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The Relationship between Demographic Characteristics and Postpartum Cognitive Function in Mothers Referring to Health Centers

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ABSTRACT

The present study aims to determine the relationship between maternal characteristics during pregnancy and postpartum cognitive function in mothers referring to health centers in Khorramabad, Iran. This descriptive-cross-sectional study was conducted on 400 mothers attending their first postpartum visit to health centers in Khorramabad during 2022-23. Data were collected using a demographic form and Addenbrooke's Cognitive Examination, and analyzed using SPSS version 25 software. Descriptive statistics and the calculation of central and dispersion indices were utilized to describe the data and provide quantitative variables. In addition, frequency and percentage were applied for qualitative variables. Independent t-tests, one-way analysis of variance, Pearson correlation, and univariate and multivariate linear regression were employed to analyze the data and determine the relationship between the variables. Finally, P≤0.05 was regarded as the significance level of the tests. A relationship was found between the mother's occupation and education demographic variables with the total cognitive function score (P<0.01). The results revealed that demographic characteristics such as occupation and education level affect postpartum cognitive disorder.

Keywords: Pregnancy, Cognitive Function, Postpartum

Introduction

Cognitive function is defined by memory abilities, information learning processes, problem-solving, knowledge retention, and attention [1-3]. Cognitive disorder in pregnancy and childbirth indicates cognitive pathology, which usually appears as weakness in thinking ability, memory loss, difficulty in concentration, impaired problem solving, attention, and verbal learning during pregnancy and postpartum period. Apparently, hormonal changes in pregnancy, as well as the stresses and pressures, can lead to cognitive dysfunction in mothers [1, 4]. Women face high levels of anxiety and stress during pregnancy and postpartum, resulting in experiencing decreased memory and cognitive ability [5-7]. Few studies have been conducted on women's cognitive function during pregnancy and postpartum. In addition, nobody exactly knows the mechanisms involved and contributing factors [8]. Wilson argued that 60% of mothers exhibited alterations in their memory retention ability during the first trimester and 80.8% during the third trimester [9]. Based on some studies, 80% of mothers experience cognitive disorders during their pregnancy [10].

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A large number of factors contribute to cognitive disorder, the most significant of which include age, occupational and educational status, drug use, especially smoking, high blood pressure, diabetes, obesity, depression, and inappropriate lifestyle in general [11]. A relationship was observed between physiological changes during pregnancy, emotional issues, alterations in sleep patterns, educational status, labor pain, and its duration, and cognitive disorder [8]. Some claim that women experience a larger number of biological changes after childbirth, resulting in creating stress and increasing their vulnerability to cognitive function and depression. Based on the results, postpartum women experience more cognitive deficits than their non-pregnant counterparts [4].

Some others reported that older women (40 years or older) were at increased risk of pregnancy and childbirth-related complications [12, 13]. Others asserted that women aged 11–18 years were more likely to experience pregnancy complications than others [13].

Cognitive dysfunction affects the mother and infant negatively [14]. In addition, cognitive function affects individuals' social, family, and work responsibilities. Thus, any impairment in this function can negatively influence performance in daily life. In fact, cognitive dysfunction in women can lead to complications such as reduced verbal fluency at work and home, increased reliance on note-taking to organize work, frequent forgetting of various matters in life, including appointments, difficulties in understanding, and even inability to return to work due to severe memory problems [7].

Structural changes occur in the brain in response to interactions between endocrine glands and environmental factors during pregnancy and postpartum. Brain evolution leads to physiological, structural, and behavioral changes in mothers during pregnancy, maternal responsibility, and a greater mother-infant bond. However, these alterations can predispose mothers to postpartum mental disorders, adversely influencing the lives of the mother, partner, and infant. Therefore, appropriate solutions and effective programs should be planned to improve mothers' mental health and quality of life [15, 16].

Currently, postpartum screening of mothers for cognitive function is not routinely performed in the Ministry of Health care system. Given the existing research gaps, this study aims to determine the relationship between maternal characteristics during pregnancy and postpartum cognitive function in mothers referring to health centers in Khorramabad, Iran during 2022-23.

Materials and Methods

This descriptive-analytical study was performed on mothers referring to health centers in Khorramabad after giving birth during 2022-23.

Qiu et al. [8] reported a 26% prevalence of cognitive dysfunction. Based on this estimate, the sample size was calculated to be 296 mothers, considering a 95% confidence interval (a=0.05), a precision of 2%, and the following formula. The final size was increased to 444 postpartum mothers, given the design effect of 1.5 and the clustered sampling approach.

The sampling method employed in this study followed a multi-stage approach, incorporating both cluster and simple random sampling methods. First, a comprehensive list of all health centers in Khorramabad was compiled. Then, the city was geographically divided into four regions, from each of which five centers were selected through simple random sampling to accommodate the large sample size. In the next step, sampling commenced by attending the selected health centers in Khorramabad. In addition, the names of eligible mothers were selected by simple random sampling from the list of those referring to health treatment centers in Khorramabad in proportion to the population of women covered by each health center.

