RESEARCH ARTICLE

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Health Literacy Assessment Tool related to Antenatal Care (HLAT-ANC) for Pregnant Women: A Methodological Research from Turkey

ABSTRACT

Objective: It is important to provide adequate antenatal care (ANC) for the lowest maternal-fetal complications in pregnancy. The increase in the level of health literacy increases the quality of the ANC, compliance with the follow-up. To develop a tool to evaluate health literacy (HL) levels of pregnant women in antenatal care (ANC).

Methods: This study is methodological research conducted between 15.02.2016-01.07.2018. "Health Literacy Assessment Tool related to Antenatal Care (HLAT-ANC)" was developed. Its validity-reliability was tested by item analysis, exploratory factor analysis (EFA), concurrent criterion validity, intergroup dissociation, and confirmatory factor analysis (CFA), and determination of the Kuder-Richardson-20 (KR-20) coefficient.

Results: The discrimination coefficients of the items in HLAT-ANC varied between 0.20-0.57 and factor loads between 0.34-0.85. It was determined that HLAT-ANC has KR-20≥0.85 in each subdomain. The scores of fit criteria obtained in the confirmatory factor analysis were within acceptable limits.

Conclusions: HLAT-ANC was found to be a valid and reliable scale.

Keywords: Health Literacy, Antenatal Care, Pregnancy, Methodological Research.

Gebelerin Doğum Öncesi Bakım İle İlgili Sağlık Okuryazarlık Düzeylerini Değerlendirme Aracının Geliştirmesi: Metadolojik Bir Çalışma, Türkiye

ÖZET

Amaç: Gebelikte maternal-fetal komplikasyonları en aza indirmek için yeterli doğum öncesi bakım (DÖB) alınması önemlidir. Sağlık okuryazarlık (SOY) düzeyinin yükseltilmesi, DÖB'nin kalitesini ve takibe uyumu arttırmaktadır. Bu çalışmada gebelerin DÖB ile ilgili SOY düzeylerini değerlendirme aracının geliştirilmesi amaçlandı.

Gereç ve Yöntem: Bu çalışma 15.02.2016-01.07.2018 tarihleri arasında gerçekleştirilen metadolojik bir araştırmadır. Doğum Öncesi Bakıma İlişkin Sağlık Okuryazarlığı Değerlendirme Aracı (DÖB-SOY)" geliştirildi. Geçerlik ve güvenirlik için, madde analizi, açımlayıcı faktör analizi (AFA), eşzamanlı ölçüt geçerliliği, gruplar arası ayrışma, doğrulayıcı faktör analizi (DFA) ve Kuder-Richardson-20 (KR-20) katsayısı hesaplandı.

Bulgular: DÖB-SOY'un maddelerinin ayırt edicilik katsayıları 0.20-0.57 arasında, faktör yükleri 0.34-0.85 arasında değişmektedir. KR-20, herbir alt alanda ≥0.85 olarak hesaplandı. Doğrulayıcı faktör analizinde elde edilen uyum kriterlerinin puanları kabul edilebilir sınırlar içindedir.

Sonuç: DÖB-SOY geçerli ve güvenilir bir ölçüm aracıdır.

Anahtar Kelimeler: Sağlık Okuryazarlığı, Doğum Öncesi Bakım, Gebelik, Metadolojik Çalışma.

INTRODUCTION

The definition of "Maternal Health Literacy (MHL)" has been developed in order to adapt the generally used health literacy (HL) concept to the results of health education regarding mother and child health. Maternal health literacy is defined as "cognitive and social skills defined as the motivation and ability of women to access, understand and use health-related information in order to protect and improve themselves and their children's health"(1). The main purpose of maternal health literacy is to prepare women to make and manage decisions about their children's health during pregnancy and the postpartum period. The level of MHL is increased with antenatal education focused on developing skills related to pregnancy, birth, and infant care. Since the HL level of many pregnant women is low, they do not understand the importance of prenatal care and therefore face adverse pregnancy outcomes (2).

This study's aim was to develop a tool to evaluate health HL levels of pregnant women in ANC.

MATERIAL AND METHODS

This study is a methodological study conducted on pregnant women living in Eskisehir (a province of Western Turkey) between 15.02.2016-01.07.2018 with the aim of developing the Health Literacy Assessment Tool related to Antenatal Care (HLAT-ANC).

In order to develop HLAT-ANC, HL scales, which are widely used in research, were examined first. It was observed that these scales could not evaluate the HL level in relation to the prenatal period due to reasons such as containing items not suitable for Turkish cultural structure, having translation problems, not wanting to deteriorate the original structure of the scales. Additionally, these scales aim to measure of the General HL level. Therefore, it was decided to develop HLAT-ANC. For this purpose, a comprehensive literature review was performed first. A question pool consisting of 130 items was created based on the Test of Functional Literacy in Adults (TOFHLA), which is widely used in research.

The educational materials prepared by the Ministry of Health of Republic of Turkey and the researches on ANC were used in creating the question pool (3-6). Later, in line with the opinions of the experts, HLAT-ANC was developed with 73 items selected from the question pool. Two sections were created, 55 of which were selected from the HLAT-ANC, verbal and 18 were selected, as numerical. The verbal section consists of 4 subdomains, and sub-domains are given below:

Subdomain 1: Healthy lifestyle behaviors during pregnancy(18 questions),

Subdomain 2: Health problems during pregnancy and its consequences (10 questions),

Subdomain 3: Tests to be done during pregnancy (15 questions),

Subdomain 4: Symptoms related to birth and the functioning of the birth process (12 questions).

The verbal section consists of 4 paragraphs with 4 options and sentences in the form of filling the gap, with increasing difficulty. Pregnant women are asked to mark only one of the 4 options, which is the most suitable for each question. Although the three incorrect options in the questions are similar to each other, either they do not comply with grammar rules or their meaning integrity deteriorates when they are brought to a gap in the sentence.

