

Mother-reported family needs across distinct neonatal intensive care settings: A cross-sectional study

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ABSTRACT

Objective: The aim of this study was describe mother-reported family needs across three clinically distinct neonatal intensive care unit (NICU) settings within a single tertiary hospital and to explore whether theory-based Neonatal Intensive Care Unit Family Needs Inventory (NFINI) item-group summary scores showed between-setting differences.

Materials and Methods: This single-centre cross-sectional study included 116 Turkish-speaking mothers enrolled after their infants had been hospitalised for at least 7 days between February and May 2022. Mothers completed the 56-item NFINI, which was analysed as five theory-based item-group mean scores: assurance, information, proximity, comfort, and support. Item-group scores were compared across NICU settings using Kruskal–Wallis tests, with Bonferroni-corrected post-hoc comparisons when appropriate. Item-level priorities and mother-nominated priority items were summarised descriptively.

Results: Overall mean theory-based item-group scores were highest for proximity (3.63±0.44), assurance (3.60±0.39), and information (3.49±0.47). The only detectable unadjusted between-setting signal was observed for proximity ($H=7.631$, $p=0.022$, $\epsilon^2=0.050$), with higher scores in NICU 3 than NICU 1 (median 4.00 vs 3.62; Bonferroni-corrected $p=0.005$). Adjusted estimates were attenuated and imprecise in exploratory models with limited adjustment for gestational age or birth weight, length of stay, and maternal education. The highest-ranked items concerned best possible care, honest answers, daily physician communication, and information about the infant's care.

Conclusion: Mother-reported needs clustered around proximity, assurance, and information. The proximity finding should be interpreted as a context-linked and access-dependent pattern rather than evidence of an independent unit effect.

Keywords: Intensive care, mothers, needs assessment, neonatal intensive care unit, patient centered care

Introduction

Admission of an infant to a neonatal intensive care unit (NICU) is a major stressor for families and has been associated with high levels of parental anxiety and post-traumatic stress symptoms (1). In this context, family-centred neonatal care extends beyond clinical stabilisation and includes reliable communication, parental reassurance, proximity to the infant, participation in care, and emotional support during hospitalisation (2,3).

Studies of neonatal care experiences have highlighted the importance of communication quality, interpersonal interactions with staff, timely and understandable information, and opportunities for parents to participate meaningfully in care (4–6). Within the same institution, neonatal care settings may differ in acuity, access policies, monitoring requirements, and discharge readiness; these differences may shape the needs

reported by families. Understanding this distribution may help identify which components of family-centred support require emphasis in each care context.

Family-centred care is also not implemented as a single uniform model across neonatal settings. Neonatal care environments may differ in clinical case-mix, available resources, staff organisation, parental access policies, infection-control routines, and opportunities for parents to participate in daily care (7,8). Evidence from resource-variable neonatal care settings indicates that parental participation in hospital care is closely linked to local resources, care practices, and unit-level constraints (7). These process-based dimensions shape whether parents experience themselves as informed observers, supported caregivers, or active participants during hospitalisation. Structured assessment of parent-reported needs can therefore complement general satisfaction measures by

identifying communication, reassurance, proximity, and support priorities that are potentially actionable within neonatal care. The Neonatal Intensive Care Unit Family Needs Inventory (NFNI), modified by Ward from the Critical Care Family Needs Inventory for parents of critically ill infants in NICU settings, offers a structured approach to assess family needs during neonatal hospitalisation (9). Earlier NFNI research identified assurance-related needs among the highest-rated parental needs in NICU settings, whereas support-related needs were generally rated lower (10).

In a mixed-methods study conducted across all level III public NICUs in Northern Portugal, mothers rated information needs more highly than fathers, and parental need scores varied according to age, educational level, and previous parenthood; qualitative findings additionally identified needs for emotional support, privacy, and coherent information (11). Subsequent psychometric work supported a shorter form of the NFNI for use with parents of infants hospitalised in NICUs (12). A systematic review of standardised parent-needs assessment instruments identified 33 publications from hospital-based NICU settings across 15 countries. Publications were most frequently from the United States, Australia, England, and Iran, with additional evidence from several European, Asian, and Middle Eastern countries, including Türkiye (13). More broadly, the NICU parental-needs literature has considered contextual factors such as hospital policies, community resources, and socioeconomic circumstances, alongside parental involvement and informational, psychosocial, and practical needs (14). Despite the international literature on parental needs in NICUs, evidence comparing mother-reported family needs across clinically distinct neonatal care settings within the same institution remains limited, particularly in middle-income contexts. This study was exploratory and hypothesis-generating; no formal hypotheses were prespecified. It aimed to describe mother-reported family needs across three clinically distinct neonatal care settings within a single tertiary hospital and to explore whether theory-based NFNI item-group summary scores differed across these settings.

