OCCUPATIONAL SAFETY AND HEALTH KNOWLEDGE AND ITS PREDICTORS AMONG MEDICAL OFFICERS IN GOVERNMENT PRIMARY HEALTHCARE FACILITIES IN KEDAH

DR AHMAD SHAHRIL HAFIFI BIN SAAD

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by

DR AHMAD SHAHRIL HAFIFI BIN SAAD

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CI	Confidence Interval
DHO	District Health Office
DOSH	Department of Occupational Safety and Health
HIRARC	Hazard Identification, Risk Assessment and Risk Control
HUSM	Hospital Universiti Sains Malaysia
ILO	International Labor Organization
KKP	Keselamatan dan Kesihatan Pekerjaan
MIDA	Malaysian Investment Development Authority
MLR	Multiple Linear Regression
MOH	Ministry of Health
MOHR	Ministry of Human Resources
NIOSH	National Institute of Occupational Safety and Health
NSI	Needlestick Injury
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act

OSHMS	Occupational Safety and Health Management System
PPE	Personal Protective Equipment
SD	Standard Deviation
SE	Standard Error
SLR	Simple Linear Regression
SOCSO	Social Security Organization (Malaysia)
UMMC	University of Malaya Medical Centre
WHO	World Health Organization

ABSTRAK

"PENGETAHUAN KESELAMATAN DAN KESIHATAN PEKERJAAN SERTA FAKTOR PERAMALNYA DALAM KALANGAN PEGAWAI PERUBATAN DI FASILITI PENJAGAAN KESIHATAN PRIMER KERAJAAN DI KEDAH"

Latar Belakang: Pengetahuan keselamatan dan kesihatan pekerjaan (KKP) adalah penting untuk mewujudkan persekitaran kerja yang selamat, terutamanya dalam sektor penjagaan kesihatan primer di mana pegawai perubatan terdedah kepada pelbagai risiko pekerjaan. Walaupun Malaysia telah memperkenalkan reformasi perundangan berkaitan KKP, jurang pengetahuan masih wujud, khususnya di peringkat penjagaan primer.

Objektif: Kajian ini dijalankan untuk menilai tahap pengetahuan KKP dalam kalangan pegawai perubatan di fasiliti kesihatan primer kerajaan di Kedah dan mengenal pasti faktor ramalan yang berkaitan dengan tahap pengetahuan yang lebih tinggi.

Metodologi: Kajian keratan rentas ini melibatkan 173 pegawai perubatan yang dipilih secara rawak dari fasiliti kesihatan primer kerajaan di Kedah, antara Januari hingga Mac 2025. Satu set soal selidik yang telah disahkan digunakan untuk menilai data sosiodemografi, ciri pekerjaan, dan pengetahuan KKP. Analisis deskriptif, ANOVA, regresi linear ringkas (SLR), dan regresi linear berganda (MLR) digunakan untuk mengenal pasti faktor peramal.

Keputusan: Skor min pengetahuan KKP ialah 71.66 (SD=14.16), namun hanya 36.4% mencapai tahap pengetahuan memuaskan (≥75%). Analisis univariat menunjukkan umur, jantina, etnik, gred jawatan, unit perkhidmatan, tempoh

perkhidmatan, dan latihan KKP terdahulu berkait secara signifikan dengan tahap pengetahuan. Dalam analisis MLR, dua faktor utama dikenal pasti: Pertama, latihan KKP (adj. $\beta = -19.37$; $p < 0.001$) dan kedua, tempoh perkhidmatan dalam servis 10–20 tahun (adj. $\beta = 7.09$; $p < 0.001$). Model akhir menerangkan sebanyak 52.5% varians skor pengetahuan ($R^2 = 0.525$). Responden yang pernah menerima latihan KKP mencatat skor lebih tinggi secara signifikan.

Kesimpulan: Kajian ini menunjukkan terdapat jurang yang ketara dalam pengetahuan KKP di kalangan pegawai perubatan kesihatan primer di Kedah. Pengalaman kerja dan latihan formal adalah faktor utama untuk tahap pengetahuan yang lebih baik. Latihan wajib, bimbingan berstruktur, dan integrasi dalam kurikulum perlu dilaksanakan untuk memastikan kompetensi KKP yang seragam dalam kalangan petugas kesihatan.

Kata Kunci: Keselamatan dan Kesihatan Pekerjaan, Pengetahuan, Pegawai Perubatan, Penjagaan Kesihatan Primer Kerajaan, Malaysia

ABSTRACT

"OCCUPATIONAL SAFETY AND HEALTH KNOWLEDGE AND ITS PREDICTORS AMONG MEDICAL OFFICERS IN GOVERNMENT PRIMARY HEALTHCARE FACILITIES IN KEDAH"

Background : Occupational safety and health (OSH) knowledge is essential in promoting a safe healthcare work environment, especially in primary healthcare settings where medical officers face multifaceted occupational hazards. Despite Malaysia's commitment to OSH through legislative reforms, knowledge gaps remain evident, particularly in primary care.

Objectives: This study aimed to assess the level of OSH knowledge among medical officers in Kedah's primary healthcare and to identify the predictors associated with higher knowledge scores.

Methodology: A cross-sectional study involving 173 randomly selected medical officers from government primary healthcare facilities across Kedah was conducted between January and March 2025. A validated self-administered questionnaire was used to measure sociodemographic data, occupational characteristics, and OSH knowledge. Descriptive analysis, one-way ANOVA, simple linear regression (SLR), and multiple linear regression (MLR) were employed to determine predictors.

