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Demographic Predictors of Health Literacy Among Hospitalized Patients

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Abstract

Introduction. One definition of health literacy describes it as the ability to access, understand, and evaluate health information with the aim of preserving and improving health. Limited health literacy represents a significant but unequal burden in different parts of the world. The results of many previous studies have found that older age, lower education level, and poor socioeconomic status significantly contribute to lower health literacy.

Aim. The objectives of this study were to examine health literacy among hospitalized patients, investigate differences in health literacy according to sociodemographic variables, and identify sociodemographic predictors of health literacy.

Methods. The research was conducted as a cross-sectional study. The study included adult hospitalized patients in the Požega General County Hospital in the period from July to October 2020. The criteria for inclusion in the study were as follows: respondents older than 18 years of age, respondents hospitalized in hospital wards, respondents who speak and understand the Croatian language, respondents voluntarily participating in the study.

A questionnaire containing demographic data was used as a research instrument, while the second research instrument was the Croatian version of the SAHLCA-50 functional health literacy test. A health illiterate person is one who had 42 or fewer correct answers.

Results. A total of 173 (34.6%) respondents had adequate health literacy, whereas 327 (65.4%) showed inadequate health literacy. Women were more likely to have adequate health literacy than men. Of the total of 289 (58%) women, 118 (68%) showed adequate health literacy ($p = 0.001$). Respondents aged 61 and older were significantly less health literate than younger respondents ($p < 0.001$). Age ≥61 was the strongest predictor of health illiteracy (OR = 8.17). Other significant predictor included completed primary school (OR = 113.3), incomplete primary school (OR = 550.8) and being retired rather than employed (OR = 6.54). Those respondents living in the city (101; 58%) $p < 0.001$) and those who were married, 128 of them (74%) ($p < 0.001$), were more likely to have adequate health literacy. Regarding the number of children, respondents without children or with only one child had higher health literacy than those with more children ($p < 0.001$).

Conclusion. In the study, we identified demographic factors that are significantly associated with health literacy levels. Future research should focus on longitudinal designs to determine the causes, outcomes, and consequences, as well as the possible impact of health status on changes in health literacy. This data can be used to develop effective public health strategies that take into account the diverse needs of different population groups. Public health interventions should particularly target men, people from rural areas, older people, and those with lower levels of education to improve their health literacy and ensure equitable access to health information.

Introduction

Health literacy is a concept that combines knowledge in the field of literacy and health, both of which are important determinants of overall well-being. Therefore, health literacy is the basis of good functioning, and has a direct impact on individual's ability to manage their own health and that of the wider community (1). In recent decades, health literacy has been highlighted as an important topic worldwide, especially for the prevention of chronic diseases (2). Inadequate health literacy has been linked to poorer disease management, non-adherence to treatment recommendations, frequent hospitalizations, and improper use of prescribed medications by patients or caregivers (3). Limited health literacy represents a significant but unequal burden in different parts of the world. Unfortunately, the research conducted so far shows a worrying proportion of insufficient health literacy of the population. A survey conducted in eight European countries found a low level of health literacy in as many as 47% of the population (4). The phenomenon of insufficient health literacy in Europe is significant and poses a challenge to public health (5). The results of many previous studies have shown that older age, lower level of education and poor socioeconomic status are significant predictors of low health literacy (6-9). Gender differences in health-related attitudesas well as the use of health services have been repeatedly documented (10-13). While there is great interest in studying health literacy worldwide due to its direct impact on the health of individuals and society as a whole, research in Croatia in this area is insufficient and has been conducted on subpopulation groups (14-15). Thus, the study by the Croatian Institute of Public Health on the mental health literacy among educational workers showed that more than half of the respondents (57,6%) did not recognize that the described case indicated a depressive disorder (16). A national survey conducted by Bobinac et al. showed that the level of health literacy in the Croatian population is on the borderline between problematic and adequate, with older people, people with lower education and lower incomes achieving worse results (17). These results confirm the importance of further research into health literacy in Croatia. In order for healthcare providers and policymakers to act effectively to raise

health literacy levels, it is essential to identify the various factors influencing health literacy before planning health information access activities and designing adequate interventions (18).