Materials and Methods

Study design and setting

This single-centre cross-sectional observational study was conducted between February 1 and May 31, 2022, in three clinically distinct neonatal intensive care settings at Turgut Özal Medical Centre, İnönü University, Malatya, Türkiye. Reporting followed the STROBE recommendations for cross-sectional studies. The hospital serves as a regional referral centre and receives neonatal patients from the city and surrounding provinces. NICU 1 provided acute observation and close monitoring for infants requiring closer clinical surveillance. NICU 2 primarily cared for very preterm and low-birth-weight infants requiring prolonged intensive neonatal care. NICU 3 was a mother-accompanied transitional care setting in which infants were closer to discharge and mothers were progressively involved in routine caregiving. Infants in NICU 3 could either be admitted directly to this mother-accompanied setting or transferred there from another neonatal care setting. The comparison was intended to describe needs across care contexts rather than to estimate an independent unit-level effect.

Participants and recruitment

Eligibility was assessed after the infant had completed at least 7 days of hospitalisation. This criterion was used because the study aimed to describe needs among mothers with established NICU experience rather than needs during the earliest admission period. Eligible participants were Turkish-speaking mothers who were present in the unit and were the infant's active bedside caregiver. Mothers' bedside availability varied according to infant acuity, unit routines, referral from other provinces, and transitions between care settings. Therefore, the NFNI was administered at the first feasible face-to-face contact after the infant had completed at least 7 days of hospitalisation. In NICU 1 and NICU 2, this usually occurred during routine bedside contact or scheduled information periods, whereas in NICU 3 it could occur when the mother and infant were transferred to the mother-accompanied transitional care setting. Therefore, the questionnaire reflected mothers' needs at the time they became accessible for study contact rather than at a fixed postnatal or hospitalisation day. To ensure comparability across the three NICU settings, recruitment was limited to mothers because NICU 3 was a mother-accompanied care setting in which paternal access was restricted. Mothers were classified according to the NICU setting in which the NFNI was administered. Each mother completed the NFNI only once, and repeated questionnaires after transfer between neonatal care settings were not administered. At questionnaire completion, mothers were instructed to rate their needs in relation to the care environment in which they were currently present. Therefore, the setting variable represents the care context at NFNI administration rather than the infant's complete transfer pathway or cumulative hospitalisation trajectory. A complete screening log of all potentially eligible dyads was not available. Therefore, the number of unique infants who became eligible after 7 days of hospitalisation, the number of mothers who could not be reached, and the participation rate among all eligible dyads could not be calculated. This limits assessment of selection bias. Mothers were not enrolled if they were unable to complete the questionnaire in Turkish, were not the infant's active bedside caregiver, declined participation, or had an infant who had not yet completed at least 7 days of hospitalisation at the time of eligibility assessment. No *a priori* sample size calculation was performed. The study used a consecutive, time-limited feasibility sample of mothers who could be reached and enrolled during the predefined study period; therefore, between-setting comparisons should be interpreted in terms of direction, effect size, and precision rather than as confirmatory hypothesis tests.

Data collection and variables

Mothers were informed about the study during routine NICU follow-up by either the developmental pediatrician or a neonatology fellow. After written informed consent was obtained, maternal, family, infant, and NFNI data were collected at the same face-to-face contact. The NFNI was completed by mothers as a mother-reported questionnaire with researcher assistance when needed. The researcher did not select responses on behalf of mothers; assistance was limited to reading or clarifying item wording and recording the mother's selected response when required. Maternal and family variables included maternal age, parental education, maternal employment, number of children,

residence, and household economic status. Infant variables included sex, delivery mode, gestational age, birth weight, and length of NICU stay at the time of NFNI administration.

