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Pain beliefs, cognitive flexibility, and birth preferences in primigravida

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Research Article

Keywords: Pregnancy, Patient Preferences, Cognitive Flexibility, Pain

Posted Date: March 18th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9040118/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

The aim of our study is to investigate the relationship between pain beliefs and preference for the method of childbirth. In addition, the relationship between pain beliefs in pregnant women with cognitive flexibility, depression, and anxiety has been investigated as a secondary purpose.

Metods:

This study was conducted in the Department of Obstetrics and Gynecology at a tertiary healthcare facility in southern Türkiye, with a total of 222 women experiencing their first pregnancy (2021). This is a single-center descriptive cross-sectional study with an analytical component. Statistical procedures were performed using SPSS Version 22 and IBM SPSS AMOS Version 22. Results were considered statistically significant if the p-value was ≤ 0.05.

Results

It was observed that pregnant women who prefer cesarean section have higher organic pain beliefs ($p = 0.029$). The CFI-Control is associated with both BDI (β=-0.154, 95% CI:-0.285;-0.024,$p = 0.021$) and STAI-T (β = 0.258, 95% CI:-0.372;-0.131, $p < 0.001$) results negatively and significantly. In addition, BDI significantly is associated with PBQ-Organic positively (β = 0.153, 95% CI: 0.029; 0.271, $p = 0.015$). While the total effect of CFI-C on PBQ-Organic was significant (β =-0.143, 95% CI:-0.267;0.015, $p = 0.026$), its direct effect was not significant (β=-0.122, 95% CI:-0.247;0.006, $p = 0.064$). Our results demonstrate the mediating effect of BDI on the impact of CFI-C on PBQ-O (β=-0.021, 95% CI:-0.058;-0.002, $p = 0.025$). As negative pain beliefs increase in pregnant women, the preference for cesarean section also increases.

Conclusions

Our findings suggest that higher cognitive flexibility, together with lower depressive symptoms and more adaptive pain beliefs, is associated with a lower preference for cesarean section.

Background

The rising global prevalence of elective cesarean sections (C-sections) without medical necessity has become a significant public health concern, despite robust evidence supporting vaginal delivery for maternal and neonatal health [1, 2]. Elective cesarean delivery performed at maternal request was demonstrated a significant association with elevated risks of venous thromboembolism, myocardial infarction, sepsis, disseminated intravascular coagulation, maternal mortality, and prolonged hospitalization duration [3]. However, the rate of elective C-sections, fear of birth pain, perceived safety

risks, and loss of control during birth are affected by non-clinical factors. Women who opt for elective C-sections often report higher levels of prenatal anxiety and depression compared to those who choose vaginal delivery [4, 5, 6]. The cognitive factor is crucial to how women experience labor. This means the meaning attached to pain during labor and the expectations concerning this pain. It determines their coping behavior and the extent to which they can successfully adapt to labor pain. Pain beliefs— defined as cognitive and emotional evaluations of pain—play a critical role in shaping childbirth preferences. Pain beliefs are particularly influential in driving the preference for C-sections, as they reflect concerns about the uncontrollability and potential harm of labor pain [6, 7]. Cognitive flexibility—the ability to adapt thoughts and behaviors to changing environmental demands—has emerged as a key psychological factor in perinatal care. Higher cognitive flexibility is associated with an increased likelihood of vaginal delivery, as it enables women to reframe labor pain as a manageable and natural process. Additionally, cognitive flexibility serves as a protective factor against perinatal mood disorders, reducing the severity of anxiety and depression [8, 9].

Study rationale

Despite these findings, the mechanisms through which cognitive flexibility influences pain beliefs and childbirth preferences remain underexplored. This study aims to address this gap by examining the relationship between pain beliefs (organic and psychological) and birth mode preference in primigravida women. Furthermore, it investigates the mediating roles of anxiety and depression in the relationship between cognitive flexibility and pain beliefs. By elucidating these psychological pathways, this research seeks to inform targeted interventions that promote vaginal delivery and improve maternal and neonatal outcomes.