Results: The mean OSH knowledge score was 71.66 (SD=14.16), with only 36.4% of respondents achieving satisfactory knowledge (≥75%). Age, gender, ethnicity, job grade, unit of service, duration of service, and prior OSH training were significantly associated with knowledge levels in univariate analysis. MLR revealed two significant predictors: prior OSH training (Adj. $\beta = -19.37$; $p < 0.001$) and 10–20 years of service

(Adj. $\beta = 7.09$; $p < 0.001$). The final model explained 52.5% of the variance in knowledge scores ($R^2 = 0.525$). Respondents who had received OSH training scored significantly higher, In contrast, younger officers and those without training showed notable knowledge gaps.

Conclusion: This study highlights critical gaps in OSH knowledge among primary healthcare medical officers in Kedah. Structured OSH training and accumulated service experience are associated with adequacy of OSH knowledge. The findings underscore the need for mandatory training, mentoring programs, and curriculum integration to ensure uniform OSH competency among all healthcare personnel.

Keywords: Occupational Safety and Health, Knowledge, Medical Officers, Government Primary Healthcare Facilities, Malaysia

CHAPTER 1
INTRODUCTION

1.1 Background

Occupational Safety and Health (OSH) is a multidisciplinary field committed to safeguarding workers' health through preventive measures, surveillance, rehabilitation, and health promotion. Its principles are grounded in international standards and supported by national legislative frameworks (Benjamin O. ALLI, 2008). In Malaysia, the Occupational Safety and Health Act 1994 serves as the primary legal instrument for promoting workplace safety and health (DOSH, 2011). The use of systematic tools such as Hazard Identification, Risk Assessment, and Risk Control (HIRARC) facilitates structured risk identification and control. Incorporating OSH strategies into human resource policies can enhance employee well-being, lower turnover rates, and create corporate accountability. As work environments continue to shift in the post-pandemic era driven by digitalization and remote work, OSH systems must evolve to remain relevant.

The health, safety, and well-being of employees are shaped by a range of interrelated workplace factors, including job nature, environmental conditions, organizational culture, and the availability of personal protective equipment (PPE). Quality health and safety training also significantly influences outcomes, while psychological and ergonomic risks such as excessive workload, poor lighting, and prolonged standing pose additional concerns (Stavroula Leka, 2010). Research by Karasek and Theorell (1990) highlights that high job demands and low job control can increase the risk of stress-related disorders (Crescenzo, 2016). Vulnerable groups such as pregnant workers, the elderly, and those with pre-existing health issues are particularly susceptible to workplace hazards if not properly managed. The

convergence of physical, chemical, biological, and psychosocial risks necessitates a holistic occupational safety and health (OSH) approach. Without appropriate oversight, these hazards can adversely affect not only individual workers but also the productivity of organizations and the economy at large.

Occupational factors significantly contribute to health outcomes, particularly in high-risk sectors like healthcare, construction, agriculture, and manufacturing (WHO-SEA, 2019). Workers in these sectors face frequent exposure to hazardous substances such as asbestos, pesticides, and infectious agents, which can result in chronic illnesses like cancer, respiratory diseases, and communicable infections (Schulte et al., 2016). Physical and mechanical risks such as noise exposure, unguarded machinery, and electrical hazards are linked to numerous workplace injuries, including occupational hearing loss (DOSH, 2016). The International Labour Organization (ILO) reports that more than 2.78 million deaths annually are attributed to occupational diseases and injuries worldwide (ILO, 2022). These alarming figures underscore the need for effective preventive strategies, including risk assessments, hazard communication, regular safety training, and monitoring. Establishing a robust safety culture remains essential to reduce incident rates and safeguard employees.

Uncontrolled occupational hazards can result in a wide range of negative outcomes, from reduced productivity due to absenteeism to long-term disability and even death. Common occupational diseases include musculoskeletal disorders, mental health issues linked to work stress, dermatitis, and occupational asthma (Lehtinen, 2021). In Malaysia, data from the Department of Occupational Safety and Health (DOSH) indicates a rising trend in reported occupational diseases, particularly in the healthcare and manufacturing sectors (DOSH, 2023). Many of these conditions are

preventable through proactive hazard identification, early intervention, and consistent safety education. Nonetheless, underreporting remains a challenge, especially within informal employment sectors where OSH laws are less rigorously enforced (Zanariah and Awang, 2019). Strengthening legislative enforcement, integrating occupational health into the primary healthcare system, and improving surveillance mechanisms are critical steps toward improving OSH outcomes.

1.1.1 Magnitude of awareness over OSH knowledge

Historically, the magnitude of the occupational casualties reached catastrophic scope at certain times. Unawareness over potential risks they faced was a common concern among the workers. From one point of view, the employers also potentially neglected the importance of hazards. It was mainly influenced by the absence of a law existing to bind employers with a legal duty to safeguard the welfare of their employees. Constant exposure to occupational hazards, frequent occupational morbidity and mortality, and several large occupational disasters, along with other factors, made adoption of the occupational legislation a necessity. It also planted the seed of the multidisciplinary field of occupational safety and health, which was subsequently enacted as an act.

Occupational safety and health is an important profession that ensures health and safety aspects in various workplaces (Daud et al., 2010). Occupational safety and health are not a new issue, and to date, only 15% of workers worldwide have access to specialized occupational health services, which include prevention, health surveillance, training, and advising employers in occupational health and safety (WHO-SEA, 2019a).

