Determination of Factors Affecting Anxiety and Comfort Level of Pregnant Women During Non-Stress Test Application

Yasemin ERKAL-AKSOY[1] , **Bihter AKIN**[1] , **Sinem DEĞIRMENCİ**[2]

[1]Department of Midwifery, Selçuk University, Faculty of Health Sciences, Konya, Türkiye
[2]Republic of Türkiye, Ministry of Health, İstanbul, Türkiye

ABSTRACT

Objective: The aim of this study is the assessment of pregnant women's anxiety and comfort level during the NST procedure.

Methods: This study is a descriptive study. The study population consisted of all pregnant women who accepted to work at a University Hospital in Konya/Türkiye, affiliated to the Ministry of Health, between November 2021 and February 2022 and enrolled in the NST polyclinic. The study sample consisted of 331 volunteer pregnant women who were over 18 years of age and who presented to the NST Polyclinic after the 32nd gestational week. The data collection instruments used were the personal information form, the NST Evaluation Form, the State and Trait Anxiety Inventory, and the Prenatal Comfort Scale.

Results: It was found that the occurrence of problems during pregnancy (nausea, vomiting, etc.) and gravida were variables that influenced the anxiety level of pregnant women. Pregnant women's body mass index, the occurrence of problems during pregnancy, gravida, number of births, knowledge of the purpose of the NST procedure, and mother's position of the during the NST procedure are the factors that influence pregnant women's comfort level.

Conclusion: Consistent with these results, it is important to determine the factors that influence the anxiety and comfort level of pregnant women.

Keywords: Anxiety, comfort, non-stress test, pregnancy

Introduction

Cardiotocography (CTG) is a commonly used fetal monitoring technique to assess fetal well-being during pregnancy and labor. CTG refers to the non-stress test (NST) during pregnancy.[1] The NST is a prenatal test that measures the fetal heart rate (FHR) in response to movements and contractions. During NST, 2 transducers are inserted into the pregnant women's abdomen to record the FHR and contractions of the uterus. The NST is a non-invasive method that is painless, does not take long, and is easy to interpret.[2] Although the use of NST in low-risk pregnancies has not been shown to improve perinatal outcomes, the NST procedure is routinely used in Türkiye at every follow-up of pregnant women, beginning at 32 weeks in every pregnancy.[3] The procedure lasts at least 20 minutes, except in pathological cases (non-reactive NST; decreased variability, decelerations, etc.). The mother is asked to assume a supine position, a fully seated position, a semi-sitting position (semi-fawler), or a left lateral position during the NST procedure.[3,4] However, the supine position may affect the outcome of NST because the mother exerts pressure on the inferior vena cava and suppresses venous circulation. Therefore, the supine position should not be preferred during the NST procedure.[4] Pregnant women may experience anxiety during NST even though it is a painless and non-invasive method that identifies potential risks to the fetus.[3,5] The level of anxiety may be higher in pregnant women undergoing this procedure for the first time. Anxiety levels may increase for reasons such as pregnant women's lack of knowledge about the procedures performed during their prenatal follow-up, the unfamiliar environment of the hospital, and the fact that they must lie down for at least 20 minutes during the NST procedure. Müller et al. showed in their study that fetal health assessment tests can induce anxiety in pregnant women.[6] As the level of anxiety in pregnant women increases, the false nonreactive test rate of the NST may increase. This may lead to false evaluations.[3,7] An abnormal test result is often more likely to be a false positive (healthy fetus) than a true positive (compromised fetus). Due to increased false positive rates

Corresponding author: Yasemin ERKAL-AKSOY, e-mail: ebeyaseminerkal@hotmail.com

for NST results, this may lead to an increase in operative deliveries.[5,8] Literature studies show that there is a strong association between mothers' psychology and their babies' health.[9,10] At the same time, reasons such as the duration of the NST procedure and the need to remain in the same position can negatively affect the comfort level of pregnant women.[4,11] Comfort is the absence of physical, social, and spiritual stress, i.e., the state of being comfortable. The concept of comfort; It is defined as the experience of satisfying basic human needs to relax, be peaceful and overcome problems.[12] Pregnant women's comfort can be affected by anatomical and physiological changes during pregnancy.[13] Changes in position during the NST procedure (pressure of the uterus on the inferior vena cava, lying in the same position for a long time) can further reduce women's comfort level. For these reasons, it is believed that pregnant women's anxiety and comfort levels may be affected during the NST procedure. As far as the investigators are aware, there is no study that determines women's anxiety and comfort levels during the NST procedure. This study was planned to investigate the relationship between pregnant women's anxiety and comfort levels during the NST procedure and the factors affecting them.

Aim

This study aims to detect the factors affecting pregnant women's anxiety and comfort during NST use and to evaluate the relationship between them.

