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Satisfaction and anxiety levels of parents of infants with positive screening test results performed as part of the national newborn hearing screening program

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Abstract

Background This study aimed to evaluate the information levels, satisfaction, and anxiety of parents whose infants failed the initial screening test within the National Newborn Hearing Screening Program (NNHSP) in Turkey and were subsequently referred to a referral center for further audiological assessment.

Methods This descriptive, cross-sectional epidemiological study was conducted in Samsun Province, Turkey, and included parents of infants who failed the NNHSP screening between January 1 and December 31, 2024. Data were collected via phone interviews using a sociodemographic characteristics questionnaire, the Parent Satisfaction Questionnaire with Neonatal Hearing Screening Program (PSQ-NHSP), the State Anxiety Inventory Short Form (STAIS-5), and the Trait Anxiety Inventory Short Form (STAIT-5). The PSQ-NHSP is a 5-point Likert-type scale (scores 1 to 5). There is no established cut-off value for high satisfaction. The STAIS-5 and STAIT-5 are 4-point Likert-type scales (scores 5–20). STAIS-5 ≥ 10 and STAIT-5 ≥ 14 are considered indicative of clinical anxiety. Statistical analyses of the collected data were performed using the t-test, analysis of variance (ANOVA) test, and Pearson correlation analysis.

Results The study included 134 parents, with a mean age of 28.37 ± 6.02 years; 82.1% were mothers. 85.5% of parents reported overall satisfaction with the NNHSP. Mean PSQ-NHSP subscale scores were 3.49 ± 0.70 for "information", 3.63 ± 0.54 for "healthcare personnel in charge of the hearing testing", 3.68 ± 0.50 for "appointment schedule", and 3.84 ± 0.61 for "overall satisfaction". PSQ-NHSP score of parents with low-income was significantly lower ($p = 0.011$) than those with high-income. PSQ-NHSP score of parents with primary-education level was significantly lower ($p = 0.015$) than those with university and above-education level. Mean STAIS-5 and STAIT-5 scores were 7.60 ± 2.16 and 8.12 ± 2.27, respectively, indicating low levels of anxiety. A significant negative correlation was found between parental satisfaction and anxiety levels ($p < 0.05$).

Conclusions Parents whose infants failed the NNHSP screening demonstrated high satisfaction but low anxiety. Ensuring adequate parental information, improving satisfaction, and addressing anxiety are essential for the effectiveness and continuity of newborn hearing screening programs.

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Background

The primary goal of early hearing detection and intervention (EHDI) is to detect and intervene in infants born with hearing loss at an early stage of development. Newborn hearing screening (NHS) aims to diagnose infants with hearing loss within the first three months of life and equip them with hearing aids by six months of age. Only in this way can children be protected from the negative consequences of hearing loss on cognitive functions, language development, academic performance, and social and emotional skills [1, 2]. Approximately 1,200,000 babies are born annually in our country, and the rate of newborns undergoing hearing screening was 95.8% in 2022 [3, 4]. The Joint Committee on Infant Hearing (JCIH) states that the rate of babies undergoing hearing screening should be at least 95–97% [2]. The incidence of neonatal hearing loss is 2–3 in every 1000 babies in our country, and as high as 4–5% in babies followed up in the neonatal intensive care unit [5].

Parents' knowledge and satisfaction are vital to the success of pediatric screening programs [6]. High levels of parental satisfaction and knowledge facilitate their cooperation with healthcare professionals and ensure treatment success [7]. JCIH emphasizes that assessing parents' satisfaction levels is vital to the success of the national NHS programs (NNHSPs). JCIH also emphasizes the importance of parents having access to accurate information about screening, testing, follow-up, and rehabilitation processes [2]. The characteristics of healthcare services, interactions with healthcare personnel, and the cultural structure of society determine individuals' perceptions of healthcare services. Individuals' perceptions, in turn, significantly influence the use of healthcare services and, consequently, their success [8]. Therefore, parents' awareness and satisfaction with NNHSPs increases their cooperation and compliance with follow-up and treatment, thereby increasing screening participation rates while decreasing refusal and loss-to-follow-up rates [9–11].