1.1.2 Elements of Occupational Safety and Occupational Health

Occupational Safety and Health (OSH) comprises two essential components: occupational safety and occupational health. Both of which are critical in promoting a safe and healthy work environment. Occupational safety focuses on preventing workplace accidents by systematically identifying, assessing, and controlling hazards through engineering controls, administrative strategies, and the use of personal protective equipment (Alli, 2008). Unsafe workplace behaviours, procedural lapses, and communication failures are among the leading causes of preventable incidents, often perpetuated through repeated unsafe routines (Goetsch, 2019); (Guldenmund, 2000). Promoting a culture of safety (Zahiri Harsini et al., 2020) and ensuring adherence to standard operating procedures remain fundamental strategies to break this cycle (ILO, 2022). In healthcare settings, safety measures include establishing health and safety committees, reporting systems for incidents like needle-stick injuries, and proper clinic safety protocols. Understanding these systems is vital for frontline healthcare workers, who are directly exposed to daily occupational risks.

Occupational health complements safety efforts by focusing on the prevention, identification, and management of work-related diseases and conditions. (Garcia et al., 2004) This discipline includes assessing exposure risks such as ergonomic hazards, infectious agents, chemical substances, and psychosocial stressors. Although still developing in many countries, including Malaysia, occupational health is gaining recognition through increasing numbers of trained professionals in public institutions and corporate sectors (Zanariah and Awang, 2019). These professionals play key roles in evaluating work fitness, managing occupational diseases, and guiding rehabilitation and return-to-work strategies (P. A. Schulte et al.,

2016). Broader elements such as noise exposure, reproductive health risks, and long-term chemical exposure also fall within the scope of occupational health. Early identification and intervention, as emphasized by WHO, are critical in minimizing the long-term consequences of occupational illnesses (WHO-SEA, 2019a)

The intersection of occupational safety and health underscores the importance of an integrated and multidisciplinary approach to workplace risk management. Unsafe environments often lead to both acute injuries and chronic illnesses, especially when protective measures are insufficient or poorly enforced (Lehtinen S, 2021) In Malaysia, OSH governance is structured under the Occupational Safety and Health Act 1994, supported by risk management tools such as HIRARC (DOSH, 2016). These frameworks aim to promote proactive measures among healthcare personnel, including the correct use of personal protective equipment and clear hazard reporting pathways. Effective OSH systems depend on the collaboration of various professionals, from safety officers to occupational health doctors, working collectively to protect employee well-being. In an evolving workplace landscape shaped by emerging technologies and public health challenges, the integration of safety and health remains central to sustainable workforce protection.

1.1.3 Recent amendments to OSH legislation in Malaysia

Malaysia's legislative landscape for occupational safety and health (OSH) has undergone a significant shift with the introduction of the Occupational Safety and Health (Amendment) Act 2022, which came into force on 1 June 2024. This amendment marks a pivotal evolution of the Occupational Safety and Health Act 1994 (OSHA 1994), aiming to enhance regulatory oversight across a broader range of workplaces (Herbert Smith Freehills, 2024) .Prior to this amendment, OSHA 1994 was applicable only to specific industries listed under the First Schedule, such as

manufacturing, mining, and construction. With the amendment now in effect, OSHA's coverage extends to almost all workplaces in Malaysia, with limited exceptions (Herbert Smith Freehills, 2024). This expansion underscores the government's commitment to elevating safety standards across both formal and informal employment sectors. The amendment reflects international best practices and aligns Malaysia more closely with the ILO's principles on universal worker protection (ILO, 2022) The broadened scope ensures that employers from previously unregulated sectors are now accountable for the safety and health of their employees. This reform is seen as timely, particularly in the wake of post-pandemic workplace changes and evolving occupational risks.

A key highlight of the OSH Amendment Act 2022 is the introduction of new legal obligations for employers, particularly regarding risk assessment and control measures. Employers are now required to conduct comprehensive health and safety risk assessments for any individual who may be impacted by their work activities, regardless of employment status (DOSH, 2024) If the assessment reveals a significant risk, employers are legally obligated to implement appropriate control measures to eliminate or mitigate those risks. This includes both physical hazards and psychosocial risks, reflecting a more holistic approach to occupational safety and health (WHO-NIOSH, 2021) Additionally, the Amendment Act imposes heavier penalties for non-compliance, ranging from RM50,000 to RM500,000, a substantial increase compared to previous fines (Herbert Smith Freehills, 2024) These increased penalties are intended to reinforce employer accountability and ensure a higher level of compliance with safety standards. This legal development also emphasizes the need for employers to establish and maintain a formal Occupational Safety and Health Policy, as required under Section 16 of OSHA 1994. Organizations must now embed safety and health

considerations into their strategic management practices to meet the amended legal expectations.