Methods

This study is descriptive and correlational. The study population consisted of all pregnant women who were accepted to work at Necmettin Erbakan University Meram Faculty of Medicine in Konya/Türkiye, affiliated to the Ministry of Health, and applied to the NST outpatient clinic between November 2021 and February 2022. Sample size calculations were performed using the G*Power 3.1.7 computer program. Using the known value of the State Anxiety Scale (53.16 ± 7.28), the sample size was determined as 326 pregnant women with an effect size of 0.13 and a power of 85% within a deviation of 1 point.[14] Considering the data losses, 331 pregnant women were included in the study. After the study, a post-hoc power analysis was performed using the State Anxiety Scale mean score, and it was found that the power of the study was 73%. In order to strengthen the study, the inclusion criteria were specified factors that are likely to influence the level of anxiety and comfort, such as age, education, and prenatal and fetal risk factors. Inclusion criteria: participants in the study having least 18 years old, having 32 to 42 gestational weeks, willing to take part, having at least elementary school education, having no psychological disorders, having no prenatal risk factors (intrauterine growth restriction, gestational diabetes, premature rupture of membranes, preeclampsia, etc.) and having no diagnosed fetal risk factor (cardiovascular disorder anomaly, etc.). Exclusion criteria: participants with twin pregnancies, working in health field and incomplete all data collecting forms were excluded from the study. The study, some participants were excluded because 3 of them having twin pregnancies, 11 of them did not complete all forms, and 3 of them had gestational diabetes.

The dependent variable of the study was the administration of NST to the pregnant women, and the independent variables were the pregnant women's sociodemographic characteristics, anxiety and comfort levels.

The research questions were determined as "What is the effect of the NST procedure on anxiety and comfort levels of pregnant women?" and "Is there a relationship between the pregnant women's anxiety and comfort levels during the NST procedure?"

Data Collection Tools

The personal information form, NST Evaluation Form, State and Trait Anxiety Inventory, and Prenatal Comfort Scale were utilized as data collection instruments.

Personal Information Form

It consists of 17 questions about women's sociodemographic and obstetric characteristics. The questions were developed by the researchers based on a literature review.[3,9]

NST Evaluation Form

It consists of 19 questions created by the researchers to record and evaluate the outcomes related to the NST procedure.[3,9] Expert opinions of 2 midwives and 2 obstetricians were obtained in the preparation of this questionnaire. The NST evaluation form included FHR and variability tracked for at least 20 minutes, the number of accelerations, decelerations, and fetal movements, and the test result (reactive or nonreactive). At the same time, questions were asked about the pregnant women's knowledge of the NST procedure and the discomfort they felt during the procedure. The NST application was carried out using a Philips Avalon FM20 NST device. A midwife and a physician, who were not researchers evaluated the NST results. An NST result was classified as reactive if 2 or more FHR accelerations of at least 15 beats per minute occurred that deviated from baseline for at least 15 seconds (not necessarily with a constant peak). The application of the NST lasted at least 20 minutes. Depending on the condition of the baby and the mother, the NST was administered for 40 minutes or longer.

85

State and Trait Anxiety Inventory/State-Trait Anxiety Inventory (STAI)

Spielberger et al. developed the State and Trait Anxiety Inventory.[15] The scale was translated into Turkish by Öner and Le Compte and validated in different groups.[16] The inventory contains 40 expressions. These expressions allow people to express their feelings. Depending on the strength of the person's emotions and feelings, they should mark one of the options "Never (1), A little (2), Quite (3) or Completely (4)." The State Anxiety Inventory measures how a person feels at a specific time and in particular circumstances. The Trait Anxiety Inventory assesses a person's feelings regardless of the situation and conditions. In this study, pregnant women's anxiety levels were measured using the State Anxiety Inventory. The scale consists of direct and reverse statements. The sum of the weighted scores for the inverted statements is subtracted from the sum of the weighted scores for the direct statements. To this number, 50 points are added for the given and unchanged state anxiety inventory. The final value yields the person's anxiety score. Increasing scores on the inventory indicate high levels of anxiety and decreasing scores indicate low levels of anxiety. It is also used with scale score intervals. Oner and Le Compte (1983) reported a Cronbach's alpha coefficient of 0.91 for the State Anxiety Inventory.[16] In our study, the inventory's Cronbach's alpha was calculated at 0.86.

Prenatal Comfort Scale (PCS)

It is a scale that was developed in 2011 by Takeishi et al. in Japan for the determination of prenatal comfort.[17] While the original form of the scale contained 35 items, Nakamura et al. revised and shortened it to 15 items.[18] The short version of the scale has 15 items and 5 subscales. The subscale "husband" stands for "deepening relationships with the husband going to be a father." The subscale "fetus" means "interacting with fetal movements." The subscale "people" represents "social support from the people around." The subscale "mother" stands for "realization of becoming a mother and attachment with the baby." The subscale "myself" means "recognizing changes in pregnancy." The scale is a 6-point Likert scale. For each item it is possible to choose between 0 and 5: 0=Strongly disagree, 1=Disagree, 2=Undecided, 3=Agree somewhat, 4=Agree, 5=Completely agree. The scale is scored with a total of 75 points. Low scores indicate low comfort level,

high scores indicate high comfort level. The scale contains no items with reversed scores and no cutoff points. The scale's Cronbach's alpha is 0.95.[17] It has been reported that the Cronbach's alpha value of the scale, validated and reliable in Turkish by Kaya Şenol et al., was 0.82.[19] In our study, the scale's Cronbach's alpha was calculated at 0.92.

