Original Article

Relationship between Health Literacy and Knowledge, Attitude, and Performance Regarding Cancer Warning Signs

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Abstract

Background: Health literacy (HL) is considered a cancer-preventive strategy. In addition, success in early diagnosis of cancer largely depends on individuals' knowledge, attitude, and performance regarding cancer warning signs. The aim of the present study was to investigate the potential relationship between HL and Knowledge, Attitude, and Performance (KAP) regarding cancer warning signs. **Materials and Methods:** This descriptive-correlational study was conducted on 280 adults who were referred to 3 health centers in Tehran, Iran, from January to March 2020. Data were collected using the Health Literacy Instrument for Adults (HELIA) and the researcher-made KAP regarding cancer warning signs questionnaire. Data were analyzed using the Pearson correlation test and linear regression in an adjusted model in the statistical package for social sciences software. **Results:** Total HL score was positively and significantly correlated with knowledge ($r = 0.35$; $p < 0.001$), attitude ($r = 0.17$, $p = 0.003$), and performance ($r = 0.46$, $p < 0.001$). Moreover, after controlling for potential confounders, a significant and positive relationship was found between HL and knowledge ($\beta = 0.48$; $t_{275} = 4.45$; $p < 0.001$), attitude ($\beta = 0.17$; $t_{265} = 4.64$; $p < 0.001$), and performance ($\beta = 0.62$; $t_{265} = 8.23$; $p < 0.001$). **Conclusions:** It seems that adults' KAP regarding cancer warning signs can be promoted by increasing their HL. Therefore, greater attention should be paid to individuals' HL at community health centers when designing and performing programs to improve their KAP regarding cancer warning signs.

Keywords: *Attitude, health literacy, Iran, knowledge, neoplasms, Psychomotor performance*

Introduction

Cancer is one of the major non-communicable diseases with a substantial burden on healthcare systems.[1] The global cancer rate is rapidly increasing, from 18.1 million new cancer cases reported in 2018 to 24.1 million projected new cases worldwide in 2030.[2] Based on the latest report of the Global Cancer Observatory (GLOBOCAN), 110115 new cancer cases were estimated in Iran.[3] Currently, cancer is ranked as the third source of death following Cardiovascular Diseases (CVDs) and accidents in Iran.[4]

Success in early diagnosis of cancer is mainly dependent on clients' Knowledge, Attitude, and Performance (KAP) regarding cancer screening and also common cancer warning signs.[5-7] Of the different contributors to KAP regarding cancer screening, Health Literacy (HL) has received great attention in different cultures.[8-16] HL is defined as the cognitive and social skills of a client that determine his or her motivation and ability to gain access to, understand, evaluate, and use essential health information in ways that maintain or promote his or her good health.[17] Clients with inadequate HL might suffer from poor health status, participate less in healthcare preventive programs, have little information about disease prevention, and have trouble understanding health instructions correctly.[18,19]

HL is a social determinant of health associated with cancer-related disparities and is considered a cancer-preventive strategy among adults.[20,21] Moreover, adults' KAP regarding cancer warning signs has an important role in the early diagnosis of cancer in Iran, where the majority of patients with cancer are diagnosed at advanced stages of the disease.[1,7,22] However, Iranian adults do not have an ideal KAP in this regard.[22-25]

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Due to these reasons and also considering correlation of HL with one of the variables of KAP regarding cancer screening in Iranians,[14-16] it is necessary to investigate the potential contributing role of HL in KAP regarding cancer warning signs in this population. To the best of the authors' knowledge, the relationship between these variables has not yet been determined. Hence, we designed the present study to investigate the potential relationship of HL and KAP regarding cancer warning signs in a sample of Iranian adults.

Materials and Methods

This descriptive, correlational study was conducted on clients who were referred to 3 health centers in the North network, affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. Participants were eligible if they were 18-65 years old, could speak and write in Persian, could complete the questionnaires, and were willing to participate in the study. Subjects were excluded if they had a history of cancer or had previously participated in cancer training programs. Moreover, participants who filled out the questionnaires incompletely were excluded.

