HEALTH LITERACY AMONG OLDER ADULTS IN KUALA LUMPUR, KEDAH, AND JOHOR OF MALAYSIA AND ITS ASSOCIATED FACTORS

UNIVERSITI KEBANGSAAN MALAYSIA

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UNIVERSITI KEBANGSAAN MALAYSIA

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ABSTRAK

Menjelang tahun 2030, Malaysia dijangka mencapai status negara menua, menjadikan pemahaman tentang literasi kesihatan (HL) dalam kalangan warga emas semakin penting bagi pembangunan dasar kesihatan awam. Dalam beberapa tahun kebelakangan ini, pendigitalan pesat maklumat dan perkhidmatan kesihatan telah menekankan kepentingan literasi eKesihatan (eHL). Walau bagaimanapun, bukti empirikal mengenai tahap HL dalam kalangan warga emas Malaysia masih terhad dan berpecah-belah, manakala peranan eHL dalam mempengaruhi HL belum diteliti secara menyeluruh. Selain itu, dapatan daripada satu sorotan sistematik melibatkan 18 kajian berasaskan Malaysia menunjukkan bahawa literasi kesihatan dipengaruhi oleh pelbagai faktor sosiodemografi dan kontekstual seperti pendidikan, etnik, pendapatan dan akses kepada maklumat kesihatan, sekali gus menekankan keperluan kepada penyelidikan empirikal terkini. Kajian ini bertujuan untuk menilai tahap literasi kesihatan dalam kalangan warga emas Malaysia, mengenal pasti penentu utamanya, serta mengkaji hubungan antara literasi eKesihatan dan literasi kesihatan dalam konteks masyarakat pelbagai etnik. Satu tinjauan keratan rentas telah dijalankan melibatkan 377 warga emas berumur 60 tahun ke atas di tiga negeri yang mewakili latar sosioekonomi berbeza, iaitu Kuala Lumpur, Johor dan Kedah. Peserta yang layak ialah warganegara Malaysia berumur ≥60 tahun dengan fungsi kognitif normal. Kaedah pensampelan berperingkat telah digunakan bagi memastikan perwakilan yang mencukupi mengikut wilayah dan kumpulan etnik. Literasi kesihatan diukur menggunakan soal selidik HL yang telah disesuaikan, manakala literasi eKesihatan dinilai menggunakan Skala Literasi eKesihatan (eHEALS). Data sosiodemografi turut dikumpulkan. Statistik deskriptif, analisis korelasi dan regresi linear berganda digunakan untuk menilai hubungan dan mengenal pasti peramal bebas literasi kesihatan. Sampel kajian terdiri daripada 377 peserta dengan purata umur 68.21 tahun (SP = 5.75). Terdapat 214 wanita (56.8%) dan 163 lelaki (43.2%), dengan komposisi etnik merangkumi 209 Cina (55.4%), 157 Melayu (41.6%) dan 11 India (2.9%). Secara keseluruhan, tahap HL dan eHL adalah relatif rendah, dengan skor purata masing-masing 10.44 (SP = 3.576) daripada 20 dan 23.14 (SP = 12.155) daripada 40. Analisis korelasi menunjukkan hubungan signifikan antara HL dengan eHL, tahap pendidikan, umur, pendapatan, etnik dan susunan tempat tinggal ($p < 0.01$). Analisis regresi linear berganda mengenal pasti tiga faktor utama yang menyumbang secara bebas kepada HL, iaitu literasi eKesihatan ($\beta = 0.260$, $p < 0.001$), pencapaian pendidikan ($\beta = 0.257$, $p < 0.001$) dan etnik ($\beta = –0.288$, $p < 0.001$). Model regresi akhir adalah signifikan secara statistik dan menerangkan 30.6% varians dalam skor literasi kesihatan. Kesimpulannya, HL warga emas Malaysia masih suboptimum dan dipengaruhi oleh faktor sosiodemografi serta kecekapan digital. Pengukuhan eHL berpotensi meningkatkan HL dan menyokong penuaan sihat.

ABSTRACT

As Malaysia approaches the status of an aging nation by 2030, understanding health literacy (HL) among older adults becomes increasingly critical for public health policy. In recent years, the rapid digitalisation of health information and services has further underscored the importance of eHealth literacy (eHL). However, empirical evidence on HL among older adults in Malaysia remains fragmented, and the role of eHL in shaping HL has not been adequately examined. In addition, findings from a systematic review of 18 Malaysia-based studies indicate that health literacy is influenced by multiple sociodemographic and contextual factors, including education, ethnicity, income, and access to health information, highlighting the need for updated empirical investigation. This study aimed to assess the level of health literacy among Malaysian older adults, identify its key determinants, and examine the relationship between eHL and HL within a multi-ethnic context. A cross-sectional survey was conducted among 377 older adults aged 60 years and above in three Malaysian states representing different socioeconomic contexts: Kuala Lumpur, Johor, and Kedah. Eligible participants were Malaysian citizens aged ≥60 years with normal cognitive function. A multistage sampling method was employed to ensure adequate representation across regions and ethnic groups. HL was assessed using an adapted HL Questionnaire, while eHL was measured using the eHealth Literacy Scale (eHEALS). Sociodemographic information was collected. Descriptive statistics, correlation analyses, and multiple linear regression were employed to examine associations and identify independent predictors of HL. The study sample comprised 377 participants with a mean age of 68.21 years (SD = 5.75). Through descriptive statistics, there were 214 women (56.8%) and 163 men (43.2%), of whom 209 (55.4%) were Chinese, 157 (41.6%) were Malay, and 11 (2.9%) were Indian. Overall HL and eHL levels are relatively low, with scores of 10.44 (SD = 3.576) out of 20 and 23.14 (SD = 12.155) out of 40. Correlation analysis revealed significant associations between HL and eHL, education, age, income, ethnicity, and living arrangement ($p < 0.01$). The multiple regression analysis revealed three key predictive factors that independently contributed to health literacy outcomes: eHL ($\beta = 0.260$, $p < 0.001$), educational attainment ($\beta = 0.257$, $p < 0.001$), and ethnicity ($\beta = –0.288$, $p < 0.001$). The final regression model was statistically significant and accounted for 30.6% of the total variance in health literacy scores. This study demonstrates that HL among Malaysian older adults remains suboptimal and is shaped by both traditional sociodemographic factors and digital competencies. eHL emerged as a significant and independent predictor of HL, highlighting its growing importance in an increasingly digital health environment. Persistent ethnic, educational, and regional disparities point to the need for culturally sensitive, digitally inclusive, and regionally targeted interventions. Strengthening eHL among older adults may serve as a key strategy for improving overall HL and promoting healthy aging in Malaysia.

TABLE OF CONTENTS

		Page
DECLARATION		iii
ACKNOWLEDGEMENT		iv
ABSTRAK		v
ABSTRACT		vi
TABLE OF CONTENTS		vii
LIST OF TABLES		x
LIST OF ILLUSTRATIONS		xi
LIST OF ABBREVIATIONS		xii
CHAPTER I	**INTRODUCTION**	
1.1	Background	1
1.2	Research Problem Statement	4
1.3	Justification of the Study	4
1.4	Research Objective	5
	1.4.1 General Objective	6
	1.4.2 Specific Objective	6
1.5	Research Questions	6
1.6	Research Hypotheses	6
CHAPTER II	**LITERATURE REVIEW**	
2.1	Introduction	8
2.2	Older Adults	8
2.3	Health Literacy	9
	2.3.1 Systematic Review of HL Among Older Adults in Malaysia	10
	2.3.2 Characteristics of Included Studies	11
	2.3.3 HL Levels Among Older Adults in Malaysia	12
	2.3.4 Determinants of HL in the systematic review	13
2.4	e-Health Literacy	15
	2.4.1 eHL Among Older Adults: Global and Malaysian Evidence	16
	2.4.2 Determinants of eHL in Previous Studies	17
	2.4.3 Relationship Between eHL and HL	18

UNIVERSITI KEBANGSAAN MALAYSIA

2.5	Summary	18
CHAPTER III	**METHODOLOGY**	
3.1	Introduction	20
3.2	Study Design	20
3.3	Ethical Consideration	21
3.4	Sampling Method	22
3.5	Sample Size Calculation	23
3.6	Eligibility Criteria	24
	3.6.1 Inclusion Criteria	24
	3.6.2 Exclusion Criteria	25
3.7	Participant Recruitment	25
3.8	Data Collection	26
3.9	Research Instruments	26
3.10	Questionnaire Selection	26
	3.10.1 HL Instrument	27
	3.10.2 eHL Instrument	27
	3.10.3 Questionnaire Pilot Testing	28
3.11	Reliability Analysis	28
3.12	Validity Assessment	31
3.13	Statistical Analysis	35
CHAPTER IV	**RESULT**	
4.1	Introduction	37
4.2	The Level of HL Among Older Adults in Thress States	38
4.3	The Level of eHL Among Older Adults in Thress States	39
4.4	Factors Associated with HL	41
4.5	eHL As a Predictor of HL	48
	4.5.1 Predictors of HL	48
	4.5.2 Predictors of eHL	49
CHAPTER V	**DISCUSSION**	
5.1	Introduction	51
5.2	HL Among Malaysian Older Adults from Previous Studies	51
5.3	HL And eHL Among Malaysian Older Adults from the Study	54

UNIVERSITI KEBANGSAAN MALAYSIA

	5.3.1 Determinants of HL	54
	5.3.2 Relationship between eHL and HL	57
	5.3.3 The Role of eHL	58
5.4	Limitations	59
5.5	Strengths and Contributions	60
CHAPTER VI	**CONCLUSION**	
6.1	Introduction	62
6.2	Suggestion For Future Study	63
6.3	Final Summary	63
REFERENCES		**65**
Appendix A	Systematic Review of Health Literacy Outcome	75
Appendix B	Letter of Ethical Approval (Universiti Kebangsaan Malaysia)	80
Appendix C	Survey Questionnaire (Chinese Version)	83
Appendix D	Survey Questionnaire (English Version)	88
Appendix E	Survey Questionnaire (Malaysia Version)	94
Appendix F	System Review: Specific Scoring Criteria	102
Appendix G	Paper Published	113

UNIVERSITI KEBANGSAAN MALAYSIA

LIST OF TABLES

Table No.		Page
Table 3.1	Statistics on median income	22
Table 3.2	Reliability test	29
Table 3.3	Reliability analysis for eHL	30
Table 3.4	Reliability analysis for HL	31
Table 3.5	KMO and Bartlett's test of the eHL	31
Table 3.6	The HL content test	33
Table 4.1	Sociodemographic differences in HL	38
Table 4.2	Sociodemographic differences in eHL	40
Table 4.3	The correlation factors of eHL and HL (N=377)	43
Table 4.4	Post-hoc test (multiple comparisons) results	45
Table 4.5	Multiple regression of HL	49
Table 4.6	Multiple regression of eHL	50

UNIVERSITI KEBANGSAAN MALAYSIA

LIST OF ILLUSTRATIONS

Figure No.		Page
Figure 2.1	PRISMA flowchart of article selection in the systematic review	11
Figure 2.2	Actors affecting the level of health literacy	19

UNIVERSITI KEBANGSAAN MALAYSIA

LIST OF ABBREVIATIONS

DOSM	Department of Statistics Malaysia
EFA	Exploratory Factor Analysis
eHEALS	eHealth Literacy Scale
eHRQL	eHealth-related Quality of Life
FSK	Fakulti Sains Kesihatan
HeLMS	Health Literacy Management Scale
HIES	Household Income and Expenditure Survey
HL	Health Literacy
HLQ	Health Literacy Questionnaire
HLS-EU-Q47	European Health Literacy Survey Questionnaire
HLS-M-Q18	Health Literacy Survey Malaysian Questionnaire
HLS-SF12	Short Form Health Literacy Questionnaire
HRQL	Health-related Quality of Life
JBI	Joanna Briggs Institute
KMO	Kaiser–Meyer–Olkin
KR-20	Kuder–Richardson Formula 20
NHMS	National Health and Morbidity Survey
PAWE	Pusat Aktiviti Warga Emas
PCA	Principal Component Analysis
PRISMA-ScR	Systematic Reviews and Meta-Analyses extension for Scoping Reviews
PROSPERO	Prospective Register of Systematic Reviews
VIF	Variance Inflation Factor
WHO	World Health Organization

UNIVERSITI KEBANGSAAN MALAYSIA

CHAPTER I

INTRODUCTION

1.1 BACKGROUND

Population aging is a global demographic phenomenon, with the number and proportion of older adults increasing rapidly in almost all countries worldwide. The United Nations defines older persons as individuals aged 60 years and above (Vienna 1982). According to the World Health Organization (WHO), the global proportion of individuals aged 65 years and older is projected to increase from approximately 10% in 2022 to 16% by 2050 (Victor et al. 2022), reflecting significant improvements in life expectancy and healthcare advancements.

Malaysia is undergoing a rapid demographic transition towards an aging society. It was reported that 10.3% of the Malaysian population were aged 60 years and above in 2018 (Sooryanarayana & Sazlina 2020), and Malaysia is projected to become an ageing nation by 2030, when individuals aged 60 years and above will constitute approximately 14–15% of the total population (Nor & Ghazali 2022). According to the latest estimates from the Department of Statistics Malaysia (DOSM), the proportion of the population aged 65 and above (the older population) rose from 7.2% in 2022 to 7.4% in 2023, involving 2.5 million people (DOSM 2023). In addition to a growing older population, the aged are experiencing increased longevity, as demonstrated by rising life expectancy. Since Malaysia is a multiracial country with three mains racial components (Malays, Indians and Chinese), affected by different factors, the degree of aging varies among the three races, according to a paper, reported that the aging index fluctuated between 22.8% Bumiputera people (Malays and other indigenous populations), 31.4% among Indians, and 55.0% among Chinese (Tey et al. 2016). Thus, for multi-ethnic countries, addressing the issue of aging poses a great challenge. Aging

UNIVERSITI KEBANGSAAN MALAYSIA

is commonly associated with an increased prevalence of chronic non-communicable diseases and multimorbidity, which require continuous health management and frequent interaction with healthcare systems. Older adults are therefore required to engage actively in disease prevention, self-management, and health-related decision-making. In this context, health literacy plays a crucial role in enabling individuals to access, understand, appraise, and apply health information effectively.

The WHO defines Health Literacy (HL) as the cognitive and social skills that determine an individual's motivation and ability to access, understand, and use information to promote and maintain good health (WHO 2014). Adequate health literacy has been consistently associated with better health behaviours, improved disease management, and enhanced quality of life, particularly among individuals living with chronic conditions (González-Chica et al. 2016; Kim & Yu 2010; Lee, Lee & Moon 2016). Conversely, limited health literacy has been linked to poorer physical and mental health outcomes and increased healthcare utilisation. With the growing proportion of older adults, the importance of health literacy for this population has become increasingly significant. Older adults often face physical, cognitive, and social challenges that may limit their ability to acquire and apply health information effectively. Previous studies have shown that gaps in health literacy can restrict older adults' capacity to manage chronic illnesses, maintain independence (Kılıç, Arifoğlu & Kızılkaya 2023), and engage in health-promoting behaviours (Abdi et al. 2019).

In this context, HL plays a crucial role in enabling individuals to access, understand, appraise, and apply health information effectively. Previous studies have demonstrated that adequate health literacy can improve health outcomes among older adults living with chronic diseases (Lu et al. 2022). Higher levels of health literacy have also been identified as a protective factor against frailty among older adults in Taiwan (Wang, Chang, et al. 2022). Furthermore, evidence from Hong Kong during the COVID-19 pandemic indicated that older adults with lower health literacy experienced greater difficulty in making vaccination decisions (Zhang, Or & Chung 2020). Taken together, these findings suggest that health literacy plays a critical role in shaping older adults' healthcare decision-making (Halverson et al. 2013), including vaccination uptake, treatment choices, and adherence to medication instructions. Given that HL is

UNIVERSITI KEBANGSAAN MALAYSIA

a potentially modifiable determinant of health among older adults, increasing research attention has been directed toward identifying the factors that influence it. Numerous scholars have conducted reviews to synthesise existing evidence in this field. Previous studies have consistently identified multiple determinants of health literacy among older adults, including age, educational attainment, income level, ethnicity, living arrangements, and access to healthcare services and so on (Abdullah, Liew, et al. 2020; Bozkurt & Demirci 2019; Chesser et al. 2016). These factors interact within broader social and structural contexts, shaping older adults' capacity to obtain, understand, and apply health information effectively.

Concurrently, the rapid digitalisation of health information and healthcare services has transformed the way individuals seek and use health information. Digital health platforms, mobile health applications, and online health resources are increasingly utilised in healthcare delivery. eHealth literacy, defined as the ability to seek, find, understand, and evaluate health information from electronic sources and apply the acquired knowledge to address health problems, has therefore emerged as an important extension of health literacy in the digital era (Wang, Gao & Li 2017). While digital health technologies offer significant opportunities to enhance health management, not all population groups benefit equally (Walker et al. 2020). Older adults with limited eHealth literacy may experience difficulties accessing reliable online health information, potentially exacerbating existing health inequalities (Bodie & Dutta 2008). Previous studies have suggested that eHealth literacy is associated with health literacy and may influence individuals' ability to utilise health information effectively, although evidence among older adults remains limited and inconsistent (Neter 2015). In the context of an ageing and increasingly digitalised society, understanding health literacy among older adults, as well as the role of eHealth literacy as a potential influencing factor, is essential for informing health education strategies and supporting healthy ageing initiatives in Malaysia. As a result, disparities in eHealth literacy will be a key study variable in our examination into the effect of eHealth education in health literacy among Malaysian older individuals.

UNIVERSITI KEBANGSAAN MALAYSIA

1.2 Research Problem Statement

The necessity for older persons to actively participate in health management, chronic disease prevention, and healthcare decision-making has increased due to Malaysia's swift transition to an aging society (Sooryanarayana & Sazlina 2020). Evidence now available, however, indicates that a sizable fraction of older persons may lack health literacy (Abdi et al. 2019), which might impair their capacity to comprehend medical information, follow treatment guidelines, and make efficient use of healthcare facilities.

At the same time, older persons must have sufficient eHealth literacy due to the growing dependence on digital platforms for the delivery of health information and services. Accessing trustworthy online health information and utilizing digital health services may be challenging for the with low eHealth literacy (Bodie & Dutta 2008), which might exacerbate already-existing health disparities.

Despite the significance of health literacy and eHealth literacy for healthy ageing, empirical research about the levels of health literacy and eHealth literacy among older persons in Malaysia is insufficient, especially across various ethnic and socioeconomic groups. The correlation between eHealth literacy and health literacy among older Malaysians is inadequately investigated. This gap constrains the advancement of evidence-based treatments and policies designed to enhance health literacy and mitigate health inequities among the aging population.

1.3 JUSTIFICATION OF THE STUDY

Malaysia is undergoing a significant demographic transition, moving toward an aging society. The proportion of individuals aged 60 and above is increasing rapidly, and it is projected that 15% of Malaysia's population will be over the age of 60 by 2030 (Nor & Ghazali 2022), officially classifying the nation as an aging society. Additionally, Malaysia's multi-ethnic composition adds complexity to this demographic shift, with the Chinese population aging at a faster rate compared to the Malay and Indian populations. However, the challenges of an aging society extend beyond population size to encompass critical issues such as the welfare, health, care, and living conditions of older adults.

UNIVERSITI KEBANGSAAN MALAYSIA

In response to these challenges, national health policies have emphasized the importance of promoting healthy aging. The Malaysian National Health and Morbidity Survey (NHMS) 2018 highlighted the need for targeted health interventions to support older adults (Ministry of Health Malaysia 2018). However, findings from the NHMS 2019 revealed that one in three adults has a relatively low level of health literacy, and the specific health literacy levels among those aged 60 and above remain unknown (National Institutes of Health 2019). Limited health literacy among older adults may hinder effective disease management, healthcare navigation, and informed health decision-making, thereby increasing health inequalities within the aging population.

Concurrently, the widespread adoption of smartphones, the Internet, and healthcare applications, e-Health has emerged as a pivotal medium for disseminating health information and delivering healthcare services. Previous studies have demonstrated that eHealth literacy significantly influences health behaviors and outcomes (Heudel et al. 2022), particularly in chronic disease management (Refahi, Klein & Feigerlova 2023). Nevertheless, empirical evidence on eHealth literacy among older adults in Malaysia remains scarce, and its contribution to overall health literacy in this population has not been adequately examined. Therefore, it is imperative to examine the eHealth literacy of Malaysian older adults and identify the factors influencing it, providing a foundation for evidence-based health policies and targeted interventions. Identifying the role of eHealth literacy alongside sociodemographic factors will provide valuable insights into the barriers and facilitators affecting older adults' ability to access, understand, and utilise health information effectively.

