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**Knowledge and Attitudes Towards Artificial Intelligence in Healthcare Among Healthcare Professionals at King Fahad Medical City, Riyadh, Saudi Arabia**

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

Artificial Intelligence (AI) has emerged as one of the most significant technological innovations transforming healthcare systems worldwide. AI refers to the capability of computer systems to perform tasks that typically require human intelligence, including learning, reasoning, problem-solving, decision-making, pattern recognition, and natural language processing. Recent advances in machine learning, deep learning, computer vision, and generative AI have expanded AI applications from research into routine clinical practice, supporting disease diagnosis, medical imaging interpretation, patient monitoring, risk prediction, treatment planning, robotic-assisted surgery, administrative workflow optimization, and personalized patient care (World Health Organization [WHO], 2024).

The increasing adoption of AI has been driven by ageing populations, the growing burden of chronic diseases, workforce shortages, rising healthcare costs, and increasing demand for efficient, safe, and patient-centered care. AI has demonstrated considerable potential to improve diagnostic accuracy, reduce medical errors, optimize resource utilization, enhance clinical decision-making, and improve healthcare delivery, leading governments and healthcare organizations to invest in AI as part of healthcare transformation initiatives (Topol, 2024; WHO, 2024).

Despite these advancements, AI is intended to complement rather than replace healthcare professionals. Clinical judgement, ethical decision-making, communication, empathy, and accountability remain fundamental aspects of healthcare practice. Therefore, healthcare professionals require adequate knowledge of AI to understand its capabilities, limitations, and appropriate clinical applications, enabling them to critically interpret AI-generated recommendations while ensuring safe and evidence-based patient care.

Healthcare professionals' attitudes towards AI are equally important because they influence technology acceptance and successful implementation in clinical practice. Positive attitudes encourage innovation, continuous professional development, and effective integration of AI into healthcare services, whereas negative attitudes or misconceptions may hinder adoption despite organizational investment. Although previous studies have generally reported favorable perceptions of AI, concerns regarding ethical issues, data privacy, algorithm transparency, legal liability, patient safety, and the impact of AI on professional roles remain evident (Blease et al., 2023).

In Saudi Arabia, artificial intelligence has become a national priority under Vision 2030 and the National Strategy for Data and Artificial Intelligence (NSDAI). National initiatives led by the Saudi Data and Artificial Intelligence Authority (SDAIA) and the Ministry of Health aim to strengthen healthcare quality, operational efficiency, precision medicine, disease prevention, and evidence-based decision-making through AI implementation.

King Fahad Medical City (KFMC), one of Saudi Arabia's largest tertiary referral hospitals, continues to adopt advanced healthcare technologies to improve service quality and patient outcomes. As AI becomes increasingly integrated into healthcare delivery, healthcare professionals at KFMC are expected to interact with AI-supported technologies in their daily practice. Their knowledge and attitudes towards AI may therefore influence the successful implementation of these technologies within the organization.

Although research on AI in healthcare has increased considerably, existing evidence remains limited. Many studies have focused on individual professional groups, such as physicians, nurses, or medical students, rather than multidisciplinary healthcare professionals working in tertiary healthcare institutions. Furthermore, the rapid evolution of AI highlights the need for updated evidence reflecting healthcare professionals' current knowledge, attitudes, and educational needs, particularly within major Saudi healthcare institutions.

Therefore, this study aims to assess the knowledge and attitudes towards artificial intelligence in healthcare among healthcare professionals at King Fahad Medical City, Riyadh, Saudi Arabia. The findings are expected to contribute to the growing body of knowledge on AI adoption while informing educational planning, policy development, and the responsible implementation of AI within Saudi healthcare organizations.

## 1.2 Problem Statement

Artificial intelligence (AI) is increasingly recognized as a transformative technology capable of improving healthcare quality, patient safety, clinical decision-making, and operational efficiency. AI applications are now widely used in disease diagnosis, medical imaging, predictive analytics, robotic-assisted surgery, electronic health records, virtual health assistants, and clinical decision support systems. As a result, healthcare organizations worldwide are investing in AI to improve healthcare delivery while addressing workforce shortages, rising healthcare costs, and increasing patient demands (World Health Organization [WHO], 2024).

In Saudi Arabia, AI has become a national priority under Vision 2030 and the National Strategy for Data and Artificial Intelligence (NSDAI), which promote digital transformation and innovation within the healthcare sector. As one of the Kingdom's leading tertiary referral hospitals, King Fahad Medical City (KFMC) continues to adopt advanced healthcare technologies to support evidence-based practice. However, the successful implementation of AI depends not only on technological infrastructure but also on healthcare professionals who are responsible for integrating these technologies into everyday clinical practice.

Healthcare professionals require adequate knowledge of AI to understand its capabilities, limitations, ethical implications, and appropriate clinical applications. Insufficient knowledge may lead to misunderstanding of AI-generated recommendations, inappropriate reliance on automated systems, reduced confidence in AI-assisted decision-making, and reluctance to utilize available

technologies. Likewise, negative attitudes towards AI may hinder technology acceptance and reduce the potential benefits of AI implementation within healthcare organizations (Topol, 2024).

Although interest in AI within healthcare has grown substantially, existing evidence indicates that many healthcare professionals continue to report limited knowledge of AI concepts and practical applications. Previous studies have also identified concerns regarding ethical issues, patient confidentiality, data security, legal accountability, algorithm transparency, and the future impact of AI on professional roles, which may influence healthcare professionals' willingness to adopt AI despite recognizing its potential benefits (Blease et al., 2023).

Furthermore, existing literature has produced inconsistent findings regarding healthcare professionals' knowledge and attitudes towards AI. While some studies reported positive attitudes despite limited knowledge, others found that AI knowledge and acceptance varied according to professional background, educational level, years of experience, and previous exposure to AI technologies. These inconsistencies suggest that healthcare professionals' perceptions are influenced by contextual factors and cannot be generalized across different healthcare settings.

Within Saudi Arabia, empirical evidence remains limited, particularly among multidisciplinary healthcare professionals working in tertiary healthcare institutions. Most studies have focused on individual professional groups, such as physicians, nurses, or medical students, while little is known about healthcare professionals collectively within hospitals such as King Fahad Medical City. Consequently, there is limited published evidence to guide AI-related education, workforce development, and implementation strategies within this institution.

### **1.3 Significance of the Study**

#### **1.3.1 Theoretical Significance**

Artificial intelligence has become an important area of healthcare research; however, empirical evidence on healthcare professionals' knowledge and attitudes towards AI remains limited, particularly within the Saudi Arabian healthcare context. Although previous studies have explored AI adoption in healthcare, many have focused on individual professional groups, such as physicians, nurses, or medical students, limiting the applicability of their findings to multidisciplinary healthcare settings.

This study is expected to contribute to the existing body of knowledge by providing updated evidence on healthcare professionals' knowledge and attitudes towards artificial intelligence within a large tertiary healthcare institution in Saudi Arabia. By examining both constructs simultaneously, the study will provide a more comprehensive understanding of healthcare professionals' perceptions of AI and their relationship. The findings may also contribute to the literature on digital health transformation, technology adoption, and workforce readiness, while serving as a useful reference for future research on artificial intelligence and healthcare innovation.

#### **1.3.2 Practical Significance**

The findings of this study are expected to benefit healthcare organizations, healthcare professionals, educators, policymakers, and future researchers.

For King Fahad Medical City, the findings will provide evidence on healthcare professionals' knowledge and attitudes towards AI, enabling hospital administrators to identify knowledge gaps, prioritize educational needs, and develop targeted training program that support effective AI implementation.

For healthcare professionals, the study may increase awareness of AI applications, encourage continuous professional development, strengthen confidence in AI-assisted practice, and promote the safe and evidence-based integration of AI into clinical care.

For healthcare educators and academic institutions, the findings may support the integration of AI-related competencies into undergraduate, postgraduate, and continuing professional education program to better prepare the future healthcare workforce.

For policymakers and healthcare authorities, including the Ministry of Health and the Saudi Data and Artificial Intelligence Authority (SDAIA), the findings may inform workforce planning, educational strategies, and policy development that support healthcare digital transformation in line with Saudi Vision 2030.

Finally, the study will provide baseline data for future researchers, supporting comparative, intervention, and longitudinal studies while encouraging further investigation into factors

influencing AI adoption, including digital literacy, organizational readiness, behavioral intention, and ethical considerations in healthcare.

## **1.4 Research Objectives**

### **1.4.1 General Objective**

To assess the knowledge and attitudes towards artificial intelligence in healthcare among healthcare professionals at King Fahad Medical City, Riyadh, Saudi Arabia.

