Original Article

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Fetal Health Anxiety: A Validity and Reliability Study of the Turkish Version of the Fetal Health Anxiety Inventory

Fetal Sağlık Kaygısı: Fetal Sağlık Kaygı Envanteri Türkçe Versiyonu Geçerlilik ve Güvenilirlik Çalışması

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ABSTRACT

Objective: In the present study, it was aimed to adapt the fetal health anxiety inventory (FHAI) into Turkish and to analyze the validity and reliability of the scale among pregnant women.

Methods: Explanatory factor analysis (EFA) was applied to 370 pregnant women in Sample I and confirmatory factor analysis (CFA) was applied to 200 pregnant women in Sample II. The Prenatal Distress Questionnaire (NuPDQ) was used to test criterion-related validity of the FHAI. The reliability of the inventory was examined with Cronbach's alpha reliability coefficient, item-total score correlation coefficient and test-retest analysis.

Results: As a result of EFA applied to Sample I, it was determined that the 14-item FHAI covered a single factor, and the scale demonstrated good fit indices (χ2/standard deviation =3.148, comparative fit index =0.907, standardized root mean squared residual =0.000, root mean square error of approximation =0.089, and p value =0.000) as a result of the CFA applied to Sample II. A statistically significant positive correlation was found between the FHAI and NuPDQ (r=0.851, p<0.01). Cronbach's alpha internal consistency coefficient of the inventory was 0.85, and item-total score correlation coefficients were found to range between r=0.34-0.59 (p<0.001). In the test-retest analysis, a statistically significant and positive correlation was found between the total scores of

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Amaç: Bu çalışma, Fetal Sağlık Kaygı Envanteri (FSKE) Türkçe'ye uyarlamayı ve ölçeğin gebelerde geçerlilik ve güvenilirliğini değerlendirmeyi amaçlamaktadır.

Yöntemler: Örnek 1'de yer alan 370 gebeye açıklayıcı faktör analizi (AFA), Örnek 2'de yer alan 200 gebeye doğrulayıcı faktör analizi (DFA) uygulanmıştır. FSKE'nin ölçüt-bağıntılı geçerlik testi için Prenatal Distres Ölçeği (PDÖ) kullanıldı. Envanterin güvenirliği Cronbach's alfa güvenirlik katsayısı, madde-toplam puan korelasyon katsayısı ve test-retest analizi ile incelendi.

Bulgular: Örnek 1'e uygulanan AFA sonucunda 14 maddelik FSKE'nin tek faktörü kapsadığı ve Örnek 2'ye uygulanan DFA sonucunda ölçeğin iyi uyum indeksleri (χ2/standart sapma =3,148, karşılaştırmalı uyum indeksi =0,907, artıkların standart sapması veya kök ortalama kare hatası =0,000, kök ortalama karekök hatası =0,089 ve p değeri =0,000) gösterdiği belirlendi. FSKE ile PDÖ arasında istatistiksel olarak pozitif yönde anlamlı ilişki olduğu saptandı (r=0,851, p<0,01). Envanterin Cronbach's alfa iç tutarlık katsayısının 0,85 olduğu ve madde-toplam korelasyon katsayılarının r=0,34-0,59 arasında değiştiği bulundu (p<0,001). Test-tekrar test analizinde, iki farklı uygulamada elde edilen envanterin toplam puanları arasında istatistiksel olarak pozitif yönde anlamlı ilişki bulundu (r=0,568, p=0,001).

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ABSTRACT

the inventory obtained in two different applications (r=0.568, p=0.001).

Conclusion: The current study supported the use of 14-item FHAI as a valid and reliable tool to measure fetal health anxiety of Turkish pregnant women.

Keywords: Anxiety, fetal health, reliability, validity

ÖZ

Sonuç: Bu çalışma, 14 maddeden oluşan FSKE'nin Türk gebe kadınlarda fetal sağlık kaygısını ölçmek için geçerli ve güvenilir bir araç olarak kullanımını desteklemiştir.

Anahtar Sözcükler: Anksiyete, fetal sağlık, geçerlilik, güvenilirlilik

Introduction

Stress and mental illnesses experienced during pregnancy may have negative effects on both the mother and the developing infant (1-4). The physiological changes required for the growth of fetus and development of fetal health as well as response to these physiological changes take place throughout pregnancy, and these changes are accompanied with dread and uncertainty. The well-being of the pregnant woman is very important both for herself and for the health of the developing fetus. If the expectant mother cannot cope with her anxiety, the risk of mental and psychological disorders increases and the anxiety negatively affects the mechanisms that enable the adaptation process to take place in a healthy way (1,2).

There are many studies in the literature showing negative birth outcomes such as low birth weight in infants, small head circumference, which is an indicator of brain development, and preterm labor associated with the stress experienced during pregnancy (5-7). At the same time, there are findings showing that the preterm is negatively affected in neurodevelopmental, emotional, and behavioral areas (8). Concerns over the health of the mother's growing fetus are referred to as fetal health anxiety (4,9). Fetal health is affected by maternal, fetal, placental, and external factors. Early diagnosis and treatment of problems that may adversely affect fetal health minimize fetal mortality and morbidity (10). Pregnant women should be examined in order to determine fetal health concerns during pregnancy. Using a qualitative methodology, Harpel (4) investigated the influence of ultrasonography on the experiences of fetal health concerns among 30 pregnant women. According to the findings, ultrasonography can help women feel less anxious about their fetuse's health, especially when they can see the image and hear positive comments (4). At the same time, it is stated in the literature that the knowledge that the fetus is healthy following an ultrasound reduces the anxiety levels of parents (11,12).

