KNOWLEDGE, ATTITUDE, AND PRACTICE OF TELEMEDICINE AMONG ATTENDEES IN OUTPATIENT CLINICS AT HOSPITAL PAKAR USM KELANTAN

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KNOWLEDGE, ATTITUDE, AND PRACTICE OF TELEMEDICINE
AMONG ATTENDEES IN OUTPATIENT CLINICS
AT HOSPITAL PAKAR USM KELANTAN

By

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Definition
AOR	Adjusted Odds Ratio
AUC	Area Under the Curve
BM	Bahasa Malaysia
HPUSM	Hospital Pakar Universiti Sains Malaysia
HTO	Health Transformation Office
ICT	Information and Communication Technology
KAP	Knowledge, Attitude, and Practice
KRK	Klinik Rawatan Keluarga
MOH	Ministry of Health
MOPD	Medical Outpatient Department
NHMS	National Health and Morbidity Survey
PDPA	Personal Data Protection Act
ROC	Receiver Operating Characteristic
SPSS	Statistical Package for the Social Sciences
USM	Universiti Sains Malaysia
VC	Virtual Consultation
VIF	Variance Inflation Factor
WHO	World Health Organization

LIST OF APPENDICES

LIST OF SYMBOLS

α	Alpha
β	Beta
=	Equal to
<	Less than
>	More than
n	Number of subjects
%	Percentage
P	Population's proportion
Δ	Precision of estimation
m	Ratio between two groups
Z	Z-score

PENGETAHUAN, SIKAP, DAN AMALAN TELEPERUBATAN DALAM KALANGAN PENGUNJUNG DI KLINIK PESAKIT LUAR HOSPITAL PAKAR USM KELANTAN

ABSTRAK

Pengenalan: Teleperubatan semakin menjadi kaedah penting dalam penyampaian perkhidmatan kesihatan, terutamanya dalam era pasca COVID-19. Walaupun penggunaannya semakin meningkat, terdapat kekurangan data mengenai tahap pengetahuan, sikap, dan amalan pesakit berkaitan penggunaan teleperubatan di hospital awam tertiari di Pantai Timur Malaysia.

Objektif: Kajian ini bertujuan untuk menentukan prevalens tahap pengetahuan, sikap dan amalan (KAP) yang baik serta mengenal pasti faktor-faktor yang berkaitan terhadap teleperubatan dalam kalangan pengunjung klinik pesakit luar di Hospital Pakar USM Kelantan.

Metodologi: Satu kajian keratan rentas telah dijalankan antara Oktober 2024 hingga Jun 2025 melibatkan 255 orang peserta yang dipilih secara sistematik daripada empat klinik pesakit luar. Instrumen KAP dalam Bahasa Malaysia yang telah disahkan sebelum ini digunakan untuk menilai tahap pengetahuan, amalan dan sikap berkaitan teleperubatan. Data dianalisis secara deskriptif dan menggunakan regresi logistik multivariat.

Keputusan: Prevalens pengetahuan, sikap dan amalan yang baik terhadap teleperubatan masing-masing adalah 60.4%, 75.7%, dan 52.2%. Amalan terhadap teleperubatan hanya dilaporkan oleh 52.2% peserta, walaupun secara umumnya tahap pengetahuan dan sikap adalah tinggi. Seramai 255 peserta daripada klinik pesakit luar di Hospital Pakar USM telah terlibat dalam kajian ini. Prevalens pengetahuan, sikap dan amalan yang baik terhadap teleperubatan masing-masing adalah 60.4%, 75.7% dan 52.2%. Amalan teleperubatan hanya dilaporkan oleh 52.2% peserta, walaupun

secara umum tahap pengetahuan dan sikap adalah tinggi. Analisis regresi logistik multivariat menunjukkan bahawa umur yang lebih muda (AOR = 0.95, 95% CI: 0.96–0.98, p < 0.05), status berkahwin (AOR = 2.86, 95% CI: 1.34–6.24, p < 0.05), dan sejarah penggunaan teleperubatan (AOR = 2.82, 95% CI: 1.27–6.98, p < 0.05) mempunyai hubungan signifikan dengan pengetahuan yang baik terhadap teleperubatan. Umur yang lebih muda (AOR = 0.95, 95% CI: 0.92–0.97, p < 0.05) dan status berkahwin (AOR = 3.69, 95% CI: 1.51–9.34, p < 0.05) pula didapati signifikan dengan sikap yang baik. Sementara itu, umur yang lebih muda (AOR = 0.97, 95% CI: 0.95–0.99, p < 0.05) dan sejarah penggunaan teleperubatan (AOR = 3.11, 95% CI: 1.42–7.43, p < 0.05) merupakan peramal signifikan bagi amalan yang baik terhadap teleperubatan.