Anxiety and stress can occur in families of babies whose NHS results necessitate further audiological testing and follow-up. Lack of parental knowledge, awareness, and communication further contributes to increased stress [12, 13]. The internationally accepted benchmark for babies needing further audiological testing based on NHS results is 4% or less [2]. A study conducted in our country found that the rate of babies referred for advanced audiological tests based on NNHSP results was 4.3% [14]. The low prevalence of permanent hearing loss, coupled with the low rate of babies referred for further audiological testing according to NNHSP results, and therefore the low false positive rate, indicates that the NNHSP is ideal. The positive predictive rate in the NHS has generally been reported to vary between 2.2% and 11.7%. The high false-positive rate is one reason why parents may be seriously concerned, although many studies have shown high acceptance and satisfaction with NNHSP [15]. A study assessing parents' satisfaction and anxiety within the NNHSP found that parents experienced low levels of stress during the screening process, whereas those whose NHS results necessitated further audiological testing and follow-up exhibited higher anxiety, which decreased over time [16]. Parental satisfaction and anxiety are strongly influenced by the attitudes and emotional competence of healthcare staff. Healthcare personnel should be able to manage stress, communicate effectively with families, and maintain clear communication within interprofessional teams. Higher emotional intelligence supports nurses in regulating emotions, managing stress, and communicating effectively. Recent evidence linking emotional intelligence with clinical decision-making among neonatal nurses highlights the importance of these interpersonal factors [17].

Studies evaluating satisfaction and anxiety levels among parents of babies referred for further audiological testing and follow-up after the NNHSP remain insufficiently represented in the literature. In this context, this study was conducted to evaluate the knowledge, satisfaction, and anxiety levels of parents of babies who had positive results from the screening test performed within the scope of the NNHSP and were subsequently referred to a referral center for further testing.

Methods

Study design and setting

This study was designed as a descriptive, cross-sectional, epidemiological study. The study protocol was approved by the Samsun University Ethics Committee (Approval No: 2025/7/12) and the institution where the study would be conducted. The objective of the study was explained to the parents whose babies were referred for further testing under the NNHSP by the researchers, and their verbal informed consent was obtained. The study was conducted in Samsun Province, located in the Black Sea region of northern Turkey. Samsun province has 17 districts. Four of these are central districts, where approximately half of the province's population lives.

Population and sample

The study population consisted of either one of the parents of 196 infants who failed the screening test performed within the scope of NNHSP, which is implemented in hospitals in all districts of Samsun province, were subsequently referred to a referral center for further examination and treatment, and were evaluated by an ear, nose, and throat (ENT) specialist and underwent the necessary audiological tests. The survey targeted families of infants who had completed hearing screening between January 1 and December 31, 2024, and were subsequently referred to a tertiary center for further audiological evaluation and treatment. The survey and data collection were conducted from August 1 to August 31, 2025, following ethical approval. Parents' contact information was obtained through the Ministry of Health Public Health Management System (HSYS) NNHSP module. Parents who did not speak Turkish, had an intellectual disability, and did not give consent to participate in the study were excluded from the study. Among the 62 parents who could not be included, 4 refused to participate, and the remaining individuals could not be reached. In the end, the study sample consisted of 134 parents.

NNHSP procedure

In Turkey, NNHSP has been implemented since 2008 to include all newborns in hospitals with a maternity unit. The NNHSP protocol was updated in 2019, requiring the use of the auditory brainstem response (ABR) test. Under NNHSP, hearing screening has been performed on babies younger than 3 months by an audiometric technician in a quiet room using the ABR test. The ABR screening protocol is applied to all babies, except those who stay in the intensive care unit for more than five days and those with risk factors who are referred directly to a referral center [3, 4]. Hearing intensity up to 35 dB nHL can be measured with the ABR. The ABR result is automatically reported as "pass" or "fail" [15]. Babies whose test results are reported as "pass" for both ears are considered to have normal hearing, while babies who receive a "fail" result in one or both ears are scheduled for a repeat test after 14 days. Babies who receive a "fail" result in one or both ears as a result of the repeat ABR test are referred to referral centers located in tertiary health institutions designated by the Ministry of Health for diagnostic evaluation.

