Clinical and Experimental Health Sciences

Maternal Anxiety Associated with Newborn Screening

Sumeyra Alan, Sule Ecevit Alpar

Marmara University, Faculty of Health Sciences, Department of Nursing, Istanbul, Turkey

Correspondence Author: Sumeyra Alan
E-mail: sumeyraalan@hotmail.com

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ABSTRACT

Objective: In this study, it was aimed to determine the anxiety levels of mothers associated with newborn hearing screening test and heel prick blood sampling.

Methods: A randomized controlled trial of 112 mothers who applied for newborn screening in a public hospital were conducted. The mothers were divided into two groups depending on their baby's assigned group; hearing screening test group (HST group) or heel prick blood sampling group (HBS group). The study was completed with a total of 101 participants. Parental Information Form, Subjective Units of Distress Scale (SUDS), State-Trait Anxiety Inventory (STAI-S, STAI-T) were used in data collection. Data analysis were performed by using descriptive statistics, Mann-Whitney U test, Kruskal Wallis test, Independent groups t test, Pearson and Spearman correlation.

Results: In the HST and HBS groups, the score median of the SUDS was 5,0 (IQR: 4,0-7,0) and 5,0 (IQR: 4,0-7,0), the score average of the STAI-S was 39,8±6,7 and 41,3±7,6, and the score average of the STAI-T was 42,5±7,1 and 41,4±6,5, respectively. There were significant relationships between the mothers' scores of the SUDS, STAI-S and STAI-T.

Conclusion: The mothers' anxiety associated with hearing screening test and heel prick blood sampling were higher than Spielberger's female population. There was no difference between the anxiety of the mothers according to whether the screening test is interventional. In order to avoid problems associated with parental anxiety, it may be advisable to investigate appropriate methods to reduce the anxiety of mothers.

Keywords: Anxiety, newborn screening, parenting

1. INTRODUCTION

In Turkey, the prevalence of phenylketonuria is 1 in 3000-4000 neonates, the prevalence of congenital hypothyroidism is 1 in 4000 neonates, the prevalence of cystic fibrosis is 1 in 3000 neonates (1), and the prevalence of profound biotinidase deficiency is 1 in 14866 neonates (2,3). The screening of these congenital metabolic diseases is carried out by pricking the baby's heel and drawing a few drops of blood onto a piece of absorbent paper (1,4). The prevalence of congenital hearing loss is 1-3 in 1000 neonates (5-7). Neonatal hearing screening is performed using otoacoustic emission (OAE) and auditory brainstem response (ABR) tests (6-9). With screening studies, approximately 4500 children per a year can be protected from the results of existing diseases, and disability can be prevented (9). However, medical practices are perceived as painful practices by mothers (10). Especially, interventional practices such as neonatal heel prick blood sampling can cause anxiety in mothers, because it is painful (1).

There is possible that each individual can feel anxiety in different densities. Especially before and/or during diagnosis and treatment procedures, parents can experience anxiety intensively. High anxiety levels can prevent families to understand the statements about the child correctly, interpret the facts realistically, make appropriate decisions, participate in the child's care and use appropriate coping methods (11). At the same time, it can slow down the working speed of health professionals and prevent to perform procedure correctly, appropriately and adequately.

2. MATERIAL AND METHODS

2.1. Design and Participants

This study was a randomized controlled trial. The population of the study consisted of newborns' mothers who applied for routine diagnosis procedures in the neonatal hearing screening unit and the baby room of the obstetrics and gynecology unit of a public hospital. The required sample size power analysis results, in total, including at least

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90 individuals were determined. In this case, 80% of the power test is expected to be obtained. The sample of the study consisted of 112 mothers who applied for the neonatal screening between July and December 2018, who agreed to participate in the study, were communicated easily and whose babies were performed the procedure for the first time. The mothers were divided into two groups depending on their baby's assigned group; hearing screening test group (HST group) or heel prick blood sampling group (HBS group). The study was completed with a total of 101 participants (Figure 1).

