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Differences in Parental Participation Between Mothers and Fathers in Neonatal Care Units and Associated Sociodemographic Factors: A Cross-Sectional Study

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Abstract

Background: Parental participation is crucial for maintaining interaction between parents and infants in the neonatal care unit. This study compares mothers' and fathers' participation in the neonatal care unit and examines sociodemographic factors associated with participation in each parent group.

Methods: We conducted an analytical comparative cross-sectional study in the neonatal care units of two regional public hospitals in Banyumas, Indonesia. Using convenience sampling, we recruited 257 parents (73 fathers and 184 mothers). Participation was measured using CO PARTNER, comprising six domains. We compared scores using the Mann–Whitney U test. We fitted separate multiple linear regression models for fathers and mothers.

Result: Fathers had a lower median total participation score than mothers (9 vs. 25; p=0.001) and significantly lower scores in all six domains (all p≤0.008). The regression model for fathers was not statistically significant overall (R^2=0.096; adjusted R^2=0.057; F(3,69)=2.445; p=0.071).In this exploratory model, fathers aged 31–48 years had higher adjusted participation scores than those aged 18–30 years (adjusted B=3.754; 95% CI: 0.110–7.398; p=0.044). Education and number of children were not significantly associated with fathers' participation. The model for mothers was also not significant (R^2=0.026; adjusted R^2=0.004; F(4,179)=1.196; p=0.314), and no predictors were significant.

Contribution for Practice: This study contributes to neonatal nursing science by strengthening evidence for father-inclusive, family-centered care and supporting greater parental participation in neonatal care.

Keywords: Intensive Care Unit, Neonatal, Nurse, Involvement.

BACKGROUND

The hospitalization of premature infants or medically vulnerable infants in neonatal care units often separates parents from their infants and interrupts the early development of parental roles. Therefore, modern neonatal care practices position parents not only as visitors but as active partners who exchange information, provide care, advocate for their infants, and participate in discussions and decision-making with health professionals (1). The CO PARTNER tool translates this multidimensional concept into six domains: daily care, medical care, information seeking, parental advocacy, time spent with the infant, and closeness and comforting the infant (2, 3). As such, assessing parental participation solely by visit frequency or physical presence may overlook substantial differences in how parents contribute to infant care.

Active parental participation is a key mechanism in family-centered and family-integrated neonatal care. Recent evidence shows that Family Integrated Care can increase parental participation, although its impact on psychological outcomes and neonatal conditions may vary by population and care environment (4). Among fathers of premature infants, higher participation in the Family Integrated Care model is associated with fewer depressive symptoms, better father-infant bonding, and lower stress levels at the time of the infant's discharge (5). These data indicate that participation is clinically meaningful, not simply a measure of parental presence, and point out the importance of providing equal opportunities for both mothers and fathers to participate during neonatal hospitalization.

However, existing evidence indicates that mothers and fathers participate in neonatal care differently. An observational study found higher overall participation rates among mothers than fathers; meanwhile, research focusing specifically on fathers identified considerable variation across activities, with fathers less involved in routine care and feeding than in procedural support or verbal interaction (6). Paternal participation can be hindered by work obligations, perceptions of caregiving competence, medical equipment around the infant, limited father-specific support, and institutional practices that implicitly place mothers as the primary caregivers (7). Consequently, observed differences should not be interpreted solely as innate effects of parental gender; they may reflect unequal caregiving opportunities and interactions among sociodemographic, occupational, cultural, and organizational factors. Furthermore, most available evidence comes from settings outside Indonesia or examines total participation, visits, or specific caregiving activities, rather than using comparable multidimensional domains. The Indonesian context requires specific research because prevailing gender expectations may influence how maternal and paternal roles are enacted during an infant's hospitalization. Studies in Indonesia show that fathers are increasingly willing to participate in maternal and newborn care. Still, their roles generally remain centered on providing financial support, logistical assistance, protection, and emotional support, whereas structured education and opportunities for direct care remain limited (8, 9). To date, Indonesia also lacks a culturally validated instrument to comprehensively assess parental participation. The CO PARTNER tool has been culturally adapted and psychometrically validated for Indonesian parents, providing a 30-item measurement tool covering the same six participation domains (2). However, this validation established only the instrument's measurement characteristics; it did not determine how mothers and fathers differ in each participation domain, or whether factors associated with participation are similar across parent groups.