Neonatal Intensive Care Unit Family Needs Inventory (NFNI)

Family needs were assessed using the Neonatal Intensive Care Unit Family Needs Inventory (NFNI), a 56-item instrument modified from the Critical Care Family Needs Inventory for parents of critically ill infants in NICU settings (9). The original NFNI groups items conceptually under five need categories: support, comfort, information, proximity, and assurance. In the present study, these categories were retained only as theory-based item groups because a formal Turkish validation of the NFNI was not available. Each item is phrased as a need statement and rated according to perceived importance. Responses were recorded on a 4-point Likert-type scale ranging from 1 ("not important") to 4 ("very important"), with higher scores indicating greater perceived importance. One example item is "To see my infant frequently." In addition to item ratings, mothers were asked to nominate up to five NFNI items they considered most important. Mothers were also offered an optional free-text prompt: "Is there anything else you would like to add about your needs during your infant's NICU hospitalisation?" Free-text comments were reviewed descriptively by the research team and grouped into broad content areas according to the main issue raised, such as father and family involvement, psychological support, physical environment and hygiene, communication and respectful care, financial support, proximity/contact with the infant, and infant safety or continuous observation. Comments could be assigned to more than one content area when they included more than one issue. No formal qualitative methodology, coding framework, or thematic analysis was applied. Permission to use, culturally adapt, and report example NFNI items was obtained from the original author before data collection. The NFNI was translated into Turkish by five independent researchers who were developmental pediatricians proficient in English. The translated versions were reviewed in consensus meetings, and a reconciled Turkish version was produced. This version was then back-translated into English by two bilingual translators who had not seen the original English NFNI. The research team compared the original English version, the reconciled Turkish version, and the back-translated English version; semantic discrepancies were discussed and resolved by consensus. The pre-final Turkish version was piloted with 5 mothers of infants hospitalised in the NICU. During pilot testing, mothers were asked about item clarity and comprehensibility, and words or expressions that were not understood were recorded. The research team reviewed this feedback and finalised the Turkish wording. Only one item required cultural adaptation: the church-related expression in the original version was adapted to "having a place where I can perform my religious practices" to fit the local Muslim-majority context. No formal Turkish psychometric validation study was performed; specifically, factor structure, measurement invariance, and criterion validity were not examined. Therefore, the five NFNI item groups were analysed as theory-based summary scores rather than as validated Turkish subscales. Cronbach's alpha was calculated only to describe internal consistency within these theory-based item groups and was not interpreted as evidence of structural validity.

Statistical analysis

Analyses were performed using IBM SPSS Statistics, version 27.0 (IBM Corp., Armonk, NY, USA). Additional analyses requested during proof review were performed in Python using SciPy 1.18.1 and statsmodels 0.15.0. The dataset was checked for coding errors, out-of-range values, category consistency, and missing data before analysis. Because no missing values were identified for variables included in the analyses, complete-case analysis was equivalent to analysis of the full included sample. Categorical variables were summarised as counts and percentages. Continuous variables were summarised as mean and standard deviation for overall descriptive reporting and as median and interquartile range for non-parametric between-setting comparisons. Maternal and infant characteristics were compared across NICU settings to describe group composition and potential confounding by clinical context; these comparisons were not treated as primary hypothesis tests. Categorical variables were compared using Pearson's chi-square test or Fisher's exact test when expected cell counts were sparse. Continuous variables were compared using Kruskal–Wallis tests. For the main descriptive analyses, a participant-level mean item-group score was calculated for each mother for each of the five theory-based NFNI item groups. These participant-level item-group scores were then compared across NICU settings using Kruskal–Wallis tests, which were applied to ranked individual observations rather than to group means. Mean item-group scores were used as the participant-level outcome because the item groups contained different numbers of items and this approach preserved the original 1–4 response metric. When the overall Kruskal–Wallis test was statistically significant, post-hoc pairwise Mann–Whitney U tests with Bonferroni correction were performed. Kruskal–Wallis statistics were reported with epsilon-squared effect sizes. Rank-biserial correlations were calculated for reported pairwise comparisons. Item-level analyses were descriptive. Items were ranked first by mean score and, in the case of ties, by the proportion rated as "very important". Frequencies of mother-nominated top-priority items were calculated using the number of mothers as the denominator.

