, which found that perception and knowledge of occupational hazards among HCW have scored very high, and safety climate scored high. Also, the result compatible with Alqam, (2013) study, which showed a high degree of participant knowledge about occupational hazards in laboratory workers in the hospitals. On the other hand, the study results differ from Kim et al.,(2018) study, which found a lack of knowledge on preventing occupational accidents to a high degree. Besides, the results incongruent with the results of the study conducted by Elbilgahy et al., (2019), which showed that half of the anesthesia nurses had a low level of knowledge about the occupational risks and how to deal with them before guidelines implementation.

4. Availability of safety measures to protect the anesthesia team from potential hazards

The results show that this domain scored at a moderate level (64.92%) and low level of the positive responses (52%). The anesthesia department's relationship with the hospital's infection control committee was moderate. This moderate relationship makes occupational risk chances to happen higher. Also, the results showed that few of the respondents had taken training courses in the field of occupational risks, the researcher due to the reason of this decrease in training courses to lack of educational and developmental programs for anesthesia staff and this compatible with the result of Elewa's (2016) study.

Concern the environment of the operating room, the results indicated that the central air-conditioner presence is at a medium level , and the presence of the anesthetic gas scavenging system is also at a medium level too . This could indicate that not all hospitals have these effective systems, which increases the chances of occupational dangers, especially inhalation of waste anesthetic gases and the possibility of infection transmission due to the absence of central circle ventilation.

Regarding the department's results related to equipment, material, and machines, there was an excellent availability of sharps boxes. Also, good availability of hand sanitizers, gloves, and face mask. These indicators are fundamental to be available to prevent and mitigate risks, primarily biological and chemical risks.

The result is matched with the study of Darkwa et al., (2017), which found that the anesthesia staff has good knowledge about the risk of exposure to inhalational anesthesia gases, but there are low safety measures implemented to reduce the risk effect in the anesthesia department. Also, the current result consistent with Boiano and Steege's, (2016) study; which concludes that there is a lack of safe handling policies (19%) and inadequate hazard awareness training (18%) in the anesthesia department.

The researcher concludes that the application of preventive and safety measures has a medium level. As the degree of these aspects was moderate according to the respondents' perception, and this may lead to an increased chance of exposure to occupational risks.

6.4. Discussion of results about relationships between exposure to occupational hazards, staff awareness, availability of safety measures, and the socio-demographic factors

- There were no significant differences founded in the mean of staff awareness and safety measures domains according to age variable, but there were significant differences in exposure to occupational hazards according to the age variable, and these differences were in favor of age groups (36 - 45). The researcher attributes the increased exposure to occupational risks for the age groups (36-45) to the theory that this age group has more experience in the field of work than the younger ages and more active than those over 45 years old. And so, this may cause more dependency on them at work, which increases the chance of exposure to occupational hazards. The study results were consistent with the study conducted by Lebni et al (2020) who found significant differences in the mean of occupational hazards and age domain on the operating room staff. The study results are

congruent with Al-sarraji et al (2017) that showed a highly significant relationship between occupational hazards and age of nurses who work in the operation rooms. Simultaneously, the present study doesn't agree with the study of Alqam (2013), who concluded that there are no significant differences in safety measures and occupational hazards perception and knowledge with age domain among the Palestinian laboratory workers governmental hospitals in the West Bank.

- There were no significant differences founded in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and gender variable. The study's result is consistent with Alqam (2013), who found no significant differences in the mean of safety measures and occupational hazards, with gender laboratory workers. Also, the study result matches the study of Lebni et al. (2020), who found no significant differences in the mean of occupational hazards and gender domain on the operating room staff.

- There were no significant differences founded in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and marital status variable. This result was agreed with Alqam (2013), which found no significant differences in perception and knowledge, and safety measures. In contrast, Libni (2020) doesn't agree with our result, which found significant differences in the domain of occupational hazards and marital status.

- Also, the researcher recognizes that there are no significant differences in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and the primary work location variable. The researcher found no statistically significant

differences according to the site of work places, this could be due to the existence of similar conditions in all hospitals in the West Bank in terms of equipment and capabilities.

