Socioeconomic status and health literacy as the important predictors of general health in Iran: a structural equation modeling approach

Tayebeh Nadi [1], Jalal Poorolajal [1, 2], Amin Doosti-Irani [1, 3]

(1) Department of Epidemiology, School of Public Health, Hamadan University of Medical Sciences, Hamadan (65178-38695), Iran
(2) Modeling of Noncommunicable Diseases Research Center, Hamadan University of Medical Sciences, Hamadan (65178-38695), Iran
(3) Research Center for Health Sciences, Hamadan University of Medical Sciences, Hamadan (65178-38695), Iran

CORRESPONDING AUTHOR: *Amin Doosti-Irani, Shahid Fahmideh St. Hamadan University of Medical Sciences, School of Public Health, Hamadan, Iran. E-mail a.doosti@umsha.ac.ir, a_doostiirani@yahoo.com*

ABSTRACT

Background: We aimed to determine the level of health literacy (HL), and its association with general health. In addition, we investigated the direct and indirect association of socioeconomic status (SES) and general health among the adult population in Iran.
Methods: This cross-sectional study involved 750 literate adults' people. The SES was assessed based on the owning of assets. HL was evaluated using a validated questionnaire in Iran. General health was assessed using the WHO general health questionnaire. The simple and adjusted linear regression models, and structural equation modeling (SEM) were used for data analysis.
Results: In adjusted model, female gender, higher level of education, use of books, pamphlets, or brochures as a source of health information, the higher level of SES were positively associated with higher HL. In addition, the HL was significantly associated with higher scores of general health. Results of SEM showed that the direct effect of SES on general health was not significant, but the indirect effect via HL was significant (path coefficient: 0.24; p<0.001).
Conclusion: Results of our study indicated HL is strongly associated with general health among the adult population. SES had a significant indirect association with general health via the effect on health literacy.

Key words: Health Literacy, health, Socioeconomic Factors, Iran.

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INTRODUCTION

Based on the World Health Organization (WHO), "health is complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (1). According to this definition, health is a multidimensional phenomenon, and many socioeconomic and environmental factors affect the health of people (2, 3).

Nowadays, one of the most important determinants of health is knowledge of people regarding the health. Health literacy (HL) is the knowledge and skills of people to resolve the complicated demands regarding their health status (4). The components of the HL are skills such as reading and writing, analysis, decision-making, and the capability of the use of these skills to the preservation and promotion of the personal and public health (5). HL helps to social, economic, and cultural growth in the communities (6). Many of unpleasant health outcomes are due to inadequate HL (7).

Based on the results of some published studies, there is an association between HL with quality of life (8), general health, health behaviors (9), and successful self-management of chronic diseases (10). However, based on the results of other studies there was no significant association between HL with health status, health utilization (9), and mental general health (11). Although some studies were published regarding the prevalence of inadequate HL and its association with health status, there is controversy in their results, and it seems, there is no adequate evidence regarding the level of HL among the general adult population and its association with general health in Iran. On the other hand, higher socioeconomic status (SES) is associated with better self-rated health and general health (12, 13) and more receiving of health care services (14). In addition, SES is associated with health literacy (13). Based on the existing background above, we had two hypotheses regarding the effect of SES on general health; 1) SES directly is associated with general health, and/or 2) indirectly via HL (Fig. 1).

We need more studies to describe a better picture regarding the association of SES and HL with general health. Therefore, the aims of this study were to determine the level of SES, HL, and their association with general health, and investigate our mentioned hypothesis simultaneously using the structural equation modeling approach, among the adult population in Arak city in Iran.

METHODS

Study design and participants

The Ethics Committee of the Hamadan University of Medical Sciences approved this study (IR.UMSHA. REC.1397.832).

This cross-sectional study was conducted in Arak city in 2019. Arak is the capital of Markazi province with about 531000 population. This study was conducted on literate adults between 18 to 65 years old. The random cluster sampling was used to select the participants in the study. The city was divided into 14 clusters based on the areas covered by health centers. The simple random sampling was used in each cluster. We select a random sample using the list of the household numbers in the health centers. The number of sample cluster was determined based on the population size of each health center.