Exploratory subgroup analyses compared NFNI item-group scores by gestational age, birth weight, and length-of-stay categories. Because proximity was the only item group showing an unadjusted between-setting signal, exploratory general linear models were used for this item group only, with limited adjustment for gestational age, length of stay, and maternal education; a sensitivity model replaced gestational age with birth weight. Adjusted differences were reported as unstandardised coefficients with 95% confidence intervals. All adjusted analyses were interpreted as descriptive exercises to assess attenuation and precision, not as causal models. For exploratory general linear models, residual distribution, influential observations, and homogeneity of variance were examined descriptively. Because residual distribution and homogeneity-of-variance assumptions were not fully met for the bounded 1–4 outcome, adjusted estimates were interpreted descriptively rather than as confirmatory or causal estimates. A two-sided p value <0.050 was considered statistically significant, except for Bonferroni-corrected post-hoc comparisons. No formal multiplicity correction was applied across the five theory-based NFNI item groups; therefore,

item-group comparisons were interpreted as exploratory and hypothesis-generating.

Results

Recruitment and sample characteristics

Aggregate service records for the study period showed 319 admission entries across the three NICU settings. These records reflected service volume rather than an individual-level eligibility

denominator because infants could contribute more than one entry through readmission, inter-service transfer, or movement between neonatal care areas. In addition, the aggregate records could not reliably distinguish infants who reached 7 days of hospitalisation from those discharged, transferred, referred to another hospital, or otherwise unavailable before eligibility assessment. The 319 admission entries were therefore not used to calculate eligibility or participation rates. During recruitment, 130 mothers were reached and

Table I: Maternal and infant characteristics across NICU settings

Characteristic	Total	NICU 1	NICU 2	NICU 3	p
Total number of patients	116	41	35	40	
Maternal age*					
<25 years	26 (22.4)	11 (26.8)	8 (22.9)	7 (17.5)	0.906
25–34 years	57 (49.1)	19 (46.3)	17 (48.6)	21 (52.5)	
≥35 years	33 (28.4)	11 (26.8)	10 (28.6)	12 (30.0)	
Maternal education*					
Primary/middle school	46 (39.7)	17 (41.5)	10 (28.6)	19 (47.5)	0.246
High school	42 (36.2)	13 (31.7)	18 (51.4)	11 (27.5)	
University	28 (24.1)	11 (26.8)	7 (20.0)	10 (25.0)	
Maternal employment*					
Not working	38 (32.8)	14 (34.1)	13 (37.1)	11 (27.5)	0.656
Working	78 (67.2)	27 (65.9)	22 (62.9)	29 (72.5)	
Household economic status*					
Below minimum wage	21 (18.1)	6 (14.6)	8 (22.9)	7 (17.5)	0.650
Minimum wage	57 (49.1)	22 (53.7)	18 (51.4)	17 (42.5)	
Above minimum wage	38 (32.8)	13 (31.7)	9 (25.7)	16 (40.0)	
Residence*					
Urban	85 (73.3)	33 (80.5)	24 (68.6)	28 (70.0)	0.427
Outside city	31 (26.7)	8 (19.5)	11 (31.4)	12 (30.0)	
Infant sex*					
Male	81 (69.8)	30 (73.2)	22 (62.9)	29 (72.5)	0.560
Female	35 (30.2)	11 (26.8)	13 (37.1)	11 (27.5)	
Gestational age category*					
<32 weeks	35 (30.2)	1 (2.4)	25 (71.4)	9 (22.5)	<0.001
32–36 weeks	42 (36.2)	17 (41.5)	8 (22.9)	17 (42.5)	
≥37 weeks	39 (33.6)	23 (56.1)	2 (5.7)	14 (35.0)	
Birth weight category*					
<1500 g	28 (24.1)	0 (0.0)	23 (65.7)	5 (12.5)	<0.001
1500–2499 g	44 (37.9)	13 (31.7)	12 (34.3)	19 (47.5)	
≥2500 g	44 (37.9)	28 (68.3)	0 (0.0)	16 (40.0)	
Length of stay category*					
<15 days	48 (41.4)	24 (58.5)	10 (28.6)	14 (35.0)	0.008
15–29 days	32 (27.6)	12 (29.3)	12 (34.3)	8 (20.0)	
≥30 days	36 (31.0)	5 (12.2)	13 (37.1)	18 (45.0)	
Number of children*					
One child	50 (43.1)	18 (43.9)	16 (45.7)	16 (40.0)	0.610
Two children	34 (29.3)	14 (34.1)	7 (20.0)	13 (32.5)	
Three or more	32 (27.6)	9 (22.0)	12 (34.3)	11 (27.5)	
Maternal age, years [†]	30.3 ± 6.8	30 (24–35)	31 (25–36)	30 (27–35.8)	0.521
Maternal education, years [†]	10.5 ± 4.1	12 (8–14)	12 (8–12)	11 (8–13.5)	0.665
Paternal education, years [†]	10.6 ± 4.3	12 (8–13)	12 (5–16)	12 (8–16)	0.333
Gestational age, weeks [†]	33.8 ± 4.2	37 (34.5–38)	29 (27–32)	35 (32–37)	<0.001 _{a,b,c} 0.028 _d
Birth weight, g [†]	2243 ± 886	2800 (2365–3385)	1300 (1100–1720)	2245 (1780–2875)	<0.001 _{a,b,c} 0.005 _d
Length of stay, days [†]	27.6 ± 23.8	12 (9–21.5)	27 (13–51)	26.5 (8.25–43.75)	0.003 _a 0.002 _b 0.115 _d 0.976 _c

