

# Prevalence of Cognitive Impairments in Postpartum Period among Young Adult Females

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## Abstract

This study aims to determine the prevalence of cognitive impairments in postpartum period among young adult female's. Pregnancy and postpartum period are the most crucial phases of women's life. During and after pregnancy, a women's body undergoes numerous changes such as physical, physiological, emotional, social, hormonal and psychological, this changes may contribute to some negative impacts on women's neuro-psychological state, due to which they may experience a range of emotions, from joy and fulfilment to anxiety, forgetfulness, sadness, often referred to as the "Mommy Brain" phenomenon. A cross-sectional study was carried out. The study sample included 50 females' in early post-partum phase and 50 females' in late post-partum phase, they were selected based on the inclusion and exclusion criteria. Convenient sampling was done. Ethical approval was taken prior to the study. Memory and cognitive functions was assessed using Everyday Memory Questionnaire-Revised (EMQ-R), and Mini-Mental Status Examination Scale (MMSE), we also assessed post-partum quality of life using Maternal Postpartum Quality of Life-Instrument (MPQOL). Appropriate statistical tests were used to analyse the data. Mean, SD, coefficient of correlation and percentage distribution of cognitive impairment were tested. Results of the study showed significant difference between two groups. On MMSE, subjects in the late postpartum phase performed better as compared to the subjects in early postpartum phase, on EMQ-R subjects in the early postpartum phase experienced higher levels of memory impairments. On MPQOL, the late postpartum group had a higher mean score on the MPQOL (Maternal Postpartum Quality of Life) compared to the early postpartum group. This implies that women in the late postpartum phase reported a better quality of life related to maternal aspects compared to those in the early postpartum phase. Accordingly, it was determined that a significant portion of postpartum women's experience some level of cognitive impairment, though the severity varies.

**Keywords:** Cognitive impairment, Postpartum period, Memory, Quality of Life.

## Introduction

One of the most vulnerable times in a woman's life is during pregnancy and the postpartum phase, when she experiences many hormonal, psychological, and physiological changes. There has been much research on short-term cognitive impairment, also known as "pregnancy/baby brain," which manifests as increased

forgetfulness, a short attention span, and disorientation. Due to the fact that up to 80% of pregnant women report experiencing subjective indicators of cognitive deficits, the phenomenon known as “baby brain” is common.<sup>[1, 2]</sup>

Pregnant women frequently complain of cognitive issues like forgetfulness, and concentration problems. Higher-order cognitive activities, such as executive functions which include working memory, planning and dual-tasking and multi-tasking are the ones that are most frequently reported to deteriorate.<sup>[3]</sup> The postpartum phase, commencing immediately after childbirth and extending approximately six months, marks a period of profound physiological and emotional shifts. This crucial but often overlooked stage in the lives of mothers and infants is emphasized by the World Health Organization. Robust correlations exist between childbirth and mental health issues, with various biological, psychosocial, and interpersonal factors implicated in the development of postpartum psychiatric disorders.<sup>[4]</sup>

Biological factors that contribute to the development of psychiatric disorders in the postpartum period include genetic predisposition, endocrine and biochemical imbalances, and disruptions in sleep patterns. Endocrine elements implicated in these disorders encompass dysregulation of the hypothalamic-pituitary-gonadal axis, fluctuations in cortisol and thyroid hormone levels, and their effects. Following childbirth, there's a notable rise in prolactin levels and a sudden decline in estrogen levels in the initial days, impacting dopamine transmission and triggering mood changes.

Women going through challenges in their spousal or partner relationships are more likely to face mental health issues during the perinatal period. Specifically, those with partners who are unsupportive, uninvolved, or prone to conflicts or alcohol misuse are at a higher risk of postpartum psychiatric problems. Postpartum psychiatric disorders jeopardize the well-being of both the mother and the infant, and they have been linked to lasting impacts on the child's development and behavior.<sup>[5, 6]</sup>

### **COGNITION:**

Cognition refers to an all-encompassing term that encompasses various higher mental functions, including attention, memory, language, orientation, executive function, judgment, and problem-solving. Women in the postpartum period may exhibit diminished intentional learning and semantic memory retrieval capabilities. Changes in the hormonal levels, including estrogen, progesterone, and glucocorticoids can further impact cognitive function during this time.<sup>[7]</sup>