- Also, there were no significant differences founded in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and the monthly income variable. The researcher explained this result since most of the anesthesia staff monthly income is very good. And so, there is no reason for the impact of the monthly income on the exposure to occupational hazards, staff awareness, and availability of safety measures. This result agreed with Alqam (2013), and Naim (2020) studies, which found that there are no significant differences between monthly income and occupational risks among healthcare providers in operating rooms at governmental hospitals in Northern Gaza.

- On the other hand, there were significant differences founded in exposure to occupational hazards, staff awareness, and availability of safety measures, and years of experience variable. Significant differences in means of exposure to occupational hazards are in favor of the experienced group (1 - 5 years), while significant differences in means of staff awareness are in favor of the experienced group (more than 15year, 11-15 years). The researcher tended to adopt the reason for the existence of statistically significant differences regarding the level of experience in adopting practical experience to know how to deal with occupational risks, This is confirmed by the effect of the domain of exposure to occupational risks with its tendency to favor the less experience group (1 - 5 years), and this is also reinforced by the domains (staff awareness) in the direction of difference for the more experienced groups favor (11-15, more than 15). These results were consistent with Younis, (2018), who found significant differences in the level of likelihood of chemical, biological, ergonomic, and physical risks between years of experience of health care providers. Also, Lebni et al (2020)

and Al-sarraji et al (2017) studies found the same result of significant differences, while Osungbemiro et al., (2016) study was inconsistence with the current result, which showed that there was no significant association between the occupational risks on health workers and year of experience.

- The researcher observed also that there were no significant differences in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and education level variable. The current study is consistent with the results of Younis, (2018) study who conclude that there are no significant differences in the likelihood and severity of occupational risks between education levels of health care providers. Results also agreed with Naim's (2020) study who assures that there no significant differences between occupational hazards and educational level.

- There were no significant differences founded in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and job position variables. The researcher attributes the founded result to the fact that the number of practitioners in the anesthesia departments is moderate and insufficient, which forces the heads of departments and divisions to work in the department working conditions of all the staff.

- Finally, there were significant differences founded in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and receiving training courses on occupational hazards variable. Also, there were no significant differences in the mean of exposure to occupational hazards, staff awareness and availability of safety measures, and the period from having the last training course variable. This study is consistent with the results of Elbilgahy et al (2019) study who found that providing training and educational

programs about health hazards reduces the possibility of these risks on the operation nurses. The researcher attributes the observed result to the fact that training courses in occupational risks increases the awareness of the trainers and makes him less exposed to occupational risks and more ready to deal with these risks.

6.5. Conclusion

Study found that more than half of participants were exposed to occupational hazards at a moderate level despite its type. The highest percentages of the type of occupational hazards that the anesthesia staff faced were the biological hazards followed by the chemical, physical, psychosocial, and ergonomic hazards. Besides, biological and chemical hazards had more severe effect than other risks, followed by physical, psychosocial, and ergonomic hazards.

Also, study illustrated that the most potential hazards that affect the anesthesia staff was the exposure to x-ray from the C-arm, followed by exposure to inhalation of anesthesia gases , and then comes the exposure to the fluids and blood-borne that comes out from the patients .

In concern of the level of staff awareness and knowledge study found it in a high level between them, while the availability of the safety measures was at a moderate level.

There was a significant between exposure to occupational hazards and age. Also study indicates a significant relationship between exposure to occupational hazards, staff awareness, availability of safety measures, and (experience and training courses on occupational hazards) variables.

6.6. Recommendation

According to the current study results and discussion, the researcher suggested several essential recommendations, represented as the following:

- Activate hospitals' training programs by organizing training courses on occupational health and safety.
- Provide personal preventive measures for the staff's safety, such as providing clothing intended for ionizing radiations, equipment for Covid19 patients, providing gloves, head covers, and appropriate shoes. Also, increase the number of anesthesia staff in the hospitals to fit the need of the number of patients scheduled.
- Activate the infection control unit and paying attention to periodic checks and vaccinations for anesthesia staff, such as hepatitis.
- Conducting more studies and research in anesthesia occupational health and safety concerning in specific topics related to occupational risks. Also, further studies about occupational safety taught in universities
- Providing modern devices that may reduce surrounding dangers: such as modern anesthesia devices which work with high efficiency to decrease direct gases exposure, effective scavenging system, and proper ventilation in operating rooms.