### **1.4.2 Specific Objectives**

This study aims to achieve the following specific objectives:

1. To determine the level of knowledge regarding artificial intelligence in healthcare among healthcare professionals at King Fahad Medical City, Riyadh, Saudi Arabia.
2. To assess the attitudes towards artificial intelligence in healthcare among healthcare professionals at King Fahad Medical City, Riyadh, Saudi Arabia.
3. To examine the association between age, gender, profession, educational level, years of clinical experience, department, and previous artificial intelligence (AI)-related training and healthcare professionals' knowledge regarding artificial intelligence in healthcare.

4. To examine the association between age, gender, profession, educational level, years of clinical experience, department, and previous artificial intelligence (AI)-related training and healthcare professionals' attitudes towards artificial intelligence in healthcare.
5. To determine the relationship between healthcare professionals' knowledge and attitudes towards artificial intelligence in healthcare.

## **1.5 Research Questions**

**RQ1.** What is the level of knowledge regarding artificial intelligence in healthcare among healthcare professionals at King Fahad Medical City, Riyadh, Saudi Arabia?

**RQ2.** What are the attitudes towards artificial intelligence in healthcare among healthcare professionals at King Fahad Medical City, Riyadh, Saudi Arabia?

**RQ3.** Is there a significant association between age, gender, profession, educational level, years of clinical experience, department, and previous artificial intelligence (AI)-related training and healthcare professionals' knowledge regarding artificial intelligence in healthcare?

**RQ4.** Is there a significant association between age, gender, profession, educational level, years of clinical experience, department, and previous artificial intelligence (AI)-related training and healthcare professionals' attitudes towards artificial intelligence in healthcare?

**RQ5.** Is there a significant relationship between healthcare professionals' knowledge and attitudes towards artificial intelligence in healthcare?

## **1.6 Research Hypotheses**

Based on the research objectives and research questions, the following hypotheses were developed to examine the relationships between the study variables.

**H<sub>01</sub>:** There is no significant association between the selected socio-demographic and professional characteristics and healthcare professionals' knowledge regarding artificial intelligence.

**H<sub>02</sub>:** There is no significant association between the selected socio-demographic and professional characteristics and healthcare professionals' attitudes towards artificial intelligence.

**H<sub>03</sub>:** There is no significant relationship between healthcare professionals' knowledge and attitudes towards artificial intelligence.

## **1.7 Operational Definitions**

The following operational definitions are provided to ensure consistency in the interpretation of the key concepts used throughout this study.

### **1.7.1 Artificial Intelligence (AI)**

Artificial intelligence (AI) refers to computer systems or software capable of performing tasks that normally require human intelligence, including learning, reasoning, problem-solving, pattern recognition, natural language processing, and decision-making. In healthcare, AI encompasses technologies that assist healthcare professionals in clinical decision-making, disease diagnosis, medical image interpretation, patient monitoring, predictive analytics, treatment planning, and administrative workflow optimization (World Health Organization [WHO], 2024).

Operationally, artificial intelligence in this study refers to healthcare professionals' understanding and perceptions of AI applications currently used or potentially applicable in healthcare settings.

### **1.7.2 Knowledge Towards Artificial Intelligence**

Knowledge refers to healthcare professionals' understanding of artificial intelligence, including its fundamental concepts, clinical applications, benefits, limitations, ethical considerations, and role in healthcare delivery.

Operationally, knowledge will be measured using the knowledge section of a structured self-administered questionnaire. Higher scores indicate greater knowledge regarding artificial intelligence in healthcare.

### **1.7.3 Attitudes Towards Artificial Intelligence**

Attitude refers to healthcare professionals' overall beliefs, perceptions, feelings, and acceptance regarding the use of artificial intelligence in healthcare practice.

Operationally, attitudes will be measured using a series of Likert-scale statements assessing participants' perceptions of AI usefulness, acceptance, trust, ethical concerns, and willingness to utilize AI within clinical practice. Higher scores indicate more positive attitudes towards artificial intelligence.

### **1.7.4 Healthcare Professionals**

Healthcare professionals refer to individuals who are professionally trained and licensed to provide healthcare services within King Fahad Medical City.

For the purpose of this study, healthcare professionals include physicians, nurses, pharmacists, laboratory professionals, radiographers, physiotherapists, respiratory therapists, dietitians, and other allied healthcare professionals employed at King Fahad Medical City during the study period.

### **1.7.5 King Fahad Medical City (KFMC)**

King Fahad Medical City is one of the largest tertiary referral hospitals under the Ministry of Health in Riyadh, Saudi Arabia. The hospital provides specialized and highly specialized healthcare services through multidisciplinary healthcare teams while actively supporting digital transformation and healthcare innovation.

Operationally, KFMC represents the study setting from which the study participants will be recruited.

### **1.7.6 Socio-demographic and Professional Characteristics**

Socio-demographic and professional characteristics refer to participants' background information collected for analytical purposes.

These variables include:

- Age
- Gender
- Nationality
- Profession
- Educational qualification

- Department
- Years of clinical experience
- Previous AI-related education or training

These variables will be analyzed to determine whether they are associated with healthcare professionals' knowledge and attitudes towards artificial intelligence.

### **1.8 Limitations of the Study**

There are several limitations in this study that should be taken into account when interpreting the results. First, the study is quantitative and cross-sectional, meaning that it reflects the knowledge and attitudes of healthcare professionals towards artificial intelligence (AI) at a specific moment in time. This means that the study cannot determine cause and effect relationships between the variables of the study.

Second, the study will be carried out at King Fahad Medical City (KFMC), Riyadh, Saudi Arabia. The participants will be selected from one tertiary healthcare institution, so the results of this study may not be applicable to healthcare professionals from other hospitals, primary healthcare centers, or other healthcare settings in Saudi Arabia or other countries.

Third, a self-administered online questionnaire will be used to collect data. Self-reporting bias, recall bias, or social desirability bias may therefore affect the responses of the participants, who might overestimate or underestimate their knowledge and attitudes towards AI.

Fourth, convenience sampling could lead to selection bias as those who choose to participate may be different from those who do not. Although efforts will be made to recruit healthcare professionals from various departments and professional groups, the sample may not fully represent the entire healthcare workforce at KFMC.

However, methodological procedures such as the use of a validated questionnaire, expert review, pilot testing and standardized data collection procedures will be used to improve the validity and reliability of the study findings.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Artificial intelligence (AI) has become one of the most significant technological innovations in healthcare, transforming clinical practice, healthcare administration, medical research, and patient care. Advances in machine learning, deep learning, natural language processing, and predictive analytics have enabled AI to support routine healthcare activities,

including disease diagnosis, treatment planning, resource management, and patient safety (World Health Organization [WHO], 2024)

The rapid integration of AI has increased interest in healthcare professionals' preparedness to work alongside intelligent technologies. Although AI offers significant benefits, its successful implementation depends on healthcare professionals who remain responsible for clinical judgement, ethical decision-making, and patient safety. Consequently, healthcare professionals' knowledge and attitudes towards AI are recognized as key factors influencing technology acceptance and successful implementation (Blease et al., 2023)

Existing literature highlights AI's potential to improve healthcare quality while identifying challenges related to limited AI literacy, insufficient training, ethical concerns, data privacy, legal accountability, and resistance to technological change. These findings vary across healthcare professions and settings, indicating the need for context-specific research (Alowais et al., 2023).

## **2.2 Artificial Intelligence in Healthcare**

### **2.2.1 Definition of Artificial Intelligence**

Artificial intelligence (AI) refers to the capability of computer systems to perform tasks that normally require human intelligence, including learning, reasoning, problem-solving, language processing, decision-making, and adaptation. Unlike conventional computer systems,

AI can analyze large datasets, identify complex patterns, generate predictions, and continuously improve performance through learning algorithms. Since its introduction at the Dartmouth Conference in 1956, advances in computational power, machine learning, deep learning, and cloud computing have enabled AI to become a key technology supporting evidence-based decision-making across healthcare. AI encompasses machine learning, deep learning, natural language processing, computer vision, and predictive analytics, all of which enhance disease detection, medical imaging, clinical documentation, and risk prediction. Rather than replacing healthcare professionals, AI functions as a clinical decision-support tool that complements professional judgement while maintaining human oversight (Russell & Norvig, 2021)

### **2.2.2 Evolution of Artificial Intelligence in Healthcare**

The evolution of AI in healthcare has progressed from rule-based expert systems to advanced machine learning and deep learning technologies capable of analyzing complex healthcare data. The digitization of electronic health records accelerated AI adoption by enabling predictive analytics and data-driven clinical decision-making. More recently, natural language processing and generative AI have expanded AI applications to clinical documentation, evidence retrieval, telemedicine, patient education, and workflow optimization (Alowais et al., 2023).