### **MEMORY:**

Memory has the ability to encode, store and recall information. Memories give an organism the capability to learn and adapt from previous experiences as well as build relationships. Encoding allows a perceived item of use or interest to be converted into a construct that can be stored within the brain and recalled later from long-term memory. Working memory stores information for immediate use or manipulation, which is aided through hooking onto previously archived items already present in the long-term memory of an individual. Encoding is the process of transforming a perceived item of value or interest into a construct that can be stored in the brain and retrieved later from long-term memory. Working memory, on the other hand, temporarily holds information for immediate use or manipulation, benefiting from connections to previously stored items in an individual's long-term memory. For example, failing to attend a crucial meeting may result in a missed work promotion, neglecting medication can lead to severe health issues, and overlooking to turn off the gas can potentially cause fires.<sup>[8, 9]</sup>

One study discovered changes in the right hippocampus activation among postpartum women. While inco-

clusive, there's an indication that the medial temporal lobe, including the hippocampus, might play a role in reflexive and automatic retrieval, particularly with specific PM cues resembling cognitive processes during ongoing tasks. Factors such as increased cognitive demands, depressive symptoms, and sleep disturbances have been linked to negative impacts on prospective memory. On the contrary, exposure to estrogen has been suggested to positively influence prospective memory. Postpartum women may face heightened vulnerability to prospective memory dysfunction due to juggling additional demanding tasks. [10]

Understanding these neurobiological changes sheds light on the profound transformation mothers undergo to nurture and care for their offspring. While much of this research has been conducted in animal models, there is evidence suggesting similar adaptations in the human maternal brain, though the complexities are still being explored. The present study was undertaken to determine the prevalence of cognitive impairments and their relation with postpartum quality of life.

### **Methodology**

Type of study: Cross-sectional

Sampling technique: Convenience sampling

Sample size: 100

Study area: PMC

Population: Female's in postpartum period

Study duration: One-time study

Outcome measures: MMSE Scale, Everyday Memory Questionnaire, MPQOL Scale.

### **Inclusion Criteria:**

1. Female's under 18-35 were included.
2. Primiparous and multiparous both were included.
3. Deliveries through normal and C-section were included.

### **Exclusion Criteria:**

1. Subjects previously having any type of cognitive impairment were excluded.
2. Subjects having any type of medical condition that have found to impair thinking and memory function such as diabetes and hypertension were excluded
3. Subjects having any vision and hearing deficits were excluded.

### **PROCEDURE:**

A cross-sectional study was carried out from October 2023 to February 2024. Subjects were chosen based on inclusion and exclusion criteria. Groups were made as 50 women's in early post-partum period (up to 6 days postpartum) and 50 women's in late post-partum period (6 week-6 month). All the subjects gave written informed consent.

A semi-structured demographic profile proforma along with the scales and questionnaire were completed by both the groups. The study was conducted after obtaining approval of the institutional ethics committee and concerned authorities. Data analysis was done and interpretation were recorded.

**Statistical Analysis and Results:**

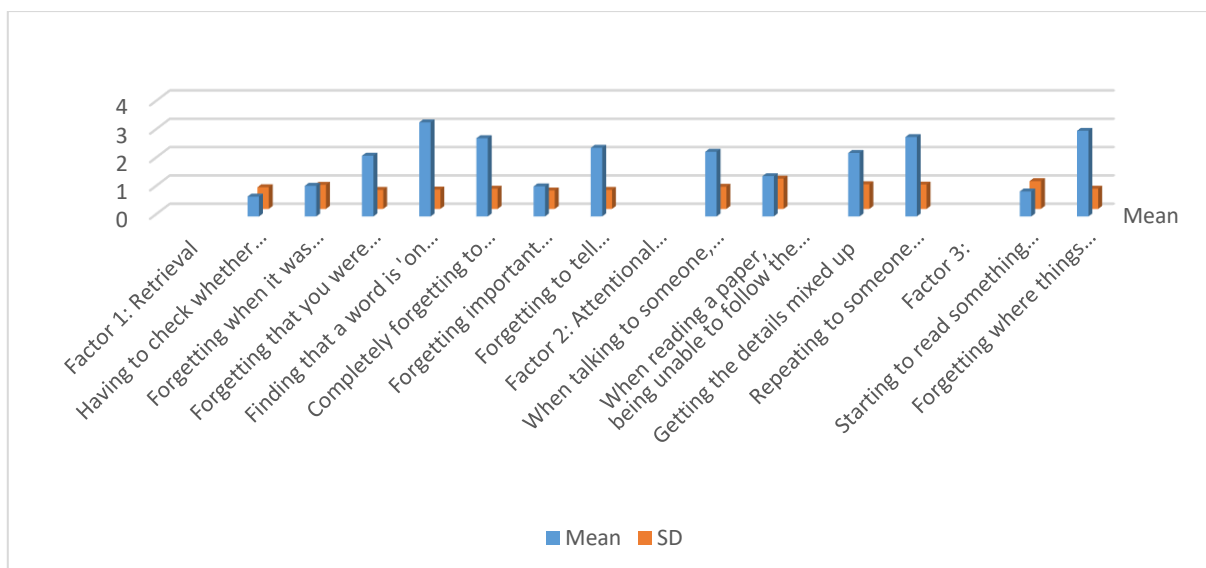
**Interpretation of EMQ-Revised scale- for early and late postpartum groups:**