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Annexes

Annex 1: Arabic Questionaire

الجزء الأول: المعلومات الشخصية:

1. العمر/السنوات :

1. 25 سنة فاقل ☐ 2. 26-35 ☐

3. 36 – 45 ☐ 4. اكثر من 45☐

2. الجنس 1. ذكر☐ 2. أنثى☐

3. الحالة الاجتماعية:

1.متزوج إة ☐ 2.غير متزوج|ة ☐ 3.غير ذلك(مطلق|ة، ارمل|ة)☐

4. مكان العمل الاساسي: ----------

5. الدخل الشهري (بالشيكل)

1. اقل من 00☐ 2. 3501 – 4500☐

3 4501 - 55☐ 4. اكثر من 5500☐

6. سنوات الخبرة في التخدير :

1. 1 - 5 ☐ **2. 6- 10** ☐

3. 11- 15 ☐ **4. اكثر من 15** ☐

7. المؤهل العلمي:

1. دبلوم في التخدير التقني ☐ 2 . بكالوريوس في التخدير التقني☐

3. ماجستير \ دبلوم عالي في التخدير التقني☐ 4. بكالوريوس|طب عام ☐

5. طبيب اخصائي ☐

8. الموقع الوظيفي:

رئيس قسم ☐ رئيس شعبة ☐ موظف ☐

9 . هل سيق واخذت دورات تدريبية في مجال المخاطر المهنية ؟

1. نعم ☐ 2. لا ☐

10 . في حال يوجد دورات تدريبية ،ما هو موضوعها:----------
11 . متى كان اخر تدريب لك:----------

الجزء الثاني :التعرض للمخاطر المهنية وايها اشد خطورة: يرجى تحديد مدى التعرض للمخاطر المهنية التالية في مكان عملك عن طريق وضع (X) في المربع الذي يعكس تجربتك منذ بداية عملك.

		الى حد كبير جدا	الى حد كبير	محايد	الى حد قليل	الى حد قليل جدا
1. المخاطر البيولوجية: المخاطر التي تحدث نتيجة للتعرض للمواد البيولوجية التي تشكل خطرا على صحة الإنسان وتشمل البكتيريا والفيروسات والفطريات والكائنات الحية الأخرى						
	عادة ما اتعرض للسوائل التي تخرج من المريض اثناء القيام بعملي. (دم، لعاب، قيء....)					
	سبق وتعرضت للوخز من الابر الخاصة بالمريض اثناء عملي					
	خلال عملي اتعرض للرذاذ الصادر عن المريض اثناء فترة التنويم او الافاقة					
	تعرضت اثناء عملي للهواء الملوث الصادر عن المريض من مسافة قريبة					
2. المخاطر الكيميائية: هي المخاطر المرتبطة باستخدام مادة كيميائية ، يمكن استنشاقها أو امتصاصها عبر الجلد أو ابتلاعها أو بلعها.						
	عادة ما اضطر لاستنشاق غازات التخدير اثناء عملي					
	تظهر على يدي حساسية بعد استخدام الكفوف اثناء العمل					
	عيوني تتحسس من المواد الكيميائية المتطايرة المستخدمة في قسم العمليات (مثل السايدكس، الفورمالين، المعقمات...)					
	يوجد لدي حساسية بعد استخدام بعض انواع المعقمات					
3. المخاطر الجسدية: العوامل أو الظروف التي يمكن أن تسبب ضررًا عند التلامس او الاتصال او التعرض ، ويشمل ذلك التعرض للإشعاع و الحرارة العالية والباردة ومخاطر الاهتزاز ومخاطر الضوضاء وغيرها.						
	تعرضت للاشعة السينية في بعض انواع العمليات من جهاز التصوير الاشعاعي في العمليات اثناء عملي					
	تزعجني الاصوات العالية للأجهزة داخل غرفة العمليات اثناء العمل					
	اثناء عملي هنالك احتمالية لخطر تعرضي للصدمة الكهربائية					
	عادة ما تكون درجة الحرارة المضبوطة داخل غرف العمليات غير ملائمة لي					
4. المخاطر النفسية والاجتماعية : الممارسات الإدارية أو الممارسات التنظيمية التي تشكل خطرًا على الصحة العقلية والرفاهية ، وتشمل التعرض للمضايقة أو العنف أو الأحداث الصادمة او غيرها, وتؤثر على العلاقات الاجتماعية. .						
	اتعرض للتعب والارهاق من العمل					
	اشعر بالاضطراب النفسي نتيجة لنظام الدوام في عملي					
	تعرضت للعنف اللفظي في مكان عملي(السب، الالفاظ المزعجة، الاهانة....)					

