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In the Shadow of Prematurity: Factors Associated with Quality of Life in Mothers of Preterm Infants Beyond the Neonatal Intensive Care Unit in Iran, 2024

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Abstract

Background: Preterm birth imposes a substantial biopsychosocial burden on mothers; however, comprehensive evidence on mothers' postpartum quality of life (PQOL), particularly among mothers whose infants were not hospitalized, remains limited.

Objectives: This study aimed to determine PQOL and its associated factors among women with recent preterm births, irrespective of neonatal hospitalization status.

Methods: This cross-sectional study included 300 women who had preterm births (gestational age < 37 weeks) and were recruited using consecutive convenience sampling. Participants were recruited from seven public health centers and two tertiary hospitals in Jiroft, Kerman, Iran, between July and December 2024. Data were collected using a demographic-obstetric checklist, the PQOL questionnaire, the Edinburgh Postnatal Depression Scale, and the Postpartum Social Support Questionnaire. Multiple linear regression and correlation analyses were performed, with statistical significance set at $P < 0.05$.

Results: The mean age of participants was 29.59 ± 7.18 years, and the mean overall PQOL score was 58.33 ± 9.08 (on a 0 - 100 scale). Multiple linear regression analysis showed that postpartum depression ($B = -5.44$, $P < 0.001$), perceived social support ($B = 0.12$, $P = 0.001$), gestational age at birth (late vs. early preterm) ($B = 3.62$, $P = 0.003$), and length of infant hospitalization ($B = -0.20$, $P < 0.001$) were significant independent correlates of postpartum PQOL. The final adjusted model explained 49% of the variance in PQOL scores ($R^2 = 0.49$).

Conclusions: The PQOL of Iranian mothers after preterm birth is compromised. Lower PQOL was significantly associated with depressive symptoms, inadequate social support, earlier gestational age, and prolonged infant hospitalization. These findings underscore the need for routine surveillance of PQOL and mental health—not only for mothers in neonatal intensive care unit (NICU) settings but also for all mothers of preterm infants, including those discharged directly home with their newborns—to facilitate timely supportive interventions.

Keywords: Postpartum Period, Maternal Health, Premature Births, Premature Infant, Quality of Life

1. Background

The arrival of a newborn is a transformative event; however, when birth occurs prematurely, its consequences extend beyond neonatal morbidity to disrupt maternal physical, emotional, and social well-being (1, 2). Preterm birth (gestational age < 37 weeks) remains a global health priority (3), with approximately 13.4 million cases annually, accounting for nearly 10% of all live births (4). In Iran, the preterm birth rate is 10.48% (5), and a recent Iranian study reported that mothers of preterm infants experience substantial physical and psychological challenges,

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including fatigue (85.5%), lower back pain (82.5%), and sleep problems (89.3%) (6). This high prevalence and substantial maternal burden highlight the importance of understanding these mothers' quality of life in the Iranian context.

Preterm birth is uniquely stressful for mothers, and neonatal intensive care unit (NICU) hospitalization often intensifies this stress. Compared with mothers of term infants, mothers of preterm infants frequently experience helplessness, anxiety, guilt, and uncertainty about their infant's future (7, 8). The NICU environment impairs mental health and undermines early bonding (9), ultimately diminishing overall postpartum quality of life (PQOL) (2).

The World Health Organization (WHO) defines quality of life as "an individual's perception of their position in life… in relation to their goals, expectations, standards, and concerns" (10). It is a multidimensional construct encompassing physical, psychological, social, and environmental domains. In the perinatal period, maternal PQOL is important because it affects both maternal health and infant development (11). Evidence consistently shows that mothers of preterm infants report significantly lower PQOL than mothers of term infants (2, 12), with the psychological–emotional domain most affected by the length of infant hospitalization (2). Qualitative studies describe additional distress: mothers feel powerless, fear infant loss, lack awareness of the warning signs of preterm birth, and perceive themselves as passive recipients of care, all of which worsen their PQOL (13).

The PQOL of these mothers is shaped by three groups of factors: 1) maternal factors, including marital status, income, parenting interactions, mental health (especially depression and anxiety), and perceived social support (2, 14-17); 2) infant factors, including gestational age, birth weight, illness severity, length of infant hospitalization, and complications such as hydrocephalus and bronchopulmonary dysplasia (2, 14, 16, 17); and 3) environmental factors, including the quality of NICU care and health-system support (2, 18).