Data Collection

The study was conducted between November 2021 and February 2022 at the Necmettin Erbakan University Meram Faculty of Medicine of NST Polyclinic in Province of Konya/Türkiye under the direction of the Ministry of Health. To achieve the sample size, pregnant women were enrolled in the study using the convenience sampling method. Convenience sampling is a method often used by researchers to select participants as they are often easily and quickly available.[20] The personal information form, NST evaluation form, State and Trait Anxiety Inventory, and Prenatal Comfort Scale in the questionnaire were collected face to face by the researchers. Pregnant women had information about the study before the start of the NST procedure. They had time to decide whether to participate. Women who agreed to participate in the study were filled a personal information form during the NST procedure. The State and Trait Anxiety Inventory was filled at the 15th minute of the NST procedure and the Prenatal Comfort Scale was completed at the end of the procedure. Then psychological support was provided to pregnant women identified as having severe anxiety during the study's data collection process. Finally, the NST evaluation form was filled in by consulting a specialist physician working in the polyclinic.

Statistical Analysis

Data from the study were analyzed on computer using the Statistical Package for Social Sciences version 20.0 software (IBM Corp.; Armonk, NY, USA). The normal distribution of the data and the values of skewness and kurtosis were examined; non-parametric tests were used for the data that did not follow a normal distribution, and parametric tests were used for the data that did follow a normal distribution. Descriptive results, numbers, and percentages are reported in a frequency table. The difference between the information on the NST procedure and the scale scores of the pregnant women was analyzed with the *t*-test (Mann–Whitney *U*-test under non-parametric conditions) and the ANOVA (analysis of variance) in independent groups. Pearson product–moment correlation was used to analyze the relationship between the scale scores of the pregnant women. Linear regression analysis was used to further analyze the variables affecting pregnant women's anxiety and comfort levels during the NST procedure.

Ethical Considerations

Approval was obtained for the conduct of the study at the meeting of the Ethics Committee for Non-Interventional Clinical Research of the Faculty of Health Sciences of the Selçuk University (Approval no: 2021/1772, Date: October 27, 2021). Official approval was obtained from the Chief Medical Officer of the Meram Faculty of Medicine of the Necmettin Erbakan University the institution where the study was conducted. Before the start of the study, pregnant women were informed about the study by the researchers and their verbal consent was obtained.

Results

The mean age of the pregnant women in the study was 27.15 ± 4.65 (min=18, max=40), and the mean body mass index (BMI) was 28.59 ± 4.15 (min = 19.95, max = 46.56). The mean gestational week was 36.17 ± 2.29 (min = 32, max = 42), and 59.2% of pregnant women were multiparous. Vaginal delivery was the last method in 62.8% of the multiparous women, and cesarean section in 37.2%.

This study shows that the levels of state anxiety are higher in pregnant women aged 18 to 30 than in those aged 31 years and over, and in pregnant women with one pregnancy compared to pregnant women with 3 pregnancies. State anxiety scores of those who took continuous prescribed medications are lower than those who did not take prescribed medications and those who had problems during pregnancy (nausea, vomiting, back pain, etc.) than those who did not have problems. State anxiety scores of primiparous pregnant women were higher than multiparous pregnant women. It was determined that there was no statistically significant difference between descriptive characteristics such as educational status, family type, employment status, income status, etc. and state anxiety levels of pregnant women.

The mean score on the PCS mother (realization of becoming a mother and attachment with the baby) subscale is higher for pregnant women who work outside the home than for women who do not. Those with high perceived family income had higher mean scores PCS total, people (social support from the people around) and myself (recognizing changes in pregnancy) subscale than those with low family income. Those who had a normal BMI during pregnancy had higher mean scores for the PCS total, husband (deepening relationships with the husband going to be a father), people (social support from the people around), mother (realization of becoming a mother and attachment with the baby), and myself (recognizing changes in pregnancy) subscale than those who were obese. Mean scores for the PCS total, husband (deepening relationships with the husband going to be a father), and myself (recognizing changes in pregnancy) subscales were lower in pregnant women with chronic diseases (asthma, thyroid, etc.) than in women without chronic diseases. Mean scores of the PCS total, husband (deepening relationships with the husband going to be a father), people (social support from the people around) and myself (recognizing changes in pregnancy) subscale were lower in pregnant women who took continuous prescribed medications than in those who did not. Those who had problems during pregnancy (nausea, vomiting, back pain, etc.) were found to have lower mean scores on the PCS total, husband (deepening relationships with the husband going to be a father), fetus (interacting with fetal movements), people (social support from the people around), and myself (recognizing changes in pregnancy) subscale than those who did not. As the number of pregnancies increased, the mean scores of the PCS total and all subscales decreased. Primiparous pregnant women were found to the have higher PCS total, husband (deepening relationships with the husband going to be a father) and people (social support from the people around) subscale mean scores than multiparous pregnant women (Table 1).

