



## Health Literacy in Iranian Women: A Systematic Review and Meta-Analysis

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### Abstract

**Background:** Inadequate health literacy (HL) is associated with poorer health outcomes and worse health care. Up to one-half of Iranian women have difficulty in interpreting medical information, and national HL assessment has been limited in Iran. We have undertaken a systematic review of the literature and used a meta-analysis to examine the situation of HL status in Iranian women, and determine the relationship between HL and self-efficacy, and self-care behaviors.

**Methods:** Six databases (PubMed, Web of Science, Scopus, Google Scholar, Scientific Information Database) and other non-indexed citations were searched using a variety of keywords regarding HL and Iranian women. The bias risk was decreased by the involvement of two independent reviewers assessing study quality and eligibility of included articles.

**Results:** The average HL scores were in the range of marginal or limited (63.08; 95% CI, 59.83–66.32) in the Iranian women. The HL score was significantly higher among pregnant women (67.55; 95% CI, 32.54– 82.57) and was lower in women with chronic disease (57.79; CI, 48.34-67.24). There was a significant association between HL and self-efficacy and self-care behaviors.

**Conclusion:** The average level of HL in the period of the review was marginal among Iranian women. The relationship of HL with self-efficacy and self-care behaviors was statistically significant but moderate.

**Keywords:** Health literacy; Women; Meta-analysis; Self-efficacy; Self-care behaviors; Iran

### Introduction

Health education experts use the term health literacy (HL) to explain the degree to which people have the “capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (1, 2). HL is a complex issue, and an inadequate HL can

negatively affect women's health, knowledge and her ability to engage in prevention and health behaviors and make informed decisions that will lead to satisfactory health outcomes both for their selves and their family (3, 4). Studies show the effect of inadequate HL on women's health

outcomes. For instance, a recent study on breast cancer risk perceptions of women and HL status (n=5163) reported that women with lower HL demonstrated a less accurate understanding of cancer prevention behaviors than did women with higher health literacy (5). In another study that examined the HL of 529 women residing in Chicago, women with low HL were less likely to have poor cervical cancer screening knowledge (4). In the USA, HL was significantly impacted reproductive healthcare behaviors (e.g., healthy pregnancy, sexual practices, and postpartum behaviors) that are essential to keep women healthy (1, 4). Likewise, in New York, mothers with higher HL skills were more likely to give their child the correct medication based on the drug information sheets and the prescription label (4, 5). Therefore, given the significant burden of HL on the women's health status, the emphasis has been considered in addressing and evaluating this risk factor to improve health outcomes in different communities.

In Iran, although the epidemiological profile on burden of healthy lifestyle in term of socio-demographic, behavioral, and clinical characteristics have significantly changed (6, 7), the low HL has been increasingly recognized as serious concern for individual's health (3, 4, 8). To the best of our knowledge, no rigorous and systematic national assessment on HL has been conducted to date examining the overall status of HL in Iranian women. This type of effort to assess HL will be crucial in determining whether the social and health ambitions of Iran for sustainable promotion in the health community are fully achieved (1, 5). Without a synthesis of the current study, it is difficult to set the new stage to clarify and understand the impact of HL on health inequality and health conditions. Given the importance of HL to public health, it would be prudent for the first time to systematically review the previous studies in Iran and determine the situation of HL status among Iranian women, and the relationship between HL and self-efficacy and self-care behaviors.

## Methods

We planned a systematic meta-review in accordance with Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (9) to address the following research question:

What is the health literacy status among Iranian women?

Is there a relationship between self-efficacy and HL among Iranian women?

Is there a relationship between self-care and HL among Iranian women?

### Search Methods

We searched articles until August 6, 2018 from six databases: the PubMed, Web of Science, Scopus, Google scholar, SID, and other non-indexed citations. Further, we hand searched reference lists of all full-text articles to detect additional articles overlooked by the search terms. The search strategy was conducted using the Medical subject heading (MeSH) thesaurus and keywords related to term "health literacy" and combined with the following free terms: "literacy", "health literacy", "self-efficacy", "Iran", "self-care behaviors" and "women".

### Data Abstraction and article Screening

Inclusion criteria were as follows: English/Persian language, described the cross-sectional studies conducted in Iranian women, full-text scientific articles published in indexed scientific journals, measured HL using a validated tool and reported on the relationship of HL with socio-demographic characteristics and health outcomes such as self-care behavior, self-efficacy, knowledge, and medication adherence. Articles were excluded if they were: irrelevant results, duplicated results, dissertations, books, and editorial letters. There weren't restrictions based on age, and date. At this stage, two authors independently screened titles and abstracts of all returned articles to select potentially eligible articles based on inclusion and exclusion criteria. Full-text articles that meet inclusion criteria were downloaded

and their results and method sections were evaluated for final inclusion. The two authors were in 100% agreement over the articles included, and a third reviewer resolved any doubts and discrepancies.

### **Outcomes**

Overall, 6356 potentially relevant articles were identified. Of these, we selected articles that used a valid specific instrument to measure HL and study protocols were described leading to the final inclusion of 34 full-text articles for analysis (Fig. 1).

### **Data extraction and Quality appraisal**

We extracted the following characteristics from all included article: 1) the author(s)/publication year, study design, type of publication, sample size, participant rate and characteristics, inclusion and exclusion criteria, aims; 2) HL score/level of the study population; 3) methodological and instrument approaches used to measure HL and other outcomes; 4) the measure of association between HL and socio-demographic parameters and other outcomes with corresponding *P*-values, for the statistical test. We used the independent dual rating based on the STROBE checklist to evaluate the quality of selected articles. The bias risk was decreased by the involvement of two independent reviewers assessing study quality and eligibility of included articles.

### **Meta-analysis**

We classified the HL status based on the instruments (TOFHLA, STOFHLA, and HELIA) used in meta-analysis studies. Overall, according to the cut-off points of these instruments, there were three levels of HL interpretation: adequate, marginal/limited, and inadequate. In the meta-analysis, the correlation coefficient (*r*) was also used for examining associations between HL with self-care behaviors and self-efficacy. Both fixed-effect and random-effect models of effect sizes are shown in the results to compare

the results of both models. Likewise, the 95% confidence interval for each outcome measure and their *P*-values were considered. Whereas the fixed-effect model highlighted the homogeneity of the effect size factors and weighted average test, the random-effect model assumes heterogeneity of the factors and un-weighted average test for each outcome. The I-square ( $I^2$ ) statistic was used to evaluate the percentage of heterogeneity among studies, which is due to heterogeneity rather than chance. If  $I^2$  shows the little variation, suggesting a fixed-effects model could be appropriate. The effect size measurement was considered to be significant in this study if the confidence interval (CI) for the effect size was zero. In this study, STATA software, version 14 (Corp LP, USA) was implemented to perform the analysis.