Despite the growing literature, several knowledge gaps remain. First, most studies have been conducted in high-income countries, with limited data from low- and middle-income settings, where cultural and health care contexts differ (2, 18). Second, investigations often examine predictors in isolation, although a multidimensional analytical approach is needed (18). Third, prior research has predominantly focused on mothers whose preterm infants were hospitalized in the NICU (14, 18), leaving mothers whose preterm infants are discharged directly home without NICU hospitalization largely unexamined. These mothers may still experience considerable psychological distress and impaired PQOL, yet may be overlooked in routine surveillance.

In Iran, despite a preterm birth rate of 10.48% (5), most studies have evaluated the effects of educational or supportive interventions on PQOL, and few have systematically identified risk factors in this population (19-21).

2. Objectives

This study aimed to 1) determine PQOL status in a broad sample of Iranian women with recent preterm births and 2) identify factors independently associated with PQOL using a comprehensive analytical framework that included mothers of preterm infants regardless of NICU hospitalization status.

3. Methods

3.1. Study Design and Setting

This cross-sectional study included women with a recent preterm birth (gestational age < 37 weeks), categorized as early preterm (< 34 weeks) or late preterm (34 - 36 weeks), who attended seven community-based public health centers and two tertiary referral hospitals in Jiroft, Kerman Province, Iran. The hospitals were designated for routine screening for retinopathy of prematurity, hearing impairment, and congenital hypothyroidism. Recruitment and data collection took place from July through December 2024. The study population included mothers of preterm infants, regardless of whether their infants were discharged directly home or required admission to a NICU. The length of infant hospitalization was recorded in days, with a value of zero assigned to infants who were not hospitalized.

3.2. Participants

Eligible women were Iranian, had a live singleton infant without congenital anomalies, were 4 - 6 weeks postpartum at assessment, and reported no previously diagnosed physical or mental health conditions, based on self-report and medical record review. Women who declined to allow their responses to be used after completing the questionnaire were excluded.

3.3. Sample Size and Sampling Strategy

The target sample size was determined using the formula for estimating a population mean PQOL: PQOL: $n = (Z^2 \times \sigma^2) / d^2$, with $\alpha = 0.05$, $d = 1.5$, and $\sigma = 13$ (for the PQOL score), derived from prior literature (22). The calculated minimum sample size was 289 women, which was rounded

up to a target of 300. With 22 candidate parameters, the participant-to-variable ratio was approximately 14, and the observed margin of error of 1.0 was lower than the assumed value of 1.5. To balance gestational age, 220 mothers were allocated to the late preterm group (34 - 36 weeks) and 80 to the early preterm group (< 34 weeks), based on a ratio of 2.7 to 1 (23). Participants were enrolled consecutively using convenience sampling at the participating facilities. Participants were recruited in proportion to the population served by each center, with larger numbers recruited from centers serving larger populations. The principal investigator attended the centers on predefined weekdays and invited all eligible women presenting during those sessions, in order of attendance, until the quota was reached.

3.4. Measurement Instruments

Data were collected through face-to-face structured interviews conducted by the lead researcher, who read each item aloud and recorded responses to minimize literacy-related errors. Three validated Persian-language instruments were administered:

The Postpartum Quality of Life Questionnaire (PQOL), originally developed by Zhou et al. (23), is a 40-item scale that evaluates four domains: infant care, physical functioning, psychological well-being, and social support. It uses a 5-point Likert format. Raw scores are transformed to a 0 - 100 scale, with higher scores indicating better PQOL. The Persian adaptation showed strong internal consistency (Cronbach's α = 0.88), test–retest reliability (intraclass correlation coefficient [ICC] = 0.87), good content validity (content validity ratio: 0.67 - 1.00; content validity index [CVI]: 0.78 - 1.00), and acceptable construct validity (confirmatory factor analysis: root mean square error of approximation = 0.038; comparative fit index = 0.90) (24).

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item screening tool for postpartum depressive symptoms, with scores ranging from 0 to 30 and a cutoff of ≥ 12 indicating probable depression (25). The validated Persian version has a Cronbach's α of 0.86 and satisfactory known-groups and convergent validity (26).

The Postpartum Social Support Questionnaire (PSSQ), developed by Hopkins and Campbell (27), is a 36-item instrument that assesses perceived support from a spouse, parents, in-laws, friends, and relatives on a 0 - 4 Likert scale. Total scores range from 0 to 144, with higher scores indicating greater support. The Persian translation demonstrated content validity and a Cronbach's α of 0.70 (28).