The COVID-19 pandemic further demonstrated AI's value in disease surveillance, medical imaging, vaccine development, resource allocation, and remote patient monitoring. Despite these advances, challenges related to data quality, algorithm transparency, cybersecurity,

ethical issues, legal accountability, and algorithmic bias remain. Consequently, successful AI implementation depends on healthcare professionals who possess sufficient knowledge to critically evaluate and safely integrate AI into clinical practice while maintaining professional accountability (UNESCO, 2021).

### **2.2.3 Applications of Artificial Intelligence in Healthcare**

Artificial intelligence is widely used in healthcare for medical diagnosis, clinical decision support, medical imaging, healthcare administration, personalized medicine, predictive analytics, education, and research. It helps healthcare professionals improve diagnostic accuracy, support evidence-based decisions, enhance operational efficiency, strengthen clinical education, and provide personalized patient care (World Health Organization [WHO], 2024).

However, translating these technologies into better healthcare outcomes depends on healthcare professionals' ability to understand, trust, and use AI appropriately. Therefore, assessing their knowledge and attitudes towards AI is essential for promoting safe, ethical, and effective implementation within healthcare organizations (Alowais et al., 2023).

## **2.3 Knowledge Towards Artificial Intelligence in Healthcare**

### **2.3.1 Concept of Knowledge Towards Artificial Intelligence**

Knowledge of artificial intelligence (AI) extends beyond awareness of its existence to include understanding its concepts, capabilities, limitations, ethical implications, clinical

applications, and appropriate interpretation of AI-generated recommendations. As AI becomes increasingly integrated into healthcare, professionals require sufficient knowledge to evaluate AI outputs critically, maintain clinical judgement, and ensure patient safety. AI knowledge encompasses fundamental terminology, machine learning, data-driven decision-making, ethical and legal considerations, and responsible clinical application. Greater knowledge helps reduce misconceptions, strengthens confidence in AI-assisted practice, and supports ethical, patient-centered care. Continuous education is therefore essential to ensure healthcare professionals remain competent as AI technologies continue to evolve (Masters, 2019; Blease et al., 2023; Alowais et al., 2023)

### **2.3.2 Importance of Knowledge Towards Artificial Intelligence Among Healthcare Professionals**

AI knowledge is essential for integrating intelligent technologies safely and effectively into healthcare. Healthcare professionals with sufficient AI knowledge are better able to interpret AI-generated recommendations, support evidence-based decisions, recognize algorithmic limitations, and avoid excessive reliance on automated systems. This knowledge also promotes ethical practice by strengthening understanding of algorithmic bias, patient confidentiality, data governance, informed consent, and legal accountability (UNESCO, 2021; Blease et al., 2023; Alowais et al., 2023).

At the organizational level, AI knowledge improves workforce readiness for digital transformation and helps healthcare institutions identify educational needs and develop competency-based training programs. Moreover, greater AI knowledge is linked to increased confidence and more positive attitudes toward AI adoption, whereas limited knowledge may contribute to fear, misunderstanding, and resistance to technological change (Topol, 2019; Alowais et al., 2023; World Health Organization [WHO], 2024).

### **2.3.3 Current Knowledge Towards Artificial Intelligence Among Healthcare Professionals**

Current evidence indicates that healthcare professionals generally recognize the potential of AI but demonstrate varying levels of knowledge across different professions and healthcare settings. Although many are familiar with AI, understanding of machine learning, algorithm development, ethical governance, and clinical implementation remains limited (Oh et al., 2021; Secinaro et al., 2021; Alowais et al., 2023).

Knowledge levels are often higher among professionals with previous AI training, postgraduate education, or greater exposure to AI-supported technologies, while opportunities for AI education remain inconsistent across healthcare disciplines. Studies in Saudi Arabia similarly report moderate AI awareness but limited formal training, highlighting significant educational needs despite ongoing national digital transformation initiatives. These findings suggest that AI knowledge is influenced by educational background, clinical exposure, and organizational context, emphasizing the need for institution-specific research to identify knowledge gaps and

inform targeted educational strategies within tertiary healthcare institutions such as King Fahad Medical City (Alowais et al., 2023; Blease et al., 2023).

## **2.4 Attitudes Towards Artificial Intelligence in Healthcare**

### **2.4.1 Concept of Attitudes Towards Artificial Intelligence**

Attitudes towards artificial intelligence (AI) refer to healthcare professionals' perceptions, beliefs, feelings, and willingness to accept and integrate AI into clinical practice. According to the Technology Acceptance Model (TAM), attitudes are shaped by perceived usefulness and perceived ease of use, which influence technology acceptance and utilization (Davis, 1989).

Healthcare professionals may recognize AI's potential to improve clinical decision-making and healthcare efficiency while expressing concerns regarding ethical issues, algorithm transparency, patient privacy, legal accountability, employment security, and the preservation of patient-centered care. Consequently, attitudes towards AI reflect a balance between perceived benefits and perceived risks and play a critical role in successful AI implementation (Davis, 1989; Blease et al., 2023; Alowais et al., 2023)

### **2.4.2 Importance of Positive Attitudes Towards Artificial Intelligence**

Positive attitudes towards AI are essential for successful digital transformation in healthcare. Healthcare professionals with favorable attitudes are more likely to accept AI-assisted clinical decision support, adapt to organizational change, engage in continuous professional

development, and integrate AI into evidence-based, patient-centered practice. Positive perceptions also strengthen workforce readiness and support national digital health initiatives, including Saudi Vision 2030. Consequently, understanding healthcare professionals' attitudes provides valuable evidence for developing educational programmes, organizational policies, and implementation strategies that encourage responsible AI adoption (Alowais et al., 2023; World Health Organization [WHO], 2024).

### **2.4.3 Factors Influencing Healthcare Professionals' Attitudes Towards Artificial Intelligence**

Healthcare professionals' attitudes towards AI are influenced by multiple factors, including knowledge, professional background, educational level, AI-related training, clinical experience, organizational support, ethical and legal concerns, and perceived usefulness and ease of use.

Greater AI knowledge and previous training are generally associated with stronger confidence and more positive attitudes, whereas limited knowledge may contribute to misconceptions and resistance. Organizational support, including leadership commitment, technical infrastructure, and continuous education, further promotes technology acceptance. Ethical concerns surrounding patient confidentiality, algorithm transparency, accountability, cybersecurity, and algorithmic bias also shape attitudes towards AI.

Collectively, these interrelated factors influence healthcare professionals' willingness to adopt AI and should be considered when developing educational interventions and implementation strategies within healthcare organizations (Alowais et al., 2023; World Health Organization [WHO], 2024).

## **2.5 Factors Associated with Knowledge and Attitudes Towards Artificial Intelligence**

### **2.5.1 Age**

Age has been widely examined as a factor influencing healthcare professionals' knowledge and attitudes towards artificial intelligence (AI). Younger professionals often demonstrate greater digital literacy and familiarity with emerging technologies, whereas older professionals may rely on greater clinical experience when evaluating AI-assisted recommendations. However, previous findings remain inconsistent, suggesting that the relationship between age and AI acceptance is influenced by educational opportunities, technological exposure, and organizational context. Therefore, age will be examined as a socio-demographic variable in this study (Blease et al., 2023).

### **2.5.2 Gender**

Previous studies have reported inconsistent findings regarding gender differences in AI knowledge and technology acceptance. While some studies suggest differences in confidence

and technology adoption, others report no significant association. Current evidence indicates that education, professional responsibilities, and organizational support may have a greater influence than gender alone. Accordingly, gender will be included as an independent variable (Blease et al., 2023).

### **2.5.3 Profession**

Professional role influences exposure to AI technologies, educational preparation, and clinical responsibilities. Physicians, nurses, pharmacists, and allied healthcare professionals encounter AI differently depending on their specialties and clinical practice. Although existing evidence suggests that professional background may influence AI knowledge and attitudes, findings remain inconsistent across healthcare settings. Profession will therefore be examined as a professional variable in this study (Alowais et al., 2023).

### **2.5.4 Educational Level**

Higher educational attainment may enhance healthcare professionals' understanding of AI through greater exposure to research, evidence-based practice, and technological innovation. However, formal qualifications alone do not ensure AI competency, highlighting the importance of continuing professional development. Educational level will therefore be examined for its association with AI knowledge and attitudes (Alowais et al., 2023).