Although there are many measurement tools and studies that analyze the mother's anxiety level during pregnancy (13-16), the fetal health anxiety cannot be determined because there is no measurement tool that determines it. The fact that fetal issues are widely acknowledged emphasizes the necessity to address the measuring techniques that may be employed to test for this issue. In actuality, it's crucial to examine whether the measuring techniques to be employed for this goal are appropriate for various cultural frameworks. By adapting the Fetal Health Anxiety Inventory (FHAI) to Turkish in terms of determining fetal health anxiety, creating strategies to eliminate anxiety, and defining it more specifically and objectively, the current study aimed to test the validity and reliability of the FHAI in Turkish population.

Methods

Study Design and Participants

The current research was designed in methodological type. The study involved expecting mothers who were enrolled in a public hospital's pregnancy course in eastern Turkey. Records showed that the researchers contacted pregnant women who satisfied the inclusion requirements and told them about the study. Women who accepted to take part in the study were asked to complete a web-based survey. The study questionnaires were created with the help of the Google Forms program (https://docs.google.com/forms), and links to the surveys were distributed to the expectant mothers via social media such as WhatsApp, and Facebook Messenger. On the first page of the online survey, there was information on the study and a consent form for participants. The data collection phase was completed by filling out the questionnaires, which took approximately 5-10 minutes.

The sample size for the current investigation was decided upon using the standards proposed by Comrey and Lee (16). Comrey and Lee (16) advised the following sample size guidelines for factor analysis: Very poor was defined as 50, poor as 100, moderate as 200, good as 300, very good as 500, and excellent as 1,000 or above. Participants in the research included 570 pregnant women. Two separate sample groups were subjected to confirmatory factor analysis (CFA) and exploratory factor analysis (EFA). Three hundred seventy pregnant women from sample I were given EFA, while 200 pregnant women from sample II were given CFA. To determine if the sample size was enough, a post hoc power analysis was carried out. Web-based and publicly available statistical software OpenEpi version 3.01 was used for power analysis (17). The study's power was determined to be 95% for 570 pregnants that were part of the sample, with a 5% margin of error, bipolar significance level, and a 95% confidence interval.

The data from Sample I was collected between the dates of August and October, 2021, and the data from Sample II was collected in December, 2021 (Figure 1). Pregnant women who met the inclusion criteria were randomly selected from the records. The inclusion criteria were being a healthy pregnant woman who was older than 18 years of age, without any psychiatric disease or depressive symptoms.

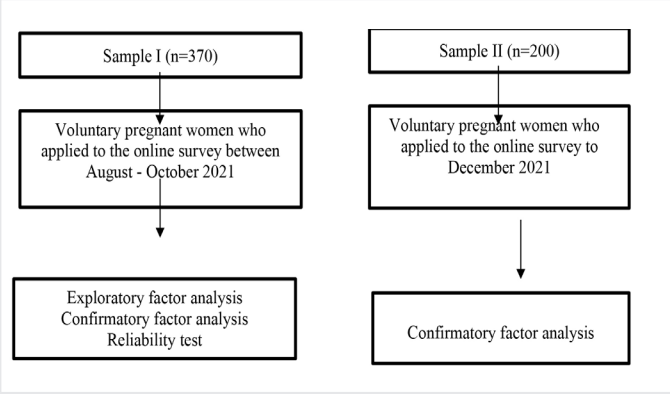

Figure 1. Study design, grouping and modeling

Data Collection Tools

Personal Information Form

It is a form consisting of questions to determine the sociodemographic characteristics of pregnant women (such as age, educational level, employment status) and obstetric characteristics (parity, the status of having a planned/desired pregnancy, trimester) (1,4,10).

Prenatal Distress Questionnaire (NuPDQ)

It was created by Yali and Lobel (18) to gauge pregnant women's prenatal discomfort levels. A 17-item version was developed by Lobel (19) as a result of revision studies, and by Yuksel et al. (20), its Turkish validity and reliability study was established. The questionnaire determines the physical and emotional symptoms that may occur during pregnancy, the levels of anxiety and concern experienced by women in matters related to motherhood, body image, and pregnancy. The questionnaire consists of four subscales: "Physical and Social Changes related to Pregnancy, Concerns regarding the Baby and Labor", "Concerns regarding the Quality of Healthcare and Health Status", "Concerns regarding the Baby-care and Postpartum Life", and "Financial Concerns". A minimum of 0 points and a maximum of 34 points can be obtained from the entire questionnaire. An increase in the scores of the questionnaire and its subscales indicates that the level of distress perceived by pregnant women increases. After doing their research, Yuksel et al. (20) discovered that the questionnaire's internal consistency coefficient was 0.85. The scale's internal consistency coefficient according to Cronbach's alpha was estimated to be 0.77 in the current investigation.

Fetal Health Anxiety Inventory (FHAI)

Reiser and Wright (21) created the FHAI, and this study examined its validity and reliability. The survey gauges pregnant women's worry over the fetus's well-being. There are no subscales in the FHAI and it consists of 14 items. Each item consists of 4 statements that best deal with the experiences of the pregnant women in the past weeks. Items on the inventory are scored between 0 (no symptoms) and 3 (severe symptoms), and the sum of the items gives the total score of fetal health anxiety (0-42), while the higher the score, the higher the fetal health anxiety level (21) (Appendix 1).

Process of the Cultural Adaptation

The main task of cultural adaptation was to translate the FHAI into Turkish. The stages of language validity, content validity, and pilot implementation made up the cultural adaptation phase.

Language validity: In the process of adapting the FHAI to Turkish, first of all, permission was obtained from Wright, who developed the scale, via e-mail. The scale was translated into Turkish during the language validation phase of the test by two faculty members and two independent linguists (lecturers in the field of midwifery, obstetrics, and gynecology nursing). The researchers looked over the translations and developed the Turkish version that most accurately reflected each item. Two separate, qualified linguists translated the generated Turkish text back into English and checked for compatibility between the two languages. It was discovered that the back translation form and the original inventory were identical.