Pregnant women reported knowing the purpose of the NST procedure; 38.4% was to determine the baby's heart tones, 29.5% was to determine if they were in pain, 18.1% was to assess the baby's health, and 13.9% was to determine if delivery had begun. It was found that 93.4% of pregnant women thought that the NST procedure provided safety for the health of the baby. When the physical discomforts of pregnant women during the NST procedure were examined, 51.6% of women reported that they had lower back pain, 25.6% had back pain, and 22.8% had shortness of breath. The mean duration of the NST procedure among pregnant women was 22.79 ± 5.60 (min=20, max=50) minutes. When the NST results of the pregnant women were evaluated, the mean number of accelerations was 3.51 ± 1.68, the mean number of decelerations was 1.10 ± 1.38, the mean FHR was 144.54 ± 9.62, and the mean number of fetal movements was 2.64 ± 1.79. When the results of those with deceleration were examined, it was found that 43.9% had early deceleration (Early deceleration is a symmetrical decrease and return of the FHR associated with the contraction of the uterus), 17.9% had late deceleration (A FHR that appears to gradually decline after uterine contraction is known as late deceleration), and 38.2% had variable deceleration

Table 1. Comparison of Pregnant Women's Descriptive Characteristics with Mean Scale Scores

Characteristics	n (%)	STAI-Total State Mean ± SD	Total PCS Mean ± SD	PCS Subscale Husband Mean ± SD	Fetus Mean ± SD	People Mean ± SD	Mother Mean ± SD	Myself Mean ± SD
Age Groups								
18-30 years old	245 (74.0)	49.04 ± 6.79	69.66 ± 7.83	18.67 ± 2.33	9.53 ± 0.99	14.11 ± 1.88	14.09 ± 1.57	13.24 ± 2.61
31 years old and older	86 (26.0)	46.81 ± 7.63	67.95 ± 10.83	18.27 ± 3.19	9.46 ± 1.36	13.52 ± 2.75	13.97 ± 2.06	12.70 ± 3.00
T		**2.539**	1.564	1.231	0.503	1.843	0.545	1.560
P		**.012**	.119	.219	.615	.068	.586	.120
Education Level								
Primary education	74 (22.4)	49.10 ± 7.77	68.90 ± 10.64	18.47 ± 2.88	9.41 ± 1.37	13.85 ± 2.29	13.89 ± 2.13	13.27 ± 2.83
Secondary education	161 (48.6)	48.37 ± 7.05	69.17 ± 8.06	18.57 ± 2.58	9.54 ± 0.95	13.90 ± 2.30	14.12 ± 1.45	13.03 ± 2.69
High education	96 (29.0)	48.13 ± 6.59	69.53 ± 8.25	18.64 ± 2.34	9.55 ± 1.10	14.14 ± 1.77	14.09 ± 1.76	13.09 ± 2.70
F		0.421	0.111	0.093	0.377	0.509	0.485	0.195
P		.657	.895	.911	.686	.602	.616	.823
Working Status Outside the Home								
Yes	49 (14.8)	47.32 ± 7.23	70.75 ± 5.34	18.95 ± 1.75	9.71 ± 0.81	14.30 ± 1.31	14.51 ± 0.91	13.26 ± 2.16
No	282 (85.2)	48.66 ± 7.04	68.95 ± 9.17	18.50 ± 2.70	9.48 ± 1.14	13.90 ± 2.27	13.98 ± 1.80	13.07 ± 2.81
T		−1.224	1.923	1.131	1.718	1.756	**3.096**	0.452
P		.222	.057	.259	.089	.082	**.002**	.651
Family Type								
Nuclear family	277 (83.7)	48.63 ± 6.94	69.14 ± 8.16	18.53 ± 2.47	9.52 ± 1.00	13.95 ± 2.11	14.03 ± 1.58	13.09 ± 2.57
Extended family	54 (16.3)	47.61 ± 7.77	69.59 ± 11.28	18.75 ± 3.09	9.48 ± 1.50	14.00 ± 2.37	14.18 ± 2.29	13.16 ± 3.41
Z		−0.848	−1.088	−1.096	−0.319	−0.441	**−2.052**	−0.917
P		.396	.276	.273	.750	.659	**.040**	.359
Perception of Family's Monthly Income Level								
Income less than expense[a]	22 (6.6)	47.22 ± 8.53	66.72 ± 10.58	18.04 ± 3.38	9.54 ± 0.80	12.68 ± 3.80	14.04 ± 1.46	12.40 ± 2.95
Income equal to expense[b]	290 (87.6)	48.42 ± 7.00	69.11 ± 8.76	18.54 ± 2.58	9.48 ± 1.15	14.00 ± 2.02	14.02 ± 1.77	13.05 ± 2.75