The numerical section consists of a single subdomain and includes 18 questions prepared using hospital forms and medicine box labels. Information cards are presented to the individuals, they are asked to read and ask questions about the cards. Individuals' answers are recorded on the questionnaire form as "correct", "wrong" and "blank".

Correct answers given to the questions in both verbal and numerical sections of HLAT-ANC are evaluated as "1" point, wrong and blank answers are evaluated as "0". No correction formula has been applied regarding "chance-based success".

In our study, the content validity of HLAT-ANC was evaluated with regard to whether it included the sub-topics of HL to be measured in the prenatal period (7). The opinions of 13 experts (three gynecologists and obstetricians, seven public health specialists, two deontologists, and one assessment/evaluation specialist), were consulted in order to validate the HLAT-ANC content. The questions were examined by the experts and each question was evaluated as "necessary-sufficient", "necessary-insufficient" and "unnecessary". In line with the opinions of the experts, although no questions were taken from the HLAT-ANC, revisions were made in the root of the question and its options. Later, expert opinions were transformed into a statistically interpretable form. The content validity ratio (CVR) for each question was calculated by the following formula:

CVR = (Number of experts who say necessary-sufficient / Half of the total number of experts performing the assessment)-1

It is recommended that questions with a CVR calculated as "0" or "negative" calculated in line with expert opinions should be removed from the measurement tool. Since the CVR values calculated in our study were not 0 or negative, no item was removed from the HLAT-ANC. After the CVR was calculated, Content Validity Index (CVI) was calculated for the numerical and verbal parts of the HLAT-ANC. Content Validity Indexes of HLAT-ANC were found to be statistically significant, and content validity was accepted to be sufficient since all of the CVIs calculated for the numerical and verbal parts of HLAT-ANC were greater than 0.67 (8).

A Turkish linguist checked whether the questions constituting the HLAT-ANC were correctly expressed or not and whether there was any wrong in terms of semantics, and after that necessary corrections were made.

A pilot study was conducted on 15 pregnant women who applied to Eskisehir State Hospital Gynecology and Diseases Polyclinics in order to determine whether the questions in HLAT-ANC were understood and possible problems that may be encountered during the application. As a result of the pilot study, it was determined that there was no question that could not be understood in HLAT-ANC. Thereupon, the data collection phase was started in order to carry out the validity-reliability study of the 73-question HLAT-ANC.

The sample size suggested in the development of a new assessment tool is 5-10 times the number of questions in the assessment tool (9). In our study, the sample size was calculated as 511, seven times the number of questions in HLAT-ANC, since the number of questions was 73.

A total of 29 family health centers provide health services in Odunpazari district of Eskisehir province, Turkey. Three of them (Emek, Gokmeydan, and Buyukdere) determined by lot were included in the study. During the study, pregnant women who applied to family health centers for any reason were informed about the subject and purpose of the study. A total of 511 pregnant women who agreed to participate in the study and received verbal consent constituted the study group.

Interviews with pregnant women were conducted in pregnant monitoring rooms of family health centers. It was paid attention that the pregnant follow-up rooms were quiet and calm and that there was no one other than the pregnant woman. The first part of the questionnaire form was filled by the researchers using face to face interview method. The verbal part of the HLAT-ANC in the second part of the questionnaire form was filled by the pregnant women themselves under observation. Later, 11 information cards related to the numerical part of the HLAT-ANC, prepared by the researchers beforehand, were given to the pregnant women respectively, and they were read by the participants. The questions about the information on the cards were directed by the researchers, and the answers given by the pregnant women were recorded in the questionnaire form. There is no time limit for filling out the questionnaire, and this process took approximately 25-45 minutes. A total of 73 pregnant women (32 who did not agree to participate in the study, and 19 illiterate women, and 15 women who were not communicated, and 7 women who healthcare professionals) were not included.

After reaching the calculated 511 pregnant women in order to perform validity and reliability analyzes, the data collection process was terminated.

Validity-Reliability Analysis:

Item Analysis: For item analysis, item difficulty and item discrimination coefficients and comparison methods for item averages for upper and lower 27% were used (7,8,10).

Determination of Building Validity: In the first step, Exploratory Factor Analysis (EFA) was performed to determine the construct validity of HLAT-ANC. Exploratory Factor Analysis,

1) In revealing the factor structure,

2) In determining the items in the factors,

3) It is the totality of methods used to evaluate whether the items are grouped under one or more factors (7).

In order to perform the EFA, it is desirable that the correlation matrix of all variables can be calculated. The tetrachoric correlation matrix was used because of the two-category scoring (true-false / 1-0) of the items in HLAT-ANC (10). Exploratory Factor Analysis was made with a software program called FACTOR, which allows it to work with the tetrachoric correlation matrix.

Bartlett's test of sphericity was used to evaluate the universal significance of the correlation matrix obtained with the EFA (8). In our study, according to Bartlett's test of sphericity, it was seen that HLAT-ANC is suitable for factor analysis.

In our study, the number of the Kaiser-Meyer-Olkin (KMO) was checked to decide whether the sample size was suitable for factor analysis (8). In our study, while doing EFA, all items belonging to the verbal field were not included in the analysis at the same time, and it was tested whether the items in the HLAT-ANC were collected under the factors determined during the development phase. The reason for such an EFA is that the KMO value for 55 items belonging to the verbal domain is lower than 0.60 (9). Since the KMO value of the numerical section is 0.74, all items in this section are included in the EFA at the same time.