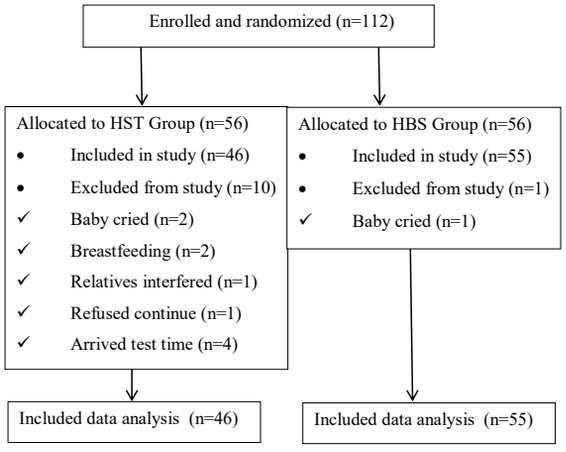

Figure 1. *Flow chart for selection of study participants*

2.2 Data Collection

Data were collected by face-to-face interview method by the researcher. The mothers apply to the Hearing Screening Department for their newborns' hearing screening test before/after discharge and apply to the Baby Room for their newborns' heel prick blood sampling before discharge. Data were filled in by the mothers in the waiting area while waiting for the tests. During the study, the babies were cared by the mothers' relatives. An interview lasted about 15-20 minutes. The mothers were divided into two groups, and data were taken from the same mother only once. Parental Information Form, Subjective Units of Distress Scale, STAI State-Trait Anxiety Inventory were used in data collection.

2.2.1. Parental information form: Based on the literature, there are 10 questions about the mothers' descriptive characteristics in the questionnaire prepared by the researchers.

2.2.2. Subjective units of distress scale (SUDS): SUDS is a subjective measure involving a person's own subjective assessment of his/her current mood (12, 13, 14, 15). The person scores of his/her discomfort in this scale between 0-10. The scale is composed of 0 (no discomfort at all) to 10 (unbearable discomfort) (12, 13, 16, 17).

2.2.3. State-trait anxiety inventory (STAI): In this study, the state – trait anxiety scale which was developed by Spielberger et al. in 1970 and was adapted by Oner and Le Compte in 1977 was used. The scale consists of state and trait anxiety subscales. The reliability coefficients determined by the alpha correlations of the scale ranges from 0,94 to 0,96 for the state anxiety scale and 0,83 to 0,87 for the trait anxiety scale. In Turkish adaptation of the scale, the reliability coefficients are between 0,42 and 0,85 for the state anxiety scale and 0,34 to 0,72 for the trait anxiety scale (18). In our study, reliability coefficients were determined as 0,72 for state anxiety subscale and as 0,71 for trait anxiety subscale. While the State Anxiety Scale aims to determine how the individual feels himself / herself at a certain time and under certain conditions, the Trait Anxiety Scale determines how the individual feels himself / herself independent of the circumstances and conditions. Both subscales are four-point likert type scales consisting of 20 items. The total score that can be taken from each of the state-trait anxiety subscales is between 20 and 80. The high score from the scales shows the high level of anxiety and the low score shows the low level of anxiety (18).

2.3. Statistical Analysis

Data were analyzed by using the IBM Statistical Package for social Sciences v20 (SPSS Inc., Chicago, IL, USA). Statistical significance was accepted as $p < 0,05$. Descriptive statistics (the frequency, percentage distribution, arithmetic mean and median) were used for the assessment of the obtained data. Normality of the distributions were tested with Shapiro-Wilk test. Independent groups t test and Pearson correlation were used for normally distributed variables, and Mann-Whitney U test, Kruskal Wallis test and Spearman correlation were used for non-normally distributed variables. As a result of univariate analyzes, we could not find any meaningfulness to lead us to multivariate analysis.

2.4. Ethical Consideration

For the implementation of the study, the necessary permission was obtained from Abant Izzet Baysal University Clinical Research and Ethics Committee (desion no: 2018/98) and Bolu Provincial Health Directorate. Participation in the study was conducted on a voluntary basis. After the information was given to the participants about the research, their written and verbal consent were taken.