The OSH Amendment Act 2022 also has broader implications for Malaysia's workforce, occupational health professionals, and enforcement bodies. The Department of Occupational Safety and Health (DOSH), under the Ministry of Human Resources, will play a more prominent role in monitoring, inspecting, and enforcing compliance across a wider array of industries (DOSH, 2016) The reform aligns with the government's long-term goal of strengthening national OSH governance and building a safety-conscious culture across all sectors (MOHR, 2021). With the formal extension of OSHA to encompass nearly all workplaces, occupational health and safety has become an issue of national significance, relevant to both private and public employers. Moreover, training and capacity building for OSH professionals, including safety officers and health practitioners, are expected to expand in response to the new legal requirements (Benjamin O. Alli, 2008) This legislative amendment supports the development of more resilient and safer workplaces, thereby contributing to improved employee well-being and productivity. It also paves the way for future digitalization and modernization of OSH reporting systems in Malaysia. Ultimately, the 2022 amendments reflect Malaysia's commitment to safeguarding worker health, reducing occupational risks, and aligning with global standards of decent and safe work. Occupational Diseases according to global

An estimate that was created by the International Labor Organization (ILO) that spans the year 2019 indicates that more than 395 million workers around the world have had a work injury that did not result in death. Additionally, work-related problems were responsible for the deaths of around 2.93 million workers, which

represents an increase of more than 12 percent when compared to the year 2000. Several reasons, which may correspond to an aggravation in terms of unprotected exposures to occupational risks, as well as changes in socio-demographic characteristics, are responsible for the considerable increase in the total number of fatalities that are attributed to work-related incidents. For instance, the number of people active in the labour force around the world rose by 26% between the years 2000 and 2019, going from 2.75 billion to 3.46 billion. In addition, diagnostic methods have undergone substantial advancements over the course of the past two decades, which has contributed to an increase in the number of instances that have been identified (ILO, 2023).

1.1.4 Challenges of Occupational Safety and Health in Malaysia

Malaysia faces a broad spectrum of challenges in the occupational safety and health (OSH) sector, especially as the country progresses toward achieving high-income and developed nation status. One of the main concerns is the increasing number of industrial accidents and occupational diseases, despite existing regulations and guidelines (DOSH, 2016). Rapid industrialization, urbanization, and the implementation of large-scale infrastructure or "mega projects" have contributed to heightened workplace risks (Garcia et al., 2004), especially under tight project deadlines and budget constraints (MOHR, 2021). The workforce composition has also changed, with younger, inexperienced employees and migrant workers forming a substantial proportion of the labour force. These workers often lack familiarity with safety protocols and are more vulnerable to workplace hazards (ILO, 2022). Additionally, internal migration from rural to urban areas has further diversified workplace demographics, creating new demands for culturally inclusive and language-accessible safety training (Zanariah and Awang, 2019). Poor safety awareness among

employers and workers continues to be a major barrier to safe working environments. (Mat Isa et al., 2021) These factors underscore the need for more comprehensive and culturally sensitive OSH policies and interventions.

Other challenges include inadequate enforcement of safety regulations, particularly in small and medium-sized enterprises (SMEs), informal sectors, and rural industries. Many of these workplaces operate under limited oversight and lack proper OSH infrastructure or management systems (Benjamin O. Alli, 2008). Furthermore, the number of trained and competent OSH professionals remains insufficient, particularly in high-risk sectors like construction and agriculture (DOSH, 2016). This shortage compromises the ability to perform effective risk assessments, inspections, and incident investigations. There has also been a notable increase in social security claims related to occupational injuries and diseases, suggesting either growing awareness or worsening safety performance (SOCSO, 2022). While Malaysia has made progress in OSH legislation, such as the Occupational Safety and Health (Amendment) Act 2022, enforcement mechanisms and preventive culture need further strengthening (Herbert Smith Freehills, 2024) Addressing these multifactorial challenges requires multisectoral collaboration, continuous workforce training, and stronger integration of OSH in corporate governance. Moving forward, Malaysia must prioritize OSH capacity-building to ensure a safe and resilient workforce in alignment with its developmental goals.

1.1.5 Definitions of Occupational Diseases

Occupational diseases are defined as conditions or disorders that are directly caused by exposure to risk factors arising from work activities or environments. The Protocol of 2002 to the Occupational Safety and Health Convention (No. 155), adopted by the International Labour Organization (ILO), defines occupational diseases as “any

disease contracted as a result of an exposure to risk factors arising from work activity" (International Labour Organization, 2002). These diseases may result from chemical, biological, physical, ergonomic, or psychosocial hazards in the workplace, and their recognition is critical for both prevention and compensation. Unlike occupational injuries, which occur due to a single incident, occupational diseases typically develop over time and may have long latency periods. Examples include noise-induced hearing loss, occupational asthma, musculoskeletal disorders, and asbestos-related illnesses. Recognition of such diseases varies between countries depending on their national legislation and reporting systems (Lehtinen S, 2021). Therefore, a standardized understanding is essential to ensure that workers' health is effectively protected across all sectors and regions.

In Malaysia, the Department of Occupational Safety and Health (DOSH) aligns with international standards and has issued regulations to classify and report occupational diseases under the Occupational Safety and Health Act 1994 and the Factories and Machinery Act 1967. The list includes specific illnesses related to chemical exposure, respiratory diseases, skin diseases, and infectious diseases affecting healthcare workers, among others (DOSH, 2024b). The ILO has also published a comprehensive list of occupational diseases that serve as a guide for national authorities to recognize and update their own registries (ILO, 2023) According to (Kyung et al., 2023), under-recognition and underreporting of occupational diseases remain a global challenge, especially in developing countries where occupational health services are limited. Having a clear and legally recognized definition supports the development of occupational health policies, facilitates disease surveillance, and improves worker compensation mechanisms. Moreover, it empowers medical professionals to correctly diagnose work-related conditions and promotes

preventive interventions in the workplace. A unified definition serves as a foundational pillar for both international collaboration and national policy enforcement in occupational health.