*: n (%) (Pearson's chi-square tests or Fisher's exact tests), †: mean ± SD or median (IQR) (Kruskal–Wallis tests), _a: All group, _b: NICU 1 vs. NICU 2, _c: NICU 2 vs. NICU 3, _d: NICU 1 vs. NICU 3

recorded. Of these, nine were not enrolled because of language barriers, three because the mother was not the infant's bedside caregiver, and two declined participation. The final analytic sample included 116 mothers who completed the NFNI: 41 in NICU 1, 35 in NICU 2, and 40 in NICU 3. No missing values were identified for the maternal, family, infant, or NFNI variables included in the analyses.

Maternal and infant characteristics across NICU settings

Maternal and infant characteristics are summarised in Table I. Maternal sociodemographic characteristics were broadly similar across NICU settings, including maternal age, education, employment, household economic status, residence, and number of children. Overall, 31 mothers (26.7%) lived outside the city, consistent with the hospital's role as a regional referral centre. Infant clinical characteristics differed across settings. NICU 2 included the highest proportion of infants born at <32 weeks' gestation and <1500 g birth weight, whereas NICU 1 included the highest proportion of term and >2500 g infants. Length of stay also differed across settings, with stays >30 days more frequent in NICU 2 and NICU 3.

NFNI item-group summaries and comparisons across NICU settings

In the overall sample, mean±SD NFNI theory-based item-group scores on the 1–4 scale were highest for proximity (3.63±0.44), assurance (3.60±0.39), and information (3.49±0.47), followed by support (3.12±0.57) and comfort (3.05±0.66). Cronbach's alpha values for the theory-based item-group summaries ranged from 0.815 to 0.904 (Table II).

Among the five theory-based NFNI item groups, only proximity differed significantly across settings in unadjusted analyses. Median proximity scores were 3.62 in NICU 1, 3.87 in NICU 2, and 4.00 in NICU 3 (Kruskal–Wallis $H=7.631$, $df=2$, $p=0.022$, $\epsilon^2=0.050$). Bonferroni-corrected post-hoc comparisons identified the clearest pairwise contrast between NICU 3 and NICU 1 ($U=529.5$, Bonferroni-corrected $p=0.005$, rank-biserial correlation=0.354). The other four theory-based item groups—assurance, information, comfort, and support—did not differ significantly across NICU settings. Their ϵ^2 values ranged from 0.008 to 0.027, indicating negligible to small between-setting differences.