Sampling was performed using a multi-stage cluster sampling method. First, from among the health networks affiliated to Shahid Beheshti University of Medical Sciences, the North network was selected through a simple random method. Then, from among the 20 urban health centers of the North network, 3 centers (Nader, Kadoos, and Imam Hassan Mojtaba) were randomly selected. Finally, participants were selected from among patients in each health center from January to March 2020, consistent with the size of the target population and the average number of clients of each center.

Based on the sample size formula suggested for correlational studies, and considering $\alpha = 0.05$, $\beta = 0.10$, and $r = 0.20$, the number of subjects required was calculated to be 260 individuals.[26] However, to increase the validity of the results and considering possible sample attrition, the sample size was increased to 285 individuals.

The data collection tools included a demographic-clinical information questionnaire, the Health Literacy Instrument for Adults (HELIA), and the KAP of cancer warning signs questionnaire. The 3 questionnaires were completed by the participants using a hand-delivered paper technique in the counseling room of each center.

The HELIA is a 33-item questionnaire that measures HL of Iranian adults in the 5 subscales of reading skill (4 items), access to information (6 items), understanding and comprehension (7 items), appraisal (4 items), and decision making/behavioral intention (12 items). Each item is scored on a 5-point Likert scale ranging from "quite difficult" (score 1) to "quite easy" (score 5) in the reading skill subscale and "never" (score 1) to "always" (score 5) in the other subscales. The score of each subscale is converted to a range of 0-100. The total score, ranging from 0-100, is computed by summing up the scores of all the subscales, and then, dividing it by 5 (number of subscales). Higher scores represent higher HL, and a total score of 0-50, 50.10-66, 66.10-84, and 84.10-100 represents inadequate, not very adequate, adequate, and high HL, respectively.[27] Montazeri *et al*.[28] evaluated the psychometric properties of the HELIA in an Iranian urban population. They reported acceptable qualitative content validity and Content Validity Ratio (CVR), confirmed by 15 experts in public health. Moreover, the qualitative face validity of the HELIA was also satisfactory as determined by 10 adults. Moreover, the construct validity of the questionnaire was satisfactory based on the results of Exploratory Factor Analysis (EFA) and Confirmatory Factory Analysis (CFA). The reliability of the questionnaire obtained using Cronbach's alpha coefficients ($r = 0.72$-0.89) and Intraclass Correlation (ICC) coefficients ($r = 0.81$-0.91) was also acceptable.[28] In the present study, the Cronbach's alpha coefficient of HELIA was 0.93 for the total scale and 0.71-0.92 for its subscales.

The KAP of cancer warning signs questionnaire was developed by the researchers with 21 items to measure KAP in adults (18-65 years). First, the qualitative face validity and qualitative content validity of items were confirmed by 10 nursing faculty members of Shahid Beheshti University of Medical Sciences. They also determined 20 items as essential and relevant, indicating a minimum CVR of 0.80 and a content validity index of 0.9-1, which are acceptable.[29] However, 1 item with a low CVR value was removed. In the next step, the qualitative face validity of the questionnaire with 20 items was confirmed by 10 adults, and then, it was prepared for psychometric analysis. Based on a pilot study on 300 adults with similar characteristics to that of the target population (not included in the main analysis), 3 factors were explored and confirmed. EFA with varimax rotation showed that 10 items with factor loadings ≥0.50 were loaded on the 2 factors of attitude (5 items) and performance (5 items) that jointly accounted for 53.78% of the variance observed (Kaiser-Meyer-Olkin test: 0.78; Bartlett's test of sphericity: $\chi^2 = 928.26$, $P < 0.001$). Moreover, the results of CFA provided a good fit to the data for the knowledge factor (10 items) (Chi-square ratio: 1.68; goodness of fit index: 0.93; the root mean square error of approximation: 0.04; normed fit index: 0.90; and comparative fit index: 0.92). To evaluate the internal consistency and stability (test-retest analysis with a 12-day interval), 30 adults completed the questionnaire and the results were satisfactory [Table 1].

