

Health Literacy Among A Young Adult Sample Of The Saudi Population: A Cross- Sectional Study

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Abstract

Health Literacy is the public's capacity to obtain, process, and utilize health information to make informed decisions concerning healthy living. The study explores its prevalence among the adult population in Saudi Arabia, focusing on identifying the influencing factors and proposing strategic recommendations to address disparities and improve healthcare outcomes.

Methods: By employing a cross-sectional design, this study aimed to include adults from all regions of KSA and utilized an online data collection method. A snowball sampling technique was employed. Data was collected using the Health Literacy Scale-12 (HLS-Q12) questionnaire between January 1, 2023, and April 30, 2023. HLS-Q12 is a 12- statement questionnaire with responses ranging from easy to difficult. Each statement is assigned a score between 1 and 4, resulting in a total score ranging from 12 to 48. Four categories of health literacy can be identified based on the total score: illiteracy (score <27), marginal ($27 \leq \text{score} < 33$), intermediate ($33 \leq \text{score} < 39$), and advanced (score ≥ 39). The data was analyzed using SPSS version 27, and multivariable linear regression analysis was conducted to identify the variables most significantly associated with the health literacy total score.

Results: A total of 1057 people responded to the survey. Most respondents were females (53%) and aged up to 40 years (71%). The majority of them were married, Saudi nationals, and employed. The mean health literacy score was found to be 36.3 ± 6.7 , with 34% of respondents classified as having Advanced knowledge and 39% classified as having Intermediate knowledge. The multivariable linear regression analysis revealed that factors associated with the health literacy total score included having a monthly income of more than SAR 15,000, being from the Northern region of Saudi Arabia, and having diabetes mellitus.

Conclusion: Mitigating disparities, reducing healthcare inequalities, and aligning Saudi Arabia's healthcare objectives with national development goals could create a health-conscious population that recognizes the interventions and how to access them to promote public health.

Keywords: health literacy, Saudi Arabia, healthcare disparities, health education, Saudi Vision 2030.

Introduction

Health literacy (HL) is defined as the extent to which individuals can obtain, process, understand, and apply basic health information and services needed to make appropriate health decisions (Institute of Medicine, 2004). It extends beyond general literacy by focusing specifically on the knowledge and competencies required to navigate healthcare systems, interpret medical instructions, engage in preventive behaviors, and make informed decisions regarding personal and family health. Adequate HL has consistently been associated with improved medication adherence, effective utilization of preventive services, and better overall health outcomes (Dewalt et al., 2004; Zhang et al., 2014). Conversely, limited HL has been linked to reduced use of preventive services, increased healthcare costs, higher emergency department utilization, and elevated morbidity and mortality rates (Coughlin et al., 2020; Duong et al., 2017; Rasu et al., 2015).

Globally, limited health literacy represents a significant public health challenge. Findings from large-scale surveys, including the European Health Literacy Survey, indicate that a substantial proportion of

populations exhibit marginal or inadequate HL levels (HLS-EU Consortium, 2012; Sørensen et al., 2015; Institute of Medicine, 2013). Socioeconomic status, educational attainment, age, and place of residence have repeatedly emerged as significant determinants of HL (Garcia-Codina et al., 2019; Lorini et al., 2019; Maricic et al., 2021; Todorovic et al., 2019). Individuals with lower income and education are particularly vulnerable, often experiencing difficulty understanding medical instructions, evaluating health information sources, and navigating healthcare systems effectively.

In the Kingdom of Saudi Arabia (KSA), healthcare reform has accelerated under Saudi Vision 2030, emphasizing patient-centered care, expanded private sector participation, and strengthened preventive services (Al-Hanawi, 2017). As the healthcare system increasingly promotes shared decision-making and self-management, HL becomes a critical determinant of healthcare quality and population health outcomes.

Several regional studies have attempted to estimate HL levels within Saudi Arabia, yet findings remain variable. Almubark et al. (2019) reported that nearly 46% of adults demonstrated inadequate HL in a national survey, with determinants including older age, lower education, lower income, and regional differences. Similarly, Abdel-Latif and Saad (2019) found that a considerable proportion of participants exhibited basic or intermediate HL levels. Other studies conducted in Riyadh and Jeddah have reported varying HL prevalence depending on the assessment tool used, including SILS and S-TOFHLA (Alkhaldi et al., 2018; Alamari & Alkwaari, 2017). These inconsistencies may reflect differences in measurement instruments, sampling techniques, and study populations.

Demographic and socioeconomic factors appear to play a substantial role in shaping HL levels within the Saudi context. Previous research has identified older age, lower educational attainment, lower income, and marital status as predictors of limited HL (Almubark et al., 2019; Alahmadi, 2023). Moreover, disparities in preventive health check-up utilization have been linked to socioeconomic inequality (Al-Hanawi & Chirwa, 2021). International evidence similarly supports the influence of education and income on HL levels (Garcia-Codina et al., 2019; Lorini et al., 2019).

Health literacy is also closely related to chronic disease management. Studies have demonstrated associations between HL and adherence to treatment among patients with chronic conditions such as diabetes and cardiovascular diseases (Fan et al., 2016; Miller, 2016). Inadequate HL has been associated with poorer disease outcomes and increased emergency service utilization (Herndon et al., 2010; Shahid et al., 2022). Within Saudi Arabia, research has indicated that knowledge gaps persist regarding chronic disease awareness and management (Robert et al., 2021; Aldhabaan et al., 2022).