Thus, the research gap does not simply concern whether fathers are less involved than mothers, since studies worldwide have already observed this overall trend. Instead, empirical evidence in Indonesia remains limited regarding parental participation measured using a validated multidimensional instrument, differences between mothers and fathers in specific participation domains, and sociodemographic factors separately associated with maternal and paternal participation. This study compares mothers' and fathers' participation in the neonatal care unit and examines sociodemographic factors associated with participation in each parent group.

METHODS

Study Design

We used an analytical comparative cross-sectional design to compare overall and domain-specific parental participation between fathers and mothers and to examine sociodemographic factors associated with participation within each parent group. For this study use to The Strengthening the Reporting of Observational studies in Epidemiology(STROBE) (10).

Participants /Sample

Respondents were mothers or fathers of infants receiving care in the participating neonatal care units during the study period and were recruited through convenience sampling. Each respondent completed a single questionnaire via Google Forms regarding the infant hospitalized at the time of data collection. Family visitation policies at both hospitals allowed mothers 24-hour access, while fathers had access under specific conditions or upon request. Both hospitals promoted family involvement, particularly maternal participation in Kangaroo Mother Care and breastfeeding. Inclusion criteria comprised mothers or fathers of infants admitted to the neonatal care unit during the study period who were willing to participate and whose infants were in stable condition. Exclusion criteria included severe illness, inability to communicate in Indonesian, or cognitive or psychological difficulties affecting questionnaire completion. Incomplete questionnaires were excluded from analysis. No minimum length of hospital stay or gestational age was required; however, infants of participating parents had to be in stable condition according to nursing assessment criteria. As a result, the study included parents of both premature and full-term infants with congenital disorders. We did not identify family pairs during data collection; therefore, we analyzed mothers and fathers as unpaired groups, although we could not rule out within-family dependence.

We estimated sample size using the Lemeshow approach. The calculation was based on the difference in parental participation scores between mothers and fathers, as reported by Buccione et al. (2024), assuming a two-sided significance level of 5%, statistical power of 80%, an anticipated mother-to-father ratio, and a 10% allowance for dropouts. The minimum required sample size was 244 parents. The final sample consisted of 257 respondents with complete data, comprising 184 mothers and 73 fathers, which was considered adequate for the primary comparative study.

Data Collection

We collected data between September and December 2025 in the neonatal care units of two regional public hospitals in Banyumas, Central Java, Indonesia. These units provide care for premature infants, low birth weight infants, clinically unstable infants, and some full-term infants with congenital disorders requiring neonatal hospitalization. The hospitals serve families from Banyumas and surrounding districts.

The research team, assisted by research assistants (ward nurses), approached potential respondents who met the inclusion and exclusion criteria when their infants' conditions were stable. The research team provided verbal information about the study's purpose, the voluntary nature of participation, confidentiality, and research procedures. Informed consent was obtained via a Google Form link, after which respondents completed an electronic questionnaire in Indonesian independently. Each respondent completed the questionnaire once during neonatal hospitalization and submitted it electronically. We collected and recorded only complete questionnaires; we did not retain data from eligible parents who declined participation or did not submit the questionnaire. The sociodemographic questionnaire collected data on parents' age, parental group, education level, employment status, and number of children. We requested gestational age and birth weight, but these data were not always available, particularly in questionnaires completed by fathers, and family identifiers were unavailable

to determine whether clinical information referred to the same infant. Data on diagnosis, disease severity, mechanical ventilation, length of stay, clinical stability at the time of questionnaire completion, feeding method, and exposure to invasive procedures were not systematically collected. Consequently, these infant characteristics could not be included as covariates, despite their potential influence on parental participation.articipation.