Content Validity Index for Items (I-CVI)

Content validity was performed for language and content control of the items of the inventory (22,23). There are two most common methods used for content validity. One of them is the Lawshe technique and the other is the Davis technique. Davis technique was used for the content validity index in our study. In the Davis technique, experts are asked to evaluate their opinions with one of four degrees. In this scoring, the statements are 1 point for "not appropriate", 2 points for "somewhat appropriate, the item needs correction", 3 points for "quite appropriate but minor changes are necessary", and 4 points for "very appropriate" (22). To determine the content validity of the scale, five faculty members, four in midwifery and one in obstetrics and gynecology, were asked to rate each item of the scale from 1 to 4. After examining the average scores given by the experts for each item of the scale, it is recommended to completely remove or rearrange the items that are at least below the agreement limit or least compatible (24). The "content validity index (CVI)" of the item is obtained by dividing the number of experts marking the options in this technique by the total number of experts. As a result of the evaluation of expert opinions using Davis method; while the statements that the experts found very appropriate were accepted without changing, the statements that the experts did not find appropriate or wanted to be corrected were revised and corrected. A CVI greater than 0.80 means that the content validity of the scale is statistically significant. As a result of the expert evaluations of the scale; the CVI calculated with the CVI formula was found to be quite high (CVI =0.95, Table 1). It was seen that the scores obtained from the experts were not statistically different and there was a consistency between the experts. The level of agreement with the expert opinions was examined with the Kendall W analysis, which was a non-parametric test (25). In line with expert opinions, the draft version of the FHAI inventory was completed.

Pilot implementation: In the next stage, the trial Turkish form of the inventory was applied to 10 pregnant women and they were asked to identify the unclear expressions. The findings obtained were not included in the results of the present research. There were no misunderstood items in the pilot implementation, and the Turkish version of the FHAI was completed.

Psychometric Testing of the FHAI

During the adaptation to Turkish of the FHAI validity-reliability analyses were performed for psychometric analysis.

Validity

Exploratory Factor Analysis

First, the applicability of the dataset was assessed in order to assess the construct validity of the FHAI. Kaiser-Meyer-Olkin (KMO) and Barlett's test of sphericity were applied for this. The KMO must exceed 0.60 in order for the data to be appropriate for factor analysis, and Bartlett's test of sphericity results must be statistically significant (26). For the inventory's construct validity, explanatory and confirmatory factor analyses were carried out.

EFA was used to identify the scale's fundamental elements. A high variance ratio as a result of EFA indicates that the factor structure power of the scale is high. A total explained variance above 50% indicates that there is strong construct validity (27). It is advised to remove goods with factor loading below 0.30 from the inventory as this is the maximum value for factor loading (28). EFA was used to analyze the data from Sample I (n=500).

Confirmatory Factor Analysis

By comparing the results of one or more measurement tools that are assumed to measure the same feature with the score of the measurement tool that is meant to assess the desired feature as a standard, criterion-related validity/concurrent validity is produced. Similar results show that the measurement tool has criterion-related validity when the measurement tool's validity has been studied and compared to the measurement tool of which validity has already been established (29). Pregnant women were subjected to the NuPDQ in order to assess the FHAI's criterion-related validity.

CFA is an analysis in which a previously defined and limited structure is tested to whether it is validated as a model (30). CFA was applied to test the structure obtained after EFA. For CFA studies, the FHAI was applied to sample II and the obtained data was analyzed. Multiple fit indices were used for CFA and chi-square goodness, comparative fit index (CFI), Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), and p value for testing the null hypothesis's fit indices were examined. In the fit indices, $\chi 2/df < 5$, $0.90 \leq$ CFI, $0.05 <$ SRMR ≤ 0.10, $0.05 \leq$ RMSEA ≤ 0.10, and p value <0.05 were regarded as acceptable criteria (31).

Reliability

Cronbach's Alpha Reliability Coefficient

The reliability of the FHAI was measured by calculating the Cronbach's alpha internal consistency coefficient, determining item-total score correlations, and test-retest reliability. Internal consistency increases as the coefficient approaches 1, and in order to say that a scale is reliable, the calculated coefficient must be at least 0.70 (32).

Item-total Score Correlation Coefficient

The item-total score correlation coefficients were looked at in order to look at the link between the scores acquired from the FHAI's items and the overall score of the inventory. The item-total score correlation coefficient provides details on how the assessment tool's items relate to one another. It is advised that the

Table 1. Content validity index scores for FHAI

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Item CVI
FHAI1	3	4	4	4	4	1.00
FHAI2	3	2	3	3	4	0.80
FHAI3	3	3	3	4	3	1.00
FHAI4	3	3	4	4	3	1.00
FHAI5	3	2	4	4	3	0.80
FHAI6	3	4	4	4	3	1.00
FHAI7	3	3	4	4	2	0.80
FHAI8	3	3	4	4	4	1.00
FHAI9	3	3	4	3	3	1.00
FHAI10	3	3	4	3	3	1.00
FHAI11	3	3	4	4	4	1.00
FHAI12	3	3	4	4	3	1.00
FHAI13	3	3	4	4	3	1.00
FHAI14	3	4	4	4	4	1.00
I-CVI total	-	-	-	-	-	0.96

1 point for "not appropriate", 2 points for "somewhat appropriate, the item needs to be adjusted", 3 points for "quite appropriate but minor changes are necessary", 4 points for "very appropriate", CVI: Content validity index

acceptable item selection coefficient be higher than 0.20 (33).

