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Review Article

Health Literacy and Care Behaviors Among Iranian Pregnant Women: A Systematic Review

Marzieh Khani Alamooti[1], Hadis Shahrahmani[2], Zeinab Hashemi[3], Elham Shirdel[4], Fatemeh Khorasanian[5], Nastaran Safavi Ardabili[6*]

[1]Department of Midwifery, School of Nursing and Midwifery, Hamedan University of Medical Sciences, Hamedan, Iran
[2]Reproductive Health, Family and Population Research Center, Kerman University of Medical Sciences, Kerman, Iran
[3]Department of Midwifery, School of Nursing and Midwifery, Lorestan University of Medical Sciences, Khorramabad, Iran
[4]Department of Midwifery, School of Medicine, North Khorasan University of Medical Sciences, Bojnurd, Iran
[5]Department of Nursing Management, School of Nursing and Midwifery, Geriatric Care Research Center, Rafsanjan University of Medical Science, Rafsanjan, Iran
[6]Department of Midwifery, School of Nursing and Midwifery, Islamic Azad University, Ardabil Branch, Ardabil, Iran

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***Corresponding author:**
Nastaran Safavi Ardabili,
Email: nastaransafaviardabili@gmail.com

Abstract

Background: Prenatal care and care behaviors can affect pregnancy outcomes. In this regard, it is crucial to identify the variables that can influence the care behaviors of pregnant women. The literature review reveals that extensive research has been conducted on the association between health literacy and care behaviors among pregnant women in Iran. However, these studies have not yet been evaluated and summarized comprehensively. Consequently, the present study aimed to investigate the impact of health literacy on care behaviors in pregnant women in Iran.

Methods: This systematic review encompassed a comprehensive search of various English-language databases, including Pub Med, Scopus, Web of Science, Google Scholar, and ProQuest. The search was conducted using MESH keywords related to health literacy, along with other relevant keywords. Furthermore, Persian language databases, namely SID, Magiran, and Irandoc, were searched using the appropriate keywords. The collected data were subjected to qualitative analysis.

Results: Finally, 19 articles were included. The findings showed that pregnant women with higher levels of health literacy exhibited improved adherence to various care behaviors. These behaviors included following a nutritious diet, using recommended supplements, practicing preventive measures for urinary infections, initiating prenatal care promptly, and maintaining good oral and dental hygiene.

Conclusion: Health literacy is a significant factor influencing care behaviors during pregnancy. Therefore, it is recommended to incorporate health literacy as a crucial consideration when designing interventions aimed at enhancing care behaviors among pregnant women.

Keywords: Health literacy, Maternal health literacy, Self-care, Care behaviors, Pregnancy

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Introduction

Pregnancy represents a significant and transformative phase in a woman's life. It necessitates specialized care to address the physical and emotional changes experienced during this period (1). Prenatal care plays a crucial role in reducing the risk of mortality and complications associated with pregnancy and childbirth. It facilitates the identification and management of potential pregnancy-related risks while encouraging behavioral modifications that can contribute to favorable pregnancy outcomes. Care behaviors encompass the adoption of personal health habits and coping strategies aimed at enhancing health, preventing or mitigating diseases, and maintaining overall well-being (2). The health and care behaviors adopted during pregnancy, such as maintaining a healthy diet and nutrition, adhering to prescribed supplements and medications, seeking timely prenatal care, abstaining from drug use, ensuring regular sleep patterns, and undergoing appropriate screening tests, have a direct impact on pregnancy outcomes (3). Promoting health

literacy provides a potential avenue for improving care behaviors among pregnant women (4).

According to the World Health Organization (WHO), health literacy is defined as the knowledge, motivation, and competence of individuals to access, understand, evaluate, and apply health information in order to make informed judgments and decisions regarding healthcare, disease prevention, and health promotion (5). Health literacy can also be defined as the ability to acquire, interpret, and utilize basic medical knowledge and services needed to make appropriate health decisions (6). Maternal health literacy, on the other hand, refers to the cognitive and social skills that determine a woman's motivation and ability to access, comprehend, and utilize health information for the promotion and maintenance of her own health and that of her children (7,8).

Several studies have investigated health literacy among pregnant women and have identified the prevalence of low health literacy to range from 10% to 45% (9). Furthermore, there is evidence linking low health literacy to adverse maternal, fetal, and neonatal outcomes, including postpartum depression, premature birth, low birth weight, and neonatal mortality (4). The impact of low health literacy extends to pregnant women's knowledge about pregnancy, consequently affecting the health of the baby. For instance, women with low health literacy tend to have limited awareness of prenatal screening tests and the harmful effects of smoking on fetal development (10). A significant proportion of pregnant women are at risk of experiencing poor health outcomes due to low health literacy (9).