FIGURE 1.The proposed model for the association of socioeconomic status, health literacy and general health

SES: socioeconomic status; GH: general health; HL: health literacy

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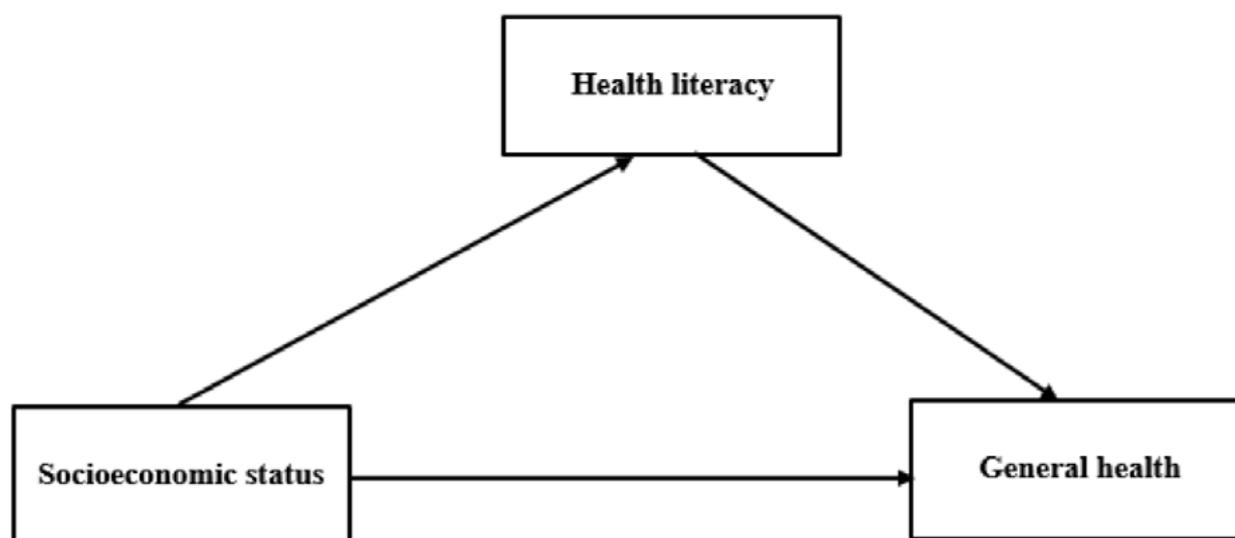
For the calculation of sample size, we used the results of a cross-sectional study conducted by Saatchi et al. in 2016 (15). In this study, the prevalence of inadequate HL was 26%. We reached a sample size 485 at the 5% significance level. Due to the method of sampling in this study, we multiplied this sample size at a design effect equal 1.5. Therefore, the sample size reached 737, and finally, 750 participants were selected in the study.

The eligibility criteria were including literate adults between 18 to 65 years, and being a resident of Arak city. The participation was voluntary in the study.

Health literacy

The health literacy was assessed using the questionnaire validated by Montazeri et al. in Iran. This questionnaire evaluates the HL in five domains; include reading, availability, understanding, evaluating, decision-making, and behavior. The Cronbach alpha coefficient for domains of this questionnaire was from 72% to 89%. The range of scores for domains was as follow: reading 4 to 20; availability 6 to 30; understanding 7 to 35; evaluating 4 to 20; decision-making and behavior 12 to 60. The range of the total HL score was from 33 to 165. We standardized the score of participants in each domain using this formula:

$$Standardized\ score = \frac{(achieved\ score - minimum\ score)}{(maximum\ score - minimum\ score)} \times 100$$

The total HL score for each participant was a summation of five standardized scores in the mentioned domain divided by five. The range of standardized score was between zero to 100 (16).

General health

The WHO general health questionnaire validated by Khalili et al. in Iran was used in this study. This questionnaire includes ten questions in eight domains, including mobility, self-care, cognition and perception, interpersonal relationships, vision status, sleep status, pain, and mental status. The intraclass correlation coefficient and the Cronbach alpha coefficient for this questionnaire were 89% and 76% respectively. The range of general health score using this questionnaire was between zero to 100 (17).