Despite the expanding body of literature, important gaps remain. Many studies have focused on specific regions or healthcare settings, limiting generalizability. Additionally, differences in HL assessment tools including REALM-R, SILS, and S-TOFHLA have complicated direct comparisons across studies (Abdel-Latif & Saad, 2019; Alkhaldi et al., 2018). Comprehensive national-level data exploring regional and socioeconomic variations remain limited. Given Saudi Arabia's geographic diversity and ongoing healthcare transformation, updated and broader evidence is essential to inform targeted public health interventions.

Improving HL aligns closely with national priorities aimed at enhancing healthcare access, reducing inequalities, and achieving the objectives of Vision 2030. Effective intervention planning requires a clear understanding of current HL levels and associated determinants among Saudi adults (Liu et al., 2020).

Therefore, the present study aimed to evaluate the level of health literacy among adults residing in Saudi Arabia and to analyze demographic and socioeconomic factors associated with HL scores. By providing updated evidence on HL distribution and its determinants, this study seeks to inform policy development and guide targeted strategies to enhance public health literacy within the Kingdom (Zhang et al., 2014).

Aim: The current research aimed to evaluate the HL level of the Saudi adult population and to analyze the factors associated with low HL levels.

Specific Objectives

- To evaluate the HL level of the Saudi adult population.
- To analyze factors associated with low HL levels in the Saudi adult population.

Research Questions

- What is the level of HL among the Saudi adult population?
- What factors are associated with low HL levels in the Saudi adult population?

LITERATURE REVIEW

1. Preview of the Local Literature

Almubark et al. (2019) explored the scope of HL in KSA to define the distribution of HL and to identify the elements that foster this outlook in the region. The definition of HL by Almubark et al. (2019) bears similar markers to what other researchers posit by asserting that HL is the nexus where suitable healthcare information converges with people's capacity to apprehend and utilize it. The study revealed a significant correlation between low HL and poor healthcare practices, including inappropriate medication, which leads to adverse health outcomes and increased healthcare costs. Therefore, it becomes imperative to delineate the reasons for low HL levels and develop intervention measures to improve the situation (Almubark et al., 2019).

In the KSA, Vision 2030 seeks to engage private medical healthcare to transform the care landscape in the region. While private healthcare is mainly available in urban centers, extending it to rural areas could benefit a significant portion of the population. Additionally, the high prevalence of chronic diseases in Saudi Arabia highlights the urgent need to improve HL levels. Almubark et al. (2019) found that 46% of the Saudi population suffers from inadequate HL, emphasizing the need to identify more profitable and reliable healthcare information channels to reinforce HL. According to Almubark et al. (2019), most people seem to be obtaining healthcare information from the internet. While this approach may be practical, it is often the case that some information may not be the befitting approach for an individual. This move necessitates exploring more secure options, such as consulting specialists (Almubark et al., 2019).

Abdel-Latif and Saad (2019) conducted a cross-sectional study that explored the outlook of healthcare literacy in KSA for men, women, and children. Their study revealed that HL was a challenge for 57.4% of the population. While this figure is different from the 46 percent obtained by Almubark et al. (2019), it indicates a critical need to increase HL levels in the country. Inadequate HL is defined as the inability of individuals to access, comprehend, and engage with health services and information (Abdel-Latif & Saad, 2019). Low HL is correlated with poor healthcare practices and a high prevalence of chronic diseases. These findings extend the need for formidable HL in navigating the nuances of disease management for patients.

Abdel-Latif and Saad (2019) also noted that culture, along with other factors such as employment, education, age, and gender, influences the scope of HL.

Previous studies have illustrated that vulnerable populations in KSA face significant information asymmetry, resulting in health inequality in the Kingdom. For instance, Al-Hanawi and Chirwa (2021) concluded that the Saudi government should develop appropriate intervention programs to improve the uptake of preventive check-ups. The authors further deduced that the ideal strategy would involve aggressive awareness campaigns to educate the population regarding the importance of preventive check-ups. Their outcomes concur with those of other scholars, such as Alahmadi (2023), who noted that the HL level in KSA is 54.4% and that factors such as educational status, age, and gender influence HL levels in the country. Education is among the critical factors that influence HL levels in the Kingdom (Al-Hanawi & Chirwa, 2021; Alahmadi, 2023). These studies provide critical insight that forms the basis for drawing assumptions regarding the low levels of preventive healthcare uptake in the population. Therefore, the current study sought to determine HL levels based on the provinces.

2. International Literary Previews

According to Garcia-Codina et al. (2019), HL entails competence and essential knowledge that enable individuals to access, comprehend, appraise, and utilize health information to make informed choices (p. 1). HL plays a vital role in today's society, as proffered by Garcia-Codina et al. (2019). The researchers took the stand that there has been a significant increase in the demand for health literacy worldwide. In their research, Garcia-Codina et al. (2019) investigated the level of HL in Catalonia by stratifying their target population into age clusters to explore the dynamics of HL. Their study, based on a randomly selected sample of 2433 respondents, indicated that 83 percent of the population has a

significant level of HL. However, the researchers also identified impediments to HL, including education, socioeconomic status, physical activity, and physical limitations, which must be considered when developing a suitable HL regime.

In another study, Lorini et al. (2019) defined HL as the ability of individuals to make sound decisions affecting their health under everyday circumstances. This finding implies that wherever an individual is in their daily lives, whether in their job setting or home, they can appropriately apprehend and practice suitable health approaches. The authors also noted that HL entails not only personal endeavors but also how communities are affected by health information. This supposition accentuates that how HL is projected on the individual level is also projected on the community.

