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ORIGINAL RESEARCH

Public Health Literacy and Emergency Department Utilization in Saudi Arabia: A Cross-Sectional Study

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Purpose: Health literacy (HL) is the degree in which individuals are able to access, comprehend, and use publicly available health resources and services. A previous study was done in the Kingdom of Saudi Arabia (KSA) assessing the prevalence of HL, the study shows that almost half of KSA residents had limited HL. Most studies that show the level of HL and its relationship to emergency department (ED) utilization were conducted outside KSA. This study aims to assess the association between HL and utilization of ED services and to estimate the prevalence, factors, and outcomes of low HL in KSA.

Patients and methods: A cross-sectional study was conducted among 903 participants in KSA over a period of 2 months (April and May 2023) using an online survey. Participants were asked about sociodemographic characteristics (age, sex, nationality, marital status, education, work status, income), associated factors (chronic diseases, psychiatric disorders, Covid-19 infection, Covid-19 vaccination, ED visits), and Health Literacy (read, access, understand, evaluation, decision). A health literacy instrument for adults (HELIA), which consists of the previously mentioned five subscales, was used to estimate the level of HL and its association with the risk factors.

Results: Almost 529 (58.58%) and 374 (41.42%) had limited HL and adequate HL, respectively. Participants with limited HL were mostly aged 35–45 years (61.7%), men ($p < 0.05$) (68.9%), divorced (65.9%), non-Saudi (69.6%), and had elementary level of education (66.7%). Participants with adequate HL had master's and PhD degree (48.1%), were healthcare students or graduates (62.8%, $p < 0.05$), had an income >30 thousand riyals (55.6%, $p < 0.05$), were previously infected with COVID-19 (43%), and did not visit ED in the preceding year (42.3%).

Conclusion: A high prevalence of low HL among KSA residents was observed. There was no significant difference in ED utilization between participants who had adequate and limited HL.

Keywords: health literacy instrument for adults, emergency department utilization, COVID-19

Introduction

Health literacy (HL) has been defined as occurring "when health information and services created for the public match with people's capacity to find, understand and use them".[1] Poor HL leads to greater emergency department (ED) utilization and several consequences.[2] ED is a crucial part of healthcare services where urgent and serious health concerns are handled. While many people who visit ED have problems requiring urgent care, some patients use ED to treat primary care ailments that might be treated elsewhere, such as at the outpatient clinics. Furthermore, many patients visit the emergency because of complications and problems that may have been avoided with appropriate outpatient care.[3] According to estimates, the prevalence of low HL in ED can range widely, reaching as high as 88%, depending on the patient mix and the screening tools used.[4] Globally, healthcare utilization is increasing rapidly, including ED visits, which is a burden on the healthcare system, especially because many ED visits are unwarranted. Approximately 37% of

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all ED visits in the United States result from non-urgent conditions. Patient-primary care provider relationships are weakened by ED visits for non-urgent conditions, leading to excessive healthcare spending and unnecessary testing and treatment. Previous studies showed that individuals with inadequate HL have contributed largely to the greater number of ED visits.[5–8]

Multiple contributing factors to HL have been reported in Saudi Arabia. These included older age, female sex, unemployment states, low financial income, rural cities, and a low educational level. It is reported that almost half of the participants had low HL.[9]

Another study showed that low HL was associated with male sex, older age, comorbidities, poor health, and lower educational attainment; the low HL is related to decreased patient satisfaction, lower compliance with preventive services, and increased healthcare utilization.[5]

ED may be preferred by people with limited HL as a point of entry into the healthcare system because it is easier and more convenient to access than primary care.

Among ED patients, limited HL is associated with worse health status, a higher rate of healthcare utilization, such as ED relapse, and a higher risk of death.[10]

Previous studies are few with lack of studies conducted in Saudi Arabia regarding the association between health literacy level and emergency department utilization. Based on prior evidence and a deficit of local studies, this study aimed to estimate the prevalence, factors, ED service utilization, and outcomes of low HL status in the Kingdom of Saudi Arabia (KSA).