Data collection procedure

First, parents were administered a nine-question sociodemographic questionnaire, developed by the researchers based on the literature. The sociodemographic characteristics queried included the parents' age, marital status, education level, employment status, economic status, and district of residence.

Secondly, parents were administered the Parent Satisfaction Questionnaire with Neonatal Hearing Screening Program (PSQ-NHSP) to assess their satisfaction levels with the NNHSP. The 5-point Likert-type PSQ-NHSP was developed by Mazlan et al. as a valid and reliable tool in Australia [10]. The Turkish version of the PSQ-NHSP was developed by Çekiç et al. with a Cronbach alpha coefficient of 0.78, indicating acceptable internal consistency reliability [18]. The PSQ-NHSP consists of four subscales: the 3-item "information" subscale, the 8-item "healthcare personnel in charge of the hearing testing" subscale, the 7-item "appointment schedule" subscale, and the 4-item "overall satisfaction" subscale. The PSQ-NHSP scale also includes 3 open-ended questions and 8 reverse-scored questions, namely the 4th, 9th, 11th, 15th, 20th, 22nd, 24th, and 26th questions.

Thirdly, parents were administered the State Anxiety Inventory Short Form (STAIS-5) and the Trait Anxiety Inventory Short Form (STAIT-5) to assess their anxiety levels in relation to NNHSP. STAIS-5 and STAIT-5 developed in 2020 as short and easily applicable tools [19]. The Turkish validity and reliability studies were conducted in 2024 by Döner et al., who found their internal consistency coefficients to be 0.838 and 0.837, respectively [20]. Both tools are 4-point Likert-type scales, each consisting of five items. Participants with a STAIS-5 score of 10 or higher and a STAIT-5 score of 14 or higher are considered clinically anxious [19].

Statistical analysis

The statistical analyses of the collected data were conducted using SPSS 23.0 (Statistical Product and Service Solutions for Windows, Version 23.0, IBM Corp., Armonk, NY, US, 2015) software package. The results of the statistical analyses were expressed using descriptive statistics, i.e., mean ± standard deviation (SD) values for normally distributed continuous variables and frequencies (n) and percentages (%) for categorical variables. The normal distribution characteristics of numerical variables were analyzed using the Kolmogorov-Smirnov test and visually using histograms. Student's t-test was used to compare PSQ-NHSP, STAIS-5, and STAIT-5 scores between two independent groups. Multiple groups, categorized by sociodemographic characteristics such as age, education level, and economic status, were compared using the one-way analysis of variance (ANOVA) test. The relationships between PSQ-NHSP scores with STAIS-5 and STAIT-5 scores were assessed using Pearson correlation coefficients. Accordingly, the relationships with $r < 0.30$, $0.30 \leq r < 0.70$, and $r \geq 0.70$ were considered weak, moderate, and strong correlations, respectively. All statistical tests were conducted as two-tailed. Probability (p) statistics of < 0.05 were deemed to indicate statistical significance. Missing data were handled using listwise

deletion, and response rates were recorded for each item. Because the amount of missing data was minimal and completely random, we used listwise deletion method.

Results

The mean age of the study sample, comprising 134 parents, was 28.37 ± 6.02 years. Of these parents, 82.1% were mothers. More than half of the parents (56.7%) were high school graduates, and 63.4% resided in central districts. The majority of the babies (62.0%) were born in public hospitals. Of the parents, 29.9% were between 18 and 25 years of age, 40.3% were between 26 and 30 years, and 29.9% were in the 30 years and above group. A total of 64.2% were not employed, and 97.8% were married. The proportions of those who described their economic status as low, medium, and high were 33.6%, 62.7%, and 3.7%, respectively. While 67.9% of the parents reported having one child, the proportion of those with 2–3 children was 29.1%, and the proportion with 4 or more children was 3% (Table 1).