Methods

Study design, aim and setting

Alanya Alaaddin Keykubat University Clinical Research Ethics Committee reviewed and approved this study in accordance with the Declaration of the Helsinki Committee. Informed consent was signed by all patients included in this study before the procedure. Ethical approval number and date 10354421-2021/03–10 dated 10 February 2021. Patients who chose not to sign informed consent were not included in our database. This study was conducted with a total of 222 primigravida pregnant women who applied to the Gynecology and Obstetrics Clinic of Alanya Training and Research Hospital, a tertiary healthcare institution located in Alanya district of Antalya province in southern Türkiye, between February 2021 and June 2021 and agreed to participate in the study. The aim of our study is to investigate the relationship between pain beliefs and preference for the method of childbirth. In addition, the relationship between pain beliefs in pregnant women with cognitive flexibility, depression, and anxiety has been investigated as a secondary purpose. This was a single-center descriptive cross-sectional study with an analytical component.

Measures

Beck Depression Inventory (BDI):

The BDI is a widely used 21-item self-report tool designed to assess the severity of depressive symptoms. Each item is scored on a 4-point Likert scale, with total scores ranging from 0 to 63. Higher scores indicate more severe depressive symptoms [10].

State-Trait Anxiety Inventory-Trait (STAI-T):

The STAI-T is a 20-item Likert-scale instrument that measures chronic anxiety. Items are rated on a 4-point scale, with total scores ranging from 20 to 80. Higher scores indicate greater levels of trait anxiety [11].

Pain Beliefs Questionnaire (PBQ):

The PBQ is a 12-item scale designed to assess beliefs about the causes and consequences of pain. It comprises two subscales. Organic Pain Beliefs (PBQ-O); 8 items evaluating perceptions of pain as physiologically threatening. Psychological Pain Beliefs (PBQ-P): 4 items assessing emotional influences on pain. Higher scores on the PBQ-O subscale reflect stronger beliefs that pain is caused by physical harm or physiological dysfunction, while higher scores on the PBQ-P subscale indicate greater emphasis on psychological factors influencing pain [12].

Cognitive Flexibility Inventory (CFI):

The CFI is a 20-item scale designed to measure cognitive flexibility, defined as the ability to generate alternative solutions and adapt to challenging situations. It comprises two subscales: Control (CFI-C): Measures the tendency to perceive challenging situations as manageable. Alternatives (CFI-A): Assesses the capacity to generate multiple solutions to problems. Higher scores on the CFI indicate greater cognitive flexibility [13].

Statistical Analysis

Normal distribution was tested by examining the kurtosis and skewness values and graphical methods. Results within the ± 2 range for kurtosis and skewness values were interpreted as normally distributed. The relationship between measurement results was calculated using Pearson correlation coefficients. The relationship between the variables BDI STAI-T, CFI-C, CFI-A, PBQ-O, and PBQ-P and birth preferences was examined with the one-way MANOVA test. As the independent variable consisted of two groups, no post-hoc analysis was required. The path analysis model for the relationship between our measurement results was established using theoretical literature knowledge, preliminary investigations, and our study hypotheses. The model was recalculated through the elimination of statistically insignificant paths. The

Maximum Likelihood (ML) estimation method was used for the model. The goodness of fit for the model was assessed using Chi-square/df, Comparative Fit Index (CFI), Goodness Fit Index (GFI) Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). ≤2.0 for X2/DF; ≥0.95 for CFI, GFI and TLI; RMSEA, ≤ 0.05 was accepted as ideal [14]. Effects were considered significant ($p < 0.05$) if the upper and lower limits of the 95% bias-corrected confidence interval did not contain "0". Statistical applications were conducted using SPSS Version 22 and IBM SPSS AMOS Version 22