	علاقاتي الاجتماعية مع المجتمع الخارجي تأثرت بشكل سلبي بسبب طبيعة عملي					
5. مخاطر عدم الملائمة : الحالات التي قد تشكل خطرًا جسديا نتيجة عدم ملائمتها , مما قد يؤثر على إصابة الجهاز العضلي الهيكلي ، مثل عضلات او الم اسفل الظهر ، والأوتار أو أعصاب اليدين / الرسغين وغيرها.						
	تعرضت لآلام في الظهر والمفاصل نتيجة لطبيعة عملي					
	ارضية غرف العمليات تؤدي الى التزحلق والوقوع					
	مساحة عمل التخدير صغيرة جدًا ومكتظة					
	مستوى الانارة غير كافي داخل غرفة العمليات					

يرجى ترتيب المخاطر التي تتعرض لها وفقًا لشدتها في مكان عملك
(1 = أقل خطورة & 5 = أعلى شدة)

نوع المخاطر المهنية	درجة المخاطرة				
	1	2	3	4	5
مخاطر جسدية					
مخاطر كيميائية					
مخاطر نفسية					
مخاطر بيولوجية					
مخاطر عدم الملائمة					

الجزء الثالث: الوعي المهني للمخاطر المهنية**:** يرجى تحديد مدى التعرض للمخاطر المهنية التالية في مكان عملك عن طريق وضع (*) في المربع الذي يعكس تجربتك

		موافق بشدة	موافق	محايد	معارض	معارض بشدة
	أنا أدرك المخاطر المهنية في مكان العمل					
	لدي المقدرة على كيفية تجنب المخاطر المهنية حولي					
	أعرف عن التدابير الوقائية الواجب اتخاذها في مجال مخاطر العمل					
	هنالك الية واضحة للتبليغ عن الحوادث التي تحدث اثناء العمل					
	لدي القدرة على توصيل المعلومة لمن حولي حول المخاطر المهنية في مكان عملي					

	التزم بلبس الكفوف اثناء التعامل مع المريض					
	اقوم بتعقيم يدي باستخدام المعقمات او غسل الايدي بعد التعامل مع كل مريض					
	التزم بلبس اللباس الواقي للاشعاع حال كان هنالك استخدام للاشعه					
	ادرك الاعراض التي قد تظهر على المرضى حاملي فيروس كوفيد19 اثناء تواجدهم في قسم العمليات					
	أنا أعرف كيف اتصرف مع مريض متوقع ان يكون حاملا لفيروس كوفيد 19					

الجزء الرابع: التدابير الوقائية وتدابير السلامة : يرجى تحديد إلى أي مدى يلتزم مستشفاكم بإجراءات الوقاية وسلامة الطاقم التالية من خلال وضع (X) في المربع المناسب

		الى حد كبير جدا	الى حد كبير	محايد	الى حد قليل	الى حد قليل جدا
	يتم اتخاذ الاجراءات المناسبة فورا حال الابلاغ عن الحوادث داخل القسم لمنع وقوع المزيد					
	يوجد اجراءات مكتوبة حول التعامل مع كل نوع من المخاطر					
	يوجد نظام التصريف لغازات التخدير فعال ومشبوك بأجهزة التخدير					
	يتوفر نظام مركزي للتهوية في غرف العمليات					
	يوجد اهتمام من قبل طاقم مكافحة العدوى في المستشفى بسلامة طاقم التخدير					
	يتابع طاقم مكافحة العدوى جدول اللقاحات الخاصة بالتهاب الكبد لطاقم التخدير					
	حاويات الادوات الحادة متوفرة طول الوقت					
	يتوفر لباس خاص للوقاية من الاشعاع حال استخدامه في العمليات					
	يتوفر مكان للاستحمام داخل قسم العمليات عند الحاجة					
	يتوفر مواد معقمة لليدين باستمرار					
	يتوفر عدد ملائم من الطاقم للقيام بالعمل					
	تتوفر القفازات والكمامات بشكل مستمر					