The findings from these studies indicate that pregnant women with higher levels of health literacy demonstrate proactive efforts in seeking health information and possess a better understanding of such information. This enhanced understanding can significantly influence their willingness to adhere to pregnancy recommendations. Consequently, promoting maternal health literacy can lead to positive changes in the health behaviors of pregnant women, ultimately resulting in favorable outcomes for both the mother and child in terms of health (9,11). Moreover, a specific study revealed that mothers with lower health literacy tended to initiate prenatal care at a later stage, which was associated with an increased risk of delivering babies with low birth weight (12). The study conducted by Kharazi et al in 2016 yielded similar results, indicating that women with higher health literacy exhibited more favorable prenatal care behaviors and achieved better pregnancy outcomes (13).

The positive aspect is that many women alter their behavior during pregnancy. However, some women continue engaging in unhealthy behaviors (3). Consequently, it is essential to develop interventions that promote the adoption of healthy healthcare behaviors during pregnancy. In this regard, identifying the factors that can influence the care behaviors of pregnant women is crucial. The literature review reveals that numerous studies have investigated the impact of health literacy on the care behaviors of pregnant women in Iran. However, these studies have not been thoroughly examined and summarized in relation to this specific aspect. It is worth noting that health literacy is influenced by cultural traits, social structures, and the healthcare system of the individual's place of residence (14). Consequently, the current study was conducted to determine the influence of health literacy on care behaviors among Iranian women.

Materials and Methods

This research is a systematic review study that adheres to the principles outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Search Strategy

To gather the necessary information, a search was conducted in English-language databases, namely PubMed, Scopus, Web of Science, Google Scholar, and ProQuest. The search utilized MESH keywords related to health literacy, as well as other relevant keywords. The search had no time restriction and was conducted until May 18, 2023. In addition, Persian language databases such as SID, Magiran, and Iran Doc were searched using keywords such as health literacy, health information literacy, and knowledge literacy. The search in these databases had no time limit and was conducted until May 5, 2023. To ensure a comprehensive search, the reference lists of the included articles were manually checked. The search process was carried out independently by two researchers. Box 1 provides an overview of the search strategy employed in the PubMed database.

Inclusion and Exclusion Criteria

Inclusion criteria: All studies with the following characteristics were included in the present study.

- Studies the population of which was Iranian pregnant women
- Studies that reported the outcome of care behaviors during pregnancy: Care behaviors in this study were all behaviors that are taught to pregnant mothers according to the country's guidelines of the safe mother when they go to receive pregnancy care. These behaviors consisted of the following:

Box 1. Search Strategy in PubMed Database

((“Health literacy”[mh] OR “Health literacy”[tiab] OR (health[tiab] AND literacy[tiab]) OR “literacy”[mh] OR literacy[tiab] OR Illiteracy[tiab] OR “Information Literacy”[mh] OR Information Literac*[tiab] OR Medical literacy [tiab] OR Health literate[tiab] OR Functional health literacy[tiab] OR “Low literacy”[tiab] OR “Low literate”[tiab] OR “limited health literacy”[tiab] OR “limited literacy”[tiab] OR “health competence”[tiab] or “Patient Medication Knowledge”[mh] OR Patient Drug Knowledge[tiab] OR “Consumer Health Information”[mh] OR Consumer Health Information[tiab] or “Health Education”[mh] OR Community Health Education[tiab]) or “Health Promotion”[mh] or Health Promotion[tiab] or Patient Education as Topic[mh] or Patient Education as Topic[tiab]) AND (iran*[tiab] OR iran[pl] OR iran[ad])

- ✓ Use of supplements and prescreened drugs during pregnancy
- ✓ Having a healthy diet
- ✓ Timely visit to receive prenatal care
- ✓ Exercise during pregnancy
- ✓ Performing pregnancy tests
- ✓ Observance of personal and genital hygiene
- ✓ Compliance with oral and dental hygiene
- ✓ Compliance with health guidelines to prevent infectious and non-infectious diseases
- ✓ Vaccination
- ✓ No smoking and no consumption of drugs and alcohol
- ✓ Observance of sexual hygiene

All studies that reported at least one of the above as outcomes were included in the present study.

- Measuring health literacy using standard tools, including the Maternal Health Literacy, Pregnancy Outcome Questionnaire (MHLAPQ), Health Literacy for Iranian Adults (HELIA), Test of Functional Health Literacy Adults (TOFHLA), Short Test of Functional Health Literacy in Adults (S-TOFHLA), Iranian Health Literacy Questionnaire (IHLQ), Newest Vital Signs (NVS), the European Health Literacy Survey questionnaire with 16 items (HLS-EU-16), and other valid health literacy questionnaires.
- Observational studies
- Written in Persian and English
- Without any time limitation

Exclusion criteria: All studies with one of the following characteristics were excluded from the study.

- Studies involving populations other than Iranian pregnant women.
- Studies that do not report any of the specified care behaviors during pregnancy as outcomes.
- Studies that do not measure health literacy using standard tools.
- Non-observational studies

The process of selecting studies was conducted independently by two researchers. In the event of any disagreement between the two researchers, a final decision was reached through consensus, involving the participation of a third researcher.

