

## CLINICAL ARTICLE

## Obstetrics

# Predictors of eHealth literacy in pregnant women: A structural equation model analysis

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## Abstract

**Objective:** To develop and evaluate a theoretical model to explain the relationships between eHealth literacy and perception of health, and perception of pregnancy risk in pregnant women.

**Method:** This cross-sectional study was carried out with 238 pregnant women in one of the hospitals in Turkey between March 15, 2021 and May 15, 2021. Data were collected using an Information Form, eHealth Literacy Scale, Perception of Health Scale, and Perception of Pregnancy Risk Questionnaire.

**Results:** The mean scores of the pregnant women participating in the study on eHealth literacy and perception of health were  $30.45 \pm 6.56$  and  $51.42 \pm 6.91$ , respectively and their mean score on perception of pregnancy risk was  $42.6 \pm 29.38$ . The direct effect of the eHealth Literacy Scale on the "Risk for Baby" subscale of the Perception of Pregnancy Risk Questionnaire was insignificant whereas the scale's effect became significant with the Perception of Health Scale ( $\beta = -0.006$ ;  $0.057$ ).

**Conclusion:** To reduce the perception of risk in pregnant women, it is important to improve not only their eHealth literacy but also their knowledge and attitudes about being healthy.

## KEYWORDS

Health literacy, Nursing, Perception, Pregnant women, Risk

## 1 | INTRODUCTION

The concept of health literacy includes accessing, understanding, and using the basic health information and services that individuals need to make the right decisions about health.<sup>1</sup> Health literacy was defined as "cognitive and social skills that determine motivation and abilities of individuals to access, understand, and use information in a way that promotes and maintains good health" by the World Health Organization.<sup>2</sup> The health state of an individual is associated with low health literacy, negatively impacts healthcare use, and increases disease burden and healthcare costs. An adequate level of

health literacy helps to develop positive health behaviors by increasing the knowledge of reproductive health.<sup>3</sup>

Health literacy is effective in making the right decisions about both the pregnant woman's health and the health of the fetus and it is important for the pregnant woman to perceive, access, and experience health information about pregnancy.<sup>4,5</sup> Despite these important effects, the health literacy levels of pregnant women differ among studies. It was revealed that health literacy is limited even in some high-income countries and that socio-economic status is an important predictor.<sup>1,6</sup>

During pregnancy, many women experience various difficulties in acquiring new information or implementing given recommendations.<sup>7</sup>

It is known that pregnant women with low health literacy are more likely to have low compliance with prenatal screening and be inadequate in perceiving prenatal screening.<sup>6</sup> In a study conducted in Spain, low health literacy was found to be associated with tobacco use during pregnancy.<sup>8</sup> However, an increase in the level of health literacy helps women to be aware of risk factors during pregnancy, to receive adequate prenatal care and self-care, and to comply with the recommendations of health professionals. It was also stated that health literacy allows mothers to increase their self-confidence in the prenatal period, decide on the mode of delivery, use iron and folic acid, be aware of issues such as weight gain during pregnancy, and spend the postnatal breastfeeding period in a healthy way.<sup>5</sup>

eHealth literacy is defined as the ability to search and find health information from electronic sources, and to understand, evaluate, and implement it to solve a health problem. Its difference from other forms of literacy is that eHealth literacy combines various aspects of different literacy skills. It is based on six basic skills: traditional literacy, health literacy, information literacy, scientific literacy, media literacy, and computer literacy.<sup>9</sup> Many studies demonstrated that pregnant women use the internet as an important source of information about pregnancy.<sup>10-13</sup>

Health perception is the sum of feelings, ideas, prejudices, concerns, and expectations of an individual about self-health. For this reason, health perception is directly associated with the presence of healthy lifestyle behaviors in individuals' lives, the maintenance of these behaviors, and the development and maintenance of health. In this respect, health perception should be evaluated as a whole in terms of an individual's well-being and physical, psychological, and social aspects.<sup>14,15</sup> Perception of good health is important for individuals to acquire healthy life behaviors, so exhibiting healthy life behaviors during pregnancy affects the health of both the pregnant woman and her infant positively.<sup>16</sup>

In the pregnancy period, which is an important life period, mothers and babies encounter many risks.<sup>17</sup> Some pregnancies and deliveries in the world can be in any risk category.<sup>18</sup> It was stated that the risk perception is affected by many personal, psychological, and social factors in pregnant women.<sup>19</sup> In particular, exaggerated risk perception may have various consequences such as stress, anxiety, and depression, and these problems may have long-term effects for both families and babies.<sup>20</sup>

Health professionals have important roles and functions in developing pregnancy-specific health literacy for pregnant women to

receive adequate prenatal care, identify risky situations in terms of maternal and infant health at an early stage, and bring possible maternal-fetal risks under control. It is very important to increase women's health literacy to prevent practices that may adversely affect maternal and infant health. This study reveals the importance of evaluating predictors of eHealth literacy in pregnant women. The current research aimed to develop and evaluate a theoretical model that can explain the relationships between eHealth literacy, health perception, and risk perception in pregnant women.