Aim

The objectives of this study were to:

- Examine health literacy among hospitalized patients.
- Investigate differences in health literacy according to sociodemographic variables.
- Identify sociodemographic predictors of health literacy.

Methods

The research was conducted as a cross-sectional study. The study included all adult hospitalized patients at the Požega General County Hospital during the period from July to October 2020.

The inclusion criteria were as follows: respondents aged 18 or older, patients hospitalized in hospital wards, individualss who speak and understand the Croatian language, and individuals who voluntarily agreed to participate in the study. The exclusion criteria were: cognitive impairments, vision and/or hearing difficulties, illiteracy, unconsciousness, confirmed COVID-19 infection, or suspected COVID-19 infection.

A total of 500 participants took part in the study, of whom 289 were women (57.8%) and 211 were men (42.2%). The largest age group consisted of participants aged 61 years and older, numbering 278 (55.6%).

Instruments

Demographic questionnaire – This section was specifically designed for the purposes of this study and included seven items (gender, age, place of residence, marital status, number of children, education level, and employment status). All questions were closed-ended, and respondents could select one of the provided answer options.

Short Assessment of Health Literacy for Croatian Adults – 50 items (SAHLCA-50) – The Croatian version of the SAHLCA-50 functional health literacy test, which has been analyzed and validated, was used (19). The questionnaire consists of fifty closed-ended items. For each question, participants could choose one of three response options: "Correct," "Incorrect," or "I don't know." The total score represents the sum of all correct answers and can range from 0 to 50. Health literacy level was treated as a dichotomous variable. Scores of 42 or higher were classified as adequate health literacy, while scores of 41 or lower indicated low health literacy. The reliability of the SAHLCA-50 was 0.91 (19).

Ethics

The research was conducted after the approval of the Ethics Committee of the Požega General County Hospital (Reg. No.: 02-7/1-1/1-4- 2020). All participants were previously informed in detail about the aim and nature of the research, and after receiving the necessary explanations, they provided written informed consent. The research was conducted anonymously.

Statistics

Categorical variables were summarized using absolute and relative frequencies, and differences between groups were assessed using the chi-square (χ^2) test with adjusted residual analysis. The normality of the distribution for continuous variables (health literacy) was evaluated using the Shapiro–Wilk test, which indicated that the variable was not normally distributed. Continuous data are presented as medians with interquartile ranges (IQR). Homogeneity of variance was also not confirmed; therefore, nonparametric tests were applied in subsequent analyses. Comparisons between two independent groups were performed using the Mann–Whitney U test, while comparisons involving more than two independent groups were conducted using the Kruskal–Wallis test followed by Conover's post hoc test. The impact of multiple predictors on the likelihood of health literacy was examined through logistic regression (both univariate and multivariate, stepwise selection). All p values were two-

tailed, and statistical significance was set at $\alpha = .05$. Analyses were performed using MedCalc® Statistical Software, version 20.111 (MedCalc Software Ltd., Ostend, Belgium) and IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, 2015).

Results

Table 1. **Basic characteristics of the subjects (N = 500)**

	n (%)
Gender	
Men	211 (42.2)
Women	289 (57.8)
Age groups	
up to 30 years	67 (13.4)
31 – 40	54 (10.8)
41 – 50	35 (7)
51 – 60	66 (13.2)
61 years and older	278 (55.6)
Whereabouts	
Village	293 (58.6)
Town	207 (41.4)
Marital status	
Married	313 (62.6)
Cohabiting	23 (4.6)
Living alone	65 (13)
Widowed	99 (19.8)
Number of children	
No children	79 (15.8)
One child	88 (17.6)
Two children	189 (37.8)
Three or more children	144 (28.8)
Level of education	
Incomplete primary school	82 (16.4)
Primary school	106 (21.2)
Secondary education	244 (48.8)
Higher education	29 (5.8)
Higher education or above	39 (7.8)
Employment status	
Employed	137 (27.4)
Unemployed	84 (16.8)
Occasionally employed	4 (0.8)
Retired	275 (55)