Income more than expense[c]	19 (5.7)	50.52 ± 6.28	73.63 ± 2.21	19.63 ± 0.76	9.94 ± 0.22	14.73 ± 0.45	14.63 ± 0.76	14.68 ± 0.67
F		1.146	**3.390**	2.082	1.575	**5.287**	1.109	**4.040**
P		.319	**.035[c>a]**	.126	.209	**.005[b,c>a]**	.331	**.018[c>a,b]**
BMI Groups								
18.6–24.9 (Normal)[a]	62 (18.7)	49.19 ± 7.17	71.40 ± 4.80	19.08 ± 1.40	9.66 ± 0.67	14.45 ± 1.05	14.29 ± 1.12	13.91 ± 1.35
25-29.9 (Overweight)[b]	175 (52.9)	48.86 ± 7.11	69.74 ± 8.85	18.75 ± 2.60	9.53 ± 1.13	14.00 ± 2.18	14.17 ± 1.73	13.28 ± 2.73
30 and over (Obese)[c]	94 (28.4)	47.24 ± 6.86	66.79 ± 9.95	17.90 ± 3.01	9.39 ± 1.25	13.56 ± 2.56	13.70 ± 1.94	12.23 ± 3.13
F		2.020	**6.048**	**4.884**	1.137	**3.263**	**3.054**	**8.287**
P		.134	**.003[a,b>c]**	**.008[a,b>c]**	.322	**.040[a>c]**	**.049[a>c]**	**<.001[a,b>c]**
Presence of Chronic Disease (Asthma, Thyroid, etc.)								
Yes	37 (11.2)	47.08 ± 8.05	65.59 ± 11.11	17.67 ± 3.18	9.08 ± 1.67	13.32 ± 2.47	13.51 ± 2.29	12.00 ± 3.00
No	294 (88.8)	48.64 ± 6.94	69.67 ± 8.29	18.68 ± 2.48	9.57 ± 0.99	14.04 ± 2.10	14.13 ± 1.61	13.24 ± 2.66
T		−1.265	**−2.704**	**−2.257**	−1.744	−1.910	−1.593	**−2.363**
P		.207	**.007**	**.025**	.089	.057	.119	**.009**
Continuous Prescribed Medication Use								
Yes	26 (7.9)	45.19 ± 7.25	64.46 ± 11.93	17.38 ± 3.37	9.03 ± 1.84	13.11 ± 2.74	13.46 ± 2.38	11.46 ± 3.31
No	305 (92.1)	48.74 ± 7.00	69.62 ± 8.30	18.67 ± 2.48	9.55 ± 1.00	14.03 ± 2.09	14.11 ± 1.63	13.24 ± 2.62
T		**−2.476**	**−2.926**	**−2.463**	−1.417	**−2.090**	−1.872	**−3.246**
P		**.014**	**.004**	**.014**	.168	**.037**	.062	**.001**
Having Problems During Pregnancy (Nausea, Vomiting, Back Pain, etc.)								
Yes	46 (13.9)	45.63 ± 9.14	62.56 ± 14.80	17.00 ± 4.37	8.95 ± 2.08	12.54 ± 3.61	13.30 ± 3.05	10.76 ± 3.73
No	285 (86.1)	48.92 ± 6.59	70.29 ± 6.74	18.82 ± 2.06	9.60 ± 0.81	14.18 ± 1.72	14.18 ± 1.35	13.48 ± 2.31
T		**−2.374**	**−3.481**	**−2.783**	**−2.089**	**−3.030**	−1.928	**−4.790**
P		**.023**	**.001**	**.008**	**.042**	**.004**	.060	**<.001**
Gravida (Number of Pregnancies)								
One[a]	127 (38.4)	49.53 ± 6.36	70.73 ± 5.98	19.00 ± 1.72	9.63 ± 0.79	14.33 ± 1.34	14.22 ± 1.41	13.53 ± 2.22
Two[b]	111 (33.5)	48.83 ± 6.37	70.65 ± 7.45	18.89 ± 2.17	9.60 ± 1.01	14.39 ± 1.51	14.23 ± 1.50	13.53 ± 2.50
Three and above[c]	93 (28.1)	46.56 ± 8.38	65.43 ± 11.73	17.61 ± 3.59	9.24 ± 1.47	12.92 ± 3.15	13.64 ± 2.20	12.00 ± 3.25
F		**5.056**	**13.060**	**9.453**	**3.961**	**16.291**	**3.921**	**11.257**
P		**.007[a>c]**	**<.001[a,b>c]**	**<.001[a,b>c]**	**.020[a>c]**	**<.001[a,b>c]**	**.021[a,b>c]**	**<.001[a,b>c]**
Number of Births								
Primiparous (never given birth)	135 (40.8)	49.54 ± 6.40	70.57 ± 6.12	18.95 ± 1.77	9.61 ± 0.81	14.34 ± 1.33	14.21 ± 1.41	13.45 ± 2.48
Multiparous (given 1 or more births)	196 (59.2)	47.72 ± 7.43	68.28 ± 10.05	18.31 ± 2.99	9.44 ± 1.26	13.69 ± 2.54	13.95 ± 1.89	12.86 ± 2.86
T		**2.382**	**2.578**	**2.450**	1.455	**2.982**	1.335	1.943
P		**.018**	**.010**	**.015**	.147	**.003**	.183	.053

Note: *P* values < .05 are shown in bold in the table, and the source of the difference between groups are shown with symbols a, b, c.
F, ANOVA test; PCS, Prenatal Comfort Scale. SD, standard deviation, STAI, State-Trait Anxiety Inventory; *T*, independent groups *t*-test; Z, Mann–Whitney *U*-test.