**Table 1: Mean scores and factor loadings in the three-factor solution in EMQ-R for early postpartum group.**

Factor and abridged item	Mean	SD
<b>Factor 1: Retrieval</b>		
Having to check whether you have done something	0.7	0.763
Forgetting when it was that something happened	1.08	0.85
Forgetting that you were told something yesterday	2.14	0.67
Finding that a word is 'on the tip of your tongue'	3.32	0.683
Completely forgetting to do things you said you would	2.76	0.715
Forgetting important details of what you did	1.06	0.651
Forgetting to tell somebody something important	2.42	0.672
<b>Factor 2: Attentional Tracking</b>		
When talking to someone, forgetting what you just said	2.28	0.783
When reading a newspaper being unable to follow the story	1.42	1.071
Getting the details mixed up	2.24	0.87
Repeating to someone what you have just told them	2.8	0.86
<b>Factor 3:</b>		
Starting to read something you have read before	0.88	0.982
Forgetting where things are normally kept	3.02	0.713

The above data is pictured in the next graph.

**Figure1: Mean and standard deviation graph for early postpartum group in using EMQ three factor solution.**



**Interpretation:**

In this figure, each question wise responses in EMQ-Revised scale were recorded for early post-partum group.

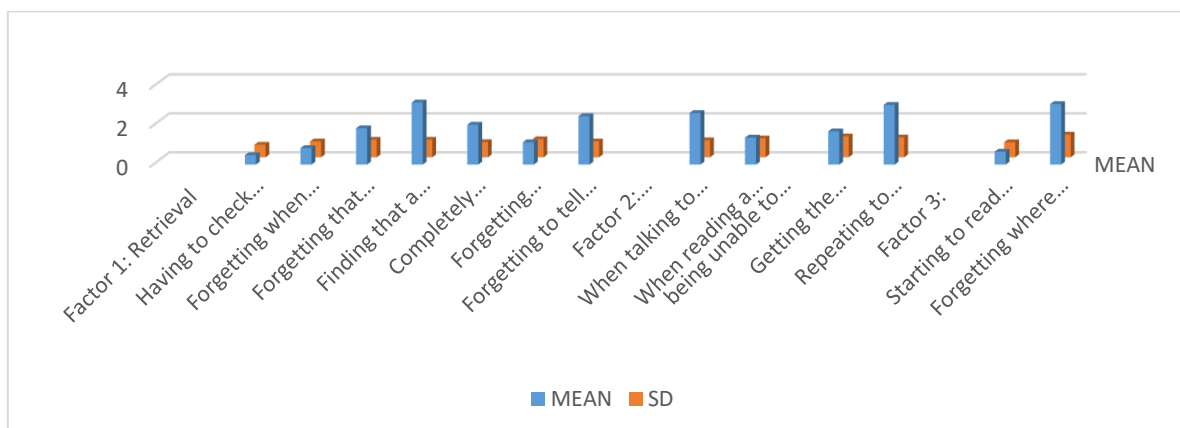
In this graph the highest mean were recorded for Q.No. 4 from Factor no.1 Retrieval (“Finding that the word is on the tip of your tongue”). as shown in table no.1.