Lorini et al. (2019) investigated the outlook of HL in Italy using questionnaires as the primary data collection technique, with 452 participants. The results indicated concern over people's literacy on mental health issues and an overabundance of "do not know/refuse" responses to key questions. The study also recognized the significant impact of culture on a population's HL based on atypical outcomes compared to research in other parts of the world. The study proposed that cultural norms, such as the composition and role of the family, education, social and market systems, and the use of media resources, create pathways through which variations in HL occur. Lorini et al. (2019) also posited the role of market systems in HL. Garcia-Codina et al. (2019) also noted that socioeconomic status plays a significant role in establishing unbending HL in a population. The conclusion is that a nation's socioeconomic situation may affect the HL levels of its inhabitants.

Reeves et al. (2020) expounded on the HL outlook in the United States. Health literacy is the bridge between patients and the medical facilities meant to galvanize their health. They emphasized that HL is crucial in fostering suitable healthcare outcomes by exposing patients to procedures and processes that effectively prevent, treat, and cure illnesses. Also, Reeves et al. (2020) noted a positive correlation between patient literary attributions and improved HL. They proposed that incongruent literary attributions may lower HL levels. The researchers highlight the findings of the Ad Hoc Committee on HL in 1999, which indicate a significant disparity between patients who require major medical attention and the information they receive, leading to the proposal to enhance communication skills in the medical professional body so that patient-doctor communication would ensue in a friendlier and easily comprehensible manner. While this challenge seems to be a twentieth-century issue, the same trend is observable today. Therefore, improving patient HL is critical in enhancing healthcare outcomes, in addition to addressing issues on the physician's side of things.

In Japan, Yamaguchi et al. (2020) explored the scope of mental HL and its impact on early intervention measures. The authors asserted that decreased literacy on mental health issues often leads to stigma, a detractor against seeking early medical attention. Their research revealed that 70 percent of respondents deemed mental health a scary concept, while over 90 percent opined a relationship between mental health issues, living environments, and the tendency for suicide. These figures reveal stereotypes and preconceptions people hold that may affect health outcomes for others. Other research approaches primarily denote a relationship between an individual and their healthcare outcomes. Yamaguchi et al. (2020) noted that HL for one individual might affect the health outcomes of another, propagating the vicious cycle of low healthcare outcomes.

3. Risk Factors of Low Health Literacy Levels in Saudi Arabia

Previous research has shown that there is a direct positive correlation between citizens' demographic characteristics and levels of HL in KSA. Specifically, older age, low educational attainment, low income levels, a higher number of healthcare service visits per year, and being formally married were associated with low literacy levels (Almubark et al., 2019). Alahmadi (2023) supported these findings and further noted that advanced age, male gender, and lower educational attainment were primary contributors to low HL levels in the Kingdom. Alahmadi (2023) also reported that the differences in HL levels based on gender were due to higher reading and writing scores among females than males. Both studies concur that demographic factors such as age, gender, education, and income levels significantly influence participants' HL levels (Alahmadi, 2023; Almubark et al., 2019). The current investigation aims to expand the scope of demographic factors to determine the applicability of these assertions in explaining HL levels in KSA.

The level of HL among patients varies depending on the conditions they are suffering from and the available support systems. For instance, some scholars have noted that low HL levels are high among

individuals suffering from chronic conditions due to their complexity (Hickey et al., 2019). Therefore, these authors concluded that healthcare providers should undertake high engagement levels with such patients to manage appointments and coordinate their conditions (Hickey et al., 2019). This conclusion concurs with that of previous authors who contended that there was a negative correlation between the number of chronic conditions a patient had and their HL levels (Wieczorek et al., 2023). Hence, the findings align with the determination that low HL is prevalent among patients with chronic conditions, which a majority of patients find challenging to interpret (Hickey et al., 2019; Wieczorek et al., 2023). However, these authors only focused on patients with chronic conditions, signifying that their conclusions cannot be generalized to those with severe diseases. Therefore, this research addresses this knowledge gap by focusing on the general population, including both the sick and the healthy.

4. Impact of Low Literacy Levels

Low literacy levels could be detrimental to individuals' decision-making abilities related to health promotion activities. Previous research has found that individuals with low HL are at increased risk of unintentional nonadherence to medical professionals' instructions (Fan et al., 2016). This assertion is supported by another study that found a robust association between HL and adherence to medical instructions among patients with cardiovascular diseases (Miller, 2016). These two author groups affirm the assumption that low HL affects treatment outcomes among patients (Fan et al., 2016; Miller, 2016). However, the study by Fan et al. (2016) focused on Type 2 diabetes, while Miller (2016) focused on cardiovascular diseases. This suggests that their findings cannot be generalized to all diseases. Therefore, this study addressed the research problem by expanding the scope to focus on the entire population, including patients with varied conditions and those in good health.

Previous research has shown that low HL is associated with an increased likelihood of emergency department visits among patients. The findings demonstrate that nonadherence to physician and clinician recommendations is common among patients with low literacy levels, which increases the likelihood of their emergency department revisions (Shahid et al., 2022). These deductions are in agreement with a previous investigation that found low HL reduced the probability of favorable health outcomes among patients because the instructions were too complex for them to understand (Herndon et al., 2010). Both author groups agree that there is a direct positive correlation between patients' HL and treatment outcomes (Herndon et al., 2010; Shahid et al., 2022). However, this study focused more on all individuals, indicating that it sought to evaluate the literacy levels in the Kingdom among all adults who met the inclusion criteria.