	يتوفر لباس خاص للتعامل مع المرضى المتوقع ان يكونوا مصابين بفيروس كوفيد 19					
	يوجد اجراءات خاصة للتعامل مع المرضى المتوقع حملهم فيروس كوفيد 19					

الجزء الخامس : الأمراض والمشاكل الصحية المتعلقة بالمخاطر المهنية: هل سبق لك أن أصبت بالمشكلات الصحية التالية بسبب وظيفتك الحالية في غرفة العمليات:

		نعم	لا
	العدوى بفيروس Covid 19		
	التهاب الكبد الفيروسي		
	الانزلاق الغضروفي		
	حساسية نتيجة استخدام المعقمات او الكفوف		
	الم في الراس نتيجة استنشاق غازات التخدير		
	(للمتزوجات): اجهاض متكرر بدون سبب محدد		
	أخرى ، يرجى التحديد:		

Annex 2: English Questionaire

Part one: Personal data:

1- **Age(years)**

1. 25 or under ☐ 2. 26 -35 ☐

36- 45 ☐ 4. older than 45 ☐

2- **Gender**: **1**. Male ☐ **2**. Female ☐

3- **Marital state**:

1- Married ☐ 2- Unmarried ☐ 3- Others(divorce, widow) ☐

4- **Primary work location**: ----------

5- Monthly income(in shekels) :

1. Less than 3500 ☐ **2.** 3501 – 4500 ☐

3.4501 - 5500 ☐ **4.** More than 5500 ☐

6- Years of experience in the anesthesia field:

1. 1-5 ☐ 2. 6-10 ☐

3. 11-15 ☐ 4. more than 15 ☐

7- Educational level(in anesthesia) :

1. Diploma degree in tech. anesthesia ☐ **2.** Bachelor's degree in tech. anesthesia ☐

3. Master /High diploma in tech. anesthesia ☐ **4**. Bachelor of General Medicine ☐

5. Doctor / Specialist Certificate ☐

8- Job position:

1. Head of department ☐ 2. Head of Division ☐ 3. Practitione ☐

9- Have you ever taken training courses on occupational hazards?

Yes ☐ **No** ☐

10- If yes, what was its subject? ----------

11- When was your last training ----------

Part two: Exposure to occupational hazards: Please identify the extent of exposure to the following occupational hazards in your workplace by putting (X) in the box that reflects your experience since the beginning of your job.

1. **Biological hazards**: risks happen as a result of exposure to the Biological substances that pose a threat to the health of humans, its include bacteria, viruses, fungi, and other living organisms.						
		To a very large extent	**To a large extent**	**Neutral**	**To a little extent**	**To a very little extent**
12	Usually, I am exposed to the fluids that come out of the patient during my work (blood, saliva, vomits…)	**5**	**4**	**3**	**2**	**1**
13	I had previously been acupunctured from the patient's needles during my work.	5	4	3	2	1
14	During my work, I was exposed to an aerosol that comes out of the patient during a period of sleeping or recovery.	5	4	3	2	1
15	While working, usually I am exposed to polluted air from the patient at close range.	5	4	3	2	1
2. Chemical hazards: Refers to the risks that surround using a chemical, it can be inhaled, absorbed through the skin, swallowed, or ingested.						
16	I have to inhale anesthetic gases while working.	5	4	3	2	1
17	My hands show allergy after using the gloves during work.	5	4	3	2	1
18	My eyes are sensitive to chemicals agents that use in the operation department (cidex, formaldehyde, sterilizers).	5	4	3	2	1
19	I have an allergy to using some types of sterilizers.	5	4	3	2	1
3. Physical hazards: An agent, factor, or circumstance that can cause harm with contact or radiation, it includes exposure to radiation, heat and cold stress, vibration hazards, and noise hazards						
20	I usually exposed to x-ray in some types of operations from the c-arm machine in operations during my work	5	4	3	2	1
21	I am disturbed by the loud sounds of the devices inside the operating room during working	5	4	3	2	1
22	While working, there is a possibility of exposure to electric shock	5	4	3	2	1