All knowledge items of the KAP questionnaire are scored on a 3-point Likert scale ranging from 1 (no) to 3 (yes). The total score of the knowledge dimension ranges from 10 to 30, and higher scores indicate higher knowledge. All performance items and the first 4 items of attitude are scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Conversely, the last item

Table 1: Cronbach's alpha and Intraclass Correlation coefficients of the knowledge, attitude, and performance regarding cancer warning signs questionnaire

Dimensions	Number of items	Cronbach's alpha coefficient	ICC* coefficient
Knowledge	10	0.78	0.81
Attitude	5	0.70	0.76
Performance	5	0.73	0.80

*ICC: Intraclass Correlation

of attitude is reverse-scored; thus, 1 represents strongly agree and 5 respresents strongly disagree. The total score of the attitude and performance dimensions ranges from 5 to 25, and higher scores indicate better attitude or performance. Based on a previous study,[30] the total score of the 3 dimensions is converted to a range of 0-100 and is categorized as weak (score: 0-33.30), moderate (score: 33.30-66.30), and good (score: 66.30-100).

The CFA of the KAP questionnaire was performed using the Linear Structural Relations software (LISREL, version 8.80; Scientific Software International Inc., USA). The EFA of the KAP questionnaire and the main analyses were performed using the Statistical Package for Social Sciences software (SPSS, version 19.00; SPSS Inc., USA). Quantitative variables and categorical variables are presented as mean (Standard Deviation: SD) and number (%), respectively. The Pearson correlation test was applied to assess the correlation of HL with KAP variables. To control the effects of potential confounders, the linear regression in the adjusted model was used to obtain independent associations of HL with KAP variables. In the adjusted model, we controlled for age, gender, marital status, educational level, employment status, monthly income status, family history of cancer, history of chronic diseases, and history of cancer screening. A P value < 0.050 was considered as significant.

Ethical considerations

Ethical approval was obtained from the Local Research Ethics Committee of Shahid Beheshti University of Medical Sciences (Approval No. IR.SBMU.RETECH.REC.1398.649). After providing a brief verbal description of the study's objectives to the eligible clients and assuring them of confidentiality and anonymity of their personal information, a written informed consent was obtained from each of them. In addition, all clients were informed that they had the right to refuse to participate in the study.

Results

The final analysis was performed for 280 participants, because 5 individuals with incomplete questionnaires were excluded from the study. The mean (SD) of participants' age was 33.96 (11.61) years. Other demographic and clinical characteristics of the clients are presented in Table 2.

The mean (SD) of total HL score and KAP variables were 71.62 (17.40), 44.78 (30.84), 80.28 (10.07), and 58.64 (23.78), respectively [Table 3]. Most of the participants had an adequate HL score (n = 134; 47.90%), poor knowledge (n = 108; 38.60%), good attitude (n = 260; 92.90%), and moderate performance (n = 124; 44.30%) [Table 4].

Total HL score was positively and significantly correlated with knowledge (r = 0.35; p < 0.001), attitude (r = 0.17; p = 0.003), and performance (r = 0.46; p < 0.001). Such direct correlations were seen between all subscales of HL and knowledge and performance (p < 0.001 for all coefficients). Moreover, there were statistically positive correlations between attitude and the subscales of access to information (r = 0.17; p = 0.003), understanding and comprehension (r = 0.16; p = 0.005), and decision making/behavioral intention (r = 0.17; p = 0.003) [Table 5].

After controlling for potential confounders, HL had a significant positive relationship with knowledge (β = 0.48; t_{275} = 4.45; p < 0.001), attitude (β = 0.17; t_{265} = 4.64; p < 0.001), and performance (β = 0.62; t_{265} = 8.23; p < 0.001). Furthermore, a significant and positive association was seen between all subscales of HL and KAP variables (p < 0.050) [Table 6].