Therefore, this study is justified as it addresses critical gaps in the existing literature by examining the levels of health literacy and eHealth literacy among older adults in selected states of Malaysia and identifying factors associated with health literacy. The findings will contribute empirical evidence to inform targeted health education programs, digital health initiatives, and policy strategies aimed at enhancing health literacy and promoting healthy aging among Malaysia's older population.

1.4 RESEARCH OBJECTIVE

This research focuses on one general objective and four specific objectives.

UNIVERSITI KEBANGSAAN MALAYSIA

1.4.1 General Objective

To study the level of health literacy among older adults in selected states of Malaysia.

1.4.2 Specific Objective

1. To determine the level of health literacy among older adults in selected states of Malaysia.
2. To determine the level of eHealth literacy among older adults in selected states of Malaysia.
3. To examine the association between sociodemographic factors and health literacy among older adults.
4. To identify predictors of health literacy among older adults, with particular emphasis on eHealth literacy.

1.5 RESEARCH QUESTIONS

Based on the research objectives, the following research questions are proposed:

1. What is the level of health literacy among older adults in selected states of Malaysia?
2. What is the level of eHealth literacy among older adults in selected states of Malaysia?
3. Are sociodemographic factors associated with health literacy among older adults?
4. Is eHealth literacy a significant predictor of health literacy among older adults?

1.6 RESEARCH HYPOTHESES

Drawing on the existing empirical evidence, this study formulates the following hypotheses.

UNIVERSITI KEBANGSAAN MALAYSIA

H1: There is a significant association between eHealth literacy and health literacy among older adults.

H2: Sociodemographic factors, including age, education level, income, and ethnicity, are significantly associated with health literacy among older adults.

H3: eHealth literacy is a significant predictor of health literacy among older adults.

UNIVERSITI KEBANGSAAN MALAYSIA

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides a comprehensive overview of the literature on health literacy among older adults in Malaysia, the status of eHealth literacy, and a summary of the relevant literature describing the factors affecting health literacy among older adults. Importantly, this chapter incorporates the findings of the systematic review, which aimed to synthesize current evidence on health literacy among older adults in Malaysia and identify key determinants relevant to the development of the conceptual framework and variables examined.

2.2 OLDER ADULTS

The term *older adult*s generally refers to individuals aged 60 years and above (Vienna 1982), also known as elders, seniors, older individuals, older adults, senior citizens, or the elderly. This age threshold is widely adopted and is commonly used in ageing research, particularly in low- and middle-income countries. In Malaysia, individuals aged 60 years and above are officially recognized as older adults in the national demographic classifications and policy frameworks, making this definition appropriate and contextually relevant for the present study.

Malaysia is currently undergoing a rapid demographic transition towards an aging society. Improvements in public health, medical technology, and living standards have contributed to increased life expectancy, while declining fertility rates have accelerated population aging. Malaysia is expected to become an aging nation when the percentage of older adults reaches 15% of the total population by 2030 (National Digital Department 2025). This demographic shift poses substantial challenges to the

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healthcare system, particularly in relation to the provision of accessible, comprehensible, and equitable health information for an aging population.

Older adults are especially vulnerable to limited health literacy due to age-related cognitive and sensory changes, the higher prevalence of chronic diseases, and increased reliance on healthcare services (MacLeod et al. 2017). The rapid digitalization of healthcare further compounds these challenges. The growing use of online platforms for health information, appointment scheduling, disease management, and public health communication requires digital competencies that many older adults lack. Limited exposure to digital technologies, lower confidence in internet use, and reduced opportunities for digital skill development may increase the risk of digital exclusion among older adults (Zhang et al. 2025), thereby exacerbating existing health inequalities.

Considering these challenges, older adults represent a critical population for health literacy research. Understanding their health literacy levels, associated determinants, and the role of digital competencies is essential for informing the development of age-friendly, culturally appropriate, and inclusive health communication strategies. Studying health literacy among older adults, therefore provides valuable insights into how healthcare systems can better support healthy ageing and promote equity in access to health information and services

2.3 HEALTH LITERACY

The HL is seen as the ability to maintain and improve one's physical and mental health by acquiring health knowledge and services through external means (WHO 2014). It has been identified as a key component of improving health and well-being while reducing health disparities (von Rueden 2023). Among older adults, adequate health literacy is essential for effective chronic disease management, medication adherence, and utilisation of preventive services, and engagement in shared decision-making with healthcare providers (Lee et al. 2016).

UNIVERSITI KEBANGSAAN MALAYSIA

2.3.1 Systematic Review of HL Among Older Adults in Malaysia

A systematic review was conducted to synthesise existing evidence on health literacy among older adults in Malaysia. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines and was registered with the International Prospective Register of Systematic Reviews (PROSPERO), CRD420251115326. Figure 2.1 presents an overview of the study selection process using the PRISMA flowchart. Peer-reviewed articles published between 2015 and 2025 were identified through comprehensive searches of electronic databases, including Web of Science, PubMed, and Scopus. Studies were included if they examined health literacy among Malaysian older adults and reported either health literacy levels, associated factors, or outcomes related to health literacy. Details of the studies included in the systematic review are provided in Appendix A.

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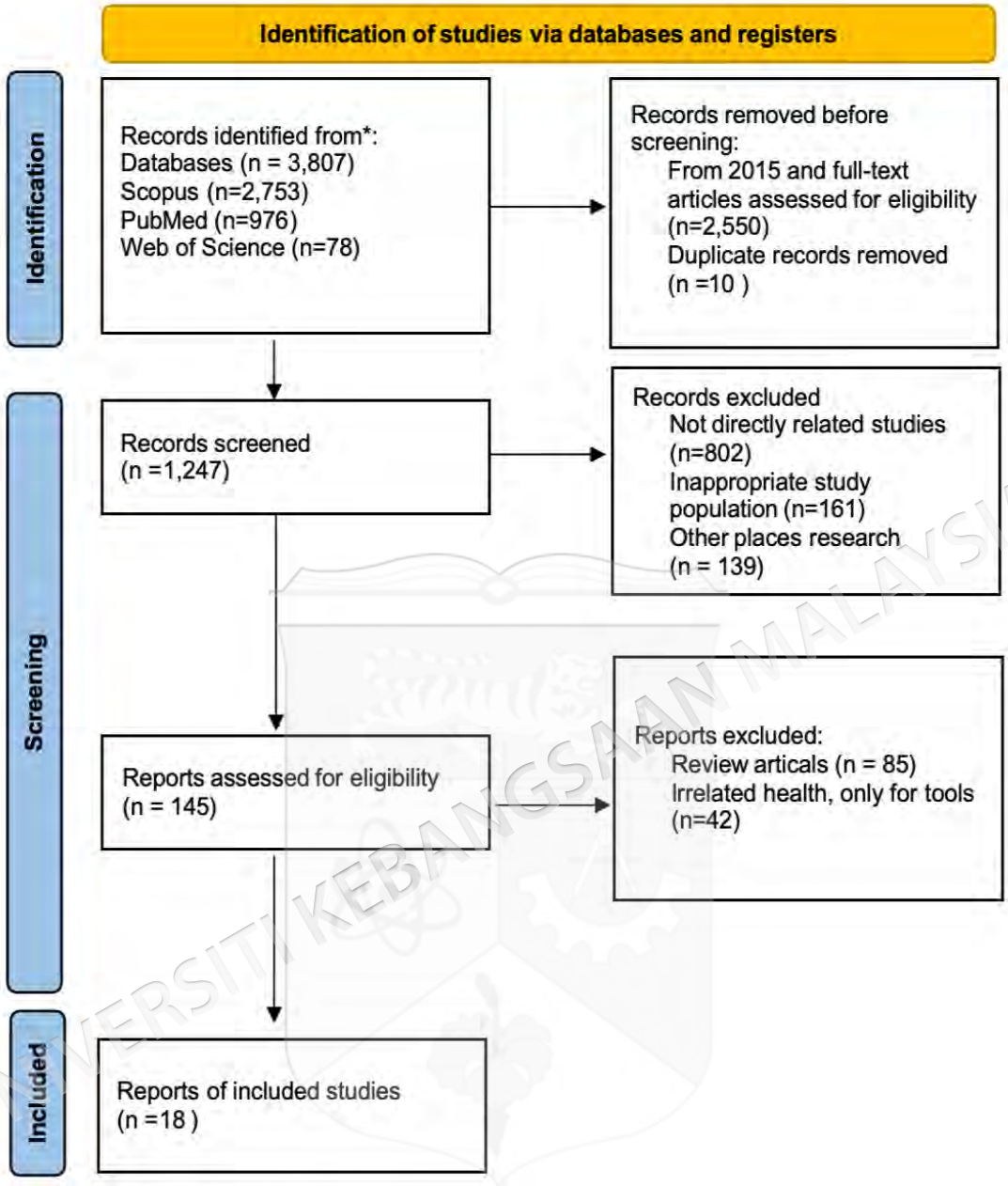

Figure 2.1 PRISMA flowchart of article selection in the systematic review

2.3.2 Characteristics of Included Studies

A total of 18 studies met the inclusion criteria and were included in the systematic review. Most studies employed cross-sectional designs and were conducted in primary care clinics, hospitals, or community settings across different regions of Malaysia. Sample sizes varied across studies, and participants were generally aged 60 years and above. Various validated instruments were used to measure health literacy, including the Health Literacy Survey Malaysian Questionnaire (HLS-M-Q18), the European

Health Literacy Survey Questionnaire (HLS-EU-Q47), the Short Form Health Literacy Questionnaire (HLS-SF12), and the Health Literacy Management Scale (HeLMS). The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) critical appraisal tools, with most studies demonstrating moderate to high methodological quality. Details of the studies included in the evaluation criteria systematic review are provided in Appendix F.

2.3.3 HL Levels Among Older Adults in Malaysia

Existing studies conducted in Malaysia consistently indicate that health literacy levels among older adults remain generally low. Evidence from studies conducted in urban primary healthcare settings suggests that a substantial proportion of older adults experience difficulties accessing, understanding, and applying health-related information (Abd-Rahim et al. 2021). Previous research has reported that between approximately one-third and two-thirds of older adults exhibit limited or insufficient health literacy, highlighting the magnitude of this public health concern among the aging population (Chan et al. 2019a). In addition to general health literacy, emerging evidence suggests that eHealth literacy among Malaysian older adults is particularly limited. Studies have reported relatively low levels of confidence and ability in using digital health information, reflecting challenges in navigating online health resources and digital healthcare platforms (Wong et al. 2022). Limited access to digital devices and low adoption of digital health technologies among older adults further exacerbate this issue, contributing to a pronounced digital divide within this population (Md Fadzil et al. 2023).

These findings collectively indicate that many older adults in Malaysia face the compounding challenge of dual deficits in health literacy and eHealth literacy. Limited capacity to utilise health information effectively, particularly in digital environments, may restrict older adults' ability to engage in informed health decision-making and self-management. These patterns underscore the importance of examining health literacy among older adults within the Malaysian context, while also considering the role of eHealth literacy in an increasingly digitalised healthcare system.

2.3.4 Determinants of HL in the systematic review

Findings from the systematic review indicate that a range of interrelated sociodemographic, cognitive, and health-related factors influences health literacy among older adults in Malaysia. The key determinants identified across the reviewed studies are discussed below.

a. Age

Across the reviewed studies, increasing age was consistently associated with lower health literacy levels, particularly among the oldest-old population. Age-related declines in cognitive and functional capacity may partially explain the reduced ability to access and process health information among older age groups (Abdullah, Ng, et al. 2020; Chan et al. 2019a). Age-related declines in cognitive functioning, sensory abilities, and digital familiarity may partially explain this association. Longitudinal data show health literacy declines over a decade in later life (Curtis et al. 2021). These findings suggest that advancing age represents a structural vulnerability factor influencing health literacy among older adults.

b. Educational Attainment

Educational attainment emerged as one of the top predictors of health literacy. Lower levels of formal education were strongly associated with inadequate health literacy (Abd-Rahim et al. 2021; Kong et al. 2019). Chinese studies in community and institutional settings show secondary or higher education roughly doubles the odds of being in a higher health-literacy profile (Xie et al. 2022). Education may enhance individuals' reading comprehension, critical thinking skills, and ability to navigate healthcare systems. Conversely, limited educational exposure may restrict the capacity to understand medical terminology and evaluate health information, thereby increasing susceptibility to misinformation.

c. Income and Socioeconomic Status

Income and socioeconomic status were consistently identified as significant determinants of HL among older adults(Abd-Rahim et al. 2021), alongside age and low

education. Chinese urban and institutionalized older adults show strong socioeconomic status gradients: higher education, higher income, and less financial strain are tightly associated with better digital health information literacy and general health literacy (Li & Guo 2021). Furthermore, individuals with lower socioeconomic status often have less access to preventive health programs and fewer interactions with healthcare providers, which may further limit their ability to develop and apply health literacy skills-even though the relationship between these factors and health literacy remains unclear (Stormacq, Van den Broucke & Wosinski 2019).

d. Marital Status and Living Arrangement

Marital status also emerged as a relevant determinant, with widowed and single older adults more likely to experience limited health literacy compared to those who were married. This pattern may reflect differences in social support and shared health-related decision-making within households (Abd-Rahim et al. 2021). Socioeconomic factors were frequently reported as important contributors to health literacy disparities. The presence of a spouse may facilitate shared decision-making and provide emotional and informational support.

e. Gender and Ethnicity

Gender-related differences were reported inconsistently across studies. While women demonstrated higher levels of disease-specific knowledge and health awareness in certain contexts, such as osteoporosis-related knowledge, the overall association between gender and health literacy remained mixed (Kamsan et al. 2020). Ethnic differences were less frequently examined; however, existing evidence suggests that health literacy may exert a stronger influence on health-related behaviours among certain ethnic groups, highlighting the importance of considering cultural and contextual factors in the Malaysian setting (Froze, Arif & Saimon 2019).

f. Cognitive Function

In addition to sociodemographic characteristics, cognitive function was identified as a significant determinant of health literacy among older adults. Evidence suggests that

UNIVERSITI KEBANGSAAN MALAYSIA

older individuals with cognitive impairment or reduced cognitive capacity are more likely to experience difficulties in understanding and applying health-related information, which may adversely affect their ability to manage health conditions effectively (Mohammad Hanipah et al. 2024).

Beyond general literacy levels, the reviewed studies also highlighted domain-specific variations in health knowledge among older adults. Limited understanding of antibiotic use and antibiotic resistance was commonly reported, alongside gaps in knowledge related to food poisoning prevention (Zaujan et al. 2021) and dietary salt intake (Haron et al. 2020). Conversely, relatively higher levels of knowledge were observed in specific areas, such as COVID-19 prevention, particularly regarding isolation and preventive practices (Elias & Rohinmi 2022). These findings suggest that health literacy among older adults is not uniform across health domains and may vary depending on exposure, public health messaging, and perceived relevance.

Overall, the systematic review indicates that health literacy among older adults in Malaysia is shaped by a complex interaction of individual, social, and contextual factors. These determinants informed the selection of variables and the development of the conceptual framework for the present study, ensuring alignment between existing evidence and the survey investigation.

2.4 E-HEALTH LITERACY

eHealth literacy, also known as digital health literacy or electronic health literacy, is an extension of the notion of health literacy (Luo et al. 2018), was first proposed in 2006, and is described as the capacity to successfully search, identify, analyze, interpret, and assess health information from electronic resources, followed by using the obtained knowledge to address and overcome health-related problems (Lwin et al. 2020). As healthcare systems increasingly rely on digital platforms for information dissemination and service delivery, eHealth literacy has become an important determinant of individuals' capacity to engage effectively with healthcare resources. So, researchers have focused heavily on the impact of eHealth literacy on health outcomes.

UNIVERSITI KEBANGSAAN MALAYSIA

2.4.1 eHL Among Older Adults: Global and Malaysian Evidence

Existing literature indicates that there is intergroup variability in the level of eHealth literacy, which is influenced by age, race, education, occupation, gender, and other. Some research implied eHL is lower in older adults than in other groups, and higher in those with more education, like on a 7-point scale, 3.99, SD 1.32, and mean 3.82, SD 1.33, for the high and low eHealth literacy groups, respectively, $F_{1,1274} = 5.43$, $P < .02$. (Neter & Brainin 2012). A literature review from the United States demonstrates a significant age and racial/ethnic e-Health digital divide among older adults in terms of skills and experience in performing digital tasks and using online resources for health information and advice, with over 75% of adults aged 65 to 79 reporting easy access. However, access rates decline with age and are lower among Black, Hispanic, and Filipino populations compared to White individuals, and less than one-third (<33%) of adults aged 65 to 79 own a smartphone. Smartphone ownership declines with age and is lower among Hispanic and Filipino adults compared to white adults. (Gordon & Hornbrook 2018). However, in the Malaysian context, empirical evidence on eHealth literacy remains limited, particularly among older adults. Available studies conducted in primary healthcare settings suggest that Malaysian adults demonstrate relatively low levels of eHealth literacy, with notable difficulties in critically evaluating online health information despite confidence in information seeking (Wong et al. 2022), but lack the skills to evaluate the information. Through a scoping search, there is a blank area for investigating the level of eHealth literacy among the older adult population in Malaysia. Therefore, exploring the level of eHealth literacy among the older adult population in Malaysia is one of the research objectives.

However, in the Malaysian context, empirical evidence on eHealth literacy remains limited, particularly among older adults. Available studies conducted in primary healthcare settings suggest that Malaysian adults demonstrate relatively low levels of eHealth literacy, with notable difficulties in critically evaluating online health information despite confidence in information seeking (Wong et al. 2022), but lack the skills to evaluate the information. Through a scoping search, there is a blank area for investigating the level of eHealth literacy among the older adult population in Malaysia.

Therefore, exploring the level of eHealth literacy among the older adult population in Malaysia is one of the research objectives.

2.4.2 Determinants of eHL in Previous Studies

eHealth literacy, defined as the ability to find, understand, and critically evaluate health information obtained from electronic sources, is influenced by several individual and contextual factors.

Demographic variables such as age, education level, and income have been shown to play an important role in determining the level of eHealth literacy. Most studies have used sociological factors as dependent or control variables to investigate how eHealth literacy and health literacy are related and have found that they are mainly related to age and education. Among the older population in China, factors such as age, educational attainment, socioeconomic status, physical and mental health conditions, and frequency of internet use significantly influence levels of eHealth literacy (Shi et al. 2023). There is also significant racial differentiation across eHealth literacy levels (Gordon & Hornbrook 2018). Additionally, several studies have highlighted the concept of self-efficacy as a critical determinant, emphasizing its pivotal role in enhancing eHealth literacy among older adults (Pourrazavi et al. 2020; Wang, Song, et al. 2022). Furthermore, the health behaviors of older adults have been found to significantly correlate with their level of eHealth literacy, indicating a reciprocal relationship between these variables (Mitsutake et al. 2016; Wang, Song, et al. 2022).

External environmental factors come more from social support and social connections. Specifically, social support (Ma et al. 2023), such as community-provided health information or technical support (Tirado-Morueta et al. 2021), can increase eHealth literacy among older adults, particularly positively affecting the self-management of chronic non-communicable diseases (Wu et al. 2023). Social connections, including trust, reciprocity, and cohesion within communities, further facilitate the adoption of eHealth literacy by fostering a supportive environment for learning and engagement (Cao et al. 2023). In addition, social interaction has a positive moderating effect on the relationship between health knowledge seeking and patient

eHealth literacy (Zhou & Fan 2019). These findings highlight the importance of leveraging community resources and social networks to bridge gaps in eHealth literacy.

2.4.3 Relationship Between eHL and HL

The level of eHealth literacy, in turn, significantly influences overall health literacy, which encompasses the capacity to access, understand, and use health information to make informed decisions. Some research implicated a positive correlation between eHealth literacy and health-related behaviors (Kim et al. 2023) of older adults to improve their quality of life (Li et al. 2021), with high eHealth literacy enhancing decision-making skills and face-to-face inquiry (Chang & Schulz 2018), while low eHealth literacy may result in limited access to health information for seniors, making it difficult to find accurate and reliable health information online, and exacerbating health problems as a result of the lack of eHealth literacy knowledge that may lead to delays in diagnosis and treatment, with some studies suggesting that low eHealth literacy is associated with poorer health outcomes (Milanti et al. 2023).

2.5 SUMMARY

This chapter reviewed existing literature on health literacy and eHealth literacy among older adults, with particular attention to the Malaysian context. The review demonstrates that health literacy among older adults is a growing public health concern, influenced by a combination of sociodemographic, cognitive, and socioeconomic factors. Prior studies have consistently demonstrated that lower health literacy levels among older adults, particularly those of advanced age, lower educational attainment, limited income, and reduced social support (Abd-Rahim et al. 2021; Abdullah, Ng, et al. 2020; Chan et al. 2019a). The literature further suggests that eHealth literacy has become an increasingly important dimension of health literacy within digitalised healthcare systems. International evidence shows that older adults tend to experience greater challenges in accessing and evaluating online health information compared to younger populations (Gordon & Hornbrook 2018). In Malaysia, the amount of empirical research concerning eHealth literacy is still developing, with a major focus on general adult populations, as compared to the specific needs of older adults (Wong et al. 2022). While prior investigations have identified a range of factors impacting

UNIVERSITI KEBANGSAAN MALAYSIA

health literacy and eHealth literacy, the majority of these studies have addressed these areas in isolation. The relationship between health literacy and eHealth literacy among older adults, particularly within the Malaysian context, has not been sufficiently explored. Moreover, the generalizability of existing research findings to Malaysia's diverse and multiethnic population is constrained, given the frequent geographical limitations and the predominance of cross-sectional study designs. Figure 2.2 demonstrates the above-mentioned factors affecting the level of eHealth literacy among older adults.