23	Usually, the temperature set in operating rooms is not suitable for me	5	4	3	2	1
	4. **Psychosocial hazards**: Elements of the work environment, management practices, or organizational practices that pose a risk to mental health and well-being, include exposure to harassment, violence, or traumatic events and affect family relationship					
24	My work is getting me tired and exhausted.	5	4	3	2	1
25	I feel psychologically disrupted. as a result of the work schedule in my work.	5	4	3	2	1
26	I am exposed to verbal violence in my workplace (Insulting, annoying words ...)	5	4	3	2	1
27	My social relationships with my external community have been negatively affected due to the nature of my work.	5	4	3	2	1
	5. **Ergonomic hazards**: physical conditions that may pose a risk of injury to the musculoskeletal system, such as the muscles or ligaments of the lower back, tendons or nerves of the hands/wrists, or bones surrounding the knees					
28	I complain of pain in the back and joints due to the nature of my work.	5	4	3	2	1
29	The floor of the operating rooms leads to sliding and falling.	5	4	3	2	1
30	Anesthesia workspace size is too small and overcrowded	5	4	3	2	1
31	The lighting level is not enough inside the operating room.	5	4	3	2	1

Please rank the hazards you exposed to according to their severity i**n your workplace**

(1= Least severity & 5= highest severity)

	Type of hazards	**Degree of risk (level of severity)**				
		1	**2**	**3**	**4**	**5**
32	**Physical**					
33	**Chemical**					

34	**Psychosocial**					
35	**Biological**					
36	**Ergonomic**					

Part Three: Occupational hazards awareness and knowledge: Please identify your level of awareness of the following occupational hazards by putting (X) in the appropriate box

		Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
37	I am aware of the occupational hazards at work.	**5**	**4**	**3**	**2**	**1**
38	I know how to avoid occupational hazards.	5	4	3	2	1
39	I know about preventive measures to be taken at work risks.	5	4	3	2	1
40	There is a transparent process for reporting accidents that occur during work.	5	4	3	2	1
41	I can provide information to those around me about occupational risks in my workplace.	5	4	3	2	1
42	I'm committed to wearing the gloves while dealing with the patient	5	4	3	2	1
43	I sterilize my hands using sterilizers or wash my hands after dealing with each patient	5	4	3	2	1
44	Adhere to wearing protective clothing to x-ray if radiation is used	5	4	3	2	1
45	I am aware of the symptoms that appear on patients carrying the Covid-19 virus while they were in the operation department	5	4	3	2	1
46	I know what to do with a suspected Covid-19 patient.	5	4	3	2	1

Part four: Preventive and safety measures: Please identify to which extent do your hospital abide by the following preventive and safety measures to the staff by putting (X) in the appropriate box

		To a very large extent	**To a large extent**	**Neutral**	**To a little extent**	**To a very little extent**
47	All incidents or accidents reported immediately and appropriate action is taken to prevent further occurrences	**5**	**4**	**3**	**2**	**1**
48	There are written procedures for dealing with each type of risk	5	4	3	2	1
49	There is an active anesthetic gas drainage system attached to the anesthesia device	5	4	3	2	1

50	Central ventilation system in operating rooms is available	5	4	3	2	1
51	There is concern from the infection control committee in the hospital for the safety of the anesthesia team	5	4	3	2	1
52	The infection control team follow up the anesthesia staff's vaccination schedule for hepatitis	5	4	3	2	1
53	The sharp box is always available	5	4	3	2	1
54	Special clothing is available to protect against radiation when used in operations	5	4	3	2	1
55	A showering bath is available inside the operating department when needed	5	4	3	2	1
56	Hand sanitizers are available all the time	5	4	3	2	1
57	adequate number of the team are available to do the work	5	4	3	2	1
58	Gloves and masks are available all the time	5	4	3	2	1
59	Special clothing is available to deal with patients expected to be infected with Covid- 19 virus	5	4	3	2	1
60	There are special procedures for dealing with patients who are expected to carry the Covid-19 virus	5	4	3	2	1

