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Association of remifentanil analgesia with postpartum depression and birth experience: an observational study

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Abstract

Background Pain is a risk factor for postpartum depression. This study aimed to determine the relationship between remifentanil analgesia and postpartum depression, as well as the birth experience among Iranian women.

Methods This observational study was conducted on 200 mothers who underwent vaginal birth at Taleghani Hospital in Tabriz, Iran, in 2023-4. The Edinburgh Postnatal Depression Scale and the Childbirth Experience Questionnaire were used to assess the outcomes. To compare the childbirth experience and postpartum depression between the exposure group (receiving remifentanil) and the non-exposure group, independent t-tests and Mann-Whitney U tests were employed, respectively.

Results The mean postpartum depression score in the remifentanil analgesia group was statistically significantly lower than that in the non-analgesia group ($p=0.002$). The mean total childbirth experience score in the exposure group was statistically significantly higher than in the non-exposure group ($p<0.001$). Additionally, a comparison of the subdomains of childbirth experience between the two groups showed that the mean scores for own capacity ($p<0.001$), perceived safety ($p<0.001$), and participation ($p<0.001$) were statistically significantly higher in the remifentanil group compared to the non-analgesia group. However, there was no statistically significant difference between the two groups regarding the professional support subdomain ($p=0.434$).

Conclusion These findings underscore the significance of using remifentanil analgesia as a potential approach for preventing postpartum depression and creating a positive childbirth experience. It is recommended that clinical trials be conducted to obtain more precise results.

Keywords Postpartum, Analgesia, Birth satisfaction

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Introduction

Pregnancy is considered a unique experience for women. This physiological process is accompanied by significant emotional and psychological changes [1]. The most common psychological disorder after childbirth is postpartum depression (PPD), which begins within the first four weeks following birth [2]. The prevalence of PPD is approximately 27% in the Eastern Mediterranean region [3] and 24% in Iran [4].

Depression or anxiety during pregnancy, a previous history of depression, recent stressful life events, and poor social support are reported as risk factors for postpartum depression. Predictors of PPD include stress related to maternal responsibilities, low maternal self-confidence, an infant's difficult temperament, obstetric complications, and low socioeconomic status [5].

Pain is a recognized risk factor for depression [6]. Labor pain is described as the most severe pain experienced by most women, with 60% describing their pain as severe or very severe [7]. Epinephrine and norepinephrine levels during labor increase, and this rise in catecholamines is associated with reduced uterine blood flow and labor pain [8]. Moreover, severe pain, anxiety, and elevated catecholamine levels result in decreased oxytocin secretion and prolonged labor [9]. Unrelieved labor pain may lead to postpartum stress disorder (PTSD) [10], a negative childbirth experience [11], and postpartum depression [12]. Women's experiences of labor pain vary and are influenced by physiological and psychological processes as well as their perception of pain. While some women adapt well to labor pain without any interventions, others require pharmacological or non-pharmacological methods for pain relief [13].

In recent years, many strategies for labor pain management have been developed and widely implemented [14, 15]. Pain relief methods include pharmacological approaches (regional anesthesia, paracervical block, pudendal block, and systemic analgesia with opioids) and non-pharmacological methods such as massage, breathing techniques, relaxation, and acupressure [16]. Among these, pharmacological pain relief methods effectively reduce the pain experienced during labor and birth [17]. One of the pharmacological methods involves opioids, including remifentanil [18], which, due to its unique pharmacodynamic and pharmacokinetic properties, may be the most suitable opioid for labor analgesia [19]. Remifentanil is a short-acting agonist with a rapid onset of action (30 to 60 s) and fast clearance (2 to 5 min) [20, 21]. Additionally, remifentanil has fewer adverse effects on the mother and fetus compared to other opioids [22].

As mentioned earlier, pain is a recognized risk factor for depression. Recently, labor and childbirth pain have garnered attention as potential risk factors for postpartum depression. Several studies have evaluated the relationship between epidural analgesia during labor and the incidence of postpartum depression, but their findings have been inconsistent. Currently, it remains unclear whether optimal pain management during labor and childbirth using epidural analgesia is associated with a reduced incidence of postpartum depression [6].