### **2.5.5 Years of Clinical Experience**

Clinical experience may influence AI knowledge and attitudes by shaping professional judgement, confidence, and adaptability to technological change. While less experienced professionals may demonstrate greater technological familiarity, experienced clinicians may apply stronger clinical reasoning when integrating AI into practice. Given the inconsistent evidence, years of clinical experience will be included as a study variable (Alowais et al., 2023; World Health Organization [WHO], 2024).

### **2.5.6 Previous Artificial Intelligence Training**

Previous AI-related education or training is consistently recognized as a key determinant of healthcare professionals' knowledge and attitudes towards AI. Formal training improves understanding of AI concepts, ethical considerations, and clinical applications while increasing confidence and reducing misconceptions. As a modifiable factor, previous AI training is expected to support workforce readiness and successful AI implementation and will therefore be examined in the present study.

## 2.6 Theoretical Framework

This study is underpinned by the Technology Acceptance Model (TAM) developed by Davis (1989), one of the most widely used theories for explaining individuals' acceptance and use of new technologies. Originally developed to examine information system adoption, TAM has since been extensively applied in healthcare research to investigate the acceptance of artificial intelligence (AI), electronic health records, telemedicine, and other digital health technologies.

According to TAM, technology acceptance is primarily influenced by two key constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived usefulness refers to the extent to which individuals believe that technology enhances job performance, while perceived ease of use reflects the degree to which they believe it can be used with minimal effort. These perceptions shape users' attitudes, which subsequently influence their intention to adopt and use technology (Davis, 1989).

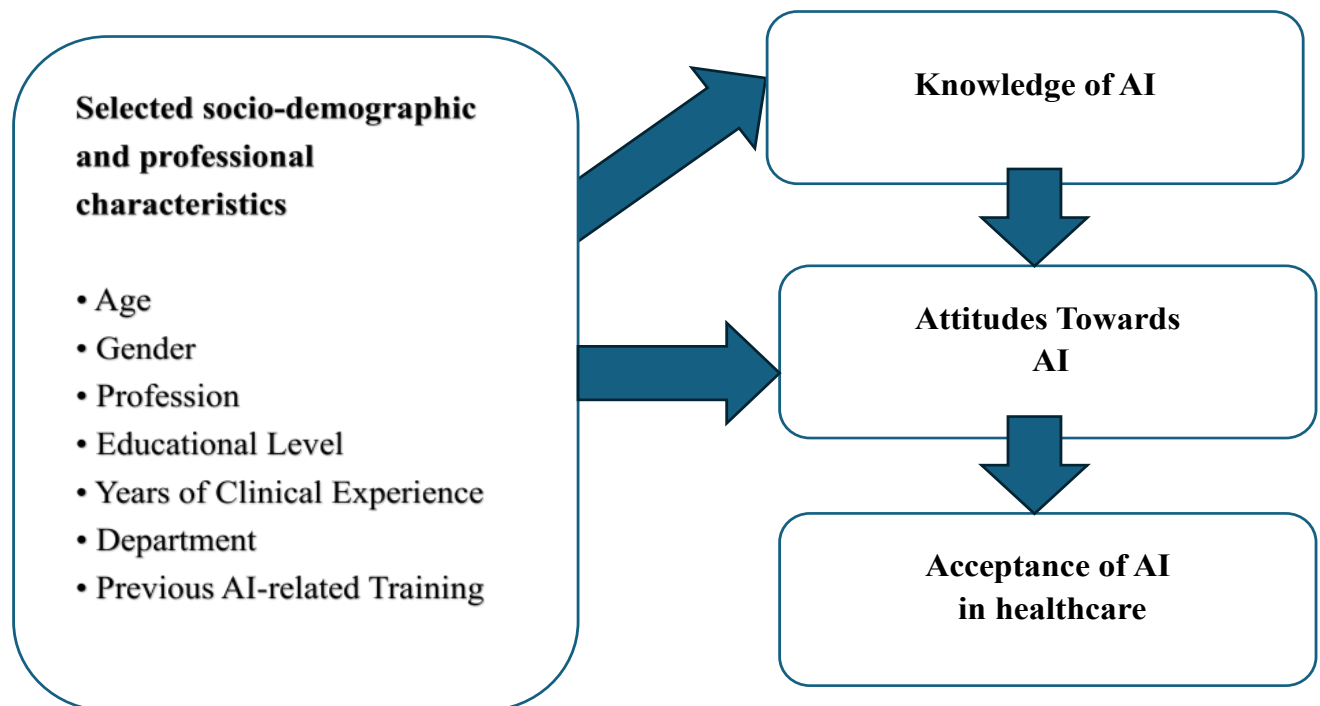
In healthcare, professionals are more likely to develop positive attitudes towards AI when they perceive it as useful for improving clinical decision-making, patient safety, diagnostic accuracy, and healthcare efficiency. In addition, greater knowledge of AI enables healthcare professionals to better understand its capabilities and limitations, contributing to more informed and favorable attitudes towards its adoption.

Based on TAM, this study proposes that healthcare professionals' knowledge of artificial intelligence is associated with their attitudes towards AI in healthcare, while selected socio-demographic and professional characteristics may influence both constructs. Therefore, TAM

provides an appropriate theoretical foundation for understanding factors that support successful AI implementation within tertiary healthcare settings.

**Figure 1.1 Theoretical Framework**

**Technology Acceptance Model (Davis, 1989)**



**Source: Adapted from Davis (1989)**

## 2.7 Conceptual Framework

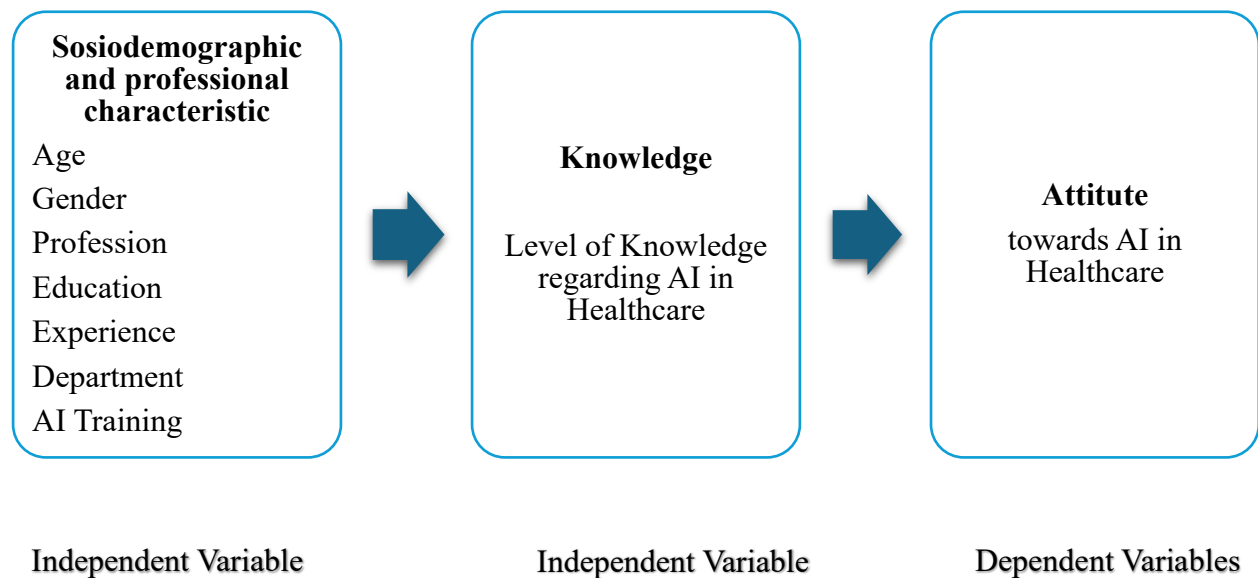
The conceptual framework for this study is based on the Technology Acceptance Model (TAM) proposed by Davis (1989) and relevant literature on artificial intelligence (AI) adoption in healthcare. It illustrates the proposed relationships between independent and dependent variables.

The independent variables comprise knowledge regarding artificial intelligence in healthcare and selected socio-demographic and professional characteristics, including age, gender, profession, educational level, years of clinical experience, department, and previous AI-related training. These factors are expected to influence healthcare professionals' understanding of AI and their perceptions of its implementation in clinical practice.