Note: n – number of participants; % – percentage

The study was conducted on 500 hospitalized patients, of which 211 (42.2%) were men and 289 (57.8%) were women. There were 278 (55.6%) respondents aged 61 and over. A total of 293 (58.6%) respondents lived in rural areas, and 313 (62.6%) were married (Table 1).

Table 2. **Differences in SAHLCA-50 scores compared to respondent characteristics (N = 500)**

	Me (IQR) SAHLCA-50	U/H (df)	*p*
Gender			
Men	36 (25 – 42)	25902.50	**0.004**
Women	39 (26 – 45)		
Age groups			
up to 30 years	44 (39 – 47)		
31 – 40	44 (39 – 48)	123.4 (4)	**< 0.001**
41 – 50	43 (34 – 46)		
51 – 60	41 (36 – 44)		
61 and older	28 (22 – 39)		
Marital status			
Married	39 (30 – 45)		
Cohabiting	36 (29 – 43)	55.5 (3)	**< 0.001**
Living alone	37 (26 – 44)		
Widowed	25 (19 – 35)		
Number of children			
No children	40 (33 – 45)		
One child	42 (29 – 46)	27.7 (3)	**< 0.001**
Two children	38 (25 – 43)		
Three or more children	31 (22 – 41)		
Level of education			
Incomplete primary school	22 (18 – 26)		
Primary school	26 (22 – 34)		
Secondary education	41 (36 – 45)	246.1 (4)	**< 0.001**
Higher education	45 (41 – 48)		
Higher education or above	47 (44 – 49)		
Employment status			
Employed	43 (38 – 47)		
Unemployed	41 (33 – 45)	113.3 (3)	**< 0.001**
Occasionally employed	43 (33 – 45)		
Retired	28 (22 – 39)		

Note: Me – Median; IQR – Interquartile range; *p* – Statistical significance; CI – Confidence interval; U – Mann–Whitney U test value; H – Kruskal–Wallis test value; df – Degrees of freedom

To determine differences in health literacy according to sociodemographic variables, the Mann-Whitney U test and the Kruskal-Wallis test were used. There was a significant difference in health literacy scores across several sociodemographic groups. Women were significantly more health-literate than men (U = 25902,50, $p = 0.004$). Respondents aged 61 years and older had significantly lower health literacy scores than all younger age groups (H(4) = 123.4, $p < 0.001$). Widowed respondents demonstrated significantly lower health literacy than those who were married, cohabiting, or living alone (H(3) = 55.5, $p < 0.001$). Participants with three or more children had lower health literacy than those with fewer children, while respondents with one child scored higher than those with two children (H(3) = 27.7, $p < 0.001$). Regarding education, respondents with a university degree or higher scored significantly higher than those with secondary, primary, or incomplete primary education (H(4) = 246.1, $p < 0.001$). Finally, retired respondents had significantly lower health literacy than employed and unemployed respondents (H(3) = 113.3, $p < 0.001$) (Table 2).

The results of the SAHLCA-50 test showed that the median total health literacy score was 37 (IQR = 25–44). To determine differences in the distribution between health-literate and health-illiterate participants, a χ^2 test was used. The analysis revealed a statistically significant difference ($\chi^2(1) = 47.43$; $p < 0.001$), with a significantly higher number of health-illiterate participants in the sample (n = 327; 65.4%) (Table 3).

The χ^2 test analysis showed that all examined sociodemographic variables (gender, age, place of residence, marital status, number of children, education, and employment status) were significantly associated with the level of health literacy ($p \leq 0.001$ for all). The strongest associations were observed for education, age, and employment status. Adjusted residual analysis (Table 4) revealed that participants with higher health literacy were significantly more likely to be women, younger, urban residents, married, have fewer children, possess higher education, and be employed. In contrast, individuals with lower health literacy were more frequently men, older, rural residents, widowed, have more children, possess lower education, and be retirees (Table 5).