Test-retest Analysis

In order to determine the invariance of the FHAI over time, the consistency of the responses of the individuals to the items of the measurement tool by applying the measurement tool to the same individuals at different times shows the invariance of the measurement tool against time. In the literature, it is stated that at least 30 participants should be reached for the test-retest (34), and the scale was applied to 30 women for the second time to be retested 15 days later. The correlation coefficient between the values obtained at the end of the two applications gives the reliability coefficient of the scale. As this value takes values between 0 and 1 and gets closer to 1, the reliability of the correlation value increases (35).

Statistical Analysis

The SPSS 25.0 (SPSS Inc., Chicago, IL, USA) and AMOS 24 (Multivariate Software, Inc., Los Angeles, CA, USA) were used to analyze the study's data (36). The Kolmogorov-Smirnov test was performed to examine the results of all scale values utilized in this study in order to verify the normalcy assumptions. Due to the data's normal distribution, parametric tests were applied. Descriptive statistics including frequency, percentage, mean, and standard deviation were used to describe the characteristics of the pregnant women. To examine the content validity of the inventory, Kendall's W-test was applied. The data's acceptability for factor analysis was assessed using KMO analysis, and the sample size's appropriateness was determined using Bartlett's test of Sphericity. EFA and the Promax Rotation technique were used to investigate the factor structure of the inventory. To validate the structure of the inventory discovered by factor analysis, CFA was carried out. The Pearson product-moment correlation analysis was used to look at the correlation between the FHAI and NuPDQ as part of the criterion-related validity/concurrent validity investigation of the inventory. In the reliability analyses of the inventory, the item analysis and test-retest analysis were investigated using Pearson correlation analysis, and the internal consistency of the inventory was examined with Cronbach's alpha reliability coefficient. Explanatory factor analysis produced the main findings. Additionally, analyses of the content validity, confirmatory factor analysis, criterion-related validity, and reliability were carried out.

Ethical Issues

Wright, who created the scale, was contacted by email to provide his consent to translate the FHAI into Turkish. Additionally, approval from the Scientific Research and Publication Ethics Committee of the İnönü University (decision number: 2020/915) was acquired prior to data collection. On the first page of the online questionnaire, which served as the study's consent form, all pregnant women who agreed to participate in it were informed about the research before it began. Included were those who freely took part in the study.

Results

A total of 2% of pregnant women with high-risk pregnancies (such as cardiac conditions and gestational diabetes) were cut from the study's sample of EFA (n=377) due to inclusion requirements. Of pregnant women with hazardous pregnancies (including placenta previa, intrauterine growth retardation, and high blood pressure) 4% were eliminated from the research after the target sample (n=208) was checked for CFA inclusion requirements. Two hundred pregnant women in Sample II of the study's CFA and 370 pregnant women in Sample I of its EFA were both included in the analysis.

Participants' Characteristics

The mean gestational week of Sample I included in the study was 36.72±4.53, 64.3% of them were between the ages of 18 and 30, 36.5% were university graduates, 78.6% were unemployed, 84.1% had the moderate level of income, 88.4% had planned pregnancy, 97.6% had the desired pregnancy, 95.4% were in the third trimester, and 62.2% were multiparas. The mean gestational week of Sample II was 30.62±9.53, 65.5% of them were between the ages of 18 and 30, 50.0% were university graduates, 65.5% were unemployed, 73.5% had moderate level of income, 82.5% had planned pregnancy, 91.5% had desired pregnancy, 74.5% were in the third trimester, and 68.5% were multiparas (Table 2).

Validity

Exploratory Factor Analysis

The items evaluated as a result of the expert views reviewed by the Kendall W analysis were not significantly different from one another for the content validity of the scale (Kendall W =0.851; p>0.05), and the expert opinions were consistent. Following the application of EFA to Sample I, the KMO value of FHAI was 0.851 and the results of Barlett's test of sphericity were X^2 =1955.003 and p=0.001, respectively. According to the results of the investigation, the sample size was suitable for factor analysis. According to the EFA findings, the sole factor with an eigenvalue above 1 was found for 14 FHAI components. Between 0.4 and 0.69 factor loadings accounted for 37.120% of the overall variation (Table 3).

Table 2. Demographic and obstetric characteristics of the pregnant women (n=570)

Variables	Sample I (n=370) n (%)	Sample II (n=200) n (%)
Age		
Between the ages of 18 and 30	238 (64.3)	131 (65.5)
31 years and older	132 (35.4)	69 (34.5)
Educational level		
Primary school	128 (34.6)	36 (18.0)
High school	107 (28.9)	64 (32.0)
University	135 (36.5)	100 (50.0)
Employment status		
Employed	79 (21.4)	69 (34.5)
Unemployed	291 (78.6)	131 (65.5)
Income level		
Low	28 (7.6)	9 (4.5)
Moderate	311 (84.1)	147 (73.5)
Good	31 (8.4)	44 (22.0)
Is it a planned pregnancy?		
Yes	327 (88.4)	165 (82.5)
No	43 (11.6)	35 (17.5)
Is it a desired pregnancy?		
Yes	361 (97.6)	183 (91.5)
No	9 (2.4)	17 (8.5)
Parity		
Primipara	140 (37.8)	83 (41.5)
Multipara	230 (62.2)	117 (58.5)
How would you rate your general well-being during your pregnancy?		
Bad	5 (1.4)	17 (8.5)
Mediocre	128 (34.6)	118 (59.0)
Good	237 (64.1)	65 (32.5)
Gestational week	**Mean ± SD**	
	36.72±4.53	30.62±9.53

SD: Standard deviation

Confirmatory Factor Analysis

To ascertain the FHAI's criteria-dependent validity, the NuPDQ was used as the criterion. According to the results of the correlation analysis, there was a statistically significant positive association between the FHAI total score and the NuPDQ overall score as well as its subscale total scores (p=0.01; Table 4).