Table 1 Demographic characteristics of participating parents

Variable	*n* (%)
Parent interviewed	
Father	24 (17.9)
Mother	110 (82.1)
Age *(years)*	28.37 ± 6.02
(range)	*(18–44)*
Age groups	
18–25 years	40 (29.9)
26–30 years	54 (40.3)
≥ 30 years	40 (29.9)
Residence	
Central districts	85 (63.4)
Other districts	49 (36.6)
Education level	
Primary	35 (26.1)
High school	76 (56.7)
University and above	23 (17.2)
Employment status	
Employed	48 (35.8)
Unemployed	86 (64.2)
Marital status	
Single	3 (2.2)
Married	131 (97.8)
Economic status	
Low	45 (33.6)
Moderate	84 (62.7)
High	5 (3.7)
Number of children	
1	91 (67.9)
2–3	39 (29.1)
≥ 4	4 (3.0)
Birth facility type	
Private hospital	51 (38.0)
Public hospital	83 (62.0)

Data are presented as n (%) for categorical variables and mean ± SD for continuous variables

Of the 127 parents, 72% had acquired their information about NNHSP from healthcare personnel at the hospital, 24% from their previous children's NHS experiences, and 4% from their immediate circle. Among the mean scores parents received from the PSQ-NHSP subscales, the highest was the mean PSQ-NHSP "overall satisfaction" subscale score (3.84 ± 0.61), and the lowest was the mean PSQ-NHSP "information" subscale score (3.49 ± 0.70). Analysis of the PSQ-NHSP "overall satisfaction" subscale scores revealed that 85.5% of parents were satisfied with the NNHSP, while 6.9% were dissatisfied. Based on PSQ-NHSP "healthcare personnel in charge of the hearing testing" subscale scores, 80.0% of parents indicated that the healthcare personnel were knowledgeable about the NNHSP, and 80.8% stated that they were kind to their babies (Table 2).

Analysis of the relationships between sociodemographic characteristics and parents' level of satisfaction with NNHSP revealed a statistically significant relationship between parents' economic status and PSQ-NHSP total score ($p = 0{,}021$). Accordingly, the mean PSQ-NHSP total score of the parents with higher economic status (3.84 ± 0.42) was significantly higher than that of those with lower economic status (3.62 ± 0.34). There was also a significant relationship between parents' education level and PSQ-NHSP total score ($p = 0.042$). Accordingly, the mean PSQ-NHSP total score of the parents with an undergraduate or graduate degree was significantly higher than that of those with lower education levels. Post-hoc analysis revealed that the PSQ-NHSP score of parents with low-income was significantly lower ($p = 0.011$) than those with high-income. Post-hoc analysis also revealed that the PSQ-NHSP score of parents with primary-education level was significantly lower ($p = 0.015$) than those with university and above-education level. No statistically significant relationship was found between parents' level of satisfaction and age groups, place of residence, employment status, or other sociodemographic variables ($p > 0.05$) (Table 3).

The mean STAIS-5 and STAIT-5 scores of the sample group were 7.60 ± 2.16 and 8.12 ± 2.27, respectively. There was a moderate positive correlation between STAIS-5 and STAIT-5 scores ($r = 0.537$, $p < 0.001$) (Table 4).

Analysis of the relationships between parents' levels of satisfaction with NNHSP and levels of anxiety in relation to NNHSP revealed significant negative relationships between mean STAIS-5 scores and all mean PSQ-NHSP subscale scores, the strongest being the one with the PSQ-NHSP "healthcare personnel in charge of the hearing testing" subscale score ($r = -0.432$, $p = 0.001$), and significant negative relationships between mean STAIT-5

Table 2 Descriptive statistics for parent satisfaction questionnaire with neonatal hearing screening programs (PSQ-NHSP)