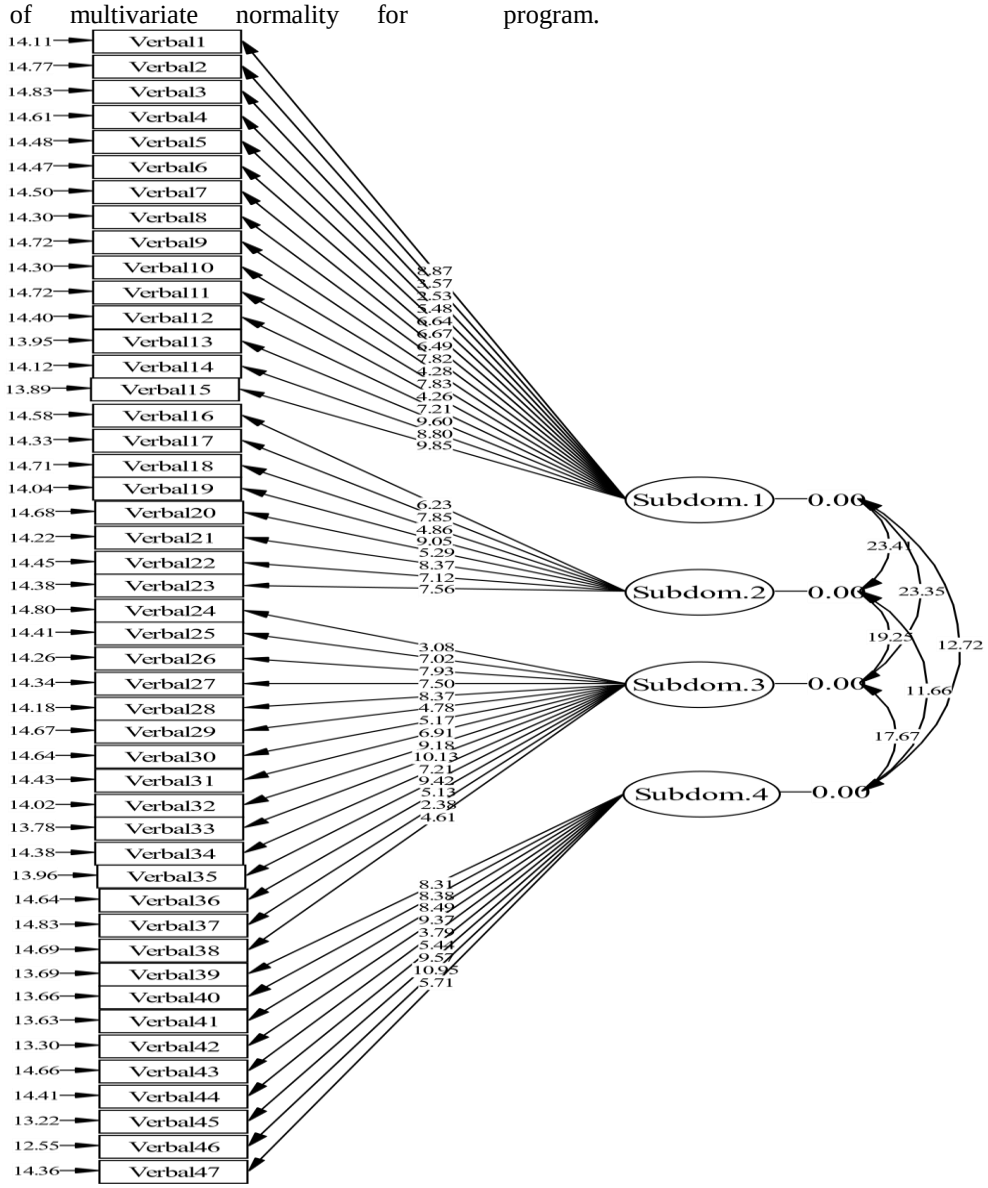
As a result of EFA, 3 items with a factor load below 0.30 were removed from HLAT-ANC (8).

Another method used in determining construct validity is concurrent criterion validity. The correlation coefficient obtained can take values varying between -1 and +1. When the correlation coefficient approaches 1, it gives information about the strength of the relationship and the validity of the developed evaluation tool (8). In our study, "Chew screening questions for health literacy" was taken as the reference test for concurrent criterion validity. Then, the relationship between the scores obtained from both measurement tools was evaluated by Spearman correlation analysis.

In order to test the construct validity of HLAT-ANC with the dissociation method between

groups, it was interviewed with the pregnant women (n = 50) who are health professionals (midwives, nurses, doctors) who are considered to have a high HL level related to prenatal care. Later, the median scores of the pregnant women with and without healthcare professionals in HLAT-ANC were compared with the Mann Whitney U test (8).

Confirmatory Factor Analysis (CFA) is a method that enables the control of factor structures revealed in EFA. While looking at the relationships between the items in the evaluation tool in EFA, the relationships between the factors in CFA are evaluated. CFA is the modeling method used to evaluate the latent structure of a measuring tool, and the fit between observed variables and latent variables is tested (11). In this study, the assumption of multivariate normality for confirmatory factor analysis was tested. Skewness and kurtosis were examined. In addition, a new randomly selected sample (n=444) different from the one in which the exploratory factor analysis was performed. In the implementation of the CFA test, robust maximum likelihood method was applied, taking into account the correlation matrices. As a result of confirmatory factor analysis, the T values of the items are given in Figure 1-2. T value is related to the significance of the load value of each item in the relevant dimension. T- value is > 1.96 for a regression weight, that path is significant at the 0.05 level or better (that is, the estimated path parameter is significant) (11). In this study, the control of the factor structure of HLAT-ANC was done with CFA using LISREL 8.71 software program.



Chi-Square=2177.12, df=1028, P-value=0.00000, RMSEA=0.050

Figure 1. The measurement model for the verbal part of HLAT-ANC (T-values)

Internal Consistency: It is recommended to calculate the Kuder-Richardson-20 (KR-20) coefficient especially in determining the internal consistency of knowledge tests and evaluation tools consisting of two-category evaluations. The fact that the KR-20 coefficient is 0.80 and above

indicates that the internal consistency or reliability of the developed assessment tool is high (7,8). In this study, the determination of the internal consistency of HLAT-ANC was made by calculating the KR-20 coefficient.

Permits: This study consists of the first stage of a thesis study in which HLAT-ANC is developed and the health literacy level of pregnant women is evaluated (Dr. Gulsum OZTURK EMIRAL. "*To Develop an instrument for determination of health literacy levels related to antenatal care, and to determine the health literacy levels for pregnant women*" (Eskisehir Osmangazi University, Medicine School, Public Health Department, Expertise Thesis, Eskisehir, 2018).