No studies have yet investigated the relationship between other pharmacological analgesia methods, particularly remifentanil, and postpartum depression. Given the association between pain and depression, it can be argued that adequate pain relief during labor and childbirth may reduce the incidence of postpartum depression [23].

Postpartum depression is a global problem, and efforts to reduce its incidence are the responsibility of all countries. Given that previous studies have indicated that pain is a strong risk factor for the occurrence of PPD, research on the association between analgesic prescription and PPD seems necessary. Therefore, this research aims to apply findings to improve current conditions and develop constructive solutions to existing problems.

This study was designed and conducted with the primary objectives of comparing the incidence of postpartum depression between the exposure group (receiving analgesia with remifentanil) and the non-exposure group (not receiving pharmacological analgesia) and comparing childbirth experience scores between the two groups. A secondary objective was to determine the correlation between childbirth experience and postpartum depression.

Method

Study design

This observational study compares postpartum depression and childbirth experiences in mothers who delivered with and without remifentanil analgesia.

Participants

Women with term pregnancies admitted for vaginal birth in the labor room were included in the study. The inclusion criterion for the exposure group with remifentanil was the administration of analgesia during the active phase of labor. The exclusion criteria for both groups included a postpartum depression score of 13 or higher based on the Edinburgh Postnatal Depression Scale, any acute or chronic illness during pregnancy, a history of mental illness based on medical records, divorce, the death of a first-degree relative within three months before data collection, the birth of a baby with known abnormalities; and infant death after birth for any reason.

Sampling

Women with vaginal deliveries and term infants (over 37 weeks) admitted to Taleghani Hospital in Tabriz, Iran,

during 2023 – 2004 were included in the study. Sampling in the remifentanil group was conducted by census, while in the non-exposure group, it was done through convenience sampling. For sampling, the researcher met with the mothers in the postpartum ward. After fully explaining the research objectives, eligible women were enrolled after obtaining written informed consent. For illiterate individuals, the researcher explained the informed consent form in their native language and took their fingerprints. Demographic questionnaires were completed 12 to 24 h after delivery through an interview by the researcher, and the obstetric checklist was filled out by reviewing medical records. The childbirth experience and postpartum depression questionnaires were completed through interviews by a non-involved person in previous stages of the research (to reduce bias), 4 to 6 weeks after delivery via telephone. To minimize loss to follow-up, the mobile phone numbers of the spouse or parents and the participant's phone number were collected, and the health center under coverage was also recorded. To maintain the confidentiality of the data, questionnaires were coded without mentioning the participants' names.

Data collection tools

Questionnaire of socio-demographic characteristics

This questionnaire includes age, marital status, occupation, monthly income, education level, and housing status, which was completed at the beginning of the study in the form of a structured interview by the first author (a master's degree student in midwifery).

Obstetric checklists

The obstetric questionnaire includes questions about the number of pregnancies, number of deliveries, number of live children, number of miscarriages, participation in childbirth preparation classes, feeling of control over the delivery, wanted pregnancy, preferred gender, history of infertility, and history of depression.

Edinburgh postpartum depression scale (EPDS)

This questionnaire contains 10 questions, with responses scored on a 4-point Likert scale from 0 to 3. The Edinburgh Scale score ranges from 0 to 30, and a score of 13 or higher suggests a higher likelihood of postpartum depression. Questions 1, 2, and 4 are scored from 0 to 3, and 3, 5, 6, 7, 8, 9, and 10 are scored from 3 to 0. The Persian version of this questionnaire has been psychometrically validated in Iran. The Cronbach's alpha coefficient and intra-class correlation (ICC) were reported as 0.7 and 0.80, respectively [24].

Childbirth experience questionnaire (CEQ)

The childbirth experience questionnaire contains 23 statements and covers the following domains: personal capacity, professional support, perceived security, and participation. Twenty statements are answered on a 4-point scale, and three are responded to on a visual analog scale (VAS). Responses are: strongly agree (score 4), mostly agree (score 3), mostly disagree (score 2), and strongly disagree (score 1). For statements answered on the VAS, scores are converted into values between 1 and 4: scores 0–40 (score 1), 41–60 (score 2), 61–80 (score 3), and 81–100 (score 4). Questions 21, 20, 19, 14, 13, 10, 8, 5, and 3 are scored negatively. The overall score range is from 1 to 4, with higher average scores indicating a more positive childbirth experience [25]. The Persian version of this tool was psychometrically validated in Iran by Ghanbari and colleagues, with Cronbach's alpha and ICC reported as 0.93 and 0.90, respectively [26].