Kesimpulan: Walaupun tahap pengetahuan dan sikap terhadap teleperubatan adalah agak tinggi, penemuan menunjukkan wujud jurang penggunaan yang sederhana, terutamanya dalam kalangan individu yang lebih berusia dan berpendapatan tinggi. Intervensi yang memfokuskan kepada literasi digital dan pendedahan terarah terhadap teleperubatan berpotensi meningkatkan kadar penggunaan dalam subkumpulan ini. Dapatan ini boleh digunakan untuk memaklumkan komponen sasaran dalam pelan hala tuju kesihatan digital Malaysia, termasuk integrasi dalam pengembangan tele-perawatan primer dan protokol telekonsultasi hospital awam. Memandangkan reka bentuk kajian yang berpusat di satu lokasi dan pengecualian pesakit akut, penemuan ini mungkin tidak mewakili keseluruhan populasi pesakit luar di Malaysia.

Kata Kunci: Teleperubatan, pengetahuan, sikap, amalan, klinik pesakit luar, hospital awam tertiari, Malaysia, kesihatan digital

KNOWLEDGE, ATTITUDE, AND PRACTICE OF TELEMEDICINE AMONG ATTENDEES IN OUTPATIENT CLINICS AT HOSPITAL PAKAR USM KELANTAN

ABSTRACT

Introduction: Telemedicine has become an increasingly important modality in delivering healthcare services, especially in the post COVID-19 era. Despite growing uptake, limited data exist on patient knowledge, attitudes, and behaviors regarding telemedicine use in public tertiary hospitals in East Coast Malaysia.

Objective: This study aimed to determine the prevalence of good knowledge, attitude, and practice (KAP) and to identify associated factors toward telemedicine among outpatient clinic attendees at Hospital Pakar USM Kelantan.

Methodology: A cross-sectional study was conducted between October 2024 and June 2025 involving 255 participants, systematically sampled from four outpatient clinics. A previously validated Bahasa Malaysia KAP instrument was used to assess telemedicine-related knowledge, attitude and practice. Data were analyzed descriptively and using multivariable logistic regression.

Results: A total of 255 participants from outpatient clinics at Hospital Pakar USM were included in the study. The prevalence of good knowledge, attitude, and practice toward telemedicine was 60.4%, 75.7%, and 52.2% respectively. Telemedicine practice was reported by only 52.2% of participants, despite generally high knowledge and positive attitudes. Multivariable logistic regression revealed that younger age (AOR = 0.95, 95% CI: 0.96–0.98, p < 0.05), being married (AOR = 2.86, 95% CI: 1.34–6.24, p < 0.05), and having a history of telemedicine use (AOR = 2.82, 95% CI: 1.27–6.98, p < 0.05) were significantly associated with good knowledge of telemedicine. Younger age (AOR = 0.95, 95% CI: 0.92–0.97, p < 0.05) and being married (AOR = 3.69,

95% CI: 1.51–9.34, p < 0.05) were significantly associated with good attitude. Meanwhile, younger age (AOR = 0.97, 95% CI: 0.95–0.99, p < 0.05) and a history of telemedicine use (AOR = 3.11, 95% CI: 1.42–7.43, p < 0.05) were significant predictors of good practice toward telemedicine.

Conclusion: Although knowledge and attitude toward telemedicine were relatively high, findings highlight a moderate uptake gap, particularly among older and higher-income individuals.

Interventions targeting digital literacy and guided exposure to telemedicine may help improve utilization in these subgroups. These findings can inform targeted components of Malaysia's digital health roadmap, including integration into tele-primary care expansion and public hospital teleconsultation protocols. Given the single-center design and exclusion of acutely ill patients, findings may not fully represent the broader outpatient population in Malaysia.

Keywords: Telemedicine, knowledge, attitude, practice, outpatient clinics, public tertiary hospital, Malaysia, digital health

CHAPTER 1
INTRODUCTION

1.1 Background

Telemedicine refers to the remote provision of healthcare services using digital communication technologies such as telephone calls, video conferencing, mobile applications, and online health platforms. According to the World Health Organization (WHO), telemedicine is defined as "the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies (ICTs) for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interest of advancing the health of individuals and their communities" (WHO, 2021). In the Malaysian context, the Ministry of Health defines telemedicine as "a healthcare system that uses ICT to deliver healthcare services and information from a distance for the purpose of health promotion, disease prevention, diagnosis, treatment, rehabilitation, and continuous learning" (MOH, 2023). This definition reflects Malaysia's commitment to leveraging digital platforms to expand healthcare access and improve service delivery, particularly for underserved populations.

Globally, the evolution of telemedicine has transformed the way healthcare is accessed and delivered. Over the past two decades, improvements in internet connectivity, widespread smartphone use, and the development of digital health platforms have enabled both high and middle income countries to extend healthcare services beyond traditional settings. The COVID-19 pandemic

acted as a major catalyst, pushing healthcare systems to adopt virtual consultations rapidly in response to lockdowns and mobility restrictions. Between 2019 and 2022, global telemedicine use increased by 38%, with countries such as the United Kingdom and Canada making significant strides toward integrated digital health systems. However, low and middle income countries like Malaysia have experienced uneven progress, with uptake constrained by infrastructural limitations and disparities in digital literacy (Shi *et al*., 2024).