Part Five: Diseases and health problems related to occupational hazards: Have you ever been afflicted by the following health problems due to your current job in the operating room:

		Yes	**No**
61	Infection with Covid 19		
62	Hepatitis		
63	Lumber disk		
64	Allergy due to the use of sterilizers or gloves		
65	Headache as a result of inhaling anesthetic gases		
66	(For married women): repeated abortions without a specific reason		
67	Others, Please specify:		

Annex 3: Panel of Experts

No	Name	Work Place	Position
1	Dr. Motsem Hemdan	Al- Quds University	Vice President for Academic Affairs\ Al-Quds University
2	Dr. Farid Ghrayeb	Al- Quds University	health Dean college of public school
3	Dr. Adnan Farhoud	Al-Makassed Hospital	Head of Anesthesia Department
4	Dr. Dirar Al zatarie	AL-Ahli Hospital	Head of Anesthesia Department
5	Dr. Khaled Sarahna	Red Crescent Society Hospital	Head of Anesthesia Department
6	Dr.Waleed AlRimawi	H Clinic Hospital	Head of Anesthesia Department
7	Dr. Majed Eljabery	Arab Society for Rehabilitation Hospital	Head of Anesthesia Department
8	Dr. Hassan Ismail	Arab Care Hospital	Head of Anesthesia Department

Annex 4: Approval of the Scientific Research Ethics Committee

Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

التاريخ:2021/2/16
المرجع.

عزيزي الطالب بشير العملة المحترم
برنامج: السياسات والادارة الصحية

الموضوع: موافقة لجنة اخلاقيات البحث العلمي

قامت اللجنة الفرعية لأخلاقيات البحث التابعة لكلية الصحة العامة بمراجعة مشروع الرسالة بعنوان:

(Assessment of exposure to Occupational Hazards Among Operating Rooms Anaesthesia Team at Governmental Hospitals In The West Bank)

المقدم من (مشرف الرسالة/ د.اسمى الامام). يعتبر مشروعك مستوفيا لمتطلبات أخلاقيات البحث في جامعة القدس.

نتمنى لكم كل التوفيق في تسيير المشروع.

رئيسة لجنة اخلاقيات البحث

د. اسمى الامام

نسخة/ أعضاء لجنة البحث
نسخة/ الملف

Jerusalem Branch/Telefax 02-2799234
Gaza Branch/Telefax 08-2644220 -2644210
P.O. box 51000 Jerusalem

فرع القدس / تلفاكس 02-2799234
فرع غزة / تلفاكس 08-264420-2644210
ص.ب. 51000 القدس

Annex 5: Approval from Palestinian Ministry of Health

State of Palestine Ministry of Health - Nablus General Directorate of Education in Health	دولة فلسطين وزارة الصحة- نابلس الإدارة العامة للتعليم الصحي

Ref.: ....
Date:...................

الرقم: [illegible]/٥٣٦/٢٠٢١
التاريخ: ٢٠٢١/٧/١٩

الأخ مدير عام الإدارة العامة للمستشفيات المحتـرم،،،

الأخ مدير مجمع فلسطين الطبي المحترم،،،

تحية واحترام..

<u>الموضوع: تسهيل مهمة</u>

يرجى التكرم بتسهيل مهمة الطالب: بشير محمود العملة، ماجستير سياسات وإدارة صحية- جامعة القدس، لعمل بحث بعنوان:

"التعرض للمخاطر المهنية لدى طاقم التخدير في المستشفيات الحكومية الفلسطينية في الضفة الغربية"

وذلك بالسماح للطالب بتعبئة استبانة الدراسة من العاملين في أقسام التخدير في المستشفيات الحكومية، مع العلم أن مشرف الدراسة: د. أسمى الإمام.