Materials and Methods

This cross-sectional study with a convenience sample was conducted in Saudi Arabia using a self-administered questionnaire collected over a 2-month period (April and May 2023). This design allowed us to compare different variables and assess the relationships between HL and its associated factors.

Determination of sample size was based on previous literature showing that the average acceptable level of HL is 50%–60%. When level of confidence is 95% (alpha = 0.05), the minimum sample size needed for the current study is 846. Furthermore, data collection was continued until 846+6.7% responses were reached to compensate for any incomplete surveys. The target sample comprised 903 participants.

Data were collected using an online survey via Google Forms between February 2023 and April 2023. We crafted the survey constructs after an extensive literature review of relevant previously validated studies.[9] Participants were contacted via social media and were asked demographic characteristic questions for the variables included in the weighting strategy. Participants were asked if they had any chronic disease, psychiatric disease, relatives with chronic disease, ED utilization during the past year (if yes), the cause and the number of visits, hospitalization during the past year, and whether they were infected with COVID-19, and COVID-19 vaccination. Based on whether their response was ‘yes’ or “no” participants were then asked to complete the HL Instrument for Adults (HELIA) questions. HELIA has five subscales (dimensions), an important aspect of the instrument that covers the fundamental ideas and structures that give HL its meaning. HELIA’s components are also pertinent to healthy lifestyles in general, and public health in particular. The instrument’s fundamental concepts address the three most significant global public health issues, including problems related to cardiovascular diseases (nutrition-related disorders), malignancies, and accidents. People with both minimal literacy and high levels of education were able to respond to questions on these themes with ease. Instead of testing people’s knowledge, this instrument examined abilities related to HL.[9]

Respondents rated the following five subscale statements on a 5-point rating scale: 1 = never, 2 = seldom, 3 = sometimes, 4 = often, and 5 = always.

Ease of Reading

- About educational materials about health.
- Written instructions about their illness, medical and dental forms.

Access to Information

- Information about healthy eating, mental health, specific disease.

- Health problems and diseases, harmful effects of tobacco and smoking.

Understand the Recommendations

- Understanding drug information on the labels.
- Understanding the risks and benefits of drugs prescribed by the physician.

Appraisal

- The ability to evaluate health-related information on the Internet.
- The ability to evaluate health-related information on the television or radio.

Decision Making/ Behavioral

- Regular checkups.
- Ask physician or health care team questions about the disease.

For scoring, we calculated each subscale of the HELIA by first adding the raw scores, and linearly transferred them to a score from 0 to 100 using a specific formula. After calculating all five subscales, we added all five results and divided it by 5. For categorical classification, scores of 0–66 were considered limited and those of 66.1–100 were considered adequate. The formula used is as follows:

$$\text{score} = \frac{\text{row score} - \text{minimum possible row score}}{\text{maximum possible rows score} - \text{minimum possible row score}}$$

Testing was performed to determine the instrument's reliability and validity. The results indicated that the scale was reliable and valid. Reliability was evaluated by calculating the Cronbach's alpha coefficient. According to these findings, all the components had satisfactory internal consistency. Institutional Review Board approval for the study was obtained from Princess Noura bint Abdulrahman University before the start of data collection. All participants provided informed consent, in accordance with the Declaration of Helsinki.

SPSS (version 23.0; IBM Corp., Armonk, NY, USA) was used to analyze the data. For the research variables and demographic parameters, frequencies, percentages, means, and standard deviations were calculated. To determine the associations between variables and demographic factors and HL, chi-square (χ^2) testing was performed. Statistical significance was set at $p < 0.05$.

Results

Prevalence of Public HL in Saudi Arabia

The total number of responses was 903; of which, 529 had limited HL (58.58%) and 374 had adequate HL (41.42%).