Selection of Studies and Data Extraction

After conducting the search and gathering relevant studies from databases and information sources, the collected studies were imported into the EndNote software. Duplicate studies were identified and removed. Subsequently, the titles and abstracts of the remaining studies were assessed to select those that aligned with the research objectives. The next step involved accessing the full text of the selected articles and reviewing them based on predefined inclusion criteria. Relevant information was then extracted from the eligible studies. To facilitate data extraction, a researcher-created form was utilized, which included the following information:

1. General information of the study (name of the first author, year of publication, and year of conducting the study)
2. Type of study (cross-sectional, cohort, etc)
3. Sampling location (city, hospital, health centers, etc)
4. Sample size and characteristics of the studied population (mean age, etc)
5. The utilized tools
6. Outcome (type of care behavior)

It should be noted that this process was carried out by two researchers independently.

Quality Assessment of the Studies

To assess the quality of the studies, the researchers utilized the Newcastle-Ottawa Scale (NOS), specifically designed for observational studies. This scale evaluates the articles based on three main criteria: selection process, comparability, and results. Under the selection process, four sections were considered: representativeness of samples, sample size, non-response, and measurement tools. The comparability aspect examines confounders and other influencing factors. Lastly, the results are evaluated from two perspectives: the findings of the study and the statistical tests employed. Studies that receive 3 or 4 stars in the selection domain, 1 or 2 stars in the comparability domain, and 2 or 3 stars in the outcome domain are deemed to have good quality. Additionally, studies that receive two stars in the selection domain, one or two stars in the comparability domain, and two or three stars in the outcome domain are considered to have acceptable quality. Poor quality is attributed to studies with 0 or 1 stars in the selection domain, 0 stars in the comparability domain, and 0 or 1 stars in the outcome domain (15).

Results

In total, 19 articles were included in the study, and the process of article selection is shown in Figure 1. The study comprised a total of 5424 participants, with sample sizes ranging from 104 to 860. Among the included articles, 12 were published in English, while 7 were published in Persian. The studies were conducted between the years 2015 and 2021. The sampling location for all the studies included in the analysis was health and treatment centers. To measure health literacy, the Iranian Health Literacy Questionnaire was used in 1 study, the European Health Literacy Survey questionnaire with 16 items was used in 1 study, the Functional Health Literacy Questionnaire was used in 2 studies, the Health Literacy for Iranian Adults Questionnaire was used in 4 studies, and the Maternal Health Literacy Questionnaire was used in 10 studies.

In 4 of the included studies, the Care Behavior Questionnaire was utilized to measure care behavior during pregnancy. These studies aimed to assess various care behaviors during pregnancy, such as regular consumption of supplements, oral and dental hygiene, physical activity, proper nutrition, vaccination, and other relevant factors. In addition to the four studies that utilized the Care