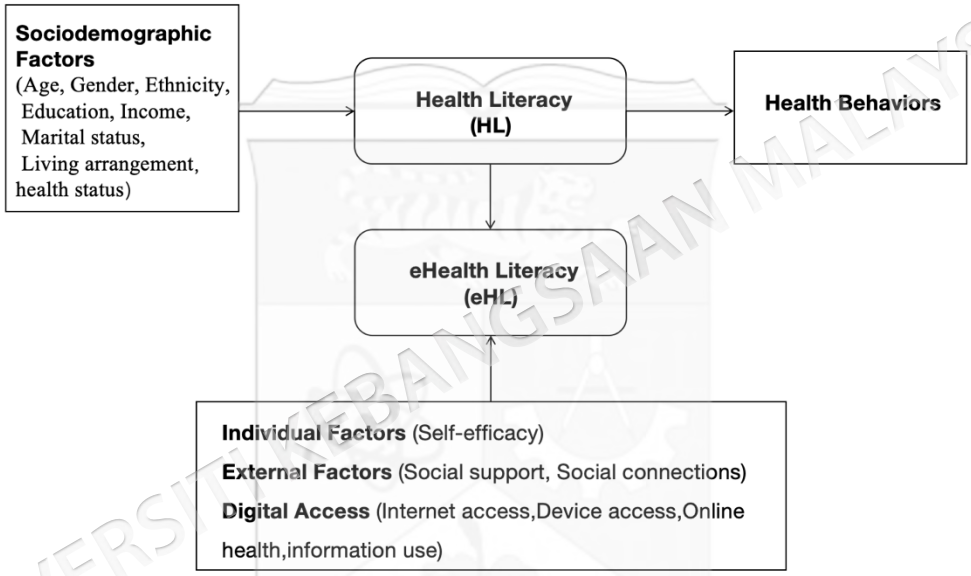

Figure 2.2 Actors affecting the level of health literacy

The existing literature, when considered taken together, highlights several significant research gaps. First, there is insufficient empirical evidence on the level of eHealth literacy among older adults in Malaysia. Second, the function of eHealth literacy as a factor influencing health literacy has not been thoroughly investigated within a unified analytical structure. Third, there is a need for population-based evidence to inform targeted interventions aimed at promoting healthy aging in an increasingly digital healthcare environment. In response to these gaps, the present study adopts a cross-sectional design to examine health literacy among older adults in Malaysia and to investigate the association between eHealth literacy and health literacy, while accounting for relevant sociodemographic and health-related factors.

UNIVERSITI KEBANGSAAN MALAYSIA

CHAPTER III

METHODOLOGY

3.1 INTRODUCTION

This chapter provides a detailed description of the methodology and tools employed in this study, including the study participants, research design, and research procedures. The main objective of this study was to assess the level of health literacy and eHealth literacy among the older population in Malaysia. In addition, this study aims to explore the interrelationship between eHealth literacy and its influencing factors, providing a theoretical basis and practical guidance to further enhance eHealth literacy among the older population.

3.2 STUDY DESIGN

This study involves a cross-sectional survey to assess the levels of health literacy and eHealth literacy among older adults in Malaysia. Guided by socioeconomic stratification, three states-each representing a high, middle, and low-income level-will be randomly selected based on rankings from the Malaysian Department of Statistics. Within each selected state, older adults aged 60 and above will be recruited using stratified sampling methods. Standardized and validated instruments will be employed to measure both general health literacy and eHealth literacy. This phase aims to generate representative, regionally diverse data to complement and extend the findings of the scoping review conducted. A population-based survey was conducted to assess the level of understanding of current research on health literacy and eHealth literacy approaches in Malaysia.

Based on the conceptual framework presented in Chapter 2, the present study operationalized health literacy as the outcome variable, with eHealth literacy and

UNIVERSITI KEBANGSAAN MALAYSIA

selected sociodemographic factors as independent variables. To collect quantitative information related to the health level of the older adults, questionnaires approach will be used as a data collection tool to collect quantitative information related to the health level of the older adults. Considering that some of the older adults have eye diseases or physical disabilities, there may be some questionnaires written by the investigator on behalf of the older adults.

3.3 ETHICAL CONSIDERATION

Given the elderly demographic of the study participants, particular emphasis was placed on safeguarding participants' rights, dignity, and well-being. Participation was entirely voluntary. Before recruitment, all potential participants received clear explanations of the study's purpose, procedures, potential risks, and anticipated benefits. Information was communicated using language that was concise and age-appropriate, with ample time provided for participants to ask questions and consider participation. Written informed consent was obtained from all participants before questionnaire distribution. For participants with limited literacy, consent forms were read aloud and explained verbally to ensure full comprehension before obtaining consent. To minimize potential psychological burden, researchers informed participants they could refuse to answer any uncomfortable questions and withdraw from the study at any stage without penalty or negative consequences. Questionnaire content focused on health literacy and digital health practices, excluding sensitive or intrusive questions. The estimated 10-to-15-minute completion time further reduced participant burden, particularly considering the age of respondents.

As a token of appreciation for their time and participation, respondents who completed the questionnaire were given a small non-monetary gift (a towel with a teddy bear design). This gesture was intended solely as a form of gratitude and did not constitute financial compensation or inducement. Participants were clearly informed that receipt of the gift was not contingent upon providing specific responses and that their decision to participate or withdraw would not affect their entitlement. In addition, participating community centres and elderly care institutions received basic supplies sponsored by the Fakulti Sains Kesihatan (FSK), Universiti Kebangsaan Malaysia.

These contributions were provided at the institutional level to support community engagement and were not linked to individual participation or responses. This approach ensured that no undue influence was exerted on potential participants, in line with ethical principles governing voluntary participation and non-coercion.

Ethical approval was obtained from the Research Ethics Committee of Universiti Kebangsaan Malaysia (Reference No.: JEP-2024-1058).

3.4 SAMPLING METHOD

The study was conducted in selected community settings. These states were selected to represent high-, middle-, and lower-income contexts based on median household income statistics reported by the DOSM (DOSM 2022). The target population consisted of community-dwelling older adults aged 60 years and above, in line with the United Nations definition of older persons.

Table 3.1 Statistics on median income

State	Income Median (RM)	Poverty
Kelantan	3,614	13.2
Kedah	4,402	9
Perak	4,494	7.5
Sabah	4,577	19.7
Perlis	4,713	4
Pahang	4,753	6.3
Sarawak	4,978	10.8
Negeri Sembilan	5,226	4.4
Terengganu	5,878	6.2
Melaka	6,210	4.2
Pulau Pinang	6,502	2
Johor	6,879	4.6
W.P. Labuan	6,904	2.5
Selangor	9,983	1.5
W.P. Putrajaya	10,056	0.1
W.P. Kuala Lumpur	10,234	1.4

Source: The Household Income and Expenditure Survey 2022

UNIVERSITI KEBANGSAAN MALAYSIA

A multistage stratified sampling strategy was employed. In the first stage, all Malaysian states and federal territories were stratified into three categories according to median household income levels (high, middle, and low) based on the Household Income and Expenditure Survey (HIES) 2022. Table 3.1: less than RM 5000, RM 5000 to RM 7000, and RM 7000 and above. One state or federal territory was randomly selected from each income stratum, resulting in the selection of Wilayah Persekutuan Kuala Lumpur (high-income), Johor (middle-income), and Kedah (lower-income).

In the second stage, districts and community areas within each selected state were identified. Community centres serving older adults, including Pusat Aktiviti Warga Emas (PAWE), were approached as recruitment sites. In the final stage, eligible participants were recruited using convenience sampling within the selected sites and through online platforms. Although probability sampling was applied at the regional selection stage, participant recruitment relied on convenience sampling due to feasibility and accessibility constraints commonly encountered when working with older adult populations.

3.5 SAMPLE SIZE CALCULATION

The population sample of this study consists of older adults in the community in Malaysia, W.P. Kuala Lumpur, Kedah, and Johor. Based on the newest report from DOSM (DOSM 2024), the total population was 2.1 million, 2.2 million, and 4.2 million, respectively. Over 60 years old, W.P. Kuala Lumpur, Kedah, and Johor, 209 000, 296 000, and 482 900, respectively. Sample size estimation was conducted using G*Power version 3.1 based on multiple linear regression analysis (Mayr et al. 2007)., based on multiple linear regression analysis, which constituted the primary analytical approach of the study. A priori power analysis was performed assuming a medium effect size ($f^2 = 0.15$), a significance level of $\alpha = 0.05$, a statistical power of 0.80, and a maximum of ten predictors included in the regression model. The analysis indicated that a minimum sample size of 270 participants was required. This sample size was thus determined to be appropriate for the study. Considering the 10% failure rate and 15% wastage rate. Accordingly, the final target sample size was set at 354 participants. Therefore, allocating the sample size to each district can be done proportionally. Based on the

UNIVERSITI KEBANGSAAN MALAYSIA

calculations, the distribution of 354 samples across the three regions is as follows: 75 for W.P. Kuala Lumpur, 106 for Kedah, and 173 for Johor. The calculation process is as follows:

1. Determine the total population:

   Total Population=209 400+296 000+482 900=988 300

2. Calculate the proportion of the population for each region:

   Proportion of W.P. Kuala Lumpur = 209 400/988 300 ≈ 0.212

   Proportion of Kedah = 296 000/988 300 ≈ 0.299

   Proportion of Johor = 482 900/988 300 ≈ 0.489

3. Multiply the proportions by the total sample size (354) to get the number of samples for each region:

   Samples of W.P. Kuala Lumpur = 0.212*354 ≈ 75

   Samples of Kedah = 0.299*354 ≈ 106

   Samples of Johor = 0.489*354 ≈ 173

3.6 ELIGIBILITY CRITERIA

The target population consisted of community-dwelling older adults aged 60 years and above residing in W.P. Kuala Lumpur, Johor, and Kedah.

3.6.1 Inclusion Criteria

The subject must be a Malaysian citizen living in W.P. Kuala Lumpur, Kedah, Johor, who is at least 60 years old and capable of providing informed and voluntary consent to participate. Only those who demonstrated no evidence of cognitive impairment or neurological disorders were included to ensure the ability to adhere to study protocols. Participants were required to hold Malaysian citizenship or permanent resident status in Malaysia.

UNIVERSITI KEBANGSAAN MALAYSIA

Furthermore, they needed to complete all sections of the questionnaire, particularly those covering demographic information, health literacy knowledge and digital literacy. Individuals unable to fulfill these requirements or complete the questionnaire in its entirety were excluded from the study.

3.6.2 Exclusion Criteria

Participants were excluded if they were younger than 60 years old, had cognitive impairments or moderate to severe neurological disorders (e.g., Parkinson's disease, multiple sclerosis, or epilepsy), or had a diagnosed mental illness. Individuals unable to complete the questionnaire independently or with the assistance of volunteers were also excluded. These exclusion criteria were established to ensure a study population representing cognitively intact older adults capable of actively participating in the research. Focusing on this group, the study seeks to investigate the challenges associated with health literacy and the reliance on electronic devices for health-related advice within a more homogeneous population. This approach facilitates a more rigorous examination of the complex interactions between eHealth literacy, health information-seeking behaviors, and the unique dynamics of aging, thereby providing deeper insights into the digital health practices of older adults

3.7 PARTICIPANT RECRUITMENT

There were a few mediums used to recruit the participants. Firstly, by approaching Pusat Aktiviti Warga Emas (PAWE) in W.P. Kuala Lumpur, Kedah and Johor areas which in Kuala Lumpur area we choose 2 areas; in Johor area we choose 5 areas; and in Kedah area we choose 4 areas. There were eleven PAWE involved in this study. Second, the questionnaire was distributed through social media platforms and collected online through Google Forms. During the recruitment process, we acquired a community center that focuses on improving the quality of life of older adults and distributed the questionnaire on its platform to select information about older adults that matched our survey area.

UNIVERSITI KEBANGSAAN MALAYSIA

3.8 DATA COLLECTION

During the offline research process, participants underwent an initial face-to-face interview, during which they were provided with an information sheet and a questionnaire to facilitate data collection. Participants completed a demographic data form capturing details such as name, age, gender, ethnicity, marital status, and education level. Data collection was conducted as a single-point process to ensure consistency. Prior to screening and recruitment, participants were presented with a detailed information sheet and a consent form to secure informed consent, adhering to ethical research standards. Participants filled out the questionnaire about eHealth literacy which is a five-point Likert scale from whole disagreement to whole agreement. Then, participants tested their health literacy knowledge. Throughout the process, the recruiter can drop out of the test and the results will not be adopted.

In addition to the online collection component, community leaders and recruiters were briefed prior to the distribution of the questionnaires to ensure smooth collection of the questionnaires.

3.9 RESEARCH INSTRUMENTS

Data for quantitative analyses were obtained by collecting questionnaires. The questionnaire consisted of three parts, the first part was personal information, the second part was eHealth literacy, and the third part was health literacy. In the first part, personal information covering several topics that may affect health literacy and eHealth literacy were included in the questionnaire through a scope overview.

3.10 QUESTIONNAIRE SELECTION

Given the growing reliance on standardized questionnaires to assess both general health literacy and eHealth literacy, contemporary studies advocate the use of validated instruments that demonstrate strong reliability, content validity, and linguistic adaptability, particularly in multicultural settings (Lee, Lee & Chae 2021). For older adults, questionnaire-based assessments remain the most practical and widely adopted

UNIVERSITI KEBANGSAAN MALAYSIA

approach, as they allow for systematic data collection while accommodating varying levels of digital familiarity and cognitive capacity.

This section presents the results of the pilot testing, reliability analysis, and validity assessment of the research instruments used in this study. This section presents the results of the pilot testing, reliability analysis, and validity assessment of the research instruments used in this study.

3.10.1 HL Instrument

The HL questionnaire is selected for our study, which was adopted from the HL Chinese resident questionnaire. The Spearman–Brown split-half coefficient was 0.94, and the overall Cronbach's alpha was 0.95 (Shen et al. 2015). Based on the original questions, delete questions until you retain 20. The questionnaire consisted of 20 questions, including 5 judgmental questions, 10 single-choice questions, and 5 multiple-choice questions, and the total scores range from 0 to 20 points, with one point. Higher scores mean higher health literacy. The questionnaire is in Mandarin and will be translated into Malay. The translated questionnaire will be translated back to Mandarin to make sure the translation is right. Finally, experts need to be invited to verify and evaluate the content validity of the questionnaire.

3.10.2 eHL Instrument

For the survey on eHL, this study selected the eHealth Literacy Scale questionnaire (eHEALS), which was created by Norman (Norman & Skinner 2006). The questionnaire consisted of eight items on a five-point Likert scale, and total scores varied from 8 to 40 points. A higher grade implies improved eHealth literacy. The Cronbach alpha values for the English, Malay, and Chinese versions of eHEALS were 0.961, 0.970, and 0.983, respectively. (Wong et al. 2022). This implies a high level of internal consistency and is consistent with the original study's Cronbach alpha value of 0.887 (Norman & Skinner 2006). To ensure the accuracy of the translation, we still conducted the content validity test. Details of the specific questionnaires can be found in the Appendices C, D, and E, including three languages: English, Chinese, and Malay languages, respectively.

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In addition, to ensure the validity of the questionnaire content across the Malay, English, and Chinese versions, an expert panel comprising 12 specialists in public health and health promotion was convened to evaluate the instrument. Since some experts reviewed more than one language version, the distribution of evaluations was as follows: four experts assessed both the Chinese and English versions; three experts assessed both the English and Malay versions; and five experts assessed only one language version (two assessed the Malay version and three assessed the Chinese version). Each item was rated on a 5-point Likert scale (1 = not relevant, 5 = highly relevant). The content validity index (CVI) at the item level (I-CVI) was calculated as the proportion of experts rating the item as "moderately relevant" or "highly relevant," while the scale-level CVI (S-CVI) was computed as the average of all I-CVIs (Polit, Beck & Owen 2007).

3.10.3 Questionnaire Pilot Testing

A pilot study was conducted to evaluate the clarity, feasibility, and preliminary psychometric properties of the research instruments. The pilot study involved a small sample of older adults drawn from the target population (n = 20), who shared similar demographic characteristics with the intended study participants.

This process aimed to identify potential ambiguities in wording, inconsistencies in item responses, and challenges in administering the survey overall. Feedback from the pilot participants was systematically collected and analyzed to refine the questionnaire items, ensuring they were comprehensible, culturally appropriate, and aligned with the study's objectives.

Furthermore, the pilot test enabled the evaluation of the duration necessary to complete the survey and the dependability of the measurement scales. Roughly 10-15 minutes to complete a questionnaire.

3.11 RELIABILITY ANALYSIS

Previous studies have demonstrated excellent internal consistency for the eHEALS across different language versions. For instance, Wong reported high reliability for the

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English, Malay, and Chinese versions (Wong et al. 2022), consistent with the original study by Norman and Skinner (Norman & Skinner 2006). A summary of these reliability coefficients is presented in Table 3.2.

Internal consistency reliability was assessed using Cronbach's alpha for the Likert-type eHL scale, and the Kuder–Richardson Formula 20 (KR-20) for the dichotomously scored HL test. The EHL scale demonstrated excellent reliability (α = 0.986), while the HL test showed acceptable reliability (KR-20 = 0.710). Table 3.3 shows the reliability test. To ensure the stability of the instrument over time, a test–retest procedure was conducted during the pilot study. The questionnaire was re-administered after a two-week interval, yielding a test–retest reliability coefficient of 0.968.

Table 3.2 Reliability test

Study	**Source Language**	**Sample Size (N)**	**Cronbach's Alpha**
Original Study (Norman & Skinner 2006)	English	664	0.887
Wong et al.(Wong et al. 2022)	English	162	0.961
	Malay	269	0.970
	Chinese	169	0.983
This study	Combined (English, Malay, Chinese)	377	0.986

UNIVERSITI KEBANGSAAN MALAYSIA

Table 3.3 Reliability analysis for eHL

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. How useful do you feel the Internet is in helping you in making decisions about your health?	0.914	0.986
2. How important is it for you to be able to access health resources on the Internet?	0.923	0.985
3. I know what health resources are available on the Internet.	0.951	0.984
4. I know where to find helpful health resources on the Internet.	0.950	0.984
5. I know how to find helpful health resources on the Internet.	0.945	0.984
6. I know how to use the Internet to answer my questions about health.	0.953	0.984
7. I know how to use the health information I find on the Internet to help me.	0.943	0.985
8. I have the skills I need to evaluate the health resources I find on the Internet.	0.922	0.985
9. I can tell high quality health resources from low quality health resources on the Internet./	0.907	0.986
10. I feel confident in using information from the Internet to make health decisions.	0.904	0.986

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Item analysis was conducted to examine the internal consistency of the health literacy knowledge test. Corrected item–total correlations ranged from 0.109 to 0.434. Most items demonstrated acceptable correlations above 0.20, indicating adequate item discrimination. Although three items showed relatively lower item–total correlations, they were retained to preserve the conceptual comprehensiveness and content coverage of the construct. The overall internal consistency of the scale was acceptable (KR-20 = 0.710), suggesting satisfactory reliability. Table 3.4 shows the item analysis details.

Table 3.4 Reliability analysis for HL

Item	Corrected Item-Total Correlation	Item	Corrected Item-Total Correlation
A01	.405	B06	.360
A02	.191	B07	.214
A03	.351	B08	.329
A04	.224	B09	.332
A05	.282	B10	.301
B01	.352	C01	.109
B02	.235	C02	.295
B03	.434	C03	.099
B04	.415	C04	.221
B05	.297	C05	.116

3.12 VALIDITY ASSESSMENT

Table 3.5 shows the Kaiser–Meyer–Olkin (KMO) and Bartlett's Test of the eHealth literacy. The combination of a KMO value of 0.960 and a significant Bartlett's Test ($p < 0.001$) indicates that the data is appropriate for factor analysis. These results suggest that the variables have sufficient intercorrelation and that the sampling adequacy is reasonable for conducting the analysis (Tavakol & Dennick 2011).