Socioeconomic status

The socioeconomic status of participants was assessed based on the owning of assets. The assets include owning a personal car (Not to make money), personal computer, smartphone, internet use, freezer, dishwasher, washing machine, vacuum cleaner, microwave, and LCD / LED TV. The principal component analysis (PCA) was used to create the wealth index, based on the mentioned assets. In PCA, the first component explains the highest amount of total variance among the variables included in the model (18). According to the PCA results, the participants were classified into five groups from lowest (quantile 1) to highest (quantile 5) socio-economic status.

The continuous variables were presented as mean and standard deviation and categorical variables as frequency and percent. The simple and multiple linear regression was used to evaluate the association between HL and independent variables and general health with HL. The backward stepwise regression was used to model building. The likelihood ratio test was used to select the best-fitted model. The results were reported at 95% confidence level.

The SEM approach was used to investigate our hypotheses (Fig. 1). The model fit was evaluated using the ratio of X^2/degree of freedom (df), root mean squared error of approximation (RMSEA), comparative fit index (CFI), Tucher-Lewis index (TLI) (19, 20). The model was modified by deleting or adding parameters based on the modification indices (21). Stata software, version 14.2 (StataCorp, TX, USA) was used for data analysis.

RESULTS

Characteristics of participants

The participation rate in this study was 94%. Overall, 750 people, including 299 male (39.87%) and 451 female (60.13) participated in the study. The mean (SD) age of participants was 34.79 (9.82). In terms of socioeconomic status, 20.27% and 16.13% of participants were at the lowest and highest level respectively. Other characteristics of participants are shown in table 1.

Health literacy and its related factors

The total mean (SD) score of HL was 75.23 (14.59). The lowest and highest mean scores were related to the availability (70.83) and understanding (81.32) domains of HL (Table 1). Based on the results of univariate linear regression increase of age was negatively associated with HL (Coeff= -0.16; p=0.003). The female gender was significantly associated with a higher HL score (Coeff= 2.56; p=0.018). The internet use (Coeff= 4.88; p<0.001) and Book or pamphlets or brochures (Coeff= 5.38; p=0.003) as the source of health information was significantly associated with a higher score of HL. On the other hand, the use of radio & TV (Coeff= -4.12; p=0.002) and friends and acquaintances (Coeff= -4.63; p=0.007) as the source of HL were significantly

associated with a lower score of HL. The higher level of education and a higher level of socioeconomic status were significantly associated with a better score of HL (Table 2).

Based on the results of the adjusted linear regression, female gender (Coeff= 7.25; p<0.001), higher level of education, intermediate (Coeff= 5.23; p=0.023), diploma, associated degree, bachelor, and masters and upper (Coeff= 14.73; p<0.001) versus elementary were positively associated with HL. Also, use of book or pamphlets or brochures as a source of health information (Coeff= 4.52; p=0.013), quantile 3 (Coeff= 4.04; p=0.012) and quintile 5 (Coeff= 5.66; p=0.004) of socioeconomic status were positively associated with HL. The HL among housekeepers was significantly lower than employed people (Coeff= -4.86; p=0.005). Also, the use of radio & TV (Coeff= -3.46; p=0.006) and friends and acquaintances (Coeff = -4.23; p=0.011) as the sources of HL were significantly associated with a lower score of HL in the adjusted model (Table 2).

TABLE 1. The baseline characteristics of participants.

VARIABLES

CONTINUOUS VARIABLES	MEAN	STANDARD DEVIATION
Age (year)	34.79	9.82
Score of health literacy domains		
Reading	76.44	19.76
Availability	70.83	19.44
Understanding	81.32	16.54
Evaluating	71.09	21.39
Decision-making & behavior	76.48	16.02
Total health literacy score	75.23	14.59
General health score	79.73	13.97
CATEGORICAL VARIABLES	**NUMBER**	**PERCENT**
Gender		
Male	299	39.87
Female	451	60.13
Socioeconomic status		
Quintile 1	152	20.27
Quintile 2	149	19.87
Quintile 3	203	27.07
Quintile 4	125	16.67
Quintile 5	121	16.13
Educational level		
Elementary	57	7.60
Intermediate	101	13.47
Diploma	267	35.60
Associate degree	95	12.67
Bachelor	195	26.00
Masters	35	4.67
Job		
Employed	289	38.53
Unemployed	27	3.60

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TABLE 1. The baseline characteristics of participants.