Malaysia began formal telemedicine implementation in 2019 through initiatives such as the Tele Primary Care Oral Health (TPC–OH) programme and the establishment of the Health Transformation Office (HTO). These efforts reflect the national agenda to strengthen healthcare access and digital integration, as outlined in the Health White Paper 2023 (MOH, 2023). Despite these advancements, challenges persist. Digital health services tend to be more common in urban or higher income areas, while uptake in public tertiary hospitals, particularly outside the Klang Valley, remains limited (Ng *et al*., 2022). This disparity highlights the need to assess patient readiness in institutions like Hospital Pakar Universiti Sains Malaysia (HPUSM), where telemedicine has yet to be formally implemented. As a public tertiary referral and teaching hospital serving a diverse outpatient population, HPUSM offers a valuable baseline setting to examine patients' knowledge, attitudes, and willingness to engage with telemedicine prior to its integration into routine care. Unlike institutions such as the University of Malaya Medical Centre (UMMC), where studies have reported openness to video consultations among patients (Liew *et al*., 2023), the digital readiness of patients at HPUSM remains

underexplored. Given HPUSM's position within the public healthcare system, understanding the knowledge, attitudes, and practices (KAP) of its outpatient attendees will offer valuable insights into broader implementation challenges and help inform more inclusive digital health strategies in Malaysia.

1.2   Statement of the Problem

Malaysia is undergoing significant demographic and epidemiological transitions, with the proportion of older adults rising from 11.3% in 2023 to 11.6% in 2024 (DOSM, 2023). This shift contributes to a rising burden of non-communicable diseases (NCDs), leading to increasing demand for continuous and accessible healthcare. Yet, healthcare infrastructure development has not kept pace. According to the National Health and Morbidity Survey (NHMS) 2023, Malaysia's doctor-to-population ratio stands at 1:412, highlighting persistent challenges in the system's capacity to meet growing needs (NHMS, 2023).

One of the most visible consequences of this mismatch is prolonged patient waiting times in outpatient settings. A cross-sectional study in a public hospital in Ethiopia found that the average patient waiting time exceeded 185 minutes, which is significantly longer than the recommended threshold for timely care (Biya *et al*., 2022). Locally, an audit involving 756 patients at a primary care clinic in Gombak District revealed that although most patients were seen in under 90 minutes, delays were primarily due to long queues at registration, which was managed by a single clerical staff member responsible for both registration and appointment scheduling (Ariffin *et al*., 2017). These

3

findings reflect systemic inefficiencies that compromise patient satisfaction and place additional strain on healthcare personnel.

Digital health interventions, particularly telemedicine, have been identified as potential solutions to reduce congestion and improve access (Ghaddaripouri *et al.*, 2023). However, implementation remains uneven across Malaysian public facilities, especially in tertiary settings. Many healthcare facilities face structural limitations, including outdated infrastructure and slow digital adoption (Mohd Khalib, 2024).

Crucially, successful telemedicine integration depends not only on system readiness but also on public readiness. While policy efforts have gained momentum, there is limited empirical evidence on how patients in public tertiary hospitals perceive and engage with telemedicine services. This inconsistency highlights the need for contextual assessments to inform tailored strategies that align technological solutions with the operational realities and patient demographics of each institution.

1.3 Rationale of Study

Telemedicine offers a valuable tool in the management of non-communicable diseases (NCDs), which require regular monitoring, patient engagement, and timely intervention. Its benefits include enhanced access to care, particularly for underserved and rural populations, as well as improved patient satisfaction and cost efficiency (Dullet *et al.*, 2017; Ezeamii *et al.*, 2024). Globally, telemedicine has demonstrated effectiveness in managing chronic conditions like diabetes and hypertension by facilitating remote consultations and follow-up care. However, the adoption and success of telemedicine depend not only on infrastructure but also on population readiness specifically, their knowledge, attitudes, and actual usage behaviour.

In Malaysia, the Ministry of Health has introduced several digital health initiatives, including the Tele Primary Care Oral Health (TPC-OH), the Health Transformation Office (HTO), and the Health White Paper 2023. These efforts aim to modernize healthcare delivery and integrate digital services into the mainstream system. Although policy initiatives are in place, there remains limited understanding of patient perceptions and engagement with telemedicine within public tertiary healthcare institutions. Most existing studies have focused on provider perspectives or urban populations, leaving a gap in understanding patient-level factors within more diverse outpatient settings.

This study aims to address this gap by exploring the knowledge, attitude, and practice (KAP) of telemedicine among outpatient clinic attendees at Hospital Pakar Universiti Sains Malaysia (HPUSM). The findings will offer insight into user readiness, identify potential barriers to adoption, and support localized implementation strategies. This aligns with national priorities outlined in the 12th Malaysia Plan and Sustainable Development Goal (SDG) 3, which emphasize equitable access and health system resilience. By examining how patients perceive and use telemedicine, the study supports efforts to advance inclusive digital healthcare in Malaysia.

1.4 Research Questions

1. What is the level of knowledge, attitude, and practice (KAP) toward telemedicine among attendees in outpatient clinics at Hospital Pakar USM Kelantan?

2. What proportion of attendees in outpatient clinics at Hospital Pakar USM Kelantan exhibit good knowledge, attitude, and practice (KAP) toward telemedicine?

3. What factors are associated with good knowledge, attitude, and practice (KAP) toward telemedicine among attendees in outpatient clinics at Hospital Pakar USM Kelantan?