5. Comparative Analysis of Health Literacy Assessment Methods in Saudi Arabia

Numerous studies in Saudi Arabia have been conducted to determine health literacy, utilizing various methods. Alahmadi (2023) employed a structured questionnaire, examining 54.4% of Saudi adults, among whom limited health literacy was present. Factors reflecting the percentage of health literacy included age, gender, and education level. Almubark et al. (2019) conducted a national online survey using the Single Item Literacy Screener (SILS) and nonprobability quota sampling. An earlier study by Abdel-Latif and Saad (2019) indicated that most Saudis possessed moderate health literacy, while some exhibited limited and basic levels. This result was yielded from 500 participants in a random survey using the REALM-R test. Health information often appeared difficult to understand.

Comparatively, the articles by Alahmadi (2023), Almubark et al. (2019), and Abdel-Latif and Saad (2019) provide comprehensive insights that facilitate an understanding of health literacy (HL), both nationally and globally. Another approach to HL, discussed by Alahmadi (2023), included the use of an in-depth tool that covers all dimensions of HL, especially placing a greater reliance on self-reported data, which could result in potential selection bias. On the other hand, the study by Almubark et al. (2019) focuses only on one aspect of HL but details many different characteristics and conceptualizes all primers of HL, using these tools to understand HL perceptions within the Saudi Arabian context. Although these studies offer differing depictions of HL within the Saudi context, they complement one another in highlighting the complexity of HL research, not only within the Saudi context but also internationally, as they demonstrate the diversity and resilience of HL against the backdrop of methodological complexity and challenges.

METHODOLOGY

1. Study Design and Population

This study employed a cross-sectional research design to assess health literacy (HL) levels among adults in the Kingdom of Saudi Arabia (KSA). Cross-sectional studies measure both exposure and outcome variables at a single point in time and are commonly used to determine prevalence and examine associations between variables (Setia, 2016). This design was selected because it allows researchers to describe population characteristics efficiently while generating baseline data for future research (Wang & Cheng, 2020).

The study was conducted between January 1, 2023, and April 30, 2023. The target population included adults aged 18 years and above residing in Saudi Arabia, including both Saudi nationals and non-Saudis living in the country. Individuals aged 18 years or younger were excluded from participation. Since the study was conducted online, participants were required to have internet access and the ability to complete an electronic questionnaire. The online approach enabled coverage of participants from various regions across Saudi Arabia, overcoming geographical barriers.

2. Sample Size and Sampling Technique

The sample size was determined using Cochran's formula for estimating proportions in large populations (Bartlett et al., 2001). The calculation was based on a previously reported prevalence of inadequate health literacy (46%) among the Saudi population (Almubark et al., 2019), with a 95% confidence level and a 5% margin of error. The minimum required sample size was calculated accordingly. To account for incomplete or missing responses, the sample size was increased by approximately 10%, resulting in a final target of 420 participants.

A non-probability snowball sampling technique was used to recruit participants. This method was considered appropriate due to the wide geographical distribution of the population and the online nature of the study. The questionnaire link was distributed via social media platforms such as WhatsApp, Telegram, and Twitter. Participants were encouraged to share the survey link within their social networks to enhance recruitment. Although snowball sampling may introduce selection bias, it is an effective strategy for reaching diverse participants in large populations within a limited time frame.

3. Data Collection Instrument and Procedure

Data were collected using a structured online questionnaire created through Google Forms. The questionnaire consisted of two main sections. The first section included demographic and personal characteristics such as age, gender, marital status, education level, income, occupation, and history of chronic illnesses.

The second section incorporated the Health Literacy Scale-12 (HLS-Q12), a validated 12-item instrument derived from the European Health Literacy Survey (Finbråten et al., 2018). Each item was rated on a four-point Likert scale ranging from "very easy" to "very difficult." Total scores ranged from 12 to 48, with higher scores indicating better health literacy. Health literacy levels were categorized into four groups: illiteracy (<27), marginal (27–32), intermediate (33–38), and advanced (≥ 39) (Guttersrud et al., 2019).

The questionnaire was originally developed in English and translated into Arabic using forward and backward translation to ensure linguistic and conceptual equivalence. Professional translators conducted the translation process, and the final version was reviewed to ensure clarity and accuracy. Participants were given the option to complete the survey in either English or Arabic. The concise structure of the questionnaire helped improve completion rates and minimize respondent fatigue.

4. Data Analysis, Pilot Study, and Ethical Considerations

Collected data were exported to Microsoft Excel for coding and cleaning, then transferred to the Statistical Package for the Social Sciences (SPSS) version 27 for analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. The total health literacy score was calculated by summing the 12 HLS-Q12 items.

Independent samples t-tests and one-way analysis of variance (ANOVA) were used to compare health literacy scores across demographic variables. Variables with a p-value < .20 in bivariate analysis were included in a multivariable linear regression model to identify independent predictors of health literacy. Statistical significance was set at $p < .05$, and results were reported using beta coefficients and 95%

confidence intervals.

A pilot study was conducted with 15 participants to assess clarity, feasibility, and comprehension of the questionnaire. Minor modifications were made based on feedback. Data collected during the pilot phase were not included in the final analysis (Fraser et al., 2018).