Domain/Item	*n* (%)	Mean ± SD	Disagree/Strongly disagree (%)	Neutral (%)	Agree/Strongly agree (%)
Information		**3.49 ± 0.70**			
Content of information sheet was sufficient	130 (97.0)	3.30 ± 1.07	21.5	30.8	47.7
Information was difficult to understand[a]	129 (96.3)	3.70 ± 1.06	67.4	19.4	13.2
Information was useful before first appointment	131 (97.8)	3.49 ± 1.10	16.8	25.2	58
Staff in charge of hearing test		**3.63 ± 0.54**			
Tester did not give clear information about follow-up[a]	127 (94.8)	3.40 ± 1.07	50.4	31.5	18.1
I know what to do next regarding my child's hearing	129 (96.3)	3.39 ± 1.02	17.1	27.1	55.9
Information about testing procedure was insufficient[a]	127 (94.8)	3.65 ± 0.99	71.7	14.2	14.2
Information about test results was sufficient	132 (98.5)	3.70 ± 1.07	12.1	21.2	65.6
Tester was knowledgeable about screening program	130 (97.0)	3.79 ± 0.94	11.5	8.5	80
Tester was skillful with equipment	133 (99.3)	3.62 ± 0.98	14.3	18	67.6
Tester was not approachable[a]	127 (94.8)	4.06 ± 0.97	81.9	11	7
Tester was gentle with my baby	125 (93.3)	3.98 ± 1.01	10.4	8.8	80.8
Appointment schedule		**3.68 ± 0.50**			
Satisfied with interval between appointments	132 (98.5)	3.64 ± 0.89	11.4	22.7	65.9
Had chance to ask about program	128 (95.5)	3.66 ± 0.87	10.2	18	71.9
Had chance to ask about test procedure	129 (96.3)	3.72 ± 0.89	11.6	13.2	75.2
Had chance to ask about test results	129 (96.3)	3.77 ± 0.98	13.2	13.2	73.7
Length of appointment was inappropriate[a]	126 (94.0)	3.64 ± 1.15	68.3	11.9	19.8
Satisfied with waiting time for testing	130 (97.0)	3.72 ± 1.05	14.6	13.8	71.5
Testing site was inappropriate[a]	131 (97.8)	3.59 ± 1.14	64.9	15.3	19.8
Overall satisfaction		**3.84 ± 0.61**			
Overall satisfied with screening program	131 (97.8)	3.98 ± 0.90	6.9	7.6	85.5
Not satisfied with test process[a]	134 (100)	3.70 ± 1.17	69.4	9.7	20.9
Will recommend program to others	134 (100)	3.79 ± 0.93	11.2	9	79.8
Will not use same service in future[a]	132 (98.5)	3.89 ± 0.99	75.8	14.4	9.9

Bold *p*-values indicate statistical significance ($p \leq 0.05$)

SD Standard deviation

[a]Reverse coded items. For these items, responses of "Disagree/Strongly Disagree" indicate a positive perception

scores and mean PSQ-NHSP "appointment schedule" ($r = -0.310$, $p = 0.001$) and "overall satisfaction" ($r = -0.249$, $p = 0.004$) subscale scores (Table 4).

Discussion

This study was carried out to assess the knowledge, satisfaction, and anxiety levels of parents whose babies failed the screening test within the scope of the NNHSP and were subsequently referred to a referral center for further testing. Parental interest and participation are key to the success of screening programs for children. Families' knowledge and attitudes about screening influence their willingness to include their children in related programs. Approximately 94% of parents in our sample reported having previously learned about hearing screening through various sources. Of those who were informed about NNHSP before the first appointment, the rate of those who found the content of the information form sufficient was 47.7%. Parents' responses regarding whether they were adequately informed about the screening program in advance indicate that they were satisfied. Most stated that they found the information they were provided prior to screening to be understandable and very helpful. Addressing the lack of information families have about the importance and goal of screening is vital for the success of the NHS. JCIH recommends providing clear, written information about the NHS to families of babies [2]. Studies have shown that parents want to be informed about the NHS before their first appointment [21, 22]. There is evidence indicating that providing information about the NNHSP during the third trimester of pregnancy increases parental satisfaction and enhances the effectiveness of early detection programs [23]. A study conducted in Iran revealed that approximately 60% of parents were informed about the NNHSP in advance, and 81% considered the "information form" sufficient [24]. A major problem with screening programs is the loss of babies to follow-up. A lack of awareness has been demonstrated among families of babies who failed hearing screenings yet did not attend follow-up appointments

Table 3 Comparison of PSQ-NHSP and State-Trait anxiety inventory scores by demographic characteristics