### **Ethical approval**

The study was conducted after approval from the Mashhad University of Medical Sciences Research Committee (ethical number: IR.MUMS.REC.1397.303).

### **Results**

Overall, 34 studies including data from 19979 participants, were used in the systematic review and meta-analysis (Table 1, Fig. 1).

### **Description of Included Studies**

#### **Study designs and populations**

Studies were carried out in 30 different cities in Iran (Table 1). Study populations were community-dwelling healthy women (17 articles from 34 articles (17/34); 50%) (10-26), pregnant women (6/34; 17.64%) (27-32), women with chronic disease (8/34; 23.59%) (33-40), and other disease (3/34; 8.82%) (41-43). Sample sizes ranged from 30 to 10426; five studies had fewer than 100 participants (15, 35, 36, 39, 43) (Table 1).

Table 1: Characterization of the included studies

References	Population	Tools	Sample size	City	Average HL	Relationship between HL and different variables		
						Age	Income	Education (P-value)
(33)	Patient	TOFHFLA	1120	Saqez	23.2±16.9	r=-0.3 P=0.0001		0.0001
(41)			175	Isfahan	63.4±18.01	r=-0.419, P<0.001	R=0.03, P=0.062	-
(34)			212	Shiraz	69.3±18.1	r=-0.146, P=0.007		0.000
(35)		HELIA	39	Gorgan	89.2±20	P=0.27, r=0.11		0.01
(36)		TOFHFLA	72	Yazd	46.6±8.2	P>0.05	P<0.001	P>0.05
(42)			130	Bushehr	65.2±12.4	P=0.0001, r=0.37		0.000
(37)			130	Chenaran	43.7±24.7	P=0.451	P=0.033	0.417
(38)			251	Tehran	38.9±29.5			P<0.001
(39)			26	Mashhad	53.4±17.6	P=0.2		0.012
(40)		HELIA	178	Bastak	95.2±24.6			0.005
(43)			80	Bidgol	109±22.4	P<0.015, R=-0.221		0.001
(10)	Health	TOFHFLA	667	5Province	41.1±36.1		P=0.0001	0.0001
(12)			562	Kerman	74.6±9.6	P=0.231	P=0.085	P<0.001
(13)			240	Izeh	64.04±2.05	P<0.002		P<0.0001
(14)			250	Roshtkhar	58.7±9.5	P=0.02, r=-0.23		0.001
(15)			30	Khaf	55.9±15.3	P<0.05		P<0.05
(11)			105	Southeast Iran	67.1±16.6	P=0.06	P=0.01	0.001
(16)		HELIA	659	Tehran	68.3±13.09	P=0.0001		0.001
(17)			10436	5 Province	69.02±15.1	P<0.05		P<0.05
(27)	Pregnant	TOFHFLA	250	Bandarabas	70.6±17.2	P<0.001	P<0.001	P<0.001
(18)	Health	HELIA	330	Lenjan	41.50±9.2	P=0.41		0.12
(19)		HELIA	431	Bardaskan	67.6±16.1	P=0.009		0.001
(20)			348	Karaj	67.3±14.6			
(21)			204	Tehran	70.5±14.1			
(28)	Pregnant	STOFHFLA	400	Urmia	66.04±15.7		P=0.01	P<0.001
(29)		HELIA	215	Balochistan	67.6±12.5			
(30)			860	Balochistan	65.9±17.4			
(22)	Health	NVS	232	Tabriz	3.3±8.2			
(23)		TOFHFLA	120	Mashhad	51.4±12.3	P<0.001	P=0.73	P<0.001
(24)		S-TOFHFLA	360	Mashhad	41.3±6.2			
(31)	Pregnant	Maternal	185	Mashhad	42.7±5.6			
(32)		HL	120	Mashhad			P=0.008	P<0.001
(25)	Health	HELIA	320	Miyaneh	46.2±0.5			
(26)			242	Tehran				

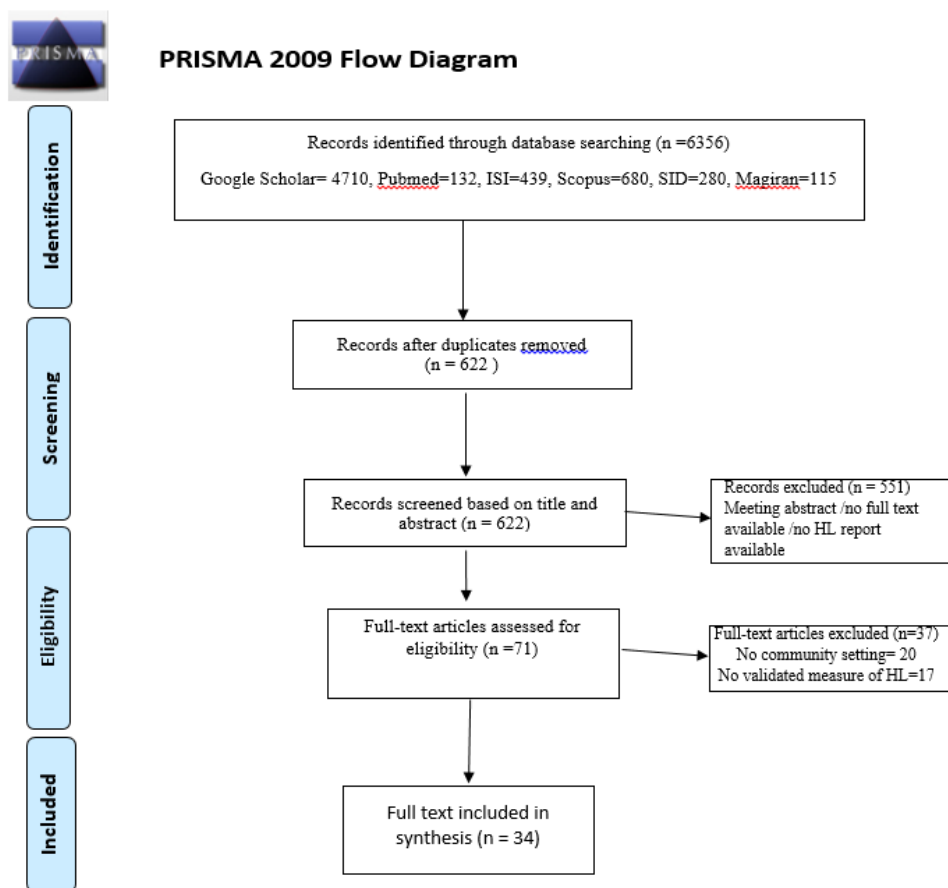


Fig. 1: Prisma flow diagram

### Health literacy measurements

Nineteen studies (55.88%) examined HL using the Test of Functional Health Literacy in Adults (TOFHLA) (10-15, 18, 23, 27, 33, 34, 36-39, 41, 42), or Short Test of Functional Health Literacy in Adults (S-TOFHLA) (24, 28), in the translated or culturally adapted version. Twelve studies (35.29%) assessed HL using the Health Literacy for Iranian Adults (HELIA) in the original version (16, 17, 19-21, 25, 26, 29, 30, 35, 40, 43). Three studies assessed HL using the Newest Vital Sign (NVS) and two studies used other health literacy instruments (22, 31, 32) (Table 1).