Ethical approval was obtained from the Institutional Review Board (IRB) at Alfaisal University (IRB-20199). Participation was voluntary, and informed consent was obtained electronically before survey completion. No identifiable information was collected, and all data were treated confidentially and used solely for research purposes. The authors declared no conflicts of interest.

RESULTS

A total of 1087 people responded to the survey. Out of these, there were 30 with incomplete responses to the health literacy questions. Therefore, the final number of respondents for the survey was 1057, and their demographic characteristics are presented in Table 1. There were 556 (53.6%) females, and the majority of the respondents were aged up to 40 years (71.1%). Most of them, 629 (59.5%), were married, Saudi nationals (91%), and 646 (61.1%) were employed. There were 248 (23.5%) respondents who had a monthly income of 5,000 to 10,000 Saudi Riyals (SAR), and another 357 (33.9%) had an income of more than 10,000 SAR. There were 655 (61.9%) respondents who had a Bachelor's degree and another 120 (11.4%) had a higher degree. The distribution among the different regions was evenly distributed according to the population distribution of Saudi Arabia, with the most respondents from the Western region (30.5%) and the least from the Northern (10.7%) and Southern (13.7%) regions. There were 654 (61.9%) persons with no chronic medical condition; diabetes mellitus (11.1%), hypertension (10.1%), and asthma (8.1%) were the top three chronic medical conditions reported by the respondents (Table 1).

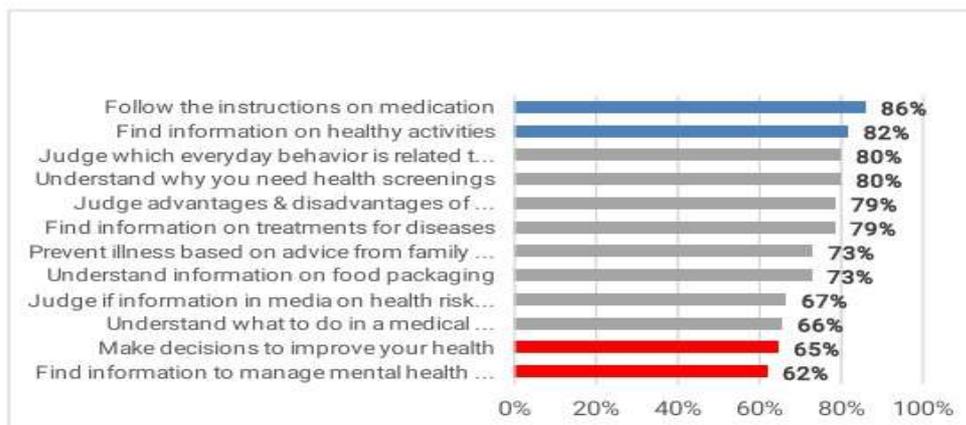
Table 1: Demographic characteristics of the respondents (N=1057)

Variable	Category	n	%
Gender	Male	501	47.4%
	Female	556	53.6%
Age group (years)	18–30	396	37.5%
	31–40	355	33.6%
	41–50	206	19.5%
	51–60	87	8.2%
	≥60	13	1.2%
Marital status	Single	360	34.1%
	Married	629	59.5%
	Divorced	55	5.2%
	Widowed	13	1.2%
Nationality	Saudi	962	91.0%
	Non-Saudi	95	9.0%
Employment status	Employed	646	61.1%
	Unemployed	161	15.2%
	Retired	67	6.4%
	Student	183	17.3%
Monthly income (SAR)	No income	118	11.2%
	<5,000	193	18.3%
	5,000–10,000	248	23.5%
	10,000–15,000	197	18.6%

Variable	Category	n	%
	>15,000	160	15.1%
	Prefer not to answer	141	13.3%
Highest education level	High school/Diploma	282	26.7%
	Bachelor's degree	655	61.9%
	Postgraduate(Master's/PhD)	120	11.4%
Region of residence	Northern	113	10.7%
	Southern	145	13.7%
	Central	245	23.2%
	Eastern	232	21.9%
	Western	322	30.5%
Chronic medical condition	None	654	61.9%
	Diabetes mellitus	118	11.1%
	Hypertension	107	10.1%
	Thyroid disease	46	4.4%
	Cardiac disease	46	4.4%
	Asthma	86	8.1%

The questionnaire included twelve questions related to the health literacy of the respondents. The Easy and Very Easy options were combined and are shown in Figure 1. There were 86% of respondents who responded Easy / Very Easy to 'following the instructions on medications' and 82% for finding information on health activities. There were responses of Easy / Very Easy by 80% for each of the two statements regarding 'judging everyday behaviors related to health' and 'understanding why health screenings are needed.' The lowest percentage of Easy / Very Easy responses were for the statements related to 'finding information related to mental health problems' (62%), 'making decisions to improve one's health' (65%), 'understanding what to do in a medical emergency' (66%), and 'judging if information in media on health risks is reliable' (67%).

Figure 1: Very Easy / Easy' Responses for the Health Literacy Questions (N=1057) The responses for the twelve health literacy questions were on a four-point



Likert scale ranging from Very Difficult to Very Easy. These responses were summed to give a Health Literacy Total score that ranged from 12 to 48. The health category scores were categorized into four categories, as shown in Figure 2. There were 357 (33.8%) respondents classified as having Advanced knowledge (39 or higher score), and another 411 (38.9%) were classified as having Intermediate knowledge (33 to <39 score). The mean health literacy total score was found to be 36.3+6.7. This total

score was compared between the demographic variables, as shown in Table 2.