1.1.6 Increasing trend of notifications of occupational diseases in Malaysia

In Malaysia, since 2006, with the introduction of guidelines on the diagnosis of occupational diseases, there have been significant shifts noted from 2006 notifications of occupational diseases until 2023 (Khoe et al., 2024). Figure 1.1 displays a clear upward trend in the notifications of occupational diseases in Malaysia from 2005 to 2023, based on data from the DOSH Annual Report 2023. The number of reported cases grew significantly from just 325 in 2005 to a peak of 12,707 in 2022, before slightly decreasing to 10,380 in 2023. The number of cases resolved has also risen over the years, but at a more gradual rate, indicating an important difference between reporting and settlements in recent years. This expanding disparity emphasizes potential issues in investigation and confirmation procedures. The significant increase beginning shortly after 2016 indicates improved awareness, stronger reporting mechanisms, or increased occupational health hazards. The persistent difference between reported and settled cases illustrates the necessity for more effective case verification processes. Figure 1.1 also displays improvements and weaknesses in the management of occupational disease reporting and response systems in Malaysia. It also suggests an increasing focus on worker safety and health during the last twenty years.

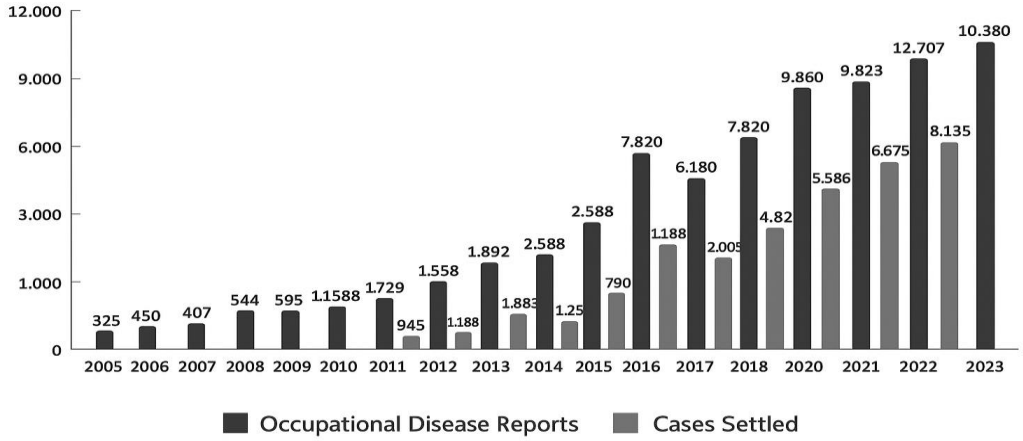

Figure 1. 1 Trends of Notifications of Occupational Diseases in Malaysia (DOSH Annual Report 2023)

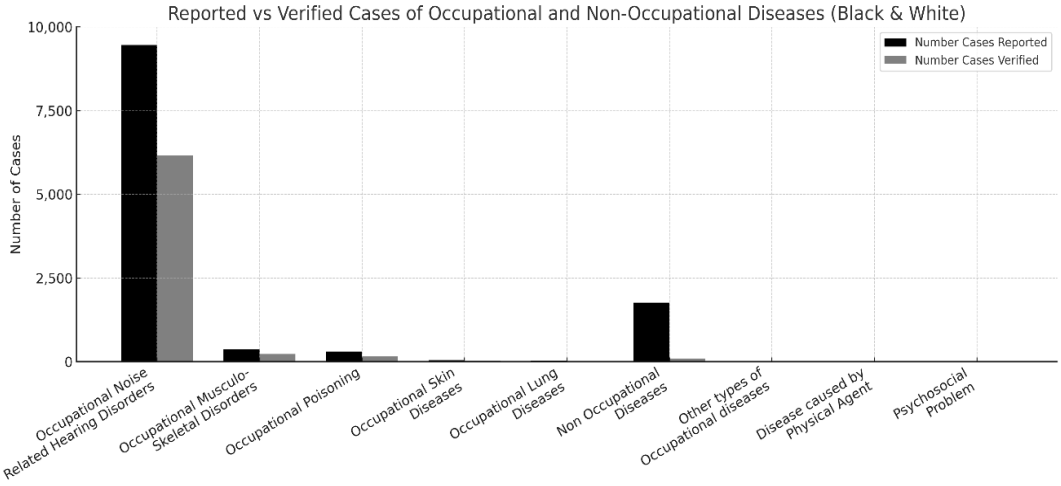

Figure 1. 2 Types of occupational diseases and poisonings reported for the year 2023 (DOSH Annual Report 2023).

Figure 1.2 represents the distribution of types of occupational and non-occupational diseases reported and verified in Malaysia for the year 2023. Occupational noise-related hearing disorders dominated the statistics, with 9,455 reported and 6,154 verified cases, making it the most prevalent category. Other categories, such as musculoskeletal disorders and poisoning, followed with significantly fewer cases. Occupational skin and lung diseases, as well as diseases caused by physical agents, showed very low frequencies. Interestingly, non-occupational diseases still registered a considerable number of reported cases, 1,764 cases, but very few cases were verified, 93 cases. The data also reveal that some categories, like psychosocial problems, had no reported or verified cases, indicating either underreporting or lack of recognition. The noticeable gap between reported and verified numbers across all categories signals a need for more stringent diagnostic or reporting protocols.