**Table 2: Mean scores and factor loadings in the three-factor solution in EMQ-R for late postpartum group.**

Factor and abridged item	Mean	SD
<b>Factor 1: Retrieval</b>		
Having to check whether you have done something	0.48	0.646
Forgetting when it was that something happened	0.84	0.817
Forgetting that you were told something yesterday	1.86	0.903
Finding that a word is ‘on the tip of your tongue’	3.18	0.9
Completely forgetting to do things you said you would	2.04	0.781
Forgetting important details of what you did	1.14	0.926
Forgetting to tell somebody something important	2.48	0.814
<b>Factor 2: Attentional Tracking</b>		
When talking to someone, forgetting what you just said	2.64	0.875
When reading a newspaper being unable to follow the story	1.38	0.967
Getting the details mixed up	1.7	1.074
Repeating to someone what you have just told them	3.06	1.018
<b>Factor 3:</b>		
Starting to read something you have read before	0.66	0.772
Forgetting where things are normally kept	3.1	1.165

The above data is pictured in the next graph.

**Figure 2: Mean and standard deviation graph for late postpartum group in using EMQ three factor solution.**



**Interpretation:**

In this figure, each question wise responses in EMQ-Revised scale were recorded for latepost-partum group.

In this graph the highest mean were recorded for Q.No. 4 from Factor no.1 Retrieval (“Finding that the word is on the tip of your tongue”). as shown in table no.1.

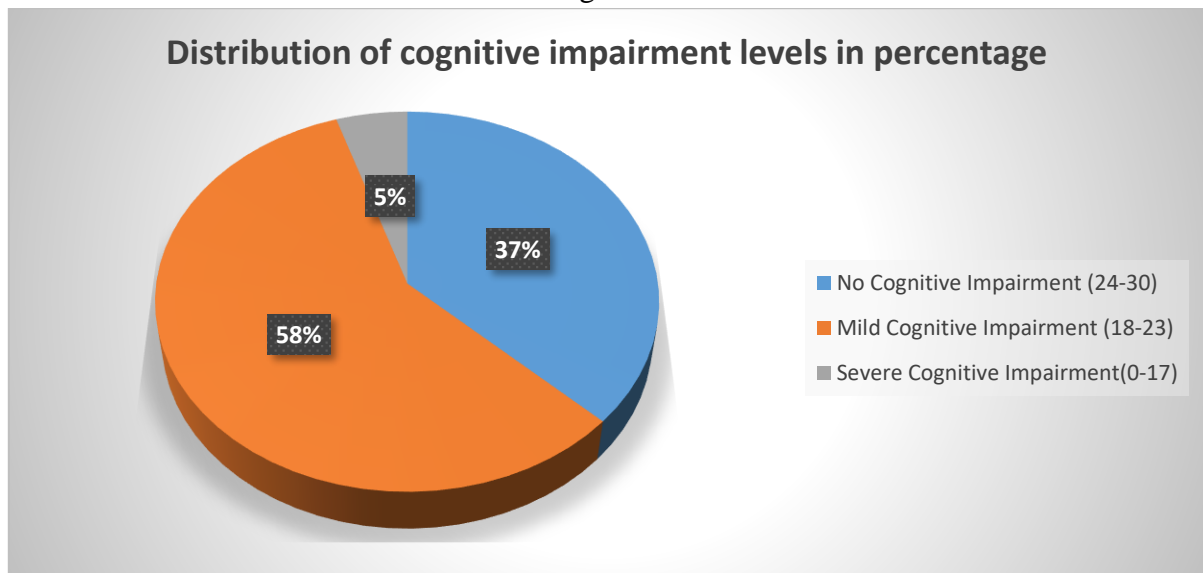
**Interpretation of MMSE Scale:**

Class	Total no. of subjects
No Cognitive Impairment (24-30)	37
Mild Cognitive Impairment (18-23)	58
Severe Cognitive Impairment(0-17)	5

**Table 3: Distribution of cognitive impairment level in female’s in their postpartum period.**

The above data is pictured in the next graph.

Figure 3



**Interpretation:**

The above graph shows that:

37% subjects have no cognitive impairment; 58% subjects have mild cognitive impairment while 5% subjects have severe cognitive impairment.

This suggests that the majority of cases fall into the category of Mild Cognitive Impairment, followed by No Cognitive Impairment. There are a smaller number of cases in the Severe Cognitive Impairment category.