Characteristic		PSQ-NHSP		State-Trait Anxiety Inventory	
	n	Mean ± SD	*p*-value	Mean ± SD	*p*-value
Parent interviewed					
Father	24	3.70 ± 0.36	0.452*	15.04 ± 3.17	0.402*
Mother	110	3.78 ± 0.42		15.92 ± 3.53	
Age groups					
18–25 years	40	3.64 ± 0.48	0.088**	14.70 ± 2.36	0.071**
26–30 years	54	3.72 ± 0.32		16.42 ± 4.47	
> 30 years	40	3.85 ± 0.33		15.94 ± 3.26	
Residence					
Central districts	85	3.77 ± 0.34	0.062*	15.86 ± 3.66	0.373*
Other districts	49	3.73 ± 0.46		15.62 ± 3.41	
Education level					
Primary[1]	35	3.63 ± 0.45	**0.042**** **1–2 = 0.116**[+] **1–3 = 0.015**[+] **2–3 = 0.612**[+]	15.99 ± 4.22	0.067**
High school[2]	76	3.67 ± 0.38		15.65 ± 3.62	
University and above[3]	23	3.75 ± 0.33		15.14 ± 3.14	
Employment status					
Employed	48	3.82 ± 0.30	0.206*	15.04 ± 3.50	0.123*
Unemployed	86	3.72 ± 0.36		15.82 ± 3.65	
Marital status					
Single	3	3.48 ± 0.51	0.493*	16.33 ± 6.65	0.064*
Married	131	3.76 ± 0.35		15.68 ± 3.46	
Economic status					
Low[1]	45	3.62 ± 0.34	**0.021**** **1–2 = 0.052**[+] **1–3 = 0.011**[+] **2–3 = 0.035**[+]	16.42 ± 5.52	0.295**
Moderate[2]	84	3.72 ± 0.38		15.98 ± 4.44	
High[3]	5	3.84 ± 0.42		15.34 ± 3.46	
Number of children					
1	91	3.65 ± 0.38	0.634**	15.66 ± 3.89	0.898**
2–3	39	3.69 ± 0.41		15.86 ± 3.56	
≥ 4	4	3.71 ± 0.42		15.74 ± 3.44	
Birth facility type					
Private hospital	51	3.72 ± 0.40	0.078*	15.85 ± 4.98	0.054*
Public hospital	83	3.78 ± 0.41		15.88 ± 4.36	

Bold *p*-values indicate statistical significance ($p \le 0.05$)

SD Standard deviation

*Student's t-test

**One-way ANOVA

[+] Data were analyzed using one-way ANOVA followed by Tukey's post hoc test; $0.05/3 \approx p < 0.017$ was considered significant

[25]. It has been reported that parents who were better informed by relevant healthcare personnel at the hospital where they gave birth had more positive attitudes about the NHS [26]. In this context, improving activities to inform parents is likely to increase success in follow-up.

Table 4 Mean scores and correlations between PSQ-NHSP domains and State-Trait anxiety inventory

Domain	Min	Max	Mean ± SD	STAI-S	STAI-T
Information	1.33	5	3.49 ± 0.70	*r* = −0.397. **p = 0.001**	*r* = −0.216. **p = 0.016**
Staff in charge	1.88	4.38	3.63 ± 0.54	*r* = −0.432. **p = 0.001**	*r* = −0.182. **p = 0.065**
Appointment schedule	2.29	4.71	3.68 ± 0.50	*r* = −0.255. **p = 0.009**	*r* = −0.310. **p = 0.001**
Overall satisfaction	1.75	4.75	3.84 ± 0.61	*r* = −0.297. **p = 0.002**	*r* = −0.249. **p = 0.004**
STAI-S	5	17	7.60 ± 2.16	1	*r* = 0.537. **p < 0.001**
STAI-T	6	16	8.12 ± 2.27	*r* = 0.537. **p < 0.001**	1

Bold *p*-values indicate statistical significance ($p \le 0.05$)

r: Pearson correlation coefficient, *SD* Standard deviation, *STAI-S* State-Trait Anxiety Inventory-State, *STAI-T* State-Trait Anxiety Inventory-Trait, *PSQ-NHSP* Parent Satisfaction Questionnaire with Neonatal Hearing Screening Programs

The parents included in our study had high levels of satisfaction with the healthcare personnel in charge of the hearing test. In parallel, Mazlan et al. found that the satisfaction rate of parents with both the healthcare personnel in charge of the hearing test and the information they were provided by the healthcare personnel was over 90% [10]. Çekiç et al. found that the satisfaction rate of parents with the healthcare personnel was 75% [18]. Ensuring effective parental compliance with diagnostic follow-up and interventions for their infants is crucial, highlighting the importance of communication between screening staff and families, particularly regarding infants referred to a primary care facility. There is a need to strengthen the role of parents in the screening and follow-up process by evaluating parental satisfaction.