There was no significant difference found in the health literacy score between any of the demographic variables ($p>0.05$). There was a borderline significance found for having chronic medical conditions ($p=0.096$), with those having diabetes mellitus and hypertension having higher health scores of 37.7 ± 7.4 and 37.1 ± 7.8 , respectively.

Figure 2: Distribution of Health Literacy categories (N=1057)

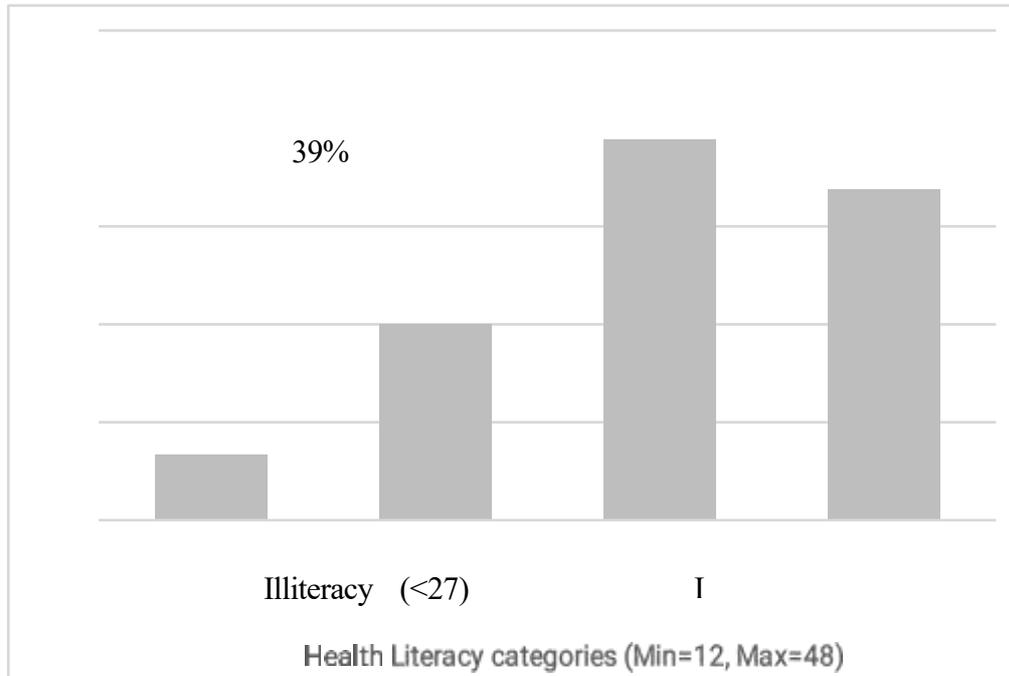


Table 2: Demographic variables association with Health Literacy total score

Variable	Category	n	Mean	SD	p-value
Gender	Male	501	36.3	7.2	0.88
	Female	556	36.3	6.2	
Age group (years)	18–30	396	36.5	6.0	0.29
	31–40	355	35.8	7.0	
	41–50	206	36.8	7.2	
	51–60	87	36.7	6.6	
	≥60	13	34.5	7.8	
Marital status	Single	360	36.3	6.1	0.29
	Married	629	36.2	6.8	
	Divorced	55	37.8	7.4	
	Widowed	13	34.5	8.8	
Nationality	Saudi	962	36.3	6.8	0.86
	Non-Saudi	95	36.4	5.5	
Chronic medical condition	None	654	36.1	5.8	0.096
	Diabetes mellitus	118	37.7	7.4	
	Hypertension	107	37.1	7.8	
	Thyroid disease	46	35.5	7.1	
	Cardiac disease	46	35.0	9.5	

	Asthma	86	36.1	7.5	
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The association of socioeconomic factors with literacy scores is shown in Figures 3-6. A significant difference ($p=0.006$) was found between the different income categories. Respondents in the highest income category of greater than SAR 15,000 per month had a higher health literacy score of 38.1 ± 7.0 as compared to the other income categories, as shown in Figure 4. A borderline significance ($p=0.085$) was found for the health literacy score among the different regions of Saudi Arabia, with those from the Northern region having a higher score of 37.6 ± 6.2 (Figure 6). No significant difference was found for the health literacy score by employment status ($p=0.12$) and highest education level ($p=0.19$)