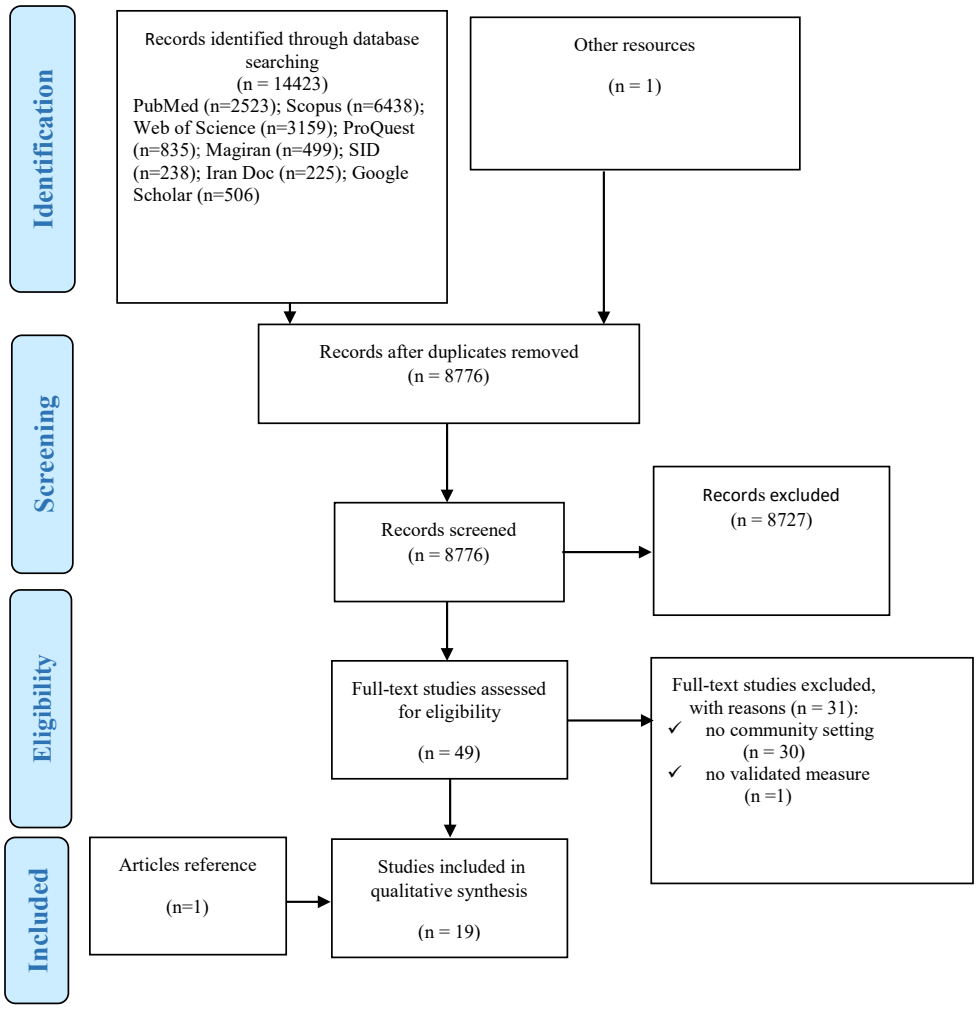

Figure 1. PRISMA Flowchart

Behavior Questionnaire to measure care behavior during pregnancy, other studies focused on specific aspects of care behaviors. One study specifically examined sports exercises during pregnancy, another study investigated compliance with genital and urinary tract hygiene, 4 studies explored compliance with a healthy diet, 8 studies analyzed visits to receive prenatal care, and 9 studies assessed adherence to the use of medication and supplements during pregnancy. Table 1 shows the characterization of the included studies. The quality of 19 studies was assessed using the NOS. Among them, 11 studies had poor, 6 studies had fair and 2 studies had good methodological quality (Table 2).

Compliance with Medication and Supplements During Pregnancy

In the study by Forghani et al, a statistically significant relationship was found between health literacy and the use of multivitamin supplements during pregnancy. The mean health literacy score of women who fully consumed multivitamins was significantly higher than that of women with incomplete consumption ($P=0.004$) (16). The results of the study conducted by Izadirad et al indicated that among women with insufficient health literacy, 2.23%, 10.23%, and 11.62% had incomplete consumption of iron tablets, multivitamins, and folic acid, respectively. On the other hand, among women with high health literacy, 1.86%, 2.79%, and 2.32% had incomplete consumption of iron tablets, multivitamins, and folic acid, respectively (21).

In the study conducted by Kharazi et al, a statistically significant relationship was found between health literacy and the consumption of multivitamins and ferrous sulfate during pregnancy. Women who used multivitamins and ferrous sulfate had a significantly higher mean score of health literacy (25) ($P<0.001$) compared to women who did not use them. In the study by Pirzadeheh et al, it was found that the mean health literacy score of women who started taking folic acid in the first trimester of pregnancy was significantly higher ($P=0.0003$) compared to women who started taking it in the second trimester. Similarly, the mean health literacy score of women who started taking iron tablets in the first trimester was significantly higher ($P=0.05$) than those who started in the second trimester (27). Furthermore, the study conducted by Ghotbizadeh et al reported that 31% of women with high health literacy and 12.7% of women with insufficient health literacy started taking folic acid tablets before pregnancy. Additionally, the researchers found that the self-administration of drugs in women with higher health

Table 1. Characterization of the included studies

First Author and Year	Year of the Study	Study Design	Setting and country	Sample Size	Health Literacy (Mean ± SE)	Age (Mean ± SE)	Tools	Result/Health Literacy Level
Forghani (2021) (16)	2020	Cross-sectional	Health service centers in Fairman, Iran	121	58.7 ± 37.16	26.6 ± 50.80	MHLAPQ	There was a significant relationship between maternal health literacy and the consumption of multivitamins, milk, and dairy products. There was no significant relationship between maternal health literacy and the consumption of ferrous sulfate, meat, eggs, legumes, fruits, and vegetables, time of starting prenatal care, and number of prenatal care.
Izadirad (2019) (17)	2017	Cross-sectional	Urban health centers in Balochistan, Iran	430	65.97 ± 17.49	22.3 ± 15.4	HELIA questionnaire and a researcher-made questionnaire for measuring prenatal care	There was only a significant relationship between health literacy and prenatal care behaviors ($r = 0.218$, $P < 0.001$).
Masoumy (2018) (12)	2017	Cross-sectional	Centers and comprehensive health service bases of Bushehr city, Iran	130	65.97 ± 17.49	27.8 ± 5.5	MHLAPQ	There was significant relationship between maternal health literacy and prenatal care behaviors ($r = 0.52$, $P < 0.05$). There was no statistically significant relationship between the health literacy score, the start time of pregnancy care, and the number of pregnancy.
Rezvani (2022) (18)	2021	Cross-sectional	Comprehensive health centers in Bojnord city, Iran	240	54.17 ± 5.06	Not mentioned	Pregnancy health literacy questionnaire and health-oriented lifestyle questionnaire	There was a significant relationship between self-care behaviors of pregnant women based on health literacy ($\beta = 0.50$, $P < 0.001$) and mindfulness ($\beta = 0.47$, $P < 0.001$) with the mediation of health-oriented lifestyle.
Sadeghi, (2019) (19)	2017	Cross-sectional	Health centers of Esfarayen city, Iran	266	57. 07 ± 9.94	Not mentioned	MHLAPQ	There was no significant relationship between maternal health literacy and the consumption of multivitamins and ferrous sulfate, and birth weight of the baby ($P > 0.05$).
Eslami (2022) (20)	2020	Cross-sectional	Health service centers in Mashhad, Iran	235	56.10 ± 16.23	26.77 ± 5.281	TOFHLA and research-made preventive behavior recommendations for urinary tract infection	There is a statistically significant correlation between health literacy and preventive behaviors of urinary tract infection ($P = 0.001$, $r = 0.959$).
Izadirad (2017) (21)	2016	Descriptive-analytical study	Urban health centers of Balochistan, Iran	215	67.69 ± 12.52	22.8 ± 7.79	Questionnaires on HELIA and prenatal care	There was a significant relationship between health literacy and taking iron tablets, multi-vitamins, and folic acid, diet, brushing, and using dental floss ($P < 0.05$). Health literacy was not significantly correlated with walking ($P = 0.86$).
Kharazi (2016) (13)	2015	Descriptive-analytical and cross-sectional study	Urban health centers of Mashhad, Iran	120	42.47 ± 7.54	27.24 ± 5.02	MHLAPQ	There was a significant relationship between maternal health literacy and time of starting care, the number of care taken during pregnancy, birth weight, supplements consumption, and anemia ($P < 0.05$).
Khosravi (2022) (22)	2020	Cross-sectional	Urban health centers in Bushehr, Iran	306	Not mentioned	Not mentioned	Health literacy questionnaire	There was no significant statistical relationship between the health literacy score and the time of starting pregnancy care, and taking iron tablets or multivitamins.

