



Relationship between Health Literacy and Multi-Infections Based on Gender Differences in the Elderly

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ABSTRACT

Aims With age, a person faces many threats, such as developing chronic diseases. Health literacy plays a crucial role in the prevention and treatment of these diseases. Therefore, the present study was conducted to determine the relationship between health literacy and multi-infection based on gender differences in the elderly.

Instrument & Methods This cross-sectional study was performed on the elderly population over 60 years in Comprehensive Health Center and Health Post at Malekan City, East Azerbaijan Province, Iran, in 2018. Four hundred eighty-seven people were sampled by the stratified random sampling method. Demographic and standard health literacy questionnaires were used to collect data. Data were analyzed using an independent t-test, chi-square, and linear regression model by SPSS 26 software.

Findings The mean participants' age was 64.9±6.5 years. The health literacy level of 63.86% of the participants was insufficient, and only 1.23% of the subjects had excellent health literacy. The rate of multi-infection in women was significantly higher than in men.

Conclusion The level of health literacy and multi-infection rate in women is higher than in men.

Keywords Heart Scan Health Literacy; Multi-infection; Gender Differences; Elderly

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Introduction

Recently, chronic, non-communicable health conditions have replaced infectious diseases as the dominant health care burden, as they are now the main causes of morbidity and mortality in many countries. This epidemiological transition creates serious problems for health care systems that are still focused on episodic and acute care [1]. However, health care systems worldwide are currently faced with the growing challenge of multimorbidity, defined as the co-occurrence of multiple chronic diseases or conditions in a single individual. Multimorbidity prevalence is high and increases with age, affecting more than 60% of people aged 65+ [1, 2]. Multimorbidity is associated with numerous negative outcomes, including mortality, disability, and poor quality of life, and the healthcare costs associated with it are high. Multimorbidity is more prevalent among socially disadvantaged population groups [3], and thus failure to provide appropriate care for multimorbid patients is likely to have a negative effect on equity in healthcare [2, 4]. Old age is a critical period when a person faces many threats, such as chronic diseases [5, 6]. The elderly population is increasing worldwide [5, 7]. The elderly typically have one or more diseases, and recent studies have reported an average prevalence of multi-infection in 56-67% of the elderly [8], with 80% of the elderly having at least one chronic disease and 35% having more than three diseases, simultaneously [9, 10]. It is important for both the health care system and the patient due to reduced quality of life, longer hospitalizations, higher costs, and mortality [11, 12]. Older people who do not have sufficient health literacy are more likely to suffer from chronic diseases, to see a doctor more often, and to need emergency services more [8]. Health literacy is a cognitive and social skill that determines individuals' motivation and ability to access, understand, and use information in a way that leads to maintain and promote their health and is a key indicator of health in the population [13]. Statistics show that the health literacy levels of some 75 million adults in the United States are poor, which imposes 69 billion dollars annually on the health care economy [11]. Thirty percent of Taiwan's population has inadequate and borderline health literacy, usually associated with several diseases and poor access to health services [12]. Also, half of Iran's population has limited health literacy, and this restriction is more common in vulnerable groups, including the elderly with chronic diseases, which puts them at risk of staying away from health [14, 15]. Paying attention to the self-care and responsibility of the elderly for various diseases is one of the supportive strategies that require a high level of health literacy [1]. Low health literacy in the elderly is associated with failure to perform preventive behaviors such as screening tests [16], performing

high-risk health behaviors [17], and poor physical and mental health [17].

Since having health, literacy is important in promoting health and improving the disease of the elderly, the prevalence of some diseases shows a different gender pattern. Due to limited studies in this field, this study aimed to determine the relationship between health literacy and multi-infection based on gender differences in the elderly.

Instrument and Methods

This cross-sectional study was conducted in 2018 in the elderly over 60 years in Comprehensive Health Center and Health Post at Malekan City, East Azerbaijan Province, Iran. The sample size was calculated using Cochran's formula (20% prevalence of optimal health literacy level [18] 95% confidence level, 80% power, and 5% error), and 487 people were sampled by stratified random sampling method. From comprehensive centers and health bases, three centers and one base were randomly selected; Among the elderly (Over 60 years) referred for routine care at each center, individuals with a family record who had no history of cognitive impairment such as Alzheimer's and could speak and hear (with or without hearing aids) were selected as the sample. Unwillingness to continue participating in the study for any reason, migration, or failure to answer the questionnaire's questions caused people to leave the study.