In this study, we were able to collect data from 903 participants. The mean age was 31 (SD ± 13.5). Moreover, 80% of the participants were women, and majority (97.4%) were Saudis. Furthermore, approximately more than half (56%) of the participants were single and less than half (37.6%) were married. Approximately 96% reported having at least high school education (Table 1). However, almost half (46.2%) of the respondents were full-time students, 28.5% had no healthcare provider (non-HCPs), 21.6% were non-employed, retired, or housewives, and only 3.6% had HCP.

Finally, approximately half (46.7%) of the participants had family income from 10 to 30 thousand riyals per month while approximately a quarter (24%) reported less than 10 thousand riyals, as family income.

The average of the health knowledge score observed was 60.79 ± 21.03; this was considered a weak average according to HELIA evaluation system for HL. This indicated a low level of health knowledge. The average score of health understanding was 68.51 ± 25.44, the overall highest average, and the lowest average for the evaluation was 52.76 ± 26.85, and the rest of the subscales are as shown in Table 2. In general, the averages of all aspects were weak, indicating a low level of health knowledge in reading, access, comprehension, evaluation, and decision-making.

Table 1 Socio-Demographic Distribution of the Study Participants

Variables	**n (%)**
Age (years, mean±SD)	31.29±13.47
Age *n (%)*	
<35	573 (62.4)
35–45	166 (18.1)
>45	177 (19.3)
Sex *n (%)*	
Male	183 (19.9)
Female	735 (80.1)
Nationality *n (%)*	
Saudi	894 (97.4)
Non-Saudi	24 (2.6)
Marital status *n (%)*	
Single	513 (55.9)
Married	361 (39.3)
Divorced/widow	44 (4.8)
Highest education *n (%)*	
Elementary	6 (0.7)
Middle school	32 (3.5)
High school	345 (37.6)
Bachelor	479 (52.2)
Master/PhD	56 (6.1)
HealthCare student/Graduate *n (%)*	
No	730 (79.5)
Yes	188 (20.5)
Work status *n (%)*	
HealthCare Provider (HCP)	33 (3.6)
Non-HCP	262 (28.5)
Student	424 (46.2)
Non-employee	50 (5.4)
Housewife	80 (8.7)
Retired	69 (7.5)

(*Continued*)

Table 1 (Continued).

Variables	n (%)
Family income, Thousands SAR *n (%)*	
<10	220 (24)
10–30	429 (46.7)
>30	138 (15)
No sustained income	131 (14.3)

Table 2 Mean Scores of Health Literacy Total and Sub-Total Scores

Health Literacy Subscales	*Mean±SD*
Read score	60.71±27.83
Access score	64.34±24.67
Understand score	68.51±25.44
Evaluation score	52.76±26.85
Decision score	57.64±22.08
Final score	60.79±21.03

We noted that 14% of the participants suffered from chronic diseases, whereas 69.9% had first-degree relatives with chronic diseases (Figure 1). Participants who had visited ED before were 46.6%, and the largest percentage of the participants (53.6%) had been infected with SARS-CoV-2, while the majority took vaccine doses against COVID-19 (90.5%).