Table 1. Continued

First Author and Year	Year of the Study	Study Design	Setting and country	Sample Size	Health Literacy (Mean ± SE)	Age (Mean ± SE)	Tools	Result/Health Literacy Level
Golshan (2021) (4)	2020	Cross-sectional	Health centers in Zahedan, Iran	113	54.5 ± 6.9	Not mentioned	Health literacy and pregnancy outcomes questionnaire	The results indicated a significant relationship between prenatal care adequacy and health literacy ($P = 0.03$)
Pirdehghan (2020) (23)	2020	Cross-sectional	Endocrinology Clinic of Beheshti Hospital, Hamadan, Iran	104	54.5 ± 6.9	32.18 ± 6.9	IHLQ	There was a positive and significant statistical relationship between health literacy score and medication adherence ($P < 0.001$, r = 0.54).
Heidari Kayed (2022) (24)	2020	Cross-sectional	Health centers affiliated to Jundishapur University of Medical Sciences, Ahvaz, Iran	400	55.65 ± 11.53	Not mentioned	MHLAPQ	Health literacy was significantly associated with adequate prenatal care index (r = 0.461, $P < 0.001$(.
Kharazi (2020) (25)	2016	Cross-sectional	Health care centers of Mashhad University of Medical Sciences, Mashhad, Iran	120	42.47 ± 7.54	27.24 ± 5.02	MHLAPQ	There was a positive and significant statistical relationship between maternal health literacy and pregnancy outcomes (r = 0.625, $P < 0.01$)
Nodoshan (2020) (26)	2017	Cross-sectional	Health centers of Yazd City, Iran	390	56.67 ± 9.85	Not mentioned	Maternal Health Literacy Questionnaire	There was no statistically significant relationship between the health literacy score and consumption of meat, eggs, legumes, milk, dairy products, fruit, and vegetables.
Pirzadeheh (2019) (27)	2017	Cross-sectional	Rural and urban health centers of Yazd city, Iran	390	56.67 ± 9.85	31.25 SD was not mentioned.	Maternal health literacy level and pregnancy outcome questionnaires	There was a positive and significant statistical relationship between health literacy and pregnancy outcomes (R = 0.633, $P < 0.0001$). Maternal health literacy was also associated with cares such as proper weight gain during pregnancy and the use of some supplements (folic acid and multivitamins). There was no significant association between the maternal health literacy score and the nutritional status of the neonate ($P = 0.32$).
Zaree (2017) (28)	2016	Cross-sectional	Health centers of Minab city, Iran	361	56.67 ± 9.85	27 ± 6.3	Adult functional health literacy questionnaire	There was a statistically significant relationship between maternal health literacy score and the start time of pregnancy care. Women with higher health literacy started their care significantly earlier.
Izadirad (2021) (29)	2016-2017	Cross-sectional	Health care centers for prenatal care in Iranshahr, Iran	860	65.97 ± 1.748	22.33 ± 4.15	HELIA	Health literacy is the most vital factor in predicting self-care behavior during pregnancy.
Baharvand 2022 (30)	2019	Cross-sectional	Governmental prenatal care center in Kuhdasht county, Iran	300	58.38 ± 8.87	25.42 ± 5,99	MHLAPQ	Multiple linear regression results indicated that age, occupation, education, ferrous sulfate uptake, history of abortion, frequency of pregnancy, the trimester for prenatal care initiation, and birth weight of infants could not significantly predict health literacy in women ($P > 0.05$).
Ghotbizadeh (2022) (31)	2018-2019	Cohort study	Imam Khomeini, Baharlu, and Ziaeian hospitals (TUMS)	323	29.1	28	HLS-EU-16	There was a statistically significant relationship between health literacy and the time of the first pregnancy visit, the time of starting to take folic acid, the use of self-medication, and pregnancy exercise. No statistically significant relationship was found between health literacy and the consumption of iron and folic acid pills.