Discussion

The present study had 2 main objectives. The first objective was to describe the participants' HL and KAP toward cancer warning signs. As the second objective, the present study was aimed at the evaluation of the correlation between HL and KAP variables. Based on the findings, most participants had an adequate level of HL as measured by HELIA. Moreover, most of them had a good attitude, a moderate performance, and a moderate-to-weak knowledge regarding cancer warning signs. Moreover, a direct and significant correlation was found between HL and KAP variables. Similarly, according to the results of the linear regression, HL was positively associated with KAP variables both in crude and adjusted models.

The findings of the present study are consistent with the results of some previous studies. In line with our findings, Baraie *et al*.[31] and Panahi *et al*.[21] reported a desirable level of HL, as obtained by HELIA, among Iranian adults. However, an inadequate level of HL, measured by the Test of Functional Health Literacy in Adults (TOFHLA), was reported in Iranian women who were referred to community health centers for cancer screening.[15,16] The discrepancy of the results may be due to the innate condition of HL and the origin of TOFHLA. It is worth noting that this tool is not specifically designed for Iranians, and is only a tool of reading comprehension, and thus is useful as a screening instrument to identify individuals with very limited reading ability rather than HL.[32] To better understand the participants' HL, we used the HELIA as an instrument

Table 2: Demographic and clinical characteristics of the participants (*n*=280)

Variables			*n* (%)
Gender	Male		100 (35.70)
	Female		180 (64.30)
Marital status	Married		182 (65.00)
	Single		98 (35.00)
Educational level	University degree		154 (55.00)
	Diploma		126 (45.00)
Employment status	Employed		128 (45.70)
	Unemployed		152 (54.30)
Monthly income status	Sufficient		138 (49.30)
	Insufficient		142 (50.70)
Family history of cancer	Yes		74 (26.40)
	No		206 (73.60)
History of chronic diseases	Yes		44 (15.70)
	No		236 (84.30)
History of cancer screening	No		134 (47.90)
	Yes (screening type)	Breast examination	12 (4.30)
		Pap smear	58 (20.70)
		Fecal immunochemical test	4 (1.40)
		Mammography	8 (2.90)
		Testicular examination	14 (5.00)
		Other	50 (17.80)
Current health condition	Excellent		36 (12.90)
	Very well		70 (25.00)
	Well		122 (43.60)
	Moderate		50 (17.90)
	Poor		2 (0.70)
Giving attention to health	High		132 (47.10)
	Moderate		120 (42.90)
	Low		28 (10.00)
Use of community health services	Yes		160 (57.10)
	No		120 (42.90)
Previous information about cancer warning signs	No		104 (37.10)
	Yes (Sources of information)	Healthcare staff	18 (6.40)
		Radio, television, internet, satellite channels	64 (22.90)
		Friends and acquaintances	10 (3.60)
		Other (newspapers, journals, magazines, booklets, and pamphlets)	84 (30.00)

Table 3: Mean (standard deviation) of participants' health literacy and knowledge, attitude, and performance regarding cancer warning signs (*n*=280)

Variables		Mean (SD)
Health literacy	Total score	71.62 (17.40)
	Reading skill subscale	76.60 (22.77)
	Access to information subscale	69.58 (21.21)
	Understanding and comprehension subscale	79.69 (21.12)
	Appraisal subscale	66.25 (22.83)
	Decision making/behavioral intention subscale	65.98 (20.76)
Knowledge		44.78 (30.84)
Attitude		80.28 (10.07)
Performance		58.64 (23.78)

specifically designed for Iranian adults.[28] Furthermore, the discrepancy could be attributed to the differences in the study population and time of the study. Similarly, the adequate HL level in this study could be explained by participants' educational level, because most of them had university degrees.