The researcher explained the study's objective after introducing herself to the mothers. The mothers willing to participate in the study were included based on the inclusion criteria (literacy, Iranian nationality, mothers with health records in the SIB system in health centers, and those giving birth within 10-14 days after delivery). The exclusion criteria were the loss of a first-degree relative within the past year, history of depression and other mental disorders in previous pregnancies based on the medical records and system information, visual or auditory impairment, history of head trauma, seizures, and stroke, as well as the use of psychiatric and antiepileptic medications. The cognitive disorders questionnaire was completed after confirming the mothers' eligibility and obtaining an informed consent form.

Cognitive function was measured by the Addenbrooke's Cognitive Examination (ACE), developed by Mathuranath et al. in 2000 to detect dementia in the early stages of development. The ACE plays a critical role in the differential diagnosis between types of dementia such as Alzheimer's disease (AD), frontotemporal dementia (FTD), progressive supranuclear palsy (PSP), and other Parkinsonian syndromes. Additionally, ACE is employed to diagnose cognitive disorders in brain-damaged patients and comprises five subtests, each examining a cognitive function. The maximum score of this test is 100, distributed across five cognitive domains, including attention/orientation (18 points), memory (26 points), language (26 points), verbal fluency (14 points), and visuospatial abilities (16 points). In addition, Pouretemad et al. investigated the validity and reliability of the Persian version of the ACE, confirming its suitability for the Iranian population. The alpha coefficient of Addenbrooke's Cognitive Examination-Revised (ACE-R) is 0.80, indicating an acceptable level of internal consistency. The Cronbach's alpha coefficient for the total subjects, as well as normal, MCI, and AD groups, was 0.84, 0.97, 0.88, and 0.93, respectively, indicating the high reliability of the test [17].

Data analysis

The data were entered into SPSS version 25 software. Descriptive statistics, as well as the calculation of central and dispersion indices, were used to describe the data and quantitative variables. Further, frequency and percentage were applied for qualitative variables. The normality of the data was measured utilizing the Kolmogorov-Smirnov test. Independent t-tests, one-way analysis of variance (ANOVA), Pearson correlation, and univariate and multivariate linear regression were applied, given the normality of the data distribution. Finally, $P \leq 0.05$ was considered as the significance level of the tests.

Ethical considerations

The ethical code (IR-lums-RER-1401-164) was obtained from Lorestan University of Medical Sciences. The informed consent form was completed, and the mothers' consent to participate in the study was obtained. The researcher strictly maintained the confidentiality of the data, which was exclusively utilized for statistical analysis.

Results

The sample size was 444 mothers, of whom 44 were excluded due to incomplete questionnaires. Based on the results, the mean age of mothers was 27.51 (6.79). Table 1 indicates the demographic characteristics of mothers referring to health centers in Khorramabad.

Table 1. The demographic characteristics of mothers referring to health centers in Khorramabad

	Variable	Number	Percentage
Education	Elementary and Secondary school	59	14.8
	High school Diploma	122	30.5
	University student/graduated	219	54.8
Occupation	Housewife	242	60.5
	Employed	158	39.5

Table 2 compares postpartum cognitive function and its subscales in mothers based on their education level. Based on the one-way ANOVA, a significant difference was reported between mothers in terms of the mean total score of cognitive function, attention and orientation, memory test, verbal fluency, language, visual-spatial test, and memory (P<0.01).

Table 3 shows the relationship between maternal occupation and postpartum cognitive function in mothers. As represented, a significant difference is identified between homemakers and employed mothers in terms of total scores of cognitive function, attention and orientation, memory test, verbal fluency, language, visual-spatial test, and memory (P≤0.001).

Table 2. The relationship between maternal education and postpartum cognitive function

Variable	Maternal education	Mean (SD)	P value*
Cognitive function	Elementary and Secondary school	85.57 (10.51)	≤0.001
	High school Diploma	90.03 (6.53)	
	University student/graduated	92.86 (6.12)	
Attention and orientation	Elementary and Secondary school	16.32 (1.65)	≤0.001
	High school Diploma	16.62 (1.74)	
	University student/graduated	17.14 (1.24)	
Memory test	Elementary and Secondary school	11.06 (1.86)	≤0.001
	High school Diploma	12.23 (1.35)	
	University student/graduated	12.96 (1.12)	
Verbal fluency	Elementary and Secondary school	9.10 (3.28)	≤0.015
	High school Diploma	9.93 (2.93)	
	University student/graduated	10.39 (3.11)	
Language	Elementary and Secondary school	24.25 (2.32)	≤0.001
	High school Diploma	25.04 (1.28)	
	University student/graduated	25.49 (0.93)	
Visuospatial test	Elementary and Secondary school	14.54 (2.14)	≤0.001
	High school Diploma	15.72 (0.53)	
	University student/graduated	15.73 (0.74)	
Memory	Elementary and Secondary school	10.28 (2.14)	≤0.001
	High school Diploma	10.47 (1.90)	
	University student/graduated	11.12 (1.41)	