Postpartum checklist

This checklist includes questions such as delivery shift, duration of labor, type of delivery, episiotomy, shoulder dystocia, third- and fourth-degree tears, post-bleeding interventions, Apgar score, NICU admission of the newborn, macrosomia, use of uterine contraction-stimulating drugs, infant feeding in the six weeks post-delivery, maternal hemoglobin level, presence of a companion, presence of a doula, and episiotomy.

Sample size

The sample size was calculated based on the results of Ding et al. (2014), considering a depression prevalence of 14% (P1) in the group receiving epidural analgesia and 34.6% (P2) in the control group (without analgesia), with a two-sided α of 0.05 and a power of 90%. The required sample size was 89 participants, and after accounting for a 10% attrition rate, the final sample size was estimated to be approximately 100 participants in the remifentanil group and 100 participants in the non-exposure group [27].

Setting

The participants were enrolled from Taleghani Hospital in Tabriz, East Azerbaijan, Iran, affiliated with Tabriz University of Medical Sciences. Tabriz has a population of approximately 1.9 million and is the third-largest city in Iran. Taleghani Hospital is an educational hospital for obstetrics and gynecology and has 8 LDR (Labor, Delivery, Recovery) rooms, with approximately 80 vaginal deliveries occurring monthly.

Ethical considerations

This study was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1402.047). Written informed consent was obtained from all participants. They were told that they were free to participate or withdraw from the study at any time

without penalty. Additionally, they were assured that all their information would remain confidential.

Data analysis

The data were analyzed using SPSS software, Version 24. The normality of the data was assessed using skewness and kurtosis. All quantitative variables in the study followed a normal distribution. To compare postpartum depression scores and childbirth experience between the exposure group (receiving remifentanil) and the non-exposure group, the Mann-Whitney U test and independent t-test were used, respectively. The correlation between childbirth experience and postpartum depression was assessed using the Spearman correlation test. A significance level of less than 0.05 was considered for all statistical analyses.

Results

The mean gestational age (weeks) of participants in the exposure and non-exposure groups was 39.04 weeks and 39.00 weeks, respectively. There was no statistically significant difference between the two groups in terms of personal-social and obstetric characteristics ($p > 0.05$) (Tables 1 and 2). The mean (standard deviation) of the total postpartum depression score, with a possible score range of 0 to 30, in the exposure group was 4.5 (3.4), and in the non-exposure group was 6.9 (3.5). According to the Mann-Whitney U test, there was a statistically significant difference between the two groups ($p = 0.002$) (Table 3). The mean (standard deviation) of the total childbirth experience score in the exposure and non-exposure groups was 2.75 (0.42) and 2.47 (0.35), respectively. Based on the independent t-test, there was a statistically

Table 1 Comparison of Socio-Demographic characteristics between study groups

Variable	Remifentanil Group ($n = 100$)	Non-Remifentanil Group ($n = 100$)	*P*-value
	n (%)	**n (%)**	
Husband's Age*(years)	32.68 (6.2)	32.49 (6.5)	0.834**
Gestational Age*(weeks)	39.04 (0.9)	39.00 (0.8)	0.756**
Mother's Age*(years)	26.75 (6.0)	28.15 (7.0)	0.143**
Duration of Labour*(hours)	8.23 (1.9)	7.84 (1.6)	0.121**
BMI	27.12 (4.6)	27.85(4.7)	0.440**
Occupation			1.000***
Housewife	93 (93.0)	93 (93.0)	
Employed	7 (76.0)	7 (7.0)	
Education			0.787***
Elementary	22 (22.0)	25 (25.0)	
Middle School	32 (32.0)	28 (28.0)	
High School	12 (12.0)	16 (16.0)	
Diploma	25 (25.0)	22 (22.0)	
Academic	9 (9.0)	9 (9.0)	
Husband's Education			0.825***
Elementary	15 (15.0)	19 (19.0)	
Middle School	35 (35.0)	24 (24.0)	
High School	6 (6.0)	14 (14.0)	
Diploma	33 (38.0)	38 (33.0)	
Academic	11(11.0)	5 (5.0)	
Husband's Occupation			0.182***
Employee	10 (10.0)	5 (5.0)	
Worker	15 (15.0)	23 (23.0)	
Self-employed	75 (75.0)	72 (72.0)	
Monthly Income Sufficiency			0.187***
Completely Sufficient	13 (13.0)	20 (20.0)	
Partially Sufficient	87 (87.0)	79 (79.0)	
Insufficient	0 (0)	1 (1.0)	
Housing			0.799***
Personal	63 (63.0)	56 (56.0)	
Rental	27 (27.0)	31 (31.0)	
Relative's Home	9 (9.0)	12 (12.0)	
Organizational	1 (1.0)	1 (1.0)	