Table 3.5 KMO and Bartlett's test of the eHL

Measure	Test Statistic	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.960
Bartlett's Test of Sphericity	Approx. Chi-Square	6,852.51
	df	45
	Sig.	p<0.001

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Exploratory factor analysis (EFA) was conducted to examine the construct validity and underlying factor structure of the eHealth literacy questionnaire. The analysis extracted one component with an eigenvalue greater than 1, indicating a unidimensional structure. The single factor accounted for 89.24% of the total variance. The scree plot further supported a one-factor solution. All items demonstrated strong loadings on the component, confirming the construct validity of the scale.

The Item-Level Content Validity Index (I-CVI) ranged from 0.80 to 1.00 across the different language versions. The Scale-Level Content Validity Index (S-CVI/Ave) was 0.95 for the Malay version, 0.964 for the English version, and 0.99 for the Chinese version. Based on expert feedback, minor linguistic and cultural adjustments were made to ensure clarity and semantic equivalence across all versions. To further assess the stability of the questionnaire, a test–retest procedure was conducted after a two-week interval, yielding a reliability coefficient of 0.968. For specific scores, refer to Table 3.6.

UNIVERSITI KEBANGSAAN MALAYSIA

Table 3.6 The HL content test

Items / Experts	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	C1	C2	C3	C4	C5	S-CVI/Ave
E-Expert 1	5	5	5	4	5	5	5	5	5	4	5	5	5	5	4	5	4	5	5	5	
E-Expert 2	4	4	5	4	5	5	5	5	4	4	4	4	5	5	3	4	5	4	4	3	
E-Expert 3	5	5	3	5	5	3	5	5	5	5	5	5	5	5	5	3	5	5	5	5	
E-Expert 4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
E-Expert 5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
E-Expert 6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
E-Expert 7	5	5	5	5	5	5	5	5	4	5	5	5	5	5	4	5	5	4	5	5	
Experts in Agreement	7	7	6	7	7	6	7	7	7	7	7	7	7	7	6	6	7	7	7	6	
I-CVI	1	1	0.857	1	1	0.857	1	1	1	1	1	1	1	1	0.857	0.857	1	1	1	0.857	0.964
M-Expert 1	4	4	5	4	5	5	5	5	4	4	4	4	5	5	3	4	5	4	4	3	
M-Expert 2	5	5	3	5	5	3	5	5	5	5	5	5	5	5	5	3	5	5	5	5	
M- Expert 3	5	5	5	5	5	5	4	5	4	5	5	5	5	5	4	5	5	5	4	4	
M-Expert 4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
M-Expert 5	5	5	5	5	4	4	4	5	4	5	5	5	5	5	5	4	4	5	4	5	
Experts in Agreement	5	5	4	5	5	4	5	5	5	5	5	5	5	5	4	4	5	5	5	4	
I-CVI	1	1	0.8	1	1	0.8	1	1	1	1	1	1	1	1	0.8	0.8	1	1	1	0.8	0.95

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UNIVERSITI KEBANGSAAN MALAYSIA

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C-Expert 1	5	5	5	3	5	5	5	5	5	4	5	5	5	5	4	5	5	5	5	5	
C-Expert 2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
C-Expert 3	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	
C-Expert 4	5	5	5	5	5	5	5	5	4	5	5	5	5	5	4	5	5	4	5	5	
C-Expert 5	5	5	4	5	5	4	5	5	5	5	4	5	4	5	4	5	5	5	5	4	
C-Expert 6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
C-Expert 7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Experts in Agreement	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
I-CVI	1	1	1	0.857	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.992

E-Expert	Native English-speaking Expert	M-Expert	Native Malay-speaking Expert
C-Expert	Native Chinese-speaking Expert	I-CVI	Item-level Content Validity Index
S-CVI/ Ave	Scale-Level Content Validity Index (averaging method)		

UNIVERSITI KEBANGSAAN MALAYSIA

3.13 STATISTICAL ANALYSIS

All statistical analyses were conducted utilizing IBM SPSS Statistics version 26.0. All statistical tests were two-tailed, and a $p < 0.05$ was considered statistically significant.

Descriptive statistics were used to summarize participants' sociodemographic characteristics and key study variables. Frequencies and percentages were reported for categorical variables, while means and standard deviations were calculated for continuous variables. The distribution of continuous variables was examined using Kolmogorov–Smirnov tests**,** histograms, and Q–Q plots.

To examine differences in HL across sociodemographic groups: Independent-samples t-tests were conducted for binary variables (e.g., gender); One-way analysis of variance (ANOVA) was applied to compare mean HL scores across multi-category variables such as state, education level, ethnicity, age group, and marital status. Where ANOVA results were statistically significant, post hoc analyses were conducted to identify specific group differences. Tukey's HSD test was used when the assumption of homogeneity of variance was met, while Games–Howell tests were applied when variances were unequal. For variables that did not meet normality assumptions, non-parametric tests (Mann–Whitney U test or Kruskal–Wallis test) were used as sensitivity analyses to confirm the robustness of the findings.

Pearson's correlation coefficients were calculated to examine the associations between health literacy, eHealth literacy, and continuous sociodemographic variables such as age, income, and education level. Correlation strength was interpreted according to conventional thresholds (small, moderate, large), and statistical significance was set at $p < 0.05$.

Multiple linear regression analysis was performed to identify independent predictors of health literacy among older adults. The Enter method was used, whereby all theoretically relevant variables were entered into the model simultaneously. Before analysis, categorical variables were transformed into dummy variables. Gender was coded like 1 = Female and 2 = Male. Race was dummy-coded using Malay as the reference category, with separate dummy variables for Chinese and Indian. State of

UNIVERSITI KEBANGSAAN MALAYSIA

residence was dummy-coded using Kedah as the reference group, while Kuala Lumpur and Johor were entered as dummy variables. Marital status was coded using Married as the reference category. Regression assumptions were assessed prior to interpretation. Linearity and homoscedasticity were examined through residual scatterplots. Normality of residuals was assessed using histograms and normal probability plots. Multicollinearity was evaluated using the Variance Inflation Factor (VIF) values, with all values below 5, indicating no serious multicollinearity. Independence of errors was assessed using the Durbin–Watson statistic. The regression model was specified as follows:

$$HL = \beta_0 + \beta_1(eHL) + \beta_2(Education) + \beta_3(Income) + \beta_4(Age) + \beta_5(Gender) + \beta_6(Race) + \beta_7(State) + \beta_8(Marital\ Status) + \varepsilon$$

UNIVERSITI KEBANGSAAN MALAYSIA

CHAPTER IV

RESULT

4.1 INTRODUCTION

This chapter presents the study's findings, including participant characteristics, health literacy and eHealth literacy levels, and the results of instrument validation analyses. The section offers a detailed empirical analysis of health literacy among older adults across three geographically and socioeconomically diverse regions in Malaysia-Kuala Lumpur, Johor, and Kedah. Special attention is given to the dimension of eHealth literacy, considering the growing importance of digital platforms in healthcare communication and information-seeking behaviors. The comparative approach provides insights into how regional characteristics, such as urbanization level, access to digital infrastructure, and community support, may shape health literacy outcomes among Malaysia's aging population.

A total of 410 were initially recruited for this study. During the recruitment and screening process, 33 participants were excluded: 13 voluntarily withdrew from the study, and 20 failed to meet the inclusion criteria. This resulted in a final sample of 377 elderly participants and an overall questionnaire response rate of 87.82%. The recruitment period extended from January to May 2025, with all study participants undergoing rigorous screening to ensure strict adherence to the predetermined inclusion and exclusion criteria. The final cohort of 377 older individuals had a mean age of 68.21 years (SD= 5.75 years). The chapter is organized into four main sections that systematically address the study's four research objectives.

Normality tests using Skewness and Kurtosis were conducted separately for both HL and eHL scores. The results indicated that while HL scores were approximately

UNIVERSITI KEBANGSAAN MALAYSIA

normally distributed, eHL scores exhibited a non-normal distribution. Therefore, to ensure consistency and robustness in the analysis, non-parametric tests (Spearman correlation) were utilized where appropriate.

4.2 THE LEVEL OF HL AMONG OLDER ADULTS IN THRESS STATES

The overall mean health literacy score was 10.44 (SD = 3.58), indicating a moderate level of health literacy among the respondents.

Across the three study locations, respondents from Kuala Lumpur reported the highest mean HL score (M = 11.93, SD = 3.54), followed by Johor (M = 10.66, SD = 3.49), while the lowest mean score was observed in Kedah (M = 8.91, SD = 3.15). The HL scores varied across age groups, with respondents aged 66–70 years reporting the highest mean score (M = 11.35, SD = 3.86) and those aged 76–80 years reporting the lowest (M = 8.90, SD = 3.58). A similar pattern was observed across educational levels, where respondents with a bachelor's degree or above demonstrated higher health literacy (M = 12.91) compared with those with elementary education or below (M = 8.34, SD = 2.81). Respondents living with a spouse and/or children reported higher health literacy (M = 11.25, SD = 3.42) than those living alone (M = 10.37, SD = 3.05), while nursing home residents had the lowest mean score (M = 8.15, SD = 3.52). In terms of ethnicity, Chinese respondents reported higher health literacy (M = 11.22, SD = 3.84) compared with Malay (M = 9.54, SD = 2.94) and Indian respondents (M = 8.36, SD = 3.01). Health literacy scores also increased with higher income levels, with respondents earning RM 3,500–5,499 reporting the highest mean score (M = 11.67, SD = 3.88). Table 4.1 presents the descriptive analysis of HL in detail.

Table 4.1 Sociodemographic differences in HL

Characteristic	**n(%) in three places**	**HL**	
		Mean (SD)	**P value**
Total sample	377(100%)	10.44(3.576)	
State			<0.001
KL	90(23.87%)	11.93(3.544)	
Johor	173(45.89%)	10.66(3.488)	
Kedah	114(30.24%)	8.91(3.153)	

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UNIVERSITI KEBANGSAAN MALAYSIA

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Gender			0.659
Male	163(43.24%)	10.54(3.339)	
Female	214(56.76%)	10.36(3.752)	
Age			<0.001
60-65	155(41.11)	10.85(3.336)	
66-70	83(22.02%)	11.35(3.862)	
71-75	68(18.04%)	10.00(3.490)	
76-80	71(18.83%)	8.90(3.576)	
Education level			<0.001
Elementary school or below	97(25.73%)	8.34(2.810)	
High school	200(53.05%)	10.47(3.473)	
Bachelor's degree	57(15.12%)	12.91(3.220)	
Master and above	23(6.1%)	12.91(2.644)	
Living situation			<0.001
Live alone	73(19.36%)	10.37(3.048)	
With spouse and/or children	226(59.95%)	11.25(3.419)	
Nursing homes	78(20.69%)	8.15(3.520)	
Race			<0.001
Chinese	209(55.44%)	11.22(3.843)	
Malay	157(41.64%)	9.54(2.936)	
Indian	11(2.92%)	8.36(3.009)	
Marital status			0.003
Unmarried/divorced/widowed	159(42.18%)	10.24(3.841)	
Married	218(57.82%)	10.89(3.576)	
Income per (RM)			<0.001
<1500	221(58.62%)	9.48(3.339)	
1500-3499	69(18.30%)	11.12(3.297)	
3500-5499	54(14.32%)	11.67(3.880)	
>5500	33(8.76%)	13.45(2.501)	

4.3 The Level of eHL Among Older Adults in Thress States

The overall mean eHL score was 29.53 (SD = 15.36), indicating a moderate level of eHL among the respondents. Table 4.2 presents the descriptive analysis of eHL in detail.

Across the three study locations, respondents from Johor reported the highest mean eHealth literacy score (M = 34.92, SD = 9.00), followed by Kuala Lumpur, while the lowest mean score was observed in Kedah (M = 28.52, SD = 16.34). eHealth literacy scores varied across age groups, with respondents aged 71–75 years (M = 35.51, SD = 10.96) and 66–70 years (M = 34.85, SD = 11.06) reporting higher scores, whereas those aged 76–80 years reported substantially lower eHealth literacy (M = 15.83, SD = 16.20).

UNIVERSITI KEBANGSAAN MALAYSIA

Clear differences were observed across educational levels. Respondents with an elementary school education or below reported the lowest mean eHealth literacy score (M = 17.45, SD = 17.18), while those with a bachelor's degree (M = 37.67, SD = 8.96) and master's degree or above (M = 38.04, SD = 5.24) demonstrated higher levels of eHealth literacy. Respondents living with a spouse and/or children reported higher eHealth literacy (M = 34.84, SD = 10.55) compared with those living alone (M = 10.37, SD = 3.05) and nursing home residents (M = 9.76, SD = 15.40). In terms of ethnicity, Malay respondents reported higher eHealth literacy (M = 34.20, SD = 12.21) compared with Chinese (M = 26.37, SD = 16.34) and Indian respondents (M = 23.00, SD = 19.94). Finally, eHealth literacy increased with higher income levels, with respondents earning RM 3,500–5,499 (M = 37.48, SD = 8.14) and above RM 5,500 (M = 38.73, SD = 6.25) reporting the highest mean scores, compared with those earning less than RM 1,500 (M = 24.07, SD = 17.26).

Table 4.2 Sociodemographic differences in eHL

Characteristic	**n (%) in Three Places**	**eHL**	
		Mean (SD)	**P value**
Total sample	377(100%)	29.53(15.360)	
State			0.009
KL	90(23.87%)	34.92(9.002)	
Johor	173(45.89%)	28.52(16.342)	
Kedah	114(30.24%)	26.81(16.907)	
Gender			0.536
Male	163(43.24%)	29.89(15.300)	
Female	214(56.76%)	29.26(15.435)	
Age			<0.001
60-65	155(41.11)	34.85(11.058)	
66-70	83(22.02%)	35.51(10.956)	
71-75	68(18.04%)	24.43(16.942)	
76-80	71(18.83%)	15.83(16.196)	
Education level			<0.001
Elementary school or below	97(25.73%)	17.45(17.177)	
High school	200(53.05%)	32.09(13.146)	
Bachelor's degree	57(15.12%)	37.67(8.957)	
Master and above	23(6.1%)	38.04(5.235)	
Living situation			<0.001
Live alone	73(19.36%)	34.23(9.804)	
With spouse and/or children	226(59.95%)	34.84(10.553)	
Nursing homes	78(20.69%)	9.76(15.395)	

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UNIVERSITI KEBANGSAAN MALAYSIA

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Race			<0.001
Chinese	209(55.44%)	26.37(16.336)	
Malay	157(41.64%)	34.20(12.207)	
Indian	11(2.92%)	23.00(19.940)	
Marital status			<0.001
Unmarried/divorced/widowed	159(42.18%)	29.04(14.995)	
Married	218(57.82%)	31.78(13.529)	
Income per (RM)			<0.001
<1500	221(58.62%)	24.07(17.261)	
1500-3499	69(18.30%)	36.41(5.869)	
3500-5499	54(14.32%)	37.48(8.135)	
>5500	33(8.76%)	38.73(6.246)	

4.4 FACTORS ASSOCIATED WITH HL

Table 4.3 presents the nonparametric correlations between HL and various demographic and socio-economic factors among 377 elderly respondents in Kuala Lumpur, Johor, and Kedah. The analysis reveals several statistically significant associations.

The correlation analysis revealed several significant associations with the HL. Positive correlations were found for eHealth literacy ($r = 0.336$, $p < 0.001$), educational attainment ($r = 0.437$, $p < 0.001$), and average monthly income ($r = 0.352$, $p < 0.001$), all showing moderate strength. These findings suggest that individuals with better digital health skills, higher education levels, and greater financial resources tend to have higher health literacy.

Conversely, negative correlations were observed for age ($r = -0.200$, $p < 0.001$), ethnicity ($r = -0.254$, $p < 0.001$), marital status ($r = -0.160$, $p = 0.002$) and current living situation ($r = -0.212$, $p < 0.001$). These small but significant correlations indicate that older participants, certain ethnic groups, and those in less supportive living arrangements demonstrated lower health literacy levels.

Under the premise of significant results from the one-way ANOVA, post-hoc multiple comparisons were conducted on the relevant categorical variables in Table 4.4. The results revealed significant differences in scores across different states, with KL scoring significantly higher than Kedah and Johor ($p < 0.05$). Regarding age, the 76–80

age group scored significantly lower than other age groups, while no significant differences were observed between the 60–65, 66–70, and 71–75 age groups. Post-hoc analysis of educational attainment revealed that those with primary education scored significantly lower than those with secondary, undergraduate, and postgraduate degrees. Additionally, secondary education holders scored significantly lower than undergraduate and postgraduate degree holders ($p < 0.05$). Regarding ethnicity, Chinese individuals scored significantly higher than Malays and Indians, while no significant difference was observed between Malays and Indians. Additionally, the lowest income group scored significantly lower than the middle- and high-income groups, with no significant difference between the middle-income groups. Comparisons of living arrangements revealed that elderly individuals residing in care facilities scored significantly lower than those living alone or with others, while no significant difference was found between those living alone and those living with others. Overall, post-hoc multiple comparison analyses indicate that state of residence, age, education level, race, income level, and housing status are all associated with score differences. Moreover, significant differences primarily emerge between specific groups rather than across all groups.

UNIVERSITI KEBANGSAAN MALAYSIA

Table 4.3 The correlation factors of eHL and HL (N=377)

Nonparametric Correlations											
		HL	**E-HL Level**	**State**	**Gender**	**Age**	**Education Level**	**Race**	**Marital Status**	**Average Monthly Income**	**Current Living Situation**
HL	Correlation Coefficient	1.000	.336**	-.047	.023	-.200**	.437**	-.254**	-.160**	.352**	-.212**
	Sig. (2-tailed)	.	<.001	.364	.659	<.001	<.001	<.001	.002	<.001	<.001
e-HL level	Correlation Coefficient	.336**	1.000	-.071	.032	-.427**	.431**	.213*	-.134**	.371**	-.387**
	Sig. (2-tailed)	<.001	.	.166	.537	<.001	<.001	<.001	.009	<.001	<.001
State	Correlation Coefficient	-.047**	-.071	1.000	-.004	.192**	-.076	-.035	.137**	-.100	.094
	Sig. (2-tailed)	.364	.166	.	.943	<.001	.141	.504	.008	.052	.067
Gender	Correlation Coefficient	.023	.032	-.004	1.000	-.061	.063	.067	-.110*	.153	-.052
	Sig. (2-tailed)	.659	.054	.943	.	.235	.223	.194	.033	.003	.313
Age	Correlation Coefficient	-.200**	-.427**	.192**	-.061	1.000	-.301**	-.094	-.218**	-.262**	.224**
	Sig. (2-tailed)	<.001	<.001	<.001	.235	.	<.001	.068	<.001	<.001	<.001
Education level	Correlation Coefficient	.437**	.431**	-.076	.063	-.301**	1.000	-.053	-.263**	.560**	-.171**
	Sig. (2-tailed)	<.001	<.001	.141	.223	<.001	.	.305	<.001	<.001	<.001
Race	Correlation Coefficient	.254**	.213**	-.035	.067	-.094	-.053	1.000	.056	-.174**	-.203**
	Sig. (2-tailed)	<.001	<.001	.504	.194	.068	.305	.	.275	<.001	<.001

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UNIVERSITI KEBANGSAAN MALAYSIA

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Marital status	Correlation Coefficient	-.160**	-.134**	.137**	-.110*	.218**	-.263**	.056	1.000	-.262**	-.029
	Sig. (2-tailed)	.002	.009	.008	.033	<.001	<.001	.275	.	<.001	.569
Average monthly income	Correlation Coefficient	.352**	.371**	-.100	.153**	-.262**	.560**	-.174**	-.262**	1.000	-.204**
	Sig. (2-tailed)	<.001	<.001	.052	.003	<.001	<.001	<.001	<.001	.	<.001
Current living situation	Correlation Coefficient	-.212**	-.387**	.094	-.052	.224**	-.171**	-.203**	-.029	-.204**	1.000
	Sig. (2-tailed)	<.001	<.001	.067	.313	<.001	<.001	<.001	.569	<.001	.