CATEGORICAL VARIABLES	NUMBER	PERCENT
Housekeeper	336	44.80
Retired	31	4.13
Student	44	5.87
Other	23	3.07
Marital status		
Single	105	14.00
Married	645	86.00
Sources of health information		
Health care workers	447	59.60
Internet	341	45.47
IVR	12	1.60
Radio & TV	157	20.93
Newspaper & magazine	28	3.73
Friends and acquaintances	80	10.67
Book or pamphlets or brochures	80	10.67
Satellite channels	23	3.07
I don't Know	1	0.13

TABLE 2. Association of baseline and socioeconomic status with health literacy.

VARIABLES	UNIVARIATE LINEAR REGRESSION			ADJUSTED LINEAR REGRESSION		
Variable	$\beta 1$	p-value	95% CI	$\beta 1$	p-value	95% CI
Age	-0.16	0.003	-0.27, -0.05	0.04	0.537	-0.08, 0.16
Sex	2.56	0.018	0.43, 4.69	7.25	<0.001	4.19, 10.32
Educational level						
Elementary (reference group)	0.00	-	-	-	-	-
Intermediate	5.70	0.013	1.21, 10.19	5.13	0.023	0.72, 9.55
Diploma	10.75	<0.001	6.80, 14.71	8.87	<0.001	4.72, 13.03
Associate degree	13.05	<0.001	8.51, 17.59	9.09	<0.001	4.29, 13.88
Bachelor	16.08	<0.001	12.00, 20.16	11.36	<0.001	6.70, 16.02
Masters & upper	19.75	<0.001	13.93, 25.57	14.73	<0.001	8.45, 21.02
Job						
Employed (reference group)	0.00	-	-	-	-	-
Unemployed	-1.48	0.612	-7.19, 4.24	0.21	0.940	-5.31, 5.73
Housekeeper	-3.27	0.005	-5.55, -1.00	-4.86	0.005	-8.27, -1.46
Retired	-5.36	0.050	-10.72, 0.00	-0.08	0.978	-5.52, 5.37
Student	-3.11	0.185	-7.70, 1.49	-4.28	0.114	-9.60, 1.03

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TABLE 2. Association of baseline and socioeconomic status with health literacy.

VARIABLES	UNIVARIATE LINEAR REGRESSION			ADJUSTED LINEAR REGRESSION		
Other	-11.37	<0.001	-17.51, -5.22	-6.67	0.024	-12.40, -0.89
Married vs single	-1.51	0.325	-4.53, 1.50	0.56	0.757	-2.99, 4.08
Sources of health information						
Health care workers	1.47	0.175	-0.66, 3.60	1.08	0.331	-1.10, 3.26
Internet	4.88	<0.001	2.81, 6.95	1.94	0.094	-0.33, 4.21
IVR	-5.27	0.215	-13.61, 3.06	-7.39	0.071	-15.42, 0.64
Radio & TV	-4.12	0.002	-6.67, -1.56	-3.46	0.006	-5.94, -0.98
Newspaper & magazine	1.26	0.653	-4.26, 6.78	-0.27	0.921	-5.67, 5.13
Friends and acquaintances	-4.63	0.007	-8.01, -1.26	-4.23	0.011	-7.48, -0.98
Book or pamphlets or brochures	5.38	0.003	1.78, 8.98	4.52	0.013	0.95, 8.09
Satellite channels	4.94	0.110	-1.12, 11.00	2.85	0.344	-3.06, 8.77
Socioeconomic status						
Quintile 1 (reference group)	0.00	-	-	-	-	-
Quintile 2	3.018	0.061	-0.14, 6.18	1.10	0.484	-1.99, 4.20
Quintile 3	8.54	<0.001	5.59, 11.48	4.04	0.012	0.89, 7.19
Quintile 4	8.44	<0.001	5.13, 11.75	2.64	0.150	-0.96, 6.25
Quintile 5	12.62	<0.001	9.28, 15.97	5.66	0.004	1.85, 9.47

TABLE 3. The univariate association between baseline, socioeconomic status, and health literacy with general health.