Based on the KAP questionnaire, a moderate-to-weak level of knowledge toward cancer warning signs was found. This finding is consistent with recent investigations conducted in different parts of Iran.[22,24,25,30,33,34] Individuals' level of knowledge can positively affect their attitude, and consequently, their performance[22]; however, we found inconsistency between participants' KAP variables. The participants' good attitude, despite their undesirable knowledge level, can be attributed to their adequate HL, because it was shown that HL, like knowledge, is an indicator of attitude toward cancer screening.[10] In addition, the inconsistency between participants' knowledge and

performance levels may be due to the method of data collection used. The KAP questionnaire was completed by the participants; hence, their answers to performance items might be affected by their awareness of being studied or the reactivity effect. Therefore, direct monitoring of participants' performance is suggested in future studies to better understand their performance level toward cancer warning signs.

Regarding the second study objective, a positive and significant relationship was found between HL and KAP variables in the linear regression model and bivariate correlation. This means that the higher the participants' HL was, the greater their KAP toward cancer warning signs was. The mechanisms of action that correlate HL with KAP variables are not well explained. Individuals with higher HL often tend to use healthcare preventive services against cancer and participate in related programs. Moreover, they better understand health instructions during cancer screening consultations.[18,19] Considering these facts, it seems that adequate HL can help individuals to improve their KAP through acquiring more knowledge, thinking or feeling more positively, and observing more healthcare preventive behaviors regarding cancer warning signs. However, further studies are needed to better understand the mechanisms of the correlation between HL and KAP regarding cancer warning signs.

Table 4: Levels of participants' health literacy and knowledge, attitude, and performance regarding cancer warning signs (*n*=280)

Variables		*n* (%)
Health literacy	Inadequate (score: 0-50)	36 (12.90)
	Not very adequate (score: 50.10-66)	46 (16.30)
	Adequate (score: 66.10-84)	134 (47.90)
	High (score: 84.10-100)	64 (22.90)
Knowledge	Poor (score: 0-33.30)	108 (38.60)
	Moderate (score: 33.30-66.30)	106 (37.80)
	Good (score: 66.30-100)	66 (23.60)
Attitude	Poor (score: 0-33.30)	0 (0.00)
	Moderate (score: 33.30-66.30)	20 (7.10)
	Good (score: 66.30-100)	260 (92.90)
Performance	Poor (score: 0-33.30)	48 (17.10)
	Moderate (score: 33.30-66.30)	124 (44.30)
	Good (score: 66.30-100)	108 (38.60)

To the best of our knowledge, the present study is the first to investigate the correlation between HL and KAP regarding cancer warning signs. In the available literature, we could not find any similar studies to compare with our results. However, the findings add information to previous studies on the role of HL in the KAP of individuals regarding cancer screening.[10,14-16] Peyman *et al*.[16] indicated a significant and direct relationship between the total score of TOFHLA and KAP regarding breast cancer screening tests among rural women in Roshtkhar, Mashhad, Iran. Similarly, Mahdavi *et al*.[15] showed that adequate HL, measured by TOFHLA, significantly increased the chance of undergoing breast examination and pap smear in a population of Iranian women. In another study, Baharum *et al*.[10] reported a significant relationship between the total score of the European Health Literacy Questionnaire (HLS-EU-Q16) and attitude towards pap smear among Malay Muslim women. However, Horshauge *et al*.[35] found no association between HL, measured using the HLS-EU-Q16, and colorectal cancer screening in Denmark. This discrepancy between findings can be attributed to the characteristics of the participants, using different HL measures, cultural issues, and differences in healthcare systems and settings in which participants obtained and used health information.

Using an Iranian-based questionnaire of HL for the first time to evaluate the relationship between HL and KAP of individuals referred to community health centers is the main strength of the present study. Moreover, statistical analyses were adjusted for important demographic and clinical characteristics to remove the effect of possible confounders. Furthermore, we used a multi-stage cluster sampling method to ensure the generalization of the findings. However, we are aware that the current study may have some limitations. First, the study was conducted on a sample of Iranian individuals in the North of Tehran; therefore, the results might not be generalizable to other groups or parts of the country, because there are other contributing factors (i.e., cross-cultural and healthcare system differences) that could affect this relationship. Second, the study had a descriptive-correlational design; hence, no cause-effect relationship could be established between HL and KAP variables. Third, considering the self-report method of data collection, the participants may have under/over reported issues. Forth, we could not