SE, standard error; MHLAPQ, Maternal Health Literacy and Pregnancy; HELIA, Health Literacy for Iranian Adults; TOFHLA, Test of Functional Health Literacy in Adults; IHLO, Iranian Health Literacy Questionnaire; HLS-EU-16, The European Health Literacy Survey questionnaire with 16 items.

Table 2. Critical appraisal of included cross-sectional studies using adapted Newcastle-Ottawa Scale

Study (year)	Selection (maximum: 5 stars)				Comparability (maximum: 2 stars)	Outcome (maximum: 3 stars)		Results
	Representativeness of the Sample	Sample Size	Non-respondents	Ascertainment of the Exposure	Comparability Other Factors	Assessment of the Outcome	Statistical Test	
Forghani (2021) (16)	*	0	*	**	0	**	*	Poor
Izadirad (2019) (17)	*	*	*	**	*	**	*	Fair
Masoumy (2018) (12)	*	*	*	**	0	**	*	Fair
Rezvani (2022) (18)	0	*	0	**	*	**	*	Fair
Sadeghi, (2019) (19)	*	0	*	**	0	**	*	Poor
Eslami (2022) (20)	*	*	*	**	0	**	*	Poor
Izadirad (2017) (21)	*	0	*	**	0	**	*	Poor
Kharazi (2016) (13)	*	0	*	**	0	**	*	Poor
Khosravi(2022) (22)	*	*	*	**	0	**	*	Poor
Golshan (2021) (4)	*	0	*	**	0	**	*	Poor
Pirdehghan(2020) (23)	0	0	*	**	*	**	*	Fair
Heidari (2022) (24)	0	0	*	**	*	**	*	Fair
Kharazi (2020) (25)	*	0	*	**	*	**	*	Fair
Nodoshan (2020) (26)	*	0	*	**	0	**	*	Poor
Pirzadeheh(2019) (27)	*	0	*	**	0	**	*	Poor
Zaree (2017) (28)	0	0	*	**	0	**	*	Poor
Izadirad (2021) (29)	*	0	*	**	**	**	*	Good
Baharvand 2022 (30)	*	0	*	**	**	**	*	Good
Ghotbizadeh (2022) (31)	0	0	*	**	0	**	*	Poor

* One score; ** Two scores.

literacy was significantly lower compared to women with lower health literacy ($P=0.003$) (31).

In the studies conducted by Khosravi et al (22) and Sadeghi et al (19), no statistically significant relationship was found between health literacy and the consumption of multivitamin and iron supplements. Similarly, in the studies conducted by Baharvand et al (30) and Ghotbizadeh et al (31), no statistically significant relationship was found between health literacy and iron consumption.

Having a Healthy Diet

In the study by Forghani et al (2021), a statistically significant relationship was found between health literacy and the consumption of milk and dairy products. Women who consumed three or more units of milk and dairy products daily had a significantly higher mean score of health literacy compared to women who consumed less or did not consume them at all ($P=0.03$) (16). Similarly, in the study by Izadirad et al, it was observed that 17.20% of women with insufficient health literacy did not adhere to their prescribed diet. In contrast, among women with high health literacy, this rate was slightly lower (15.34%) (21). In the study conducted by Kharazi et al, a positive and significant statistical relationship was found between the health literacy score and nutritional behaviors (25). However, the results of the study by Forghani (2021) indicated that there was no statistically significant relationship between maternal health literacy score and the consumption of meat, eggs, legumes, fruits, and vegetables (16). Similarly, in the study conducted by Nodoshan et al, no statistically significant relationship was found between the health literacy score and the consumption of meat, eggs, legumes, milk, dairy products, fruits, and vegetables (26).

Timely Visit to Receive Prenatal Care

The results of the study by Kharazi et al indicated that women who initiated their pregnancy care in the first trimester had a higher mean score of health literacy compared to those who started care in the second and third trimesters. Additionally, women with higher health literacy had a significantly greater number of pregnancy care procedures performed ($P<0.001$) (13). Based on the results of the study by Zaree et al, it was found that 7.48% of women with good health literacy and 0.83% of women with poor health literacy initiated prenatal care at the beginning of their pregnancy (28). Additionally, the results of the study conducted by Ghotbizadeh et al revealed that women with good health literacy were 2.64 times more likely to have their first prenatal care visit before pregnancy compared to women with poor health literacy (OR = 2.64; $P<0.05$) (31). Moreover, the results of the study by Heidari et al demonstrated that as health literacy increased, the adequacy index of prenatal care also improved (24).