* Mean (Standard Deviaion), **Independent t-test; ***Chi square test

Table 2 Comparison of obstetric characteristics between study groups

Variable	Remifentanil Group ($n=100$)	Non-Remifentanil Group ($n=100$)	*P*-value
	n (%)	*n* (%)	
Number of Pregnancies			0.851*
0	47 (47.0)	46 (46.0)	
1	37 (37.0)	35 (35.0)	
2	16 (16.0)	19 (19.0)	
Number of Children			0.934*
0	48 (48.0)	45 (45.0)	
1	36 (36.0)	37 (37.0)	
2	16 (16.0)	17 (17.0)	
Number of Abortions			0.471*
0	83 (83.00	79 (79.0)	
1	17 (17.0)	21 (21.0)	
Number of Pregnancies			0.683*
1	43 (43.0)	38 (38.0)	
2	32 (32.0)	32 (32.0)	
3	25 (25.0)	30 (3.0)	
Childbirth Preparation Class			0.514*
Yes	27 (27.0)	23 (23.0)	
No	73 (73.0)	77 (77.0)	
Wanted Pregnancy			0. 294*
Yes	70 (70.0)	63 (63.0)	
No	30 (3.0)	37 (37.0)	
Desired Sex of the Baby			0.159*
Yes	67 (67.0)	76 (76.0)	
No	33 (33.0)	24 (24.0)	
History of Infertility			1.000*
Yes	1 (1.0)	0 (0.0)	
No	99 (99.0)	100 (100.0)	
History of Depression			1.000*
Yes	0 (0.0)	1 (1.0)	
No	100 (100.0)	99 (99.0)	
Labour Shift			0.985*
Morning	35 (35.0)	35 (35.0)	
Afternoon	31 (31.0)	32 (32.0)	
Night	34 (34.0)	33 (33.0)	
Shoulder Dystocia			1.000*
Yes	0 (0.0)	1 (1.0)	
No	100 (100.0)	99 (99.0)	
Episiotomy			0.663*
Yes	87 (87.0)	89 (89.0)	
No	13 (13.0)	11 (11.0)	
One-minute Apgar score			0.774*
8	6 (6.0)	7 (7.0)	
9	94 (94.0)	93 (93.0)	
Five-minute Apgar score			1.000*
8	3 (3.00	4 (4.0)	
9	97 (97.0)	96 (96.0)	
Immobility During Labour			1. 000*
Yes	0 (0.0)	1 (1.0)	
No	99 (99.0)	100 (100.0)	
Use of Uterotonic Drugs			0.060*
Yes	89 (89.0)	96 (96.0)	

Table 2 (continued)

Variable	Remifentanil Group (*n* = 100)	Non-Remifentanil Group (*n* = 100)	*P*-value
	***n* (%)**	***n* (%)**	
No	11 (11.0)	4 (4.0)	
Companion During Labour			0.683*
Yes	2 (2.0)	4 (4.0)	
No	98 (98.0)	96 (96.0)	
Doula During Labour			0.713*
Yes	19 (19.0)	17 (17.0)	
No	81 (81.0)	83 (83.0)	
Infant Feeding at 6 Weeks			0.133*
Breastfeeding Only	82 (82.0)	88 (88.0)	
Formula Only	10 (10.0)	3 (3.0)	
Mixed Feeding	8 (8.0)	9 (9.0)	
Postpartum Hemoglobin (gr/dL)			1. 000*
≥ 11	97 (97.0)	97 (97.0)	
< 11	3 (3.0)	3 (3.0)	