According to the results of CFA performed on Sample II, the values of $\chi 2$/sd (cmin/df) =3.148, CFI =0.907, SRMR =0.000, RMSEA =0.089, and p value =0.000 were determined for the FHAI (Table 4; Figure 2). It was found that there was a satisfactory fit between the measurement model and the data after looking at the numbers in the fit indicators (Table 5).

Reliability

Cronbach's Alpha Reliability Coefficient

The FHAI was found to have an internal consistency coefficient of Cronbach's alpha of 0.85 (p<0.001; Table 3).

Item-total Score Correlation Coefficient

It was discovered that each of these items had a correlation coefficient with the overall score derived from the inventory items that ranged from r=0.34-0.59 and that this connection was statistically significant (p<0.001; Table 3).

Table 3. Factor loadings, means, item-total correlations and Cronbach's alpha of the Fetal Health Anxiety Inventory (Sample I, n=370)

Item	Factor	Mean ± SD	Corrected item-total correlations	Cronbach's alpha if item deleted
4	0.69	1.08±0.58	0.59	0.83
3	0.68	0.97±0.64	0.59	0.80
5	0.65	0.85±0.57	0.57	0.83
13	0.63	0.84±0.54	0.55	0.83
11	0.63	0.86±0.65	0.53	0.83
9	0.57	0.86±0.47	0.48	0.83
10	0.57	0.94±0.63	0.48	0.83
1	0.56	1.05±0.50	0.47	0.83
6	0.56	0.41±0.55	0.46	0.83
2	0.55	1.60±0.80	0.46	0.84
7	0.55	0.44±0.67	0.45	0.84
8	0.54	0.17±0.42	0.45	0.84
12	0.50	0.74±0.48	0.40	0.84
14	0.41	1.04±0.41	0.34	0.84
Total of item				
Variance 37.120				
Cronbach's alpha 0.85				

All correlations are significant at p<0.01 (2-tailed)
SD: Standart deviation

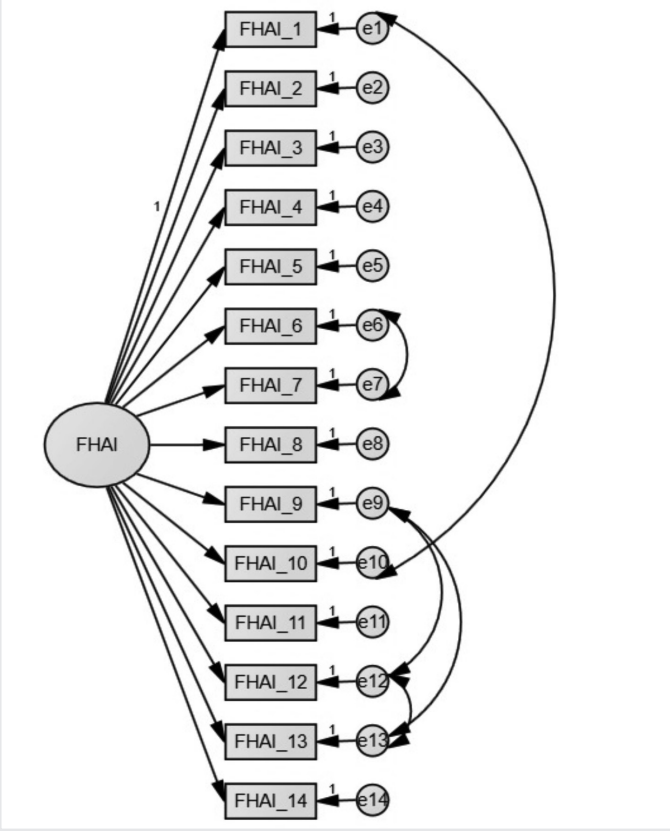

Figure 2. FHAI -standardized factor loadings and interfactor (Sample II, n=200)

Test-retest Mean Scores of the FHAI

A statistically significant positive correlation between the total mean scores of the inventory was discovered when the first and second measurement correlation findings of the FHAI administered with a three-week interval were assessed (r=0.568, p=0.001).

Discussion

Chronic stress is one of the most common modifiers of fetal and postnatal development with lifelong effects on health (37). There is no scale to determine fetal anxiety stress in Turkey. The FHAI was modified for Turkish use in the current study, and the instrument's reliability and validity were assessed. With a sample of Turkish pregnant women, the FHAI showed overall high validity and reliability. The CFA in this study verified that the single-factor construct had good fit indices and its reliability values were in an acceptable range. The EFA in this study suggested that a pregnant mother's worry for the health of her growing fetus might be analyzed as a single-factor construct. It was found that the factor loads of the FHAI in the Turkish adaption research were distributed similarly to how they were in the original form. The data of the CFA fit index, which was used to check whether the items were compatible with the data in the original FHAI (21), was not used, but the results of the analysis we used in the Turkish version were in the right range of values, ensuring the construct validity of the inventory (31,36,38).

Table 4. Correlation between the FHAI and NuPDQ

Scales	1	2	3	4	5	6
1.FHAI	-	0.851**	0.474**	0.743**	0.633**	0.353**
2. NuPDQ	-	-	0.230**	0.423**	0.309**	0.311**
3. Physical and social changes related to pregnancy, concerns regarding the baby and labor	-	-	-	0.214**	0.160**	0.104*
4. Concerns regarding the quality of healthcare and health status				-	0.537**	0.248**
5. Concerns regarding the baby-care and postpartum life					-	0.277**
6. Financial concerns						-
Mean ± SD	12.29±3.53	10.88±3.73	7.50±2.20	0.57±0.86	1.50±1.16	1.30±0.91

**Correlations are significant at p<0.01 (2-tailed).
*Correlations are significant at p<0.05 (2-tailed).
SD: Standart deviation

Table 5. CFA fit indices for FHAI (Sample II, n=200)