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

UNIVERSITI KEBANGSAAN MALAYSIA

Table 4.4 Post-hoc test (multiple comparisons) results

Post Hoc Test								
Item	**Homogeneity of Variance**	**I**	**J**	**Mean Difference (I-J)**	**SE**	**Sig.**	**Lower Bound**	**Upper Bound**
eHL	<.001	KL	Kedah	8.115*	1.838	<.001	3.77	12.46
		Kedah	Johor	-1.713	2.005	0.67	-6.44	3.02
		Johor	KL	-6.402*	1.563	<.001	-10.09	-2.72
HL	0.155	KL	Kedah	3.021*	0.48	<.001	1.89	4.15
		Kedah	Johor	-1.752*	0.411	<.001	-2.72	-0.79
		Johor	KL	-1.269*	0.442	0.012	-2.31	-0.23
eHL	<.001	60-65	66-70	-0.661	1.495	0.971	-4.54	3.22
		60-65	71-75	10.419*	2.238	<.001	4.56	16.27
		60-65	76-80	19.014*	2.117	<.001	4.56	16.27
		66-70	71-75	11.08*	2.381	<.001	4.87	17.29
		66-70	76-80	19.675*	2.117	<.001	13.48	24.55
		71-75	76-80	8.595*	2.813	0.014	1.28	15.91
HL	<.001	60-65	66-70	-0.504	0.501	0.746	-1.81	0.8
		60-65	71-75	0.845	0.501	0.335	-0.46	2.15
		60-65	76-80	1.944*	0.478	<.001	0.7	3.19
		66-70	71-75	1.349	0.599	0.114	-0.21	2.91
		66-70	76-80	2.448*	0.580	<.001	0.94	3.96
		71-75	76-80	1.099	0.58	0.235	-0.41	2.61
eHL	<.001	Elementary	Middle	-14.636*	1.976	<.001	-19.77	-9.5
		Elementary	Underground	-20.213*	2.109	<.001	-25.69	-14.73
		Elementary	Master	-20.590*	2.057	<.001	-25.96	-15.22
		Middle	Underground	-5.577*	1.507	.002	-9.50	-1.65
		Middle	Master	-5.953*	1.434	<.001	-9.74	-2.17
		Underground	Master	-0.377	1.612	0.995	-3.87	4.62

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UNIVERSITI KEBANGSAAN MALAYSIA

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HL	<.001	Elementary	Middle	-2.125*	0.376	<.001	-3.10	-1.15
		Elementary	Underground	-4.572*	0.513	<.001	-5.91	-3.23
		Elementary	Master	-4.573*	0.621	<.001	-6.25	-2.90
		Middle	Underground	-2.447*	0.492	<.001	-3.73	-1.16
		Middle	Master	-2.448*	0.604	.002	-4.08	-0.81
		Underground	Master	-0.001	0.697	1.000	-1.85	1.85
eHL	<.001	Chinese	Malaysia	-7.829*	1.492	<.001	-11.34	-4.32
		Chinese	India	3.368	6.117	0.848	-13.22	19.96
		Malaysia	India	11.197	6.117	0.205	-5.36	27.76
HL	<.001	Chinese	Malaysia	1.679*	0.354	<.001	0.84	2.51
		Chinese	India	2.856*	0.945	0.027	0.33	5.38
		Malaysia	India	1.178	0.937	0.446	-1.34	3.70
eHL	<.001	1500<	1501-3500	-12.338*	1.359	<.001	-15.85	-8.83
		1500<	3501-5500	-13.414*	1.604	<.001	-17.57	-9.25
		1500<	<5501	-14.659*	1.591	<.001	8.83	15.85
		1501-3500	3501-5500	-1.076	1.313	0.845	-4.51	2.36
		1501-3500	<5501	-2.321	1.297	0.288	-5.75	1.11
		3501-5500	<5501	-1.246	1.552	0.853	-5.32	2.83
HL	<.001	1500<	1501-3500	-1.641*	0.456	.003	-2.83	-0.45
		1500<	3501-5500	-2.192*	0.574	.002	-3.70	-0.68
		1500<	<5501	-3.979*	0.490	<.001	-5.28	-2.68
		1501-3500	3501-5500	-0.551	0.661	0.838	-2.28	1.17
		1501-3500	<5501	-2.339*	0.589	<.001	-3.88	-0.79
		3501-5500	<5501	-1.788	0.684	0.051	-3.58	0.01
eHL	<.001	Live alone	With others	-0.603	1.345	0.895	-3.79	2.59
		Live alone	Nursing home	24.476*	2.087	<.001	19.53	29.42
		With others	Nursing home	25.080*	1.879	<.001	20.61	29.55

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UNIVERSITI KEBANGSAAN MALAYSIA

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HL	<.001	Live alone	With others	-0.878	0.423	0.099	-1.88	0.12
		Live alone	Nursing home	2.216*	0.535	<.001	0.95	3.48
		With others	Nursing home	3.094*	0.459	<.001	2.01	4.18

*. The mean difference is significant at the 0.05 level

UNIVERSITI KEBANGSAAN MALAYSIA

4.5 EHL AS A PREDICTOR OF HL

This subsection primarily addresses Research Question d, which aims to identify the predictors of health literacy among older adults, with particular emphasis on eHealth literacy. After recoding categorical variables-including state, educational attainment, age, gender, incoming, marital status, living situation, and ethnicity -into dummy variables, multiple regression analyses were conducted using HL and eHL as the respective dependent variables.

4.5.1 Predictors of HL

A multiple linear regression analysis was conducted to examine the associations between demographic characteristics, socioeconomic factors, eHL, and HL. The overall regression model was statistically significant ($R^2 = 0.602$, $F = 11.328$, $p < 0.001$), explaining approximately 60.2% of the variance in health literacy.

eHL was a significant positive predictor of health literacy (HL) ($B = 0.043$, $\beta = 0.186$, $p = 0.004$), indicating that higher eHL was associated with higher HL scores. Respondents from Kedah had significantly lower HL than those from the reference state ($B = -1.725$, $\beta = -0.222$, $p < 0.001$), while no significant difference was observed for Johor. Higher educational attainment was consistently associated with higher HL, with participants holding high school, bachelor's, or master's degrees showing significantly higher HL than those with primary education or below (all $p < 0.001$). Malay respondents had significantly lower HL compared with the reference ethnic group ($B = -2.018$, $\beta = -0.279$, $p < 0.001$). Other demographic and socioeconomic variables were not significantly associated with HL. VIF values indicated no multicollinearity among the independent variables. Table 4.5 details the relevant information.

Table 4.5 Multiple regression of HL

Coefficients[a]						
Model		**Unstandardized B(SE)**	**Standardized Coefficients Beta**	**t**	**Sig.**	**VIF**
1	(Constant)	9.071(0.823)		11.029	<.001	
	eHL	.043(0.015)	.186	2.870	.004	2.354
	Johor	-.527(0.397)	-.074	-1.329	.185	1.720
	Kedah	-1.725(.478)	-.222	-3.610	<.001	2.121
	66-70	.523(.409)	.061	1.279	.202	1.264
	71-75	.381(.447)	.041	.853	.394	1.301
	76-80	.100(.498)	.011	.201	.841	1.667
	Male	.537 (.338)	.074	1.589	.113	1.233
	High school	1.516(.413)	.212	3.673	<.001	1.869
	Bachelor's degree	2.756(.626)	.276	4.402	<.001	2.215
	Master and above	2.695(.788)	.181	3.420	<.001	1.567
	Unmarried/divorced/widowed	-.021(.403)	-.003	-.051	.959	1.740
	With spouse and/or children	.246(.496)	.034	.496	.620	2.599
	Nursing homes	-1.057(.608)	-.120	-1.740	.083	2.669
	Malay	-2.018(.362)	-.279	-5.574	<.001	1.404
	Indian	-1.578(.947)	-.074	-1.666	.096	1.119
	1500-3499	.217(.446)	.024	.487	.627	1.310
	3500-5499	-.390(.530)	-.038	-.736	.462	1.519
	>5500	.178(.702)	.014	.253	.800	1.732

a. Dependent Variable: HL. Model R2=0.602, F=11.328, p<0.001

4.5.2 Predictors of eHL

A multiple linear regression analysis was performed to examine factors associated with eHL. The regression model was statistically significant ($R^2 = 0.585$, $F = 28.004$, $p < 0.001$), explaining 58.5% of the variance in eHL.

Age was significantly associated with eHealth literacy (eHL), with respondents aged 71–75 years ($B = -5.139$, $p < 0.001$) and 76–80 years ($B = -7.147$, $p < 0.001$) showing lower eHL than the reference age group. Education level was significantly associated with eHL, with high school ($B = 5.283$, $p < 0.001$), bachelor's degree ($B = 8.515$, $p < 0.001$), and master's degree or above ($B = 7.251$, $p = 0.009$) associated with

UNIVERSITI KEBANGSAAN MALAYSIA

higher eHL compared with primary education or below. Living arrangement was significantly associated with eHL, with nursing home residents having lower eHL (B = −15.176, p < 0.001). Ethnicity and income were also significant predictors, with Malay respondents (B = 5.130, p < 0.001) and those with monthly incomes of 1,500–3,499 (B = 4.328, p = 0.005) and 3,500–5,499 (B = 4.008, p = 0.029) showing higher eHL. Other variables were not significantly associated with eHL. VIF values indicated no multicollinearity. Table 4.6 details the relevant information.

Table 4.6 Multiple regression of eHL

Coefficients[a]						
	Model	**Unstandardized B(SE)**	**Standardized Coefficients Beta**	**t**	**Sig.**	**Statistics VIF**
1	(Constant)	23.296(2.793)		8.339	<.001	
	HL Score	.520(.181)	.121	2.870	.652	1.534
	Johor	-.398(1.686)	-.013	-.289	.773	1.728
	Kedah	-.648(1.378)	-.019	-.384	.701	2.198
	66-70	-.051(1.421)	-.001	-.036	.972	1.269
	71-75	-5.139(1.527)	-.129	-3.365	<.001	1.264
	76-80	-7.147(1.684)	-.182	-4.245	<.001	1.587
	Male	-1.236(1.174)	-.040	-1.053	0.293	1.238
	High school	5.283(1.431)	.172	3.693	<.001	1.868
	Bachelor's degree	8.515(2.182)	.199	3.902	<.001	2.240
	Master and above	7.251(2.750)	.113	2.637	.009	1.588
	Unmarried/divorced/widowed	2.679(1.390)	.086	1.928	.055	1.723
	With spouse and/or children	.246(1.719)	.008	.143	.887	2.600
	Nursing homes	-15.176(1.958)	-.401	-7.752	<.001	2.304
	Malay	5.130(1.281)	.165	4.006	<.001	1.460
	Indian	5.168(3.285)	.057	1.573	.117	1.120
	1500-3499	4.328(1.530)	.109	2.829	.005	1.282
	3500-5499	4.008(1.827)	.092	2.193	.029	1.501
	>5500	4.186(2.423)	.077	1.727	.085	1.718

a. Dependent Variable: eHL. Model R2=0.585, F=28.004, p<0.001

UNIVERSITI KEBANGSAAN MALAYSIA

CHAPTER V

DISCUSSION

5.1 INTRODUCTION

This chapter discusses and interprets the key findings of the study, also including review discussion, with explicit reference to the research objectives and hypotheses proposed in Chapter 1. The overall aim of the study was to examine the level of the HL among older adults in Malaysia and to explore the role of eHL and selected sociodemographic factors in shaping HL outcomes. This chapter integrates the study findings with existing literature to offer a comprehensive interpretation of health literacy among older adults in Malaysia. The discussion is organised thematically, addressing overall health literacy levels, the contribution of eHealth literacy, and the influence of sociodemographic characteristics. The implications of these findings for health policy, practice, and future research are subsequently discussed, followed by a consideration of the study's limitations.

5.2 HL AMONG MALAYSIAN OLDER ADULTS FROM PREVIOUS STUDIES

The findings of the present study align closely with existing evidence regarding the generally low level of health literacy among older adults in Malaysia. A synthesis of prior studies consistently indicates that a substantial proportion of the older population demonstrates insufficient or limited health literacy, with reported prevalence rates ranging from 44.2% to 68.2% (Abdullah, Ng, et al. 2020; Chan et al. 2019b). These figures underscore health literacy as a persistent public health concern among older Malaysians. This pattern is not unique to Malaysia. Comparable international studies have reported similarly high levels of limited health literacy among older populations, including findings from Turkey, where 85.1% of older adults were classified as having

UNIVERSITI KEBANGSAAN MALAYSIA

inadequate health literacy (Bozkurt & Demirci 2019), and from Germany, where low health literacy among the older population has also been widely documented (Vogt et al. 2018). Such cross-national consistency reinforces the interpretation that limited health literacy among older adults represents a global challenge associated with ageing, cognitive decline, and increasing healthcare complexity.

It is noteworthy that previous Malaysian studies employed diverse approaches to conceptualising and measuring health literacy. While some investigations utilised established instruments such as the HLS-EU-Q47, HLS-SF12, and eHEALS, many relied on self-developed questionnaires focusing on disease-specific knowledge or health-related information competencies. Although these studies did not always explicitly label their outcomes as "health literacy," they nonetheless captured key dimensions of health literacy, including access to health information, comprehension of medical advice, and disease prevention knowledge. The heterogeneity in measurement tools, however, poses challenges for cross-study comparison and highlights the absence of a standardized framework for assessing health literacy and related constructs such as health-related quality of life (HRQL) and eHealth-related quality of life (eHRQL) among older populations. This lack of standardisation underscores the importance of employing validated and reliable instruments in the present study to ensure methodological rigour and comparability.

In terms of determinants, previous evidence consistently identifies educational attainment, age, and income as key factors influencing health literacy levels among older adults. These findings are consistent with broader theoretical models of health literacy, which emphasise the role of socioeconomic resources and cognitive capacity in shaping individuals' ability to access, understand, and use health information (Jaafar et al. 2021; Paasche-Orlow et al. 2005). Malaysian studies have further reported ethnic disparities in health literacy, reflecting the country's multi-ethnic composition, linguistic diversity, and cultural differences that may influence health communication and information access (Abd-Rahim et al. 2021).

Despite the growing digitalisation of healthcare services, existing literature reveals a notable scarcity of studies examining eHealth literacy among Malaysian older

UNIVERSITI KEBANGSAAN MALAYSIA

adults. Only one identified study assessed eHealth literacy in this population, reporting a relatively low mean score of 24. 4 out of 40, with education level, age, and internet usage emerging as significant predictors (Wong et al. 2022) This limited evidence base suggests that eHealth literacy remains an under-explored yet increasingly critical component of health literacy in Malaysia, particularly as healthcare delivery becomes more reliant on digital platforms.

This review also revealed significant evidence gaps in eHL research. Only one Malaysian study (Wong et al. 2022) assessed eHL among the older population, yielding an average score of 24.4/40, with educational level, age, and internet usage identified as significant predictors. This gap suggests that despite the growing importance of eHL in the delivery of digital healthcare services, eHL remains an under-explored dimension of health literacy in the Malaysian context.

In addition, previous research relates to geographical representation. Most studies have been conducted in Peninsular Malaysia, with very limited data from East Malaysia. This geographical imbalance represents a significant limitation in our understanding of health literacy patterns across Malaysia's diverse regions. West Malaysia, comprising Peninsular Malaysia, differs substantially from East Malaysia (Sabah and Sarawak) in terms of demographic composition, socioeconomic development, healthcare infrastructure, cultural diversity, and linguistic patterns. The underrepresentation of East Malaysian populations is particularly concerning given that these states have distinct ethnic compositions, including a higher proportion of indigenous communities, different educational systems, and varying levels of healthcare accessibility compared to Peninsular Malaysia. The rural and remote nature of many communities in East Malaysia may present unique challenges for health literacy development and healthcare navigation that are not adequately captured in the predominantly West Malaysian literature.

Overall, the review confirms that limited HL is a persistent and multifactorial issue in Malaysia, shaped by demographic, cognitive, and technological determinants. It also highlights the paucity of evidence on eHL, especially in rural and ethnically diverse settings. These gaps provide important context for interpreting the findings of

UNIVERSITI KEBANGSAAN MALAYSIA

the present study and underscore the need to empirically examine the role of eHealth literacy among older adults in Malaysia.

5.3 HL AND EHL AMONG MALAYSIAN OLDER ADULTS FROM THE STUDY

The health literacy (HL) and eHealth literacy (eHL) of 377 older people in three Malaysian states-Kuala Lumpur, Johor, and Kedah-were surveyed. These three states represent high-income, middle-income, and low-income regions, respectively, from the Department of Statistics Malaysia. Overall HL scores indicated that a significant proportion of participants had insufficient health literacy, consistent with the low levels identified in the literature review. eHL scores also fell short, 23.14 (SD = 12.155) out of 40, with a significant proportion of respondents lacking the skills needed to effectively access, evaluate, and apply digital health information. Correlation analysis revealed significant associations between HL and eHL ($r = 0.336$, $p < 0.001$), educational level ($r = 0.437$, $p < 0.001$), age ($r = -0.200$, $p < 0.001$), income ($r = -0.254$, $p < 0.001$), ethnicity ($r = -0.254$, $p < 0.001$), living conditions ($r = -0.212$, $p < 0.001$), and marital status ($r = -0.160$, $p = 0.002$). Multiple regression analysis identified eHL ($\beta = 0.260$, $p < 0.001$), education ($\beta = 0.257$, $p < 0.001$), and ethnicity ($\beta = -0.288$, $p < 0.001$) as independent predictors of HL, explaining 30.6% of its variability.

5.3.1 Determinants of HL

The findings of the present study indicate that health literacy among Malaysian older adults remains at a suboptimal level, reinforcing concerns raised in previous research. The present study identified multiple factors significantly associated with HL among Malaysian older adults, including eHL, educational attainment, ethnicity, age, income, marital status, and living arrangements. Regression analysis confirmed that eHL, education, and ethnicity were independent predictors of HL, collectively explaining 30.6% of its variance. While the review identified education, age, income, and ethnicity as recurrent determinants of HL in Malaysian older adults, the present survey provides additional empirical insights and nuances. In particular, eHL emerged as a significant and independent predictor of HL, suggesting that digital competencies are not only correlated with but also directly influence the ability to access, understand, and apply health information. These findings directly address the study's the first (a) and fourth

(d) research objectives and provide empirical support for the proposed hypotheses concerning the determinants of health literacy among older adults.

The analysis also revealed ethnic disparities in HL, with Chinese participants scoring higher than Malay and Indian participants. While the review suggested ethnicity as a determinant, the present survey highlights the persistence of this gap across three states with different socioeconomic profiles, implying that language accessibility and culturally tailored health communication remain pressing issues (Abdullah, Ng, et al. 2020). The analysis of potential reasons suggests that one contributing factor to the observed ethnic disparities may lie in the measurement tool itself. The health literacy questionnaire used in this study was adapted from the Chinese Residents' Health Literacy Test (Wang et al. 2023), with the original items developed in Chinese. Although the instrument underwent a rigorous process of translation, back-translation, and pilot testing to ensure linguistic equivalence and psychometric validity, subtle cultural and contextual differences may still have affected comprehension among Indian and Malay older adults. For instance, certain concepts, idiomatic expressions, or culturally specific health practices embedded in the original Chinese version might not fully resonate with or be easily understood by respondents from different linguistic and cultural backgrounds (Sørensen et al. 2012). Such cultural incongruence could result in construct underrepresentation-where the instrument fails to fully capture the intended construct across groups-or construct-irrelevant variance, where extraneous factors such as unfamiliar terminology influence scores. These effects may partly explain why Chinese participants scored higher than their Malay and Indian counterparts, even after adjusting for sociodemographic variables. This highlights a broader methodological challenge in cross-cultural health literacy research: ensuring not only linguistic but also cultural adaptation of assessment tools. These findings underscore the need for multilingual, culturally tailored health literacy interventions that address not only language translation but also culturally relevant examples, delivery channels, and trust-building strategies. Policy initiatives could include community-based workshops conducted in multiple languages, collaboration with ethnic community organizations, and adaptation of digital health tools to reflect linguistic diversity.

UNIVERSITI KEBANGSAAN MALAYSIA

Another factor contributing to the observed disparities in HL is educational attainment. In the present sample, approximately one-quarter of participants had only completed primary school or had never attended formal education. Low levels of formal education have been consistently linked to limited health literacy, as they are associated with reduced reading comprehension, numeracy, and critical thinking skills necessary for understanding and applying health information (Paasche-Orlow & Wolf 2007). In the Malaysian context, generational differences in access to education-particularly among older adults in rural areas-have been shaped by historical, socioeconomic, and geographic factors (Jaafar et al. 2021). Older adults who grew up before the expansion of the national education system in the 1970s may have had fewer opportunities to pursue secondary or tertiary education, especially women and individuals from lower-income households (DOSM 2022). This educational disadvantage likely compounds the challenges of navigating increasingly complex healthcare systems and digital health environments.

In terms of regional factors, although no significant associations were detected in the multiple regression and correlation analyses, regional comparisons revealed that, even after controlling for demographic variables, older adults in Kuala Lumpur consistently exhibited higher HL scores than those in Kedah. This difference is likely multifactorial. Kuala Lumpur, as the capital, has greater healthcare infrastructure, a higher density of medical professionals, and more frequent public health campaigns, all of which may improve exposure to and understanding of health information. In contrast, Kedah State, which is predominantly rural, faces challenges such as low internet penetration rates, inadequate medical facilities, and low frequency of health promotion activities, and thus relies more heavily on traditional healthcare services (Hassali et al. 2014). Digital access, which is closely tied to eHealth literacy, may therefore be a critical mediating factor in regional HL disparities (Norman & Skinner 2006, 2006; Wong et al. 2022). Furthermore, socioeconomic differences-such as lower average household income in Kedah-may limit the affordability of digital devices, internet subscriptions, and transportation to healthcare services (DOSM 2024). The persistence of this geographic variation, despite adjusting for individual-level demographics, suggests that structural and environmental factors play a substantial role in shaping health literacy (Paasche-Orlow & Wolf 2007; Sørensen et al. 2012). These findings

UNIVERSITI KEBANGSAAN MALAYSIA

emphasize the importance of addressing regional inequalities through targeted health education programs, improved digital infrastructure, and decentralized healthcare services that reach rural communities more effectively (Abdullah, Ng, et al. 2020; Karim 2020).