*Chi-Square Tests

Table 3 Comparison of mean postpartum depression scores between study groups

Variables	Remifentanil Group (*n* = 100)		Non-Remifentanil Group (*n* = 100)		*P*-value*
	Mean (SD)	Median (Interquartile Range 25 to 75)	Mean (Standard Deviation)	Median (Interquartile Range 25 to 75)	
Depression (Score Range: 0 to 30)	4.5 (3.4)	4.0 (2.0 to 7.0)	6.9 (5.3)	7.0 (2.0 to 11.0)	0.002

*Mann–Whitney U

Table 4 Comparison of mean overall childbirth experience scores and its subdomains between study groups

Variable	Remifentanil Group (*n* = 100)	Non-Remifentanil Group (*n* = 100)	Mean Difference (95% Confidence Interval)	*P*-value*
	Mean (SD)	Mean (SD)		
Total Score	2.75 (0.42)	2.47 (0.35)	0.28 (0.17 to 0.39)	**< 0.001**
Own Capacity	2.81 (0.52)	2.45 (0.45)	0.35 (0.22 to 0.49)	**< 0.001**
Professional Support	2.56 (0.38)	2.52 (0.37)	0.04 (-0.06 to 0.14)	**0.434**
Perceived Security	2.80 (0.56)	2.45 (0.45)	0.35 (0.21 to 0.50)	**< 0.001**
Participation	2.81 (0.55)	2.47 (0.48)	0.33 (0.19 to 0.48)	**< 0.001**

*Independent t-test

significant difference between the two groups ($p < 0.001$). Comparison of the subdomains of childbirth experience between the two groups showed that the mean score for the subdomains of own capacity ($p < 0.001$), perceived safety ($p < 0.001$), and participation ($p < 0.001$) were statistically significantly higher in the remifentanil group compared to the non-exposure group. However, there was no statistically significant difference between the two groups regarding the subdomain of professional support ($p = 0.434$) (Table 4). Additionally, based on the Spearman test, no statistically significant correlation was found between childbirth experience and postpartum depression in both the remifentanil ($p = 0.621$; r= -0.05) and non-exposure groups ($p = 0.924$; r= -0.01).

Discussion

This study aimed to compare postpartum depression scores between the exposure group (those receiving pain relief with remifentanil) and the non-exposure group (those not receiving pain relief). The secondary objective was to compare childbirth experience scores between the two groups. The results of the present study showed that the mean postpartum depression score in the exposure group was statistically significantly lower than in the non-exposure group. Comparison of the total childbirth experience score between the two groups indicated a statistically significant difference in the mean total childbirth experience score and its subdomains, except for the professional support subdomain. Furthermore, no statistically significant correlation was found between

childbirth experience and postpartum depression in either group.

The results of the present study showed that the mean postpartum depression score in the non-exposure group (without pain relief) was statistically significantly higher than in the exposure group (remifentanil). Given the association between pain and depression [6], it can be argued that adequate pain relief during labor and childbirth may reduce the incidence of postpartum depression [23]. Few studies have been conducted on the relationship between remifentanil and postpartum depression (PPD). The results of this study align with some previous studies. Additionally, the findings are consistent with a prospective observational study (2020) that assessed the relationship between labor pain and postpartum depression symptoms in women with epidural analgesia during labor. The study showed that the experience of pain during labor, its management, and the use of epidural anesthesia were independently associated with depression scores at six weeks postpartum, with epidural anesthesia potentially reducing pain and postpartum depression [28].

The results of this study are somewhat consistent with the findings of Wang et al. (2022), who examined the impact of pain relief techniques, including epidural anesthesia, combined epidural-spinal anesthesia, and the use of analgesics like ketamine and remifentanil, on psychological outcomes in 200 nulliparous women in China. Their findings indicated a higher depression score in the vaginal delivery group without pain relief compared to the women who received pain relief (12). Similarly, in the cross-sectional study by Dousti et al. (2022), the mean postpartum depression score in women who underwent elective cesarean section was statistically significantly higher than in the vaginal delivery group that received remifentanil pain relief [29].