The approval of the Non-Invasive Clinical Research Ethics Committee of Eskişehir Osmangazi University Faculty of Medicine, dated February 24, 2016, and numbered 80558721 / G-11.

Statistical Analysis: The data obtained in our study were evaluated in the computer environment in the Statistical Package for Social Sciences version 20.0 (SPSS 20.0). The compliance of the data to normal distribution was evaluated with the Shapiro-Wilk test. Mann Whitney U test, and Spearman correlation analysis were used for statistical analysis of the data in the study. Its validity-reliability was tested by item analysis, exploratory factor analysis (EFA), concurrent criterion validity, intergroup dissociation, and confirmatory factor analysis (CFA), and determination of the Kuder-Richardson-20 (KR-20) coefficient. The statistical significance level was accepted as $p < 0.05$.

RESULTS

The validity and reliability analyzes of HLAT-ANC were conducted on two separate study groups. Item analysis, EFA, KR-20, the separation between groups, concurrent criterion validity, and comparison of item scores for the lower-upper 27% groups were carried out in the study group consisting of 511 pregnant women. CFA was conducted on a separate study group of 444 pregnant women.

It was found that the item discrimination coefficient varied between 0.20-0.57 in the verbal part of HLAT-ANC, and between 0.21-0.48 in the numerical part (for valid items). In the verbal part of HLAT-ANC, items 2, 5, 13, 25, 28, 51, and 54 were removed, while items 1, 12, 16, and 18 were removed from the numerical part (for each one, item discrimination coefficients are less than 0.20). The average difficulty level of HLAT-ANC was calculated as 0.74. According to the item difficulty index, no item was removed from the HLAT-ANC.

Results of Exploratory Factor Analysis: After the item analysis, HLAT-ANC was performed with the remaining 62 items EFA. According to the EFA results, item 47 from the verbal part of HLAT-ANC and items 2 and 4 from the numerical part were removed from HLAT-ANC (because factor loadings were lower than 0.30). In addition, as a result of EFA, it was seen that items 9 and 10 in the numerical section were collected under a separate factor. These items were excluded from HLAT-ANC since a factor should consist of at least three items (109). Although the contribution of items 3, 24, 41, and 42 in the verbal part of HLAT-ANC and item 5 in the numerical part to the common variance was less than 0.20, it was not removed from HLAT-ANC (the reasons for this are factor loads were higher than 0.30, and it has not to narrow the scope of HLAT-ANC). As a result of EFA, items in the verbal section of HLAT-ANC were collected in 4 subdomains, and items in the numerical part were collected in one subdomain.

Internal Consistency: It was found that the KR-20 coefficient for the verbal part of HLAT-ANC ranged from 0.85 to 0.89. For the numerical part, the KR-20 coefficient was calculated as 0.85.

EFA results and KR-20 coefficients of HLAT-ANC are presented in Table 1.

Table 1. EFA results and KR-20 coefficients of HLAT-ANC

Sections of HLAT-ANC	Kaiser-Meyer-Olkin (KMO)	Bartlett's test of sphericity χ^2 ; p	Described variance (%)	Kuder-Richardson-20 (KR-20)
Verbal section				
Subdomain 1	0.80	776.8 ; <0.001	39.36	0.89
Subdomain 2	0.76	298.8 ; <0.001	44.28	0.85
Subdomain 3	0.80	1218.3 ; <0.001	39.00	0.89
Subdomain 4	0.82	652.2 ; <0.001	49.00	0.87
Numerical section	0.74	786.7 ; <0.001	42.00	0.85

Separation between Groups: For the separation method between groups, the median scores of the pregnant women with and without health professionals from HLAT-ANC were compared, and it was determined that the median scores of the health professionals from all subdomains of HLAT-ANC were higher (for each subdomain; $p < 0.05$).

Concurrent Criterion Validity: It was found that there is a weak negative correlation between the scores obtained from all sub-domains of HLAT-ANC and the scores obtained from the Turkish version of Chew screening questions for health literacy (for each one $p<0.05$).

Comparison Methods for Item Averages for Upper and Lower 27%: It was determined that

the scores of the 27% upper group were higher than the 27% lower group in all sub-domains of HLAT-ANC (for each sub-domain; $p < 0.05$).

Results of Comfirmatory Factor Analysis (CFA): After performing the validity and reliability analysis of HLAT-ANC, CFA was performed on a separate data set.

As a result of the CFA performed for the verbal part of the HLAT-ANC, it was found that X2 ÷ SD, Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Error (SRMR) values were within acceptable limits.