### Description of Included Results

#### Systematic Review

TOFHLA and HELIA were the most common instruments used to assess HL, while NVS, S-

TOFHLA, and REALM were rarely used (Table 1). Overall, 19979 women were included, of whom 6334 women (31.7%) had inadequate HL and another had marginal (8312, 41.6%) and adequate HL (5334, 26.7%). The prevalence rates for low HL ranging from 4.8% to 82.8% (12, 14). Of 20 studies assessed association between age and HL, 12 studies reported a statistically significant inverse association ( $P < 0.05$ ) between age and HL (13-17, 19, 23, 27, 33, 34, 42, 43). Likewise, 24/34 studies assess the association between education level and HL (10-19, 23, 27, 28, 32-40, 42, 43), they observed 22/24 (91.6%) significant direct association ( $P < 0.05$ ) between education and HL. Eight studies assessed whether the HL affected the level of self-efficacy and self-care behaviors among women population (18, 22-26, 31, 32). The findings showed women with higher

HL categories had higher self-efficacy and self-care behaviors.

### Meta-analysis

Of 34 studies included in the systematic review, 27 studies had a design and data, which permitted inclusion in the meta-analysis (10-21, 27-30, 33-43).

### Health literacy status

The total score of 27 individual studies gave an overall effect size (ES) of 63.08 (95% CI: 59.83–66.32) for the average of HL, suggesting that HL

score in the range of marginal literacy level among Iranian women. Among surveys using the TOFHLA, S-TOFHLA, and HELIA, the average score of HL were 61.90 (95% CI: 58.46–65.35), 66.04 (95%CI: 35.17-96.91), and 72.70 (95% CI: 62.83–82.56), respectively.

The  $I^2$  statistic for overall ES of HL was 7% ( $P=0.361$ ), and it was 15.7% ( $P=0.270$ ) and 0.0% ( $P=0.844$ ) from studies using TOFHLA/ S-TOFHLA and HELIA, respectively. This indicated the homogeneity within the fixed-effects results, therefore, these results were suitable for interpretation (Fig. 2).