However, our study's results are inconsistent with the findings of some other studies. In a randomized clinical trial (2024) involving 66 term-pregnant women who presented for vaginal delivery at Tabriz's Taleghani Hospital, it was found that the postpartum depression score was lower in women who received non-pharmacological pain relief strategies with active participation in delivery compared to those who received pharmacological pain relief (remifentanil) [30]. The difference in the design of these two studies and the fact that in the mentioned study, the control group received non-pharmacological pain relief strategies, while in our study, the non-exposure group received no pain relief intervention, may explain the lack of consistency in the results.

In the meta-analysis by Ghanbari-Homaie et al. (2024), observational studies examining the relationship between epidural anesthesia during labor and postpartum depression (PPD) were included. According to the results of the meta-analysis, no statistically significant association was found between epidural anesthesia during labor and PPD [31]. However, due to the high heterogeneity of the studies (99.7%), it was suggested that further studies with more precise methodology and longer follow-up be conducted. Epidural anesthesia is different from pain relief with remifentanil, and women tend to prefer remifentanil over other pain relief methods. A 2019 observational study in Ireland reported that over 10 years, remifentanil was the most popular analgesic, chosen by 31.9% of women, and these women did not experience more complications than those who received diamorphine or epidural anesthesia [32].

Epidural anesthesia may influence women's participation during labor and birth, potentially affecting postpartum depression (PPD) in a way that is not as effective as other pain management methods. However, in the present study, the participation score in the remifentanil group was higher than in the non-intervention group. This suggests that mothers may experience greater satisfaction due to their higher participation, which could positively influence their pain perception and, consequently, reduce the likelihood of PPD.

The timing of PPD assessment and follow-up could also influence the results. In this study, PPD was assessed at 4 to 6 weeks postpartum, while the timing in other studies varies, ranging from immediately after delivery (48 to 72 h) to 12 months postpartum. Furthermore, the Edinburgh Postpartum Depression Scale (EPDS) raises the possibility of depression but does not provide a definitive diagnosis. Therefore, some women may not express their symptoms due to shame or fear of being judged. This could lead to underreporting and affect the overall results.

The comparison of the overall childbirth experience score between the study groups showed a statistically significant difference between the remifentanil and non-intervention groups. In a study by Ghanbari-Homayi et al. (2019) aimed at determining predictors of childbirth experience, it was reported that the likelihood of a negative childbirth experience in the absence of pain relief, whether pharmacological or non-pharmacological, was 4.24 times higher than when any form of pain relief was used [11]. In a meta-analysis, the effect of pharmacological pain relief methods (epidural, nitrous oxide, and hyoscine) on the childbirth experience was evaluated. The meta-analysis reported that pharmacological pain relief improved the childbirth experience [33, 34], consistent with the present study. The results of a cohort study in Finland also showed that inadequate pain relief in women undergoing labor induction was associated with dissatisfaction with childbirth [34, 35].

There was no statistically significant correlation between childbirth experience and postpartum

depression in both groups [35, 36]. The results of some studies indicate an inverse and significant correlation between these two variables. However, other studies have not found a connection between childbirth experience and postpartum depression. In a review study that examined the relationship between childbirth experience (BE) and postpartum depression (PPD), out of 15 included studies, 11 showed a statistically significant correlation between these two. However, the review study suggested that further studies are needed due to the high heterogeneity of the included studies, the lack of standardized tools for assessing childbirth experience, and the need to adjust for the effect of the quality of care provided during labor and childbirth [37]. It seems that PPD, being multifactorial, may not be solely related to the childbirth experience, and other factors could also be involved in its occurrence.

Strengths and limitations

One strength of this study is its evaluation of two important postpartum outcomes related to remifentanil analgesia, which has been addressed in a few studies. A limitation of this study is the lack of longer-term follow-up for postpartum depression (PPD), as PPD can emerge up to 12 months after childbirth. Another limitation is the failure to examine factors such as fear of childbirth, pain perception, and maternal preferences for analgesia, which are important components of the childbirth experience. Mothers who had more fear of childbirth and a more negative perception of pain may have had a greater desire to receive remifentanil. That fear of childbirth and pain perception indirectly influenced their experience of labor. Internal and external locus of control, which are other factors related to analgesia and childbirth experience, should have been assessed using a standardized questionnaire rather than just a single question. Additionally, since this study was designed as an observational study, it is recommended that future studies be designed as randomized controlled clinical trials.

If future studies assess participants' expectations of pain relief methods before administering analgesia, it would provide valuable insights into the relationship between expectations, actual pain relief, and maternal outcomes such as postpartum depression.

