

The Effect of Education Regarding Non-Stress Test (NST) on the Levels of Anxiety among Pregnant Women: A Quasi-Experimental Controlled Study

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ABSTRACT

Background & aim: Non-stress test (NST) is a procedure that can cause anxiety in pregnant women. No studies were found to address the effect of education regarding NST on levels of anxiety. This study aimed to investigate the effect of education regarding non-stress test on the levels of anxiety among pregnant women.

Methods: This quasi-experimental controlled trial was carried out on 208 pregnant women who visited the Non-Stress Test Clinic of Aydın Maternity and Pediatrics Hospital, Aydın, Turkey between July 2020 and 2021 by convenience sampling. The demographic questionnaire and State-Trait Anxiety Inventory were used to collect data. During the study, the pregnant women in the educational group were educated using the "Non-Stress Test Education Booklet for Pregnant Women" prepared by the researchers before the non-stress test procedure. Data were analysed using SPSS software (version 18) by Chi-square, independent t-test and Pearson correlation.

Results: There was no significant difference in the mean scores of anxiety in the education and control groups before intervention. After the education, the state anxiety levels of the pregnant women in the education group were found to be significantly lower ($p < 0.05$). However, the mean trait anxiety scores in the education group were lower than in the control group, but the difference was insignificant ($p > 0.05$).

Conclusion: In the present study, state anxiety levels decreased in the education group post-education. Both groups exhibited mild anxiety before and after education, while trait anxiety levels remained similar post-education.

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Introduction

Pregnancy is a challenging period in women's lives, when hormones and psychosocial life undergo changes and sociological, physiological and psychological balance is at risk. Good psychosocial health status of the pregnant woman during this period is very important for the health of the fetus (1-4). For women who are preparing to become mothers, pregnancy follow-ups, screening tests and the unknowns of

these practices are events that cause stress and anxiety (5).

Anxiety is defined as the state of being overly worried occurring as a result of stress due to real or unreal events and impairs the individual's ability to make decisions about the future (6-7).

Non-stress test (NST) is a procedure that can cause anxiety in pregnant women, yet it is an important assessment that provides valuable

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information about the health of the fetus. The NST evaluates the relationship between fetal movements, the mother's contractions, and the fetal heartbeat. During the test, the mother's contractions and the fetal heartbeat are recorded on a sheet, allowing for a comprehensive analysis of fetal well-being. (8-10). However, during this test, which is essential for the health of both the mother and the fetus, the pregnant woman may feel lonely due to being in a foreign environment; she may experience stress being away from her family and the people who support her and by worrying about the health of the baby (5). Increased risk for pregnancy and birth complications, difficult delivery, and the need for more surgical intervention during delivery have been reported as consequences of this emotional tension experienced by pregnant women (11-12, 3, 13). Additionally, this situation may cause problems with bonding between the mother and the baby, growth retardation, delay in motor and language development, deterioration in emotional development and behavioural problems (3).

It is extremely important for pregnant women to receive education and counselling from health professionals in order not to be affected by the stress experienced or to be able to use their defence systems against stressors (14). Moreover, studies have shown that expectant mothers experience a healthier, happier and more positive pregnancy due to the information they receive regarding pregnancy (11, 15-16). Therefore, it is thought that informing pregnant women about the NST process will reduce the anxiety levels of the pregnant women and positively contribute to the health of the mother and her baby. No studies were found to address the effect of education regarding NST on anxiety levels. Given the available evidence, the present study was conducted to examine the impact of education provided to pregnant women about the non-stress test on their levels of anxiety.

Materials and Methods

This quasi-experimental controlled trial was conducted at the Non-Stress Test Clinic of Aydın Maternity and Paediatrics Hospital, Aydın, Turkey, between 15 July 2020 and 15 July 2021. Based on the study data of Koçak and Ege (2016) (6), using G-power, the minimum

number of pregnant women to be recruited in order to reach 80% power at $\alpha=0.05$, 95% confidence interval was calculated to be a sample size of 180 using t-test with effect power calculated as $d=0.42$.

Pregnant women who were at least primary school graduates, could read and understand Turkish, were over the age of 20, between 32nd and 40th week of pregnancy and would experience non-stress test for the first time were included in the current study. However, pregnant women with previous education on non-stress test and pregnant women with any obstetric complications were excluded from the study.

276 pregnant women were invited to join in the study (using convenience sampling); 1 of these pregnant women who was an illiterate, 42 who had undergone NST before, 8 who had pregnancy complications and 10 who declined from participating in the study were excluded from the study. Consequently, 215 pregnant women in total were included in the study (education group: 106, control group: 109). Subsequently, 2 of the 106 pregnant women included in the education group and 5 of the 109 pregnant women included in the control group who did not want to complete their final tests were excluded from the analysis, therefore, the study was finalised with 208 pregnant women (Figure 1).