Results

The mean age of the pregnant women was 26.40 ± 3.48. The mean gestation period was determined as 28.97 ± 8.37 weeks. 157 (70.7%) of the participants expressed a preference for natural childbirth, while 65 (29.3%) stated that they preferred cesarean section for delivery. While 81 (36.5%) of the participants had university and higher education levels, 65 (29.3%) were working in a job. All measurement results have shown normal distribution (The results of Skewness and Kurtosis values are between ± 2). PBQ-O showed a positive and significant correlation with both BDI ($p = 0.025$) and STAI-T ($p = 0.017$). It was observed that higher organic beliefs about pain indicated higher depressive symptoms and anxiety levels. Moreover, a negative and significant relationship was found between PBQ-O and CFI-C scale scores ($p = 0.011$). CFI-C also had a negative and significant relationship with BDI ($p = 0.011$) and STAI-T ($p < 0.001$). A higher tendency to control cognitive flexibility was associated with lower depressive symptoms and anxiety levels (Table 2). One-way MANOVA was conducted to determine whether there is a difference between women who prefer cesarean section and natural childbirth on PBQ-O and PBQ-P test scores. Before MANOVA, necessary assumptions were reviewed. A moderate correlation was detected between the dependent variable. (Table 1). The result of Box's test showed that the assumption of the homogeneity of variances was not violated (Box's M = 39,083,p = 0,111). Levene's test results revealed that the variances were distributed homogeneously ($p > 0.05$).

Table 1
Correlation matrix and univariate analysis of the results of the tests

	Mean ± SD (Min-Max)	STAI	CFI-A	CFI-C	PBQ-O	PBQ-P	AGE	Skew	Kurt
BDI	**6.26 ± 3.09 (0–14)**	**0.219****	**-0.051**	**-0.170***	**0.151***	**-0.050**	**0,095**	**0.349**	**-0.285**
STAI-T	47.53 ± 5.25 (35–63)	-	-0.018	**-0.258****	**0.161***	-0.011	0-,064	0.423	0.282
CFI-A	52.71 ± 7.21 (24–65)		-	**0.236****	0.067	0.078	0,074	-0.886	1.812
CFI-C	24.76 ± 5.11 (11–35)			-	**-0.169***	-0.085	0,080	-0.057	-0.299
PBQ-O	3.53 ± 0.76 (1.38–5.58)				-	**0.317****	-0,024	-0.021	-0.426
PBQ-P	4.63 ± 1.03 (1.25-6)					-	-0,002	-0.596	-0.254
AGE	28,58 ± 4,51(20–39)						-	0,335	-0,418

*: $p < 0.05$, ** $p < 0.01$. BDI: Beck Depression Inventory, STAI-T: State-Trait Anxiety Inventory-Trait, PBQ-O : The Pain Beliefs Questionnaire-Organic, PBQ-P: The Pain Beliefs Questionnaire-Psychological, CFI-C: The Cognitive Flexibility Inventory-Control,, CFI-A: The Cognitive Flexibility Inventory-Alternatives, Skew: Skewness, Kurt: Kurtosis.

Table 2
One Way Manova Results for Birth Preference

	Childbirth preference							
	Vaginal	**Cesarean**					**95% CI Differ[b]**	
DV	**Mean ± SD (Min-Max)**	**Mean ± SD (Min-Max)**	**MD**	***F***	***p***	η^2	**LB**	**UB**
PBQ-O	27,79 ± 5,72 (11–41)	29,74 ± 6,81 (14–43)	-1,949	4,756	**0,030**	0,021	**-3,710**	**-0,188**
PBQ-P	18,59 ± 4,19 (5–24)	18,31 ± 4 (8–24)	0,285	0,218	0,641	0,001	-0,918	1,488
CFI-A	52,59 ± 7,53 (24–65)	53 ± 6,43 (28–65)	-0,408	0,146	0,702	0,001	-2,508	1,693
CFI-C	24,72 ± 5,13 (11–35)	25,85 ± 5,10 (14–35)	-0,126	0,028	0,867	< 0,001	-1,616	1,363
BDI	6,21 ± 3,10 (0–14)	6,34 ± 3,09 (1–13)	-0,128	0,079	0,779	< 0,001	-1,029	0,772
STAI-T	47,50 ± 4,85 (35–63)	47,58 ± 6,16 (35–63)	-0,081	0,011	0,917	< 0,001	-1,612	1,449
AGE	27,80 ± 4,26 (20–39)	30,46 ± 4,56 (21–39)	-2,665	17,255	**< 0,001**	0,073	**-3,930**	**-1,401**