The study did not address the long-term effects of remifentanil on postpartum mental health beyond the 4–6 week follow-up period. So, additional research is necessary to explore this aspect.

Conclusion

The results of the study indicate a decrease in postpartum depression scores and an increase in childbirth experience scores among women receiving remifentanil compared to those not receiving any analgesia during labor. The findings highlight the importance of using remifentanil analgesia as a preventive measure against postpartum depression and as a means of creating a positive childbirth experience. It is recommended that clinical trials with precise methodologies and sufficient sample sizes be conducted to achieve more definitive results.

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Author contributions

FS, JM and SGH contributed to the design of the study. FS, SGH, and MM contributed to the implementation and analysis plan. FS and SGH has written the first draft of this manuscript and all authors have critically read the text and contributed with inputs and revisions, and all authors read and approved the final manuscript.

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Data availability

Data will be made available by email upon request.Data availability: The data that support the findings of this study are available from Solmaz Ghanbari-Homaie but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Declarations

Ethics approval and consent to participate

All methods were carried out following the Helsinki Declaration. The study has been approved by the Ethics Committee of Tabriz University of Medical Sciences, Tabriz, Iran (Code: IR.TBZMED.REC.1402.047). Written informed consent was obtained from all participants. Participation in the survey for pregnant women was voluntary, and they were assured of the confidentiality of the collected information.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Obrochta CA, Chambers C, Bandoli G. Psychological distress in pregnancy and postpartum. Women Birth. 2020;33(6):583–91.
2. Edition F. Diagnostic and statistical manual of mental disorders. Am Psychiatric Assoc. 2013;21(21):591–643.
3. Alshikh Ahmad H, Alkhatib A, Luo J. Prevalence and risk factors of postpartum depression in the middle East: a systematic review and meta–analysis. BMC Pregnancy Childbirth. 2021;21:1–12.
4. Ghanbari-Homaie S, et al. Prevalence of postpartum depression and its relationship with birth experience among adolescent mothers: a cross-sectional study. Payesh (Health Monitor). 2024;23(2):199–208.
5. Ayoub K, Shaheen A, Hajat S. Postpartum depression in the Arab region: A systematic literature review. Clin Pract Epidemiol Mental Health: CP EMH. 2020;16(Suppl–1):142.
6. Almeida M, et al. The association between labor epidural analgesia and postpartum depression: a systematic review and meta-analysis. BMC Womens Health. 2020;20:1–7.