Logistic regression was conducted to identify predictors of health literacy based on several sociodemographic factors among hospitalized patients. The bivariate regression analysis indicated that age, education, and employment status had the strongest effects. Respondents aged 61 years and older were significantly less likely to be health-literate compared to those aged up to 30 years (OR = 8.17, 95% CI [4.55–14.68]). Participants with completed primary education (OR = 113.3, 95% CI [32.5–395.18]) or unfinished primary education (OR = 550.8, 95% CI [62.01–4892.6]) were markedly less likely to be health-literate compared to those with a university degree or higher. Additionally, retired respondents were less likely to be health-literate than employed respondents (OR = 6.54, 95% CI [4.14–10.34]) (Table 5).

Discussion

The results of this study indicate that women, individuals with higher education, married respondents, those with fewer children, residents of urban areas,

Table 3. **Levels of health literacy according to the SAHLCA-50 test and differences between health-literate and health-illiterate participants**

	Health literacy			
	Health literate	Health illiterate	Altogether	
		Me (IQR)		
Total health literacy score	45 (43 - 48)	29 (22 - 37)	37 (25 - 44)	
		n (%)	χ^2 (df)	*p*
Categorized health literacy	173 (34,6)	327 (65.4)	47.432 (1)	**<0.001**

Note: Me – Median; IQR – Interquartile range; n – Number of participants; % – Percentage; p – Statistical significance; χ^2 – Chi-square value; df – Degrees of freedom.

Table 4. **Distribution of respondents according to health literacy in relation to basic characteristics (N = 500)**

	Number (%) of respondents				
	Health literate (n = 173)	**Health illiterate (n = 327)**	**Altogether**	**χ^2 (df)**	*p*
Gender					
Men	55 (32)	156 (48)	211 (42)	11.748 (1)	**0.001**
Women	118 (68)	171 (52)	289 (58)		
Age groups					
up to 30 years	43 (25)	24 (7)	67 (13)		
31 - 40	34 (20)	20 (6)	54 (11)	91.824 (1)	**< 0.001**
41 - 50	21 (12)	14 (4)	35 (7)		
51 - 60	25 (14)	41 (13)	66 (13)		
61 years or older	50 (28.9)	228 (69.7)	278 (55.6)		
Whereabouts					
Village	72 (42)	221 (68)	293 (59)	31.443 (1)	**< 0.001**
Town	101 (58)	106 (32)	207 (41)		
Marital status					
Married	128 (74)	185 (57)	313 (63)		
Cohabiting	9 (5)	14 (4)	23 (5)	20.985 (3)	**< 0.001**
Living alone	20 (12)	45 (14)	65 (13)		
Widowed	16 (9)	83 (25)	99 (20)		
Number of children					
No children	33 (19)	46 (14)	79 (16)		
One child	48 (28)	40 (12)	88 (18)	27.697 (3)	**< 0.001**
Two children	60 (35)	129 (39)	189 (38)		
Three or more children	32 (18)	112 (34)	144 (29)		
Level of education					
Incomplete primary school	1 (1)	81 (25)	82 (16)		
Primary school	6 (3)	100 (31)	106 (21)	158.375 (4)	**< 0.001**
Secondary education	111 (64)	133 (41)	244 (49)		
Higher education	21 (12)	8 (2)	29 (6)		
Higher education or above	34 (19.7)	5 (1.5)	39 (7.8)		
Employment status					
Employed	82 (47)	55 (17)	137 (27)		
Unemployed	37 (21)	47 (14)	84 (17)	76.135 (3)	**< 0.001**
Occasionally employed	3 (2)	1 (0)	4 (1)		
Retired	51 (29)	224 (69)	275 (55)		