Although the PSSQ and the social support domain of the PQOL are conceptually related, they measure distinct constructs: the PSSQ assesses broader support from multiple sources, whereas the PQOL domain is a narrower component with limited items. The average interview duration was 15 - 20 minutes per participant.

3.5. Statistical Analysis

All analyses were performed using IBM SPSS Statistics, version 26. Descriptive data are presented as means (standard deviations [SDs]) and frequencies (percentages). The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Pearson and Spearman correlation coefficients were used for quantitative–quantitative and ordinal–quantitative associations, respectively. Mean PQOL scores were compared between groups using independent-samples t tests for two groups and one-way analysis of variance (ANOVA) for three or more groups. To identify factors independently associated with PQOL while adjusting for potential confounders, we used multiple linear regression, entering all variables with a univariable association of $P < 0.20$. Residual normality was confirmed using a quantile–quantile (Q–Q) plot. Homoscedasticity and linearity were assessed using scatter plots of standardized residuals against predicted values; no specific pattern was observed. Multicollinearity was not problematic (variance inflation factor < 10; tolerance > 0.1). Cook's distance (0.000 - 0.039; mean = 0.003) indicated no influential observations. The adjusted model's explanatory power was quantified using the coefficient of determination (R^2). Statistical significance was set at a two-tailed $P < 0.05$.

3.6. Ethical Considerations

This study was part of an ethically approved PhD dissertation. Ethical clearance was obtained from the Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.PHARMACY.REC.1402.312), and local permission was obtained from Jiroft University of Medical Sciences. All procedures complied with the Declaration of Helsinki. Participants provided written informed consent and were assured of data anonymity and confidentiality, as well as their right to withdraw at any time without consequence.

4. Results

Of the 325 women initially assessed, 300 met the eligibility criteria and were enrolled (response rate: 92.3%). All 300 enrolled participants completed the study; no withdrawals or protocol deviations occurred. Table 1 presents the participants' demographic, obstetric, psychosocial, and neonatal characteristics. All women were Muslim, married, and living with their spouses. Most women had infants who were hospitalized in the NICU.

The mean overall PQOL score on a 0 - 100 scale was 58.33 ± 9.08 (mean ± SD). Univariable analyses using Pearson and Spearman correlation coefficients, independent-samples t tests, and one-way analysis of variance (ANOVA) were performed to examine associations between demographic, obstetric, psychosocial, and neonatal characteristics and maternal PQOL. As summarized in Table 1, several factors were significantly associated with PQOL. Among demographic variables, spousal education ($r = 0.14$, $P = 0.013$) and perceived income adequacy ($r = 0.12$, $P = 0.029$) were positively associated with PQOL, and spousal occupation was also significantly associated with PQOL ($F = 4.67$, $P = 0.003$). Post hoc comparisons using Tukey's test showed that women whose husbands were employees or self-employed had significantly higher PQOL scores than those whose husbands were farmers. Among neonatal and obstetric factors, infant birth weight was positively correlated with PQOL ($r = 0.40$, $P < 0.001$), whereas length of infant hospitalization was negatively correlated with PQOL ($r = -0.51$, $P < 0.001$). Women who received postpartum care between days 10 and 15 had significantly higher PQOL scores ($t = -4.66$, $P < 0.001$). Women whose infants were not hospitalized in the NICU had significantly higher PQOL scores than those whose infants were hospitalized ($t = 6.46$, $P < 0.001$). Women with late preterm births had significantly higher PQOL scores than those with early preterm births ($t = -9.06$, $P < 0.001$). Women whose infants had no complications had significantly higher PQOL scores ($t = 6.08$, $P < 0.001$). Women without postpartum depression (PPD; EPDS score < 12) had significantly higher PQOL scores than those with PPD (EPDS score ≥ 12; $t = 9.87$, $P < 0.001$), and higher perceived social support was positively correlated with PQOL ($r = 0.21$, $P < 0.001$).

To identify factors independently associated with PQOL while adjusting for potential confounders, we constructed a multiple linear regression model that included all variables with $P < 0.20$ in univariable analyses. The final adjusted model, detailed in Table 2, identified four statistically significant independent correlates: 1) PPD: Women with probable depression (EPDS ≥ 12) had, on average, PQOL scores 5.44 units lower than those of mothers without probable depression ($B = -5.44$; 95% confidence interval [CI]: −7.13 to −3.75; $P < 0.001$); 2) perceived social support: Each one-unit increase in the overall PSSQ_score was associated with a 0.12-unit higher PQOL score ($B = 0.12$; 95% CI: 0.05 to 0.19; $P = 0.001$); 3) gestational age at birth: Compared with early preterm birth (< 34 weeks), late preterm birth (34 - 36 weeks) was independently associated with a higher PQOL score ($B = 3.62$; 95% CI: 1.23 to 6.00; $P = 0.003$), consistent with an association between greater gestational maturity and higher PQOL; and 4) length of infant hospitalization: Each additional day of infant hospitalization in the NICU corresponded to a 0.20-unit decrease in maternal PQOL ($B = -0.20$; 95% CI: −0.31 to −0.09; $P < 0.001$), highlighting the cumulative burden of prolonged separation.