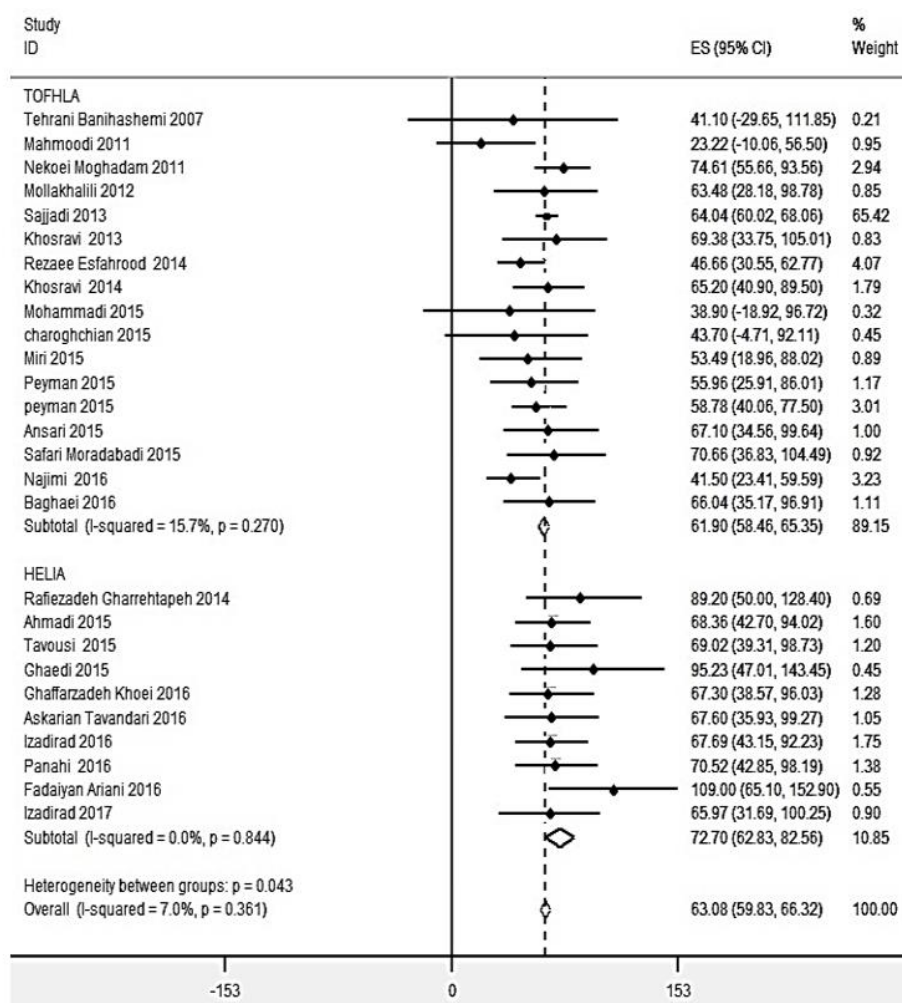


Fig. 2: Forest plot of health literacy status, stratified by type of instruments

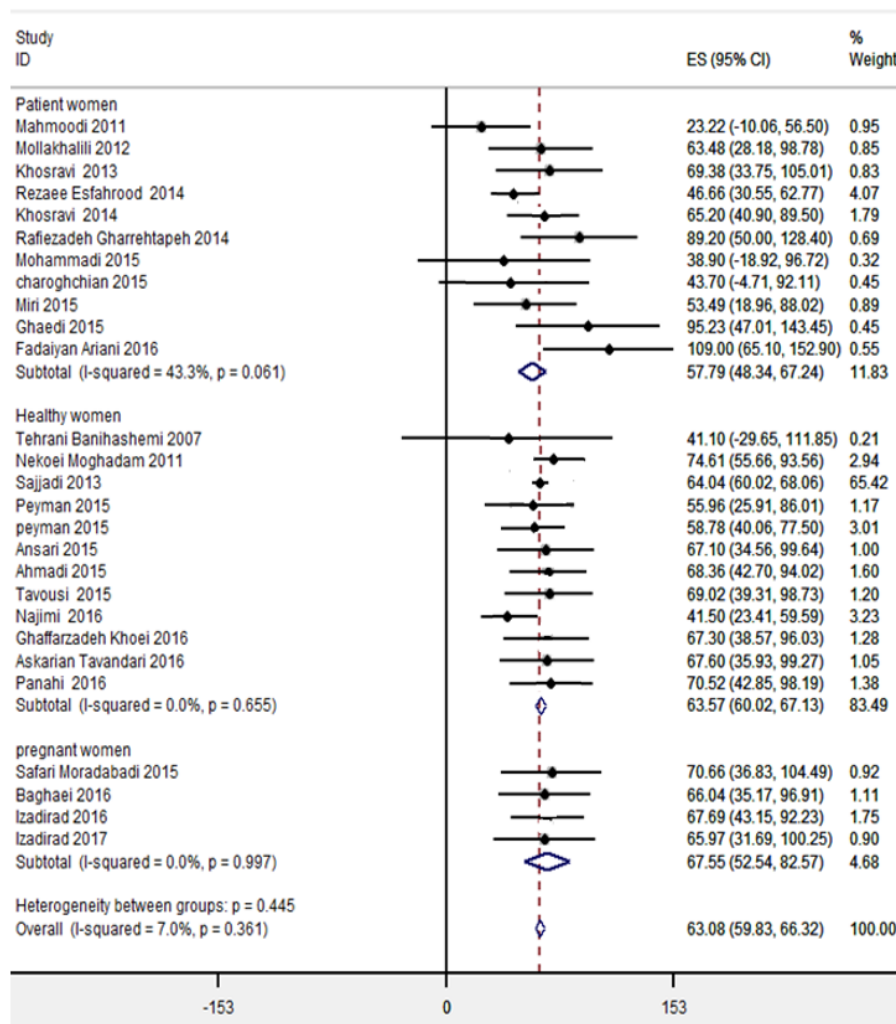
The analysis indicated that the use of study setting, age, education of the study population did

not have a significant effect on the overall effect size.

The effect measure from studies using HELIA categories was markedly larger than those using TOFHLA and STOHFLA to assess HL (Fig.2). The individual studies showed that Rafiezadeh, Ghaedi and Fadiayan’s studies (35, 40, 43) were the significant outliers and the overall effect estimate for HELIA scores was 65.75 (marginal category) with the omission of these studies. This result indicated these outliers might affect the pooled effect size for the HELIA score, falling from 89.20 to 109.

The meta-analysis for study populations showed

higher HL scores in pregnant women 67.55 (95% CI; 32.54– 82.57), while lower scores were observed in women with other types of disease 57.79 (48.34-67.24) (Fig. 3). Investigation of the individual studies showed that 3 studies (35, 40, 43) were the significant outlier in women with the disease compared to the other studies. The overall effect estimate for this population was 50.3 with the omission of these studies, indicating these outliers may increase the pooled effect size for the overall HL categories among women with a type of disease.



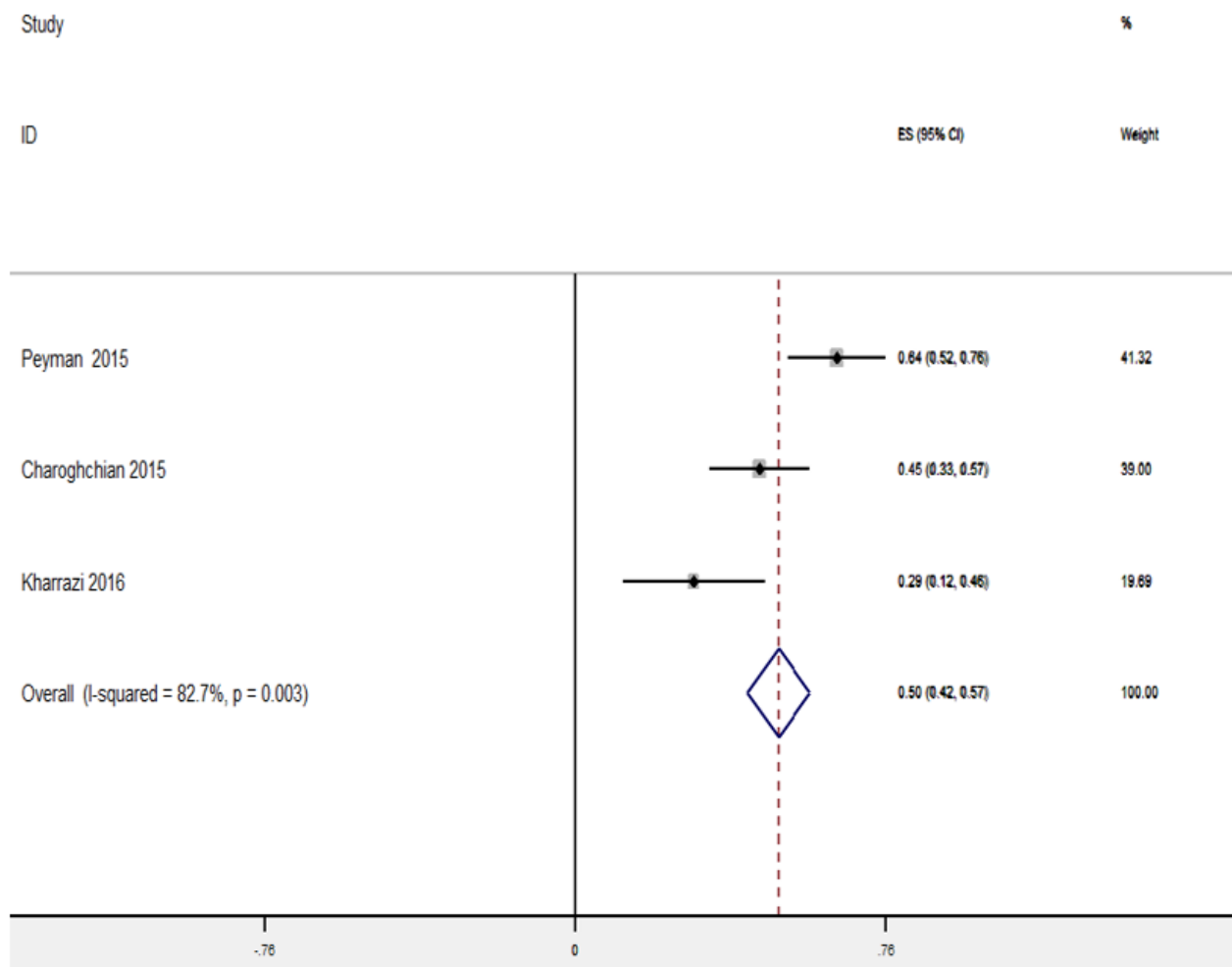
**Fig. 3:** Forest plot of health literacy status, stratified by type of women population. *Association of HL with Self-care and Self-efficacy behaviors*  
Only 8 studies were eligible for assessing the rela-