The results of the studies conducted by Forghani et al (16), Pirzadeh et al (27), Masoumi et al (12), and Khosravi et al (22) collectively indicated that there was no significant association between maternal health literacy and the timing of initiating prenatal care and the number of prenatal care visits.

Observance of Sexual Hygiene

Eslami et al conducted a study on 235 pregnant women and used a questionnaire to assess preventive behaviors of UTI. The questionnaire included inquiries about dressing, eating habits, urination, hygiene, and sexual behavior habits. The findings of the study indicated that as health literacy increased, there was an associated increase in adherence to preventive behaviors of UTI (20).

Exercise During Pregnancy

Based on the results of the study conducted by Ghotbizadeh et al on 323 pregnant women, it was found that women with higher health literacy engaged in significantly more sports exercises during pregnancy compared to women with lower health literacy (31).

Compliance With Oral and Dental Hygiene

Based on the results of the study conducted by Izidirad et al, it was observed that women with favorable health literacy had 2.57 times higher compliance with oral and dental hygiene compared to women with unfavorable health literacy (OR = 2.57; $P < 0.05$) (21).

Prenatal Self-care

Four studies had examined a set of care behaviors using the prenatal care behaviors questionnaire. In the following, the findings of these studies are described:

Izadirad et al conducted a study to investigate the predictive factors of care behaviors in 430 primigravida pregnant women. These behaviors encompassed all the care necessary for pregnant women during pregnancy, including regular consumption of supplements, oral and dental hygiene, physical activity, proper nutrition, vaccination, and so on. The results of the mentioned study showed that health literacy emerged as the sole predictor of care behaviors among the other variables examined (OR = 1.027; $P = 0.004$) (17). Additionally, the study conducted by Izadirad et al on 860 primiparous pregnant women revealed that health literacy, self-efficacy, income, and social support were predictors of pregnancy care behaviors. It was further found that health literacy exhibited the strongest explanatory power in predicting care behaviors during pregnancy (29). The results of the study by Masoumi et al demonstrated that prenatal care improved as maternal health literacy increased (12). In the study conducted by Rezvani et al, the relationship between health literacy and self-care during pregnancy was investigated. In the study conducted by Rezvani et al, prenatal self-care behaviors were defined as a range of actions performed by pregnant women to maintain their health and well-being. These behaviors included performing prenatal tests, observing personal hygiene, observing oral and dental hygiene, timely visits to receive care, regular consumption of supplements, performing breast examinations, wearing appropriate shoes, following health instructions to prevent infectious diseases, and participating in educational classes. The results of the mentioned study indicated a positive and significant statistical relationship between the health literacy score and prenatal self-care behaviors (18). Similarly, the findings of the study by Golshan et al demonstrated that as health literacy increased, there was an associated increase in the performance of care behaviors during pregnancy (4).

Discussion

The purpose of this study was to investigate the relationship between health literacy and care behaviors among Iranian pregnant women. The results of this systematic review indicated that health literacy is associated with various prenatal care behaviors. These behaviors include following a healthy diet, engaging in exercise during pregnancy, taking supplements, adopting preventive measures against urinary infections, and adhering to appropriate prenatal care visit schedules.

The results of the studies conducted by Forghani et al (16), Izadirad et al (21), and Kharazi et al (25) suggest that pregnant women with higher health literacy tend to have higher rates of compliance with diet and exhibit better nutritional behaviors. However, in the study conducted by Nodoshan et al (26), no statistically significant relationship was found between health literacy and diet among pregnant women.

Carrara and Schulz conducted a systematic review to explore the relationship between health literacy and nutritional behaviors. The review included a total of 26 studies, with the studied population consisting of individuals with underlying diseases (17 articles) as well as the general population (9 articles). The findings of the review indicated that among the studies focusing on the general population, five studies demonstrated a direct and positive statistical relationship between health literacy and nutritional behaviors. However, in 15 studies, no significant relationship was observed between health literacy and nutritional behaviors. These researchers concluded that the relationship between health literacy and nutritional behaviors in patients with underlying diseases is weak. The researchers provided several reasons to justify these findings. They suggested that adhering to a healthy diet can be challenging due to various factors such as cultural influences, social pressure, the pleasure derived from consuming unhealthy foods, difficulty in resisting temptations, and the importance of social support. Additionally, they highlighted the role of healthcare providers, family members, or other caregivers in assisting patients with understanding nutritional recommendations and information, which may enable individuals to adhere to their diet even with low health

literacy. However, the researchers also acknowledged that there is likely a relationship between health literacy and nutritional behaviors in the general population (32). Therefore, when designing health literacy interventions aimed at improving nutritional behaviors and promoting a healthy diet, it is crucial to consider the characteristics of the target population.