Demographic questionnaire and the State-Trait Anxiety Inventory (PIF-STAI) were used to collect research data. The opinions and recommendations of five faculty members working in the field of midwifery were sought to ensure the comprehensibility and applicability of the personal information questionnaire used in the present study. In addition, pre-test was carried out among 10 pregnant women at the NST clinic and no change in the questionnaire was deemed necessary at end of the pre-test. The questionnaires used for pre-test were not included in the data analysis.

Personal Information questionnaire developed by the researchers. It contained questions on pregnant women about their socio-demographic and obstetric characteristics (3, 17).

State-Trait Anxiety Inventory (STAI) developed in 1964 by Spielberg et al. and adapted into Turkish by Öner and Le Compte (18). The state

anxiety scale describes the feelings of a person about themselves at a particular time and under certain circumstances and is answered according to the severity of the individual's feelings at that moment when reading the items of the scale. The trait anxiety scale, however, involves the individual expressing how they feel generally. Both scales contain 20 items. The total score obtainable from the scales ranges from 20 to 80; a high score shows a high level of anxiety (18). The reliability coefficients of the Turkish adaptation of the scale as measured by alpha correlations were found to be 0.83-0.92 for the state anxiety scale and 0.83-0.87 for the trait anxiety scale (19).

The education booklet was put together by the researchers based on the relevant literature and comprised the following topics: "What is NST?, Who perform an NST?, What are the advantages and disadvantages of NST?, When NST is performed?, How is NST performed and how can you learn the results of the NST?" (9, 20, 21). While preparing the education booklet, expert opinion was obtained from five faculty members working in the Midwifery Department for the content and validity of the booklet. For the evaluation of the education booklet, the experts were asked to fill in the "Education Booklet Evaluation Form", developed by Top (2012), by grading (22). According to the scores given by the experts for the education booklet, there was no significant difference, statistically, in Kendall's Coefficient of Concordance correlation test ($p>0.05$). Based on this result, expert opinions were compatible with each other, and the scope of the education material was accepted as valid.

In order to prevent data contamination, data for the education group were collected on Tuesdays, Wednesdays and Thursdays, and that of the control group on Mondays and Fridays. The data collection process in the study consisted of four stages.

- *First stage (education and control group):* At this stage, pregnant women in both the control and education groups were met and informed about the research. Consent from the pregnant women who volunteered to take part in the study was obtained and the Personal

Information questionnaire and State-Trait Anxiety Inventory" were administered.

- *Second stage (education group):* At this stage, the participants were individually educated about the Non-Stress Test using the Non-Stress Test (NST) Education Booklet for Pregnant Women prepared by the researchers in a separate room. The questions of the pregnant women were answered as well. This stage took approximately 20-30 minutes.

- *Second stage (control group):* Since this was the control group, no intervention was administered to the pregnant women.

- *Third stage (education and control group):* At this stage, the Non-Stress Test was performed for the pregnant women.

- *Fourth stage (education and control group):* At this stage, the pregnant women were asked to complete the State-Trait Anxiety Scale again.

Data were analyzed by SPSS software (version 18). The socio-demographic and obstetric characteristics of the education and control groups were compared using Chi-square/independent samples t-test). Paired samples t-test was used to compare the state and trait anxiety levels of the groups before and after the education, while Pearson correlation analysis was used in examining the relationship between the state anxiety levels and trait anxiety levels of the groups pre and post education.

Results

The participants in the education and control groups were statistically similar in terms of personal and obstetric characteristics (Table 1).

In the present study, the mean SAI score (49.73 ± 7.45) of the participants in the education group was found to be higher compared to that of the participants in the control group (48.31 ± 5.36) before the education, but this difference was not statistically significant ($p>0.05$). Moreover, the mean TAI scores of the participants in the education group (37.29 ± 6.25 , mild anxiety) were lower than those of the participants in the control group (38.03 ± 5.82 , mild anxiety), but this difference was not statistically significant ($p>0.05$) (Table 2).

Table 1. Personal and obstetric characteristics of the participants in the education and control groups (n=208)