1.5 Objectives

1.5.1   General Objective
To determine knowledge, attitude, and practice (KAP) of telemedicine among   attendees in outpatient clinics at Hospital Pakar USM Kelantan

1.5.2   Specific Objectives
1. To estimate the proportion of good KAP toward telemedicine among attendees in outpatient clinics at Hospital Pakar USM Kelantan.

2. To determine factors associated with good KAP toward telemedicine among attendees in outpatient clinics at Hospital Pakar USM Kelantan

1.6 Research Hypotheses

There are associations between sociodemographic characteristics and good knowledge, attitude and practice toward telemedicine among attendees in outpatient clinics at Hospital Pakar USM Kelantan.

CHAPTER 2
LITERATURE REVIEW

2.1 Existing Literature Review on Knowledge, Attitude, and Practice (KAP)

Toward Telemedicine

Existing literature on telemedicine has increasingly adopted the KAP framework to assess community and patient readiness for digital health integration. These studies provide valuable insights into behavioral and systemic enablers or barriers to telemedicine adoption. A study conducted at selected public hospitals in Malaysia focused on physicians and nurses as participants, highlighting that gaps in telemedicine understanding often stemmed from limited exposure and inadequate digital infrastructure. The study emphasized that the uptake of telemedicine is highly influenced by its acceptance among healthcare providers, as patients are more likely to adopt such services when recommended by their physicians or nurses (Zailani *et al*., 2014). Subsequent research by Amin *et al*. (2022) noted that participants with higher education levels were more receptive to telemedicine, suggesting the role of socioeconomic and informational access in shaping user perceptions.

Attitudinal studies have also highlighted that positive sentiment alone may not guarantee active participation. (Idriss *et al*., 2022) found that prior telemedicine use was a key factor shaping confidence and willingness to re-engage with such services. These findings echo patterns reported in other low- and middle-income countries, where trust in digital platforms grows primarily through experiential use.

However, a recurring theme in KAP studies is the disconnect between positive attitudes and actual practice. Several researchers, including Soriano *et al*. (2021) and (John *et al*., 2021), argue that structural issues such as internet reliability, unfamiliarity with

virtual consultation tools, and lack of institutional standardization hinder consistent engagement. Furthermore, (Alam *et al.*, 2020) pointed out that healthcare providers themselves may lack training or confidence in telemedicine, thereby influencing the degree to which patients are exposed to or encouraged to use such services.

KAP studies on telemedicine emphasize the need for more than just raising awareness. They point toward a broader requirement for system level interventions, user-friendly platforms, and supportive health policies. These findings form the basis for evaluating KAP among Malaysian outpatient populations and highlight the relevance of context-specific data to inform equitable and sustainable digital health integration.

2.2 Studies on Prevalence of Good Knowledge of Telemedicine

The prevalence of good knowledge regarding telemedicine across different populations reveals both global progress and local disparities in digital health literacy. In the Malaysian context, studies show that while awareness of telemedicine is increasing, a deeper understanding of its applications, limitations, and ethical considerations remains inconsistent. This gap in comprehensive knowledge can hinder effective adoption, particularly in public healthcare settings.

A cross-sectional study conducted at the University Malaya Medical Centre (UMMC) involving adult outpatients reported that only 31.7% of respondents demonstrated good knowledge of telemedicine, despite 80.9% exhibiting positive attitudes (Liew *et al.*, 2023). The limited understanding among patients included uncertainty about the types of medical services that can be delivered virtually, the security of personal health information, and the role of telemedicine in chronic disease management.

Comparable findings from other Southeast Asian nations further reinforce this observation. A cross-sectional survey conducted in Indonesia during the COVID-19 pandemic reported that 63.5% of urban adult participants had good knowledge of telemedicine (Dwi Guna *et al.*, 2023). In contrast, a study in India among healthcare professionals found that only 41% demonstrated high or above-average knowledge, indicating a relatively low level of understanding despite their medical background (Zayapragassarazan and Kumar, 2016). Meanwhile, in Jordan, 51.5% of participants were classified as knowledgeable, yet actual experience with telemedicine services remained limited (Murshidi *et al.*, 2022).

These differences in prevalence illustrate that factors such as urbanisation, the effectiveness of public health messaging, and the urgency created by the COVID-19 pandemic can play a significant role in shaping telemedicine knowledge. Countries with more developed digital infrastructure and stronger public health communication during the pandemic tended to report higher knowledge levels. However, even in relatively connected urban populations, knowledge often remains superficial, suggesting that awareness does not always translate into functional understanding.

Comparative studies have shown that telemedicine knowledge is significantly influenced by age and geographic location. Younger individuals generally exhibit higher levels of understanding due to their familiarity with digital technologies and frequent use of mobile platforms, whereas older adults often struggle with limited digital literacy and confidence in using virtual health systems (Alajwari *et al.*, 2022; Jungwon Yoon and Soojung Kim, 2012). Similarly, urban populations tend to demonstrate better knowledge of telemedicine compared to rural residents, largely due to improved access to internet connectivity, smart devices, and proximity to healthcare services offering telehealth options (Curtis *et al.*, 2022).