This figure provides valuable insight into occupational health burden patterns and areas needing targeted interventions in Malaysia. This vastly improved notification awareness, mostly due to increased occupational safety and health training that was conducted by either the Ministry of Health (MOH) or another government body like the National Institute of Occupational Safety and Health (NIOSH), in which they enhanced the understanding and knowledge of occupational safety and health among healthcare workers. Occupational health doctor is one of the trainings currently being held by NIOSH. All these improvements made by both MOH and NIOSH subsequently made awareness of notifications over occupational diseases rise, especially among occupational health doctors in 2023, as Figure 1.3 shows. Across the year, 10,309 cases of occupational diseases were reported in 2023 compared to only 319 cases of occupational diseases reported in 2005. (DOSH Annual Report, 2023).

Meanwhile, occupational noise-related hearing disorders were the most notified and confirmed occupational diseases in 2023.

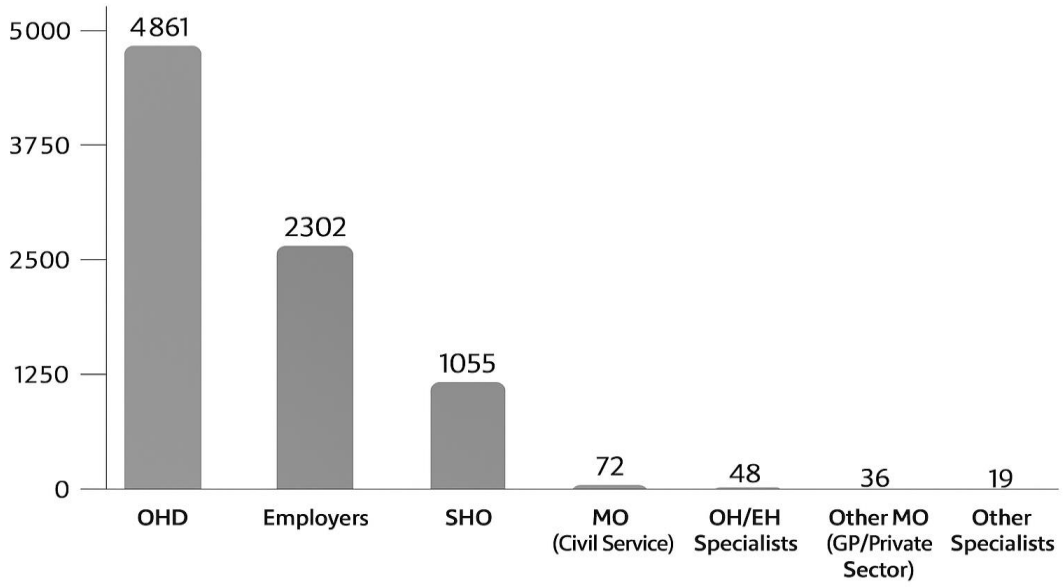

Figure 1. 3 Notification sources of occupational diseases and poisoning in the year 2023 (DOSH Annual Report 2023).

1.1.7 Occupational Safety and Health Awareness among Healthcare workers

Workplaces in the healthcare sector, particularly in government institutions, present unique occupational safety and health (OSH) challenges that are often underestimated by the public (Rampal et al., 2010). Although perceived as clean and controlled environments, healthcare facilities expose both patients and workers to a variety of biological, chemical, and radiological hazards (WHO-NIOSH, 2021). Healthcare workers are often at risk of contracting infectious diseases such as tuberculosis, hepatitis B and C, and COVID-19 due to direct contact with patients and bodily fluids (Wilburn and Eijkemans, 2004). The use of cytotoxic drugs (Nor Nabila Binti Shari, 2021), disinfectants, and anaesthetic gases further compounds chemical exposure in clinical settings (ILO, 2022) Moreover, unintended clinical errors, needlestick injuries(Rampal et al., 2010), and exposure to radiation during diagnostic procedures represent persistent risks that require strong preventive measures and compliance with standard safety protocols (DOSH, 2004). The implementation of infection control measures and regular OSH training programs are essential to ensure awareness and safe practices among healthcare staff (MOHR, 2021) Continuous monitoring, risk assessments, and personal protective equipment (PPE) usage remain core pillars of OSH in medical institutions. Enhancing awareness is critical in mitigating avoidable injuries and maintaining both workforce productivity and patient safety.

Physical hazards in the healthcare setting contribute significantly to occupational health issues, especially musculoskeletal disorders (MSDs). Manual lifting, frequent repositioning of patients, and prolonged standing often result in lower back pain, neck strain, and joint discomfort among nurses, medical assistants, and paramedics (Burdorf et al., 2013). Studies have shown that proper lifting techniques,

use of ergonomic devices, and mechanical aids such as hoists significantly reduce the incidence of these conditions (Wilburn and Eijkemans, 2004) The lack of training in safe handling procedures and limited access to assistive devices further exacerbates the problem in overcrowded and resource-limited facilities (Zanariah and Awang, 2019). Apart from musculoskeletal risks, exposure to ionizing radiation during procedures like X-rays and CT scans also presents long-term health hazards, including an elevated risk of cancer (DOSH, 2016) Adhering to radiation safety guidelines, using shielding equipment (Islam et al., 2022), and ensuring dosimetry monitoring are fundamental in controlling these risks (ILO, 2023). It is imperative that healthcare facilities conduct routine assessments and maintenance of safety equipment to safeguard frontline workers. Comprehensive training, infrastructure investment, and administrative support are key towards a safe physical work environment.