7. Ashagrie HE, Fentie DY, Kassahun HG. A review Article on epidural analgesia for labor pain management: A systematic review. Int J Surg Open. 2020;24:100–4.
8. Wong CA. Advances in labor analgesia. Int J women's health, 2010: pp. 139–54.
9. Czech I, et al. Pharmacological and non-pharmacological methods of labour pain relief—establishment of effectiveness and comparison. Int J Environ Res Public Health. 2018;15(12):2792.
10. El Khsim F. Risk factors for post-traumatic stress disorder after childbirth: a systematic review. Diagnostics. 2022;12(11):2598.
11. Ghanbari-Homayi S, et al. Predictors of traumatic birth experience among a group of Iranian Primipara women: a cross sectional study. BMC Pregnancy Childbirth. 2019;19:1–9.
12. Mo J, et al. Association between perinatal pain and postpartum depression: a systematic review and meta-analysis. J Affect Disord. 2022;312:92–9.
13. Mathur VA, Morris T, McNamara K. Cultural conceptions of Women's labor pain and labor pain management: A mixed-method analysis. Volume 261. Social Science & Medicine; 2020. p. 113240.
14. Fan ZT, Gao XL, Yang HX. Popularizing labor analgesia in China. Int J Gynecol Obstet. 2007;98(3):205–7.
15. Orange FAd, et al. Combined spinal-epidural anesthesia and non-pharmacological methods of pain relief during normal childbirth and maternal satisfaction: a randomized clinical trial. Volume 58. Revista da Associação Médica Brasileira; 2012. pp. 112–7.
16. Zuarez-Easton S, et al. Pharmacologic and nonpharmacologic options for pain relief during labor: an expert review. Am J Obstet Gynecol. 2023;228(5):S1246–59.
17. Logtenberg SL, et al. Pharmacological pain relief and fear of childbirth in low risk women; secondary analysis of the RAVEL study. BMC Pregnancy Childbirth. 2018;18:1–9.
18. Show KL, et al. Fentanyl for labour pain management: a scoping review. BMC Pregnancy Childbirth. 2022;22(1):846.
19. Lavand'homme P, Roelants F. Patient-controlled intravenous analgesia as an alternative to epidural analgesia during labor: questioning the use of the short-acting opioid remifentanil. Survey in the French part of Belgium (Wallonia and Brussels). Acta Anaesthesiologica Belgica. 2009;60(2):75–82.
20. Babenco H, Conard P, Gross J. The pharmacodynamic effect of a remifentanil bolus on ventilatory control. Anesthesiology. PHILADELPHIA: LIPPINCOTT WILLIAMS & WILKINS 227 EAST WASHINGTON SQ; 1998. PA 19106 USA.
21. Glass PS, et al. Preliminary pharmacokinetics and pharmacodynamics of an ultra-short-acting opioid: remifentanil (GI87084B). Anesth Analgesia. 1993;77(5):1031–40.
22. Zhi M, et al. Sufentanil versus Fentanyl for pain relief in labor involving combined spinal-epidural analgesia: a systematic review and meta-analysis of randomized controlled trials. Eur J Clin Pharmacol. 2020;76:501–6.
23. Lu L, Shen Y. Postpartum pain and the risk of postpartum depression: A meta-analysis of observational studies. J Obstet Gynecol Res. 2024;50(3):358–65.
24. Ahmadi kani Golzar A, GoliZadeh Z. Validation of Edinburgh postpartum depression scale (EPDS) for screening postpartum depression in Iran. Iran J Psychiatric Nurs. 2015;3(3):1–10.
25. Dencker A, et al. Childbirth experience questionnaire (CEQ): development and evaluation of a multidimensional instrument. BMC Pregnancy Childbirth. 2010;10:1–8.
26. Ghanbari-Homayi S, et al. Validation of the Iranian version of the childbirth experience questionnaire 2.0. BMC Pregnancy Childbirth. 2019;19:1–10.
27. Ding T, et al. Epidural labor analgesia is associated with a decreased risk of postpartum depression: a prospective cohort study. Anesth Analgesia. 2014;119(2):383–92.
28. Lim G, et al. Obstetric pain correlates with postpartum depression symptoms: a pilot prospective observational study. BMC Pregnancy Childbirth. 2020;20:1–14.
29. Dousti R, et al. Cesarean section can be related with postpartum depression: A Cross-sectional study. Volume 10. International Journal of Women's Health & Reproduction Sciences; 2022. 4.
30. Masroor P, et al. The comparison of the effect of non-pharmacological pain relief and Pharmacological analgesia with remifentanil on fear of childbirth and postpartum depression: a randomized controlled clinical trial. BMC Pregnancy Childbirth. 2024;24(1):305.
31. Ghanbari-Homaie S et al. Association between epidural analgesia and postpartum psychiatric disorders: A meta-analysis. Heliyon, 2024. 10(6).
32. Murray H, Hodgkinson P, Hughes D. Remifentanil patient-controlled intravenous analgesia during labour: a retrospective observational study of 10 years' experience. Int J Obstet Anesth. 2019;39:29–34.
33. Ghanbari-Homaie S, et al. Correlations between primiparous women's perceived internal control, external control, support and their birth experience. Int J Childbirth. 2022;12(3):131–8.
34. Mäkelä K, et al. Satisfaction and dissatisfaction with pain relief and birth experience among induced and spontaneous-onset labours ending in vaginal birth: A prospective cohort study. Eur J Obstet Gynecol Reproductive Biology: X. 2023;18:100185.
35. Urbanová E, Škodová Z, Bašková M. The association between birth satisfaction and the risk of postpartum depression. Int J Environ Res Public Health. 2021;18(19):10458.
36. Nakić Radoš S, et al. The relationship between birth satisfaction, post-traumatic stress disorder and postnatal depression symptoms in Croatian women. Stress Health. 2022;38(3):500–8.
37. Bell AF, Andersson E. The birth experience and women's postnatal depression: A systematic review. Midwifery. 2016;39:112–23.

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