3. RESULTS

The age of the mothers who participated in the study ranged from 19 to 42 years. The average age of the mothers in the HST group and the HBS group were 29,1 ± 5,6 years and 27,0 ± 4,7 years, respectively. The median age of the newborns was 2,0 (IQR: 2,0-3,0) days in the HST group and 2,0 (IQR: 1,0-2,0) days in the HBS group (Table 1).

The majority of mothers were high school graduates; 37% of the HST group and 40% of the HBS group. All participants were married and had social security insurance or maternity insurance. A percentage of 69,6 of the HST group and 72,7%

of the HBS group were non-working, and 52,2% of the HST group and 65,5% of the HBS group evaluated their income status as middle (Table 1).

A percentage of 78,3 of the HST group and 87,3% of the HBS group reported that they wanted the pregnancy. 56,5% of the HST group and 61,8% of the HBS group delivered by cesarean section. %56,5 of the HST group had a female baby and %50,9 of the HBS group had a male baby. 45,7% of the HST group and %45,5 of the HBS group gave birth to their second baby. 76,1% of the HST group and 89,1% of the HBS group reported that they delivered at term (Table 1).

Table 1. *Participant characteristics*

Characteristics	Study Groups			
	HST Group		HBS Group	
	n	%	n	%
Age (years)				
19-30	31	67,4	44	80,0
31-42	15	32,6	11	20,0
x̄± sd (Min-Max)	29,1±5,6 (19-42)		27,0±4,7 (19-39)	
Newborn's age (days) Median (IQR)	2,0 (2,0-3,0)		2,0 (1,0-2,0)	
Educational status				
Literate	0	0	2	3,6
Primary school	6	13,0	6	10,9
Secondary school	13	28,3	14	25,5
High school	17	37,0	22	40,0
University	10	21,7	11	20,0
Working status				
Working	14	30,4	15	27,3
Non-working	32	69,6	40	72,7
Income level				
Good	22	47,8	19	34,5
Middle	24	52,2	36	65,5
Pregnancy intention				
Intended	36	78,3	48	87,3
Unintended	10	21,7	7	12,7
Delivery method				
Vaginal	20	43,5	21	38,2
Cesarean	26	56,5	34	61,8
Newborn's gender				
Female	26	56,5	27	49,1
Male	20	43,5	28	50,9
Newborn's birth order				
1	18	39,1	21	38,2
2	21	45,7	25	45,5
3	7	15,2	7	12,7
4	0	0	2	3,6
Gestational age				
Term	35	76,1	49	89,1
Preterm	5	10,9	2	3,6
Postterm	6	13,0	4	7,3

x̄: Average, sd: Standart deviation, Min: Minimum, Max: Maximum

When the anxiety scores of the participants were considered, both of the study groups' SUDS score median was 5,0 (IQR:4,0-7,0). In the HST and HBS groups, the score average of the STAI-S was 39,8±6,7 and 41,3±7,6 and the score average of the STAI-T was 42,5±7,1 and 41,4±6,5, respectively (Table 2).

Table 2. *Participant anxiety scores*

	Study Groups	
Anxiety scores	HST Group	HBS Group
SUDS Median (IQR)	5,0 (4,0-7,0)	5,0 (4,0-7,0)
STAI-S x̄± sd (Min-Max)	39,8±6,7 (30-53)	41,3±7,6 (28-58)
STAI-T x̄± sd (Min-Max)	42,5±7,1 (31-58)	41,4±6,5 (29-57)

x̄: Average, sd: Standart deviation
Min: Minimum, Max: Maximum

In the HBS group, the median of the STAI-S score was significantly higher in mothers with cesarean delivery (Median: 45,0; IQR: 37,0-50,0) than in mothers with vaginal delivery (Median: 37,0; IQR: 34,0-43,0) (p=0,02), and the median of the STAI-T score was significantly higher in mothers with unintended pregnancy (Median: 47,0; IQR: 41,0-52,5) than in mothers with intended pregnancy (Median: 40,0; IQR: 36,5-46,0) (p=0,03) (Table 3).