(Variable decelerations is defined as intermittent decrease of FHR, occurring with less than half of uterine contractions). It was found that the variability status was moderate in 76.7%, 13.9% had increased level, 8.5% had decreased level and 0.9% had no variability. It was stated that there was no difference between the variables related to the NST procedure and the mean scores of the State Anxiety Scale of pregnant women. Mean scores on the PCS total and husband (deepening relationships with the husband going to be a father), fetus (interacting with fetal movements), mother (realization of becoming a mother and attachment with the baby), and myself (recognizing changes in pregnancy) subscales are higher in pregnant women who underwent NST in the previous pregnancy than in pregnant women who did not. Pregnant women who know the purpose of the NST procedure have higher PCS score averages for total, husband (deepening relationships with the husband going to be a father), people (social support from the people around), and mother (realization of becoming a mother and attachment with the baby) subscales than women who do not. Pregnant women who were placed in the left lateral position during the NST procedure were found to have higher PCS total and myself (recognizing changes in pregnancy) subscale score averages than pregnant women who were supine (Table 2).

Table 2. Comparison of Pregnant Women the Results of the NST Procedure with the Mean Scale Scores

Variables	n(%)	STAI-Total State Mean ± SD	Total PCS Mean ± SD	PCS Subscale Husband Mean ± SD	Fetus Mean ± SD	People Mean ± SD	Mother Mean ± SD	Myself Mean ± SD
The Person Who for the NST								
Alone	102 (30.8)	48.65 ± 7.32	68.12 ± 10.42	18.35 ± 2.98	9.44 ± 1.30	13.55 ± 2.73	13.97 ± 1.89	12.80 ± 2.92
My partner	156 (47.1)	47.80 ± 7.10	69.60 ± 8.49	18.65 ± 2.50	9.58 ± 1.05	14.08 ± 2.04	14.09 ± 1.74	13.17 ± 2.80
Other (Mother, mother-in-law, etc.)	73(22.1)	49.63 ± 6.59	69.91 ± 6.25	18.71 ± 2.12	9.47 ± 0.88	14.24 ± 1.24	14.12 ± 1.35	13.35 ± 2.19
F		1.718	1.183	0.550	0.565	2.713	0.221	0.992
P		.181	.308	.577	.569	.068	.801	.372
Status of Applying NST Procedure in Her Previous Pregnancy								
Yes	293(88.5)	48.59 ± 7.02	69.70 ± 8.58	18.73 ± 2.46	9.54 ± 1.10	14.06 ± 2.01	14.13 ± 1.73	13.23 ± 2.62
No	38(11.5)	47.47 ± 7.56	65.44 ± 9.01	17.34 ± 3.11	9.31 ± 1.09	13.15 ± 2.96	13.52 ± 1.46	12.10 ± 3.28
T		0.920	**2.860**	**2.650**	**1.195**	1.832	**2.063**	**2.032**
P		.358	**.005**	**.011**	**.233**	.074	**.040**	**.048**
Knowing the Purpose of the NST Procedure								
Yes	279(84.3)	48.74 ± 7.10	69.74 ± 8.59	18.73 ± 2.51	9.53 ± 1.11	14.10 ± 1.98	14.14 ± 1.68	13.22 ± 2.69
No	52(15.7)	47.00 ± 6.84	66.38 ± 8.99	17.73 ± 2.82	9.40 ± 1.01	13.21 ± 2.81	13.61 ± 1.80	12.42 ± 2.80
T		1.633	**2.570**	**2.584**	0.803	**2.177**	**2.063**	1.968
P		.104	**.011**	**.010**	.422	**.033**	**.040**	.050
Feeling Restricted During the NST Procedure								
Yes	85(25.7)	49.57 ± 6.65	70.63 ± 8.76	19.00 ± 2.45	9.56 ± 1.13	14.18 ± 1.94	14.16 ± 1.84	13.71 ± 2.02
No	246(74.3)	48.08 ± 7.19	68.72 ± 8.68	18.42 ± 2.61	9.50 ± 1.09	13.88 ± 2.22	14.02 ± 1.66	12.89 ± 2.89
T		1.678	1.742	1.768	0.466	1.127	0.631	**2.880**
P		.094	.082	.078	.641	.260	.528	**.004**
Feeling Discomfort Based on the Position During NST Procedure								
Yes	119(36.0)	49.24 ± 7.14	69.25 ± 9.22	18.52 ± 2.66	9.49 ± 1.15	13.95 ± 2.28	13.99 ± 1.75	13.27 ± 2.77
No	212(64.0)	48.03 ± 7.02	69.19 ± 8.46	18.59 ± 2.54	9.52 ± 1.07	13.96 ± 2.09	14.10 ± 1.69	13.00 ± 2.69
T		1.495	0.054	−0.235	−0.257	−0.017	−0.571	0.873
P		.136	.957	.814	.797	.986	.569	.383
Feeling Discomfort Based on the Duration of the NST Procedure								
Yes	105(31.7)	49.11 ± 6.98	69.71 ± 7.43	18.70 ± 2.22	9.53 ± 0.94	13.93 ± 2.14	14.14 ± 1.36	13.40 ± 2.16
No	226(68.3)	48.16 ± 7.11	68.98 ± 9.27	18.51 ± 2.73	9.50 ± 1.17	13.97 ± 2.16	14.02 ± 1.85	12.96 ± 2.94
T		1.132	0.705	0.627	0.188	−0.157	0.574	1.512
P		.259	.481	.531	.851	.875	.566	.132
Position of the Mother During the NST Procedure								
Supine[a]	187(56.5)	47.88 ± 7.43	68.14 ± 10.06	18.29 ± 2.97	9.45 ± 1.25	13.75 ± 2.47	13.88 ± 1.95	12.75 ± 3.12
Left lateral[b]	134(40.5)	49.19 ± 6.52	70.48 ± 6.53	18.88 ± 1.96	9.58 ± 0.86	14.23 ± 1.62	14.26 ± 1.33	13.50 ± 2.05
Semi-fawler (half-sitting)[c]	10(3.0)	49.60 ± 7.15	72.30 ± 3.80	19.60 ± 0.96	9.60 ± 0.84	14.10 ± 1.72	14.80 ± 0.42	14.20 ± 1.03
F		1.464	**3.500**	2.906	0.568	2.001	2.891	**3.890**
P		.233	**.031[b>a]**	.056	.567	.137	.057	**.021[b>a]**
Results of NST								
Reactive NST	282(85.2)	48.76 ± 6.74	69.36 ± 8.84	18.60 ± 2.58	9.52 ± 1.14	13.99 ± 2.12	14.08 ± 1.74	13.15 ± 2.73
Non-reactive NST	49(14.8)	46.77 ± 8.65	68.34 ± 8.06	18.36 ± 2.60	9.46 ± 0.84	13.77 ± 2.38	13.93 ± 1.54	12.79 ± 2.68
T		1.529	0.756	0.606	0.325	0.650	0.551	0.854
P		.132	.450	.545	.746	.516	.582	.394