The dependent variable is attitudes towards artificial intelligence in healthcare, which refers to healthcare professionals' perceptions, beliefs, acceptance, and willingness to support the integration of AI into healthcare practice. Positive attitudes are expected to facilitate successful AI implementation, whereas negative attitudes may hinder technology adoption and organizational digital transformation.

Based on the proposed framework, healthcare professionals with greater knowledge of artificial intelligence are expected to demonstrate more positive attitudes towards AI implementation. In addition, socio-demographic and professional characteristics may influence both knowledge and attitudes. Understanding these relationships will provide valuable evidence to support educational strategies, workforce development, and the effective implementation of AI within tertiary healthcare institutions.

**Figure 1.2 Conceptual Framework**



## **2.8 Technology Acceptance Model (TAM)**

### **2.8.1 Overview of the Technology Acceptance Model**

The Technology Acceptance Model (TAM), developed by Davis (1989), explains individuals' acceptance and use of new technologies. Derived from the Theory of Reasoned Action, TAM proposes that technology adoption is primarily influenced by perceived usefulness and perceived ease of use, which shape users' attitudes, behavioral intention, and actual technology use. Owing to its strong explanatory power, TAM has been widely applied in healthcare research

to investigate the adoption of electronic health records, telemedicine, clinical decision support systems, and artificial intelligence (AI).

### **2.8.2 Core Constructs of the Technology Acceptance Model**

TAM comprises five key constructs: Perceived Usefulness, Perceived Ease of Use, Attitude Towards Technology, Behavioral Intention, and Actual Technology Use (Davis, 1989). In healthcare, professionals are more likely to adopt AI when they perceive it as useful, user-friendly, and capable of improving clinical performance and patient outcomes. Positive attitudes strengthen behavioral intention, while actual AI utilization also depends on organizational readiness, leadership support, institutional policies, and continuous professional education.

### **2.8.3 Application of TAM in Artificial Intelligence Research**

TAM has been extensively used to explain healthcare professionals' acceptance of AI technologies, including AI-assisted diagnosis, clinical decision support, telemedicine, robotic surgery, predictive analytics, and generative AI. Recent studies have expanded TAM by incorporating factors such as trust, digital literacy, organizational support, ethical concerns, previous technology experience, and AI knowledge to better explain AI adoption.

#### **2.8.4 Justification for Using TAM in the Present Study**

This study adopts TAM as its theoretical foundation because it provides a robust framework for understanding healthcare professionals' acceptance of AI. While the original model emphasizes perceived usefulness and perceived ease of use, the present study extends TAM by proposing that AI knowledge influences attitudes towards AI, with socio-demographic and professional characteristics affecting both constructs. This modified framework is appropriate for examining healthcare professionals' knowledge and attitudes towards AI at King Fahad Medical City.

### **2.9 Previous Empirical Studies**

#### **2.9.1 International Studies**

International studies consistently report positive attitudes towards AI among healthcare professionals despite limited AI knowledge. Greater AI literacy is commonly observed among physicians working in AI-intensive specialties, whereas nurses and allied healthcare professionals often report lower knowledge levels. Previous AI education is consistently associated with stronger knowledge, confidence, and willingness to adopt AI. However, concerns regarding ethics, privacy, transparency, and legal accountability remain significant barriers to implementation (Davenport & Kalakota, 2019; Topol, 2019; Wartman & Combs, 2019; Masters, 2019; European Commission, 2021; Oh et al., 2021; Secinaro et al., 2021; Alowais et al., 2023; Blease et al., 2023).

### **2.9.2 Previous Studies in the Middle East**

Studies across the Middle East generally report favorable attitudes towards AI but identify limited AI knowledge, inadequate formal education, and ethical concerns as major barriers to implementation. Existing evidence remains limited and has largely focused on physicians and medical students rather than multidisciplinary healthcare professionals working in tertiary hospitals (SDAIA, 2020; WHO, 2021; UNESCO, 2021; Alowais et al., 2023).

### **2.9.3 Previous Studies in Saudi Arabia**

Saudi studies similarly report positive attitudes but only moderate AI knowledge among healthcare professionals. Limited formal AI education, together with the need for structured training and continuing professional development, remains a recurring finding. Previous AI education, profession, and educational level have been associated with AI knowledge and acceptance; however, studies involving multidisciplinary healthcare professionals in tertiary hospitals remain scarce (SDAIA, 2020; Wartman & Combs, 2019; Masters, 2019; Alowais et al., 2023).

## **2.10 Research Gap**

Despite growing research on AI in healthcare, several gaps remain. Most studies have focused on individual professional groups rather than multidisciplinary healthcare professionals

and have been conducted in educational settings instead of tertiary referral hospitals (Oh et al., 2021; Secinaro et al., 2021; Alowais et al., 2023).

Within Saudi Arabia, evidence from major tertiary healthcare institutions remains limited despite national AI initiatives (SDAIA, 2020). In addition, inconsistent findings regarding socio-demographic and professional factors, together with the rapid emergence of generative AI, highlight the need for updated, context-specific research. Therefore, this study aims to assess healthcare professionals' knowledge and attitudes towards AI at King Fahad Medical City, Riyadh, to provide evidence supporting workforce development, educational planning, and effective AI implementation (Blease et al., 2023; Alowais et al., 2023).

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter describes the methodology employed to achieve the objectives of the present study. It outlines the research design, study setting, study population, sampling technique, sample size determination, inclusion and exclusion criteria, research instrument, validity and reliability of the instrument, pilot study, data collection procedures, data analysis, ethical considerations, and chapter summary.

The methodology was developed to ensure that the study is conducted systematically, ethically, and scientifically while producing valid and reliable findings regarding healthcare professionals' knowledge and attitudes towards artificial intelligence (AI) in healthcare at King Fahad Medical City (KFMC), Riyadh, Saudi Arabia.

The study adopts a quantitative cross-sectional design because it is appropriate for assessing the current level of knowledge and attitudes among healthcare professionals and examining the relationships between these variables and selected socio-demographic and professional characteristics. The methodology also aligns with the study objectives, research questions, hypotheses, and conceptual framework presented in the previous chapters.

### **3.2 Research Design**

The present study will employ a quantitative cross-sectional descriptive correlational research design. A quantitative approach is appropriate because the study aims to obtain measurable data regarding healthcare professionals' knowledge and attitudes towards artificial intelligence. Quantitative research enables statistical analysis of relationships between variables and facilitates objective interpretation of findings through numerical data (Polit & Beck, 2021).

A cross-sectional design will be adopted because data will be collected from participants at a single point in time without any follow-up period. This design is suitable for determining the current level of knowledge and attitudes towards AI among healthcare professionals and

identifying associations between study variables. Cross-sectional studies are widely used in healthcare research because they are cost-effective, relatively quick to conduct, and appropriate for describing current phenomena within a defined population.

The study is also descriptive because it seeks to describe healthcare professionals' knowledge and attitudes towards AI without manipulating any variables. Furthermore, the study incorporates a correlational component by examining the relationships between knowledge, attitudes, and selected socio-demographic and professional characteristics.

The independent variables in this study include socio-demographic and professional characteristics (age, gender, profession, educational qualification, department, years of clinical experience, and previous AI training) together with healthcare professionals' knowledge regarding artificial intelligence. The dependent variable is healthcare professionals' attitudes towards artificial intelligence in healthcare.

The quantitative cross-sectional descriptive correlational design is considered appropriate because it enables the researcher to obtain comprehensive information regarding healthcare professionals' current knowledge and attitudes while examining statistically significant relationships among the study variables.

### **3.3 Study Setting**

This study will be conducted at King Fahad Medical City (KFMC), Riyadh, Saudi Arabia.

King Fahad Medical City is one of the largest tertiary referral hospitals under the Ministry of Health and provides highly specialized healthcare services across multiple clinical specialties. The hospital consists of several specialized hospitals and centers, including the Women's Specialized Hospital, Children's Specialized Hospital, Rehabilitation Hospital, Main Hospital, Prince Sultan Heart Center, and specialized outpatient services.

As one of the leading referral hospitals in Saudi Arabia, King Fahad Medical City continues to implement digital health initiatives and advanced healthcare technologies in line with Saudi Vision 2030 and the National Strategy for Data and Artificial Intelligence (SDAIA). Consequently, healthcare professionals employed at KFMC are increasingly exposed to digital healthcare systems and emerging artificial intelligence technologies.

The study setting was selected because it provides access to a multidisciplinary healthcare workforce representing various healthcare professions. Assessing healthcare professionals within a technologically advanced tertiary healthcare institution is expected to provide valuable evidence regarding current knowledge and attitudes towards artificial intelligence in healthcare.