وذلك في: **جميع المستشفيات الحكومية ومجمع فلسطين الطبي**

على أن يتم الالتزام بجميع تعليمات وإجراءات الوقاية الصادرة عن وزارة الصحة بخصوص جائحة كورونا، وتحت طائلة المسؤولية.

على ان يتم تزويدنا بنسخة من نتائج البحث والتعهد بعدم النشر.

مع الاحترام..

د. عبد الله القواسمي
مدير التعليم الصحي والبحث العلمي

نسخة : معالي وزيرة الصحة حفظها الله
: مشرف الدراسة المحترم/ جامعة القدس

P.O .Box: 14
Tel.:09-2333901

ص.ب. 14
تلفون: 09-2333901

Annex 6: Consent Form

الزميلات والزملاء المشاركون في هذه الدراسة تحية طيبة و بعد:اضع بين يديك/ي استبيان يتعلق بدراسة تهدف إلى موضوع :

التعرض للمخاطر المهنية لدى طاقم التخدير في المستشفيات الحكومية الفلسطينية في الضفة الغربية

ان هذه الدراسة هي عمل بحثي لدراسة المخاطر المهنية التي يتعرض لها العاملون في اقسام التخدير في مستشفيات وزارة الصحة الفلسطينية، وذلك تحت اشراف جامعة القدس ضمن برنامج ماجستير السياسات والادارة الصحية, وهي متطلب تكميلي للحصول على شهادة الماجستير في السياسات والادارة الصحية .

وانوه الى ان المشاركة في هذه الدراسة طوعية كما يمكنك الانسحاب منها متى شئت ، وان السرية التامة حول هوية المشارك مضمونة وان الاجابات سوف تستخدم لأغراض البحث العلمي فقط .

شاكراحسن تعاونكم

الباحث: بشير العمله

basheralmleh12@gmail.com

Annex 7: Positive Rsponses of Exposure to Occupational Hazards Types:

N	Statement	Positive Responses	Percent
1	Biological hazards	383	59.8
2	Chemical hazards	330	52
3	Physical hazards	310	49
4	Psychosocial hazards	301	47
5	Ergonomic hazards	295	46
Total score of total Hazard		**1616**	**50.5**

Annex 8: Positive Responses of Awareness Level and Knowledge of Anesthesia Staff:

No.	Statement	Positive Responses	Percent
1	I am aware of the occupational hazards at work.	145	91
2	I know how to avoid occupational hazards.	126	79
3	I know about preventive measures to be taken at work risks.	127	79
4	There is a transparent process for reporting accidents that occur during work.	97	61
5	I can provide information to those around me about occupational risks in my workplace.	128	80
6	I'm committed to wearing the gloves while dealing with the patient	136	85
7	I sterilize my hands using sterilizers or wash my hands after dealing with each patient	133	83

8	Adhere to wearing protective clothing to x-ray if radiation is used	113	71
9	I am aware of the symptoms that appear on patients carrying the Covid-19 virus while they were in the operation department	141	88
10	I know what to do with a suspected Covid-19 patient.	131	80
Total score of occupational awareness		**1277**	**80**

Annex 9: Positive Responses of Preventive Measures:

No	Statement	Positive Responses	Percent
1	All incidents or accidents reported immediately and appropriate action is taken to prevent further occurrences	64	40
2	There are written procedures for dealing with each type of risk	67	42
3	There is an active anesthetic gas drainage system attached to anesthesia device	67	42
4	Central ventilation system in operating rooms is available	74	46
5	There is concern from the infection control committee in the hospital for the safety of the anesthesia team	42	26
6	The infection control team follow up the anesthesia staff's vaccination schedule for hepatitis	40	25
7	The sharp box is always available	134	84
8	Special clothing is available to protect against radiation when used in operations	94	59
9	A showering bath is available inside the operating department when needed	74	46
10	Hand sanitizers are available all the time	113	71

11	adequate number of the team are available to do the work	69	43
12	Gloves and masks are available all the time	108	68
13	Special clothing is available to deal with patients expected to be infected with Covid- 19 virus	101	63
14	There are special procedures for dealing with patients who are expected to carry the Covid-19 virus	97	61
Total score of safety measures domain		**1144**	**52**