Characteristics	Education Group N (%)	Control Group N (%)	X ² /p
Educational Status			
Primary	11 (10.5)	13 (12.5)	1.253/0.234
High School	28 (26.0)	25 (24.0)	
Univeristy and above	65 (62.5)	66 (63.5)	
Employment status			
Yes	44 (42.3)	45 (43.3)	0.542/0.745
No	60 (57.7)	59 (56.7)	
Social security status			
Present	96 (92.3)	95 (91.3)	1.254/0.652
Absent	8 (7.7)	9 (8.7)	
Place of residence			
City	82 (78.8)	79 (76.0)	1.452/0.421
Town	12 (11.5)	13 (12.5)	
Village	10 (9.7)	12 (11.5)	
Planned preganancy			
Yes	95 (91.3)	91 (87.5)	2.536/0.745
No	9 (8.7)	13 (12.5)	
Feeling of discomfort during pregnancy			
Yes	77 (74.0)	79 (76.0)	2.542/0.369
No	27 (26.0)	25 (24.0)	
Common complains during pregnancy			
Nausea	70 (67.3)	71 (68.3)	0.253/0.325
Nausea-vomiting	55 (52.9)	53 (51.0)	
Reflux	51 (49.0)	54 (51.9)	
Leg cramps	59 (56.7)	57 (54.8)	
Anaemia	62 (59.6)	59 (56.7)	
Characteristics	Education Group Mean±SD (min-max)	Control Group Mean±SD (min-max)	t/p
Age	21.94±4.25 (20-44)	22.05±4.23 (20-43)	0.523/0.865
Gestational age (Week)	34.25±5.21 (32-35)	34.85±4.52 (31-36)	0.362/0.412

The mean SAI scores of the participants in the education group (40.16±6.25) were significantly

less than those of the pregnant women in the control group (46.41±7.41) after the education (p<0.05).

Table 2. The comparison of SAI and TAI scores between the education and control groups (n=208).

Scales	Education Group Mean±SD	Control Group Mean±SD	t/p
Pre-Education SAI	49.73± 7.45 (28-76)	48.31±5.36 (24-77)	0.652/0.521 1.525/0.006*
Post-Education SAI	40.16± 6.25 (28-76) t/p: 2.658/0.007	46.41±7.41 (24-77) t/p: 0.576/0.898	
Pre-Education TAI	37.29± 6.25(32-79)	38.03±5.82 (30-75)	0.253/0.785 0.452/0.123
Post-Education TAI	35.89± 6.56 (32-79) t/p: 0.254/0.756	37.21±5.82 (30-75) t/p: 0.413/0.654	

*p<0.05, SAI: State Anxiety Inventory, TAI: Trait Anxiety Inventory

Moreover, the mean TAI scores of the participants in the education group (35.89 ± 6.56 , mild anxiety) were lower than those of the participants in the control group (37.21 ± 5.82 , mild anxiety), but the difference was not statistically significant ($p > 0.05$) (Table 2). While there was a statistically significant difference between the mean SAI scores before and after the education in the education group ($p < 0.05$), no statistically significant difference was observed in the control group ($p > 0.05$). Furthermore, there was no statistically significant difference between the mean TAI

scores of the education and control groups before and after the education in the present study ($p > 0.05$) (Table 2).

Before the education, a highly significant positive correlation was observed between the mean scores of SAI and TAI of the participants in both groups. Following the education, while a fairly significant positive correlation was found between the mean SAI and TAI scores of the pregnant women in the education group, a highly significant positive correlation was observed in the control group (Table 3).

Table 3. The comparison of SAI and TAI levels of the participants in the groups before and after the education

Scales		SAI	
		Education Group	Control Group
Pre-education TAI	r	0.798	0.842
	p	<0.001	<0.001
Post-education TAI	r	0.612	0.813
	p	<0.001	<0.001

SAI: State Anxiety Inventory, TAI: Trait Anxiety Inventory

Discussion

In this quasi-experimental controlled trial examining the effect of education about the non-stress test on the anxiety levels of pregnant women, the state anxiety levels of the education group were found to be lower than those of the control group after the intervention. This can be explained by the fact that the pregnant women in the education group experienced a decreased sense of uncertainty regarding the procedure, as their questions were addressed through the information provided prior to the NST. Both the personal and obstetric features of the participants in the education group and control group were similar in the current study. These results are important as they demonstrate that both groups are homogeneous and comparable in terms of anxiety levels.

Although no study examining the effect of education provided before NST on the level of anxiety was found during literature review, studies examining the effect of education given before various prenatal tests on the level of anxiety were accessed. In one of the studies reviewed, similar to the findings obtained in the present study, it was reported that the state anxiety levels of the pregnant women in the experimental group decreased significantly after

the pregnant women who would undergo prenatal diagnosis test were counselled (16). Furthermore, according to a study by Potur et al. (2009), pregnant women experienced a feeling of uncertainty and anxiety due to their lack of knowledge about tests evaluating fetal health (15). Contrary to the findings of the present study, Koçak & Ege (2016) report that no statistically significant difference was observed between being informed about the prenatal test to be performed and the mean state anxiety score (6). Similarly, in the study of Altundağ et al. (2019), no significant difference was noted between the mean state anxiety score of the pregnant women and being informed about the procedures to be performed (23). In another study, the difference between being informed and the mean state anxiety score being insignificant was reported (24). The above references draws attention to an important point that there are varying results regarding the effects of pregnancy screening tests and the education regarding these tests on the level of state anxiety as reported by the studies accessed, and that no study examining the effect of education given before the NST procedure on the level of anxiety was found. These results are important in that they show the need to tackle prenatal screening tests one by one in different

studies and for studies examining the effect of education programs tailored for each of these tests on the level of anxiety.