### **3.4 Study Population**

The target population for this study comprises healthcare professionals currently employed at King Fahad Medical City (KFMC), Riyadh, Saudi Arabia. Healthcare professionals play a central role in patient care and are increasingly expected to interact with digital health

technologies, including artificial intelligence (AI), in their daily clinical practice. Therefore, this population is considered appropriate for assessing knowledge and attitudes towards AI in healthcare.

The study population will include multidisciplinary healthcare professionals from various clinical departments within KFMC. These include physicians, nurses, pharmacists, medical laboratory scientists, radiographers, physiotherapists, respiratory therapists, occupational therapists, dietitians, and other allied healthcare professionals directly involved in healthcare delivery.

Including participants from different professional backgrounds will provide a comprehensive understanding of AI knowledge and attitudes across the multidisciplinary healthcare workforce. This approach also allows comparisons between professional groups and supports the identification of profession-specific educational needs that may facilitate future AI implementation within the organization.

### **3.5 Sample Size Determination**

The sample size for this study will be determined using the Raosoft Sample Size Calculator, which is widely used in health sciences research to estimate the minimum number of participants required to produce statistically reliable findings.

Assuming a 95% confidence level, 5% margin of error, and 50% response distribution, the required sample size will be calculated based on the total number of eligible healthcare professionals employed at King Fahad Medical City during the study period.

If the estimated number of eligible healthcare professionals is approximately 5,000, the minimum required sample size is 357 participants according to the Raosoft sample size calculation.

To compensate for incomplete questionnaires and non-response, an additional 10–20% will be added to the calculated sample size. Therefore, approximately 400–430 participants will be invited to participate in the study.

The final sample size will be adjusted according to the actual number of eligible healthcare professionals obtained from the Human Resources Department or relevant administrative authority at King Fahad Medical City before data collection commences.

### **3.6 Sampling Technique**

A proportionate convenience sampling technique will be employed in this study. Participants will be recruited from different professional groups, including physicians, nurses, pharmacists, laboratory professionals, radiographers, physiotherapists, respiratory therapists, dietitians, and other allied healthcare professionals working at King Fahad Medical City (KFMC). To improve the representativeness of the sample, efforts will be made to recruit participants from each professional group in proportion to their availability during the data collection period.

Convenience sampling is considered appropriate because obtaining a complete sampling frame of healthcare professionals within KFMC may not be feasible due to institutional policies, staff confidentiality, and operational constraints. Similar sampling approaches have been widely adopted in hospital-based cross-sectional studies involving healthcare professionals, particularly where random selection is not practically achievable (Polit & Beck, 2021).

Although convenience sampling may introduce selection bias, several measures will be implemented to minimize this limitation. Participants will be recruited from multiple departments, different professional categories, and various work shifts to maximize sample diversity and improve the representativeness of the study population.

### **3.7 Inclusion Criteria**

Participants will be eligible to participate in this study if they meet the following criteria:

1. Healthcare professionals currently employed at King Fahad Medical City.
2. Physicians, nurses, pharmacists, medical laboratory scientists, radiographers, physiotherapists, respiratory therapists, dietitians, occupational therapists, or other allied healthcare professionals directly involved in patient care.
3. Aged 21 years and above.
4. Have been employed at King Fahad Medical City for at least six months.

5. Able to read and understand English.
6. Willing to participate voluntarily and provide informed consent.

### **3.8 Exclusion Criteria**

The following individuals will be excluded from this study:

1. Administrative and non-clinical staff.
2. Undergraduate students, interns, and trainees.
3. Healthcare professionals on long-term leave during the data collection period.
4. Healthcare professionals who decline participation or fail to provide informed consent.
5. Questionnaires with substantial missing data (more than 20% incomplete responses) will be excluded from the final analysis.

### **3.9 Research Instrument**

A structured, self-administered questionnaire will be used as the research instrument for this study. The questionnaire will be developed by adapting items from previously validated instruments used in studies assessing healthcare professionals' knowledge and attitudes towards artificial intelligence in healthcare. Permission will be obtained from the original authors where required before the questionnaire is used.

The questionnaire will be prepared in English, as English is the primary language of professional communication and documentation at King Fahad Medical City (KFMC).

The questionnaire will consist of four sections.

### **Section A: Socio-demographic and Professional Characteristics**

This section will collect participants' background information, including:

- Age
- Gender
- Nationality
- Profession
- Department
- Highest educational qualification
- Years of clinical experience
- Previous AI-related education or training
- Previous experience using AI in healthcare (if applicable)

These variables will be used to describe the study population and examine their association with knowledge and attitudes towards AI.

## **Section B: Knowledge Towards Artificial Intelligence**

This section will assess participants' knowledge regarding artificial intelligence in healthcare.

The items will cover:

- Basic AI concepts
- Applications of AI in healthcare
- Benefits of AI
- Limitations of AI
- Ethical considerations
- AI in clinical decision-making

Knowledge items will be presented as multiple-choice or True/False statements. Each correct response will receive one point, while incorrect or "I don't know" responses will receive zero points. The total knowledge score will be calculated by summing all correct responses, with higher scores indicating greater knowledge regarding artificial intelligence.

### **Section C: Attitudes Towards Artificial Intelligence**

This section will assess healthcare professionals' attitudes towards AI.

Statements will evaluate:

- Acceptance of AI
- Perceived usefulness
- Trust in AI
- Willingness to use AI
- Ethical concerns
- Perceived impact on patient care
- Perceived impact on professional practice

Responses will be measured using a 5-point Likert scale:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

Higher scores will indicate more positive attitudes towards artificial intelligence.

#### **Section D: Perceived Educational Needs**

To support future educational planning, participants will also be asked about their perceived learning needs regarding artificial intelligence.

Items may include:

- Interest in AI training
- Preferred learning methods
- Confidence in using AI
- Perceived need for AI education
- Willingness to attend future AI workshops

#### **3.10 Validity of the Instrument**

Content validity refers to the extent to which an instrument adequately measures the intended research constructs.

To establish content validity, the questionnaire will be reviewed by a panel of experts consisting of specialists in healthcare research, nursing, healthcare management, digital health,

and artificial intelligence. The experts will evaluate the questionnaire based on relevance, clarity, simplicity, and comprehensiveness.

Appropriate revisions will be made following expert recommendations before the questionnaire is distributed to study participants.

Face validity will also be assessed by requesting several healthcare professionals to review the questionnaire for readability, clarity, language, and ease of understanding before the pilot study.

### **3.11 Reliability of the Instrument**

Reliability refers to the consistency of an instrument in measuring the intended construct.

A pilot study will be conducted before the main study to evaluate the internal consistency of the questionnaire.

Cronbach's alpha coefficient will be used to assess the reliability of the attitude scale. Cronbach's alpha value of 0.70 or above will be considered acceptable, indicating satisfactory internal consistency (Polit & Beck, 2021).

For the knowledge section, internal consistency will also be examined where appropriate depending on the final questionnaire format.

Any questionnaire items that reduce the overall reliability of the instrument may be revised or removed prior to the main data collection.

### **3.12 Pilot Study**

A pilot study will be conducted involving approximately 30 healthcare professionals who meet the inclusion criteria but will not participate in the main study.

The objectives of the pilot study are to:

- evaluate questionnaire clarity;
- assess the average time required to complete the questionnaire;
- identify ambiguous or confusing questions;
- evaluate the reliability of the instrument;
- determine the feasibility of the data collection procedure.

Data collected during the pilot study will not be included in the final analysis of the main study.

### **3.13 Data Collection Procedure**

Data collection will commence only after obtaining ethical approval from the relevant Institutional Review Board (IRB) and administrative permission from King Fahad Medical City (KFMC). Approval will also be obtained from the relevant department heads before approaching potential participants.

The researcher will coordinate with department managers and unit supervisors to facilitate participant recruitment across different clinical departments. Eligible healthcare professionals will be invited to participate voluntarily in the study. Before completing the questionnaire, participants will receive a Participant Information Sheet explaining the purpose of the study, study procedures, confidentiality, voluntary participation, potential risks and benefits, and their right to withdraw from the study at any stage without penalty.

Data will be collected using a self-administered online questionnaire developed through Google Forms. A Quick Response (QR) code and electronic survey link will be distributed through official communication channels, including departmental WhatsApp groups, institutional email (where permitted), and QR code posters placed in staff areas following approval from the relevant departments.

Participants will first complete the electronic informed consent form before proceeding to the questionnaire. The questionnaire is expected to require approximately 10–15 minutes to complete.