Fit criteria	Good fit	Acceptable fit	Model results	Fit
$\chi 2/df$ (c_{min}/df)	0< x2/df <3	<5	3.148	Acceptable fit
CFI	≥0.95	0.90≤ CFI ≤0.97	0.907	Acceptable fit
SRMR	0≤ SRMR ≤0.05	0.05< SRMR ≤0.10	0.000	Good fit
RMSEA	0< RMSEA <0.05	0.05≤ RMSEA ≤0.10	0.089	Acceptable fit
p value	<0.05		0.000	Good fit

CFI: Comparative fit index, SRMR: Standardized root mean square residual, RMSEA: Root mean square error of approximation, CFA: Confirmatory factor analysis

In the present study, factor loads of the FHAI varied between 0.41-0.69 according to the results of EFA. Similarly, factor loading values of the FHAI were found to be between 0.51 and 0.77 in the original inventory (22). It was discovered that the distribution of the items in the Turkish inventory, which was made up of the initial 14 items, was the same. As a result of the EFA applied in the original Reiser and Wright's (21) inventory, it was possible to divide the inventory into two subscales titled Disease Probability and Body Attention, but in a two-factor structure, item 1 (time worrying about your baby's health) and item 7 (ability to take the mind off of thoughts of baby's health) indicated that the factors were not distributed appropriately. Considering this inconsistency, it was suggested that items 1 and 7 might not be loaded on individual subscales as expected, and they could be used as a unitary inventory as well as subscales of the FHAI (21). In the present study, it was determined that Reiser and Wright's single-factor model fitted the Turkish FHAI data more appropriately. Additionally, it was discovered that the KMO, Barlett's test of sphericity, and explained variance values in this investigation were comparable to those in the initial study. The data in the current investigation showed an adequate distribution for factor analysis, according to the results of KMO and Barlett's test of sphericity (39). The overall variance of the inventory can be deemed sufficient when 30% or more of the variation rate described in scale adaptation experiments is regarded sufficient (28).

Strong relationships between prenatal distress (NuPDQ total score, including the subscale of concerns regarding the baby) and the FHAI total score were found, indicating high concurrent validity (40). Additionally, Reiser and Wright (21) showed relationships between the FHAI and measures of anxiety related to pregnancy, anxiety related to maternal health, general anxiety, anxiety sensitivity, and uncertainty intolerance. Numerous studies in the literature demonstrate the detrimental short- and long-term consequences of anxiety on the mother and unborn child during pregnancy (41-43). The significance of the function that fetal health anxiety can play in mother's and child's health has been shown when taking into account the association between prenatal distress and fetal health anxiety in the current investigation.

In the current study, the FHAI showed good internal consistency. The FHAI, developed by Reiser and Wright (21), was also reported to have a high level of reliability when Cronbach's alpha value was examined. In addition, the item-total score correlation coefficients in the current study were found to be similar to those in Reiser and Wright's (21) study, and it was determined that the coefficients of all items were above the acceptable value (r≥0.20 for all items in the inventory) for item selection (33). To prove that the FHAI was invariant over time, the inventory was re-administered to 30 pregnant women three weeks after the first application. The high correlation value between the first and second application scores indicates that the inventory gives consistent results and is invariant over time.

Given these findings, it can be concluded that the FHAI, of which Turkish validity and reliability research we have conducted, and the original of this inventory are in agreement, making it a valid and reliable instrument for assessing pregnant women's fetal health anxiety.

Study Limitations

The present study had certain shortcomings. First off, pregnant women from other institutions were not included in this study since it only included pregnant women who were registered at one public hospital. The findings of this study might not apply to all pregnant women because it only included pregnant women who were admitted to the hospital. Another drawback was that the FHAI validity and reliability analyses were conducted without taking gestation and trimester into account. Future research may advocate doing the validity and reliability tests of the inventory independently based on gestational age and trimester. Regarding the measurement, web-based questionnaires were applied to pregnant women, and the reports were in the form of self-reports. This variable was susceptible to bias.

Conclusion

The FHAI is a potential tool for detecting fetal health anxiety during pregnancy, as well as for application in research and clinical practice, according to the study's findings. Due to the harmful effects that may occur on maternal and fetal health of those who experience fetal health anxiety intensely, healthcare professionals can make a better analysis of the expectant mothers' anxiety levels in order to be aware of the anxiety levels experienced by women during pregnancy, and they can enable the mother and fetus to have a better pregnancy period. This may also assist in developing specific initiatives to meet the needs of individual care. The FHAI can be applied as a rapid and accurate pre-screening tool to assess fetal health anxiety levels in the clinics and studies.

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Ethics

Ethics Committee Approval: Wright, who created the scale, was contacted by email to provide his consent to translate the FHAI into Turkish. Additionally, approval from the Scientific Research and Publication Ethics Committee of the İnönü University (decision number: 2020/915) was acquired prior to data collection.

Informed Consent: On the first page of the online questionnaire, which served as the study's consent form, all pregnant women who agreed to participate in it were informed about the research before it began.

Peer-review: Externally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: N.G, Z.B, T.U., Concept: N.G, Z.B., Design: N.G, Z.B., Data Collection or Processing: N.G, Z.B., Analysis or Interpretation: : N.G, Z.B, T.U., Literature Search: N.G, Z.B., Writing: N.G, Z.B, T.U.