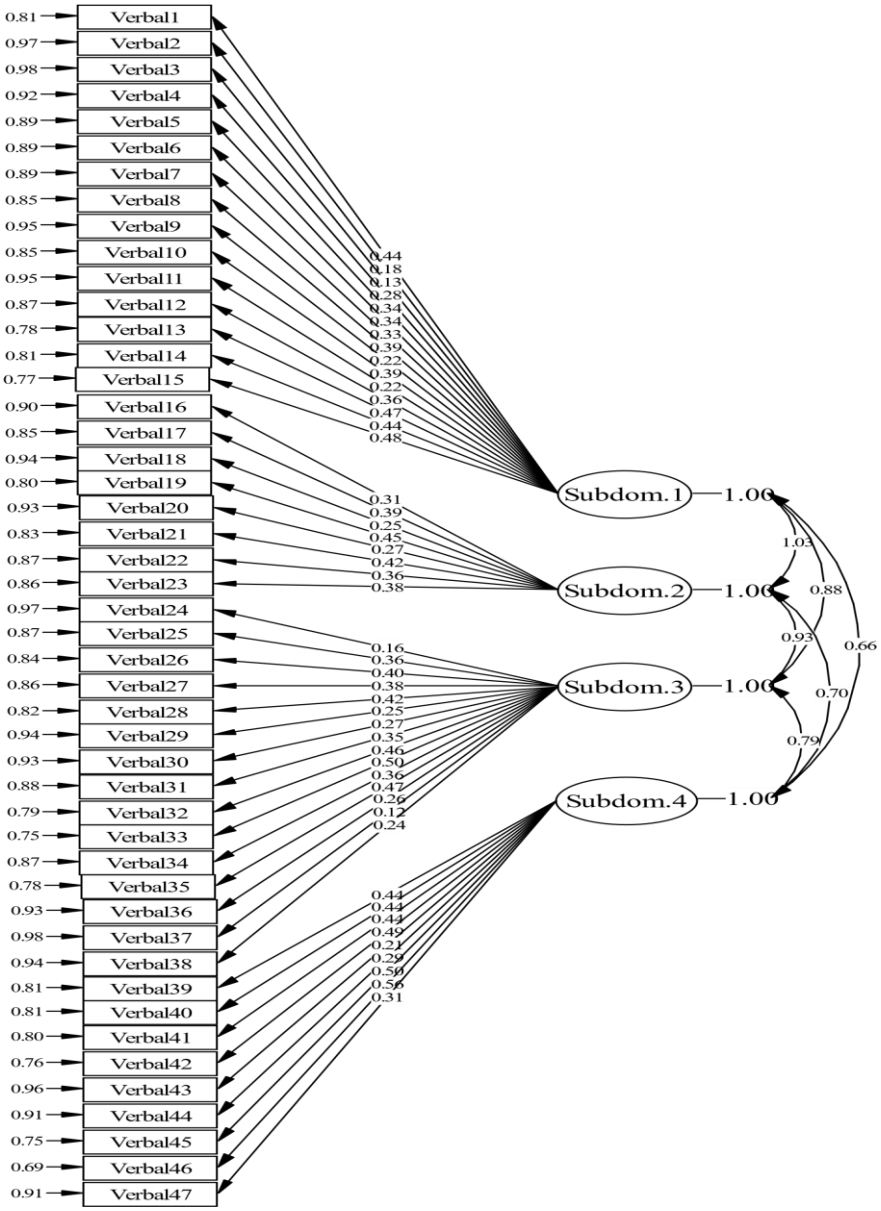
However, it was observed that the Comparative Fit Index (CFI), Goodness of fit Index (GFI), and Adjusted Goodness of fit Index (AGFI) values were not within acceptable limits.

As a result of the CFA, the measurement model for the verbal part of HLAT-ANC and the fit values of this measurement model are presented in Table 2 and Figure 1.

Table 2. Fit indexes obtained for the verbal part of HLAT-ANC as a result of CFA

Fit indexes	**Fit values (Acceptable fit values) of the measurement model obtained for the verbal part of HLAT-ANC**
$X^2 \div SD$	2.12 (≤5)
Root Mean Square Error of Approximation (RMSEA)	0.05 (≤0.08)
Standardized Root Mean Square Error (SRMR)	0.06 (≤0.08)
Comparative Fit Index (CFI)	0.86 (≥0.90)
Goodness of fit Index (GFI)	0.83 (≥0.90)
Adjusted Goodness of fit Index (AGFI)	0.81 (≥0.85)

SD: Standard Deviation



Chi-Square=2177.12, df=1028, P-value=0.00000, RMSEA=0.050

Figure 2. The measurement model for the verbal part of HLAT-ANC (Standardized Solution

As a result of the CFA performed for the verbal part of the HLAT-ANC, it was determined that the standardized factor loads of the items varied between 0.12-0.56 (Figure 2).

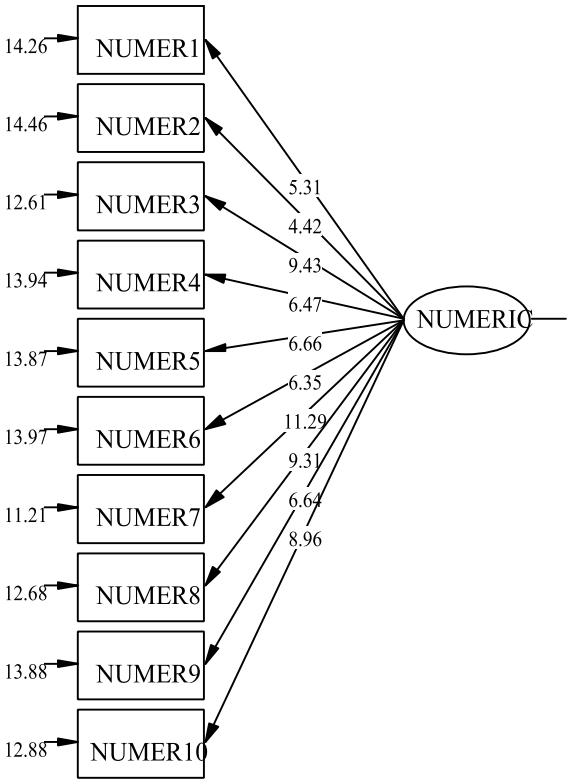
As a result of the CFA performed for the numerical part of the HLAT-ANC, It was determined that the values of all of the fit indices (X2 ÷ SD, RMSEA, SRMR, CFI, GFI and AGFI) were within acceptable limits.

As a result of the CFA, the measurement model for the verbal part of HLAT-ANC and the fit values of this measurement model are presented in Table 3 and Figure 3.