Note: n – Number of participants; % – Percentage; p – Statistical significance; χ^2 – Chi-square test value; df – Degrees of freedom

Table 5. **Prediction of the probability of health illiteracy (bivariate regression analysis), N = 500**

Factor	ß	Wald	*p*	OR	95% CI
Gender (M)	0.67	11.59	**< 0.001**	1.96	1.33 - 2.88
Age (up to 30)					
31 - 40	0.05	0.02	0.89	1.05	0.50 - 2.22
41 - 50	0.18	0.17	0.68	1.19	0.52 - 2.77
51 - 60	1.08	8.98	**0,003**	2.94	1.45 - 5.95
61 years or older	2.1	49.4	**< 0.001**	8.17	4.55 - 14.68
Place of residence (city)	-1.07	30.5	**< 0.001**	0.34	0.23 - 0.5
Marital Status (Married)					
Cohabiing	0.07	0.03	0.87	1.08	0.45 - 2.56
Living alone	0.44	2.29	0.13	1.56	0.88 - 2.76
Widowed	1.28	18.6	**< 0.001**	3.59	2.01 - 6.41
Number of children (without children)					
One child	-0.51	2.7	0.1	0.59	0.32 - 1.1
Two children	0.43	2.46	0.12	1.54	0.89 - 2.65
Three or more children	0.92	9.19	**0.002**	2.51	1.38 - 4.55
Level of education (university degree and above)					
Higher education	0.95	2.25	0.13	2.59	0.75 - 8.97
Secondary education	2.09	17.89	**< 0.001**	8.15	3.08 - 21.5
Primary school	4.73	55.1	**< 0.001**	113.3	32.5 - 395.18
Incomplete primary school	6.31	32.07	**< 0.001**	550.8	62.01 - 4892.6
Employment status (employed)					
Unemployed	0.64	5.18	**0.02**	1.89	1.09 - 3.28
Occasionally employed	-0.69	0.36	0.55	0.49	0.05 - 4.9
Retired	1.87	64.9	**< 0.001**	6.54	4.14 - 10.34

Note: *p* – statistical significance; ß – regression coefficient; OR – odds ratio

and employed individuals demonstrate higher levels of health literacy compared to men, those with lower education, unmarried respondents, parents with more children, rural residents, and retirees. These differences can be explained by a combination of social, educational, and lifestyle factors.

Women and married individuals are often more involved in managing family health, communicate more frequently with healthcare providers, and are more exposed to health-related resources (3, 20–23), while individuals with higher education possess stronger cognitive, communication, and digital skills (20, 24, 25). Empirical evidence consistently shows a significant association between lower levels of education and poorer health literacy, with educational status recognized as a key determinant of health literacy (26). These findings confirm that better-educated individuals are more capable of understanding and internalizing health information, and that education represents a fundamental prerequisite for health literacy (27).

The analysis also revealed that age and employment status are strong predictors of health literacy. Older participants, particularly those aged over 60, exhibited significantly lower health literacy compared to younger groups. This result can be explained by lower formal education levels among older generations, reduced digital competence, age-related cognitive changes, and limited access to modern health information sources. These findings are consistent with previous research showing that older age is associated with a higher risk of low health literacy (3, 37, 38).

Employed participants demonstrated higher health literacy than unemployed and retired individuals. A possible explanation is that those who are employed have more opportunities for social interaction, easier access to information, and more developed skills for managing their own health. In contrast, retirees and unemployed individuals may experience social isolation and lower motivation to actively seek health information, which can lead to poorer health literacy.

A smaller number of children and living in urban areas were also associated with higher levels of health literacy, which can be explained by better access to health and digital resources, more developed infrastructure, and more available time for health-related activities (31, 32). The study also found higher health literacy among married participants, which is consistent with previous research (33-36). This finding can be explained by reduced motivation and a lack of social and emotional support among divorced or widowed individuals, or by marriage serving as a possible protective factor.