To maximize the response rate, reminder messages will be distributed two weeks after the initial invitation and again during the fourth week of data collection. Data collection is expected to continue for approximately six to eight weeks, depending on the response rate.

Upon completion of data collection, all responses will be exported from Google Forms into Microsoft Excel before being transferred to the Statistical Package for the Social Sciences (SPSS) version 29.0 for data cleaning, coding, and statistical analysis.

### 3.14 Data Analysis

The collected data will be analyzed using the Statistical Package for the Social Sciences (SPSS) version 29.0. Prior to analysis, the dataset will be screened for completeness, missing values, outliers, and data entry errors to ensure data quality. Descriptive and inferential statistical analyses will then be performed according to the study objectives.

For Objective 1, descriptive statistics, including frequency, percentage, mean, and standard deviation, will be used to determine healthcare professionals' level of knowledge regarding artificial intelligence.

For Objective 2, descriptive statistics comprising frequency, percentage, mean, and standard deviation will also be used to assess healthcare professionals' attitudes towards artificial intelligence.

To address Objectives 3 and 4, the associations between selected socio-demographic and professional characteristics (age, gender, profession, educational level, years of clinical experience, department, and previous AI-related training) and healthcare professionals' knowledge and attitudes towards artificial intelligence will be examined using the Independent Samples t-test, One-Way Analysis of Variance (ANOVA), and the Chi-square test, where appropriate, depending on the nature of the variables.

For Objective 5, the relationship between healthcare professionals' knowledge and attitudes towards artificial intelligence will be assessed using Pearson's correlation coefficient. If the assumptions of normality are not satisfied, Spearman's rank correlation coefficient will be used as a non-parametric alternative.

A p-value of less than 0.05 ( $p < 0.05$ ) will be considered statistically significant for all inferential analyses.

| Research Objective | Statistical Analysis                                  |
|--------------------|-------------------------------------------------------|
| Objective 1        | Frequency, Percentage, Mean, SD                       |
| Objective 2        | Frequency, Percentage, Mean, SD                       |
| Objective 3        | Independent Samples t-test, One-Way ANOVA, Chi-square |
| Objective 4        | Independent Samples t-test, One-Way ANOVA, Chi-square |
| Objective 5        | Pearson's Correlation / Spearman's Rank Correlation   |

### **3.15 Ethical Considerations**

Ethical approval will be obtained from the appropriate Institutional Review Board (IRB) and the Research Ethics Committee of King Fahad Medical City before commencement of the study. Permission to conduct the study will also be obtained from the relevant hospital administration and department heads.

Participation in the study will be entirely voluntary. All eligible participants will receive detailed information regarding the study objectives, procedures, risks, benefits, confidentiality, and their rights before providing informed consent. Electronic informed consent will be obtained before participants access the questionnaire.

Participants will be informed that they may decline participation or withdraw from the study at any time without providing a reason and without any consequences to their employment or professional responsibilities.

To maintain confidentiality, no personally identifiable information such as names, employee identification numbers, or contact details will be collected. Each completed questionnaire will be assigned a unique study identification number. Electronic data will be stored in password-protected files accessible only to the researcher and research supervisor.

The findings of the study will be reported only in aggregate form. Individual participants, departments, or professional groups will not be identifiable in any publications or presentations arising from the study.

All electronic data will be securely stored for the period required by university and institutional research policies before being permanently destroyed according to approved data management procedures.

The study is anticipated to involve minimal risk, as participants will only be required to complete an anonymous questionnaire regarding their knowledge and attitudes towards artificial intelligence. No clinical interventions or experimental procedures will be performed.

## References

- Alowais, S. A., Alghamdi, S. S., Alsuhebany, N., Alqahtani, T., Alshaya, A. I., Almohareb, S. N., Aldairem, A., Alrashed, M., Bin Saleh, K., Badreldin, H. A., Al Yami, M. S., Al Harbi, S., Albekairy, A. M., Alnajjar, F., & Alshammari, T. M. (2023). Revolutionizing healthcare: The role of artificial intelligence in clinical practice. *BMC Medical Education*, 23(1), 689. <https://doi.org/10.1186/s12909-023-04698-z>
- Blease, C., Kaptchuk, T. J., Bernstein, M. H., Mandl, K. D., Halamka, J. D., & DesRoches, C. M. (2023). Artificial intelligence and the future of primary care: Exploratory qualitative study of UK general practitioners' views. *Journal of Medical Internet Research*, 25, e44341. <https://doi.org/10.2196/44341>
- Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future Healthcare Journal*, 6(2), 94–98. <https://doi.org/10.7861/futurehosp.6-2-94>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>

European Commission. (2021). *Proposal for a regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act)*. <https://artificial-intelligence-act.eu>

Masters, K. (2019). *Artificial intelligence in medical education*. Springer.  
<https://doi.org/10.1007/978-3-030-12385-7>

Oh, S., Kim, J. H., Choi, S. W., Lee, H. J., Hong, J., & Kwon, S. H. (2021). Physician confidence in artificial intelligence: An online mobile survey. *Journal of Medical Internet Research*, 23(3), e27014. <https://doi.org/10.2196/27014>

Polit, D. F., & Beck, C. T. (2021). *Nursing research: Generating and assessing evidence for nursing practice* (11th ed.). Wolters Kluwer.

Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Saudi Data and Artificial Intelligence Authority. (2020). *National strategy for data and artificial intelligence*. <https://sdaia.gov.sa>

Secinaro, S., Calandra, D., Secinaro, A., Muthurangu, V., & Biancone, P. (2021). The role of artificial intelligence in healthcare: A structured literature review. *BMC Medical*

*Informatics and Decision Making*, 21(1), 125. [https://doi.org/10.1186/s12911-021-01488-](https://doi.org/10.1186/s12911-021-01488-9)

[9](#)

Topol, E. (2019). *Deep medicine: How artificial intelligence can make healthcare human again*.

Basic Books.

Topol, E. (2024). *The Topol Review: Preparing the healthcare workforce to deliver the digital future* (Updated edition where applicable). NHS Health Education England.

UNESCO. (2021). *Recommendation on the ethics of artificial intelligence*.

<https://unesdoc.unesco.org>

World Health Organization. (2021). *Ethics and governance of artificial intelligence for health*.

World Health Organization. <https://www.who.int/publications/i/item/9789240029200>

World Health Organization. (2024). *Ethics and governance of artificial intelligence for health:*

*WHO guidance on large multi-modal models*. World Health Organization.

<https://www.who.int/publications>

## LIST OF ABBREVIATIONS

| <b>Abbreviation</b> | <b>Full Term</b>                                              |
|---------------------|---------------------------------------------------------------|
| <b>AI</b>           | <b>Artificial Intelligence</b>                                |
| <b>ANOVA</b>        | <b>Analysis of Variance</b>                                   |
| <b>CVI</b>          | <b>Content Validity Index</b>                                 |
| <b>IRB</b>          | <b>Institutional Review Board</b>                             |
| <b>KFMC</b>         | <b>King Fahad Medical City</b>                                |
| <b>ML</b>           | <b>Machine Learning</b>                                       |
| <b>MOH</b>          | <b>Ministry of Health</b>                                     |
| <b>NSDAI</b>        | <b>National Strategy for Data and Artificial Intelligence</b> |
| <b>PEOU</b>         | <b>Perceived Ease of Use</b>                                  |
| <b>PU</b>           | <b>Perceived Usefulness</b>                                   |
| <b>SDAIA</b>        | <b>Saudi Data and Artificial Intelligence Authority</b>       |
| <b>SPSS</b>         | <b>Statistical Package for the Social Sciences</b>            |
| <b>TAM</b>          | <b>Technology Acceptance Model</b>                            |

|            |                                  |
|------------|----------------------------------|
| <b>WHO</b> | <b>World Health Organization</b> |
|------------|----------------------------------|

## Appendices

### Appendix A : Participant Information and Informed Consent

#### Research Title:

*Knowledge and Attitudes Towards Artificial Intelligence in Healthcare Among Healthcare Professionals at King Fahad Medical City, Riyadh, Saudi Arabia*

You are invited to participate in this research study. Before deciding whether to participate, please read the following information carefully.

- Your participation is voluntary.
- You may withdraw at any time before submitting the questionnaire.
- The questionnaire will take approximately 10–15 minutes to complete.
- No personally identifiable information will be collected.
- All responses will be kept confidential and used solely for research purposes.
- There are no known risks beyond those encountered in daily life.

- There is no monetary compensation for participation.
- If you have any questions, you may contact the researcher.