The final multiple linear regression model accounted for 49% of the total variance in PQOL scores ($R^2 = 0.49$). Examination of the standardized beta coefficients showed that PPD had the strongest standardized association ($\beta = -0.30$), followed by length of infant hospitalization ($\beta = -0.24$), gestational age at birth ($\beta = 0.18$), and perceived social support ($\beta = 0.17$). In separate univariable linear regression analyses, the corresponding R^2 values were 0.24, 0.26, 0.22, and 0.04, respectively. Although all four factors were independently associated with PQOL, PPD had the strongest standardized association in the early postpartum period.

5. Discussion

This study evaluated PQOL among mothers of preterm infants and identified associated factors, irrespective of whether their infants were hospitalized. The mean PQOL score was 58.33, and PPD, perceived social support, gestational age at birth, and length of infant hospitalization were the principal factors independently associated with PQOL. These results reaffirm the multidimensional nature of PQOL in this population, indicating that psychological, social, and clinical variables collectively shape maternal well-being.

The mean PQOL score observed in this study was consistent with the score of 59.27 reported in Lebanon (12) and the score of approximately 56 reported in Iran (19), suggesting consistency across these regional contexts. In contrast, a study conducted in Turkey reported a markedly higher mean score of 73.87 (29). Although this disparity may partly reflect the use of different instruments—the brief version of the WHO Quality of Life questionnaire (WHOQOL-BREF) versus the PQOL questionnaire used here—it may also reflect broader sociocultural, economic, and health care system differences across populations, emphasizing the need for culturally grounded interpretations.

Depression emerged as the most clinically salient correlate. Women screening positive for PPD had PQOL scores 5.44 units lower. This inverse relationship is supported by longitudinal evidence: A study conducted in Brazil showed that depressive symptoms in mothers of very-low-birth-weight infants persistently undermined nearly all PQOL domains from discharge through 36 months postpartum (16). Similarly, a study conducted in Portugal found that depressed mothers of preterm infants consistently reported poorer physical, psychological, and

relational functioning (14). The mechanisms underlying this association are multifaceted. Persistent uncertainty about neonatal survival, exposure to invasive medical procedures, and the chronic stress of navigating the NICU environment collectively contribute to emotional exhaustion. Even subthreshold depressive symptoms appear sufficient to disrupt daily functioning and erode perceived well-being (16).

Social support was positively associated with PQOL; each one-unit increase in perceived support was associated with a statistically significant increase in PQOL. This finding is consistent with international evidence. A study conducted in Lebanon noted that social support declines significantly between 4 and 6 months postpartum but remains a key buffer for maternal PQOL (12). Studies conducted in Turkey and Korea have similarly identified perceived social support as a primary explanatory factor for postpartum well-being (15, 29). These observations suggest that the positive association of support networks extends beyond emotional support to practical assistance with childcare and household responsibilities. Consequently, interventions focused solely on the individual mother may be insufficient; involving family, friends, and community resources is important for providing sustained support (30).

Gestational age at birth was also associated with PQOL. Women who delivered early preterm infants (gestational age < 34 weeks) reported significantly lower PQOL than those who delivered late preterm infants. A study conducted in Malaysia found that lower gestational age correlated with lower physical, psychological, and environmental PQOL scores in a large cohort (31), whereas a study conducted in the United States confirmed this relationship at NICU discharge (17). Greater prematurity typically entails more severe neonatal morbidities, prolonged hospitalization, and heightened maternal anxiety, which collectively compromise the maternal experience (16). Nevertheless, mothers of late preterm infants had a mean PQOL score of 60.87. A study conducted in Iran emphasized that even when NICU hospitalization is unnecessary, mothers of late preterm infants experience substantial physical exhaustion and psychological strain during outpatient caregiving and require dedicated support (32).