These findings align with international literature showing a strong association between health literacy, education, age, gender, urban living, and social support (3, 37, 38). Systematic reviews emphasize that rural populations often exhibit lower health literacy due to limited access to health information, weaker digital infrastructure, and lower socioeconomic resources. However, local context and cultural factors may modify these general trends (39).

Conclusion

This study identified demographic factors that serve as key determinants of health literacy. The greatest impact on health literacy was observed among respondents aged 61 years and older, followed by educational attainment—where completion of only primary school significantly contributed to health illiteracy—and employment status, with retirees showing notably lower literacy levels.

As the research was conducted among hospitalized patients, the generalizability of the findings to the wider population may be limited. Hospitalized individuals may display a distinct health literacy profile due to acute health conditions, frequent interactions with healthcare professionals, and direct exposure to medical information.

In practical terms, these findings underscore the need for targeted educational and public health interventions aimed at groups with lower health literacy—particularly men, single individuals, those with lower education, rural residents, and parents with larger families. Such programs should include components of digital education, access to reliable health information, communication strategies tailored to varying literacy levels, and mechanisms to strengthen social support and family involvement in health management.

Future research, especially longitudinal and interventional studies, is needed to establish causal relationships and to evaluate the effectiveness of targeted interventions designed to improve health literacy among vulnerable populations.

Author contributions

Conceptualization (BL, TJ, MM, SHČ); Methodology (BL, TJ, MM, TP); Investigation (BL, ŽJ, BD, BAM); Writing—original draft preparation (TJ, LJOŠ, DD, IV); Writing—review and editing (IV, TJ, MM, BL). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.