A health literacy questionnaire was used to collect data, the validity and reliability of which were assessed by Montazeri *et al.* (Structural validity was %53/2 and reliability was 0.72 to 0.89) [15]. This questionnaire has 33 items in the scales of reading skills (4 items), accessibility (6 items), comprehension (7 items), evaluation (4 items), and decision making and application of health information (12 items). All questions had a 5-point Likert scale answer; Answer of the reading skills and the accessibility scores as "completely hard" (0 points), "hard" (1 point), "neither easy, not hard" (2 points), "easy" (3 points) and "quite easy" (4 points) and the scales of understanding, evaluation, and decision making were calculated as "by no means" (zero points), "rarely" (1 point), "sometimes" (2 points), "most of the time" (3 points) and "always" (4 points) [15]. To score the questionnaire, the raw scores of the five health literacy scales were calculated and then converted to the standard score (between 0 and 100); A score of 0 to 50 was considered as inadequate health literacy level, 50.1 to 66 as not enough, 66.1 to 84 as sufficient and 84.1 to 100 as excellent [19]. The demographic characteristics questionnaire included age, gender, marital status, education level, access to information, and occupation.

The elderly health records were used to assess the status of multi-infection, and the checklist of common geriatric patients was completed using the records, and individuals were divided into two groups: more than one infection and one or no infection. At the bottom of the checklist was an open-ended question about other off-list diseases. A trained questioner completed the questionnaires through interviews with the elderly.

Independent t-test (due to the normality of data) and chi-square test were used to evaluate the significant differences between quantitative variables between men and women, and the chi-square test was used for qualitative variables. Stepwise linear regression was used to examine the relationship between health literacy and the variables of age, literacy level, and multi-infection. All calculations were performed in SPSS 26 statistical software, and the significance level was considered 0.05.

Findings

About 70% of the study population were men. The mean age was 69.6±6.9 years in women and 69.4±6.3 years in men. There was no significant difference between men and women in the variables of age, marital status, and access to information ($p>0.05$), but there was a significant difference in the variables of education and employment status between men and women ($p<0.05$; Table 1).

63.86% of the participants had inadequate health literacy, and only 1.23% had excellent health literacy. 61.4% of the elderly had experienced more than one infection. According to the Chi-square test results, the level of health literacy in women was significantly higher than men, and the rate of multi-infection was significantly higher for women than men (Table 2).

There was a significant relationship in health literacy ($p=0.002$) and education ($p=0.004$), and employment status ($p<0.001$) between women and men. However, accessing information did not show a significant relationship with health literacy in both women and men ($p>0.05$). The gamma correlation coefficient between health literacy and Multi-infection was reported to be -0.38, which a significant relationship confirmed the inverse relationship between health literacy and Multi-infection. Marital status in women had a significant relationship with health literacy, but this significant relationship was not observed in men. With increasing ten years of age, a decrease of 6.7 units in health literacy was observed in women and decreased 6.2 units in men. Also, for women with a diploma and higher education level, health literacy was 26.29 points higher than women with below

diploma education. For men with a diploma or higher, health literacy was 15.11 points higher than men with a post-diploma education level. The health literacy of single women was 3.7 points lower than married women's health literacy significantly. The health literacy of employed women was 10.22 points higher, and homemakers were 6.42 points lower than unemployed women. Health literacy of employed men was 9.5 units higher; homemakers were 5.14 units lower, and retired men were 17.9 units higher than unemployed men (Table 3).

By adding the multivariate variable to the model in the second step, health literacy in women maintained its significant relationship with the variables of age, education, access to information, and multivariate, but lost its significance in the marital status variable. The change in the coefficients of age, education, and employment status in the second step was negligible. On the other hand, the health literacy level of women who accessed information electronically was 2.76 points higher than women who traditionally accessed information. Also, the level of health literacy in women with more than one disease was 7.11 points lower than women with no disease.

Table 1) Frequency (numbers in parentheses are percent) of demographic characteristics of participants (N=487)

Variable	Total (n=487)	Male (n=337)	Female (n=150)	χ^2	p.
Level of Education					
Below diploma	360 (73.92)	262 (77.74)	98 (65.33)	8.29	0.004
Diploma or higher	127 (26.08)	75 (22.26)	52 (34.67)		
Marital status					
Married	414 (85.01)	291 (86.35)	123 (82)	1.5	0.24
Single	73 (14.99)	46 (13.65)	27 (18)		
Employment status					
Unemployed	165 (33.88)	96 (28.49)	69 (46)	111	<0.001
Employed	52 (10.68)	24 (7.12)	28 (18.67)		
Retired	215 (44.15)	199 (59.05)	16 (10.67)		
Housewife	55 (11.29)	18 (5.34)	37 (24.67)		
Access to information					
Traditional	275 (56.47)	189 (56.08)	86 (57.33)	0.07	0.8
Electronic	212 (43.53)	148 (43.92)	64 (42.67)		