DV: Dependent Variable, b. Adjustment for multiple comparisons: Bonferroni. BDI:Beck Depression Inventory, STAI-T: State-Trait Anxiety Inventory-Trait, PBQ-O : The Pain Beliefs Questionnaire-Organic, PBQ-P: The Pain Beliefs Questionnaire-Psychological, CFI-C: The Cognitive Flexibility Inventory-Control,, CFI-A: The Cognitive Flexibility Inventory-Alternatives, MD: Mean Difference, η^2: Partial eta square, 95% CI Differ: 95% Confidence Interval Difference, LB: Lower Bound ,UB: Upper Bound,

*** p < 0.001, *p < 0.05. BDI: Beck Depression Inventory, STAI-T: State-Trait Anxiety Inventory-Trait, PBQ-O : The Pain Beliefs Questionnaire-Organic, PBQ-P: The Pain Beliefs Questionnaire-Psychological, CFI-C: The Cognitive Flexibility Inventory-Control, The direct effect of CFI-C on PBQ-O

Insert Table 1 **here.**

Insert Table 2 **here.**

The multivariate analysis revealed a significant effect of birth preference on the combined dependent variables, Wilks' Lambda = 0.896, F(7, 214) = 3.551, p < 0.001, partial η2 = 0.104. Pregnant women who prefer cesarean delivery had significantly higher PBQ-O average scores than those who prefer normal birth, F(1,220) = 4.756, p = 0.030, partial η2 = 0.021. In addition, the age of the group who preferred cesarean delivery was significantly higher, F(1,220) = 17.255, p < 0.001, partial η2 = 0.073. In the BDI (p = 0,779), STAI-T(p = 0,917), CFI-C (p = 0,867), CFI-A (p = 0,702) and PBQ-P (p = 0,641) test scores, there was no difference between those who preferred cesarean delivery and those who preferred normal birth. (Table 2). Path analysis was conducted based on theoretical assumptions and preliminary statistical results. The effectiveness of CFI-C on BDI, STAI-T, and PBQ-O was examined in the path analysis. In addition, the impact of BDI and STAI-T on PBQ-O was examined. Finally, whether BDI and STAI-T played a mediating role in the potential effect of CFI-C on PBQ-O was tested. Non-significant paths were sequentially removed from the model, and the goodness of fit indices of the final model were examined. The final model has demonstrated good model fit results. $\chi 2/df = 1.305$; p = 0.265; CFI = 0.98; GFI = 0.99; TLI = 0.95; RMSEA = 0.037. The CFI-C is associated with both BDI (β=-0.154, %95 CI:-0.285; -0.024, p = 0.021) and STAI (β =-0.258, %95 CI:-0.372; -0.131, p < 0.001) results negatively and significantly. In addition, BDI significantly is associated with PBQ-O positively (β = 0.153, 95% CI:0.029;0.271, p = 0.015). While the total effect of CFI-C on PBQ-O was significant (β=-0.143, 95% CI:- 0.267; -0.015, p = 0.026), its direct effect was not significant (β = -0.126, 95% CI: -0.247; 0.006, p = 0.064). Our results demonstrate the mediating effect of BDI on the impact of CFI-C on PBQ-O (β=-0.021, 95% CI: -0.058; -0.002, p = 0.025) (Fig. 1).