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References

1. Kwan B, Zumbo B, Hayes M, Fraser S. The Development and Validation of Measures of "Health Literacy" in Different Populations. Institute of Health Promotion Research, University of British Columbia; 2006. Available at: https://blogs.ubc.ca/frankish/files/2010/12/HLit-final-report-2006-11-24.pdf
2. World Health Organization. Noncommunicable diseases: progress monitor 2020. WHO; 2020. Available at: https://www.who.int/publications/i/item/9789240000490. Access: 01.07.2025.
3. Noordman J, van Vliet L, Kaunang M, van den Muijsenbergh M, Boland G, van Dulmen S. Towards appropriate information provision for and decision-making with patients with limited health literacy in hospital-based palliative care in Western countries: a scoping review into available communication strategies and tools for healthcare providers. BMC Palliat Care. 2019;18(1):37. https://doi.org/10.1186/s12904-019-0421-x
4. Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25(6):1053–8. https://doi.org/10.1093/eurpub/ckv043
5. Roediger A, Immonen-Charalambous K, Kujawa M, Sørensen K. Nothing about me without me: Why an EU health literacy strategy embracing the role of citizens and patients is needed. Arch Public Health. 2019;77(1):10–2. https://doi.org/10.1186/s13690-019-0342-4
6. García-García D, Pérez-Rivas FJ. Health Literacy and Its Sociodemographic Predictors: A Cross-Sectional Study of a Population in Madrid (Spain). Int J Environ Res Public Health. 2022;19(18):11815. https://doi.org/10.3390/ijerph191811815
7. Neter E, Brainin E. Association Between Health Literacy, eHealth Literacy, and Health Outcomes Among Patients With Long-Term Conditions. European Psychologist. 2019; 24(1):68–81. https://doi.org/10.1027/1016-9040/a000350
8. Garcia-Codina O, Juvinyà-Canal D, Amil-Bujan P, Bertran-Noguer C, González-Mestre MA, Masachs-Fatjo E, et al. Determinants of health literacy in the general population: results of the Catalan health survey. BMC Public Health. 2019; 19(1):1122. https://doi.org/10.1186/s12889-019-7381-1
9. Bahramian M, Najimi A, Omid A. Association between health literacy with knowledge, attitude, and performance of health-care providers in applying health literacy education strategies for health education delivery. J Educ Health Promot. 2020;9:10. https://doi.org/10.4103/jehp.jehp_199_19
10. Meier C, Vilpert S, Borrat-Besson C, Jox RJ, Maurer J. Health literacy among older adults in Switzerland: cross-sectional evidence from a nationally representative population-based observational study. Swiss Med Wkly. 2022;152:w30158. https://doi.org/10.4414/smw.2022.w30158
11. Toçi E, Burazeri G, Kamberi H, Toçi D, Roshi E, Jerliu N, et al. Health literacy and body mass index: a population-based study in a South-Eastern European country. Journal of Public Health. 2021;43(1):123–30. https://doi.org/10.1093/pubmed/fdz103
12. Vozikis A, Drivas K, Milioris K. Health literacy among university students in Greece: determinants and association with self-perceived health, health behaviours and health risks. Arch Public Health. 2014;72(1):15. https://doi.org/10.1186/2049-3258-72-15
13. Esna Ashari F, Pirdehghan A, Rajabi F, Sayarifard A, Ghadirian L, Rostami N, et al. The Study of Health Literacy of Staff about Risk Factors of Chronic Diseases in 2014. Avicenna Journal of Clinical Medicine. 2015;22(3).
14. Kesić MG, Perić M, Gilić B, Manojlović M, Drid P, Modrić T, et al. Are Health Literacy and Physical Literacy Independent Concepts? Gender stratified analysis of medical school students from Croatia. Children (Basel). 2022; 9(8):1231. https://doi.org/10.3390/children9081231
15. Lovrić B, Placento H, Farčić N, Lipič Baligač M, Mikšić Š, Mamić M, et al. Association between Health Literacy and Prevalence of Obesity, Arterial Hypertension, and Diabetes Mellitus. Int J Environ Res Public Health. 2022;19(15):9002. https://doi.org/10.3390/ijerph19159002
16. Muslić Lj, Jovičić Burić D, Markelić M, Musić Milanović S. Mental health literacy. *Socijalna psihijatrija.* 2020;48(3):324–43. https://doi.org/10.24869/spsih.2020.324
17. Bobinac A, Dukić Samaržija N, Ribarić E. Zdravstvena pismenost u Republici Hrvatskoj. Rev Soc Polit. 2022;29(3):427-43. https://doi.org/10.3935/rsp.v29i3
18. Trezona A, Dodson S, Osborne RH. Development of the Organizational Health Literacy Responsiveness (Org-HLR) Framework in Collaboration with Health and Social Services Professionals. BMC Health Serv Res. 2017;17(1):513. https://doi.org/10.1186/s12913-017-2465-z
19. Placento H, Lovrić B, Gvozdanović Z, Farčić N, Jovanović T, Jovanović JT, et al. Croatian Version of the Short Assessment of Health Literacy for Spanish Adults (SAHLSA-50): Cross-Cultural Adaptation and Psychometric Evaluation. Healthcare (Basel). 2022;10(1):111. https://doi.org/10.3390/healthcare10010111
20. Aljassim N, Ostini R. Health literacy in rural and urban populations: A systematic review. *Patient Educ Couns.* 2020;103(10):2142–54. https://doi.org/10.1016/j.pec.2020.06.007
21. World Health Organization. Health literacy [Internet]. WHO; 2024. Available at: https://www.who.int/news-room/fact-sheets/detail/health-literacy