Table 3. Fit indexes obtained for the numerical part of HLAT-ANC as a result of CFA

Fit indexes	Fit values (Acceptable fit values) of the measurement model obtained for the verbal part of HLAT-ANC
X^2 ÷ SD	3.20 (≤5)
Root Mean Square Error Of Approximation (RMSEA)	0.07 (≤0.08)
Standardized Root Mean Square Error (SRMR)	0.05 (≤0.08)
Comparative Fit Index (CFI)	0.90 (≥0.90)
Goodness of fit Index (GFI)	0.95 (≥0.90)
Adjusted Goodness of fit Index (AGFI)	0.92 (≥0.85)

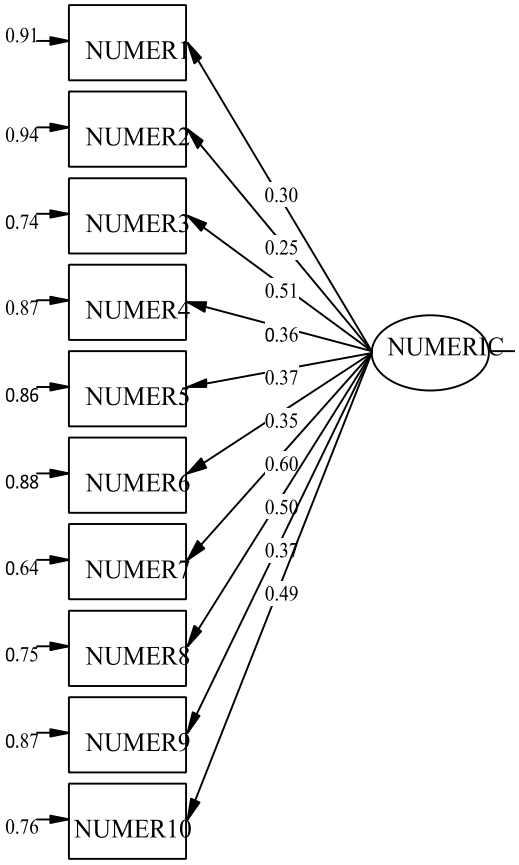
SD: Standard Deviation



Chi-Square=112.05, df=35, P-value=0.00000, RMSEA=0.070

Figure 3. The measurement model for the numerical part of HLAT-ANC (T values)

As a result of the CFA performed for the numerical part of the HLAT-ANC, it was determined that the standardized factor loads of the items varied between 0.25-0.60 (Figure 4).



Chi-Square=112.05, df=35, P-value=0.00000, RMSEA=0.070

Figure 4. The measurement model for the numerical part of HLAT-ANC (Standardized Solution)

Scoring the HLAT-ANC: The scores that can be obtained from the numerical section vary between 0-10. As the scores from each sub-domain of HLAT-ANC increase, the HL level related to each sub-domain also increases.

DISCUSSION

Women are not only responsible for their own health, but also for the health of their families. These responsibilities increase even more during pregnancy. The ability to access, understand, and use accurate health information is extremely important in fulfilling these responsibilities. The ability of pregnant women to access, understand, and use general information about health, and to make appropriate health-related decisions for themselves and their families is closely related to the level of HF (1). It is clear that women with a high level of health literacy will contribute to increasing the health level of themselves, their families, and society.

It is extremely important to determine the extent of the problem by determining the HL levels

for planning health services to increase the HL level of pregnant women. In order to determine the HL level of pregnant women, there should be a standard measurement tool for the prenatal period. As a result of the literature review, no measurement tool was found in print, so it was necessary to develop a new scale. For this reason, in our study, it was aimed to develop HLAT-ANC, to make its reliability and validity.

The purpose of measuring any abstract or concrete feature in research is to evaluate individuals, events, or objects in terms of this feature and to reach certain laws, decisions, concepts, etc. based on the results obtained in the research. One of the important factors affecting the making of correct and appropriate inferences is whether the assessment tools used in research are standard or not. In order for assessment tools to be standard, they must have two basic features, which are described as "validity" and "reliability". Validity; The characteristic that an assessment tool aims to measure is the degree to which it can measure accurately without confusing any other feature. Reliability is; the fact that the test or scale results reveal the conceptual structure correctly is an indicator of the stability of the measurement values obtained in repeated measurements under the same conditions as an evaluation tool (8,12).

In developing a new assessment tool, it is desired that the items to be included in the assessment tools should not be too easy or too difficult. However, if the ease or difficulty of the assessment tool as a whole is important rather than each item to be included in the assessment tool, the average difficulty level should be considered. In order for the assessment tool to be not too easy or too difficult in general, the average difficulty value is desired to be around 0.50 (13). In our study, the average difficulty level of HLAT-ANC was calculated as 0.74. It was reported that the average difficulty level of TOFHLA, which was taken as a basis in the development phase of HLAT-ANC, was 72% in the verbal part, 64% in the numerical part, and 0.68 in the scale (14). In addition, the difficulty level was calculated for each item in the HLAT-ANC in this study. Although the difficulty level of the two items in the numerical part of HLAT-ANC is considered high, they were not removed from the assessment tool because of the high item discrimination coefficients of these items and the average difficulty value of HLAT-ANC at the desired level. A high level of item difficulty may indicate that the item is not always easy, but that the subject is well understood by people. In our study, lower and upper limits were not determined for the difficulty level of the items in the HLAT-ANC, and different analyzes were used in item selection.

The items in the measurement tools that evaluate the characteristics such as ability and success that require individuals to exhibit their maximum performance should be able to distinguish between knowing and unfamiliar people. When developing a new assessment tool, the item discrimination coefficient is required to be at least 0.20 in order for the items to be distinctive and fit for their purpose (10). In this study, insufficiently indistinguishable items were removed from HLAT-ANC. In addition, in our study, item distinctiveness was evaluated by comparing the scores of the sub-top 27% groups, and it was observed that all items in HLAT-ANC were distinctive. As a result, HLAT-ANC consists of relatively easy but highly discriminating substances. One of the reasons why HLAT-ANC is easy maybe that pregnant women are more likely to answer correctly because the substances in HLAT-ANC are specific to the gestational period rather than the general HL level. In the HL index development study conducted by Yang et al. (15), on immigrant married women, it was reported that item discrimination was prioritized in item selection, and even if the items were very easy or difficult, they were not excluded from the index if their discrimination was sufficient. There are also studies reporting similar results in the literature (16,17).