The trait anxiety levels of both groups were comparable before and after the education in the current study. In addition, no significant difference was found between the trait anxiety levels of both groups before and after the education. These results are important, as they show that the education offered before the NST procedure is not effective for trait anxiety levels. No study examining the effect of education given before the NST procedure on the level of anxiety was found during literature review. However, according to study by Yavan (2004) study examining the effect of counselling offered to pregnant women who would undergo prenatal diagnostic test, consistent with the results of this study, pregnant women in the experimental and control groups did not show any statistically significant difference in terms of trait anxiety levels after the education (16). Additionally, in the same study, the participants in the experimental group who stated that the counselling provided was not sufficient also stated the timing of the counselling not being appropriate as the reason, and that this counselling should have been given at an earlier period during the pregnancy (16). These results suggest that information about prenatal tests should be given at the early stages of pregnancy. Furthermore, given the knowledge that prenatal stress has a long-term effect on a number of cognitive and behavioural outcomes including prematurity of the foetus and attention deficit and hyperactivity disorder in the new-born (23), giving education at the early stages of pregnancy seems advantageous for both maternal and infant health.

In the present study, a highly significant positive correlation was observed between the state and trait anxiety levels of the pregnant women in both groups before the education. Subsequent to the education, however, a moderately significant positive correlation was noted between the state and trait anxiety levels of the participants in the education group, while a highly significant positive correlation was found in the control group. Based on these findings, it could be concluded that as the level of state anxiety increases, the level of trait

anxiety increases and education weakens this strong relationship. Considering the knowledge that prenatal screening tests increase the level of state anxiety among pregnant women (6), providing education at the early stages of pregnancy for all prenatal tests, especially for frequently performed tests such as NST, may contribute to reducing both the state and trait anxiety levels of participants. Well-planned, experimental and randomized studies are needed on this subject in order to increase the evidence value of the limited number of studies accesses up to this point.

This research has some limitations. Firstly, the research data is limited to the reports of the pregnant women who took part in the study and only represent the participants of the study. Secondly, pregnant women may have been uneasy owing to the usage of masks and social distancing measures due to the Covid-19 pandemic that existed during the data collection process. This may have increased the level of anxiety in the pregnant women. Finally, self-reporting of pregnant women with scales is among the limitations of this study. The strength of the research was to determine the effect of training on non-stress test on anxiety levels of pregnant women. However, it is known that informing pregnant women before non-stress test is limited. It is thought that informing pregnant women about the NST process will reduce their anxiety levels and thus contribute positively to the health of the mother and the baby.

Conclusion

In the present study, the state anxiety levels of the education group decreased post-education. Participants in both groups exhibited mild anxiety levels before and after the education, and the trait anxiety levels of both groups were similar post-education. In light of these results, to minimize the anxiety levels of pregnant women, their anxiety status should be evaluated before the non-stress test (NST), and information should be provided about the administration, purpose, benefits, risks, and potential harms of the NST procedure. Finally, in-service training should be offered to midwives and nurses to help them identify factors contributing to anxiety during pregnancy and to teach pregnant women coping strategies

for managing anxiety. Increasing awareness on this subject is recommended.

Declaration

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Conflicts of interest

Authors declared no conflicts of interest.

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Ethical considerations

To use the "Educational Material Evaluation Form" for the research, permission was sought from Lecturer Dr. Ekin Dila Topaloğlu Ören via e-mail. The participants were informed that the participation was voluntary and that they could withdraw from the study at any time. It was also explained that the data would be used for scientific purposes without using the names of the participants, and the Helsinki Declaration was followed.

Ethical approval

Ethical approval (No: 2020/025) was obtained from Non-Invasive Clinical Research Ethics Committee, Faculty of Health Sciences, Aydın Adnan Menderes University Aydın, Turkey for the research protocol. Written institutional permission was obtained from the Provincial Health Directorate, Turkish Republic Ministry of Health.

Authors' contributions

ZKI, KA submitted the idea or concept, designed the project, and supervised or gave consulting; ZKI collected and processed the data; ZKI, KA provided analysis and/or interpretation. ZKI, KA completed the literature review; ZKI, KA wrote the paper; ZKI, KA performed the critical review; ZKI, KA managed resources and fundraising; and ZKI, KA provided materials. ALL authors read and approved the final article and agreed to be accountable for all parts of the work, including investigating and resolving any accuracy or integrity issues.

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