Instruments

We assessed parental participation using the validated and reliable Indonesian version of the CO PARTNER tool. This instrument consists of 30 items across six domains: daily care (11 items; score 0–22; α=0.886), medical care (4 items; score 0–8; α=0.816), acquiring information (3 items; score 0–3; α=0.759), parent advocacy (3 items; score 0–3; α=0.829), time spent with the infant (3 items; score 0–12; α=0.866), and closeness and comforting the infant (6 items; score 0–12; α=0.905). Construct validity analysis demonstrated good model fit (CFI = 0.994; TLI = 0.993; RMSEA = 0.044). Total scores ranged from 0 to 60, with higher scores indicating greater parental participation and involvement with medical professionals (2). Van Veenendaal developed the CO PARTNER tool in the Netherlands specifically to measure parental participation in the NICU (3).

Data Analysis

Categorical variables are presented as frequencies and percentages. As none of the continuous variables followed a normal distribution, data are reported as medians and minimum-maximum values. We analyzed differences in total scores and scores for each CO PARTNER domain between fathers and mothers using the Mann-Whitney U test, supplemented with rank-biserial correlation and 95% confidence intervals to indicate the magnitude of the difference. We analyzed sociodemographic factors associated with total CO PARTNER scores using multiple linear regression, performed separately for fathers and mothers. Predictors included age, education, number of children, and employment status; employment status was excluded for fathers because it showed little variation. Although the raw data were not normally distributed, we assessed the suitability of linear regression based on residual distribution and fulfillment of assumptions of linearity, homoscedasticity, absence of multicollinearity, and absence of highly influential observations. Results are reported as unstandardized coefficients (B), 95% confidence intervals, p-values, R^2, and adjusted R^2. A two-sided p-value <0.05 was considered statistically significant.

Ethical Consideration

Ethical approval was granted by the Ethics Committee of the Faculty of Nursing, Universitas Indonesia (KET-243/UN2.F 12.D 1.2.1/PPM.00.02/2025). All respondents received study information and provided written consent. Participation was voluntary, and respondents could discontinue at any time without consequences for their infants' care.

RESULT AND DISCUSSION

RESULT

Demographic and Baseline Characteristics

The study included 257 parents: 73 fathers (28.4%) and 184 mothers (71.6%). As shown in Table 1, parental age, education, occupation, and number of children did not differ significantly between fathers and mothers. However, employment status differed significantly (p=0.001): all fathers were employed, while most mothers (82.1%) were unemployed.

Table 1. Respondent Characteristics (n=257)

Variables	Paternal (n=73)	Maternal (n=184)	P value*
Parents' age (years)			
18-30 y.o	40 (54.8)	104 (56.5)	0.801
31-48 y.o	33 (45.2)	80 (43.5)	
Parents' education (f,%)			
University	8 (11)	35 (19)	0.118
Non university	65 (89)	149 (81)	
Parents occupation (f,%)			
Work	73 (100)	33 (17.9)	0.001
No working	0 (0)	151 (82.1)	
Number of children (f,%)			
One child	37 (50.7)	80 (43.5)	0.295
More than one	36 (49.3)	104 (56.5)	

Note. Data are presented as *n* (%). *p*-values were calculated using the Chi-square test or Fisher's exact test, as appropriate. $p < 0.05$ was considered statistically significant. *Chi-square test/Fisher's exact test. y.o., years old.

Table 2 shows that fathers had a lower median total participation score than mothers (9 vs. 25; p=0.001), and the difference was statistically significant. In all six participation domains, fathers demonstrated significantly lower participation scores than mothers.