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References

1. Topaç Tunçel N, Kahyaoğlu Süt H. The Effect of Anxiety, Depression and Prenatal Distress Levels in Pregnancy on Prenatal Attachment. The Journal of Gynecology-Obstetrics and Neonatology 2019;16:9-17.
2. Öztürk N, Aydın N. The Importance Of Maternal Mental Health. Marmara University Journal of Women and Gender Studies 2017;2:29-36.
3. Özdamar Ö, Yılmaz O, Beyca HH, Muhcu M. Common Psychiatric Disorders in Pregnancy and Postpartum Period. Zeynep Kamil Medical Journal 2014;45:71-7.
4. Harpel TS. Fear of The Unknown: Ultrasound and Anxiety About Fetal Health. Health (London) 2008;12:295-312.
5. Yonkers KA, Gilstad-Hayden K, Forray A, Lipkind HS. Association of panic disorder, generalized anxiety disorder, and benzodiazepine treatment during pregnancy with risk of adverse birth outcomes. JAMA Psychiatry 2017;74:1145-52.
6. Kikkert HK, Middelburg KJ, Hadders-Algra M. Maternal anxiety is related to infant neurological condition, paternal anxiety is not. Early Hum Dev 2010;86:171-7.
7. Dole N, Savitz DA, Hertz-Picciotto I, Siega-Riz AM, McMahon MJ, Buekens P. Maternal stress and preterm birth. Am J Epidemiol 2003;157:14-24.
8. Huizink AC, Robles de Medina PG, Mulder EJ, Visser GH, Buitelaar JK. Stress during pregnancy is associated with developmental outcome in infancy. J Child Psychol Psychiatry 2003;44:810-8.
9. Kowalyk KM, Hadjistavropoulos HD, Jones SL. What impact does pregnancy have on anxiety about health? J Psychosom Obstet Gynaecol 2009;30:223-30.
10. Yılmaz T, Dinç H, Demirgöz Bal M. Practices Carried out by Pregnant Women to Improve Fetal Health. JAREN 2015;1:21-9.
11. Ekelin M, Crang Svalenius E, Larsson AK, Nyberg P, Maršál K, Dykes AK. Parental expectations, experiences and reactions, sense of coherence and grade of anxiety related to routine ultrasound examination with normal findings during pregnancy. Prenat Diagn 2009;29:952-9.
12. Akca E, Gökyıldız Sürücü Ş, Sanberk I. Validity and reliability of the Turkish version of the PEER-U scale. J Reprod Infant Psychol 2019;37:1-14.
13. Van der Bergh BRH. The influence of maternal emotions during pregnancy on fetal and neonatal behavior. Journal of Prenatal & Perinatal Psychology and Health 1990;5:119-30.
14. Huizink AC, Delforterie MJ, Scheinin NM, Tolvanen M, Karlsson L, Karlsson H. Adaption of pregnancy anxiety questionnaire–revised for all pregnant women regardless of parity: PRAQ-R2. Arch Womens Ment Health 2016;19:125-32.

15. Kırca Şolt A, Kanza Gül D. Pregnancy-related Anxiety Scale (The PrAS): Validity and Reliability Study of its Turkish Version. Celal Bayar University-Health Sciences Institute Journal 2020;7:529-37.
16. Comrey AL, Lee HB. A First Course in Factor Analysis. Lawrance Erlbaum Associates. New York; 1992;2nd edition:217.
17. https://www.openepi.com/Power/PowerCross.htm
18. Yali MA, Lobel M. Coping and distress in pregnancy: an investigation of medically high risk women. J Psychosom Obstet Gynaecol 1999;20:39-52.
19. Lobel M. The Stony Brook pregnancy project: Revised Prenatal Distress Questionnaire (NUPDQ) Scoring information, 2008.
20. Yuksel F, Akin S, Durna Z. Prenatal distress in Turkish pregnant women and factors associated with maternal prenatal distress. J Clin. Nurse 2012;23:54-64.
21. Reiser SJ, Wright KD. Fetal health anxiety: development and psychometric properties of the fetal health anxiety inventory. J Psychosom Obstet Gynaecol 2019;40:264-73.
22. Gözüm S, Aksayan S. Guidelines for Cross-Cultural Scale Adaptation II: Psychometric Properties and Cross-Cultural Comparison. Journal of Research and Development in Nursing 2003;1:3-14.
23. Aker S, Dündar C, Pekşen Y. Two Vital Concepts in Measurement Tools: Validity and Reliability. 19 May University Medical Journal 2005;22:50-60.
24. Ozturk H, Babacan E. A study in scale development: the occupational safety scale (oss) for health care personnel working in hospital. Journal of Education and Research in Nursing 2012;9:36-42.
25. Yurdugül H. Using scope validity indices for scope validity in scale development studies XIV. National Educational Sciences Congress. 2005;1-6.
26. Lim S, Jahng S. Determining the number of factors using parallel analysis and its recent variants. Psychol Methods 2019;24:452-67.
27. Samuels P. Advice on exploratory factor analysis. 2017; URL: https://www.open-access.bcu.ac.uk/id/eprint/6076.
28. Tavşancıl E. Measuring Attitudes and Data Analysis with SPSS. 4. Baskı. Ankara, Turkey: Nobel Yayın Dağıtım; 2010 (in Turkish).
29. Mohajan HK. Two crıterıa for good measurements in research: Validity and reliability. Annals of Spiru Haret University Economic Series 2017;17:59-82.
30. Zeybek SU, Çeçen Eroğul AR. An Examination of Psychometric Properties of Positive Functional Attitudes Scale. JCBPR 2017;6:59-66.
31. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Structural Equation Modeling 1999;6:1-55.
32. Taber KS. The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education 2018;48:1273-96.
33. Piedmont RL. Inter-item correlations. In Michalos AC (ed.), Encyclopedia of Quality of Life and Well-Being Research. Dordrecht: Springer 2014;3303-4.
34. Alpar R. Applied statistics and validity and reliability with examples from sports, health and educational sciences. Detay Publishing; 2018, 5th Edition:672.
35. Ercan I, Kan I. Reliability and validity in scales. Uludag Universiy Journal of College of Medicine 2004;30:211-6.
36. Cokluk O, Şekercioğlu G, Buyukozturk Ş. Multivariate Statistics for Social Sciences: SPSS and LISREL Applications. 3rd ed. Ankara: Pegem Akademi Yayıncılık: 2014;275-332 (in Turkish).
37. Frasch MG, Lobmaier SM, Stampalija T, Desplats P, Pallarés ME, Pastor V, et al. Non-invasive biomarkers of fetal brain development reflecting prenatal stress: An integrative multi-scale multi-species perspective on data collection and analysis. Neurosci Biobehav Rev 2018;117:16-83.
38. Capık C. Use of confirmatory factor analysis in validity and reliability studies. Journal of Anatolia Nursing and Health Sciences 2014;17:196-205.
39. Alpar R. Applied statistics and validity and reliability with examples from sports, health and education sciences. Ankara: Detay Yayıncılık, 2010. (in Turkish).
40. Dolgun G, İnal S, Erdim L, Korkut S. Reliability and validity of the Bristol Breastfeeding Assessment Tool in the Turkish population. Midwifery 2018;57:47-53.
41. Laursen M, Johansen C, Hedegaard M. Fear of childbirth and risk for birth complications in nulliparous women in the Danish National Birth Cohort. BJOG 2009;116:1350-5.
42. Madhavanprabhakaran GK, Kumar KA, Ramasubramaniam S. Effects of pregnancy related anxiety on labour outcomes: a prospective cohort study. J Res Nurs Midwifery 2013;2:96-103.
43. Nieminen K, Stephansson O, Ryding EL. Women's fear of childbirth and preference for cesarean section -a cross-sectional study at various stages of pregnancy in Sweden. Acta Obstet Gynecol Scand 2009;88:807-13.