In the HST group, there was a moderate positive correlation between the SUDS and the STAI-S scores (r = 0,63, p<0,05), a weak positive correlation between the SUDS and the STAI-T scores (r = 0,37, p<0,05), and a moderate positive correlation between the STAI-S and the STAI-T scores (r = 0,40, p<0,05). There was a weak positive correlation between the birth order of the newborns and the STAI-S scores (r= 0,37, p<0,05) (Table 4).

In the HBS group, there was a weak positive correlation between the SUDS and the STAI-S scores (r= 0,35, p<0,05) and a weak positive correlation between the STAI-S and the STAI-T scores (r=0,31, p<0,05). There was a moderate positive correlation between the birth order of the newborn and the mother's age (r= 0,50; p<0,05) (Table 4).

Table 3. *Anxiety scores according to the participant characteristics*

Participant Characteristics	Anxiety Scales					
	SUDS		STAI-S		STAI-T	
	HST (N=46)	HBS (N=55)	HST (N=46)	HBS (N=55)	HST (N=46)	HBS (N=55)
	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Age						
19-30	5 (5-7,5)	5 (4-7)	40,0 (34,0-46,0)	38,5 (35,0-46,5)	43,0 (38,0-48,0)	40,5 (36,5-46,0)
31-42	4 (3,5-7)	5 (4-6,5)	39,0 (34,5-42,0)	44,0 (37,0-48,0)	41,0 (35,5-47,0)	42,0 (38,0-47,0)
p	0,25[a]	0,53[a]	0,58[a]	0,45[a]	0,38[a]	0,44[a]
Educational status						
Literate	-	7,5 (5-10)	-	47,5 (43,0-53,0)	-	49,5 (47,0-52,0)
Primary school	6,5 (5-7)	5,5 (5-8)	44,0 (32,0-47,0)	39,0 (34,0-44,0)	45,0 (38,0-51,0)	41,5 (40,0-46,0)
Secondary school	5 (4-6)	5 (4-6)	33,0 (31,0-41,0)	39,5 (36,0-46,0)	42,0 (38,0-53,0)	41,0 (35,0-46,0)
High school	5 (4-7)	5 (4-7)	40,0 (35,0-48,0)	41,5 (34,0-48,0)	43,0 (33,0-48,0)	39,5 (36,0-44,0)
University	5,5 (3-7)	5 (4,5-7,5)	40,0 (38,0-43,0)	39,0 (36,5-46,5)	41,5 (39,0-43,0)	41,0 (38,0-47,5)
p	0,73[b]	0,64[b]	0,21[b]	0,73[b]	0,74[b]	0,34[b]
Working status						
Working	5 (3-7)	5 (4-6,5)	38,5 (35,0-41,0)	44,0 (35,5-46,5)	39,0 (35,0-42,0)	38,0 (37,0-41,5)
Non-working	5,5 (4,5-7)	5 (4-7)	40,5 (33,5-47,0)	40,0 (35,0-47,0)	43,0 (38,5-50,5)	42,0 (37,0-46,5)
p	0,13[a]	0,63[a]	0,34[a]	0,92[a]	0,06[a]	0,14[a]
Income level						
Good	5,5 (5-7)	5 (4-6,5)	41,0 (38,0-46,0)	44,0 (34,0-46,0)	42,0 (36,0-49,0)	41,0 (37,0-42,5)
Middle	5 (3,5-7)	5 (4-7)	37,0 (31,5-44,5)	40,0 (37,0-49,0)	42,5 (37,5-48,0)	42,0 (37,0-48,0)
p	0,26[a]	0,90[a]	0,11[a]	0,36[a]	0,93[a]	0,40[a]
Pregnancy intention						
Intended	5 (4,5-7,5)	5 (4-6,5)	40,5 (35,0-46,5)	39,0 (35,0-46,5)	43,0 (37,5-48,5)	40,0 (36,5-46,0)
Unintended	4,5 (3-6)	5 (4,5-7,5)	36,0 (32,0-41,0)	43,0 (40,5-47,0)	39,0 (33,0-42,0)	47,0 (41,0-52,5)
p	0,10[a]	0,66[a]	0,09[a]	0,47[a]	0,14[a]	**0,03**[a]
Delivery method						
Vaginal	5 (5-8)	5 (3-6)	38,5 (32,0-46,0)	37,0 (34,0-43,0)	43,0 (39,0-50,5)	41,0 (36,0-46,0)
Cesarean	5 (3-7)	5 (4-7)	40,0 (36,0-46,0)	45,0 (37,0-50,0)	42,0 (36,0-48,0)	42,0 (37,0-46,0)
p	0,20[a]	0,32[a]	0,38[a]	**0,02**[a]	0,36[a]	0,53[a]
Newborn's gender						
Female	5,5 (4-8)	5 (4-6)	41,0 (33,0-47,0)	39,0 (37,0-46,0)	43,5 (38,0-48,0)	40,0 (35,5-46,0)
Male	5 (3,5-7)	5 (5-7)	39,0 (35,0-41,5)	43,0 (34,0-47,5)	42,0 (35,5-46,0)	41,5 (37,5-48,0)
p	0,29[a]	0,35[a]	0,41[a]	0,72[a]	0,51[a]	0,34[a]
Newborn's birth order						
1	5,5 (4-7)	5 (5-7)	41,0 (38,0-45,0)	41,0 (37,0-47,0)	41,5 (37,0-50,0)	39,0 (36,0-42,0)
2	5 (5-8)	5 (4-6)	35,0 (31,0-47,0)	39,0 (35,0-46,0)	44,0 (38,0-49,0)	41,0 (38,0-46,0)
3	5 (3,5-6)	6 (5-7)	39,0 (35,0-45,0)	39,0 (31,5-46,5)	42,0 (34,5-42,5)	47,0 (36,0-48,5)
4	-	6 (4-8)	-	50,0 (44,0-56,0)	-	42,0 (41,0-43,0)
p	0,58[b]	0,52[b]	0,35[b]	0,50[b]	0,39[b]	0,61[b]
Gestational age						
Term	5 (4-7)	5 (4-6)	40,0 (34,5-45,0)	43,0 (35,0-46,0)	42,0 (36,5-46,5)	42,0 (38,0-46,0)
Preterm	7 (6-8)	8,5 (8-9)	47,0 (46,0-47,0)	49,5 (48,0-51,0)	48,0 (45,0-48,0)	42,5 (37,0-48,0)
Postterm	5 (4-7)	4,5 (3,5-6)	37,0 (32,0-40,0)	37,5 (33,5-39,5)	41,0 (39,0-47,0)	37,0 (36,0-45,0)
p	0,29[b]	0,97[b]	0,21[b]	0,12[b]	0,65[b]	0,78[b]