Table 2. Comparison of parental participation between maternal and paternal (n=257)

Variables	Paternal (n=73), Median (min–max)	Maternal (n=184), Median (min–max)	Mann–Whitney U	Z	*p*-value	*r*
Total participation (0–60)	9 (1–24)	25 (6–45)	1,233.5	−10.208	<0.001	0.637
Domain 1: Daily Care (0–22)	0 (0–0)	4 (0–17)	1,825.0	−9.655	<0.001	0.602
Domain 2: Medical Care (0–8)	0 (0–6)	2 (0–7)	4,587.0	−4.178	<0.001	0.261
Domain 3: Acquiring Information (0–3)	3 (0–3)	3 (1–3)	5,848.0	−3.976	<0.001	0.248
Domain 4: Parent Advocacy (0–3)	0 (0–3)	2 (0–3)	3,225.5	−6.836	<0.001	0.426
Domain 5: Time Spent with Infant (0–12)	3 (0–12)	7.5 (3–12)	5,338.0	−2.654	0.008	0.166
Domain 6: Closeness and Comforting the Infant (0–12)	0 (0–9)	7 (0–12)	964.0	−10.822	<0.001	0.675

Note. Data are presented as median (minimum–maximum). Differences between paternal and maternal participation were analyzed using the Mann–Whitney U test. Effect size (*r*) was calculated as $|Z|/\sqrt{N}$, where *N* represents the total sample size (N = 257). Effect sizes were interpreted as small ($r \geq 0.10$), moderate ($r \geq 0.30$), and large ($r \geq 0.50$). A *p*-value < 0.05 was considered statistically significant. Higher scores indicate greater parental participation.

Table 3. Multiple linear regression of sociodemographic factors associated with parental participation scores

Gender	Variable	B	SE	t value	p value	95% CI for the coefficient Lower	Upper
Paternal (n=73)	(Constant)	9.268	3.092	2.997	0.004	3.098	15.437
	Age	3.754	1.826	2.055	0.044*	0.110	7.398
	Education	-2.478	2.107	-1.176	0.244	-6.682	1.726
	Number of children	-3.094	1.844	-1.678	0.098	-6.773	0.585
	Occupation	Deleted from analysis (constant variable)					
	R^2=0,096; adjusted R=0,057; F(3,69)=2,445; overall p value=0,071						

Gender	Variable					95% CI for the coefficient	
Maternal (n=184)	(Constant)	23.777	4.066	5.848	0.001	15.754	31.800
	Age	1.320	1.761	0.750	0.455	-2.154	4.794
	Education	-3.385	2.359	-1.435	0.153	-8.040	1.270
	Number of children	-2.741	1.774	-1.545	0.124	-6.242	0.760
	Occupation	2.245	2.430	0.924	0.357	-2.550	7.040
	R^2=0,026; adjusted R=0,004; F(4,179)=1,196 overall p value=0,314						

Note. Multiple linear regression was used to examine sociodemographic factors associated with parental participation scores separately for fathers and mothers. *B* = unstandardized regression coefficient; SE = standard error; CI = confidence interval; R^2 = coefficient of determination; adjusted R^2 = adjusted coefficient of determination.

The paternal regression model accounted for 9.6% of the variance in participation scores (R^2=0.096; adjusted R^2=0.057), but the overall model was not statistically significant, F(3,69)=2.445, p=0.071. Paternal age demonstrated a positive association with participation after adjustment for education and number of children (B=3.754; 95% CI: 0.110–7.398; p=0.044). Interpret this individual association with caution, given the lack of significance in the overall model. Education and number of children were not significantly associated with paternal participation. The maternal model explained 2.6% of the variance (R^2=0.026; adjusted R^2=0.004) and was not statistically significant, F(4,179)=1.196, p=0.314. None of the examined sociodemographic factors were significantly associated with maternal participation.