In addition to physical hazards, healthcare workers increasingly face psychological and psychosocial challenges that affect their mental well-being and job performance. These include long working hours, understaffing, exposure to traumatic events, and unrealistic performance expectations, especially in high-pressure environments like emergency departments and primary healthcare settings (WHO-NIOSH, 2021). Stress, burnout, workplace violence, and emotional exhaustion are now widely recognized as leading contributors to declining mental health among healthcare personnel (WHO-NIOSH, 2021). Studies emphasize that unresolved psychosocial stress can lead to reduced job satisfaction, high turnover, and poor patient outcomes (P. A. Schulte et al., 2016). The importance of workplace support systems has gained traction, with institutions implementing peer support programs, resilience-building workshops, and mental health interventions as core strategies to improve well-being (WHO-NIOSH, 2021). Occupational health policies must go beyond

physical safety and include psychological hazard assessments and mental health promotion. A holistic OSH framework that addresses both tangible and intangible risks is essential for creating a resilient healthcare workforce. Cultivating a positive work culture (Zahiri Harsini et al., 2020), early stress detection, and support for mental wellness are critical for long-term healthcare system sustainability. As such, OSH awareness among healthcare workers must continue evolving to meet the complex and dynamic needs of the modern clinical workplace.

1.1.8 Occupational safety and health in primary healthcare settings

Globally, extensive research has been conducted across various sectors to address occupational safety and health (OSH) challenges, revealing clear patterns of concern such as underreporting, workplace hazards, and weak safety governance. Despite advancements in legislation, surveillance, and risk management, gaps in OSH awareness and reporting persist in many countries, including Malaysia (ILO, 2022). A particularly concerning issue is the under-identification and notification of occupational diseases, especially in primary healthcare settings where frontline medical officers often lack the capacity or training to recognize OSH-related risks (Zanariah and Awang, 2019).

In Malaysia's public health system, primary healthcare workers, especially medical officers, play a critical role, yet they are frequently overwhelmed with clinical demands, administrative tasks, and rotational postings that limit their ability to focus on OSH responsibilities (MOHR, 2021). Under such conditions, identifying work-related illnesses or exposures may not be prioritized, which leads to significant underreporting and loss of valuable surveillance data (DOSH, 2023) Globally, this phenomenon has drawn concern, as early identification and reporting are crucial for timely interventions, worker compensation, and preventive policymaking (Paul A.

Schulte et al., 2024). Despite the scientific advancements in occupational health, the awareness and enforcement gaps in Malaysia's primary healthcare sector remain under-addressed. This underlines the need for targeted education and systems strengthening at the grassroots level of the healthcare system.(Krishnan, 2013)

The concept and delivery of primary healthcare itself have evolved considerably since the Alma-Ata Declaration in 1978, often leading to confusion regarding its scope and operationalization. According to the World Health Organization (WHO), primary healthcare is no longer limited to basic clinical services but encompasses a broad, societal approach to health that promotes equity, community empowerment, and comprehensive care (WHO-NIOSH, 2021). It includes not just treatment and prevention but also rehabilitation and palliative care, delivered as close as possible to individuals' environments and daily lives. However, in Malaysia, this shift has not been matched by equivalent capacity building in occupational health among frontline providers. Medical officers may be well-versed in curative medicine but lack training in occupational health surveillance, diagnosis of occupational diseases, and the process of official notification (Wilburn and Eijkemans, 2004). The result is a gap between what is expected from primary care providers in OSH and what is practiced, which contributes to weak OSH integration at the primary level. Without embedding OSH as a key component in primary healthcare education and systems, Malaysia risks continued under-detection of occupational health issues among workers. Thus, redefining primary care to fully integrate occupational safety and health remains a strategic priority.

A major contributing factor to the issue of underreporting is the lack of awareness and structured OSH training among government primary care medical

officers (Elms *et al.,* 2005). Many officers undergo frequent rotations and are posted to new facilities every few years, resulting in inconsistent exposure to OSH programs and training modules (MOHR, 2021). This situation leads to a limited understanding of occupational diseases, diagnostic criteria, and the notification process, especially for non-obvious conditions such as work-related musculoskeletal disorders or chronic respiratory diseases (Lehtinen S, 2021). Inadequate training can result in missed diagnoses and, consequently, missed opportunities for early intervention and prevention.(Krishnan, 2013) This issue is particularly pressing in states like Kedah, where there is a large public healthcare network serving industrial, agricultural, and rural populations exposed to occupational hazards (DOSH, 2016). Given these gaps, the current study was designed to assess the level of occupational safety and health knowledge among medical officers in Kedah's primary healthcare settings. Understanding this knowledge gap will not only inform training needs but also help develop strategies to strengthen Malaysia's OSH surveillance and reporting framework (Holness and Brown, 2023) . Such efforts are vital to improving workforce health and aligning with national goals of comprehensive, safe, and equitable healthcare.

1.2 Problem Statements & Study Rationale

The rising complexity of occupational safety and health (OSH) in Malaysia's primary healthcare sector necessitates urgent and focused investigation. Medical officers, as frontline providers, face constant exposure to occupational hazards but often operate without consistent OSH knowledge or training frameworks. Studies show that a sound understanding of OSH principles is essential for ensuring safe work environments, particularly after the COVID-19 pandemic, which has intensified

workplace stress and risk exposure among healthcare workers (WHO-NIOSH, 2021). Yet, in many Malaysian primary healthcare settings, the level of OSH knowledge among medical officers remains undocumented and highly variable. (Veronica Lugah et al., 2010) identified significant gaps in occupational health awareness among providers in non-urban areas, highlighting disparities in training access and preparedness. (Goppu A/L Mohan, 2020) also stressed that insufficient OSH competence among healthcare workers undermines both worker safety and patient outcomes (Zahiri Harsini et al., 2020). These challenges underscore the necessity of assessing and strengthening OSH knowledge among medical officers, particularly in states like Kedah, where industrial expansion is rapidly progressing.