Note: *P* values less than .05 are shown in bold in the table, and the source of the difference between groups are shown with symbols a, b, c.
NST, non-stress test;, STAI, State-Trait Anxiety Inventory;, PCS, Prenatal Comfort Scale; SD, standard deviation; *r*, correlation coefficient.*T,* independent groups *t*-test; *F,* ANOVA test.

Table 3. The Relationship between STAI and PCS Scale Scores of Pregnant Women during the NST Procedure

Scales	Mean ± SD	r
STAI-Total State	48.46 ± 7.08	
Total PCS	69.21 ± 8.73	0.501*
Husband	18.57 ± 2.58	0.423*
Fetus	9.51 ± 1.10	0.369*
People	13.96 ± 2.15	0.418*
Mother	14.06 ± 1.71	0.413*
Myself	13.10 ± 2.72	0.465*

NST, non-stress test; STAI, State-Trait Anxiety Inventory; PCS, Prenatal Comfort Scale; SD, standard deviation; r, correlation coefficient.
*P < .001.

When the state anxiety groups of pregnant women were examined, it was found that 14.8% of them had a score of 0 to 40 (no anxiety), 81% of them had a score of 41 to 60 (mild anxiety), and 4.2% of them had a score of 61 and above (severe anxiety). It was determined that during NST procedure, there was a positive significant correlation between the total State Anxiety Scale score of pregnant women and the total scores and subscales of PCS (r = 0.36-0.50 value range) (Table 3).

Table 4 shows the evaluation of factors affecting anxiety and comfort levels of pregnant women during the NST procedure using multiple linear regression analysis. According to Model 1, a significant relationship was found between state anxiety and having problems during pregnancy (nausea, vomiting, back pain, etc.) (P = .020) and gravida (P = .006). According to Model 2, a significant association was found between the variables PCS scores and BMI (P = .006), having problems during pregnancy (nausea, vomiting, back pain, etc.) (P < .001), gravida (P < .001), number of births (P = .049), knowledge of the purpose of the NST procedure (P = .022) and position of the mother during the NST procedure (P = .006) determined (Table 4).

Discussion

Many factors can affect pregnant women's anxiety and comfort during the NST procedure. Our study found that state anxiety levels were high in pregnant women aged 18 to 30 years and in primiparous pregnant women during the NST procedure. There is no evidence at all that it is beneficial to do this for women with low risk pregnancies, so it should be abandoned the routine NST practice for low risk pregnant women.[21] Those who are obese and have problems (nausea, vomiting,

back pain, etc.) during their pregnancy have lower comfort levels. The comfort levels of those with 3 or more pregnancies and those with multiparous pregnancies were found to be lower. Similar studies have reported lower comfort levels in multiparous pregnant women.[11,22,23] It can be assumed that the weight gains during pregnancy and the physical changes that increase with the number of pregnancies have a negative impact on comfort of pregnant women. Providing weight management during pregnancy with a diet program implemented by a specialist to obese pregnant women can positively affect their comfort levels.