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Discussion

The findings of this study provide valuable insights into the psychological factors influencing childbirth preferences among primigravida women. Women who preferred elective C-sections demonstrated significantly stronger organic pain beliefs (PBQ-O), aligning with fear-avoidance models that link pain catastrophizing to delivery avoidance. This result is consistent with previous studies showing the relationship between pain and cesarean delivery preference [15, 16]. In addition, the average age in the cesarean delivery preference group was found higher similar to previous studies [17].

Cognitive flexibility emerged as a psychological factor associated with lower levels of depressive symptoms and anxiety, which in turn mediated lower organic pain beliefs. Higher cognitive flexibility was associated with reduced depressive symptoms and anxiety, suggesting that adaptability mitigates emotional distress that exacerbates pain perceptions. This finding aligns with previous research demonstrating the role of cognitive flexibility in chronic pain management [18]. Women with higher cognitive flexibility may be better equipped to reframe labor pain as a manageable and natural process, thereby reducing fear and avoidance behaviors.

Organic pain beliefs (PBQ-O) disproportionately influenced delivery mode preference compared to psychological beliefs (PBQ-P). This may reflect misconceptions about the safety and controllability of

vaginal delivery, as well as cultural or societal narratives emphasizing the risks of labor pain Women with higher organic pain beliefs, may perceive C-section as a safer and more is associated with option, despite evidence supporting the benefits of vaginal delivery. The mediating effect of depressive symptoms on the relationship between cognitive flexibility and organic pain beliefs highlights the interconnectedness of psychological factors in childbirth decision-making. Depression may amplify negative pain perceptions, while cognitive flexibility serves as a resilience factor, reducing emotional distress and promoting adaptive coping strategies [19].

Clinical Implications

Integrating assessments of pain beliefs, cognitive flexibility, and mood disorders into routine prenatal care could help identify women at risk for elective C-section requests. Early identification of maladaptive pain beliefs and low cognitive flexibility may enable targeted interventions to promote vaginal delivery. Cognitive-behavioral therapy (CBT) and mindfulness-based interventions targeting pain reappraisal and cognitive flexibility may reduce unnecessary surgical births. These interventions are effective in other patient groups [20]. For example, psychoeducation programs could address misconceptions about labor pain and emphasize the benefits of vaginal delivery for maternal and neonatal health. Healthcare providers should adopt a patient-centered approach, addressing women's fears and concerns about childbirth while providing evidence-based information. Open communication and shared decision-making may help align childbirth preferences with clinical guidelines.

Limitations and Future Directions

Due to the cross-sectional design of the study, the temporal relationships between cognitive flexibility, depression, anxiety, and pain beliefs remain speculative. Given the cross-sectional nature of the study, the observed mediation should be interpreted as a statistical rather than temporal mechanism, and longitudinal designs are required to confirm directionality. Longitudinal studies tracking these variables across trimesters and postpartum periods are needed to establish causal pathways. Selection Bias; excluded populations, such as women with severe anxiety or psychiatric disorders, may limit the generalizability of findings. Future studies should include diverse samples to capture a broader range of psychological experiences. The study was conducted in a single hospital in Türkiye, which may limit the applicability of findings to other cultural or healthcare contexts. Cross-cultural studies are needed to explore how societal norms and healthcare systems influence childbirth preferences. While validated scales were used, self-report measures may be subject to response bias. Future research could incorporate objective measures, such as physiological markers of stress or pain, to complement self-reported data.

Conclusion

This study highlights the critical role of cognitive flexibility, depression, and pain beliefs in shaping childbirth preferences among primigravida women. Higher organic pain is associated with Csection preference, while cognitive flexibility indirectly mitigates negative pain perceptions through depression

reduction. Integrating psychological interventions into prenatal care— such as CBT, mindfulness, and patient-centered education—could align childbirth choices with evidence-based obstetric guidelines. Future research should explore longitudinal and cross-cultural perspectives to further elucidate these relationships.