22. Roxo L, Silva M, Perelman J. Gender gap in health service utilisation and outcomes of depression: A cross-country longitudinal analysis of European middle-aged and older adults. Prev Med. 2021;153:106847. https://doi.org/10.1016/j.ypmed.2021.106847
23. Zhang F, Or PPL, Chung JWY. How different health literacy dimensions influences health and well-being among men and women: The mediating role of health behaviours. Health Expectations. 2021;24(2):617–27. https://doi.org/10.1111/hex.13208
24. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, Brand H; (HLS-EU) Consortium Health Literacy Project European. Health literacy and public health: a systematic review and integration of definitions and models. BMC Public Health. 2012:25;12:80. https://doi.org/10.1186/1471-2458-12-80
25. Guo C, Wu Y, Bai X, Qiao Q, Qi D, Zang S. Association of health literacy with illness perception of Chinese community patients with chronic disease. BMC Public Health. 202520;25(1):1857. https://doi.org/10.1186/s12889-025-23123-2
26. Schaeffer D, Berens E-M, Vogt D, Gille S, Griese L, Klinger J, et al. Health literacy in Germany - findings of a representative follow-up survey. Dtsch Arztebl Int. 2021;118(43):723–9. https://doi.org/10.3238/arztebl.m2021.0310
27. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Viera A, Crotty K, et al. Health literacy interventions and outcomes: an updated systematic review. Evid Rep Technol Assess (Full Rep). 2011;(199):1-941. https://doi.org/10.3238/arztebl.m2021.0310
28. Berry LL, Danaher TS, Beckham D, Awdish RLA, Mate KS. When patients and their families feel like hostages to health care. Mayo Clin Proc. 2017;92(9):1373–81. https://doi.org/10.1016/j.mayocp.2017.05.015
29. MacLeod S, Musich S, Gulyas S, Cheng Y, Tkatch R, Cempellin D, et al. The impact of inadequate health literacy on patient satisfaction, healthcare utilization, and expenditures among older adults. Geriatrician Nurs. 2017;38(4):334-41. https://doi.org/10.1016/j.gerinurse.2016.12.003
30. Paasche-Orlow MK, Wolf MS. The causal pathways linking health literacy to health outcomes. Am J Health Behav. 2007; 31 Suppl 1:19-26. https://doi.org/10.5555/ajhb.2007.31.supp.S19
31. Ji S, Kwon YG, Lee H, Shin C, Sohn M, Choi M. Regional disparities in health literacy for chronic diseases: focusing on healthcare resources and local extinction index. Front Public Health. 2024;12:1423645. https://doi.org/10.3389/fpubh.2024.1423645
32. Yang W, Liu Y, Zhang G, Yao Y, Wang Y, Leng D, et al. Health literacy and associated factors in China: findings from the Wa ethnic group. Front Public Health. 2024;12:1407593. https://doi.org/10.3389/fpubh.2024.1407593
33. Mollakhalili H, Papi A, Zare-Farashbandi F, Sharifirad G, HasanZadeh A. A survey on health literacy of inpatient's educational hospitals of Isfahan University of Medical Sciences in 2012. J Educ Health Promot. 2014;3:66. https://doi.org/10.4103/2277-9531.134804
34. Reisi M, Javadzade SH, Heydarabadi AB, Mostafavi F, Tavassoli E, Sharifirad G. The relationship between functional health literacy and health promoting behaviors among older adults. J Educ Health Promot. 2014;3:119. https://doi.org/10.4103/2277-9531.145925
35. Saatchi M, Panahi M, Ashraf Mozafari A, Sahebkar M, Azarpakan A, Baigi V, et al. Health Literacy and Its Associated Factors: A Population-Based Study, Hormuz Island. Irje. 2017;13(2):136-44.
36. Lee HY, Hwang J, Ball JG, Lee J, Yu Y, Albright DL. Mental Health Literacy Affects Mental Health Attitude: Is There a Gender Difference? Am J Health Behav. 2020;44(3):282-91. https://doi.org/10.5993/AJHB.44.3.1
37. Svendsen MT, Bak CK, Sørensen K, Pelikan J, Riddersholm SJ, Skals RK, et al. Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults. BMC Public Health. 2020;20(1):565. https://doi.org/10.1186/s12889-020-08498-8
38. Nutbeam D. Improving health literacy: How to succeed. Public Health Res Pract. 2023;33(1):3312301. https://doi.org/10.17061/phrp3312301
39. Zahnd WE, Scaife SL, Francis ML. Health literacy skills in rural and urban populations. Am J Health Behav. 2009;33(5):550-7. https://doi.org/10.5993/ajhb.33.5.8