Pregnant women may be psychologically affected and experience discomfort with some applications during pregnancy, such as the NST procedure. In a qualitative study, pregnant women said they were afraid that something might happen to their baby during the NST procedure.[24] In a study similar to ours, high anxiety levels in pregnant women were found to negatively affect NST parameters.[25] In our study, the pregnant women's anxiety level did not affect the outcome of the NST. The comfort levels of pregnant women who had previous experience with NST procedures and knew the purpose of the procedure was higher. The fact that pregnant women are familiar with and have knowledge about the procedure may have a positive effect on their comfort level. This study found no significant difference in discomfort experienced by pregnant women depending on the position and duration of NST application. However, it was found that more than half of the pregnant women had lower back pain, and a quarter of them suffered from back pain and shortness of breath. In a study, it was found that the complaints of back pain and shortness of breath were reported more in pregnant women who underwent NST in the supine position.[4]

According to the study by Kıratlı et al. (2018), it was found that mothers were most comfortable in the left lateral, semi-fawler, and sitting positions during the NST procedure.[26] In our study, pregnant women who were placed in the left lateral position during the NST procedure had higher overall comfort levels and higher mean scores for the subscales than pregnant women who were supine.

In the study, it was found that the mean total PCS score of pregnant women was 69.21 ± 8.73, and in a similar study it was 62.98 ± 8.28.[11] Özkan et al. (2020) in their study found that the comfort level of pregnant women was higher in the age group 18 to 25 years,[11] and it was found that there was no difference between the age groups and comfort level in our study.

89

Table 4. Evaluation of the Variables Affecting the Anxiety and Comfort Levels of Pregnant Women during the NST Procedure by Regression Analysis

	β	t	P	95% CI	
Model 1: The effect of sociodemographic variables on state anxiety					
Continuous Prescribed Medication Use	2.427	1.667	.096	−0.437	5.292
Having Problems During Pregnancy	2.654	2.346	**.020**	0.429	4.879
Gravida (Number of Pregnancies)	−1.308	−2.775	**.006**	−2.235	−0.381
R:0.241, R²: 0.058, Durbin-Watson: 1.076 (P < .001)					
Model 2: The effects of sociodemographic and NST-related variables on PCS					
Perception of Family's Monthly Income Level	2.054	1.656	.099	−0.386	4.494
BMI	−0.288	−2.751	**.006**	−0.493	−0.082
Continuous Prescribed Medication Use	3.056	1.844	.066	−0.205	6.317
Having Problems During Pregnancy	5.99	4.606	**<.001**	3.432	8.550
Gravida (Number of Pregnancies)	−3.934	−3.692	**<.001**	−6.030	−1.838
Number of Births	3.446	1.977	**.049**	0.017	6.876
Knowing the Purpose of the NST Procedure	−2.758	−2.309	**.022**	−5.108	−0.408
Position of the Mother During the NST Procedure	2.142	2.762	**.006**	0.616	3.667

P values less than 0.05 are shown in bold in the table.
NST: Non-Stress Test, PCS: Prenatal Comfort Scale. BMI: Body Mass Index, CI: Confidence Interval.

According to the correlation analysis of the study, it was found that there was a positive relationship between the anxiety and comfort levels of the pregnant women. The comfort scale provides information about comfort in the last week. The result in the study may be due to the fact that it does not directly measure comfort during the NST procedure.

Limitations

The study was conducted in a hospital faculty of medicine in a city located in the Anatolian region of Türkiye. Therefore, the results of the study cannot be generalized to the general population. Other limitations of our study were included women who have raised BMI >30 kg/m² and had chronic diseases, which are likely to increased discomfort in pregnancy. Our other limitations are the age parameter and gestational week of pregnant women. These 2 variables may affect the comfort or discomfort levels of pregnant women.

Conclusion

This study investigated the factors that affect pregnant women's anxiety and comfort levels during the NST procedure. As a result, it was found that problems during pregnancy (nausea, vomiting, back pain, etc.) and gravida are the variables that affect the anxiety level of pregnant women. Pregnant women's BMI, problems during pregnancy (nausea, vomiting, back pain, etc.), gravida, number of births, knowledge of the purpose of the NST procedure, and mother's position during the NST procedure are the factors that influence pregnant women's comfort. In accordance with these results, identifying the factors that affect the anxiety and comfort level of pregnant women and taking the necessary measures will improve the quality of care.

Clinical Implications

The NST is a non-invasive application commonly used by healthcare professionals to assess fetal health. According to the findings of this study, the NST procedure should not be routinely applied to low-risk pregnant women. Remaining in the same position for long periods of time during this application may negatively affect the level of anxiety and comfort. During this procedure, the anxiety and comfort levels of the pregnant women should be considered. Measures such as providing a comfortable position for the pregnant women during the NST application, having the husband and mother present, and asking the pregnant women to observe the baby's heartbeat and movements may contribute can help increase the pregnant women's comfort by reducing her anxiety.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Selçuk University (Approval no: 2021/1772, Date: October 27, 2021).

Informed Consent: Written informed consent was obtained from pregnant women who participated in this study.

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90