DISCUSSION

This study found a clear, significant gap in mothers' and fathers' participation in neonatal care. Fathers had a lower median total participation score than mothers, with a large effect size (r=0.637), and showed lower participation across all six domains. These findings align with the original CO PARTNER development research, which also reported higher participation scores for mothers than fathers, as well as an observational study in Italy that found similar results both at baseline and after about seven days of neonatal care (3,7). However, this gap may not result immediately from gender differences or a lack of willingness among fathers to be involved. In the original CO PARTNER study, the Family Integrated Care model's effect on participation scores was even greater than the difference between mothers and fathers. This suggests that the healthcare system and the opportunities provided by the neonatal unit may influence participation more than parental status itself (3). In this study, mothers had 24-hour access, while fathers' presence was limited to certain conditions or upon request. This access disparity may reduce fathers' time with their infants and limit opportunities to receive guidance, practice care, and develop independence in parenting. Nist et al. also found that uncomfortable facilities and home responsibilities are the main barriers to parental presence, while encouragement from health workers to be involved in care is one of the most important supporting factors (11).

Domain-level analysis shows that the gap in mother and father participation is not evenly distributed, but concentrated in activities that require direct involvement, physical and emotional closeness, and active parental roles. Clinically, this pattern suggests the disparity relates not only to the time parents spend in the neonatal care unit, but also to opportunities to perform routine care, touch, hold, soothe the infant, and communicate the infant's needs. However, the CO-PARTNER score does not directly measure motivation or the opportunities parents are given. Therefore, low paternal scores cannot be interpreted as a lack of paternal interest. Qualitative research shows that some fathers refrain from caregiving activities because they fear touching or holding a fragile-looking infant, feel incompetent, and have not yet been given a clear role by healthcare workers, conversely, more consistent presence and guidance from staff help fathers develop knowledge, confidence, and a sense

of identity as caregivers (12). Kangaroo care is a concrete example of an intervention that can bridge this gap. Fathers who provide kangaroo care describe it as a way to build a psychological relationship and attachment with their infants. At the same time, studies on stable premature infants show that kangaroo care by fathers results in no significant differences in infants' temperature, heart rate, blood pressure, oxygen saturation, and cortisol response compared to kangaroo care by mothers (13, 14). Thus, low paternal participation in domains of direct care and closeness is likely due to limited access, a lack of explicit invitation, unclear roles, and inadequate skill development(12, 15).

Structural and sociocultural conditions provide important contextual explanations for low levels of paternal participation. Research findings indicate that all fathers in the study were employed, whereas most mothers were not. This suggests a potential disparity in time available to be with the infant and creates a confounding factor between parental status (father vs. mother) and employment status. Because there was no variation in employment within the group of fathers (i.e., no comparison group of unemployed fathers), the independent effect of employment status on paternal participation could not be evaluated. A qualitative study by Nørgaard et al. shows that fathers desire an equal caregiving role but must balance this against social norms that position them as family breadwinners and protectors (16). While the infant is receiving care, fathers often juggle multiple roles simultaneously, including supporting the mother's recovery, meeting family needs, receiving clinical information, and relaying that information to their partners and other family members (17). Such overlapping role burdens can reduce a father's physical presence in the neonatal unit, even when he wishes to be involved. A survey by Nist et al. reinforces this explanation by identifying home-based responsibilities as a primary personal barrier to parental presence, while uncomfortable facilities act as a system-level barrier (10). Conversely, encouragement from healthcare professionals to participate in care is one of the most significant system-level facilitators. Gender and cultural norms also shape how fathers perceive their needs and how services are delivered, particularly when the neonatal environment implicitly positions the mother as the primary caregiver and the father as a companion or secondary caregiver (18, 19). This positioning can be inadvertently reinforced when clinical information, care education, and invitations to touch or care for the infant are directed more frequently toward the mother. Studies indicate that staff support, direct communication, and recognizing fathers as equal parents are modifiable components of care (20).