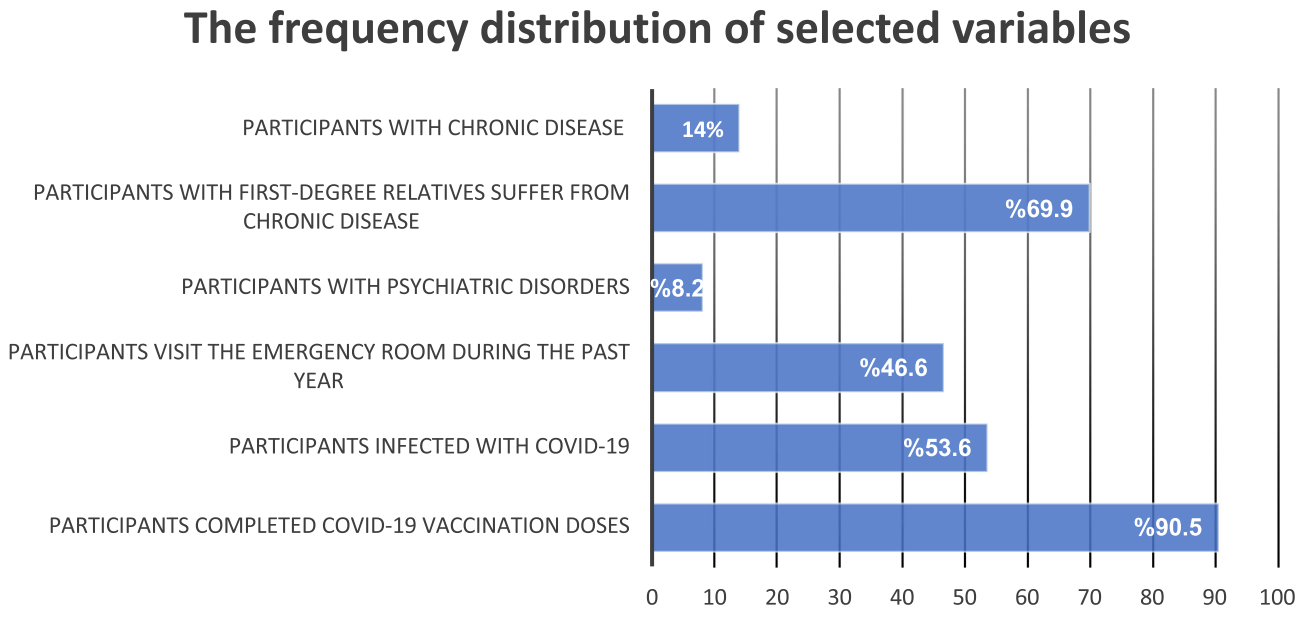

Figure 1 Frequency distribution of selected variables.

Certain categories had significant observations among participants with limited HL. Out of these, the age range 35 to 45 years exhibited the largest proportion (61.7%) of participants with limited HL. Regarding sex, compared to women, men were more likely to have limited HL (68.9%; $p < 0.05$). Furthermore, the highest percentage of people with limited HL by marital status was the divorced group (65.9%). By nationality, non-Saudi participants more commonly had limited HL (69.6%). Regarding level of education, those with elementary level had the highest percentage (66.7%) of participants with limited HL. Furthermore, not being a healthcare student or graduate was significantly more common (64.0%, $p < 0.05$) among participants with limited HL. Participants who were retired seemed to make up the highest percentage of participants with limited HL by employment status (69.6%). Additionally, there was a substantial difference in family income, with most families who had limited HL (67.3%, $p < 0.05$) earning below 10 thousand riyals. Moreover, more than half of the participants without chronic diseases or first-degree relatives with chronic diseases had limited HL. Furthermore, regarding whether individuals had attended ED in the preceding year, nearly two-thirds of those who attended had limited HL. Moreover, in terms of whether the participants were infected with COVID-19, the study found that those who were infected three times were more likely to have limited HL.

Among participants with adequate HL, some observations stood out. The under-35 age group made up the highest percentage (43.1%), despite having a non-significant p-value of 0.452. Single participants were slightly more common (43.2%). Moreover, compared with other education levels, master's and PhD holders comprised a marginally higher proportion (48.1%) among those with adequate HL. Notably, by work status, health care providers made up the highest group (54.5%) among those with adequate HL. In terms of family income, individuals earning >30 thousand riyals had the highest representation among the participants with adequate HL (55.6%, $p < .05$). Finally, among those infected with COVID-19, participants who were infected once with covid (43%) had adequate HL (Table 3).