In the present study, a theoretical model that shows the predicted relationships between eHealth literacy score, health perception score, and perception of pregnancy risk score was established (Figure 1).

The following hypotheses were put forward: (1) eHealth literacy of pregnant women affects health perception and its subscales' scores; (2) eHealth literacy of pregnant women affects perception of pregnancy risk and its subscale scores; and (3) health perception affects pregnant women's perception of pregnancy risk and its subscale scores.

## 2 | MATERIALS AND METHODS

The present study has a cross-sectional design. The population comprised women who applied to the Gynecology and Obstetrics Outpatient Clinic of a hospital in one city center in Turkey between March 15, 2021 and May 15, 2021. The number of individuals to be included in the study sample was determined by power analysis. As there is no study in which three scales were used together in the literature, the effect size was determined as 0.2, which is the lowest effect size, using the Cohen coefficient. The sample of the study was determined as 199 in the computer environment with a power of 80% and a confidence interval of 95%. Considering design effects that may arise as a result of the possibility of the non-normal distribution of the data, the sample size was increased by 20% and the research was completed with 238 individuals.

The inclusion criteria were: being at least 18 years old, being at least a primary school graduate, and knowing Turkish. The exclusion criteria were having a communication problem or being diagnosed with psychiatric disease.

Data were collected by the survey method using an Information Form, the eHealth Literacy Scale (eHEALS), the Perception of Health Scale (PHS), and the Perception of Pregnancy Risk Questionnaire (PPRQ).

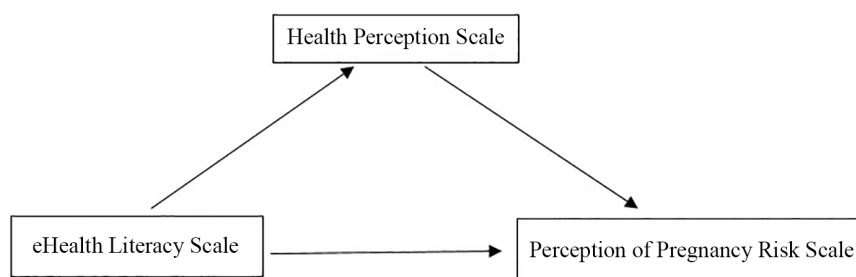


FIGURE 1 Theoretical model.

A descriptive information form developed by the researchers in line with the literature was used. The form consisted of 18 questions regarding the sociodemographic and obstetric characteristics of pregnant women.<sup>4,21</sup>

eHEALS was developed by Norman and Skinner in 2006.<sup>9</sup> The lowest score obtainable from the scale is 8 and the highest score is 40. A high score on the scale indicates a high level of eHealth literacy. The Turkish validity and reliability study of eHealth was conducted by Tamer Gencer in 2017.<sup>22</sup> In this study, the Cronbach  $\alpha$  value of the scale was found to be 0.936.

The PHS was developed by Diamond et al. in 2007.<sup>23</sup> The validity and reliability study was conducted by Kadioglu & Yıldız.<sup>24</sup> In their study, as a result of the item total correlation analysis, the correlation values of all scale items were found to be over 0.25.<sup>24</sup> The scale consists of 15 items and has four subscales: center of control, certainty, importance of health, and self-awareness. The minimum score obtainable from the scale is 15 and the maximum score is 75. In this study, the Cronbach  $\alpha$  value of the scale was found to be 0.628.

The PPRQ scale was developed by Heaman and Gupton<sup>25</sup> to evaluate the perception of risk of pregnant women. The scale has a two-factor structure. These factors are named as "Risk for baby" and "Risk for self". The "Risk for baby" factor consists of five items: items 2, 6, 7, 8, and 9. The "Risk for self" factor consists of four items: items 1, 3, 4, and 5. The Turkish validity and reliability of the scale was established by Evcil and Daglar.<sup>26</sup> In their study, the Cronbach  $\alpha$  value of the scale was found to be 0.938.