The majority of parents included in this study had high levels of satisfaction with the appointment schedule. Only 6.9% of the parents reported overall dissatisfaction. In comparison, a study conducted in Iran found that 16% of parents were generally dissatisfied, primarily due to the testing environment and delays in screening appointments [24]. Most parents included in this study (65.6%) found the information provided by screening personnel about screening results to be adequate and were satisfied with the appointment schedule. They stated that the testing personnel were sufficiently knowledgeable and skilled regarding the screening procedure and that they had the opportunity to ask further questions about the screening results. Similarly, Mazlan et al. reported that 95% of the parents were generally satisfied with the quality of the screening program [10]. A study conducted in Spain found that 90% of parents were satisfied with the NHS [27]. An Iranian study found that parents' overall satisfaction rate was 90%, while their satisfaction rates with the healthcare personnel and appointment schedule

were 60% and 58%, respectively [28]. In one study from Saudi Arabia, the researchers reported that 30% of parents received information about the screening program beforehand, and the overall satisfaction level of parents was 80% [25]. A study conducted in Albania reported that 94% of mothers were satisfied with the NHS and that as their economic levels increased, their knowledge and satisfaction with screening tests also increased [29]. In parallel, this study found that PSQ-NHSP total scores were significantly higher in parents with higher economic status. Çekiç et al., who adapted the PSQ-NHSP to Turkish, found that 78%, 68%, and 74% of parents had high scores on the PSQ-NHSP overall satisfaction, information, and appointment schedule subscales, respectively [18].

The parents included in this study had low levels of anxiety, consistent with findings of the studies in the literature. Hergils et al., while emphasizing the negative impact of false-positive screening results on the parent-child relationship, still reported low levels of parental anxiety [15]. Similarly, Lam et al. stated that the NHS did not increase parental anxiety [26]. In a study conducted with Spielberger's State-Trait Anxiety Inventory, Watkin et al. found no significant difference in anxiety status between parents of the infants in the retest group and those of control subjects who did not undergo neonatal hearing testing [30]. There are also studies in the literature reporting that parents of babies who fail screening tests have higher anxiety levels [31–33]. A study conducted in Albania found that two-thirds of mothers of babies undergoing hearing screening were very stressed while waiting for the screening results [29]. In the case of referred babies, parents being told that inconclusive results at the end of each screening stage, as well as the need for further testing, can increase their anxiety levels. The role of screening personnel in such cases is to provide in-depth information about the screening procedure, potential outcomes, and opportunities for intervention [34]. Consistent with the existing literature, our study identified a significant negative correlation between anxiety levels and the satisfaction sub-dimensions [35]. Enhancing the communication skills of personnel is essential for reducing parental anxiety. Transparent and effective communication by healthcare staff increases patient trust and engagement, thereby improving satisfaction. In this regard, training programs that emphasize active listening, cultural sensitivity, and patient engagement are recommended. Understanding differences based on educational and economic levels may also contribute to the development of targeted interventions aimed at promoting equity in healthcare services [35]. The importance of preparing healthcare personnel to provide emotional support to patients' families, as well as implementing effective intervention programs to improve coping skills related to workload and stress, has been highlighted [36]. Some studies emphasize the interrelationship among emotional regulation, critical thinking, and clinical decision-making in nursing practice, noting that emotional and cognitive skills can be strengthened. Based on these findings, interventions aimed at improving healthcare personnel's emotional regulation and interpersonal skills may be recommended [37]. A study using two scales evaluated separately according to the two-factor anxiety theory reported that personality trait anxiety scores did not change much in repeated measurements between 10 days and 1 year, while state anxiety scores changed significantly [38]. In our study, in the case of babies born at the beginning of the study period, the long period after the end of screening may have made it ineffective to assess the anxiety levels of their parents.