The findings of the present research indicate a significant relationship between health literacy and the use of multivitamin supplements in the studies conducted by Forghani et al (16), Izadirad et al (21), Kharazi et al (13), and Pirzadeh et al (27). However, in the studies conducted by Khosravi et al (22) and Sadeghi et al (19), no significant relationship was observed between health literacy and the use of multivitamin and iron supplements. Similarly, in the studies conducted by Baharvand et al (30) and Ghotbizadeh et al (31), no statistically significant relationship was found between health literacy and iron supplement consumption. The reason for this difference can be explained by other influential factors such as geographical location, age of the studied population, spouse support, study time, and follow-up of mothers by caregivers.

Zhang et al conducted a systematic review and meta-analysis to determine the effect of health literacy on medication adherence. The findings of 35 studies included in this study indicated that a higher level of health literacy is associated with improved adherence to medication. While this association was statistically significant, it was considered weak compared to other predictors of medication adherence. The researchers noted that medication adherence is influenced by multiple factors, and although increasing patient health literacy can be part of a comprehensive strategy to address non-adherence, its individual impact may be limited (33).

The findings of the present study indicate that in four studies conducted by Kharazi et al (13), Zaree et al (28), Heydari et al (24), and Ghotbizadeh et al (31), a statistically significant relationship was observed between health literacy and prenatal care. The results suggest that as health literacy increases, an earlier initiation of prenatal care and an increase in the number of prenatal care visits are observed. Additionally, a study conducted in Turkey revealed that an increase in the score of the "Adult Health Literacy Scale" was associated with a higher likelihood of receiving adequate prenatal care (34). Endres et al also stated in their study conducted in Chicago that pregnant women with low health literacy received less counseling than those with adequate health literacy (35). The results of the study by Forghani et al (16), Pirzadeh et al (27), Masoumi et al (12), and Khosravi et al (22) showed that there is no statistically significant relationship between health literacy and the time of initiation of prenatal care or the number of prenatal care visits. The reason for this difference can be other influential factors such as geographical location, age of the studied population, spouse support, study time, and follow-up of mothers by caregivers.

The results of the studies by Izadirad et al (17), Masoumi et al (12), Izadirad et al (29), and Rezvani et al (18) demonstrated a relationship between health literacy and care behaviors among pregnant women. It was found that women with a high level of literacy exhibit greater awareness of their health status and possess more agency in making decisions regarding health issues. Health literacy was also found to be associated with perceived health status, indicating that individuals with sufficient health literacy actively seek out health information and are more likely to take action when faced with deteriorating health conditions (14). On the other hand, individuals with low literacy levels are less likely to comprehend written and verbal information provided by healthcare professionals and follow instructions, which consequently leads to lower engagement in preventive care (18).

This study has certain limitations that should be taken into consideration. Firstly, the majority of the included studies were cross-sectional in nature, which means they were descriptive-analytical or correlational studies. Cross-sectional studies have inherent limitations, such as the inability to establish causal relationships between variables and the potential influence of confounding variables on the main outcomes. This limitation restricts the ability to draw definitive conclusions and accurately identify the factors associated with the research topic. Other limitations of the study were the overall low quality of the included studies and lack of access to the full text of some articles.

Conclusion

The findings of this study highlighted the significance of health literacy as an influential factor in the care behaviors of pregnant women. It underscores the importance of addressing health literacy in the provision of effective health education for prenatal care. Currently, the national program for prenatal care does not include specific guidelines on enhancing maternal health literacy by healthcare workers and personnel. In light of these results, it is recommended that national planners and policymakers prioritize health literacy as a crucial factor when developing interventions aimed at improving care behaviors among pregnant women. Based on the present findings, it is suggested that interventions should be designed with a comprehensive approach that includes health literacy as an integral part of the strategy.

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Authors' Contribution

Conceptualization: Nastaran Safavi Ardabili, Marzieh Khani Alamooti.
Data curation: Hadis Shahrahmani, Zeinab Hashemi, Elham Shirdel.
Investigation: Hadis Shahrahmani, Zeinab Hashemi, Elham Shirdel,

Fatemeh Khorasanian.
Methodology: Marzieh Khani Alamooti, Zeinab Hashemi, Elham Shirdel, Fatemeh Khorasanian.
Project administration: Nastaran Safavi Ardabili.
Supervision: Nastaran Safavi Ardabili, Marzieh Khani Alamooti.
Validation: Hadis Shahrahmani.
Visualization: Hadis Shahrahmani, Zeinab Hashemi, Elham Shirdel.
Writing–original draft: Marzieh Khani Alamooti, Hadis Shahrahmani, Zeinab Hashemi, Elham Shirdel, Fatemeh Khorasanian, Nastaran Safavi Ardabili.
Writing–review & editing: Marzieh Khani Alamooti, Hadis Shahrahmani, Zeinab Hashemi, Elham Shirdel, Fatemeh Khorasanian, Nastaran Safavi Ardabili.

Competing Interests

The authors have no conflict of interests to disclose.

Ethical Approval

Since this article is based on a literature review or analysis of existing studies, there may not be any direct ethical considerations related to human subjects or data collection. However, it is important to note that ethical principles were upheld in terms of the trustworthiness of sources and proper citation of the original studies.

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