Before the research, permission was received from Ordu University Non-Interventional Research Ethics Committee (2021/81) and institutional permissions were taken from the Provincial Directorate of Health and the hospital where the research was carried out. Informed consent was obtained from the participants with an Informed Consent Form, in which information about the research topic, purpose, and the questionnaire forms was given.

For analysis, first, the normality and homogeneity of variances was checked. While performing data analysis, the independent two-group *t*-test and the Mann-Whitney *U* test were used when normality was not provided. Categorical data were analyzed with Fisher exact test and  $\chi^2$  test. In the study, linear regression analysis was used to reveal the model of the relationship between the independent variables and the dependent variable. In addition, a structural equation model suitable for confirmatory factor analysis was created and the accuracy of the model was checked with fit index values.

### 3 | RESULTS

**Table 1** presents the descriptive findings of the participants included in the study.

Of the pregnant women, 41.6% were in their first pregnancy, 19.3% experienced at least one miscarriage, and 52.1% had at least one living child. Of the pregnant women, 63.9% were in the third trimester of their pregnancy and 86.1% stated that they had planned their pregnancy; 23.5% of the pregnant women stated a risk in their

**TABLE 1** Characteristics of pregnant women ( $n = 238$ )

Variables	<i>n</i>	%
Age, year		
18–26	68	28.6
27–35	132	55.5
36–46	38	15.9
Education level		
Primary school graduate	8	3.4
Secondary education graduate	21	8.8
High school graduate	89	37.4
University graduate	120	50.4
Duration of marriage, year		
1–9	210	88.2
10–25	28	11.8
Working status		
Yes	127	53.4
No	111	46.6
Partner's education level		
Primary school graduate	4	1.7
Secondary education graduate	17	7.1
High school graduate	104	43.7
University graduate	113	47.5
Partner's occupation		
Officer	81	34.0
Worker/Self-employed/tradesman	157	66.0
Health insurance status		
Yes	226	95.0
No	12	5.0
Family type		
Elementary family	223	93.7
Extended family	15	6.3
Income level		
Income higher than expenses	99	41.6
Income equal to expenses	134	56.3
Income lower than expenses	5	2.1

current pregnancies and the most frequently stated risk was the risk of miscarriage (55.3%) (**Table 2**).

**Table 3** shows the distribution of eHEALS, PHS, and PPRQ scores of the participants. The mean eHEALS score ( $\pm$  standard deviation) of the pregnant women was  $30.45 \pm 6.56$ ; their mean PHS score was  $51.42 \pm 6.91$ ; their mean PPRQ score was  $42.6 \pm 29.38$  (**Table 3**).

The eHEALS had a positive and significant effect on the Certainty ( $\beta = 0.104, P < 0.01$ ) and Center of Control ( $\beta = 0.086, P = 0.05$ ) subscales of PHS, but had no significant effect on the Importance of Health and Awareness subscales (**Table 4**).

The eHEALS had a negative and nonsignificant effect on the Risk for self ( $\beta = -0.410, P = 0.169$ ) and Risk for baby ( $\beta = -0.377, P = 0.218$ ) subscales of PPRQ. The effect of eHEALS on the Risk

TABLE 2 Distribution of Pregnant women by obstetrical characteristics (n = 238)

Variables	n	%
Number of gravida		
First	99	41.6
Second	91	38.2
Third	33	13.9
Fourth and above	15	6.3
Number of miscarriages		
0	192	80.7
1	38	16.0
2 or more	8	3.3
Number of living children		
0	114	47.9
1	95	39.9
2	29	12.2
Pregnancy duration		
First trimester	39	16.4
Second trimester	47	19.7
Third trimester	152	63.9
Status of pregnancy planning		
Unplanned pregnancy	15	6.3
Planned pregnancy	205	86.1
Unplanned but intended pregnancy	18	7.6
Health problems in pregnancy		
No	182	76.5
Yes	56	23.5
Health problems in pregnancy (n = 56)		
Risk of miscarriage	31	55.3
Hyperemesis gravidarum	15	23.2
Hypertension	3	5.3
Infection	7	12.5
Gestational diabetes	5	8.9

for self subscale of PPRQ was  $-0.499$  and indirectly nonsignificant at a confidence level of 95% ( $-0.032$  to  $0.025$ ) whereas the indirect effect of eHEALS on the Risk for baby subscale was  $-0.452$  at a confidence level of 95% ( $0.006$ – $0.057$ ). The indirect effect was considered statistically significant because this range did not include the zero value. In other words, although the direct effect of eHEALS on the Risk for baby subscale of PPRQ was insignificant, its indirect effect became significant with the effect of PHS (Table 4).