tionship between HL and other domains. The meta-analysis of 5 studies gave an overall fixed-effects R of 0.48 (95% CI: 0.44–0.52) for the as-

sociation between HL score and self-care behaviors. The  $I^2$  statistic was 96.1% ( $P < 0.001$ ), suggesting that significant heterogeneity within the fixed-effects model, while that data from the random-effects model ( $\tau = 0.36$ ; 95% CI: 0.17–0.60,  $P < 0.001$ ) were suitable for interpretation (Fig. 4). The Egger's test (Bias=10.23,  $P=0.393$ ) showed insignificant publication bias.

Within studies examining the association between HL and self-efficacy, fixed-effects R was 0.49 (95% CI: 0.42–0.57), with  $I^2$  statistic of 82.7%, indicating that heterogeneity was significant. The

random-effect R was 0.47 (95% CI: 0.28–0.65). In these analyses, the random and fixed effects Rs were negligibly different; therefore, the fixed-effects R were selected for interpretation because it was consistent and conservative with our result (Fig. 5). The Egger's test (Bias=17.02,  $P=0.078$ ) showed significant publication bias, while the Trim and Fill test ( $P=0.057$ ) showed insignificant bias. Overall, all studies found a statistically significant direct association between HL and self-care and self-efficacy behaviors.



**Fig. 4:** Forest plot of random-effects pooled odds ratios for the association between self-care behaviors and health literacy



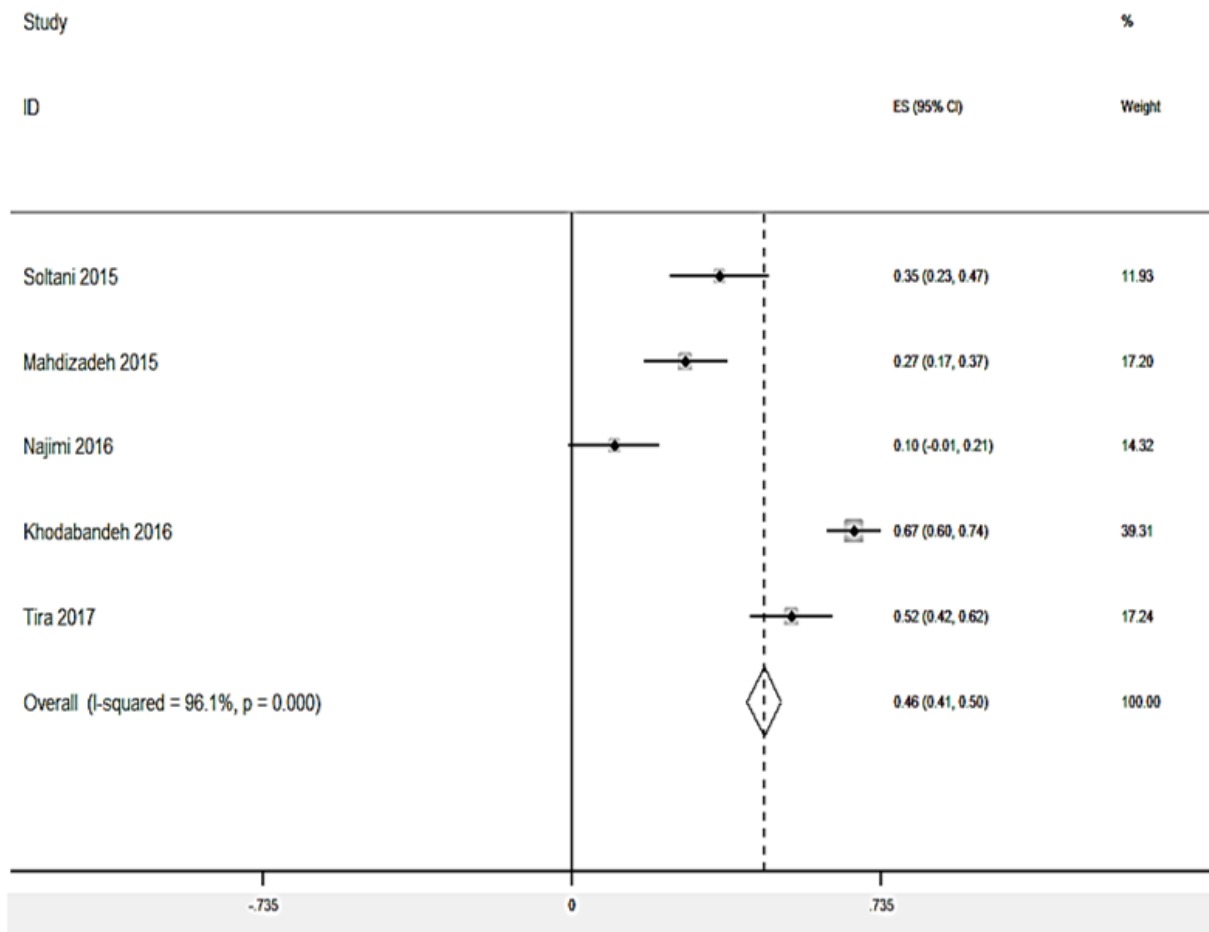


Fig. 5: Forest plot of random-effects pooled odds ratios for the association between self-efficacy and health literacy

## Discussion

### Systematic review

Studies included in the systematic review revealed that 31.7% of women had inadequate HL and another 69.1% had adequate or marginal HL skills. The prevalence of inadequate HL in our study ranging from 4.8% to 82.8%. Likewise, our finding showed that TOFHLLA was used more frequently (19/34) than the other questionnaires to assess HL status in Iran. This may due to its representativeness of health-related duties, common usage, and association with fluid cognitive abilities (44).