In this study, EFA was used to demonstrate the construct validity of HLAT-ANC. According to Bartlett's sphericity test result obtained with EFA, it was determined that the correlation matrix of the items in HLAT-ANC was suitable for factor analysis, and the sampling adequacy according to the KMO criterion was at a medium-good level. In the scale development studies conducted to determine the HL level in different study groups, it was reported that the suitability of the sample and the correlation matrix to the factor analysis was evaluated by KMO and Bartlett's test of sphericity, similar to our study (18,19).

It was determined that each subdomain of the structure revealed for HLAT-ANC with EFA explained approximately 40% of the variance. Generally, measurement tools are required to explain 50% -70% of the variance, and in social sciences, this value is considered to be "sufficient" to be 40% -60% (8). It was reported that Bjørnsen et al. (20) explained 41% of the variance in the factor structure revealed as a result of EFA in their scale development study conducted to evaluate mental health literacy on adolescents in 2017. Similar results were reported in the study of Hashimoto and Yanagisawa (18). The variance explained by each subdomain of HLAT-ANC was considered sufficient for this study.

Another indicator for the validity of the structure revealed by EFA is the low correlation coefficients between factors (8). The fact that this coefficient is below 0.60 is proof that the factor structure is suitable. The correlation coefficients of the subdomains of the HLAT-ANC verbal part were found to be at the desired level, and the factor

structure of HLAT-ANC was found to be appropriate. In the study conducted by Hashimoto and Yanagisawa on immigrant mothers in Japan in 2011, it was reported that the correlation coefficient between factors was 0.39 in the two-factor scale structure revealed by EFA (18).

The weight of the items in the assessment tool on the factor in which they are included is determined by the factor load. Item factor load ranges from (-1) to (+ 1), and 0.30 is the lowest accepted level (8). In our study, items with a factor load of less than 0.30 were excluded from the assessment tool. It has been revealed that the factor loadings of the items of HLAT-ANC adequately explain the structure to which they belong. In scale development studies on health literacy, it is reported that the minimum values accepted for factor load range between 0.30-0.40 (15,18,20). In our study, all these results obtained with EFA show that the structure validity of HLAT-ANC is ensured.

Another method used in determining the construct validity is that the correlation coefficient between the two assessment tools in concurrent criterion validity is neither too high nor too low (13). In our study, Chew screening questions for health literacy was used for concurrent criterion validity, and it was found that there was generally a weak-moderate negative correlation with subdomains of HLAT-ANC. Similar results from Korea are reported in two different studies conducted by Yang et al. (15,17). In the study conducted by Matsumoto and Nakayama (21), it was reported that the correlation level between the HL scales used was good. In the validity and reliability study of Yin et al. (22), Chew screening questions for health literacy were used for concurrent criterion validity, and it was reported that a weak negative correlation was found between the two scales in the USA. It is expected that the correlation coefficients between the scores obtained from Chew screening questions for health literacy and the scores from HLAT-ANC will be negative. High scores from Chew screening questions for health literacy mean that the perceived HL level is low; High scores from HLAT-ANC indicate a high HL level. One of the reasons for the weak-medium correlation between the two measurement tools may be that the items of Chew screening questions for health literacy are Likert-type, statement-based, and reflect the individual's typical responses. Additionally, it may be that it measures the HL perceived by the individual. However, since HLAT-ANC is a measurement tool that individuals should show their maximum performance, individuals may not be able to give correct answers to items when addressing multiple-choice items. Therefore, it is normal that the correlation coefficient between the two-scale scores is low.

The separation between groups is one of the methods used in determining the construct validity in validity and reliability studies. In our study for this method, we compared the HLAT-ANC scores of pregnant women with and without healthcare professionals, with the thought that their HL levels would be high due to the high health-related education levels of health professionals. It was observed that those who were health professionals had a higher level of HL related to the antenatal period. This result supports that the structure validity of HLAT-ANC is ensured. Similar results have been reported in the scale development studies for evaluating HL in the literature (17,20). The higher the internal consistency coefficients in validity and reliability studies, the higher the consistency of the items in the assessment tool with each other. In general, an internal consistency coefficient of at least 0.70 is recommended for an assessment tool to be considered reliable (8). In our study, it was found that the reliability levels of all subfields of HLAT-ANC were high. In Turkey, Ozdemir et al (23) in a study, it was reported that the internal consistency coefficient of 0.70. In the study of Bilgel et al. (24), it was reported that the internal consistency coefficients varied between 0.77-0.89 in the subdomains of the scale.

In the study in which Yin et al. (22), evaluated the parenteral HL level, a scale scored similarly to the HLAT-ANC developed in our study was used and the internal consistency coefficient was reported to be 0.64. There are studies reporting different results in the literature (25,26). The reasons such as the difference of the scoring systems of the scales used in the studies and the size of the study groups in which the studies were conducted may be the reasons why different internal consistency coefficients are reported in the literature.

CFA, which is a modeling method, is performed in order to verify the scale structure determined by fictionalized or other analyzes. In Confirmatory Factor Analysis (CFA), more than one statistical criterion is used to evaluate the fit between observed variables and latent variables. However, there is no consensus on which criteria should be used and what the predictive values of these criteria should be (27). In our study, for the verbal part of HLAT-ANC, the harmony values of RMSA, SRMR, and X2 ÷ SD are high; CFI, GFI, and AGFI fit values were found to be at acceptable levels. It was observed that all fit values obtained for the numerical part of HLAT-ANC were at high levels (11,28,29). In some studies, RMSA, SRMR, and X2 ÷ SD values were frequently examined as criteria of compliance and it was reported that the obtained results were similar to our study (21,26). However, since GFI and AGFI values may vary according to the characteristics of the study groups, they are mostly not recommended to be used as a fit criterion (27,30). Since the fit criteria obtained in our study are among the acceptable or even good fit limits, it can be said that the measurement model

established with CFA has a high degree of compliance with the data.