The relevant model is given in Figure 2.

## 4 | DISCUSSION

The scores on eHealth literacy and perception of health were  $30.45 \pm 6.56$  and  $51.42 \pm 6.91$ , respectively. Previous

TABLE 3 Distribution of mean scores of eHEALS, PHS and sub-dimensions, and PPRQ and sub-dimensions (n = 238)

Scale scores	Mean $\pm$ SD	Median (Min.–Max.)
eHEALS total score	$30.45 \pm 6.56$	32 (8–40)
PHS total score	$51.42 \pm 6.91$	51 (30–73)
Center of control	$15.29 \pm 4.23$	15 (5–25)
Certainty	$12.72 \pm 3.52$	13 (4–20)
Importance of health	$12.15 \pm 2.07$	12.5 (6–15)
Self-awareness	$11.24 \pm 2.26$	11 (4–15)
PPRQ total score	$42.6 \pm 29.38$	39 (0–100)
Risk to self	$45.78 \pm 30.25$	43.25 (0–100)
Risk to baby	$40.09 \pm 30.97$	37.90 (0–100)

Abbreviations: eHEALS, eHealth Literacy Scale; Max., maximum; Min., minimum; PHS, Perception of Health Scale; PPRQ, Perception of Pregnancy Risk Questionnaire; SD, standard deviation.

studies reported that women's eHealth literacy was higher than that of men and that the eHealth phenomenon was very high during pregnancy.<sup>27–29</sup> The high level of eHealth literacy in pregnant women in this study might be a result of their high education levels and young age. In a study conducted on the perception of health in pregnant women, it was demonstrated that the perception of health of pregnant women improved as their health literacy increased.<sup>21</sup> The high perception of health might also be due to the high education levels and high health literacy skills of pregnant women. Pregnant women obtained the highest score on the center of control subscale of the perception of health. Accordingly, it can be suggested that pregnant women mostly think that they have control over their health. The subscale with the lowest score was self-awareness.

It was demonstrated that pregnant women's level of perception of pregnancy risk both for themselves and their offspring was  $42.6 \pm 29.38$ . This might be because nearly half of the pregnancies within the scope of the research (41.6%) were the first pregnancy, women were experiencing pregnancy for the first time, and almost one-quarter of the pregnant women (23.5%) had a health problem and were therefore worried.

According to the structural equation model established within the scope of the research, it was demonstrated that pregnant women's perceptions regarding certainty and center of control, the subscales of perception of health, increased positively with their eHealth literacy. It has been demonstrated that there is a significant relationship between the health perception and health literacy in pregnant women and that an increase in health literacy increases pregnant women's health perception.<sup>21</sup> Accordingly, it can be said that eHealth literacy supports pregnant women's state of knowing and being sure of healthy behaviors and also the perception that being healthy is demonstrated by self, not by others.

According to the structural equation model established within the scope of the research, it was demonstrated that health

TABLE 4 Evaluation of the direct and indirect effects of PHS and PPRQ on the eHEALS (n = 238)<sup>a</sup>

		Result variables					
		PHS		PPRQ			
		Certainty $\beta \pm SH$	Center of control $\beta \pm SH$	Importance of health $\beta \pm SH$	Self-awareness $\beta \pm SH$	Risk for $\beta \pm SH$	Risk for $\beta \pm SH$
eHEALS Scale		0.104 ± 0.034**	0.086 ± 0.041*	(-0.007 ± 0.021)	0.011 ± 0.022	-0.377 ± 0.305	-0.410 ± 0.298
R <sup>2</sup>		0.037	0.018	0.0001	0.001	0.006	0.008
eHEALS Scale						-0.177 ± 0.302	-0.168 ± 0.293
PHS	Certainty					0.024 ± 0.976	-0.944 ± 0.612
	Center of control					-1.610 ± 0.493**	-0.592 ± 1.050**
	Importance of health					-1.661 ± 0.509	-0.230 ± 1.018
	Self-awareness					-0.588 ± 0.631	-0.733 ± 0.945
R <sup>2</sup>						0.073	0.087
Indirect effect						-0.452** (0.006 to 0.057)	-0.499 (-0.032 to 0.025)

Abbreviations: eHEALS, eHealth Literacy Scale; Max., maximum; Min., minimum; PHS, Perception of Health Scale; PPRQ, Perception of Pregnancy Risk Questionnaire; SD, standard deviation.