Table 5: Correlation of health literacy with knowledge, attitude, and performance regarding cancer warning signs

Health literacy	Knowledge		Attitude		Performance	
	r	*p**	*r*	*p**	*r*	*p**
Total health literacy	0.35	<0.001	0.17	0.003	0.46	<0.001
Reading skill subscale	0.23	<0.001	0.07	0.180	0.31	<0.001
Access to information subscale	0.34	<0.001	0.17	0.003	0.40	<0.001
Understanding and comprehension subscale	0.26	<0.001	0.16	0.005	0.32	<0.001
Appraisal subscale	0.24	<0.001	0.10	0.080	0.25	<0.001
Decision making/behavioral intention subscale	0.33	<0.001	0.17	0.003	0.60	<0.001

**r*: correlation coefficient

Table 6: Linear associations between health literacy and knowledge, attitude, and performance regarding cancer warning signs in crude and adjusted model

Health literacy	Knowledge			Attitude			Performance		
	β (95% CI)	*t*	*p**	β (95% CI)	*t*	*p**	β (95% CI)	*t*	*p**
Total health literacy									
Crude	0.62 (0.43-0.82)	6.30	<0.001	0.16 (0.10-0.23)	4.92	<0.001	0.64 (0.49-0.78)	8.85	<0.001
Adjusted model*	0.48 (0.26-0.69)	4.45	<0.001	0.17 (0.10-0.24)	4.64	<0.001	0.62 (0.47-0.77)	8.23	<0.001
Reading skill subscale									
Crude	0.31 (0.15-0.46)	3.96	<0.001	0.06 (0.01-0.11)	2.50	0.013	0.33 (0.21-0.44)	5.54	<0.001
Adjusted model*	0.19 (0.03-0.35)	2.35	0.032	0.06 (0.006-0.11)	2.19	0.029	0.25 (0.13-0.37)	4.08	<0.001
Access to information subscale									
Crude	0.50 (0.34-0.66)	6.20	<0.001	0.11 (0.05-0.16)	4.10	<0.001	0.45 (0.33-0.57)	7.35	<0.001
Adjusted model*	0.38 (0.21-0.56)	4.32	<0.001	0.12 (0.06-0.18)	4.01	<0.001	0.44 (0.31-0.56)	6.82	<0.001
Understanding and comprehension subscale									
Crude	0.38 (0.22-0.55)	4.59	<0.001	0.10 (0.05-0.16)	3.85	<0.001	0.36 (0.23-0.48)	5.65	<0.001
Adjusted model*	0.25 (0.08-0.43)	2.86	0.004	0.10 (0.04-0.15)	3.25	0.001	0.30 (0.17-0.43)	4.65	<0.001
Appraisal subscale									
Crude	0.32 (0.16-0.47)	4.11	<0.001	0.11 (0.06-0.16)	4.30	<0.001	0.26 (0.14-0.38)	4.34	<0.001
Adjusted model*	0.28 (0.12-0.45)	3.49	0.001	0.10 (0.05-0.16)	3.83	<0.001	0.33 (0.21-0.45)	5.43	<0.001
Decision making/behavioral intention subscale									
Crude	0.50 (0.33-0.66)	5.98	<0.001	0.13 (0.08-0.18)	4.76	<0.001	0.69 (0.58-0.79)	12.58	<0.001
Adjusted model*	0.39 (0.21-0.56)	4.45	<0.001	0.14 (0.09-0.20)	4.91	<0.001	0.63 (0.52-0.75)	11.29	<0.001

CI: Confidence Interval. *Adjusted for age, gender, marital status, educational level, employment status, monthly income status, family history of cancer, history of chronic diseases, and history of cancer screening

directly monitor the participants' performance, which may reduce the external validity of the study.