a=Mann Whitney U test, b= Kruskal-Wallis test

Table 4. *Comparison of anxiety scores of the study groups*

Anxiety scores	Study groups	N (101)	Median (IQR) / x̄±sd	p
SUDS	HST	46	5,0 (4,0-7,0)	0,98[a]
	HBS	55	5,0 (4,0-7,0)	
STAI-S	HST	46	39,83±6,7	0,28[b]
	HBS	55	41,36±7,6	
STAI-T	HST	46	42,50±7,1	0,42[b]
	HBS	55	41,40±6,5	

a= Mann Whitney U test, b= Independent samples t-test

When the anxiety score averages of the HBS and HST groups were compared, there was no significant differences between the groups; SUDS (p=0,98), STAI-S (p=0,28), STAI-T (p=0,42) (Table 5).

Table 5. *The study groups and correlations*

		HST Group		HBS Group		
		STAI-S	STAI-T	STAI-S	STAI-T	Mother's age
SUDS	r	0,634*	0,377*	0,355**		
	p	0,000	0,010	0,008		
	n	46	46	55		
STAI-S	r		0,402*		0,315*	
	p		0,006		0,019	
	n		46		55	
Newborn's birth order	r	0,379**				0,505**
	p	0,009				0,000
	n	46				55

**r= Pearson's correlation coefficient, **r= Spearman's correlation coefficient*

4. DISCUSSION

According to the Turkish Statistical Institute's data (2018), the average age of the mothers who gave birth in 2017 was 28,7 years (19). The average age of the mothers who participated to study was 29,1 years in the HST group and 27 years in the HBS group (Table 1). Study results were similar to the average of Turkey.