In contrast to socioeconomic and digital determinants, demographic factors such as age and gender exerted weaker effects on HL in this study. Previous research has reported mixed results, with some studies suggesting women tend to have higher HL than men, and others showing no significant differences (Abdullah, Liew, et al. 2020). The study's findings suggest that once education, income, and eHL are accounted for, the influence of gender and age diminishes. However, the survey process also revealed that age effects may be confounded by generational differences in digital exposure and educational attainment rather than chronological age alone.

What is more, differences were observed in living arrangements, but the living situation was not significant in the model. Older adults residing in nursing homes tended to have lower HL and eHL compared with those living independently or with spouses and children. This may be partly attributable to poorer physical health among institutionalized older adults, which limits their engagement with digital tools. Additionally, in nursing homes, the presence of healthcare workers and structured medical support may reduce the perceived need for self-directed health information seeking. In contrast, independently living older adults, particularly those supported by family members, often demonstrated higher levels of HL and eHL, likely due to greater daily exposure to decision-making and the encouragement of family assistance in navigating digital platforms. These observations suggest that social context and living arrangements may act as mediating factors in shaping HL and eHL (Arcury et al. 2020; Kong et al. 2019), highlighting the importance of family and community-based support systems in public health interventions.

5.3.2 Relationship between eHL and HL

A key objective of this study was to examine the relationship between eHealth literacy and health literacy among older adults in Malaysia. The pooled data analysis confirmed a significant but moderate positive correlation between eHL and HL ($r = 0.336$, $p <$

UNIVERSITI KEBANGSAAN MALAYSIA

0.001), indicating that while the two constructs are closely related, they are not interchangeable. eHL may provide the skills necessary to navigate online health resources, but HL ensures that the information is understood and effectively used. eHL builds upon general HL by adding competencies such as media literacy and digital navigation, making it essential for effective engagement with modern healthcare systems and person-centered care (Busse et al. 2022).

A growing body of literature has emphasized the nuanced relationship between eHL and HL. Lily Model posited that eHL was built upon six core literacies (Norman & Skinner 2006), including traditional HL. This implied that eHL development was unlikely without a foundation in HL. Chan & Kaufman (2011) further highlighted that high eHL without adequate HL may lead to misuse or misinterpretation of online health information. For example, individuals may confidently use search engines and social media for health queries but struggle to appraise the credibility or relevance of the content. Empirical evidence supports this interconnection. In a large-scale study by Mitsutake et al (Mitsutake et al. 2012), it was found that individuals with higher HL were more likely to exhibit higher eHL, with HL acting as a mediator between demographic factors and eHL outcomes. Similarly, Paige et al. (Paige et al. 2018) argued that health-related decision-making in digital contexts requires not only functional digital skills but also strong interpretive and communicative abilities provided by HL.

In the context of this study, no significant correlation was found in the Kuala Lumpur region, which may suggest the presence of a saturation effect or digital overconfidence phenomenon, meaning that digital access does not guarantee users can achieve meaningful interaction. This phenomenon is also reflected in studies examining the usability gap: despite having digital access, older adults often struggle to effectively utilize relevant tools due to limitations in their comprehension or critical thinking abilities (Bailey et al. 2015).

5.3.3 The Role of eHL

One of the most important findings of the present study is that eHealth literacy emerged as an independent predictor of health literacy, even after controlling for

UNIVERSITI KEBANGSAAN MALAYSIA

sociodemographic factors. This finding directly supports the study's central hypothesis and underscores the growing importance of digital competencies in contemporary health information environments. This is consistent with global data indicating that the capacity to search, assess, and use digital health information has become essential to HL as health information is distributed more widely through digital channels (van der Vaart & Drossaert 2017).

The widespread adoption of digital health technologies in Malaysia, particularly through the MySejahtera app during the COVID-19 pandemic, has further highlighted the necessity of eHL in managing the health of older adults. However, significant regional differences were observed during the survey. Many older adults in Kedah reported difficulty accessing online systems, especially those residing in nursing homes, who often rely on staff, family members, or community leaders to interpret digital health information. In contrast, respondents in Kuala Lumpur were generally more accustomed to using smartphones and health apps. These findings provide a useful explanation for the strong statistical association between eHL and HL, suggesting that lower levels of health literacy among older adults may directly stem from digital exclusion.

Thus, interventions to improve HL must therefore consider the social environment in which older individuals obtain and process health information in addition to individual-level digital training. Programs that are rooted in the community and make use of family caregivers or peer educators may be very successful in closing the digital divide (Alkureishi et al. 2021). eHL may be positioned as a crucial lever for encouraging healthy aging in Malaysia's diverse population by combining supporting social institutions with individual capacity building.

5.4 LIMITATIONS

Several points should be noted. First, the cross-sectional design inherently limits the ability to establish causal relationships. For example, it cannot be determined whether higher health literacy is a consequence of higher eHealth literacy, or vice versa. Longitudinal or interventional studies are therefore needed to clarify the directionality of these relationships. Second, while the sample included participants from three

UNIVERSITI KEBANGSAAN MALAYSIA

Malaysian states representing different income levels, the overall sample size and geographic coverage remain insufficient to represent the national older population. In addition, in terms of ethnicity, the sample size of Indian Americans was relatively small. Fourth, potential limitations relate to the measurement instrument. The Health Literacy Questionnaire (HLQ) was adapted from the Chinese Residents' Health Literacy Test, which may contain culturally specific items. Although rigorous translation, back-translation, and validation procedures were undertaken, some items may still have been less culturally relevant or comprehensible to certain ethnic groups, potentially influencing their scores. Finally, older adults with severe cognitive impairment or advanced neurological conditions were excluded from the study to ensure data reliability. While this was methodologically necessary, it may have resulted in an underestimation of the overall burden of limited health literacy among the older population, as cognitively vulnerable individuals are likely to face even greater challenges in accessing and using health information.

5.5 STRENGTHS AND CONTRIBUTIONS

Despite the limitations, this study offers several noteworthy innovations. First, it systematically synthesizes the current evidence on health literacy among older adults in Malaysia, identifies key influencing factors and research gaps, and establishes a foundation for subsequent empirical investigations and variable selection. While previous research has highlighted low levels of health literacy in this population, few studies have systematically explored the role of eHealth literacy as a contributing factor. By explicitly testing the relationship between eHealth literacy and health literacy, this study extends existing knowledge and provides novel empirical evidence within the Malaysian context.

In terms of sampling, a stratified multi-regional approach was employed, incorporating states with high, medium, and low-income levels to enable meaningful regional comparisons. This design allowed for meaningful comparisons across regions and enhanced the internal validity of the findings by capturing socioeconomic and contextual variation among older adults. Third, the use of validated and rigorously tested instruments across three languages (Malay, English, and Chinese) represents a

UNIVERSITI KEBANGSAAN MALAYSIA

methodological strength. The process of translation, back-translation, expert review, and pilot testing ensured acceptable reliability and content validity, increasing confidence in the measurement of both health literacy and eHealth literacy. Fourth, the findings have clear practical and policy relevance. By identifying eHealth literacy as an independent predictor of health literacy, the study highlights the importance of integrating digital competency training into health promotion strategies for older adults. This has direct implications for public health planning, particularly in the context of Malaysia's increasing reliance on digital health platforms.

UNIVERSITI KEBANGSAAN MALAYSIA

CHAPTER VI

CONCLUSION

6.1 INTRODUCTION

This study investigated HL and eHL among older adults in Malaysia. Drawing on both a synthesis of existing literature and empirical evidence from a multi-regional survey, the study provided a comprehensive understanding of health literacy challenges faced by Malaysia's aging population.

The findings indicated that health literacy among older adults in Malaysia remains generally low, with substantial disparities across educational levels, ethnic groups, and regions. Consistent with prior research, lower educational attainment and socioeconomic disadvantage were associated with poorer health literacy outcomes. In addition, the study provided robust evidence that eHealth literacy was significantly associated with health literacy and served as an independent predictor even after adjusting for key demographic variables. This underscored the increasing importance of digital competencies in enabling older adults to access, interpret, and apply health information in an increasingly digitalised healthcare environment. Ethnic and regional differences in health literacy were also observed. Older adults residing in more urbanised and economically developed areas demonstrated higher levels of health literacy compared to those in less developed regions, suggesting that structural factors such as healthcare accessibility, digital infrastructure, and exposure to health promotion initiatives play a critical role. Ethnic disparities further highlight the influence of language, cultural context, and the suitability of health communication strategies in a multi-ethnic society such as Malaysia.

UNIVERSITI KEBANGSAAN MALAYSIA

Overall, the study confirms that health literacy among older adults is shaped by a complex interaction of individual, social, and structural factors. Importantly, it identifies eHealth literacy as a modifiable and policy-relevant determinant, positioning digital inclusion as a key component of strategies aimed at promoting healthy aging.

6.2 SUGGESTION FOR FUTURE STUDY

Considering the strengths and limitations of this study, several directions for future research are warranted. First, the inherent constraints of cross-sectional designs-particularly the inability to establish causal relationships-should be addressed through longitudinal studies, which can verify whether improvements in eHealth literacy directly lead to enhanced health literacy. Second, intervention-based studies are needed to evaluate the effectiveness of digital literacy programmes in supporting older adults' health management. Third, expanding the sample size and geographic coverage will allow for more accurate examination of variations across ethnic groups and regions, thereby improving generalisability. Finally, incorporating additional variables such as chronic disease management and quality of life as potential determinants or outcomes of health literacy would provide a more comprehensive understanding of its role in aging populations.

6.3 FINAL SUMMARY

In conclusion, this study contributes meaningful empirical evidence to the growing body of research on health literacy among older adults in Malaysia. It not only identifies the determinants and disparities in HL but also highlights eHL as a modifiable factor with significant potential for policy and intervention. While limitations in design, sampling, and measurement should be addressed in future research, the study approach provides a strong foundation for advancing both academic knowledge and practical solutions in promoting healthy ageing within a multi-ethnic, middle-income country. The insights generated here can guide policymakers, healthcare providers, and researchers in developing equitable, culturally relevant, and digitally inclusive strategies for improving health literacy among Malaysia's rapidly growing older population. Taken together, this study offers a strong foundation for future studies and

UNIVERSITI KEBANGSAAN MALAYSIA

legislative efforts targeted at promoting fair, culturally aware, and technologically inclusive approaches to healthy aging in Malaysia's quickly aging population.

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UNIVERSITI KEBANGSAAN MALAYSIA

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APPENDIX A

SYSTEMATIC REVIEW OF HEALTH LITERACY OUTCOME

Authors, year	Location	Study Design	Mean Ages; Finial Stamps	Tools	Results and Findings	Rate
(Abd-Rahim et al. 2021)	Selangor, Malaysia	cross-sectional study	60+,413/497	HLS-SF12	The prevalence of limited health literacy among older adults in primary care settings in Malaysian cities was 59.5% and was significantly associated with older age (OR=1.12), lower education level (OR=3.44), unemployment (OR=2.14), weaker cognitive function (OR=3.25), and fewer channels for accessing health information (OR=2.98).	8/8
(Kong et al. 2019)	Kuala Lumpur, Malaysia	cross-sectional study	60+,402/402	Revised antibiotic knowledge questionnaire	This study found that only one-third of elderly people in Malaysia had good knowledge of antibiotics, while those with lower levels of knowledge were more likely to have lower levels of education ($p=0.003$), to be unaware of antibiotic resistance ($p<0.0001$), and to obtain health information primarily from informal channels such as friends and family ($p=0.015$).	6/8
(Zaujan et al. 2021)	Terengganu, Malaysia	Pre-post design	50+,12:13/50:50	KAP2	Before the intervention, many older adults lacked knowledge about food poisoning prevention. After using the mobile app, their knowledge scores improved significantly.	7/9
(Froze et al. 2019)	Sarawak, Malaysia	cross-sectional study	60+,146/1006	HLS-14 and Metabolism and Disease Health Knowledge Questionnaire	Health literacy ($\beta = 0.24$, $p < 0.001$) is a key factor influencing healthy lifestyles and metabolic syndrome risk among different ethnic groups in Sarawak, Malaysia, particularly among the Malay population ($\beta = 0.288$, $p < 0.001$). Educational attainment and information access capacity are significant predictors of health literacy; variables such as age, income, and gender indirectly influence health literacy.	8/8

… to be continued

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… continuation

(Wong et al. 2022)	Kuala Lumpur, Malaysia	cross-sectional study	57.1 ±16.9, NA/381	eHEALS	The overall level of eHealth literacy among primary care patients in Malaysia is relatively low (mean = 24.4/40). Educational level (β = 0.23, $p < 0.001$), age (β = -0.15, $p < 0.001$), health status (β = 0.16, p = 0.002), and frequency of internet use (β = 0.24, $p < 0.001$) are independent predictors of eHL.	8/8
(Md Fadzil et al. 2023)	Klang Valley and Rembau, Negeri Sembilan, Malaysia	cross-sectional study	60+,476	Digital technology assessments	Among older adults in Malaysia, the use of digital health technologies is extremely low, with less than one-third of the population owning related devices. Telemedicine and health information searches are even less common, with educational attainment (p=0.008), visual function (p=0.01), mental health (p=0.04), and cognitive function being the key influencing factors.	6/8
(Karim 2020)	Sabah, Malaysia	cross-sectional study	60+,44/371	Semi-interview	Older adults tend to have lower levels of health literacy due to low educational attainment, insufficient media literacy, and limited access to information channels. They rely more heavily on traditional channels to obtain health information, resulting in a narrow range of sources and making them more susceptible to misinformation.	4/8
(Abdullah, Ng, et al. 2020)	Perak, Malaysia	cross-sectional study	58.1±10.6, 427	HLS-EU-Q47 and MDKT	Among the respondents, 44.2% had low health literacy levels, with older age, lower education levels, and lower income significantly correlated with low health literacy levels.	8/8
(Selvakumar et al. 2023)	Selangor, Malaysia	cross-sectional study	60+,346	TBQ-15), HLS-SF12, and MyMAAT	Participants had limited health literacy levels, with lower health literacy levels associated with higher perceived treatment burdens ($p<0.05$). Health literacy also had a significant positive effect on medication adherence (β = 0.220, p = 0.008), and health literacy acted as a significant mediator between treatment burden and medication adherence.	8/8

… to be continued

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… continuation

(Sahril et al. 2023)	Malaysia from the National Health and Morbidity Survey 2018	cross-sectional study	60+,3997	NHMS 2018 Standardized Questionnaire	Among older adults in Malaysia, approximately 39.6% of respondents reported poor self-rated health (SRH). Multivariate analysis revealed that factors such as advanced age (≥80 years), low household income, having three or more chronic diseases, multiple physical functional impairments (e.g., IADL limitations), feelings of loneliness, depressive symptoms, and lack of social support were associated with poor self-rated health.	8/8
(Chan et al. 2019a)	Klang Valley, Malaysia	cross-sectional study	60+, 329/786	OPAAT and OHBS	This study found that lower educational attainment (OR=1.55, $p<0.001$), older age (especially 75 years and older) (OR=1.59, $p<0.01$), economic hardship (OR=1.80, $p<0.001$), depressive symptoms (OR=2.60, $p<0.001$), functional impairment (OR=2.50, $p<0.001$), and multiple chronic disease burden (OR=1.80, $p<0.001$) are significant predictors of poorer self-rated health status among older adults in Malaysia.	8/8
(Mustafa et al. 2023)	the northern Malaysian region	cross-sectional study	51+,117/416	The scale assessing perception of health	The study found that health literacy had no direct significant impact on financial retirement planning ($p = 0.126$); the role of financial advisors did not significantly moderate the relationship between health literacy and financial retirement planning (H6 was not supported, $p = 0.104$).	7/8
(Chan et al. 2019b)	Klang Valley, Malaysia	cross-sectional study	60.75 (9.03), 367	OPAAT and OHBS	Participants had moderate knowledge of osteoporosis (average score of 67.6%) and high levels of health beliefs (average score of 71.9%). Women scored higher than men in general knowledge of osteoporosis and perception of susceptibility, but men scored lower than women in perception of mobility impairment. Knowledge about osteoporosis and health beliefs are positively correlated, but there is no strong correlation with actual behavior (such as diet and exercise). Health beliefs are positively correlated with certain behaviors, and beliefs have a greater influence on behavior than knowledge.	7/8

… to be continued

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… continuation

(Rosli et al. 2022)	Selangor, Malaysia	cross-sectional study	66.7 (±0.286), 321	MUSE Malay and RVDQOL-13 Malay versions	The median MUSE score of 30 (out of 32) among patients indicates a generally high level of "medication adherence self-efficacy"; the median DQOL score of 19 (out of 65) reflects overall good quality of life (lower scores indicate better QOL). The stronger the medication adherence self-efficacy, the higher the quality of life.	8/8
(Kamsan et al. 2020)	Klang Valley, Malaysia	cross-sectional study, a qualitative study	73.2 ± 7.27, 35	Interview	There are significant differences in understanding the "cause-process-consequence" of KOA: most can describe joint degeneration and main symptoms (pain, stiffness), but have limited understanding of the pathological mechanism, long-term prognosis, and complications. Insufficient understanding of self-management strategies	8/10
(Mohammad Hanipah et al. 2024)	Klang Valley and Rembau, Negeri Sembilan, Malaysia	cross-sectional study	60+, 757	HLS-M-Q18	The study found that approximately two-thirds (68.2%) of the elderly participants had limited health literacy. Elderly individuals with limited health literacy were 2.6 times more likely to suffer from cognitive impairment than those with adequate health literacy (OR = 2.644, $p < 0.001$).	8/8
(Haron et al. 2020)	Klang Valley, Malaysia	cross-sectional study	60+, 94	KAP	The elderly population has a generally low level of knowledge about salt intake, especially regarding misconceptions about recommended daily intake and the risks of high salt consumption. Although there is no significant difference in knowledge and practice scores among individuals with hypertension, those with higher knowledge and better practice tend to have lower blood pressure levels.	6.5/8
(Elias & Rohinmi 2022)	Kuantan, Pahang, Malaysia	cross-sectional study	60+, 382	Knowledge on COVID-19	Older adults generally have a good understanding of COVID-19 (77.3% accuracy rate), particularly in terms of isolation and preventive measures, but they have some misconceptions about the transmission routes and treatment of the disease itself. Educational attainment and marital status are significantly correlated with knowledge levels. Those with higher educational attainment and those who are married have higher knowledge levels.	7/8

HLS-SF12= Health Literacy Survey Questionnaire Short Form 12 question

TBQ-15= the Burden of Treatment Questionnaire

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KAP2= Knowledge, Attitude and Practice

MyMAAT= Malaysia Medication Adherence Assessment Tool

HLS-14= Health Literacy Survey Questionnaire Short Form 14 questions

OPAAT= Osteoporosis Prevention and Awareness Tool

eHEALS=digital Health Literacy Scales

UNIVERSITI KEBANGSAAN MALAYSIA

APPENDIX B

LETTER OF ETHICAL APPROVAL (UNIVERSITI KEBANGSAAN MALAYSIA)

UNIVERSITI KEBANGSAAN MALAYSIA
The National University of Malaysia

SEKRETARIAT ETIKA PENYELIDIKAN UKM • *UKM RESEARCH ETHICS SECRETARIAT*
Reference : UKM PPI/111/8
Date : 31 January 2025

Associate Professor Dr. Yanti Rosli
Center for Toxicology and Health Risk (CORE)
Faculty of Health Sciences
The National University of Malaysia

Dear Professor/Datuk/Dato'/Datin/Sir/Madam,

ETHICAL APPROVAL TO CONDUCT RESEARCH IN THE NATIONAL UNIVERSITY OF MALAYSIA

Research title	:	Exploring the E-Health Literacy and Health Literacy in Malaysian Older Adults
Ethics Ref. No.	:	JEP-2024-1058
Approval period	:	23 January 2025 – 22 January 2026
Study Site	:	1. Wilayah Persekutuan Kuala Lumpur 2. Kedah 3. Johor
Sample Size	:	354 samples (75 for W.P. Kuala Lumpur, 106 for Kedah and 173 for Johor)

With reference to the above.

2. The Research Ethics Committee, The National University of Malaysia (RECUKM) has provided ethical approval for above study. Please be reminded permission from the Deputy Dean of research of the faculty or Director of Institute/Centre and all relevant heads of departments / units where the study will be carried out must be obtained prior to the study. You are required to follow and comply with their decision and all other relevant regulations.