Table 3 Relation Between Health Literacy and the Associated Factors: Between Health Literacy and the Associated Factors

Variable	Response	Limited 529 (58.58%)	Adequate 374 (41.42%)	p-value
Age, years	<35	321 (56.9%)	243 (43.1%)	0.452
	35–45	100 (61.7%)	62 (38.3%)	
	>45	106 (60.6%)	69 (39.4%)	
Sex	Male	124 (68.9%)	56 (31.1%)	<0.05
	Female	405 (56.0%)	318 (44.0%)	
Marital status	Single	287 (56.8%)	218 (43.2%)	0.372
	Married	213 (60.2%)	141 (39.8%)	
	Divorced	29 (65.9%)	15 (34.1%)	
Nationality of participant	Saudi	513 (58.3%)	367 (41.7%)	0.391
	Non-Saudi	16 (69.6%)	7 (30.4%	
Highest educational degree of participant	Elementary	4 (66.7%)	2 (33.3%)	0.498
	Middle school	19 (61.3%)	12 (38.7%)	
	High school	189 (55.9%)	149 (44.1%)	
	Bachelor	289 (61.0%)	185 (39.0%)	
	Master/PhD	28 (51.9%)	29 (48.1%)	

(*Continued*)

Table 3 (Continued).

Variable	Response	Limited 529 (58.58%)	Adequate 374 (41.42%)	p-value
Healthcare student/Graduate	No	461 (64.0%)	259 (36.0%)	<0.05
	Yes	68 (37.2%)	115 (62.8%)	
Work status of participant	HCP	15 (45.5%)	18 (54.5%)	0.115
	Non-HCP	158 (61.5%)	99 (38.5%)	
	Student	236 (56.7%)	180 (43.3%)	
	Non-employee	25 (50.0%)	25 (50.0%)	
	Housewife	47 (60.3%)	31 (39.7%)	
	Retired	48 (69.6%)	21 (30.4%)	
Family income per month	<10	146 (67.3%)	71 (32.7%)	**<0.05**
	10–30	252 (59.7%)	170 (40.3%)	
	>30	60 (44.4%)	75 (55.6%)	
	No sustained income	71 (55.0%)	58 (45.0%)	
Do you complain of any chronic diseases?	No	463 (59.6%)	314 (40.4%)	0.128
	Yes	66 (52.4%)	60 (47.6%)	
Does any of your first-degree relatives suffer from any chronic disease?	No	171 (62.9%)	101 (37.1%)	0.086
	Yes	358 (56.7%)	273 (43.3%)	
Do you complain of any psychiatric disorders?	No	485 (58.5%)	344 (41.5%)	0.873
	Yes	44 (59.5%)	30 (40.5%)	
During the past year, did you visit the emergency department?	No	278 (57.7%)	204 (42.3%)	0.554
	Yes	251 (59.6%)	170 (40.4%)	
Have you been infected with COVID-19	Never	251 (60.0%)	167 (40.0%)	0.843
	Once	224 (57.0%)	169 (43.0%)	
	Twice	46 (58.2%)	33 (41.8%)	
	Three	8 (61.5%)	5 (38.5%)	
Have you completed COVID-19 vaccination doses?	No	62 (72.1%)	24 (27.9%)	<0.05
	Yes	467 (57.2%)	350 (42.8%)	

Discussion

This study demonstrated a low rate of adequate HL, with more than half of the participants having difficulty reading, understanding, and interpreting healthcare information. In terms of work status, we found that students constituted a larger proportion of participants who had inadequate HL. In the descriptive analysis, Saudis, non-healthcare students or graduates, those with lower incomes, and those who did not complete their COVID-19 vaccinations were over-represented among those with limited HL. In general, our representative sample displayed a weak average HL according to the HELIA scoring. More than half of our sample showed limited HL, which is consistent with the results of a study

conducted in Iran (2016) using the same evaluation tool. Moreover, another study in the KSA suggested that almost half of the residents had low HL.[5,9]

Our analysis showed that male participants were significantly less likely than female participants to have adequate HL; however, another study reported no difference in HL scores between the two sexes.[8] In addition, older age groups had a lower HL score than younger groups, which aligns with the finding in another study that justifies the reasons for the decline in comprehension, memory, and word recognition abilities that occur in older age groups.[8]