Declarations

CONFLICT OF INTEREST STATEMENT

The author declare that they have no conflict of interest with regard to the present work.

Ethical approval

for the study was obtained from the Alanya Alaaddin Keykubat University Clinical Research Ethics Committee with approval number 10354421-2021/03–10 dated February 10, 2021.

CONFLICT OF INTEREST STATEMENT

The author declare that they have no conflict of interest with regard to the present work.

FINANCIAL DISCLOSURE

No financial support was received for this article.

Author Contribution

V.D.. (0000-0002-8628-2760), T.K. (0000-0002-0313-558X), R.E.D. (0000-0003-0299-3133), K.K (0000-0001-6354-0969) All authors contributed to the manuscript conception, design, literature search, writing, critical review and final approval.

Data Availability

The data supporting the findings of this study are not publicly available due to ethical and privacy restrictions. However, they may be provided by the corresponding author upon reasonable request and with approval from the institutional ethics board.

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Figures

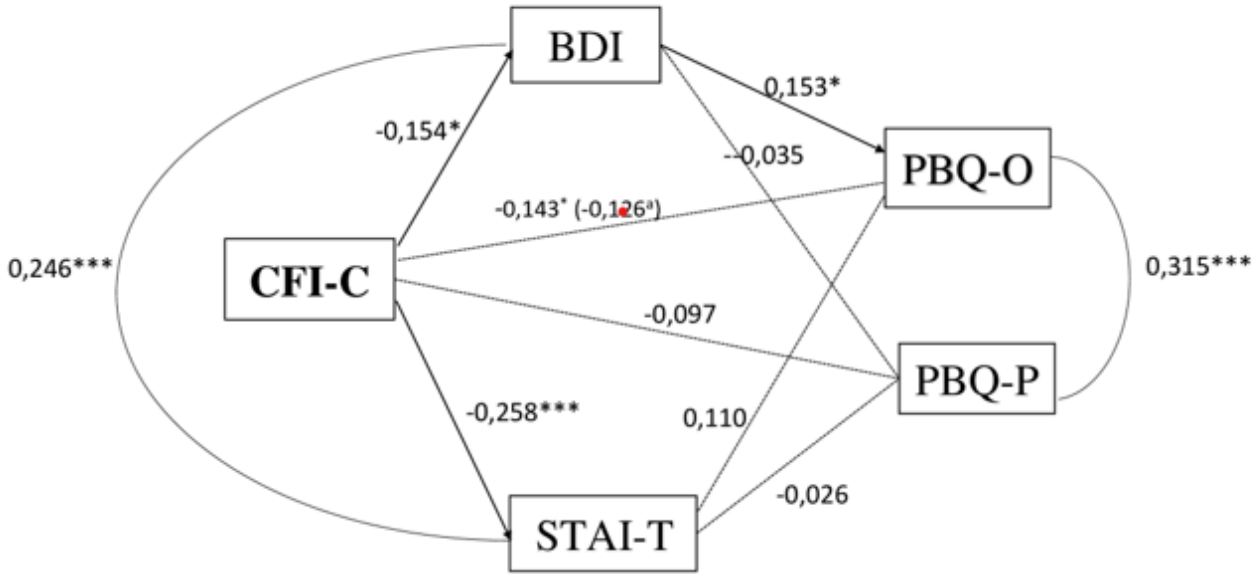


Figure 1

Cognitive Flexibility and Pain Beliefs Path Analysis Model

*** p< 0.001, *p<0.05. BDI: Beck Depression Inventory, STAI-T: State-Trait Anxiety Inventory-Trait, PBQ-O : The Pain Beliefs Questionnaire-Organic, PBQ-P: The Pain Beliefs Questionnaire-Psychological, CFI-C: The Cognitive Flexibility Inventory-Control, The direct effect of CFI-C on PBQ-O