Table III: Exploratory adjusted analysis of proximity item-group scores

Variable	Model 1 B (95% CI)	Model 1 p	Model 2 B (95% CI)	Model 2 p
NICU 1 vs NICU 3	-0.186 (-0.391 to 0.019)	0.074	-0.164 (-0.374 to 0.045)	0.123
NICU 2 vs NICU 3	-0.121 (-0.360 to 0.117)	0.316	-0.169 (-0.413 to 0.075)	0.173
Gestational age, per week	0.001 (-0.026 to 0.028)	0.947	-	-
Birth weight, per 100 g	-	-	-0.0046 (-0.018 to 0.009)	0.495
Length of stay, per day	-0.001 (-0.005 to 0.002)	0.478	-0.002 (-0.005 to 0.002)	0.383
Primary/middle school vs university	-0.160 (-0.371 to 0.051)	0.136	-0.170 (-0.382 to 0.043)	0.116
High school vs university	-0.080 (-0.297 to 0.138)	0.470	-0.092 (-0.311 to 0.127)	0.408
Model summary	Overall NICU effect, $p=0.178$; partial eta-squared=0.031		Overall NICU effect, $p=0.175$; partial eta-squared=0.031	

Exploratory adjusted analyses were performed using general linear models. Outcome was the proximity item-group mean score (1–4). Model 1 was adjusted for gestational age, length of stay, and maternal education. Model 2 was adjusted for birth weight, length of stay, and maternal education. Reference categories were NICU 3 and university education. Because NICU assignment in this setting is closely linked to infant clinical profile and stage of care, these adjusted models should be interpreted as exploratory analyses rather than causal estimates. Model assumptions were not fully met, particularly for residual distribution and homogeneity of variances; estimates are reported primarily to describe attenuation and precision rather than confirmatory associations.

Table II: Theory-based NFNI item-group summaries, internal consistency, and comparisons across NICU settings

Item group	Internal consistency α	Overall*	NICU 1†	NICU 2†	NICU 3†	H	p	ϵ^2	Post-hoc
Assurance (12 items)	0.828	3.60 ± 0.39	3.67 (3.42–3.83)	3.67 (3.33–3.92)	3.83 (3.58–3.92)	2.883	0.237	0.008	-
Information (11 items)	0.847	3.49 ± 0.47	3.54 (3.14–3.82)	3.64 (3.09–3.82)	3.73 (3.32–3.98)	3.194	0.203	0.011	-
Proximity (8 items)	0.828	3.63 ± 0.44	3.62 (3.31–3.87)	3.87 (3.25–4.00)	4.00 (3.62–4.00)	7.631	0.022	0.050	NICU 3 > NICU 1
Comfort (7 items)	0.815	3.05 ± 0.66	2.86 (2.57–3.14)	2.86 (2.43–3.71)	3.29 (2.71–3.86)	4.321	0.115	0.021	-
Support (18 items)	0.904	3.12 ± 0.57	3.00 (2.75–3.39)	3.11 (2.61–3.56)	3.33 (3.00–3.72)	5.077	0.079	0.027	-

*: mean ± SD, †: median (IQR). Item-group scores are mean item scores on the 1–4 scale. Medians and interquartile ranges are shown for NICU-specific comparisons because of non-normal distributions. Between-setting comparisons used Kruskal–Wallis tests with $df=2$ for all item groups. Effect size was calculated as $\epsilon^2 = (H - k + 1) / (n - k)$, with $k=3$ and $n=116$. Post-hoc pairwise Mann–Whitney U tests with Bonferroni correction were performed only when the overall Kruskal–Wallis test was significant. For proximity, the only significant pairwise comparison was NICU 3 versus NICU 1 ($U=529.5$, Bonferroni-corrected $p=0.005$, rank-biserial correlation, $r_{rb}=0.354$). Internal consistency estimates describe reliability of the theory-based item-group summaries but do not establish structural validity.

Table IV: Top 10 highest-ranked NFNI items in the overall sample

Rank	Item	Mean score	Rated very important, %
1	To be assured that the best care possible is being given to my infant (Assurance)	3.89	90.5
2	To have questions about my infant answered honestly (Assurance)	3.82	86.2
3	To talk to the doctor caring for my infant every day (Information)	3.78	84.5
4	To know exactly what is being done for my infant (Information)	3.78	83.6
5	To receive information about my infant at least once a day (Proximity)	3.78	81.0
6	To know specific facts concerning my infant's progress (Assurance)	3.75	81.0
7	To hold my infant in my arms and against my skin as soon as I can (Proximity)	3.74	79.3
8	To see that the NICU staff provide comfort to my infant, such as giving my infant a pacifier, using blankets to support my infant's body, and talking softly to my infant (Comfort)	3.73	78.4
9	To know the expected outcome for my infant (Assurance)	3.71	81.0
10	To know how my infant is being treated medically (Information)	3.71	78.4