Participants with higher education levels reported adequate HL scores. This result is consistent with the literature, as another study in the KSA showed that participants with low education levels are nearly three times more likely to have low HL than those with good education.[10] Not surprisingly, healthcare students and graduates reported higher levels of HL. Moreover, our findings indicated a higher percentage of limited HL with lower family income. This is consistent with the findings of a study that reported that patients with no income or annual income below $20,000 had inadequate or low HL compared with 25% of patients with a yearly income of $75,000 or greater.[8] Moreover, the findings of this study were similar to those of another study by Abdel-Latif and Saad,[21] who stated that age, sex, and educational status were strong factors affecting the level of HL.[11]

Our study reported no statistical differences between having a chronic condition and having a first-degree relative with a chronic condition, based on the HL score. However, a study in Iran using the HELIA score of patients with hypertension reported that the majority of patients with hypertension had inadequate HL and that there was a significant correlation between blood pressure knowledge and the mean HL score.[12] Another study examining the relationship between HL and patients' knowledge of chronic diseases and found a relationship between HL and knowledge of chronic diseases. HL has been shown to be an independent predictor of patients' knowledge of chronic illnesses.[13]

There was no significant difference between those who visited ED in the past year and those who did not in terms of HL score; however, another study reported that patients with inadequate HL were more likely to revisit ED than those with adequate HL.[8] HL was inversely associated with healthcare utilization and expenditure. Individuals with below-basic or basic HL level (HLL) have greater healthcare utilization and expenditures, spending more on prescriptions than individuals with above-basic HLL.[5] The results of this study established a link between lower HL status and higher healthcare spending. To make the most of the expanding healthcare system in the KSA, the general public will need to be able to locate appropriate healthcare services and information, comprehend it, and use it successfully to improve their health. It is estimated that approximately half of the population did not have sufficient HL levels to fully benefit from healthcare.[5] It has been noticed that those who have low HL may struggle to understand the medical information read or the medical instructions they were given; thus, they lack proper understanding of their own diseases and treatments, which can result in the development of chronic diseases that will require much more expenditure.[14]

The inappropriate use of EDs places an enormous strain on the healthcare system.[15] Enhancing patient knowledge may alleviate this strain. Some studies have proposed that ED may serve as ideal settings for educating patients regarding ED usage, thereby enhancing HL.[16–18]

The limitations of the present study include the unbalanced representation of sex; females constituting approximately 80.1% of the participants, and the student representations being 46.2% of the sample. Owing to the cross-sectional nature of our study, we could not confirm the relationship between the number of ED visits and COVID-19 or adequate HL. Nevertheless, these results provide valuable information on the prevalence of public HL.

Furthermore, these data will be useful for healthcare providers planning community education.

Conclusion

This study analyses the prevalence, factors, ED service utilisation, and outcomes of low HL status in Saudi Arabia, considering different factors. Most participants who had limited HL were more associated with low-income, non-healthcare students and graduates, and participants who did not complete their COVID-19 vaccination.

Low HL makes people unable to understand medical knowledge and instructions. The study lacks explanations for the relationship between having COVID-19 and the number of visits to the ER and the association between low HL and ER visits. Inappropriate gender representation and the lack of explanation between HL and ER visits are the primary limitations; specifically, four-fifths of the participants are women. Further research on the HL and its association with the number of ER visits in Saudi Arabia and with more diverse representatives can help better understand the adequacy of health literacy in the country.

Abbreviations

HL, health literacy; ED, emergency department.

Data Sharing Statement

The data of this study are available for sharing upon request from the corresponding author.

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Disclosure

The authors of this study declare that they have no conflicts of interest in this work.