VARIABLE	β_1	P-VALUE	95% CI
Age	0.00	0.371	-0.01, 0.00
Gender (Female vs male)	-0.08	0.070	-0.16, 0.01
Educational level			
Elementary (reference group)	0.00	-	-
Intermediate	0.08	0.382	-0.10, 0.26
Diploma	0.19	0.020	0.03, 0.35
Associate degree	0.15	0.102	-0.03, 0.34
Bachelor	0.29	0.001	0.12, 0.46
Masters & Upper	0.25	0.036	0.02, 0.49
Job			
Employed (reference group)	0.00	-	-
Unemployed	0.03	0.793	-0.19, 0.25
Housekeeper	-0.08	0.091	-0.17, 0.01
Retired	-0.06	0.602	-0.27, 0.15
Student	-0.14	0.137	-0.32, 0.04
Other	-0.11	0.351	-0.36, 0.13

TABLE 3. The univariate association between baseline, socioeconomic status, and health literacy with general health.

VARIABLE	β1	P-VALUE	95% CI
Married vs single	0.12	0.044	0.00, 0.24
Health literacy			
Inadequate (reference group)	0.00	-	-
Not enough	0.24	0.016	0.04, 0.43
Enough	0.45	<0.001	0.27, 0.64
Excellent	0.54	<0.001	0.35, 0.73
Socioeconomic status			
Quintile 1 (reference group)	0.00	-	-
Quintile 2	0.12	0.073	-0.01, 0.24
Quintile 3	0.20	0.001	0.08, 0.32
Quintile 4	0.29	<0.001	0.15, 0.42
Quintile 5	0.19	0.007	0.05, 0.32

TABLE 4. The association between health literacy and general health adjusted for gender, marital status and socioeconomic status using multiple linear regression .

VARIABLE	β1	P-VALUE	95% CI
Gender (Female vs male)	-0.09	0.019	-0.18, -0.02
Married	0.17	0.005	0.05, 0.28
Health literacy			
Inadequate (reference group)	0.00	-	-
Not enough	0.23	0.019	0.04, 0.43
Enough	0.43	<0.001	0.24, 0.61
Excellent	0.51	<0.001	0.32, 0.71
Socioeconomic status			
Quintile 1 (reference group)	0.00	-	-
Quintile 2	0.08	0.183	-0.04, 0.21
Quintile 3	0.13	0.036	0.01, 0.25
Quintile 4	0.21	0.002	0.08, 0.35
Quintile 5	0.09	0.208	-0.05, 0.22

General health and its related factors

The total mean (SD) score of general health among participants was 79.73 (13.97). According to the results of simple linear regression, an increase in the HL level versus inadequate HL was significantly associated with more score of general health. Enough and excellent HL versus inadequate were associated with a (Coeff= 0.45; p<0.001) and (Coeff = 0.54; p<0.001) increase in

general health score, respectively. In addition, a higher level of socioeconomic status was associated with more score of general health significantly (Table 3).

Results of adjusted linear regression regarding the association of HL with general health are shown in table 4. Based on the results of this model increase in the HL level versus inadequate adjusted for gender, marriage status, and socioeconomic status was significantly associated with an increase in the score of general