Kedah, transitioning from agriculture to industrialization, now faces emerging occupational risks tied to sectors such as manufacturing, logistics, and electronics. Developments like the Kulim High-Tech Park and Kedah Aerotropolis are projected to elevate exposure to ergonomic, chemical, and psychosocial hazards (MIDA, 2022). However, Mohd Roze et al, (2021) found that many healthcare providers are not yet equipped to handle such shifts due to inadequate training and inconsistent implementation of OSH protocols. Administrative restructuring, overlapping roles, and limited policy dissemination further complicate OSH integration at the primary care level (WHO-EM, 2002). This lack of systemic standardization has likely contributed to rising occupational disease reports, not necessarily due to increased prevalence, but because of greater detection from improved surveillance systems. The gap between evolving industry risks and stagnant healthcare preparedness presents a critical challenge for the primary care sector. Thus, research focusing on medical officers' OSH knowledge is needed to inform capacity-building in line with Kedah's socioeconomic development.

Existing literature has largely concentrated on OSH in secondary and tertiary care, leaving a significant gap in primary care-focused studies. Hospital-based facilities often benefit from dedicated safety units and access to occupational health specialists, whereas primary healthcare clinics may lack both infrastructure and professional development programs (Darimaani et al., 2024). This underrepresentation has led to overlooked risks among primary care personnel, despite their role as first responders to occupational illnesses and injuries. A study by (Choudhry et al., 2007) emphasized that frontline healthcare staff in decentralized settings often operate with outdated or limited knowledge of national OSH guidelines. The underreporting of occupational diseases is further compounded by a lack of structured training modules for OSH among general medical staff (Darimaani et al., 2024). Policies such as OSHA 1994 and USECHH are foundational, yet their practical applications are often unclear or inconsistently enforced. Therefore, identifying knowledge gaps, training access, and policy awareness levels in primary healthcare is crucial to drive effective policy implementation. (Garcia et al., 2004)

Primary healthcare officers in Kedah face inconsistencies in OSH knowledge and practice due to disparities in clinic leadership, resources, and professional development opportunities. (Krishnan, 2013) Studies such as those by (P. A. Schulte et al., 2016) reveal that poor training exposure and lack of occupational health integration into clinical roles contribute to underreporting and unsafe practices. This variability threatens uniformity in healthcare delivery and increases the risk of avoidable occupational injuries or diseases among staff. Investigating predictors that influence OSH knowledge including prior training, work experience, and unit type can support more equitable and targeted interventions. Furthermore, understanding these determinants can inform the design of mandatory OSH induction programs or

continuing medical education modules for all government medical officers. As Kedah's industrial landscape expands, the readiness of its healthcare workforce to recognize and respond to evolving hazards becomes a public health imperative. This study therefore aims to provide evidence-based recommendations for standardizing OSH practices, enhancing training, and reinforcing a safety culture throughout the state’s primary healthcare facilities.

1.3 Objective

1.3.1 General Objectives:

To assess the level of Occupational Safety and Health (OSH) knowledge and its predictors among medical officers in Government Primary Healthcare Facilities in Kedah.

1.3.2 Specific Objectives:

1. To determine the satisfactory level of Occupational Safety and Health (OSH) knowledge score among medical officers in Government Primary Healthcare Facilities in Kedah.
2. To determine predictors of OSH knowledge among medical officers in Government Primary Healthcare Facilities in Kedah.

1.4 Research Question(s)

1) What is the mean score of OSH knowledge among medical officers in Government Primary Healthcare Facilities in Kedah?

2) What are the predictors of OSH knowledge among medical officers in Government Primary Healthcare Facilities in Kedah?

1.5 Research Hypothesis

There are significant predictor factors of OSH knowledge among medical officers in Government Primary Healthcare Facilities in Kedah.

CHAPTER 2
LITERATURE REVIEW

2.1 Overview Strategy

Occupational safety and health knowledge posed significant differences among healthcare workers. Several associated factors related to the objectives of the study have been identified that subsequently impacted how healthcare providers perceived occupational safety and health knowledge towards the outcome of the patient treatment. The articles related to this topic have been searched using Google Scholar, PubMed, and Scopus databases. The keywords used were “OSH Knowledge,” “Predictors”, “Healthcare Workers,” “Medical Officers,” and “Primary Healthcare,” etcetera. This literature review section is organized into global and Malaysian mean scores of OSH knowledge and key predictors with occupational safety and health among medical practitioners.

2.2 Global and Regional Burden

World Day for Safety and Health at Work is held every year on April 28 to bring attention to ways to keep everyone safe and healthy at work. The International Labour Organization (ILO) started World Day in 2003 to bring health and safety at work to the attention of politicians as part of their advocacy strategy for health and safety at work. People who work should have the right to a safe and healthy place to do their job. This is very important because almost 60% of the world's population is working in society. People do spend a lot of their time at work, so health and safety at work is a public health problem. The goal of occupational health is to keep workers safe from physical, mental, and social harm at work and to look out for their general health. Some dangers at work can make it harder for people to do their jobs, which can make them more likely to get long-term illnesses. The World Health Organization