Figure 3: Comparison of Health Literacy Total Scores by Employment Status

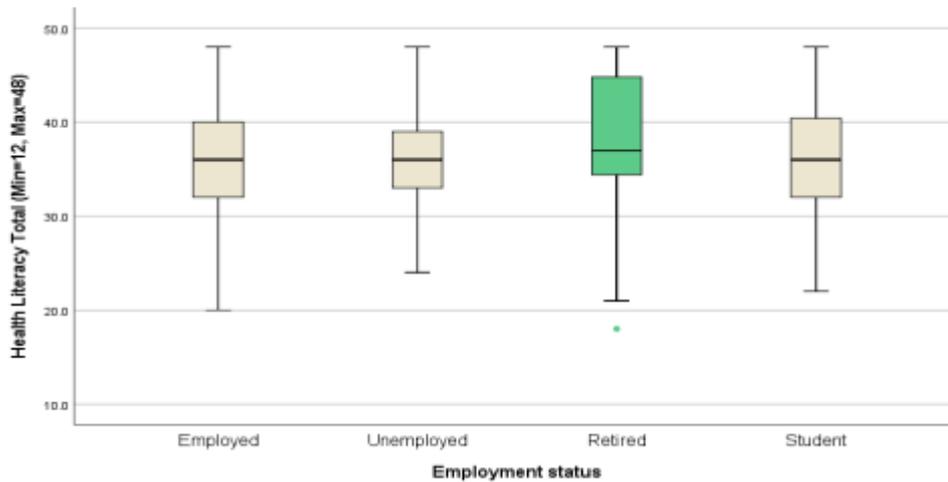


Figure 4 Comparison of Health Literacy Total Scores by Income Categories

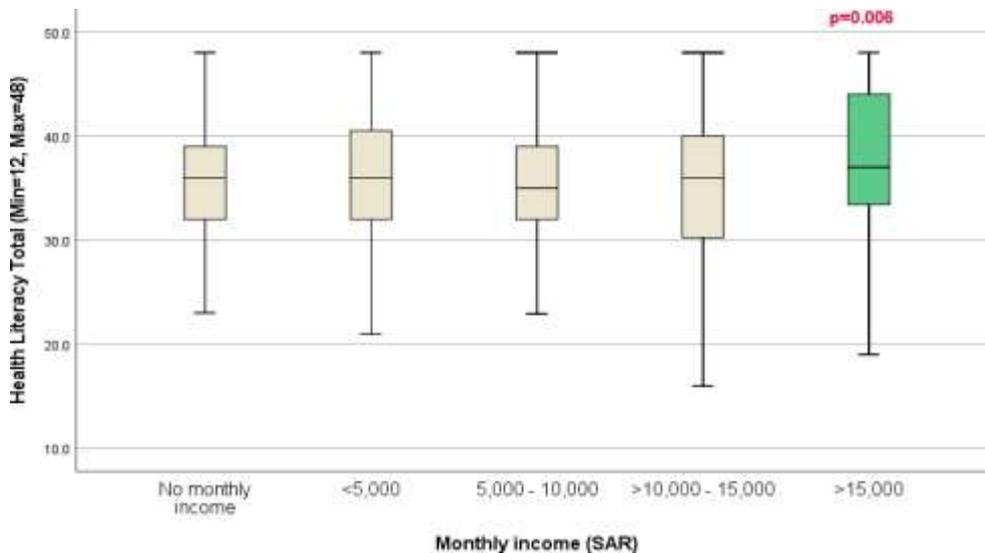


Figure 5 Comparison of Health Literacy Total Scores by Highest Education Level

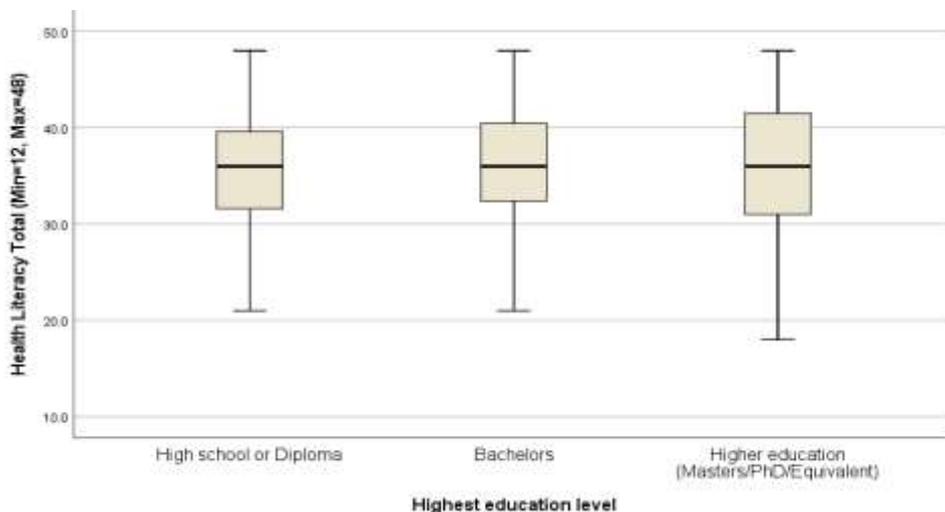


Figure 6 Comparison of Health Literacy Total Scores by Region of Saudi Arabia

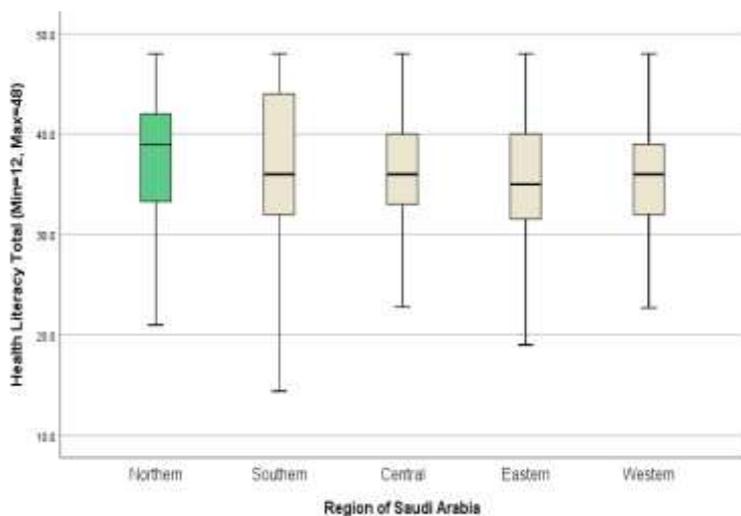


Table 3 shows the results of the multivariable linear regression analysis for determining the main factors associated with the health literacy total score. Variables with a p-value less than 0.20 on bivariate analysis were included in this analysis. The factors found to be significant on the multivariable analysis included monthly income, region of Saudi Arabia. It was found that respondents having monthly income >10,000-15,000 SR ($p=0.01$) and 5,000-10,000 SR ($p<0.001$) had significantly lower health literacy scores as compared to those with monthly income >15,000 SR. It was also seen that respondents from the Western region of Saudi Arabia had a significantly lower health literacy score ($p=0.04$) as compared to the Northern region. Persons who reported as having diabetes mellitus had significantly higher health literacy score ($p=0.002$) as compared to those with no chronic medical condition.