**Interpretation of correlation between MMSE, EMQ-R AND MPQOL in early and late post-partum groups:**

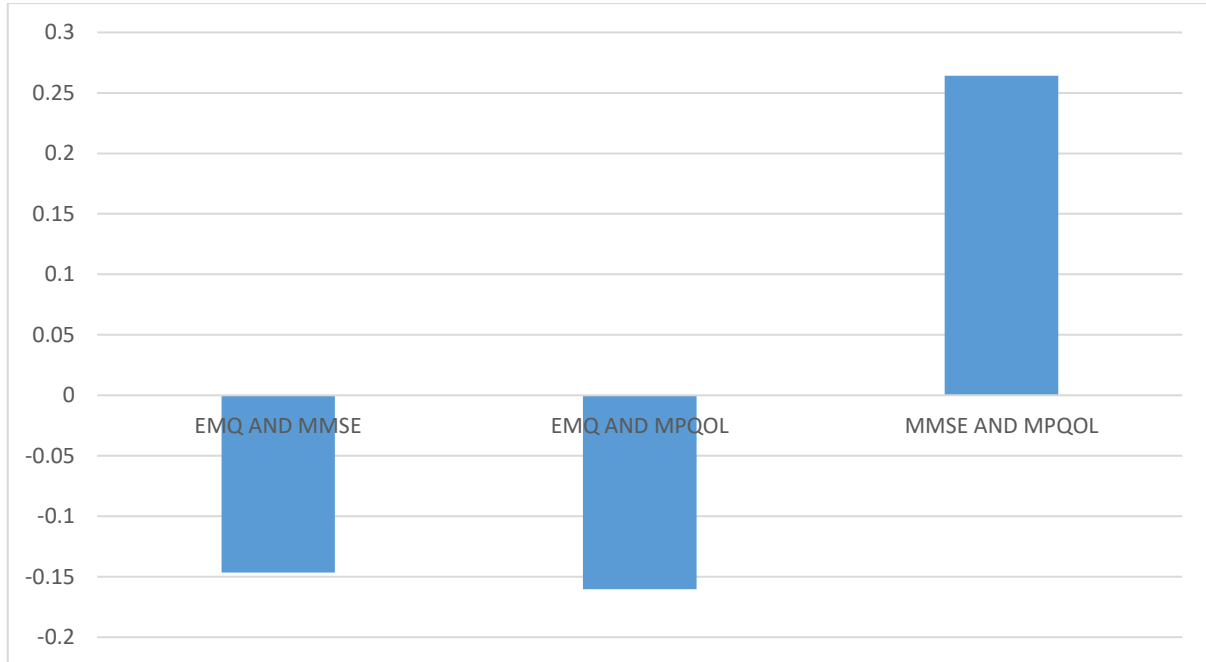
Table 4

Correlation between three tests	Coefficient of correlation(r)
EMQ-R AND MMSE	-0.146540764
EMQ-R AND MPQOL	-0.160284606

MMSE AND MPQOL	0.264138319
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The above data is pictured in the next graph.

**Figure 4: Correlation between three tests MMSE, MPQOL and EMQ-R**



**Interpretation:** The above figure suggests that:

The correlation between EMQ-R and MMSE indicates perfect negative association.

The correlation between EMQ-R and MPQOL indicates perfect negative association.

The correlation between MMSE and MPQOL indicates perfect positive correlation

In the early post-partum group, the average (mean) MMSE total score was  $21.1 \pm 3.183$ , contrasting significantly with the late post-partum group's average of  $23.28 \pm 2.87$  ( $p < 0.001$ ). The early post-partum group demonstrated a higher mean EMQ-R total score ( $26.12 \pm 3.021$ ) compared to the late post-partum group ( $24.56 \pm 5.94$ ,  $p < 0.001$ ). Furthermore, the late post-partum group exhibited a higher mean MPQOL total score ( $58.76 \pm 3.1$ ) than the early post-partum group ( $54.46 \pm 3.638$ ,  $p < 0.001$ ).

**Table 5: Comparison of results of MMSE, EMQ-R and MPQOL Tests.**

Test	Mean( $\pm$ SD) Score	p-Value
MMSE		
Early PP Group	$21.1 \pm 3.183$	<0.001
Late PP Group	$23.28 \pm 2.872$	
EMQ-R		
Early PP Group	$26.12 \pm 3.021$	<0.001
Late PP Group	$24.56 \pm 5.945$	
MPQOL		
Early PP Group	$54.46 \pm 3.638$	<0.001
Late PP Group	$58.76 \pm 3.1$	



## DISCUSSION

The period of pregnancy and postpartum is a most crucial time for women, in which there is marked physical, hormonal, psychological, and physiological changes, this changes can further impact women's mental and social health. The purpose of this study was to understand the extent and nature of cognitive changes experienced by women's in postpartum period.