Length of infant hospitalization was associated with maternal PQOL: each additional day of hospitalization corresponded to a 0.20-unit lower PQOL score. This relationship is consistent with findings from an Ethiopian study reporting a 0.24-unit decrease per additional day (33) and Portuguese mixed-methods data highlighting the challenges associated with prolonged separation (14). Longer infant hospitalization may be associated with greater maternal distress, potentially reflecting restricted physical contact, challenges in maternal–infant bonding, and the ongoing vigilance required in an intensive care setting (17). Even women whose infants were discharged without NICU hospitalization had a mean PQOL score of 62.95. This finding suggests that maternal PQOL is associated with factors beyond infant hospitalization. Feeding and caregiving challenges, concerns about infant health, and psychological distress may also be relevant to maternal well-being when hospitalization is not required (14, 34). These findings highlight that the absence of a critical neonatal event does not necessarily indicate optimal maternal well-being. Accordingly, clinical surveillance and supportive care should extend to all mothers of preterm infants, not solely those whose infants are admitted to the NICU.

In univariable analyses, spousal education and occupation, perceived income adequacy, infant birth weight, infant complications, and receipt of postpartum care showed significant associations with PQOL. Consistent with these findings, studies conducted in Brazil and Portugal also reported associations between socioeconomic and infant-related factors and PQOL following preterm birth (14, 16). However, these associations attenuated after adjustment for the core psychosocial and clinical variables in the multiple linear regression model. Their initial significance nevertheless points to the socioeconomic and biological context of maternal PQOL.

The principal strengths of this study are its comprehensive analytical framework, which simultaneously accounts for psychological, social, obstetric, and neonatal factors, and its inclusive sampling strategy, which included women across the spectrum of preterm severity and hospitalization status. However, the cross-sectional design precludes causal inference. A major limitation was the use of convenience sampling at selected health care facilities in Jiroft, Iran. Probability sampling was not feasible because a complete sampling frame of eligible mothers was unavailable, which may have introduced selection bias and limits the generalizability of the findings. The sample was heterogeneous with respect to infant hospitalization status. In addition, the inclusion of both early and late preterm infants encompassed a broad range of gestational ages and may have introduced clinical heterogeneity. Excluding mothers with previously diagnosed physical or mental health conditions and infants with congenital anomalies may further restrict the applicability of the findings. Finally, face-to-face interviews using self-reported data may introduce recall and social desirability biases.

These findings have clinical implications. Routine screening for PPD and systematic assessment of social support networks should be integral to postpartum care for all mothers of preterm infants. Prolonged infant hospitalization may also help identify mothers who require additional psychological and social support. We advocate a family-centered, multidisciplinary approach that extends psychosocial support from the inpatient setting through the transition to home. Future research should use longitudinal designs with extended follow-up, test targeted interventions such as peer mentorship and cognitive-behavioral counseling, and conduct stratified analyses across diverse cultural and health care settings to improve understanding and management of this issue.

5.1. Conclusions

Postpartum depression, social support, gestational age at birth, and length of infant hospitalization were the principal factors independently associated with quality of life among mothers of preterm infants. Lower quality of life was consistently associated with greater depression, weaker social support, earlier gestational age at birth, and longer hospitalization. Even mothers whose infants were not hospitalized in the NICU or whose infants were late preterm experienced suboptimal quality of life, underscoring the need to attend to all mothers of preterm infants, regardless of infant severity or hospitalization status. Targeted interventions to reduce depression and strengthen social networks are recommended, alongside routine mental health and PQOL screening to identify risk early and provide timely support.

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Footnotes

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Authors' Contribution: Study design, data collection, data analysis and interpretation, and manuscript drafting: A. A.; study supervision and critical revision: S. H.; statistical analysis: M. N.; conceptualization, supervision, and critical revision: S. S. M. All authors approved the final manuscript.

Conflict of Interests Statement: The authors declare that they have no conflicts of interest.

Data Availability: The datasets generated and/or analyzed during the current study are not publicly available because of privacy and ethical restrictions but are available from the corresponding author upon reasonable request.

Ethical Approval: This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (ethics code: IR.SBMU.PHARMACY.REC.1402.312). Permission was also obtained from Jiroft University of Medical Sciences. All procedures were performed in accordance with the ethical standards of the institutional research committee and the Helsinki Declaration.

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Informed Consent: Written informed consent was obtained from all participants before their inclusion in the study. Participants were informed of the study objectives, data confidentiality, voluntary participation, and their right to withdraw at any time without consequences. All procedures were performed in accordance with the ethical standards of the institutional research committee.

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