Differences in HL were found according to age group, education level and income (45, 46). Consistent with the literature, the present study confirms that low HL is associated with low income

(45, 46) and income (47). Our findings were also consistent with reviews on the prevalence of HL in the United Kingdom and the USA, which reported older age was significantly associated with having limited HL(44). In our review, older age to be more likely to have limited HL in studies that examined HL as numeracy skills, and reading comprehension by TOFHLLA or S-TOFHLLA. Older age was also weakly correlated with limited HL in studies that examine HL by psychometric properties, using the HELIA. This result suggests that aging-related HL reduce mainly occurs with abilities requiring fluid cognitive, rather than crystallized cognitive skills. However, the role of cognition in the apparent older age-related HL decline has not been yet well understood and it is not still clear why HL tended to reduce with increasing age (44, 48). Therefore, longitudinal

studies are needed to assess the effect of cognition aging on HL decline. In addition, the sample size was generally limited to assess HL- relationship with demographic factors. Thus, difficult to infer whether the impact of these factors could significantly affect HL score, and these results must be interpreted with caution.

### *Meta-analysis*

The overall HL was marginal in the Iranian women across 27 studies and 18075 women and pregnant women had higher HL score compared to women with chronic disease and healthy women. Our finding showed that adequate HL led to an improvement in self-efficacy and self-care behaviors among women population. Findings in this study are consistent with the 2009 National Assessment of HL in the USA surveyed 19,000 adults showed that a marginal level of HL among women population in the USA (49). They estimated that approximately 36% of the adults in the USA have limited HL skills (4, 5). A recent study by European Health Literacy Survey reported that nearly 50% of all adults in the 8 European countries have marginal (35%) or inadequate (21%) HL skills that negatively affect their life quality (50). In Philadelphia, approximately 50% of the women had low HL levels that were explained as functionally inadequate (4). In Siberia, 44% of women had inadequate HL, and in Taiwan, only 29% of women had marginal or adequate HL (4, 5).

While this meta-analysis reported marginal score as the overall effect of HL in Iranian women, small differences in HL categories within instrument sub-groups were observed. Our finding showed that the overall effect of HL measured by HELIA in range of adequate health literacy compared with TOFHILA and STOFHILA that showed marginal effect among women. These differences in the overall score of HL in this study probably due to the difference in the content of instruments examining items range of constructs as "health literacy," and cutoff scores to defining marginal or adequate HL. For instance, TOFHILA containing comprehension and arithmetic items, which estimated functional skills

by the number of correct questions that subject could answer by filling in blank in a written text or answer orally (44, 51). All items in the TOFHILA are extracted from actual health context and real hospital materials such as instructions for health examinations, medical forms and medical prescriptions. But, all items in HELIA are extracted from psychometric characteristics such individual's perception and attitude (53-55), which examined based on a 5-point Likert scale (52, 53). Such measurement challenges have been previously reported in almost all reviews focusing on HL and make conflicting results (44). These challenges related to the content of instruments and cutoff scores highlight the need to consider the creation of the new HL measures that effectively assess HL skills in different population. However, our finding indicated that some studies overestimated the overall effect estimates of HELIA scores (35, 40, 43). Given the type of population and instrument of the included studies, these finding must be interpreted with caution, and consider the effect of these studies as a significant outlier. While the inclusion of these studies indicated an adequate level of HL among women population, the authors believe that the overall effect estimates with the omission of these studies showed a more accurate effect estimate, indicating the marginal level of HL status, which exactly fits the pattern seen in TOFHILA and STOFHILA.

Differences were also found according to the type of population. The meta-analysis for study populations showed higher HL scores in pregnant women, while the lower score was seen in women with chronic disease. Therefore, the overall effect estimate for the patient's group may notably decrease the pooled effect size for the overall HL scores among Iranian Women. Although, health disparities have been recently reduced in Iran (54-59), systematic synthesis indicated up to half of the women with chronic disease have trouble using health skills and interpreting medical information (33-40). Pregnant women were more likely to have initiated prenatal care and received preconception counseling with an obstetric provider in health house where

women enjoy reproductive health care services free of charge. Furthermore, difference by HL status in Iranian women population could be related to use of information sources that women used to get health information during pregnancy (60, 61). A higher percentage of pregnant women with adequate HL in Iran were more likely to engage in the frequent use of the Internet as a source of health information. Our data appear to support this relationship (60, 61). A study conducted in Japan reported improvement of pregnant women's HL and its association with quality of prenatal care, access to the media source, community activities to promote the HL and living environment conditions (44, 47).

The meta-analysis indicated that adequate HL led to an improvement in self-efficacy and increased involvement in self-care behaviors among women population. Although the number of studies was limited, it may the meta-analysis lacked enough power to infer whether this association could increase self-efficacy and self-care behaviors, long term, in routine care. Therefore, this finding must be interpreted with caution. Likewise, the effect size of the correlation in our study was weak compared with other determinates of self-efficacy and self-care behaviors such as medication beliefs, disease and cost limitation. Improvement in self-efficacy and self-care behaviors requires myriad determinants and approaches that involve educational, psychological, clinical, financial and behavioral factors, and increasing the HL could be one factor of a multilevel strategy to promote these abilities (44).

Although we made a considerable attempt to use several search strategies and select eligible studies, it is possible that some studies were lost unintentionally. Given the low quality of randomized controlled trial studies on women population in Iran, we decided to include cross-sectional study designs. Furthermore, we can find longitudinal research of HL in Iran. Therefore, the sample size was small and follow-up was generally limited to examine the association of HL with demographic factors and some cognitive parameters. However, these results were not pooled in the meta-analysis and only are interpreted in the

systematic review. Likewise, like other research, we cannot exclude the possibility that some studies were missed in their results such as a potential threat to validity and reduced precision. However, our fixed-effects model and random-effects model identified significant homogeneity. The use of the different instruments, study setting, age, education of the study population was not having a significant effect on the measurement of the overall effect. Therefore, our data was suitable for interpretation over the pooled point estimate. We also conducted stratified analysis based on the type of instrument and study population to reduce potential bias. Finally, few studies examined the association between HL and cognitive abilities; therefore, we could not able to report actual conclusions about these associations. However, our findings may guide other studies in the future.