Items were ranked primarily by mean score and secondarily by the proportion rated very important to resolve ties. Labels in parentheses indicate the original theory-based NFNI item group for each item and are provided to orient readers. In this Turkish dataset, these item groups were analysed as theory-based summaries rather than as validated Turkish subscales

Exploratory adjusted analysis of the proximity item group

Because proximity was the only item group with a statistically detectable unadjusted difference across settings, exploratory adjusted general linear models were restricted to this item group (Table III). In the model adjusted for gestational age, length of stay, and maternal education, the overall NICU-setting term was attenuated and imprecise ($p=0.178$; partial $\eta^2=0.031$). Relative to NICU 3, adjusted differences were -0.186 points for NICU 1 (95% CI -0.391 to 0.019) and -0.121 points for NICU 2 (95% CI -0.360 to 0.117). In the sensitivity model replacing gestational age with birth weight, estimates were similar in direction and magnitude, and the overall NICU-setting term remained imprecise and not statistically significant ($p=0.175$; partial $\eta^2=0.031$).

Exploratory subgroup comparisons by gestational age, birth weight, and length of stay are shown in Supplementary Table S1. No statistically significant differences were observed across these subgroup comparisons; effect sizes were negligible to small.

Item-level and mother-nominated priorities

Table IV shows the 10 highest-ranked NFNI items by mean score. Items centred on assurance of best possible care, honest answers, daily physician communication, and information about the infant's care.

The most frequently nominated priority items were being sure that the infant was receiving the best possible care (48/116,

41.4%), being able to speak with the physician every day (44/116, 37.9%), knowing the expected outcome for the infant (35/116, 30.2%), and being able to visit the infant at any time (30/116, 25.9%) (Supplementary Table S2, Panel A).

Optional free-text comments

Optional free-text comments were provided by 13 mothers (11.2%). Within this small optional-comment subset, the most frequent content area concerned father and family involvement, including requests for fathers to see the infant, opportunities for parents to experience the process together, and ways for other family members to view the infant. Other comments referred to psychological support, environmental and hygiene needs, financial difficulties, respectful communication, clearer answers to family questions, education about infant care, and opportunities for holding or being close to the infant (Supplementary Table S2, Panel B).

Discussion

In this single-centre cross-sectional study conducted in a tertiary NICU in an upper-middle-income country, the highest-ranked individual needs centred on best possible care, honest answers, daily physician communication, and knowing what was being done for the infant. Because the NFNI has not undergone formal Turkish psychometric validation, these directly observed item-level findings provide the primary basis for interpretation, whereas the five theory-based item-group scores are used only as a broad descriptive framework. Within that framework, proximity, assurance, and information received the highest scores. Differences in parental access, care organisation, and available family-support practices are relevant to interpreting these needs across the three neonatal care contexts. Proximity differed across NICU settings in unadjusted analyses, but this difference became less clear after limited adjustment for infant and maternal characteristics. Therefore, the proximity finding should be interpreted in relation to care context and parental access rather than as evidence that one NICU setting is superior to another.

The prominence of assurance and information is consistent with earlier NFNI work, in which assurance-related needs were among the most highly rated family needs in NICU settings, and with recent literature linking parental experience to communication quality, interpersonal interactions, and timely information (4–6,10). Mothers' prioritisation of honest answers, daily physician communication, and clear explanations is consistent with the view that communication and reassurance are central components of family-centred neonatal care (2,3,15,16). Because non-Turkish-speaking mothers were excluded, the findings may not apply to families facing language barriers or to settings where interpreter-mediated communication is central to neonatal care.

The proximity finding requires cautious interpretation. Although proximity differed across settings in unadjusted analyses, the adjusted models did not support a clear independent between-setting contrast. Higher proximity scores in the transitional care setting may reflect its mother-accompanied structure and a care phase closer to discharge; however, NICU assignment was also strongly linked to gestational age, birth weight, length of stay, and the timing at which mothers became reachable for

study contact. In addition, because some infants may have moved between neonatal care settings before questionnaire completion, mothers' responses may partly reflect prior cumulative NICU experience rather than the current care setting alone. This limits interpretation of the proximity contrast as a setting-specific effect. The high proximity scores, particularly the median score of 4.00 in NICU 3, also suggest a possible ceiling effect that may have limited discrimination across settings. This interpretation is consistent with literature distinguishing parental presence, participation, and engagement and showing that family-centred practices vary by care organisation, access, and implementation context (2,7,8,17–19).