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FIGURE. 2. The SEM model indicating health literacy as an intermediate variable of association between socioeconomic status and general health.
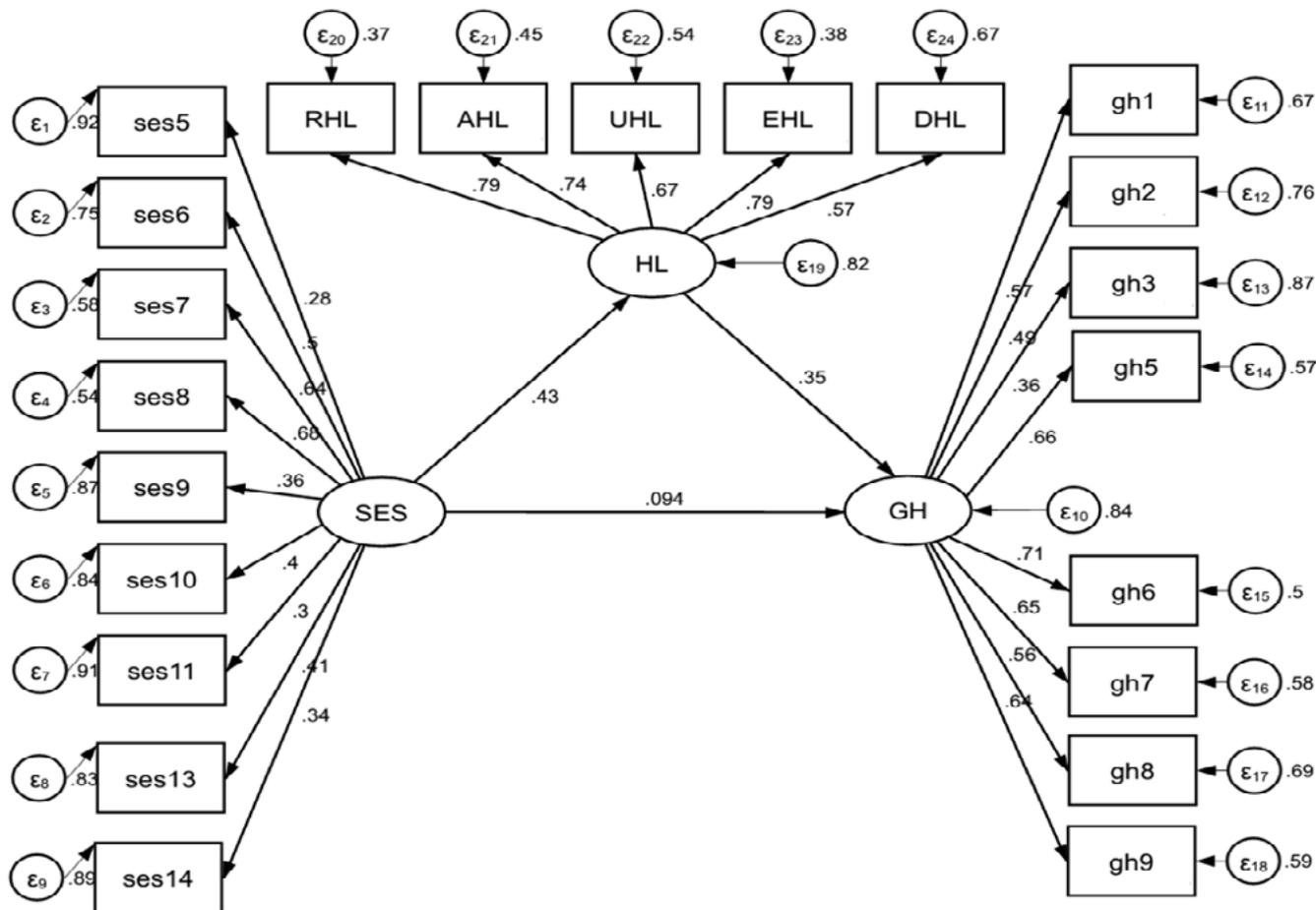
SES: socioeconomic status; GH: general health; HL: health litercy; RHL: reading domain of health literacy; AHL: availability domain of health literacy: UHL: understanding domain of health literacy; EHL: evaluating domain of health literacy; DHL: decision-making domain of health literacy.

health. Enough and excellent HL versus inadequate were significantly associated with (Coeff = 0.43; p<0.001) and (Coeff= 0.52; p<0.001) increase in general health score, respectively. The female gender was negatively associated with general health score (Coeff= -0.09; p=0.019) adjusted for marriage status, HL level, and socioeconomic status. The mean score of general health among married people was significantly more than unmarried (Coeff= 0.17; p=0.005).