## Conclusion

This review closely adhered guidelines in the PRISMA and Cochrane Handbook for meta-analysis and systematic review reporting. Based on our findings, it is the first quantitative synthesis of data on Iranian women and HL that systematically examine the HL status and its relationship with health outcomes. This allowed us to examine not only their power of outcome measurement but also how much more likely their score was to be higher or below threshold. Marginal HL is likely to be common among Iranian women and worthy of further research and attention. Higher HL scores were found in pregnant women compared with healthy women and women with other conditions. The theoretical understanding of the status of HL in women population has been hampered by the use of different questionnaires, a lack of longitudinal studies, and few studies assessing cognitive processes. Although the STOFHLA, TOFHLA and, NVS appear to be sensitive to detect HL limitation in the broad functional skills needed to improve health, scoring levels of these instruments need psychometric assessment for comparison against one another. The HELIA appears a promising

instrument to assess psychometric characteristics but it less examined in terms of its ability to detect well functional HL skills. In this context, our findings highlighted careful methodological decisions and designing a comprehensive instrument for future studies. A longitudinal study that includes women at different demographic characteristics and cognitive ability are required to promote our understanding of the dynamics of HL variation and its causal processes among women population. In addition, the implications of this review would be practical for public health educators and health promoters to better understand the HL status of women populations as well as variables that affect HL.

### Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

### Acknowledgements

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### Conflict of interest

The authors declare that there is no conflict of interest.

### References

1. Kilfoyle KA, Vitko M, O'Connor R, et al (2016). Health literacy and Women's reproductive health: a systematic review. *J Womens Health (Larchmt)*, 25(12):1237-55.
2. Kharazi SS, Peyman N, Esmaily H (2016). Association between maternal health literacy level with pregnancy care and its outcomes. *Iran J Obstet Gynecol Infertil*, 19(37):40-50.
3. Charoghchian Khorasani E, Peyman N, Esmaily H (2018). Measuring Maternal Health Literacy in Pregnant Women Referred to the Healthcare Centers of Mashhad, Iran, in 2015. *J Midwifery Reprod Health*, 6(1):1157-1162.
4. Shieh C, Halstead JA (2009). Understanding the impact of health literacy on women's health. *J Obstet Gynecol Neonatal Nurs*, 38(5):601-10.
5. Corrarino JE (2013). Health literacy and women's health: challenges and opportunities. *J Midwifery Womens Health*, 58(3):257-64.
6. Siuki Alizade H, Peyman N, Vahedian-Shahroodi M, et al (2019). Health education intervention on HIV/AIDS prevention behaviors among health volunteers in healthcare centers: An applying the theory of planned behavior. *J Soc Serv Res*, 45(4): 582-588.
7. Ghoreishi MS, Vahedian Shahroodi M, Jafari A, et al (2019). Self-care behaviors in patients with type 2 diabetes: Education intervention base on social cognitive theory. *Diabetes Metab Syndr*, 13(3):2049-56.
8. Peyman N, Alipour Anbarani M (2015). The effect of training diabetes prevention behaviors on promotion of knowledge, attitude and practice of students for prevention of diabetes in Mashhad city. *Iran J Pediatr*, 3(2.2):501-7.
9. Moher D, Liberati A, Tetzlaff J, et al (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*, 6(7): e1000097.
10. Banihashemi SA, Amirkhani M, Haghdoost AA, et al (2007). Health Literacy and the Influencing Factors: A Study in Five Provinces of Iran. *Strides Dev Med Educ*, 4(1):1-9.
11. Ansari H, Almasi Z, Ansari-Moghaddam A, et al (2016). Health literacy in older adults and its related factors: a cross-sectional study in Southeast Iran. *J Health Scope*, 5(4):e37453.
12. Nekoei-Moghadam M, Parva S, Amiresmaili M, et al (2012). Health Literacy and Utilization of health Services in Kerman urban Area 2011. *Toloo e Bebdasht*, 11(14):123-34.
13. Sajjadi H, Hosseinpour N, Sharifian Sani M, et al (2016). Association between health literacy and life style in married rural women in Izeh, Iran. *J Health*, 7(4):479-89.
14. Peyman N, Amani M, Esmaily H (2016). 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*, 9(3):60-9.
15. Peyman N, Samiee-Roudi Kh (2016). Investigating the status of health literacy among health providers of rural area. *J Health Literacy*, 1(1):46-52.
  16. Ahmadi FZ, Mehr-Mohammadi M, Talaei E, et al (2018). Health Literacy among students of Farhangian University. *Payesh*, 17(3):257-66.
  17. Tavousi M, Haeri Mehrizi A, Rafiefar Sh, et al (2016). Health literacy in Iran: findings from a national study. *Payesh*, 15(1):95-102.
  18. Najimi A, Golshiri P, Amini S, et al (2017). Health literacy and self-care in reproductive age: The role of reading and numeracy skills. *Journal of Nursing Education*, 6(5):19-24.
  19. Askarian-Tavandari P, Hashemian M, Joveini H, et al (2018). A Survey on the Level of Health Literacy among the Women in Bardaskan City, Iran, in Year 2016: A Cross-Sectional Study. *J Health Syst Res*, 14(1):35-40.
  20. Ghaffarzadeh Khoei M, Lamyaiian M, Lotfi R, et al (2017). The relationship between postpartum depression and health literacy among nulliparous women. *Payesh*, 16(6):797-805.
  21. Panahi R, Ramezankhani A, Tavousi M, et al (2018). Studying and comparison of health literacy among smokers and non-smokers students in Shahid Beheshti University of Medical Sciences in 2016. *J Health Literacy*, 2(4):255-65.
  22. Soltani R, Eslami AA, Akhlaghi N, et al (2017). Does health literacy affect women's oral health self-care behavior? A cross-sectional study in health centers of Tabriz, North West of Iran. *J Oral Health Oral Epidemiol*, 6(3):138-44.
  23. Peyman N, Abdollahi M (2016). The relationship between health literacy and self-efficacy physical activity in postpartum women. *J Health Literacy*, 1(1):5-12.
  24. Mahdizadeh M, Solhi M (2018). Relationship between self-care behaviors and health literacy among elderly women in Iran, 2015. *Electron Physician*, 10(3):6462-69.
  25. Khodabandeh M, Avarasin SM, Nikniaz L, et al (2017). The Relationship between Health Literacy, Perceived Self-efficacy and Self-care Performance of Female Senior High School Students in Health Promoting Schools of Miyaneh, 2016-2017. *J Health Literacy*, 2(3):164-76.
  26. Tira M, Rahvar M (2018). The influence of health literacy on self-care in women aged between 69-17 years, who visited municipality cultural centers. *J Health Literacy*, 2(4):224-37.
  27. Safari Moradabadi A, Aghamolaei T, Ramezankhani A, et al (2017). The Health Literacy of Pregnant Women in Bandar Abbas, Iran. *J School Public Health and Institute Public Health Res*, 15(2):121-32.
  28. Baghaei R, Najarzadeh M, Saei M, et al (2017). Functional health literacy in pregnant women in health centers of Urima city-2015. *J Urmia Nurs Midwifery Fac*, 15(5):368-75.
  29. Izadirad H, Niknami S, Zareban I, et al (2017). Relationship between health literacy and prenatal care in young pregnant women. *J Health Literacy*, 2(3):141-7.
  30. Izadirad H, Niknami S, Zareban I, et al (2018). Health literacy and prenatal care adequacy index on the outcome of birth weight in pregnant women in Balochistan, Iran. *Payesh*, 17(2):191-8.
  31. Charoghchian Khorasani E, Peyman N, Esmaily H, et al (2017). Relations between breastfeeding self-efficacy and maternal health literacy among pregnant women. *Evidence Based Care*, 6(4):18-25.
  32. Kharrazi S, Peyman N, Esmaily H (2018). Correlation between Maternal Health Literacy and Dietary Self-Efficacy in Pregnant Mothers. *Health Education and Health Promotion*, 6(1):9-16.
  33. Mahmoodi H, Negarandeh R, Javaheri M (2014). Examining the relation of health literacy with outcomes of diabetes among type 2 diabetes patients in Saez, western Iran, 2011. *J Urmia Nurs Midwifery Fac*, 12(1):56-62.
  34. Khosravi A, Ahmadzadeh K, Zareivenovel M (2018). Evaluating the Health Literacy Level among Diabetic Patients Referring to Shiraz Health Centers. *International Journal of Information Science and Management*, 16(1):137-51.
  35. Rafiezadeh Gharrehtapeh S, Tabarsy B, Hojjati H (2015). Relationship between the health literacy with self-efficacy of the diabetic