DISCUSSION

This study assessed health literacy (HL) levels among adults residing in Saudi Arabia and examined their association with demographic and socioeconomic characteristics. Overall, the findings indicate a moderate level of HL within the study population, with a mean total score of 36.3 (SD \approx 6.8) on a scale ranging from 12 to 48. While the majority of participants demonstrated acceptable literacy levels,

notable variations were observed across certain demographic subgroups.

Gender was not significantly associated with HL scores in this study. Both males and females demonstrated comparable mean scores, suggesting relatively equal access to health information and healthcare services. This finding aligns with several regional and international studies that reported no statistically significant gender-based differences in overall HL levels. The absence of gender disparity may reflect improved educational opportunities and widespread access to digital health information across both sexes in Saudi Arabia.

Similarly, age groups did not demonstrate statistically significant differences in HL scores, although a slight decline was observed among participants aged 60 years and older. This trend is consistent with existing literature indicating that older adults may experience challenges related to cognitive processing, digital literacy, and comprehension of complex medical information. However, the relatively small proportion of elderly participants in the present sample may have limited the ability to detect significant differences.

Marital status was also not significantly associated with HL levels. Although divorced participants exhibited slightly higher mean scores, this difference did not reach statistical significance. Previous studies have reported mixed findings regarding the influence of marital status on HL, with some suggesting that married individuals may benefit from shared decision-making and informational support within households. The lack of significant association in the current study suggests that marital status alone may not be a strong independent determinant of HL.

Nationality similarly showed no statistically significant association with HL scores. Both Saudi and non-Saudi participants demonstrated comparable literacy levels. This may reflect the relatively high educational attainment observed within the study population, as the majority of participants held at least a bachelor's degree. Educational attainment is consistently identified as one of the strongest predictors of HL, potentially mitigating disparities related to nationality.

Although chronic medical conditions were not significantly associated with HL scores overall ($p = 0.096$), participants with diabetes mellitus and hypertension demonstrated slightly higher mean HL scores compared to those without chronic conditions. This pattern may be explained by increased exposure to healthcare services and disease-related education among individuals with chronic illnesses. Regular interaction with healthcare providers may enhance familiarity with medical terminology, treatment plans, and self-management strategies. Nonetheless, the absence of statistical significance suggests that disease status alone does not guarantee higher literacy levels and that structured educational interventions remain essential.

The overall moderate HL level observed in this study has important public health implications. As Saudi Arabia continues to advance healthcare transformation initiatives under Vision 2030, patient empowerment and shared decision-making are becoming central components of healthcare delivery. Adequate HL is fundamental for effective participation in preventive services, chronic disease management, medication adherence, and navigation of increasingly digitized healthcare systems. Strengthening HL may therefore contribute to reducing healthcare disparities, optimizing service utilization, and improving long-term health outcomes.

This study possesses several strengths. It included participants from multiple regions of Saudi Arabia, enhancing geographic representation. Additionally, the use of a standardized and validated instrument for HL measurement strengthens the reliability of the findings. However, several limitations must be acknowledged. The cross-sectional design prevents causal inference between sociodemographic variables and HL levels. The use of online data collection and snowball sampling may have introduced selection bias, potentially overrepresenting younger, educated, and digitally literate individuals. Consequently, the findings may not fully represent older adults or individuals with limited internet access.

Future research should consider longitudinal designs and probability-based sampling methods to enhance generalizability. Furthermore, targeted studies focusing on vulnerable populations—including older adults and individuals with lower educational attainment—are warranted. Intervention-based research assessing the effectiveness of community-level HL improvement programs would also be valuable.

In conclusion, this study demonstrates that while health literacy levels among adults in Saudi Arabia are generally moderate, disparities across specific demographic groups remain evident. Continued efforts to enhance health education, promote accessible communication strategies, and strengthen

community-based awareness initiatives are essential to support national healthcare transformation goals.

Conclusion

This study evaluated health literacy levels among adults in Saudi Arabia and examined their association with selected sociodemographic factors. The findings indicate that the overall health literacy level within the study population was moderate. No statistically significant differences were observed across gender, age groups, marital status, nationality, or chronic medical condition status, although minor variations were noted in certain subgroups.

These findings suggest that while general health literacy appears acceptable, continuous efforts are required to strengthen public awareness, particularly in the context of Saudi Arabia's ongoing healthcare transformation. Enhancing health literacy is essential to support preventive health behaviors, improve chronic disease management, and promote effective engagement with healthcare services.

Targeted educational initiatives, simplified health communication strategies, and community-based awareness programs should be prioritized to ensure equitable access to health information across diverse population groups. Future research employing representative sampling methods is recommended to further explore health literacy disparities and guide evidence-based policy development.

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