In our study, parents with lower educational levels demonstrated lower satisfaction with NHS services. A major factor affecting the acceptability of screening tests is limited understanding of the health intervention and its procedures. Consequently, insufficient knowledge regarding the NNHSP has been associated with increased parental anxiety and decreased satisfaction [39]. Parents may be concerned not only about the possibility of false-positive results but also about whether their child might develop hearing loss in the future despite normal test outcomes. The perceived complexity of the screening process may further hinder comprehension and heighten anxiety. Consistent with our findings, the literature identifies maternal educational level and anxiety as key determinants of negative perceptions and attitudes toward the NNHSP [39]. Our study also indicated that parents with lower income levels reported reduced satisfaction with NHS. Previous research suggests that parents from lower socioeconomic backgrounds may place greater trust in traditional approaches to managing hearing loss. Furthermore, the repeated visits required throughout the screening process may impose additional financial burdens, contributing to increased anxiety and decreased program participation [40]. These findings highlight the influence of socioeconomic disparities on satisfaction and underscore the need for targeted interventions to support low-income families during the information, communication, and follow-up phases of the program.

There were several limitations to this study. The cross-sectional design precludes any causal inferences between the variables examined. The sample was drawn from a single province. Given the regional variations in educational attainment and socioeconomic status across Turkey, the findings may not be generalizable to the broader population. The fact that the majority of the sample consisted of mothers may have caused gender-specific bias. The cut-off value of the satisfaction scale score evaluated based on the rates of responses given to items, as has been done in previous studies, has not been determined.

In our study, the response rate was 68.4%, and given that non-participating participants may have differed in certain characteristics, potential selection bias was considered a limitation. However, due to the voluntary nature of participation and the balanced demographic distribution of the sample to represent the population, this effect is not considered decisive on the findings. In addition, collecting data via phone interviews could introduce response bias. Although efforts were made to standardize data collection, the potential for interviewer bias cannot be entirely ruled out, as participants' responses may have been influenced by interactions with the data collectors. Additionally, some items in the survey had missing responses. These non-responses may introduce a minor source of bias and should be considered when interpreting the findings. Last, conducting interviews with some parents long after the screening process may have introduced recall bias, particularly in relation to state anxiety, potentially compromising the accuracy of the responses. This delay may have resulted in parents reporting lower or differently perceived levels of anxiety compared to their real-time experiences. Focusing future studies on the relationship between parents' satisfaction and anxiety levels and compliance with follow-up and interventions will contribute to improving the NNHSP.

Conclusions

Our findings indicate that while parents generally hold positive attitudes toward the screening program, the provision of information and emotional support requires enhancement. Targeted interventions to reduce parental anxiety and increase satisfaction are essential for optimizing program effectiveness. These results highlight the need for a comprehensive, family-centered approach for parents of infants referred to tertiary centers under the NNHSP. Addressing parents' informational and psychosocial needs can improve program outcomes and support the sustainability of early detection and intervention efforts. Accordingly, policies and training programs for healthcare professionals should prioritize effective communication and parental education, particularly for families with lower educational and socio-economic backgrounds, within a framework of health equity.

Abbreviations

ABR	Auditory Brainstem Response
ANOVA	Analysis of Variance
EHDI	Early Hearing Detection and Intervention
ENT	Ear, Nose, and Throat
HSYS	Public Health Management System
JCIH	Joint Committee on Infant Hearing
NHS	Newborn Hearing Screening
NNHSP	National Newborn Hearing Screening Program
PSQ-NHSP	Parent Satisfaction Questionnaire with Neonatal Hearing Screening Program
SD	Standard Deviation
SPSS	Statistical Product and Service Solutions
STAIS-5	State Anxiety Inventory Short Form
STAIT-5	Trait Anxiety Inventory Short Form

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Authors' contributions
FNTY: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Supervision, Project administration. ŞÖ: Investigation, Data curation, Writing – review & editing. All authors read and approved the final manuscript.

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Data availability
The datasets used and analysed during the current study are available from the corresponding author upon reasonable request, subject to institutional data protection policies and ethical approval requirements.

Declarations

Ethics approval and consent to participate
This study was approved by the Samsun University Non-Interventional Clinical Research Ethics Committee (Approval No: 2025/7/12, dated April 8, 2025). The study was conducted in accordance with the Declaration of Helsinki. Verbal informed consent was obtained from all participants prior to phone interviews, as approved by the ethics committee.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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