The distinction between theory-based item-group summaries and individual item-level findings is clinically important. Item-group summaries identified broad patterns, but they may obscure specific practices that matter to families; for example, comfort was not among the highest-scoring item groups, yet seeing staff try to comfort the infant was highly ranked. Because the Turkish structural validity of the NFNI has not been established, these item-group scores should be interpreted as theory-based summaries rather than validated Turkish subscales. Item-level reporting may therefore provide more directly interpretable information for local service improvement while limiting over-reliance on unconfirmed latent domains (10).

Mother-nominated priorities largely echoed the item mean rankings: best possible care (41.4%), daily physician communication (37.9%), expected outcome (30.2%), and visiting access (25.9%) were the four most frequently selected items. Optional free-text comments were provided by only 13 mothers and were not analysed using formal qualitative methods; therefore, they should be read as contextual observations. Within this self-selected subgroup, comments suggested that father and family involvement may be a contextual concern, which is relevant because fathers were not surveyed and one setting restricted paternal access. This observation is consistent with studies describing fathers' needs for recognition, information, inclusion, and support (20,21). Other comments on psychological support, hygiene, food quality, financial strain, respectful communication, and closeness to the infant were consistent with broader literature on emotional, practical, role-related, and environmental support needs (22–25).

These findings should not be interpreted as evidence that one NICU care context is preferable to another; the three settings differ by design, clinical case-mix, and infant acuity, and the observed differences in reported needs may reflect these structural distinctions. They suggest that communication and reassurance may represent common priorities across settings, whereas proximity, participation, transition preparation, father involvement, and practical support may need to be considered in relation to infant stability, monitoring needs, staffing, and parental access.

Limitations

This study has several limitations. First, its single-centre cross-sectional design limits causal interpretation and generalisability. Second, a complete screening log was not available; therefore, the exact number of eligible dyads and the overall participation rate could not be calculated.

Third, NFNI administration was not standardised to a fixed postnatal or hospitalisation day, which may have introduced timing-related variability. In addition, individual transfer pathways between neonatal care settings were not systematically recorded. Therefore, we could not quantify how many mothers had prior exposure to more than one NICU setting before NFNI administration. Although mothers were classified according to the setting in which the questionnaire was completed and were instructed to respond in relation to the current care environment, prior cumulative NICU experience may have influenced their responses. This may have introduced care-context misclassification and further supports interpreting between-setting differences as descriptive, context-linked patterns rather than independent unit-level effects. Fourth, the NFNI has not undergone formal psychometric validation in Turkish NICU populations; therefore, item-group findings should be interpreted as theory-based summaries rather than validated subscales. Finally, adjusted analyses were exploratory, model assumptions were imperfect for the bounded 1–4 outcome, and multiple comparisons increase the possibility of chance findings.

Strengths include real-world bedside data from three clinically distinct care contexts within the same tertiary hospital, complete analytic data for included mothers, combined item-group and item-level reporting, and transparent handling of key methodological limitations.

Conclusion

Mother-reported needs in this tertiary NICU sample clustered around proximity, assurance, and information. Communication, honest answers, and reassurance were consistent priorities across care settings. The higher proximity scores observed in the transitional care setting should be interpreted in relation to care context, infant stability, and parental access rather than as an independent unit-level effect. These findings support routine assessment of family needs and context-sensitive planning of communication, participation, and family involvement practices in neonatal care.

Ethics committee approval

This study was conducted in accordance with the Helsinki Declaration Principles. The study was approved by Inonu University Scientific Research and Publication (18.01.2022, reference number: 2022/3014).

Contribution of the authors

Study conception and design: HMB, UD, MAB, DG; data collection: HMB, MA, TKA, TYG; analysis and interpretation of results: HMB, UD, DD; draft manuscript preparation: HMB, UD. All authors reviewed the results and approved the final version of the article

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Conflict of interest

The authors declare that there is no conflict of interest.

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