Expecting mothers often express cognitive issues like forgetfulness and difficulty in concentrating, particularly in higher-order cognitive activities such as executive functions (Memory, attention, judgement, calculation etc.), which are frequently reported to decline. Women facing challenges in their spousal or partner relationships during the perinatal period are more susceptible to mental health issues. Specifically, those with unsupportive, uninvolved, conflict-prone, or alcohol-misusing partners face a higher risk of postpartum psychiatric problems. These disorders not only jeopardize the well-being of the mother but also have lasting impacts on the child's development and behavior. Moreover, hormonal changes, including fluctuations in estrogen, progesterone, and glucocorticoids, can further influence cognitive function during this phase.

Discussing postpartum cognitive impairments involves considering the multifaceted nature of this research. The observed alterations in cognitive functions among postpartum women, particularly in memory-related areas like the hippocampus, raise intriguing questions about the underlying mechanisms. However, the inconclusive findings emphasize the need for further investigation.

In 2016, a study entitled "Cognitive Dysfunction and Associated Behavior Problems in Postpartum Women: A Study from North India."<sup>1</sup> Their objective was to assess cognitive impairments and psychiatric issues in postpartum women and compare them with healthy non-pregnant women. The assessment of cognitive function involved the SMMSE scale, Brief Cognitive Rating Scale (BCRS), and Trail Making Test Part B (TMT-B). The results revealed that postpartum women exhibited lower scores on the SMMSE, BCRS, and TMT-B in comparison to non-pregnant women. The study's conclusion emphasized that women faced significantly more cognitive deficits during the postpartum period compared to their non-pregnant counterparts.

In 2021, study entitled "Working Memory from Pregnancy to Postpartum: Do Women Really Change?"<sup>2</sup> Their aim was to investigate shifts in working memory (WM) over the transition from pregnancy to postpartum in mothers. The study provided substantial evidence supporting the notion that, for the majority of mothers, cognitive capacities remain consistent from late pregnancy to early postpartum. However, it also suggested that a subgroup of mothers might experience a decline in cognitive function during the postpartum period.

The MMSE examination evaluates various cognitive aspects, including awareness of time and place, memory (both short and long term), registration, attention, recall, and retrieval functions. Other than MMSE the EMQ-R (Everyday Memory Questionnaire-Revised) were used to assess memory functions such as attention tracking and retrieval. It's noteworthy that in the present study the significant differences were noted:

**1. MMSE Scores:** The early postpartum group had a mean MMSE (Mini-Mental State Examination) score of 21.1, which was significantly lower than the late postpartum group's mean score of 23.28. This indicates that women in the late postpartum phase performed better on this cognitive assessment.

**2. EMQ-R Scores:** The early postpartum group had a higher mean score on the EMQ-R (Everyday Memory Questionnaire-Revised) compared to the late postpartum group. This suggests that women in the early postpartum phase experienced higher levels of memory impairments.



**3. MPQOL Scores:** Conversely, the late postpartum group had a higher mean score on the MPQOL (Maternal Postpartum Quality of Life) compared to the early postpartum group. This implies that women in the late postpartum phase reported a better quality of life related to maternal aspects compared to those in the early postpartum phase.

**4. Cognitive Impairment Distribution:** Across both groups, the distribution of cognitive impairment varied, with 37% of women showing no impairment, 58% displaying mild impairment, and 5% showing severe impairment. This suggests that a significant portion of postpartum women experience some level of cognitive impairment, though the severity varies.

Overall, these findings highlight the importance of understanding and addressing cognitive and emotional well-being during the postpartum period, with implications for healthcare interventions and support services for new mothers.

Additionally, attention tracking, concentration, retrieval, executive function, judgment, and calculation abilities were impaired in both early and late postpartum groups during the postpartum period.

## CONCLUSION

Pregnancy and postpartum are essential phases of women's life when their body undergoes different physical, physiological, hormonal and neuropsychological changes. These changes can affect their behavior toward child's care and development, and also have impact on their mental and social health. The present study concludes that, there is a prevalence of cognitive impairment. The distribution of cognitive impairment varies, with 37% showing no cognitive impairment, 58% having mild cognitive impairment, and 5% experiencing severe cognitive impairment in both early and late postpartum groups.

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