Appendix 1. Turkish version of the Fetal Health Anxiety Inventory (FHAI)

1. (a) I do not worry about my baby's health.
(b) I occasionally worry about my baby's health.
(c) I spend much of my time worrying about my baby's health.
(d) I spend most of my time worrying about my baby's health.

2. (a) If I notice pains/discomforts, I rarely worry about what this means for my baby.
(b) If I notice pains/discomforts, I sometimes worry about what this means for my baby.
(c) If I notice pains/discomforts, I often worry about what this means for my baby.
(d) If I notice pains/discomforts, I always worry about what this means for my baby.

3. (a) As a rule I am not concerned about how my own bodily sensations/changes are related to my baby's health.
(b) Sometimes I am concerned about how my own bod- ily sensations/changes are related to my baby's health.
(c) I am often concerned about how my own bodily sensations/changes are related to my baby's health.
(d) I am constantly concerned about how my own bodily

4. (a) Resisting thoughts of my baby having a health problem is never a problem.
(b) Most of the time I can resist thoughts of my baby having a health problem.
(c) I try to resist thoughts of my baby having a health problem but am often unable to do so.
(d) Thoughts of my baby having a health problem are so strong that I no longer even try to resist them.

5. (a) As a rule I am not afraid that my baby has a serious health problem.
(b) I am sometimes afraid that my baby has a serious health problem.
(c) I am often afraid that my baby has a serious health problem.
(d) I am always afraid that my baby has a serious health problem.

6. (a) I do not have images (mental pictures) of my baby having a health problem.
(b) I occasionally have images of my baby having a health problem.
(c) I frequently have images of my baby having a health problem.
(d) I constantly have images of my baby having a health problem.

7. (a) I do not have any difficulty taking my mind off thoughts about my baby's health.
(b) I sometimes have difficulty taking my mind off thoughts about my baby's health.
(c) I often have difficulty taking my mind off thoughts about my baby's health.
(d) Nothing can take my mind off thoughts about my baby's health.

8. (a) I am lastingly relieved if my doctor tells me there is nothing wrong with my baby.
(b) I am initially relieved but the worries sometimes return later.
(c) I am initially relieved but the worries always return later.
(d) I am not relieved if my doctor tells me there is nothing wrong with my baby.

9. (a) If I hear about a health problem in developing babies I never think my baby has it.
(b) If I hear about a health problem in developing babies I sometimes think that my baby has it.
(c) If I hear about a health problem in developing babies I often think my baby has it.
(d) If I hear about a health problem in developing babies I always think that my baby has it.

10. (a) If I have a bodily sensation or change I rarely wonder what it means for my baby.

(b) If I have a bodily sensation or change I often wonder what it means for my baby.

(c) If I have a bodily sensation or change I always wonder what it means for my baby.

(d) If I have a bodily sensation or change I must know what it means for my baby.

11. (a) I usually feel at very low risk for my baby developing a serious health problem.

(b) I usually feel at fairly low risk for my baby developing a serious health problem.

(c) I usually feel at moderate risk for my baby developing a serious health problem

(d) I usually feel at high risk for my baby developing a serious health problem.

12. (a) I never think that my baby has a serious health problem.

(b) I sometimes think that my baby has a serious health problem.

(c) I often think that my baby has a serious health problem.

(d) I usually think that my baby has a serious health problem.

13. (a) If I notice an unexplained bodily sensation that is (or could be) related to my baby's development I don't find it difficult to think about other things.

(b) If I notice an unexplained bodily sensation that is (or could be) related to my baby's development I sometimes find it difficult to think about other things.

(c) If I notice an unexplained bodily sensation that is (or could be) related to my baby's development I often find it difficult to think about other things.

(d) If I notice an unexplained bodily sensation that is (or could be) related to my baby's development I always find it difficult to think about other things.

14. (a) My family/friends would say I do not worry enough about my baby's health.

(b) My family/friends would say I have a normal attitude about my baby's health.

(c) My family/friends would say I worry too much about my baby's health.

(d) My family/friends would say I am extreme in my worries about my baby's health.