References

1. Agency for healthcare research and quality. Health literacy [Internet]. Agency for healthcare research and quality; 2020. Available from: https://www.ahrq.gov/health-literacy/about/index.html. Accessed April 15, 2024.
2. Morrison AK, Glick A, Yin HS. Health literacy: implications for child health. *Pediatr Rev*. 2019;40(6):263–277. doi:10.1542/pir.2018-0027
3. Williams CA, Haffizulla F. Factors associated with avoidable emergency department visits in Broward county, Florida. *Cureus*. 2021;13:e15593.
4. Carpenter CR, Kaphingst KA, Goodman MS, et al. Feasibility and diagnostic accuracy of brief health literacy and numeracy screening instruments in an urban emergency department. *Acad Emerg Med*. 2014;21(2):137–146. doi:10.1111/acem.12315
5. Almubark R, Basyouni M, Alghanem A, et al. Health literacy in Saudi Arabia: implications for public health and healthcare access. *Pharmacol Res Perspect*. 2019;7(4):e00514. doi:10.1002/prp2.514
6. MacLeod S, Musich S, Gulyas S, et al. The impact of inadequate health literacy on patient satisfaction, healthcare utilization, and expenditures among older adults. *Geriatr Nurs*. 2017;38(4):334–341. doi:10.1016/j.gerinurse.2016.12.003
7. Hesselink G, Cheng J, Schoon Y. A systematic review of instruments to measure health literacy of patients in emergency departments. *Acad Emerg Med*. 2022;29(7):890–901. doi:10.1111/acem.14428
8. Shahid R, Shoker M, Chu LM, et al. Impact of low health literacy on patients' health outcomes: a multicenter cohort study. *BMC Health Serv Res*. 2022;22(1):1148. doi:10.1186/s12913-022-08527-9
9. Tavousi M, Haeri-Mehrizi A, Rakhshani F, et al. Development and validation of a short and easy-to-use instrument for measuring health literacy: the Health Literacy Instrument for adults (Helia). *BMC Public Health*. 2020;20(1):656. doi:10.1186/s12889-020-08787-2
10. AbuAlreesh A, Alburikan KA. Health literacy among patients with poor understanding of prescription drug label instructions in Saudi Arabia. *Saudi Pharm J*. 2019;27(6):900–905. doi:10.1016/j.jsps.2019.06.003
11. Abdel-Latif MMM, Saad SY. Health literacy among Saudi population: a cross-sectional study. *Health Promot Int*. 2019;34(1):60–70. doi:10.1093/heapro/dax043
12. Chajaee F, Pirzadeh A, Hasanzadeh A, Mostafavi F. Relationship between health literacy and knowledge among patients with hypertension in Isfahan province, Iran. *Electron Physician*. 2018;10(3):6470–6477. doi:10.19082/6470
13. Gazmararian JA, Williams MV, Peel J, Baker DW. Health literacy and knowledge of chronic disease. *Patient Educ Couns*. 2003;51(3):267–275. doi:10.1016/S0738-3991(02)00239-2
14. Alahmadi YM. Evaluation of health literacy and associated factors among adults living in Saudi Arabia: a cross-sectional study. *Inquiry*. 2023;60:469580231161428. doi:10.1177/00469580231161428
15. Weinick RM, Burns RM, Mehrotra A. Many emergency department visits could be managed at urgent care centers and retail clinics. *Health Aff (Millwood)*. 2010;29(9):1630–1636. doi:10.1377/hlthaff.2009.0748
16. Schumacher JR, Hall AG, Davis TC, et al. Potentially preventable use of emergency services: the role of low health literacy. *Med Care*. 2013;51(8):654–658. doi:10.1097/MLR.0b013e3182992c5a
17. Balakrishnan MP, Herndon JB, Zhang J, et al. The association of health literacy with preventable emergency department visits: a cross-sectional study. *Acad Emerg Med*. 2017;24(9):1042–1050. doi:10.1111/acem.13244
18. Zhang L, Ding D, Neubeck L, Gallagher R. Health literacy as a predictor of emergency department visits and self-rated health among Chinese immigrants: findings from an Australian survey. *Patient Educ Couns*. 2020;103(11):2353–2360. doi:10.1016/j.pec.2020.04.017