3. Please note that the investigator's responsibility is to ensure that:

i. All Adverse Events should be reported to RECUKM as soon as possible.
ii. Progress report should be submitted every **6 Months.**
iii. All changes / amendments to the study documents / study sites / study team must be notified to the RECUKM. All changes must be approved by RECUKM before continuation of the study.
iv. Application for renewal of the approval has to be submitted to RECUKM within one month (1 month) prior to the expiry of ethical approval.
v. Final Report should be provided to RECUKM when the project is complete.
vi. Please take note that all records and data are to be kept strictly CONFIDENTIAL and can only be used for the purpose of this study. All precautions are to be taken to maintain data confidentiality.

Required forms can be obtained from the The Research Ethics Committee, The National University of Malaysia (RECUKM) website: **https://www.ukm.my/jepukm**

Thank you.

Sekretariat Etika Penyelidikan Universiti Kebangsaan Malaysia
Tingkat 1, Blok Klinikal, Hospital Canselor Tuanku Muhriz,Pusat Perubatan UKM, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras Kuala Lumpur.
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Email: sepukm@ukm.edu.my Web: https://www.ukm.my/jepukm/

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The National University of Malaysia

SEKRETARIAT ETIKA PENYELIDIKAN UKM • *UKM RESEARCH ETHICS SECRETARIAT*

Yours sincerely,

PROFESSOR DR. MOHD SHAHRIR MOHAMED SAID
Chairman
Research Ethics Committee
The National University of Malaysia

c.c.
- **Deputy Dean (Research & Innovation)**
  Faculty of Health Sciences
  National University Of Malaysia
- **Chairperson of Center for Toxicology and Health Risk (CORE)**
  Faculty of Health Sciences
  National University Of Malaysia
- **Professor Dr. Ruzita Abd. Talib**
- **Associate Profesor Dr. Nur Zakiah Mohd Saat**
  Centre for Community Health Studies (ReaCH)
  Faculty of Health Sciences
  National University of Malaysia
- **Zhang Yanjie (P131983)**
  Center for Toxicology and Health Risk (CORE)
  Faculty of Health Sciences
  National University of Malaysia
- Approval letter File 2024

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SEKRETARIAT ETIKA PENYELIDIKAN UKM • *UKM RESEARCH ETHICS SECRETARIAT*

NAME OF ETHICS COMMITTEE/IRB: Research Ethics Committee, The National University of Malaysia	**ETHICS COMMITTEE/IRB** **REF NO: JEP-2024-1058**
PROTOCOL TITLE: Exploring the E-Health Literacy and Health Literacy in Malaysian Older Adults	
PRINCIPAL INVESTIGATOR: Associate Professor Dr. Yanti Rosli Center for Toxicology and Health Risk (CORE) Faculty of Health Sciences The National University of Malaysia	

The following items [X] have been received and reviewed in connection with the above study to be conducted by the above investigator.

Documents

- [X] Research Application Form (UKM-JEP-BO01)
- [X] Review Form (UKM-JEP-BO02)
- [X] Non-Disclosure Agreement (UKM-JEP-BO03)
- [X] Conflict Of Interest Form
- [X] Research Proposal / Protocol
- [X] Participant Information Sheet:
  - [X] Malay [X] English [X] Others : Chinese
- [X] Participant Consent Form:
  - [X] Malay [X] English [X] Others : Chinese
- [X] Questionnaire:
  - [X] Malay [X] English [X] Others : Chinese
- [ ] Case report Form:
  - [ ] Malay [ ] English [ ] Others :
- [X] Curriculum Vitae of Researchers:
  - [X] Principal [X] Co-researcher [X] Student
- [ ] Good Clinical Practice Certificate (GCP)
- [ ] Project Agreement

The Research Ethics Committee, The National University of Malaysia operates in accordance to the International Conference of Harmonization Good Clinical Practice Guidelines.

Comments (if any):_____

Date of Approval: 23 January 2025

PROFESSOR DR. MOHD SHAHRIR MOHAMED SAID
Chairman
Research Ethics Committee
The National University of Malaysia

Sekretariat Etika Penyelidikan Universiti Kebangsaan Malaysia
Tingkat 1, Blok Klinikal, Hospital Canselor Tuanku Muhriz,Pusat Perubatan UKM, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras Kuala Lumpur.
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APPENDIX C

SURVEY QUESTIONNAIRE (CHINESE VERSION)

银发族群使用电子健康教育与健康有关咨询的问卷调查

说明：随着人口老龄化的加剧，为了更好地研究老年教育，特设计本问卷，以下问题涉及您对使用电子产品对健康方面的看法。(请选择最合适的答案。如果您一时无法确定，您脑海中的第一个答案往往是最正确的。)
请放心，本问卷是出于科学目的而保密制作的。所有问题均应根据您自己的标准、愿望或感觉来回答。

个人资料

姓名 **所在地**

性别 ☐男 ☐女

年龄 ☐ 60-65 ☐ 66-70 ☐ 71-75 ☐ 76-80

教育程度

☐小学 ☐初中 ☐高中 ☐学士 ☐硕士及以上学历

种族

☐中国人 ☐马来人 ☐印度人 ☐其他

婚姻状况

☐未婚 ☐已婚 ☐离婚 ☐丧偶

平均月收入

☐1500RM 及以下 ☐1500-3500RM

☐3500-5500RM ☐5500RM 及以上

目前的生活状况

☐独居 ☐与配偶或/和子女同住 ☐养老院

是否正在从事或从事过健康相关工作 ☐是 ☐ 不是

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附录 1:电子健康知识调查量表

1. 您觉得互联网在帮助您做出与健康相关的资源有多大的作用?

完全没用	无用	不确定	有用	非常有用

2. 能够在互联网上获取与健康相关的资源对您来说有多重要?

根本不重要	不重要	不确定	重要	非常重要

3. 我知道互联网上有哪些与健康相关的资源。

强烈不同意	不同意	不确定	同意	非常同意

4. 我知道从哪里在互联网找到有用的与健康相关的资源。

强烈不同意	不同意	不确定	同意	非常同意

5. 我知道如何在互联网找到有用的与健康相关的资源。

强烈不同意	不同意	不确定	同意	非常同意

6. 我知道如何使用互联网来回答有关健康的问题。

强烈不同意	不同意	不确定	同意	非常同意

7. 我知道能够利用互联网上找到的健康资源来帮助自己。

强烈不同意	不同意	不确定	同意	非常同意

8. 我具备评估在互联网上找到的健康资源所需的能力。

强烈不同意	不同意	不确定	同意	非常同意

9. 我能够分辨出互联网上的高质量健康资源和低质量健康资源。

强烈不同意	不同意	不确定	同意	非常同意

10. 我有信心利用互联网上的信息与健康相关的决定。

强烈不同意	不同意	不确定	同意	非常同意

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附录 2：健康知识测试

问卷内容主要包括基本卫生知识和概念、健康生活方式和行为、基本技能三个方面。

I. 判断问题（请在你认为正确的问题后面的括号中加上“√”，如果你认为它们是错误的，请加上“×”）

A01.预防流感的最好方法是服用抗生素(抗炎药物)。 （ ）

A02.保健品不是药物，也不能替代治疗疾病的药物。 （ ）

A03.输液（吊水）是有效的和快速作用的，所以它是你患病时的首选。（ ）

A04.抑郁症也可能发生在儿童和青少年中。 （ ）

A05.长期的睡眠不足不仅会加速衰老，而且还会引发各种健康问题。（ ）

II. 单个选择题(在每个问题后给出的 3 个选项中，只有一个正确的答案，所以请在相应的选项号上打一个标记。如果您不知道，请选择×)

B01.乙肝可以通过哪一种方式传播给他人？（ ）

①与病人或感染者一起工作、进食、游泳

②它可以通过性交、输血和母婴传播来传播。

③会说话，握手，拥抱病人或感染者。

B02.关于血压的自我检测，错误的说法是：（ ）

①自测血压对高血压的诊断有参考价值

②高血压患者定期自行测量血压，可为医生制定治疗方案和评价治疗

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效果提供依据

③只要自我测量血压稳定，高血压患者就可以避免在门诊进行定期随访治疗

B03.关于吸烟危害的说法是假的？（　　）

①烟草依赖是一种慢性成瘾性疾病

②吸烟可导致许多慢性疾病

③低焦油香烟比普通香烟的危害更小。

B04.以下哪一种不是癌症的早期危险迹象？（　　）

①在身体上有异常的肿块

②粪便中不知名的血液

③体重增加

B05.气体中毒后，救援者应如何立即处理？（　　）

①给病人饮水

②将患者移到通气区域

③呼叫 999，并等待去医院接受治疗

B06.碘缺乏症最重要的危险是：（　　）

①患有“SARS”（严重急性呼吸道综合症）

②影响智力和生长

③导致高血压

B07.在剧烈活动中，身体由于出汗而失水分。在这种情况下，最好是补充：（　）

①水

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②含糖饮料

③盐水

B08.如果一种药物被标记为“OTC”，则该药物是：（　　）

①处方药，必须由医生开处方才能购买

②非处方药，没有医生的处方，就可以买到

③保健产品

B09.刘阿姨在附近散步时被狗咬了。皮肤已经破了，但并不严重。正确的执行以下操作的方法是什么：（　　）

①自己清理伤口

②应尽快清洗伤口，并尽快接种狂犬病疫苗

③忽略了这个伤口，因为它并不严重

B10.如果发生火灾，正确的反应如下：（　　）

①用手抱着你的头，或者用衣服裹住你的头，然后冲出火堆

②不要乘电梯逃生

③用你的衣服来灭火

III. 多项选择题（每个问题有 2 个或更多的正确选择，请勾选适当的选项序列号）

C01.关于肝脏的描述，以下的陈述是正确的：（　　）

①可分泌胆汁

②具有解毒的功能

③肝脏是人体重要的消化器官

④肝脏有两部分组成

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APPENDIX D

SURVEY QUESTIONNAIRE (ENGLISH VERSION)

Questionnaire on E-Health Education

Note: As the aging of the population intensifies, in order to better study the education of the elderly, this questionnaire is specially designed. The following questions relate to your views on the health aspects of using electronic gadgets. (Please choose the most appropriate answer. If you are unsure at the moment, the first answer in your mind is often the most correct.)
Please be assured that this questionnaire is confidential for scientific purposes. All questions should be answered based on your own standards, desires or feelings.

Personal Information

Name: State:

Gender ☐ Male ☐ Female

Age ☐ 60-65 ☐ 66-70 ☐ 71-75 ☐ 76-80

Education level

☐Elementary school ☐ Middle school ☐High school ☐ Bachelor's degree

☐Graduate and above

Race

☐ Chinese ☐ Malay-Chinese ☐ Malay ☐ Indian

☐ Other

Marital status

☐ Unmarried ☐ Married

☐ Divorced ☐ Widowed

Average monthly income

☐1500MYR

☐1500-3500MYR

☐3500-5500MYR

☐5600MYR

Current living situation

☐ Live alone ☐ With spouse and/or children ☐ Nursing homes

Are you working or have worked in a health-related job

☐ Yes ☐ No

UNIVERSITI KEBANGSAAN MALAYSIA

Appendix 1: eHEALTH LITERACY SCALE

How useful do you feel the Internet is in helping you in making decisions about your health?

Not useful at all	Not useful	Unsure	Useful	Very useful

How important is it for you to be able to access health resources on the Internet?

Not important at all	Not important	Unsure	Important	Very important

I know what health resources are available on the Internet.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I know where to find helpful health resources on the Internet.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I know how to find helpful health resources on the Internet.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I know how to use the Internet to answer my questions about health.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I know how to use the health information I find on the Internet to help me.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I have the skills I need to evaluate the health resources I find on the Internet.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I can tell high quality health resources from low quality health resources on the Internet.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

I feel confident in using information from the Internet to make health decisions.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

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Appendix 2: HEALTH LITERACY

The content of the questionnaire is mainly including three aspects of basic health knowledge and concepts, healthy lifestyles and behaviors, and basic skills.

Perception questions (please put a "√" in parentheses after the questions you think are correct and a "×" if you think they are wrong)

A01. The best way to prevent the flu is to take antibiotics (anti-inflammatory drugs). ( )

A02. Healthcare products are not medicines and cannot replace medicines in curing diseases. ( )

A03.Infusion is effective and fast-acting, so it is the first choice when you have a disease. ( )

A04. Depression can also be occurred in children and adolescents. ( )

A05. Chronic sleep deprivation not only accelerates aging, but also induces a variety of health problems. ( )

Multiple-choice questions (Of the 3 options given after each question, tick 1 that you think is the correct answer. If you do not know, please fill "×")

B01. In which of the following ways can hepatitis B be transmitted to others? ( )

A. Working, eating, swimming with a sick or infected person.

B. It can be transmitted through sexual intercourse, blood transfusion, and mother-to-child transmission.

C. Talking, shaking hands, hugging a sick or infected person.

B02. Regarding self-testing of blood pressure, the wrong statement is ( )

A. Self-measurement of blood pressure has reference value for the diagnosis of hypertension.

B. Hypertension patients regularly self-measurement of blood pressure, can provide a basis for doctors to formulate treatment programs and evaluation of the effectiveness of treatment.

C. As long as the self-measurement of blood pressure is stable, hypertensive

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patients can be exempted from regular follow-up treatment in outpatient clinics.

B03. Which statement about the harm of smoking is false? ( )

A. Tobacco dependence is a chronic addictive disease.

B. Smoking can cause many chronic diseases.

C. Low-tar cigarettes are less harmful than regular cigarettes.

B04. Which of the following is not an early danger sign of cancer? ( )

A. Abnormal lumps on the body

B. Unexplained blood in stools

C. Weight gain

B05. After gas poisoning, how should the rescuer first deal with the gas-poisoned person? ( )

A. Give the patient water

B. Move the patient to a ventilated area

C. Call 999 and wait the hospital for treatment.

B06. The most important danger of iodine deficiency is ( )

A. suffer from "SARS"(Severe acute respiratory syndrome)

B. affect intelligence and growth

C. cause high blood pressure

B07. During strenuous activities, the body loses water due to sweating. In this case, it is best to supplement ( )

A. water

B. sugar-sweetened beverages

C. salt water

B08. If a medicine is labeled "OTC", the medicine is ( )

A. prescription drugs, must be prescribed by a doctor to buy

B. non-prescription drugs, without a doctor's prescription, you can buy

C. health care products

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B09. Miss Liu was bitten by a dog while walking in her neighborhood. The skin is broken, but not seriously. What is the correct way to do the following? ( )

A. Clean the wound herself

B. Wash the wound and give the rabies vaccine as soon as possible

C. Ignore the wound as it is not serious

B10. In the event of a fire, which of the following is the correct response ( )

A. Hold your head in your hands or wrap your head in clothes and rush out of the fire

B. Do not take the elevator to escape

C. Use your clothes to fight the flames while evacuating out of the fire

Multiple Choice Questions (Each question has 2 or more correct choices, please tick the appropriate option serial number.)

C01. Regarding the description of the liver, which the following statements are correct ( )

① Can secrete bile

② Has the function of detoxification

③ The liver is an important digestive organ of the human body

④ The liver is made up of two parts

C02. What measures should be taken in case of respiratory or cardiac arrest? ( )

① Artificial respiration

② Chest compression

③ Call the emergency number

④ Give medication

C03. The health benefits of exercise include ( )

① Maintaining proper weight

② Preventing chronic diseases

③ Reducing psychological pressure

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④ Improving sleep

C04. When you cough or sneeze, the correct way to deal with it is ( )

① Cover your nose and mouth directly with your hands

② Cover your nose and mouth with a handkerchief or tissue paper

③ Cover your nose and mouth with the crook of your elbow

④ No need to cover the mouth and nose

C05. Outdoors, when there is thunder, which of the following practices are correct ( )

① Hide under a big tree

② Stay away from high voltage lines

③ Avoid talking on a cell phone

④ Stand on high ground

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APPENDIX E

SURVEY QUESTIONNAIRE (MALAYSIA VERSION)

Soal Selidik mengenai E-Pendidikan Kesihatan untuk warga emas

Nota: Apabila usia penduduk semakin meningkat, soal selidek ini direka khas untuk mengkaji dan dapatkan pendapat anda berkaitan penggunaan gajet eletronik di kalangan warga emas. Soalan berikut berkaitan dengan pandangan anda tentang aspek kesihatan penggunaan gajet elektronik. (Sila pilih jawapan yang paling sesuai. Jika anda tidak pasti pada masa ini, jawapan pertama dalam fikiran anda selalunya adalah yang paling betul.)
Sila yakin bahawa soal selidik ini adalah sulit untuk tujuan saintifik. Semua soalan harus dijawab berdasarkan piawaian, keinginan atau perasaan anda sendiri.

Maklumat peribadi

Nama **Negeri**

Jantina ☐**Lelaki** ☐**Perempuan**

Umur ☐ **60-65** ☐ **66-70** ☐ **71-75** ☐ **76-80**

Peringkat Pendidikan

☐Sekolah rendah ☐Sekolah Menengah ☐Sekolah Menengah

☐Ijazah Sarjana Muda ☐Sarjana dan ke atas

Bangsa

☐ Cina ☐Melayu ☐India ☐ Lain-lain

Status perkahwinan

☐Bujang ☐Berkahwin ☐Bercerai ☐Balu/ Janda

Purata pendapatan bulanan

☐1500RM dan ke bawah ☐1500-3500RM

☐3500-5500RM ☐5500RM dan ke atas

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Keadaan hidup semasa

☐Tinggal bersendirian

☐Dengan pasangan dan/atau anak-anak

☐Rumah penjagaan

Adakah anda bekerja atau pernah bekerja dalam didang yang berkaitan dengan kesihatan ☐ YA ☐ Tidak

Lampiran 1: Skala Literasi eKesihatan

1. Sejauh manakah anda rasa Internet berguna dalam membantu anda membuat keputusan tentang kesihatan anda?

Tidak berguna sama sekali	Tidak berguna	Tidak pasti	Berguna	Sangat berguna

2.Sejauh manakah pentingnya untuk anda boleh mencapai sumber kesihatan di Internet?

Tak penting langsung	Tidak penting	Tidak pasti	Penting	Sangat penting

3.Saya tahu apakah sumber kesihatan yang terdapat di Internet

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

4. Saya tahu di mana untuk mencari sumber kesihatan yang membantu di Internet

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Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

5. Saya tahu cara bagaimana untuk mencari sumber kesihatan yang membantu di Internet

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

6. Saya tahu cara menggunakan Internet untuk menjawab soalan saya tentang kesihatan.

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

7. Saya tahu kaedah menggunakan maklumat kesihatan yang saya temui di Internet untuk membantu saya.

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

8. Saya mempunyai kemahiran yang saya perlukan untuk menilai sumber kesihatan yang saya dapati di Internet.

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

9. Saya boleh membezakan sumber kesihatan berkualiti tinggi daripada sumber kesihatan berkualiti rendah di Internet

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

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10. Saya berasa yakin dalam menggunakan maklumat daripada Internet untuk membuat keputusan kesihatan

Sangat tidak setuju	Tidak bersetuju	Tidak pasti	Setuju	Sangat bersetuju

Lampiran 2: LITERASI KESIHATAN

Kandungan soal selidik terutamanya merangkumi tiga aspek pengetahuan dan konsep kesihatan asas, gaya hidup dan tingkah laku sihat, dan kemahiran asas.

Soalan persepsi (sila letakkan "√" dalam kurungan selepas soalan yang anda fikir betul dan "×" jika anda fikir ia salah).

A01. Cara terbaik untuk mencegah selesema adalah dengan mengambil antibiotik (ubat anti-radang).

( )

A02. Produk penjagaan kesihatan bukanlah ubat dan tidak boleh menggantikan ubat untuk menyembuhkan penyakit.

( )

A03. Infusi berkesan dan bertindak pantas, jadi ia adalah pilihan pertama apabila anda menghidap sesuatu penyakit.

( )

A04. Kemurungan juga boleh berlaku pada kanak-kanak dan remaja. ( )

A05. Kekurangan tidur kronik bukan sahaja mempercepatkan penuaan, tetapi juga mendorong pelbagai kesihatan masalah.

( )

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Soalan aneka pilihan *(Daripada 3 pilihan yang diberikan selepas setiap soalan, tandakan 1 yang anda fikir adalah jawapan yang betul. Jika anda tidak tahu, sila isi "×")*

B01.Antara cara berikut, yang manakah kaedah hepatitis B boleh berjangkit kepada orang lain? ( )

①Bekerja, makan, berenang dengan orang yang sakit atau dijangkiti

②Ia boleh disebarkan melalui hubungan seksual, pemindahan darah, dan transmisi darah ibu kepada anak.

③Bercakap, berjabat tangan, memeluk orang yang sakit atau dijangkiti.