### **Consent**

☐ **I have read and understood the information above. I voluntarily agree to participate in this study.**

### **Appendix B**

#### **INFORMED CONSENT FORM**

##### **Research Title**

*Knowledge and Attitudes Towards Artificial Intelligence in Healthcare Among Healthcare Professionals at King Fahad Medical City, Riyadh, Saudi Arabia*

##### **Principal Researcher**

**Name :**

**Course :**

**University name :**

**Email:**

**Telephone:**

### **Participant Consent**

I have read and understood the Participant Information Sheet regarding this research study.

I understand that:

- I have been informed about the purpose, procedures, benefits, and possible risks of this study.
- My participation in this study is entirely voluntary.
- I am free to refuse participation or withdraw from the study at any time without penalty or consequences.
- The questionnaire will require approximately 10–15 minutes to complete.
- My responses will remain anonymous, and no personally identifiable information will be collected.
- All information obtained during this study will be kept strictly confidential and used solely for research purposes.
- The data collected will be stored securely and will only be accessible to the researcher and supervisor.
- The findings of this study may be published or presented in academic publications or conferences; however, my identity will not be disclosed.

- I have had the opportunity to ask questions regarding this study and have received satisfactory answers.
- By providing my consent, I voluntarily agree to participate in this research study.

### **Declaration of Consent**

- ☐ I confirm that I have read and understood the information provided above.
- ☐ I voluntarily agree to participate in this research study.
- ☐ I understand that I may withdraw from the study before submitting my responses without any consequences.

**Participant's Name**

**Signature**

**Date**

### **For Online (Google Form) Participants**

By selecting "I agree to participate" and proceeding to the questionnaire, you are providing your electronic informed consent to participate in this study.

☐ I have read and understood the information above and voluntarily agree to participate in this study.

## **Appendix C**

### **QUESTIONNAIRE**

#### **Research Title**

*Knowledge and Attitudes Towards Artificial Intelligence in Healthcare Among Healthcare Professionals at King Fahad Medical City, Riyadh, Saudi Arabia*

#### **Instructions**

Please answer all questions honestly by selecting the most appropriate response. There are no right or wrong answers. All information provided will remain confidential and will be used solely for research purposes.

**Please tick (✓) ONE answer only unless otherwise stated.**

#### **Section A: Socio-Demographic and Professional Characteristics**

##### **A1. Age**

☐ 20–29 years

☐ 30–39 years

☐ 40–49 years

☐ 50 years and above

## **A2. Gender**

☐ Male

☐ Female

☐ Prefer not to say

## **A3. Profession**

☐ Physician

☐ Nurse

- ☐ Pharmacist
- ☐ Medical Laboratory Scientist/Technologist
- ☐ Radiographer
- ☐ Physiotherapist
- ☐ Respiratory Therapist
- ☐ Dietitian/Nutritionist
- ☐ Occupational Therapist
- ☐ Other (please specify): \_\_\_\_\_

#### **A4. Highest Educational Level**

- ☐ Diploma
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctorate (PhD)
- ☐ Other (please specify): \_\_\_\_\_

**A5. Years of Clinical Experience**

- ☐ Less than 5 years
- ☐ 5–10 years
- ☐ 11–15 years
- ☐ More than 15 years

**A6. Department/Unit**

- ☐ Emergency Department
- ☐ Intensive Care Unit (ICU)
- ☐ Operating Room (OR)
- ☐ Medical Ward
- ☐ Surgical Ward
- ☐ Outpatient Department (OPD)
- ☐ Pharmacy

- ☐ Radiology
- ☐ Laboratory
- ☐ Rehabilitation Services
- ☐ Administration
- ☐ Other (please specify): \_\_\_\_\_

**A7. Have you received any formal education or training related to Artificial Intelligence (AI)?**

- ☐ Yes
- ☐ No

**A8. If Yes, what type of AI-related training have you received?**

- ☐ Undergraduate course/module

- ☐ Postgraduate course/module
- ☐ Hospital workshop/seminar
- ☐ Online course/webinar
- ☐ Professional certification
- ☐ Self-learning
- ☐ Other (please specify): \_\_\_\_\_
- ☐ Not applicable

**A9. How would you rate your overall knowledge of Artificial Intelligence (AI)?**

- ☐ Very Poor
- ☐ Poor
- ☐ Fair
- ☐ Good
- ☐ Excellent

**A10. Have you ever used an AI-assisted application or tool in your clinical practice?**

☐ Yes

☐ No

☐ Not sure

## Section B: Knowledge Towards Artificial Intelligence in Healthcare

**Instructions: Please indicate whether each statement is True, False, or Not Sure.**

| No.       | Statement                                                                                                    | True                     | False                    | Not<br>Sure              |
|-----------|--------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| <b>B1</b> | Artificial intelligence (AI) refers to computer systems that can perform tasks requiring human intelligence. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B2</b> | Machine learning is a branch of artificial intelligence.                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B3</b> | AI can assist healthcare professionals in clinical decision-making.                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B4</b> | AI can be used to analyse medical images such as X-rays, CT scans, and MRI scans.                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B5</b> | AI can help predict disease risks and patient outcomes.                                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B6</b> | AI is capable of completely replacing healthcare professionals in all clinical situations.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B7</b> | Clinical judgement should always be exercised when using AI-generated recommendations.                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|            |                                                                                                                     |                          |                          |                          |
|------------|---------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| <b>B8</b>  | AI systems may produce biased or inaccurate results if trained using poor-quality data.                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B9</b>  | Patient privacy and data security are important considerations when implementing AI in healthcare.                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B10</b> | Healthcare professionals remain legally and professionally accountable for clinical decisions even when AI is used. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B11</b> | AI can improve efficiency by reducing repetitive administrative tasks.                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>B12</b> | Healthcare professionals should receive appropriate education and training before using AI in clinical practice.    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

### Scoring:

- Correct answer = 1
- Incorrect/Not Sure = 0
- Total score = 0–12
- Higher scores indicate greater knowledge of artificial intelligence in healthcare.

## Section C: Attitudes Towards Artificial Intelligence in Healthcare

**Instructions: Please indicate the extent to which you agree with each statement by selecting ONE response.**

### Response Scale

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

| No. | Statement                                                                         | 1                        | 2                        | 3                        | 4                        | 5                        |
|-----|-----------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| C1  | I believe artificial intelligence can improve the quality of healthcare services. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C2  | AI can support healthcare professionals in making better clinical decisions.      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C3  | AI can improve the efficiency of healthcare delivery.                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C4  | I am willing to use AI-assisted technologies in my clinical practice.             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|            |                                                                                               |                          |                          |                          |                          |                          |
|------------|-----------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>C5</b>  | I am confident that I can learn to use AI technologies effectively.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C6</b>  | AI should be integrated into routine healthcare practice where appropriate.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C7</b>  | Healthcare professionals should receive formal AI education and training.                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C8</b>  | AI should always be used under the supervision of qualified healthcare professionals.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C9</b>  | I am concerned that AI may increase ethical and legal challenges in healthcare.               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C10</b> | I am concerned about patient privacy and data security when AI is used in healthcare.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C11</b> | I believe AI will complement rather than replace healthcare professionals.                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>C12</b> | Overall, I have a positive attitude towards the use of artificial intelligence in healthcare. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Scoring:**

- Responses are scored on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).
- For negatively worded items (C9 and C10), reverse scoring will be applied during data analysis.
- Higher total scores indicate a more positive attitude towards artificial intelligence in healthcare.

**Section D: Educational Needs and Readiness for Artificial Intelligence**

**Instructions: Please indicate the extent to which you agree with each statement by selecting ONE response.**

**Response Scale**

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

| No.       | Statement                                                                                                   | 1                        | 2                        | 3                        | 4                        | 5                        |
|-----------|-------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>D1</b> | I am interested in learning more about artificial intelligence in healthcare.                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D2</b> | I believe AI education should be included in healthcare professional training programmes.                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D3</b> | My organization should provide regular training on AI applications in healthcare.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D4</b> | I would attend AI-related workshops or seminars if they were offered.                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D5</b> | I feel adequately prepared to use AI technologies in my clinical practice.                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D6</b> | Additional AI training would improve my confidence in using AI-assisted technologies.                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D7</b> | Healthcare organizations should establish clear policies and guidelines for AI use.                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>D8</b> | AI competency should become part of continuing professional development (CPD) for healthcare professionals. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Open-Ended Question (Optional)**

**D9.** In your opinion, what is the greatest challenge to implementing artificial intelligence in healthcare?

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**Thank you for your participation.**

**Your time and contribution to this study are greatly appreciated.**