It is recommended that all newborns should be screened with an appropriate hearing screening method (OAE and / or ABR) in the first month of their lives in order to obtain early diagnosis and appropriate prevention (20, 21). The median age of the newborns was 2 (IQR: 2,0-3,0) days in the HST group (Table 1). Hearing screening of newborns of our study group was performed in accordance with the recommendation of the literature. The median age of the newborns was 2 (IQR: 1,0-2,0) days in the HBS group (Table 1). Although it is recommended that the heel prick blood sample should be taken within 48-72 hours postnatally, blood samples are taken "at the last moment before leaving hospital" in order to reach more babies and to be diagnosed early (22).

A percentage of 37 of the HST group and 40% of the HBS group were the high school graduates, and 21,7% of the HST group and 20% of the HBS group were university graduates (Table 1). In Turkey, schooling rate for women are 83,4% for high school, and 47,4% for university (23). Our study population has lower educational status compared to Turkey's average. The mothers may not have benefited from educational opportunities sufficiently because they lived in rural areas.

Turkey employment rate for women is 28,9% (24). The minority of our study population was working (Table 1), that was similar to Turkey's average. It was seen that the mothers did not take part in business life enough. All mothers in the study groups evaluated their income status as good / medium level (Table 1), and they were generally satisfied with their income status.

The majority of mothers reported that they wanted the pregnancy. More than half of the participants delivered by cesarean section (Table 1). In Turkey, cesarean delivery rate in all deliveries in 2016 was 53,1% (25). The ideal cesarean section rate should be 10-15% in all deliveries (26). However, according to 2014-2017 data, Turkey has the highest rate of cesarean delivery among OECD countries (27). Our research results are in line with the average of Turkey.

In Turkey, the total fertility rate for 2018 was 1,99 (19). Almost all of the mothers delivered at term and gave birth to their first or second baby (Table 1). Research results are similar to the average of Turkey.

In the postpartum period; although maternal age (28, 29), socioeconomic status (29, 30), educational status (28, 30), unplanned pregnancy (30), delivery method (31, 32, 33), parity status (33) and gestational age (33, 34) have been reported to be affected the anxiety levels of mothers, there are inconsistent results in the literature (35). In current study; maternal age, educational and working status, income level, gestational age, gender of the baby and birth order of the baby did not significantly affect the anxiety levels of mothers. However, in the HBS group, it was found that the state anxiety was significantly higher in mothers with cesarean delivery than in mothers with vaginal delivery, and the trait anxiety was significantly higher in mothers with unintended pregnancies than in mothers with intended pregnancies ($p<0,05$) (Table 3). Some studies reported that an important part of mothers who delivered by cesarean section had high levels of anxiety before and after delivery (31, 35), women who experienced psychological distress during pregnancy more likely delivered cesarean section and their psychological distress tended to continue after childbirth (35). In another study reported that the state anxiety score was higher in mothers with unintended pregnancy than in mothers with intended pregnancy (36).

The SUDS score medians of the HST and the HBS groups were with 5,0 (IQR: 4,0-7,0) out of 10. Spielberger reported that the STAI-S score average of the women was 35,2 (37). In this study, the average STAI-S score was 39,8 in the HST group and 41,3 in the HBS group (Table 2). The state anxiety score average of mothers was higher than the state anxiety score average of Spielberger's female population. This situation may be due to the fact that mothers did not have enough information about the procedures. In a study that investigated the state anxiety levels of parents regarding to magnetic resonance imaging

under anesthesia; the average state anxiety scores were 39 in the group who was detailed information, and were 43,6 in the group who was provided information about only the risks of anesthesia (38). In another study that examined parental anxiety before and after surgery; the average state anxiety scores of the mothers were 50,02 before the operation, and were 40,68 after the operation (39). In a study that examined the anxiety levels of the parents whose children would undergo surgical procedures, the average score of the state anxiety of the parents ranged from 38 to 47,5 (40). In another study that evaluated the anxiety states of mothers of children with obstructive sleep apnea; it was reported that mothers' anxiety levels increased according to the severity of the disease (41).