B02. Mengenai pengambilan bacaan takanan darah secara sendiri, pernyataan yang salah ialah: ( )

①Pengukuran tekanan darah sendiri mempunyai nilai rujukan untuk diagnosis hipertensi

②Pesakit hipertensi kerap mengukur sendiri tekanan darah, boleh menyediakan maklumat asas kepada doktor untuk merangka program rawatan dan penilaian rawatan keberkesanan

③Selagi pengukuran sendiri tekanan darah stabil, pesakit hipertensi boleh dikecualikan daripada rawatan susulan biasa di klinik pesakit luar

B03. Pernyataan yang manakah palsu tentang bahaya merokok? ( )

①Pergantungan tembakau adalah penyakit ketagihan yang kronik

②Merokok boleh menyebabkan banyak penyakit kronik

③Rokok rendah tar kurang berbahaya daripada rokok biasa.

B04. Antara berikut, yang manakah bukan tanda merbahaya

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peringkat awal kamser? ( )

①Kewujutan ketulan tidak normal pada bandan

②Kehadiran darah tanpa sebab dalam najis

③Pertambahan berat badan

B05. Selepas keracunan gas, apakah langkah pertama keselamatan untuk menyelamatkan mangsa keracunan gas itu? ( )

①Beri pesakit air

②Pindahkan pesakit ke kawasan pengudaraan baik.

③Hubungi 999 dan tunggu bantuan hospital untuk rawatan.

B06. Bahaya paling penting kekurangan iodin ialah ( )

①menghidapi "SARS" (sindrom pernafasan akut yang teruk)

②mempengaruhi kecerdasan dan pertumbuhan

③menyebabkan tekanan darah tinggi

B07. Semasa melakukan aktiviti berat, badan kehilangan air akibat berpeluh. Dalam kes ini, lebih baik untuk menambah ( )

①air(water)

②minuman manis gula

③air garam(salt water)

B08. Jika ubat berlabel "OTC", ubat itu adalah ( )

① ubat preskripsi, mesti ditetapkan oleh doktor untuk membeli

② ubat bukan preskripsi,, anda boleh membeli tanpa preskripsi doktor

③ merupakan produk penjagaan Kesihatan

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B09. Cik Liu digigit anjing ketika berjalan di kawasan kejiranannya. Lukanya menembusi kulit tetapi tidak serius. Apakah cara yang betul untuk dilakukan dalam kes perkara berikut ( )

① Bersihkan luka itu sendiri

② Basuh luka dan ambil vaksin rabies secepat mungkin

③ Abaikan luka kerana ia tidak serius

B10. Sekiranya berlaku kebakaran, yang manakah antara berikut merupakan tindak balas yang betul ( )

① Pegang kepala anda di tangan anda atau bungkus kepala anda dengan pakaian dan bergegas keluar dari kawasan kebakaran

② Jangan gunakan lif untuk menyelamatkan diri

③ Gunakan pakaian anda untuk memadamkan api semasa keluar dari kebakaran.

Soalan Aneka Pilihan *(Setiap soalan mempunyai 2 atau lebih pilihan yang betul, sila tandakan nombor siri pilihan yang sesuai.)*

C01.Mengenai organ hati, yang mana pernyataan berikut adalah betul ( )

①hati merembeskan hempedu

②Mempunyai fungsi detoksifikasi

③hati adalah organ pencernaan yang penting bagi tubuh manusia

④hati terdiri daripada dua bahagian

C02. Apakah langkah-langkah yang perlu diambil sekiranya berlaku

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serangan pernafasan nafas atau jantung? ( )

①Bantuan pernafasan

②Mampatan dada

③Hubungi nombor kecemasan

④Beri ubat

C03.Faedah kesihatan senaman termasuklah ( )

①Mengekalkan berat badan yang bersesuaian

②Mencegah penyakit kronik

③Mengurangkan tekanan psikologi

④Baiki kualiti tidur

C04. Apabila anda batuk atau bersin, cara yang betul untuk ialah:

( )

①Tutup hidung dan mulut anda dengan tangan anda.

②Tutup hidung dan mulut anda dengan sapu tangan atau kertas tisu.

③Tutup hidung dan mulut anda dengan lengan anda.

④Tak perlu tutup mulut dan hidung

C05. Apabila ada guruh di luar rumah, manakah di antara amalan berikut betul ( )

①Berteduh di bawah pokok besar

②Jauhi tabel voltan tinggi

③Elakan penggunaan telefon bimbit

④Berdiri di kawasan tinggi

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APPENDIX F

SYSTEM REVIEW: SPECIFIC SCORING CRITERIA

	JBI Analytical Cross-Sectional Checklist							
Title	**Q1: Were the criteria for inclusion in the sample clearly defined?**	**Q2: Were the study subjects and the setting described in detail?**	**Q3: Was the exposure measured in a valid and reliable way?**	**Q4: Were objective, standard criteria used for measurement of the condition?**	**Q5: Were confounding factors identified?**	**Q6: Were strategies to deal with confounding factors stated?**	**Q7: Were the outcomes measured in a valid and reliable way?**	**Q8: Was appropriate statistical analysis used?**
(Kong et al. 2019)	☑ Clearly state that Malaysian adults aged ≥60 years are included and exclude those with cognitive impairment.	☑ Johor with olders above 60 years old in a tertiary hospital in Kuala Lumpur from March 2019 to May 2019.	☑ The questionnaire was developed using the WHO questionnaire as a reference and was validated by experts, pre-tested, and assessed using Cronbach's α (knowledge α=0.686, expectations α=0.829).	☑ The knowledge scores of >10 and <10	✗	✗ Just use t-test and chi-square test	☑ The questionnaire has been validated by experts and piloted.	☑ Descriptive statistics, chi-square, and t-tests were used, which were appropriate for the study design.

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… continuation

(Abd-Rahim et al. 2021)	☑ Clearly state that outpatients aged 60 years or older are included and exclude those with dementia and cognitive impairment.	☑ Elderly patients aged at least 60 years who understood English or the Malay language were included January 2020 and January 2021	☑ HLS-SF12 was used, which is a recognized standard tool.	☑ A questionnaire health literacy (HL) with a four-point Likert scale, score ≤ 33 was classified as insufficient health literacy, while> 33 was classified as adequate health literacy.	☑ The dependent variable is health literacy level; the independent variables are demographic variables, health-related variables, cognitive variables, and diversity of health information access.	☑ The study used multivariable logistic regression to control for potential confounders such as age, education, and cognitive status. Therefore, strategies to deal with confounding factors were clearly stated.	☑ The outcome (health literacy) was measured using the validated HLS-SF-12 questionnaire with Cro's α of 0.85, which has demonstrated reliability and validity across various populations.	☑ Descriptive, chi-square, and logistic regression analyses were used.
(Froze et al. 2019)	☑ It is clearly stated that the target population is residents aged 18 years or older in three groups, but when extracting the data, only the elderly population was extracted.	☑ Clearly describes the data acquisition process between April 2017 and October 2018.	☑The questionnaire is from a questionnaire that has been validated by other scholars.	☑	☑The study clearly identified and included several potential confounding variables, including sociodemographic factors and health status (metabolic syndrome).	☑by control path variables in the structural equation model.	☑Use validated questionnaires and multivariate models.	☑Use of PLS-SEM and model fit assessment

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UNIVERSITI KEBANGSAAN MALAYSIA

… continuation

(Wong et al. 2022)	☑ Clearly state that the patient is ≥18 years old and able to understand English.	☑ Study in an urban outpatient primary care clinic at University of Malaya Medical Centre (UMMC), Kuala Lumpur, Malaysia from June to July 2019.	☑ Variables include age, educational attainment, frequency of internet use, self-rated health status, etc.	☑eHEALS was an 8-item self-assessment scale that has been validated in multiple languages and is widely used in eHL research in various countries.	☑Report age, education, frequency of Internet use, self-rated health status, etc. as confounding factors.	☑Control variables in multiple regression analysis.	☑eHEALS is widely validated, using mean scores and standard deviations.	☑Use t-tests, ANOVA, and regression analysis.
(Md Fadzil et al. 2023)	☑ Clearly state that Malaysian adults aged ≥60 years are included.	☑ The inclusion criteria were older adults aged 60 years and above, living in an urban or rural community and able to communicate in Malay or English from October 2021 to March 2022	☑Variables were measured using structured questionnaires covering demographic factors, cognitive function, and device usage.	☑MoCA, EFS, GDS, etc. are all standard scales.	✗	✗	☑Use validated scales (Cro's α of 0.72)	☑ Although no regression analysis was performed, the chi-square and t-tests were reasonable.

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UNIVERSITI KEBANGSAAN MALAYSIA

… continuation

(Karim 2020)	☑ Clearly state that Malaysian adults aged ≥18 years are included.	☑The quantitative part was conducted using purposive sampling at health centres in urban and rural areas; the qualitative part was conducted using snowball sampling for interviews.	⚠Unverified scales, by simply collection	✗	✗	✗	⚠ Interviews are effective but lack a quantitative scoring mechanism.	☑The quantitative part uses descriptive analysis, while the qualitative part uses thematic analysis.
(Abdullah, Ng, et al. 2020)	☑ Clearly defines inclusion criteria	☑Recruiting Malaysians aged 18 and above with type 2 diabetes from Jan to March 2018	☑Variables include demographic factors, health literacy levels, and diabetes-related knowledge.	☑ As having limited health literacy if their General Health Literacy Index was ≤33 points.	☑Classified according to factors such as educational attainment and income	☑Using multiple regression to control for confounding factors	☑All questionnaires have been tested with Cronbach's α=0.702 and Cronbach's α of 0.96	☑Using descriptive statistics and multivariate logistic regression, appropriate

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UNIVERSITI KEBANGSAAN MALAYSIA

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(Selvakumar et al. 2023)	☑ Clearly defines inclusion criteria	☑ Using a convenience sample of the elderly population aged ≥60 years.	☑The variables are demographic factors, treatment burden, health literacy, and physical condition.	☑Use validated tools to measure HL and adherence, limited health literacy level (score 0–24), problematic (score 25–33), sufficient health literacy level (score 34–42), and excellent health literacy level (score 43–50) in this present study, adherent (scores 54–60) and non-adherent (scores 12 to 53).	☑Include variables such as income and number of illnesses in the regression model.	☑Multivariate regression modelling to control confounding variables	☑All questionnaires have been tested with Cronbach's Alpha of 0.82	☑Multiple linear regression, mediation analysis
(Haron et al. 2020)	☑ Clearly defines inclusion criteria	☑ The elderly population aged ≥60 years.	☑A standardized KAP questionnaire (self-developed) was used, and its reliability and validity were tested.	☑Blood pressure measurement standards are clear, and the questionnaire has been validated.	⚠ Only factors such as gender and age were considered, but no control analysis was performed.	❌	☑All questionnaires have been tested with Cronbach's Alpha of 0.7	☑Descriptive statistics and correlation analysis were used.

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UNIVERSITI KEBANGSAAN MALAYSIA

… continuation

(Sahril et al. 2023)	☑ Use a national database of elderly people	☑ Clearly define the population aged 60 and above in Malaysia in 2018	☑ Exposure variables (such as age, chronic diseases, functional impairment, psychological status, etc.) were collected using standardized questionnaires.	☑ The primary outcome variable of the study was "self-rated health," which is typically measured using a standard five-point scale.	☑ The number of chronic diseases, physical disabilities, symptoms of depression, economic status, marital status, lifestyle, etc.	☑ Multivariate logistic regression analysis to control for confounding factors	☑ "Self-Rated Health" uses a five-point scale that has been widely validated internationally.	☑ Descriptive statistics, chi-square tests, and multivariate logistic regression were used to analyse the data.
(Chan et al. 2019a)	☑ Malaysian residents aged 60 and above, and the data was obtained from a nationally representative sample (NHMS 2018).	☑ Clearly define the population aged 60 and above from April 2018 to April 2019.	☑ Exposure variables such as depression, functional status, income, and chronic diseases were assessed using standardized questionnaires and structured interviews.	☑ The questionnaire has a graded scale, such as the five-level scale.	☑ The model considered confounding factors such as gender, age, income, and number of diseases.	☑ multiple logistic regression	☑ Self-rated health (SRH) validated through standard questions with Cro's α of 0.739 and 0.731.	☑ Use complex sample design correction, descriptive analysis, chi-square test, and logistic regression.

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UNIVERSITI KEBANGSAAN MALAYSIA

… continuation

(Rosli et al. 2022)	☑60 years of age or older, cognitively intact, T2DM ≥ 1 year, taking ≥ 5 medications, able to read and write Malay or English.	☑ 60+ in Selangor from December 2019 to November 2020.	☑ Gender, age, ethnicity, education, income, complications, method of administration.	☑a four-point Likert scale and a five-point Likert scale.	☑ Include multiple variables such as income, number of days of medication use, total number of medications, method of administration, and complications.	☑ Multiple linear regression analysis was used to adjust for the main variables simultaneously.	☑Cronbach's alpha of 0.867 and 0.846, respectively.	☑ Using Spearman correlation and multiple linear regression.
(Elias & Rohinmi 2022)	☑ Specifically defined as persons aged 60 or above, residing in Pahang State, and with internet access capabilities.	☑ Describes the study subjects (382 elderly people, including gender, age, education, marital status, living conditions, etc.) and the study location (Kuantan, Malaysia) between March and May 2021.	☑ Including gender, age, educational attainment, marital status, cohabitants, etc.	☑Use standardized questionnaires with clear scoring criteria. Total score varied from 0 to 22.	☑ Potential confounding factors (such as age, gender, education, marital status, living arrangements, etc.) were identified and listed separately in the analysis.	❌Although confounding factors were identified, no methods such as multiple regression were used to control for confounding, and only univariate analysis was performed.	☑ Both the knowledge and attitude scales used validated questionnaires with Cronbach's α reliability coefficients of 0.7 and 0.81, respectively, and were back translated and pre-tested.	☑ The Mann–Whitney U test and Kruskal–Walli's test were applied to analyse the differences in knowledge and attitudes of older people. The Pearson correlation test was applied to determine the correlation between knowledge and attitude.

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UNIVERSITI KEBANGSAAN MALAYSIA

… continuation

(Chan et al. 2019b)	☑≥40 years old, Chinese descent, residing in the Klang Valley, no history of bone metabolic diseases or related medications.	☑ mean years60.75 (9.03) in Klang Valley from April 2018 to January 2019 in Klang Valley	☑ Gender, age, education, income, occupation, marital status, lifestyle habits, etc. are all described.	☑The knowledge score was summed up and categorized into low (less than or equal to 50%), moderate (51% to 69%), and high (70% and above); Likert's scale from 1 to 5.	☑ Analysed demographic variables such as gender, age, education, income, occupation, and marital status.	✗Mainly using single-factor analysis (t-test, analysis of variance), no multi-factor regression control for confounding factors was observed.	☑Both the knowledge and belief questionnaires are based on validated scales and have good reliability 0.739 and 0.731, respectively.	☑ T-tests, analysis of variance, correlation analysis, and other statistical methods were used, and the statistical methods were reasonable.
(Mustafa et al. 2023)	☑The target population was defined as "self-employed individuals," with a total sample size of 416 self-employed individuals from the northern region of Malaysia.	☑Described the sociodemographic characteristics of the sample and the geographical area where the study was conducted (northern Malaysia).	☑The questionnaire tools used to measure financial attitudes, financial literacy, health literacy, and the role of financial advisors were adapted from existing validated scales.	☑ Adapted from existing research.	☑Listed sociodemographic variables such as age, gender, educational attainment, business experience, and business location.	✗	☑Project loadings (Loadings > 0.708%), composite reliability (CR > 0.7), and average variance extracted (AVE > 0.5) were met for all constructs.	☑Analysed using partial least squares structural equation modelling (PLS-SEM)

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… continuation

(Mohammad Hanipah et al. 2024)	☑ Citizens aged 60 and above who can understand Malay and English.	☑ 757 citizens in two places between April 2021 to March 2022	☑ Age, gender, race, marital status, place of residence, employment status, educational attainment, income, cognitive status, and health literacy level	☑ a Likert scale with four levels	☑ The study identified and listed several potential sociodemographic confounding factors, including age, gender, place of residence, marital status, employment status, educational attainment, and income.	☑ Binary logistic regression analysis was used to assess the association between health literacy and cognitive impairment, and all sociodemographic variables that were statistically significant in the univariate analysis were included as covariates in the model for adjustment.	☑ The reliability of the HLS-M-Q18 is good (Cronbach's α for all three domains is above 0.7, and the overall reliability of the questionnaire is 0.89).	☑ Descriptive statistics, independent t-tests, chi-square tests, Mann-Whitney U tests, and binary logistic regression analysis were used.

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JBI Quasi-Experimental Studies Checklist									
Title	**Q1. Is there congruity between the stated philosophical perspective and the research methodology?**	**Q2. Is there congruity between the research methodology and the research question or objectives?**	**Q3. Is there congruity between the research methodology and the methods used to collect data?**	**Q4. Is there congruity between the research methodology and the representation and analysis of data?**	**Q5. Is there congruity between the research methodology and the interpretation of results?**	**Q6. Is there a statement locating the researcher culturally or theoretically?**	**Q7. Is the influence of the researcher on the research, and vice- versa, addressed?**	**Q8. Are participants, and their voices, adequately represented?**	**Q9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?**
(Zaujan et al. 2021)	☑ Whether intervention via a mobile app influence knowledge about food poisoning.	☑And divide the comparison group and intervention group by age group.	☑ the current study adopted a 12-week educational period for respondents from March to June 2020.	⚠Unclear	❌There is no report on whether other environmental factors, information sources, and other external interference were controlled.	☑12 weeks of intervention education	☑Although the scale was self-created, it demonstrated reliability through pre-testing, with Cronbach's α = 0.76.	☑It is reasonable to use independent samples t-tests and paired t-tests.	⚠unclear

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JBI Critical Appraisal Checklist for Qualitative Research									
Title	**Q1. Is there congruity between the stated philosophical perspective and the research methodology?**	**Q2. Is there congruity between the research methodology and the research question or objectives?**	**Q3. Is there congruity between the research methodology and the methods used to collect data?**	**Q4. Is there congruity between the research methodology and the representation and analysis of data?**	**Q5. Is there congruity between the research methodology and the interpretation of results?**	**Q6. Is there a statement locating the researcher culturally or theoretically?**	**Q7. Is the influence of the researcher on the research, and vice- versa, addressed?**	**Q8. Are participants, and their voices, adequately represented?**	**Q9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?**
(Kamsan et al. 2020)	☑ Use focus groups to dig deeper into older folks' understanding and needs regarding KOA.	☑ Collect diverse perspectives through semi-structured (6 topics) interview guidelines.	☑ Using the Braun & Clarke thematic analysis framework	☑ The theme closely corresponds to the sample speech.	☑	✗	✗ No in-depth reflection on interviewer bias	☑ Abundant quotations from original sources	☑ Obtained ethical approval from two universities and obtained written consent prior to the visit.

UNIVERSITI KEBANGSAAN MALAYSIA

APPENDIX G

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Review article

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Scoping review of the e-health literature in older adults

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Abstract

Objective and purpose: The purpose of this scoping review was to examine the breadth and scope of the existing literature on eHealth in older adults, with a particular focus on access, uptake, usability, and outcomes related to eHealth technologies. The review aims to map the existing evidence, identify research gaps, and from these, analyze the factors that influence eHealth literacy in older people and inform future research and interventions aimed at increasing eHealth engagement in the older population.

Methodology: A scoping review was conducted using Arksey and O'Malley's framework. Relevant peer-reviewed articles published over 10 years between 2015 and 2024 were screened from multiple electronic databases. Studies were selected based on predetermined inclusion and exclusion criteria, with a focus on older adults and their interactions with eHealth technologies.

Results: A scoping review of literature from PubMed, Web of Science, SCOPUS, and EBSCO identified 2247 studies, with 25 full-text articles published in the past 10 years. Findings reveal that e-health literacy decreases with age and lower education levels. External factors such as social support, technology access, and healthcare policies fluctuate with economic conditions, while internal factors like cognition, attitudes, and motivation are influenced by age and life experiences.

Conclusion: eHealth literacy holds promise for enhancing healthcare access and outcomes among older adults. However, significant barriers remain, particularly regarding usability, accessibility, and digital literacy. Future research should focus on targeted education and longitudinal evaluation to better understand and support older adults' engagement with eHealth technologies.

Keywords

e-Health literacy, e-health education, health literacy, older adults

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Introduction

Background

Population aging is becoming one of the major social challenges of the 21st century.[1] The United Nations reported that 1 in 11 people was aged 65 or older in 2019[2]; by 2050, the ratio is expected to be 1 in 6. With this demographic shift, the prevalence of chronic diseases among older adults is expected to increase dramatically. Available data emphasize the importance of health literacy for reducing comorbidities as well as enhancing the prevention and management of chronic diseases.[3] Traditionally measured at the individual level, health literacy refers to individual cognitive abilities that facilitate accessing, understanding, and utilizing health information for informed decision-making and the successful management of health.[4] Sørensen et al. expanded this concept by identifying three domains of health literacy: healthcare, disease prevention, and health promotion.[5]

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