<sup>a</sup>Significance is indicated as \*P = 0.05; \*\*P < 0.01.

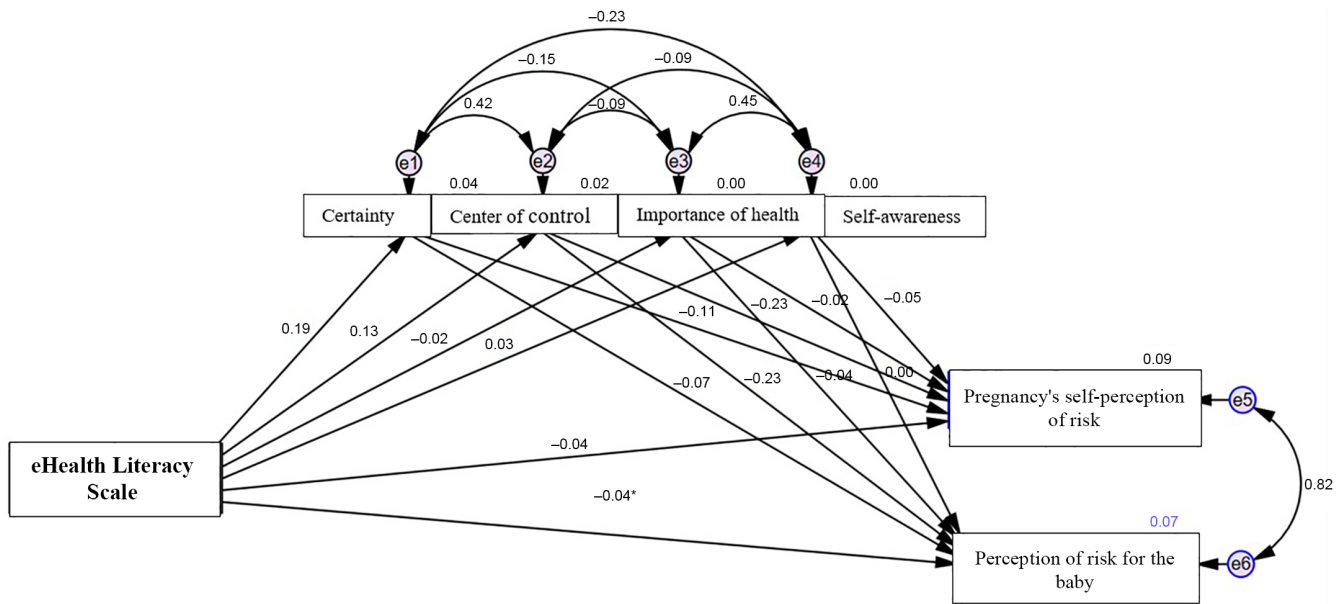


FIGURE 2 Structural Equation Model Related to Model.

perception is an important variable in reducing the perception of pregnancy risk for the baby.

In other studies conducted on health literacy in pregnant women, it was found that health literacy supports breastfeeding self-efficacy, that breastfeeding self-efficacy of mothers increases and the frequency of traditional practices decreases as their health literacy increases.<sup>3,30,31</sup>

It was demonstrated that while the direct effect of eHEALS on the risk for baby subscale, a subscale of the PPRQ, was insignificant, its indirect effect became significant with the effect of PHS.

In this respect, it is thought that providing pregnant women with comprehensive prenatal care services, evaluating pregnant women in terms of eHealth literacy, perception of health and risk, planning effective health training, and conducting studies to manage and reduce the perception of risk will significantly contribute to the development of maternal and child health.

The research was conducted with pregnant women who applied to a hospital in a city center in Turkey. Therefore, the results of the study can only be generalized to this research group.



## AUTHOR CONTRIBUTIONS

EŞ, AÇ, KÖ, and GDBB were responsible for the study concept and design, for drafting the manuscript. EŞ and AÇ collected the data. EŞ, AÇ, and GDBB performed the data analysis. All authors contributed equally to this study.

## CONFLICT OF INTEREST

The authors have none to declare.

## DATA AVAILABILITY STATEMENT

Research data are not shared.

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