Results of structural equation modeling approach

The produced SEM model after calculation of its parameters is shown in Fig. 2. The model fit indices were as follow: $X^2/df=2.28$, RMSEA=0.041 (95% CI: 0.036, 0.047), CFI=0.95, and TLI=0.93. Based on these indices the model is acceptable. According

to the results of the SEM, SES had a significant direct effect on the HL (path coefficient: 0.43; p<0.001), HL had a significant direct effect on general health (path coefficient: 0.35; p<0.001), and direct effect of SES on general health was not significant (path coefficient: 0.094; p=0.084). The total effect of SES on general health was significant (path coefficient: 0.24; p<0.001).

DISCUSSION

Main finding of this study

Based on the results of our study SES was significantly associated with HL. In addition, SES and HL were associated with general health significantly. Female gender, a higher level of education, use of the internet, use of books, pamphlets or brochures as a

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source of health information, a higher level of SES were significantly associated with HL. On the other hand, HL among housekeepers was lower than employees. In addition, the use of radio & TV, and friends and acquaintances as the sources of HL were significantly associated with a lower score of HL.

What is already known on this topic

The results of our study are in the line of previous literature regarding the association of HL with a higher level of education and SES (15, 22, 23). Female gender was significantly associated with HL, which confirmed by previous studies (23, 24). Our results regarding the association of written materials as the sources of health information with an increase of HL is in the line of another study which showed the effect of written training materials on the HL of the patients with acute ischemic stroke (25). Use of the Internet in both simple and adjusted model was associated with an increase of HL, although this association in the adjusted model was not statistically significant. This finding confirmed by the previous studies, which showed a strong association between HL and internet use (26), especially the use of the medical website (27). Our results showed a strong negative association between HL and use TV & radio as a source of health information. Our finding was in the line of a study in the US that showed higher health literacy is associated with lower use of television (27). This issue may be due to ineffective or insufficient radio and television program regarding health education and health promotion, and low use of radio & TV. In our study, 20.93% of participants use radio & TV as a source of health information.

Based on our results, the higher level of HL after adjusting for gender, marriage status, and SES, was significantly associated with better general health. In addition, female gender, marriage, and SES were significantly associated with a higher level of general health. Results of a study in Iran showed mental health literacy was not associated with general psychological health (28) that is not in the line of our results. Another study in Isfahan province showed no significant association between HL with health status and health utilization (29). The results of our study were in the line of a study in the US, which confirmed the effect of HL on the health status and health services utilization among elderly people (30). The result of inadequate HL on a poor physical function dimension of quality of life among patient with ischemic heart disease is shown in a study in Queensland and South Australia (31). HL may lead to a better lifestyle (32, 33), more use of preventive care (34), and adherence to medical treatment (35).

What this study adds

Results of SEM showed that SES affected the general health via HL indirectly and the direct effect of SES on general health was not significant. In other words, the first hypothesis (direct effect of SES on general health) was rejected and the second hypothesis (indirect effect of SES on general health) was accepted.

SES is a fundamental cause of health inequalities, and people with a high level of SES have more access to resources such as knowledge, money, power, and better social connections that protect their health status (36). Based on our results people with a high level of SES had a higher level of HL and HL is associated with better general health. The direct effect of SES on general health was not significant, but the total effect was significant. Therefore, our model showed that SES affected the general health indirectly via HL, and HL is an intermediate variable in the path of SES with general health. In the SEM approach, we simultaneously assessed the association of three structures (SES, HL, and general health) in one model, and it seems our model demonstrated the indirect effect of SES on general health via HL. However, between SES and general health, there are many other constructs and intermediate variables, which we recommended evaluate in future studies.

Limitations of this study

A limitation of our study is the cross-sectional design of the study, although the association of some factors with HL and HL with general health were statistically significant, it is difficult to establish the temporality, a major criterion for causation, between the variables. Therefore, it must be emphasized that causal inferences should be with more caution. In the SEM model, we evaluated only one path between SES and general health. However, a strong point of the study is a large random sample of the adult, which may produce a good picture of HL and general health status among the Iranian population.

Conclusion

The results of our study indicated HL is strongly associated with general health among the adult population. In addition, our results indicated the indirect association of SES with general health among participants. Therefore, although SES had an indirect association with general health, improvement of SES and reducing the SES inequalities can lead to the promotion of general health among the Iranian population.

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Conflict of Interest

None declared.

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