Conclusion

A significant direct correlation was found between HL and KAP regarding cancer warning signs in a population of Iranian adults, who were referred to community health centers. Accordingly, special attention should be paid to the promotion of individuals' HL at community health centers when designing and performing programs to improve their KAP regarding cancer warning signs. In addition, it is recommended that future interventional studies evaluate the potential effects of HL-enhancing programs on individuals' KAP regarding cancer warning signs to fully understand the role of HL in this regard. Moreover, considering the inconsistency in participants' KAP variables, data triangulation or direct monitoring of participants' performance is suggested to better understand their KAP levels regarding cancer warning signs. In addition, the investigation of specific mechanisms and pathways of action that mediate HL in KAP regarding cancer warning signs is suggested in future studies.

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Conflicts of interest

Nothing to declare.

References

1. Mohammadi E, Aminorroaya A, Fattahi N, Azadnajafabad S, Rezaei N, Farzi Y, *et al*. Epidemiologic pattern of cancers in Iran; current knowledge and future perspective. J Diabetes Metab Disord 2020:In press. doi: 10.1007/s40200-020-00654-6.
2. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2018;68:394-424.
3. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, *et al*. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021;71:209-49.
4. Farhood B, Geraily G, Alizadeh A. Incidence and mortality of various cancers in Iran and compare to other countries: A review article. Iran J Public Health 2018;47:309-16.
5. Al Qadire M. Awareness of cancer signs and barriers to help seeking: A national survey. J Cancer Educ 2018;33:1206-12.
6. Al-Azri M, Al-Hamedi I, Al-Awisi H, Al-Hinai M, Davidson R. Public awareness of warning signs and symptoms of cancer in Oman: A community-based survey of adults. Asian Pac J Cancer Prev 2015;16:2731-7.
7. Badakhsh M, Balouchi A, Taheri S, Bouya S, Ahmadidarehsima S, Aminifard M. Attitude and practice regarding breast cancer early detection among Iranian women: A systematic review. Asian Pac J Cancer Prev 2018;19:9-16.
8. Oldach BR, Katz ML. Health literacy and cancer screening:

A systematic review. Patient Educ Couns 2014;94:149-57.
9. Morris NS, Field TS, Wagner JL, Cutrona SL, Roblin DW, Gaglio B, *et al*. The association between health literacy and cancer-related attitudes, behaviors, and knowledge. J Health Commun 2013;18(Suppl 1):223-41.
10. Baharum NN, Ariffin F, Isa MR, Tin ST. Health literacy, knowledge on cervical cancer and pap smear and its influence on pre-marital Malay Muslim women attitude towards pap smear. Asian Pac J Cancer Prev 2020;21:2021-8.
11. Fernandez DM, Larson JL, Zikmund-Fisher BJ. Associations between health literacy and preventive health behaviors among older adults: Findings from the health and retirement study. BMC Public Health 2016;16:1-8.
12. Sentell TL, Tsoh JY, Davis T, Davis J, Braun KL. Low health literacy and cancer screening among Chinese Americans in California: A cross-sectional analysis. BMJ Open 2015;5:e006104.
13. Yilmazel G. Low health literacy, poor knowledge, and practice among Turkish women patients undergoing cervical cancer screening. J Cancer Res Ther 2019;15:1276-81.
14. Ghanbari A, Rahmatpour P, Khalili M, Mokhtari N. Health literacy and its relationship with cancer screening behaviors among the employees of Guilan University of Medical Sciences. J Health Care 2017;18:306-15.
15. Mahdavi Z, Ramezani A, Ghanbari S, Khodakarim L. Relationship between health literacy and female cancers preventive behaviors. Payesh Health Monit 2017;16:613-25.
16. Peyman N, Amani M, Esmaili H. The relationship between health literacy and constructs of theory of planned behavior and breast cancer screening tests performance among women referred to health care centers in Roshtkhar, 2015. Iran J Breast Dis 2016;9:60-9.
17. Liu C, Wang D, Liu C, Jiang J, Wang X, Chen H, *et al*. What is the meaning of health literacy? A systematic review and qualitative synthesis. Fam Med Community Health 2020;8:e000351.
18. Tolan NV. Health literacy and the desire to manage one's own health. Clin Lab Med 2020;40:1-12.
19. Weishaar H, Hurrelmann K, Okan O, Horn A, Schaeffer D. Framing health literacy: A comparative analysis of national action plans. Health Policy 2019;123:11-20.
20. Simmons RA, Cosgrove SC, Romney MC, Plumb JD, Brawer RO, Gonzalez ET, *et al*. Health literacy: Cancer prevention strategies for early adults. Am J Prev Med 2017;53:S73-7.
21. Panahi R, Namdar P, Siboni FS, Fallah S, Anbari M, Dehghankar L, *et al*. Association between health literacy and adopting preventive behaviors of breast cancer in Iran. J Educ Health Promot 2020;9:241.
22. Tazhibi M, Feizi A. Awareness levels about breast cancer risk factors, early warning signs, and screening and therapeutic approaches among Iranian adult women: A large population based study using latent class analysis. Biomed Res Int 2014;2014:306352.
23. Sharifikia I, Rohani C, Estebsari F, Salmani F, Matbouei M, Hossein-Nejad A, *et al*. Awareness about warning signs for cancers in women referred to health centers affiliated with Bushehr University of Medical Sciences. Iranian J Cancer Care 2019;1:30-9.
24. Monadi Ziarat H, Tovfighian T, Ahmadi Chenari H, Sarvandian S, Jesmi AA, Gorjian Z. Knowledge assessment of Abadan high school female teachers about seven warning signs and effective factors of cancer in 2013-2014. Adv Biores 2016;7:66-70.
25. Feizi A, Kazemnejad A, Hosseini M, Parsa-Yekta Z, Jamali J. Assessing awareness level about warning signs of cancer and its determinants in an Iranian general population. J Health Popul Nutr 2011;29:656-9.
26. Hulley SB, Cummings SR, Browner WS, Hearst N, Grady D, Newman TB, *et al*. Designing Clinical Research: An Epidemiologic Approach. Philadelphia, PA: Lippincott Williams and Wilkins; 2014.
27. Tavousi M, Haeri-Mehrizi A, Rakhshani F, Rafiefar S, Soleymanian A, Sarbandi 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;20:656.
28. Montazeri A, Tavousi M, Rakhshani F, Azin SA, Jahangiri K, Ebadi M, *et al*. Health Literacy for Iranian Adults (HELIA): Development and psychometric properties. Payesh Health Monit 2014;13:589-99.
29. Polit DF, Yang F. Measurement and the Measurement of Change. Philadelphia, PA: Wolters Kluwer; 2016.
30. Sharifikia I, Rohani C, Estebsari F, Salmani F, Matbouei M, Hossein-Nejad A, *et al*. Awareness of cancer warning signs in a sample of Iranian women in health centers. J Adv Pharm Educ Res 2018;8:89-95.
31. Baraie B, Pashaei T, Kakemam E, Mahmoodi H. Health literacy and its predictors among urban and rural adults in Bijar County. J Educ Health Promot 2020;9:181.
32. Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults: A new instrument for measuring patients' literacy skills. J Gen Intern Med 1995;10:537-41.
33. Zolfaghari M, Parsa Yekta Z, Bahram Nejad F, Kazem Nejad A, Monjamed Z. Knowledge about seven warning signs of cancer and protective measures of cancer among people in Tehran, Iran. Payesh Health Monit 2010;9:317-24.
34. Javanmardi K. A Study of Awareness of Warning Signs of Cancer and its Risk Factors among Adults in Ghorveh County-2017. Tabriz, Iran: Tabriz University of Medical Science; 2018.
35. Horshauge PM, Gabel P, Larsen MB, Kirkegaard P, Edwards A, Andersen B. The association between health literacy and colorectal cancer screening uptake in a publicly funded screening program in Denmark: Cross-sectional study. Prev Med Rep 2020;19:101132.