The sociodemographic characteristics assessed in this study did not sufficiently account for parental participation. For fathers, age, education, and number of children explained only 9.6% of the variance in participation scores, and the overall model was not statistically significant. For mothers, age, education, occupation, and number of children accounted for just 2.6% of the variance, with the model also non-significant. Thus, these predictors explained over 90% of the variance in fathers' participation and 97% in mothers' participation. Fathers aged 31–48 years demonstrated adjusted participation scores 3.754 points higher than those aged 18–30 years after controlling for education and number of children. However, interpret this result as exploratory rather than evidence that age is an independent determinant, given the model's overall non-significance. Neither education nor number of children was significantly associated with fathers' participation; similarly, age, education, occupation, and number of children were not significantly associated with mothers' participation. Therefore, the high prevalence of non-university education among fathers does not account for the observed low levels of paternal participation. This pattern is consistent with previous research, such as Pineda et al., which indicates that parental involvement in neonatal care is not determined solely by individual characteristics(21) . Instead, a combination of family factors, social support, and clinical characteristics influences behaviors such as presence, holding, and skin-to-skin contact. Zauche et al. further demonstrated that the number of children at home, the infant's neurological comorbidities and surgical history, room type, and perceived stress in the NICU collectively explained 65.8% of the variance in parental presence (22). Additional studies, including Buccione et al., have found that extreme

prematurity and the use of devices associated with critical conditions are linked to lower participation (7). Socioeconomic status of the residential area is more consistently associated with visitation and kangaroo care than individual education levels (23). Collectively, these findings indicate that parental participation is more likely influenced by the infant's clinical condition, opportunities for presence, family support, social resources, unit design, access policies, and care models than by the sociodemographic characteristics examined in this study.

This study has several limitations. Using convenience sampling from only two hospitals may affect how widely the results can be applied and could introduce selection bias. Because there were no identifiers, researchers could not match father-child pairs or account for similarities within families. Participants completed the questionnaire at inconsistent times. Important details about the infants and their situations, such as how sick they were, their gestational age, how long they stayed in the hospital, how much access parents had, and how much time they had to participate, were missing or incomplete. This could lead to confounding factors that were not fully addressed. Differences in hospital access policies and parents' employment status might also have influenced the differences seen between mothers and fathers. Finally, the small number of fathers in the sample, the low variance explained by the regression models, and the fact that the overall model for fathers was not significant mean that the link between paternal age and the outcomes should be seen as exploratory. These findings support neonatal care that includes fathers through equitable access, structured bedside education, explicit invitations to participate, and opportunities for fathers to provide direct care and contribute to decision-making. Future longitudinal studies should employ family identifiers, standardized measurement timing, and comprehensive infant, family, and organizational variables to determine the factors shaping maternal and paternal participation.

IMPLICATION STUDY FOR NURSING PRACTICE

These findings support the implementation of more father-inclusive and family-centered neonatal care by ensuring equitable opportunities for both parents to participate in infant care. Neonatal care units should facilitate flexible parental access, provide structured bedside education, actively invite fathers to engage in direct caregiving, and involve both parents in communication and decision-making. Particular attention should be given to activities related to daily care, closeness, and comforting, where the largest participation gaps were observed. Strengthening nurses' roles in guiding, encouraging, and supporting fathers may help improve paternal confidence and caregiving involvement during neonatal hospitalization.

CONCLUSION

Fathers participated less than mothers across all six domains. The largest differences were in daily care and infant closeness, indicating greater disparities in hands-on caregiving and close contact. Sociodemographic variables did not sufficiently explain participation levels for either group.

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AUTHORS CONTRIBUTION STATEMENT

ER: conceptualization, writing original draft, review & editing. YR: Conceptualization, methodology, manuscript review. YR&DW: Supervision. AI: validation, manuscript review.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

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DATA AVAILABILITY

The data may be obtained at any time from the corresponding author, if needed.

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