Table 2) Comparison of health literacy and multi-infection between women and men (numbers in parentheses are percent)

Variable	Total (n=487)	Male (n=337)	Female (n=150)	χ^2	p.
Health literacy level					
Inadequate	311 (63.86)	220 (65.28)	91 (60.67)	14.8	0.002
Not enough	123 (25.26)	92 (27.3)	31 (20.67)		
Adequate	47 (9.65)	23 (6.82)	24 (16)		
Excellent	6 (1.23)	2 (0.59)	4 (2.67)		
Multi-infection					
0 or 1	188 (38.6)	123 (36.5)	65 (43.33)	1.4	0.03
More than 1	299 (61.4)	214 (63.5)	85 (56.67)		

Table 3) Hierarchical linear regression analysis for health literacy according to gender

Gender	Predictors	Step 1				Step 2			
		β	t	p	95%CI	β	t	p	95%CI
Female	Age	-0.67	8.56	<0.001	-1.1 to -0.3	-0.6	-3.07	<0.001	-1 to -0.2
	Education (Diploma or higher)	26.29	-3.38	<0.001	20.3 to 32.2	24.89	8.35	<0.001	19 to 30.8
	Marital (Single)	-3.7	8.73	<0.001	-11.1 to 3.7	-4.23	-1.15	0.25	-11.5 to 3
	Access to information (Electronic)	7.1	-0.98	0.33	2.3 to 11.9	6.54	2.76	0.01	1.9 to 11.2
	Employment (Employed)	10.22	2.94	<0.001	3.7 to 16.8	9.05	2.77	0.01	2.6 to 15.5
	Employment (Homemaker)	-6.42	3.08	<0.001	-14.1 to 1.3	-6.39	-1.68	0.09	-13.9 to 1.1
	Employment (Retired)	13.04	-1.65	0.1	6.4 to 19.7	11.19	3.33	<0.001	4.6 to 17.8
	Multi-infections (More than one disease)	-	-	-	-	-7.11	-2.84	0.01	-12 to -2.2
Male	Age	-0.62	-4.8	<0.001	-0.87 to -0.36	-0.61	14.91	<0.001	-0.9 to -0.4
	Education (Diploma or higher)	15.11	6.5	<0.001	10.6 to 19.7	14.35	-4.77	<0.001	9.8 to 18.9
	Marital (Single)	-2.05	-0.8	0.4	-7 to 2.9	-2.29	6.26	<0.001	-7.1 to 2.6
	Access to information (Electronic)	1.68	0.94	0.35	-1.8 to 5.16	2.1	-0.93	0.36	-1.3 to 5.5
	Employment (Employed)	9.5	2.6	0.009	2.4 to 16.7	9.61	1.2	0.23	2.6 to 16.7
	Employment (Homemaker)	-5.14	-2.6	0.009	-9 to -1.3	-5.04	2.68	0.01	-8.9 to -1.2
	Employment (Retired)	17.9	4.02	<0.001	9.2 to 26.8	17.35	-2.6	0.01	8.7 to 26
	Multi-infections (More than one disease)	-	-	-	-	-5.88	3.94	<0.001	-9.4 to -2.4

By adding the multivariate variable to the model in the second step, health literacy in men maintained its significant relationship with the variables of age, education, marital status, employment status, and multi-infection. However, the variable of access to information did not show a significant effect on predicting health literacy. The change in the coefficients of age, education, and employment status in the second step was negligible. On the other hand, the level of health literacy in single men was 2.29 points lower than in married men. Also, the level of health literacy for men with more than one disease was 5.88 points lower than men with no disease.

Demographic variables in the first step of regression explained 68% of the variance of health literacy in women and 36% of the variance of health literacy in men, which in the second step increased by 70% in women and 38% in men. In other words, the multivariate variable explained only 2% of the variance of health literacy in women and men independently.