- patient's type 2 referred to Gorgan city clinic in 2014. *J Diabetes Nurs*,3(2):30-42.
36. Rezaee Esfahrood Z, Haerian ardekani A, Rahmanian M, et al(2016). A Survey on Health Literacy of Referred Diabetic Patients to Yazd Diabetes Research Center. *Toloo e Behdasht*,15(3):176-86.
  37. Charoghchian Khorasani E, Peyman N, Moghzi M, et al(2017). Investigating health literacy in patients with type2 diabets referring to the health houses of Chenaran in 2016. *J North Khorasan Univ Med Sci*,9(2):191-83.
  38. Mohammadi Z, Banihashemi Tehrani A, Asgharifard H, et al(2015). Health literacy and its influencing factors in Iranian diabetic patients. *Med J Islam Repub Iran*,29(1):566-571.
  39. Miri A, Ghanbari MA, Najafi A(2016). The relationship between health literacy and the recovery rate of cardiovascular patients after bypass surgery. *J Health Literacy*,1(2):83-91.
  40. Ghaedi M, Banihashemi F, Latifi M, et al(2016). The relationship between health literacy and self-care among patients with type 2 diabetes residing in the city of Bastak. *Iran J Endocrinol Metab*,18(2):90-6.
  41. Mollakhalili H, Papi A, Zare-Farashbandi Z, et al(2014). A survey on health literacy of inpatient's educational hospitals of Isfahan University of Medical Sciences in 2012. *J Educ Health Promot*,3:66.
  42. Khosravi A, Ahmadzadeh K (2016). Investigating health literacy Level of patients referred to Bushehr hospitals and recognizing its effective factors. *Iran South Med J*,18(6):1245-53.
  43. Fadaiyan Arani A, Amin Shokravi F, Tavakoli Ghouchani H, et al(2018). The Relationship between Health Literacy and Nutrition Behaviors in Patients with Type 2 Diabetes Mellitus. *J North Khorasan Univ Med Sci*,9(4):49-55.
  44. Kobayashi LC, Wardle J, Wolf MS, et al (2016). Aging and Functional Health Literacy: A Systematic Review and Meta-Analysis. *J Gerontol B Psychol Sci Soc Sci*,71(3):445-57.
  45. Tavakoly Sany SB, Peyman N, Behzhad F, et al(2018). Health providers' communication skills training affects hypertension outcomes. *Med Teach*,40(2):154-63.
  46. Tavakoly Sany SB, Peyman N, Zadehahmad Z, et al(2019). Effect of educational interventions on health literacy in patients with heart failure. *International Journal of Health Promotion and Education*, 57:23-36.
  47. Shieh C, Mays R, McDaniel A, et al(2009). Health literacy and its association with the use of information sources and with barriers to information seeking in clinic-based pregnant women. *Health Care Women Int*,30(11):971-88.
  48. Cotten SR, Gupta SS (2004). Characteristics of online and offline health information seekers and factors that discriminate between them. *Soc Sci Med*,59(9):1795-806.
  49. Cutilli C, Bennett IM (2009). Understanding the Health Literacy of America Results of the National Assessment of Adult Literacy. *Orthop Nurs*,28(1):27-32.
  50. World Health Organization (2017). Health literacy. The solid facts. <https://apps.who.int/iris/bitstream/handle/10665/128703/e96854.pdf>
  51. Marques SRL, Lemos SMA (2017). Health literacy assessment instruments: literature review. *Audiology-Communication Research*,22.
  52. Montazeri A, Tavousi M, Rakhshani F, et al(2014). Health Literacy for Iranian Adults (HELIA): development and psychometric properties. *Payesh*,13(5):589-599.
  53. Tavakolikia N, Kheiltash A, Shojaeefar E, et al(2017). The most well-known health literacy questionnaires: a narrative review. *Social Determinants of Health*,3(2):104-13.
  54. World Health Organisation(2014).Malaria in the Eastern Mediterranean Region 2013. [http://applications.emro.who.int/dsaf/emro\\_pub\\_2014\\_EN\\_1778.pdf](http://applications.emro.who.int/dsaf/emro_pub_2014_EN_1778.pdf)
  55. World Health Organisation (2014). Global health observatory data repository: Neglected tropical diseases.
  56. World Health Organisation (2014). Global health observatory data repository: Immunization.
  57. World Health Organisation(2015). Trends in maternal mortality: 1990 to 2015. Estimates by WHO, UNICEF, UNFPA, the World Bank and the United Nations Population Division.
  58. World Health Organisation(2015). Levels and trends in child mortality. Estimates developed by the UN Inter-agency Group for Child Mortality Estimation.

59. UNESCO Institute for Statistics (2012). Welcome to UIS.Stat. Available from: <http://data.uis.unesco.org>
60. Ghanbari S, Majlessi F, Ghaffari M, et al(2012). Evaluation of health literacy of pregnant women in urban health centers of Shahid Beheshti Medical University. *Daneshvar Med*,19(97):1-12.
61. Amini B, Baghchesaraie H, Torabi Z (2009). Prevalence of bacterial vaginosis and impact of genital hygiene practices in non-pregnant women in Zanjan, Iran. *Oman Med J*, 24(4):288-93.