Despite growing awareness, many individuals still possess only a superficial understanding of telemedicine, often lacking clarity on its practical use, legal implications, and data privacy concerns. This limited comprehension is particularly evident in underserved and rural communities, where digital literacy and access remain challenging. As such, targeted health education and digital capacity-building initiatives are essential to bridge these knowledge gaps and support equitable digital health adoption in Malaysia (John *et al*., 2021; Zailani *et al*., 2014).

2.3 Studies on Prevalence of Good Attitude of Telemedicine

Attitudes toward telemedicine are generally positive across various populations, but their strength and consistency differ depending on socioeconomic background, sector of healthcare use, and access to digital tools. Understanding these variations is essential for tailoring telemedicine strategies to meet the needs of diverse population groups.

A cross-sectional study involving medical students at a government university revealed that the majority showed a favourable attitude toward mobile health applications, driven by familiarity with technology and openness to digital innovation in healthcare (Jembai *et al*., 2022). The findings suggest that individuals with greater educational exposure to healthcare systems and digital platforms are more receptive to adopting telemedicine. Similarly, a study comparing user acceptance between the M40 and B40 income groups in Selangor using the SELangkah application found that the M40 group had significantly higher acceptance and attitude scores (Omar *et al*., 2024). These differences were attributed to better access to

smartphones, internet connectivity, and prior experience with digital healthcare services, indicating that income plays a critical role in shaping perceptions of telemedicine.

A conveniently conducted cross-sectional study by (Marzo *et al*., 2022) focusing on digital health literacy and health information seeking behaviour during the COVID-19 pandemic found that despite limited resources, many in the B40 income group were willing to engage with digital health services if adequate support and education were provided. Participants recognized the convenience and time-saving potential of telemedicine, especially during movement restrictions. However, their positive attitudes were accompanied by uncertainty in navigating unfamiliar platforms and concerns about data protection and system usability.

These findings align with post-pandemic studies in Southeast Asia, which observed that favourable attitudes toward telemedicine are generally stronger among individuals with stable internet access, higher digital literacy, and greater exposure to private healthcare services, where telehealth systems are often more streamlined and responsive (Jungwon Yoon and Soojung Kim, 2012). In contrast, users of public healthcare, although open to the idea of telemedicine frequently report concerns related to technical reliability, limited interpersonal communication, and inadequate engagement with healthcare providers.

Across studies, both educational level and income status consistently influence attitudes. Those from higher socioeconomic strata are more likely to perceive telemedicine as efficient and trustworthy, while individuals from disadvantaged backgrounds express cautious optimism, often requiring additional assurance regarding usability, access, and service quality. These patterns highlight the need to design inclusive digital health platforms that are sensitive

to the expectations and limitations of lower-income and underserved groups, thereby fostering equitable adoption of telemedicine across Malaysia's healthcare landscape.

2.4 Studies on Prevalence of Good Practice of Telemedicine

While awareness and attitudes toward telemedicine are generally favorable, actual utilization of telemedicine services remains significantly lower across many populations. The gap between intention and behavior reflects deeper structural and behavioral barriers, including limited digital access, insufficient institutional support, and varying levels of confidence in using technology.

In Malaysia, a cross-sectional study among outpatients at a public tertiary hospital reported that only 24.6% of respondents had engaged in telemedicine consultations, despite widespread positive attitudes (Liew *et al*., 2023). A similar trend was observed in Southern Ethiopia, where a cross-sectional study involving 407 randomly selected healthcare professionals found that only 26% had practiced telemedicine (Fikrie *et al*., 2025). The low uptake was attributed to infrastructural limitations, lack of institutional guidelines, and inadequate training, which are challenges commonly encountered in resource-limited settings.

In contrast, higher prevalence rates are observed in high-income countries. A national internet-based cross-sectional survey in the United States reported that 50.8% of adult respondents had used at least one form of telehealth (Fischer *et al*., 2020). This relatively higher engagement is likely due to more mature digital infrastructure, widespread device access, and policy-level support that accelerated telemedicine use during the COVID-19 pandemic.

However, usage patterns remain uneven across age groups, income brackets, and digital literacy levels, indicating persistent gaps even in digitally advanced settings.

A cross-sectional study conducted among general practitioners (GPs) in the Greater Eastern Region of France further illustrates the variability in telemedicine practice. Before the pandemic, only 10.3% of GPs had conducted teleconsultations. This figure increased sharply to 74.2% at the onset of the pandemic (Carrier *et al*., 2022). Despite this increase, 93.6% of GPs still conducted fewer than 15 teleconsultations per week, with nearly half conducting between one and five sessions. These figures suggest that although exposure to telemedicine increased rapidly due to necessity, its regular use remained constrained, possibly due to concerns over clinical appropriateness, workflow integration, and patient readiness.

Educational level has also been shown to influence the prevalence of good telemedicine practice. In a cross-sectional study conducted in Jordan, 67.8% of adults expressed willingness to use telemedicine for diagnosis or follow-up (Murshidi *et al*., 2022). Participants with higher education levels were significantly more open to engaging with telehealth platforms, suggesting that health literacy and digital competence are important enablers of telemedicine practice.