CONCLUSION

As a result, it has been concluded that HLAT-ANC meets the standards required to be accepted as a scale and is a valid and reliable measurement tool. Raising the HL level has become one of the primary issues of public health in the protection and improvement of maternal and child health and in improving health outcomes. The first step of the studies to increase the HL level is to determine the current HL level of women. The HLAT-ANC developed in this study can be used to determine the HL levels of different study groups.

REFERENCES

1. Renkert S, Nutbeam D. Opportunities to improve maternal health literacy through antenatal education: An exploratory study. Health Promot Int. 2001;16(4):381-8.
2. Mojoyinola J. Influence of maternal health literacy on healthy pregnancy and pregnancy outcomes of women attending public hospitals in Ibadan, Oyo State, Nigeria. Afr. Res. Rev. 2011;5(3).
3. Bick D. National Collaborating Centre for Women's and Children's Health. National Institute for Clinical Excellence Caesarean Section Clinical Guideline National Collaborating Centre for Women's and Children's Health: commissioned by the National Institute for Clinical Excellence. Worldviews Evid Based Nurs. 2004;1(3):198-9.
4. Villar J, Ba'aqeel H, Piaggio G, Lumbiganon P, Belizán JM, et al. WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care. The Lancet. 2001;357(9268):1551-64.
5. Republic of Turkey Ministry of Health, Turkey Public Health, Women and Reproductive Health Department, Risk Pregnancy Management Guide 2014.
6. Samur, G. Nutrition During Pregnancy and Lactation, T.C. Ministry of Health Publication, Sinem Press, Ankara. 2008
7. Erkus, A. Writings on Psychometry: Historical Origins of Measurement and Psychometry, Reliability, Validity, Item Analysis, Attitudes; Components and Measurement. 1st edition, Turkish Psychologists Association Publications Ankara. No:24., 2003.
8. Alpar R. Applied statistics with examples from sports, health and education sciences and validity-reliability: Detay Publishing; 2010.
9. Tavsancil E. Measuring attitudes and data analysis with SPSS. Nobel Publishing, Ankara. 2002.
10. Baykul Y. Measurement in education and psychology: Classical test theory and application: OSYM Publications; 2000.
11. Yilmaz V, Celik HE. Structural equation modeling with Lisrel-I: Basic concepts, applications, programming. Ankara: Pegem Academy Publishing; 2009.
12. Ercan I, Ismet K. Reliability and validity in scales. Journal of Uludag University Faculty of Medicine. 2004;30(3):211-6.
13. Erkus A. Writings on Psychometry, Turkish Psychologists Association Publications Ankara. No:24., 2003.
14. Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults. J. Gen. Intern. Med. 1995;10(10):537-41.
15. Yang SJ, Chee YK. Development and psychometric testing of the Health Literacy Index for Female Marriage Immigrants (HLI-FMI) in Korea. Women Health. 2017;57(8):1007-30.
16. Shen M, Hu M, Liu S, Chang Y, Sun Z. Assessment of the Chinese Resident Health Literacy Scale in a population-based sample in South China. BMC Public Health. 2015;15(1):637.
17. Yang SJ, Chee YK, An J, Park MH, Jung S. Analysis of Validity and Reliability of the Health Literacy Index for Female Marriage Immigrants (HLI-FMI). Asia Pac J Public Health. 2016;28(4):368-81.
18. Hashimoto H, Yanagisawa S. Development of health literacy scale among Brazilian mothers in Japan. Health Promot Int. 2016;32(6):1034-40.
19. Pires C, Rosa P, Vigário M, Cavaco A. Short Assessment of Health Literacy (SAHL) in Portugal: development and validation of a self-administered tool. Prim Health Care Res Dev. 2018:1-18.
20. Bjørnsen HN, Ringdal R, Espnes GA, Moksnes UK. Positive mental health literacy: development and validation of a measure among Norwegian adolescents. BMC public health. 2017;17(1):717.
21. Matsumoto M, Nakayama K. Development of the health literacy on social determinants of health questionnaire in Japanese adults. BMC public health. 2017;17(1):30.
22. Yin HS, Sanders LM, Rothman RL, Mendelsohn AL, Dreyer BP, White RO, et al. Assessment of health literacy and numeracy among Spanish-Speaking parents of young children: validation of the Spanish Parental Health Literacy Activities Test (PHLAT Spanish). Acad Pediatr. 2012;12(1):68-74.
23. Ozdemir H, Alper Z, Uncu Y, Bilgel N. Health literacy among adults: a study from Turkey. Health Educ Res. 2010;25(3):464-477.
24. Bilgel N, Sarkut P, Bilgel H, Ozcakir A. Functional health literacy in a group of Turkish patients: A pilot study. Cogent Soc. Sci. 2017;3(1):1287832.

25. Ernstmann N, Halbach S, Kowalski C, Pfaff H, Ansmann L. Measuring attributes of health literate health care organizations from the patients' perspective: Development and validation of a questionnaire to assess health literacy-sensitive communication (HL-COM). Z Evid Fortbild Qual Gesundhwes. 2017;121:58-63.
26. Moll S, Zanhour M, Patten SB, Stuart H, MacDermid J. Evaluating Mental Health Literacy in the Workplace: Development and Psychometric Properties of a Vignette-Based Tool. J Occup Rehabil. 2017;27(4):601-11.
27. Schreiber JB, Nora A, Stage FK, Barlow EA, King J. Reporting structural equation modeling and confirmatory factor analysis results: A review. J Educ Res. 2006;99(6):323-38.
28. Tabachnick, Barbara G., and Linda S. Fidell. "Çok değişkenli istatistiklerin kullanımı [Using multivariate statistics]." Trans. M. Baloğlu]. Nobel (2015).
29. Aksu, Gökhan, Mehmet Taha Eser, and Cem Oktay Güzeller. structural equation model applications with Exploratory and Confirmatory factor analysis. Detay Yayıncılık, 2017.
30. Cokluk O, Sekercioglu G, Büyüköztürk S. Multivariate statistics for social sciences: SPSS and LISREL applications: Pegem Academy; 2012.