In a study that examined the effects of positive newborn screening results on families; it was reported that uncertainty caused anxiety, and while the uncertainty was increasing, families' anxiety was also increasing (42). Parental anxiety increases as the risk and unknownness of the procedure is increased. Additionaly, stressful life events are a risk factor for anxiety (35), neonatal screening tests are also stressful events for mothers and may cause anxiety. The mothers may concern about the screening test itself as well as the result of the test, and the process after the positive test result. Especially, unknownness is increased anxiety (43). In a study found that pregnant women experienced anxiety because of unknownness during the prenatal screening test (44). Although the difference was not significant, the HBS group mothers had higher anxiety than the HST group (Table 4). Heel prick blood sampling may have increased anxiety because it is an interventional procedure.

Spielberger reported that the STAI-T score average of the women was 34,8 (37). In a study that examined parental anxiety before surgery; the trait anxiety score average of the mothers was 38,47 (39). In another study that examined the anxiety levels of the parents who would undergo surgical procedures to their children, the trait anxiety score average of the parents ranged from 33 to 35 (40). In this study, the STAI-T score average was 42,5 in the HST group and 41,4 in the HBS group (Table 2). The trait anxiety score average of mothers was higher than the trait anxiety score average of Spielberger's female population. There was no statistically significant difference between the groups ($p>0,05$) (Table 4).

There was a moderate positive correlation between the SUDS scores and the STAI-S scores in the HST group ($r = 0,63$) and a weak positive correlation between the SUDS scores and the STAI-S scores in the HBS group ($r = 0,35$) ($p<0,05$) (Table 5). These findings showed that, as anxiety levels of mothers related to the procedures increase their subjective evaluations scores increased, as well as state anxiety scores. At the same time these results showed that the SUDS can measure the state anxiety.

In the HST group, there was a weak positive correlation between the SUDS scores and the STAI-T scores, and also a moderate positive correlation between the STAI-S scores and the STAI-T scores.

There was a weak positive correlation between the STAI-S scores and the STAI-T scores in the HBS group (Table 5). These results showed that the trait anxiety affects the state anxiety. In a study that investigated parents' anxiety levels, a moderate positive correlation was found between the STAI-S and the STAI-T (45). It is reported that an another study, adolescents with higher trait anxiety may have higher state anxiety at induction of anesthesia (46). According to another study, high trait anxiety in children and parents are predictive of elevated levels of perioperative anxiety (47). Similarly, to these studies, the current study was found that, mothers with high trait anxiety had high anxiety about the procedure, and at the same time there was a relationship between their state and trait anxiety.

There was a weak positive correlation between the birth order of the baby and the STAI-S scores of the mothers, in the HST group ($p<0,05$) (Table 5). In this study it was determined that, as the number of children increased, the mothers' anxiety about the procedure have also increased. In particular, during the procedure, if the baby moves/cries or does not sleep, it can cause the procedure time to pass, and the mothers can wait a long time. These situations may increase the level of anxiety in mothers. The mothers may have lived similar negative situations at their previous child or may have witnessed in other newborns similar situations while waiting for their procedure time.

There was a moderate positive correlation between the birth order of the baby and mother age, in the HBS group ($p<0,05$) (Table 5). It is usual that, as mother age increases, mothers can have more children.

5. CONCLUSION

Newborn screening tests increase the anxiety levels of mothers. Increased of maternal anxiety can adversely affect mothers' capacities to properly understand the explanations and referrals, and adaptation to screening procedure. On the other hand, health professionals may experience problems caused by anxiety of mothers during screening procedure. This situation may cause newborn screening can not be performed at a desired level and repeated practices and time wasting. It may be advisable to provide adequate, clear and comprehensible information on newborn screening tests to avoid problems with anxiety of the mothers. Additionally, appropriate methods to reduce anxiety may be identified and implemented.

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