Although the global advancement of telemedicine has advanced significantly in the wake of COVID-19, the uptake of telemedicine practice remains modest. Closing this gap requires coordinated strategies to enhance system readiness, build user confidence, and ensure equitable access especially for those with limited technological exposure, lower education levels, or reliance on public healthcare systems.

2.5 Factors Associated with Good KAP Toward Telemedicine

2.5.1 Age

Age has consistently been identified as a significant factor influencing knowledge, attitude, and practice related to telemedicine. A large cross-sectional study conducted in the United States found that individuals aged 18 to 44 were significantly more likely to use telemedicine services compared to those aged 65 and older. The study highlighted younger adults not only accessed telemedicine more frequently but also reported greater satisfaction and ease of use, likely due to higher digital literacy and greater comfort with mobile technology platform (Chang *et al*., 2024).

Similarly, research in Saudi Arabia reported that younger age groups demonstrated higher telemedicine knowledge scores and greater actual use of telemedicine services. Younger individuals' greater exposure to online platforms and digital technologies has contributed to their higher levels of engagement with telemedicine, reflecting a generational gap in both technological confidence and accessibility (Alajwari *et al*., 2022).

In the Malaysian context, a study found that younger respondents were more likely to have a positive attitude and greater confidence in using telemedicine platforms, while older adults expressed discomfort with digital tools and concern about the impersonal nature of remote consultations (Liew *et al*., 2023). These findings collectively suggest the importance of targeted digital literacy initiatives for older populations to reduce age-related disparities in telemedicine adoption.

2.5.2 Sex

Sex differences have been observed as a significant factor influencing telemedicine-related knowledge, attitudes, and usage patterns. A cross-sectional study conducted in Jordan by found that female participants exhibited higher awareness and more favorable attitudes toward telemedicine compared to their male counterparts (Murshidi *et al*., 2022). This disparity may be attributed to women's greater involvement in health-related decision-making and caregiving roles, which could enhance their receptivity to alternative healthcare delivery models such as telemedicine.

Similarly, one study focusing on Jordanian public healthcare organizations reported that female healthcare professionals demonstrated a higher acceptance of telemedicine technologies than male professionals. This finding was linked to women's proactive engagement with digital health tools and their adaptability to new healthcare technologies (Al-Rawashdeh *et al*., 2023).

These findings highlight the importance of considering sex-based differences when developing and implementing telemedicine programs. Tailoring telehealth initiatives to address the specific needs and preferences of different genders can enhance the effectiveness and adoption of such services across diverse populations.

2.5.3 Race

Race and ethnicity have been identified as relevant determinants of disparities in telemedicine access and utilization. In the United States, a large-scale analysis found that Black and Hispanic patients were significantly less likely to access video-based telemedicine compared to White patients, even after adjusting for income and comorbidities (Eberly *et al*.,

2020). The study suggested that structural inequalities, differences in broadband access, and digital literacy levels may contribute to these racial disparities in telemedicine engagement.

A more recent study observed racial gaps in telehealth adoption during the COVID-19 pandemic. Their findings showed that although telephone-based telemedicine was more evenly used across races, video visits were disproportionately lower among patients from minority backgrounds, particularly among older Black and Latino adults (Rodriguez *et al.*, 2021). This emphasized that the "digital divide" continues to affect telemedicine equity, despite broader availability of services during the pandemic.

While racial disparities in telemedicine have not been as widely documented in Malaysia, the influence of race may still play a role, particularly in relation to language barriers, cultural perceptions of healthcare, and geographical distribution of healthcare resources. Future research in multi-ethnic contexts like Malaysia could explore how cultural attitudes and health system access across different racial groups affect KAP toward telemedicine.

2.5.4 Educational Level

Educational attainment plays a significant role in shaping individuals' engagement with telemedicine. A cross-sectional study conducted in Singapore found that lower educational levels were associated with decreased acceptability, desirability, and adherence to telemedicine services among adults aged 40 to 99. The study highlighted individuals with less education demonstrated lower levels of engagement with telemedicine, underscoring the need for targeted interventions to bridge this gap (J. Y. Tan *et al.*, 2024).

Similarly, data from the 2021 National Health Interview Survey in the United States revealed that telemedicine usage increased with higher education levels. Adults with a college degree or higher reported a 43.2% usage rate, compared to 28.7% among those without a high school diploma (Jacqueline and Maria, 2022). This trend suggests that higher educational attainment may facilitate better understanding and utilization of telehealth services.

Furthermore, a systematic review examining medical students' knowledge and attitudes toward telemedicine found that while students generally held positive attitudes, their knowledge levels were often insufficient (Ghaddaripouri *et al.*, 2023). The review emphasized the importance of integrating telemedicine education into medical curricula to enhance future healthcare providers' competencies in this domain.

These findings collectively indicate that educational level is a critical determinant of telemedicine engagement. Efforts to improve digital literacy and incorporate telemedicine training into educational programs are essential to promote equitable access and utilization of telehealth services across diverse populations.