Discussion

Today, health inequalities are exacerbated by the healthcare system's complexities, the aging population, low health literacy rates, and rising chronic diseases. Health literacy has been identified as one of the priorities for improving the quality of health services and has a key role in improving the quality of life, quality of health care, and health outcomes. This study aimed to determine the relationship between health literacy and multi-infection based on gender differences in the elderly. According to the findings of this study, the level of health literacy and multi-infection in women was significantly higher than men, and with age, the level of health literacy in men and women decreased, which was more noticeable in women than men. According to Lee & Fabbri, women are less healthy than men [20, 21]. Also, according to Peterson and Kobayashi & Cajita, older people are less literate [22-24]. Thompson also showed that young women have

higher health literacy than older women, which may be due to the greater importance of women in preventive care at a young age [25]. Cognitive and perceptual problems are likely to increase with age, a major barrier to accessing health information [26]. The present study results contradict Tiller & Kim [18, 27], which reports a higher level of health literacy in older people than other ages, which may be due to differences in measurement tools or demographics or pre-aging education differences.

Tiller [18] and Shoou-Yih Daniel [28] report that women's health literacy levels are lower than men's. To justify this, it can be said that men are more successful in accessing information and thus increasing health literacy due to job opportunities and greater presence in society than women. Contrary to the present study's findings, Clouston reports that women's health literacy is higher than men's [29]. However, Wu, Peterson, and Eronen did not report any significant health literacy relationship based on gender [22, 30, 31]. Differences in health assessment tools, cultural differences, and social context in different studies may affect both sexes' health literacy levels.

The level of health literacy of the elderly was significantly related to education, so that with increasing the level of education, health literacy also increased. The present study results were consistent with Chaser's study [32], and health literacy was directly related to education. According to Simon's study, the elderly with a university education had higher health literacy [33]. Education level probably affects the acquisition and understanding of health information and the evaluation and use [18].

Marital status had a significant relationship with health literacy level, as married elderly had higher health literacy levels. Thompson also reports higher levels of health literacy than married people, and those who lost their spouses had lower levels of health literacy [25]. Singleness and loneliness are more likely to lead to isolation, depression, reduced social participation and interpersonal relationships in the elderly, and as a result, reduced desire to

obtain information and use it in the field of health. However, Liu *et al.* reported the level of health literacy of divorced elderly higher than other elderly [17], and in the study of Oztora *et al.*, no significant relationship was observed between marital status and health literacy [34]. The reason can be differences in measurement tools, characteristics of the research community, and cultural and educational backgrounds of the subjects in different societies.

There was a significant relationship between health literacy and multi-infection so that the elderly with more than one disease had a lower level of health literacy than the elderly with one or without the disease. This finding is consistent with the findings of Lee *et al.* [12]. Also, various studies have shown that the level of health literacy of the elderly with various diseases is low [18, 35]. It seems that with the increase in the incidence of diseases in the elderly, their physical and cognitive abilities decrease, and access to health information and its use decreases; However, the elderly are expected to be more concerned about their health due to the increased risk of chronic diseases at older ages, and the level of health literacy is better in people with various diseases [18].

There was a significant relationship between the employment status of the elderly and the level of health literacy, and the level of health literacy in the employed elderly was higher than the unemployed elderly. Findings of Mohseni *et al.* [36], Li *et al.* [37], and Liu *et al.* [17] showed that the level of health literacy is significantly related to the job and employed people have higher health literacy. One possible reason is that working elderly are more exposed to more information due to their greater presence in the community and have more opportunities to obtain information and benefit from experiences and information resources. However, it is suggested that studies be conducted to examine the information contexts of the elderly in middle age or before old age.

Women who obtained their health information through electronic media and virtual networks had a higher level of health literacy than women who obtained their information through traditional methods such as asking a doctor and a booklet. Other studies have reported the relationship between health literacy and the use of virtual networks (Internet) and have emphasized the media's role as an electronic method in promoting health literacy [11, 16]. Social media plays an important role in encouraging, encouraging, and integrating certain behaviors, habits, and tendencies, and electronic media can be used in health and the promotion of health education at the community level. In another study, in terms of the source of health information and disease, radio and television, and then family and friends were the most important sources of health information,

respectively, and the share of newspapers and magazines was the lowest. Also, only 14% named the elderly, health workers, and health care providers for health information [38].

One of the limitations of the present study is the participation of the elderly who referred to comprehensive health centers in the study, and as a result, the elderly who did not visit the centers were not included in the study; As a result, the generalizability of the results should be done with caution. Therefore, it is recommended that the elderly who live in nursing homes or the elderly without health records be studied in future studies.

Conclusion

Health literacy and multi-infection are higher in women than men; therefore, using health promotion programs to increase public awareness, especially in the elderly, can prevent and control multiple diseases.

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