2.5.5 Monthly Income

Monthly income is an important socioeconomic factor that influences how individuals engage with telemedicine services. People with higher incomes are more likely to have access to the necessary tools such as smartphones, stable internet connections, and private spaces to comfortably and confidently use telemedicine platforms.

In a study conducted in Saudi Arabia, respondents with higher monthly income levels were significantly more knowledgeable about telemedicine and more likely to have used it (Alajwari *et al.*, 2022). The authors suggested that financial capacity improves both access to

digital devices and exposure to healthcare innovations, which in turn leads to more frequent use. Similarly, in Malaysia, income level was found to significantly affect the adoption of telemedicine among patients and healthcare providers. Higher income individuals reported fewer concerns about cost, better access to infrastructure, and more confidence in using digital systems (Zailani *et al*., 2014). On the other hand, those in lower-income groups faced challenges such as limited access to technology and poor internet coverage, especially in rural areas, which reduced their engagement with telemedicine services.

These findings highlight that while telemedicine can improve healthcare accessibility, financial inequalities must be addressed to ensure that digital health services are truly equitable. Subsidised internet packages, device lending schemes, and simplified platforms can help bridge this income-related gap in telemedicine use.

2.5.6 Marital Status

Marital status may influence how individuals engage with telemedicine, especially through the lens of social support and shared responsibility in health decision-making. Those who are married or living with a partner tend to have more frequent exposure to healthcare needs either for themselves or their family members which can increase their openness to digital health solutions.

One systematic review showed that individuals cohabiting with partners were more inclined to adopt telemedicine, possibly due to the supportive role of spouses in navigating both healthcare decisions and the use of digital platforms (Harst *et al*., 2019). In addition, an online study conducted among Korean immigrants in the United States found that married women were more likely to use online health forums to obtain information relevant to both

their own health and that of their family. (Jungwon Yoon and Soojung Kim, 2012). This highlights how marital roles, particularly in caregiving, can drive more proactive health seeking behaviours and greater receptiveness to tools like telemedicine.

Conversely, unmarried individuals may lack such informal support systems and may be less inclined to explore or adopt telemedicine due to lower perceived necessity or confidence in using digital platforms.

2.5.7 Duration of Follow Up

The length of time a patient has been engaged in follow-up care can influence their exposure to healthcare innovations, including telemedicine. Patients with longer follow-up durations are more likely to be familiar with the hospital system, staff workflows, and available digital services, making them more receptive to adopting telemedicine as part of their routine care. A study in Malaysia found that patients who had regular interactions with healthcare providers over an extended period were more willing to adopt telemedicine (Zailani *et al*., 2014). Their familiarity with the healthcare setting and trust in the continuity of care contributed to a higher perceived usefulness of teleconsultations.

Similarly, a study assessed Malaysian citizens' willingness to pay for telehealth consultations. The study found that individuals with more frequent healthcare interactions, such as regular follow-ups, demonstrated a higher willingness to pay for telehealth services (Mey and Ogasawara, 2024). This suggests that ongoing engagement with healthcare providers may enhance patients' appreciation and acceptance of telemedicine options.

In contrast, patients who are new to a hospital system may be less aware of telemedicine options or hesitant to adopt them without having first built rapport with their

providers through in-person visits. These observations suggest that integrating telemedicine into follow-up routines, especially for patients with chronic conditions or frequent appointments, could enhance both acceptability and usage.

2.5.8 History of Using Telemedicine

Prior experience with telemedicine is strongly associated with higher levels of knowledge, more positive attitudes, and greater likelihood of continued use. Familiarity with the process from booking a virtual consultation to communicating with a healthcare provider online can help reduce uncertainty and build trust in the system.

A national study in Jordan among the adult population found that participants who had previously used telemedicine services were significantly more knowledgeable about its functions and limitations (Murshidi *et al*., 2022). These users also demonstrated more confidence in the effectiveness of remote care and reported greater satisfaction with their healthcare experiences. In contrast, those without prior exposure expressed more concerns about clinical accuracy, data privacy, and the lack of physical examination.

Similarly, previous experience with telemedicine has been shown to greatly improve patient satisfaction and increase the likelihood of future use (Idriss *et al*., 2022). Individuals who have engaged with telemedicine services before are more inclined to continue using them, largely due to greater familiarity, comfort with digital tools, and a recognition of the convenience and efficiency these platforms offer. Such positive encounters help to ease initial hesitations, foster trust in virtual care, and encourage long-term integration of telemedicine into routine healthcare practices. These findings emphasize the importance of initiating patients into telemedicine through guided experiences or trial consultations. When patients are

given an opportunity to use telemedicine in a supportive setting, it can demystify the process and encourage long-term engagement.

2.5.9 Geographic Location

Geographical location plays a significant role in shaping how individual access, perceive, and utilize telemedicine services. In general, individuals residing in urban areas are more likely to have better knowledge and more frequent use of telemedicine, primarily due to greater exposure to technology, better internet connectivity, and proximity to healthcare institutions that offer digital services.

A study by (Alajwari *et al*., 2022)in Saudi Arabia found that urban respondents were significantly more knowledgeable about telemedicine and more likely to have used it, compared to those in rural settings. The researchers attributed this gap to differences in infrastructure availability and digital readiness between urban and rural populations.

In Malaysia, findings by (Liew *et al*., 2023) support similar trends. Their study reported that patients in urban areas expressed more favourable attitudes toward telemedicine and were more likely to engage in virtual consultations. Rural participants, on the other hand, cited barriers such as limited internet coverage, lack of digital literacy, and a stronger preference for face-to-face interactions. These obstacles can hinder the acceptance and consistent use of telemedicine, despite its potential to improve healthcare access in remote regions.

Bridging this urban-rural divide requires investment in digital infrastructure, community-based education, and policies that support equitable telehealth implementation across all geographic areas.

2.6 Conceptual Framework

Figure 2.1 refers to the conceptual framework used for the current study. The framework illustrates that a range of factors may influence the knowledge, attitude, and practice (KAP) of telemedicine among outpatient clinic attendees. These factors were classified into sociodemographic characteristics, clinical factors, social influences, and geographical factors. Sociodemographic variables included age, gender, ethnicity, marital status, education level, and monthly income, while clinical factors consisted of the attending specialty and duration of follow-up. Social media usage and geographical factors were also considered as potential influences on patients' engagement with telemedicine. Other elements, such as hospital system and infrastructure, government policy, and technological advancement (e.g., mobile applications, digital healthcare platforms, MySejahtera), were acknowledged in the framework but were not studied within the scope of this research. These identified sociodemographic, clinical, and contextual factors were expected to be associated with participants' level of knowledge, attitude, and practice toward telemedicine, which was subsequently categorized as either good or poor.
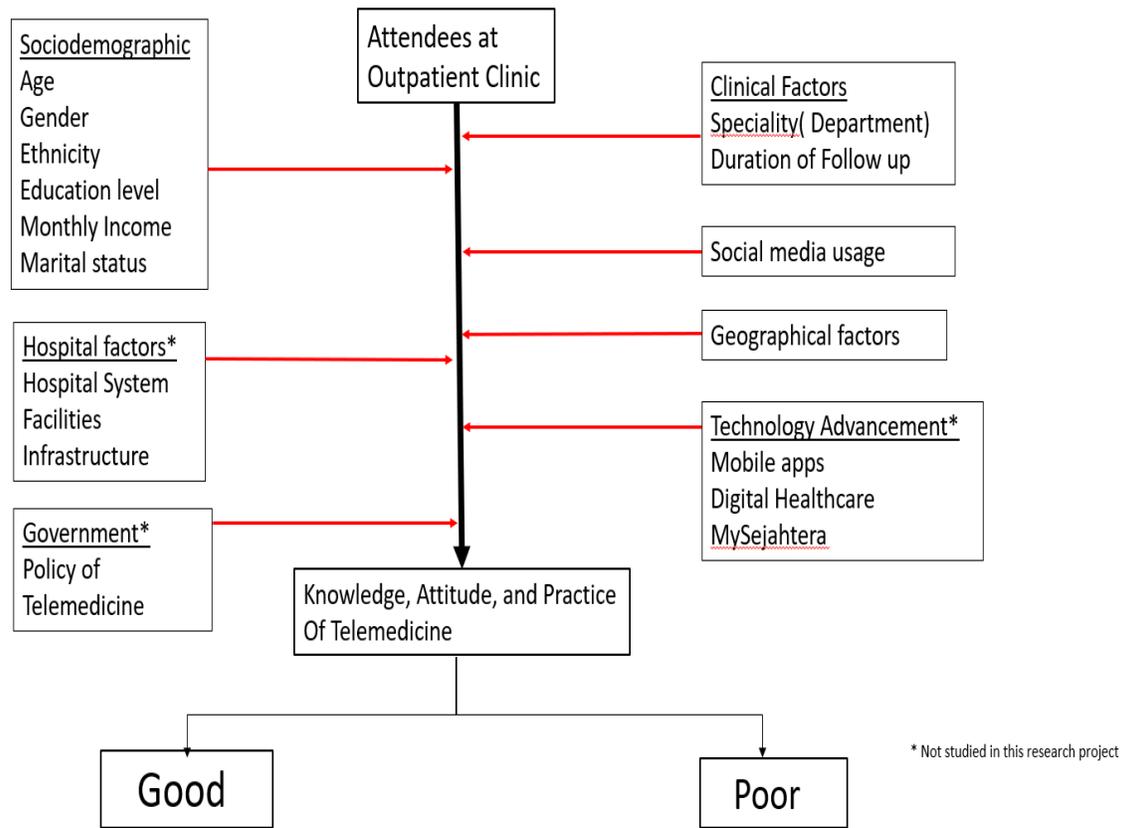
Figure 2.1 Conceptual Framework

CHAPTER 3
METHODOLOGY

3.1 Study Design

This study was a cross-sectional study using primary data

3.2 Study Duration

This study commenced from October 2024 until June 2025

3.3 Study Location

Outpatient Clinics at Hospital Pakar USM Kelantan

3.4 Reference Population

All adult patients attending outpatient services at public hospitals across the state of Kelantan.

3.5 Source Population

Adult patients attending outpatient clinics at Hospital Pakar USM Kelantan during the study period