Table 3. The relationship between maternal occupation and postpartum cognitive function

Variable	Maternal Occupation	Mean (SD)	P value*
Total cognitive function	Housewife	89.04 (8.06)	≤0.001
	Employed	93.81 (5.39)	
Attention and orientation	Housewife	16.63 (1.69)	≤0.001
	Employed	17.21 (1.10)	
Memory test	Housewife	12.11 (1.52)	≤0.001
	Employed	13.00 (1.22)	
Verbal fluency	Housewife	9.54 (3.13)	≤0.001
	Employed	10.48 (2.91)	
Language	Housewife	24.83 (1.63)	≤0.001
	Employed	25.69 (0.64)	
Visuospatial test	Housewife	15.40 (1.30)	≤0.001
	Employed	15.79 (0.66)	
Memory	Housewife	10.49 (1.93)	≤0.001
	Employed	11.27 (1.20)	

Table 4 presents the relationship between maternal age and postpartum cognitive function with its subscales in mothers. Based on the results, a significant difference was found between individuals less than or equal to 30 years and those over 30 years only regarding the mean verbal fluency score (P≤0.001). However, no significant difference was observed between the two age groups in terms of the mean total cognitive function, attention and orientation, memory test, language, visual-spatial test, and memory.

As indicated in Table 5, a significant relationship is reported only between maternal occupation and education and cognitive function (P≤0.05).

Discussion

The results indicated a relationship between maternal demographic characteristics and postpartum cognitive function. In addition, a correlation was found between maternal age and cognitive function in verbal fluency. The cognitive dysfunction in verbal fluency increased as the mother's age increased. However, no relationship was observed between the aforementioned factors. Further, a significant association was reported between the mother's education level and total score of cognitive function and its subscales (attention and orientation, memory test, verbal fluency, language, visuospatial test, and memory). Kassow et al. addressed cognitive disorder and its relevant factors among pregnant women referring for prenatal care services in Dilla University Referral and Teaching Hospital in 2022. They declared that tests of memory, information processing speed, and executive cognitive function, requiring rapid analysis, decline with age. Mothers aged 26 years and over are 1.23 times more likely to experience cognitive disorder [1].

Table 4. The relationship between maternal age and postpartum cognitive function

Variable	Maternal age	Mean (SD)	P value*
Cognitive function	<=30 years	91.44 (6.70)	≤0.052
	>30 years	89.61 (9.06)	
Attention and orientation	<=30 years	16.86 (1.47)	≤0.961
	>30 years	16.87 (1.59)	
Memory test	<=30 years	12.49 (1.46)	≤0.550
	>30 years	12.39 (1.53)	
Verbal fluency	<=30 years	10.37 (2.95)	≤0.001
	>30 years	9.27 (3.36)	
Language	<=30 years	25.25 (1.15)	≤0.135
	>30 years	24.97 (1.86)	
Visual-spatial test	<=30 years	15.61 (0.85)	≤0.197
	>30 years	15.41 (1.58)	
Memory	<=30 years	10.84 (1.70)	≤0.423
	>30 years	10.70 (1.77)	

Table 5. The multivariate regression results of pregnancy and childbirth risk factors associated with maternal cognitive function

Variable	coefficient B	Standard error	Standardized beta	t	P Value
Cognitive function	19.559	9.885		1.979	0.049
Age	-0.22	0.081	-0.20	-0.274	0.785
Occupation	2.277	0.641	0.149	3.553	<0.001
Education	1.637	0.472	0.160	3.469	0.001

R^2=0.525

Furthermore, Anggraini et al. found a relationship between maternal education level and mental disorders and revealed that mothers with higher levels of education cope with stressors effectively [18]. In another study, Khanam et al. reviewed the risk factors for depression during pregnancy and its impact on preterm birth in South Asia. They concluded that older and less educated pregnant mothers face a heightened risk of experiencing depression during pregnancy [19]. Similarly, Yarube et al. assessed the cognitive function among primiparous mothers and identified a significant difference between education and cognitive disorder. Primiparous mothers suffer from mild cognitive disorders related to their level of education [20]. Given the consistency of the results of the studies, the demographic characteristics affect the level of cognitive function. In addition, a significant relationship was found between maternal occupation and cognitive function. Based on the results of some studies, employed mothers experience a stressful period during pregnancy, working conditions are not appropriate for pregnant mothers, and most mothers suffer from few obstacles. Consequently, such circumstances affect the mental health of the minority of mothers exposed to occupational stress [21].

Conclusion

We have shown that demographic characteristics such as occupation and education level were associated postpartum cognitive function. Thus, cognitive function, along with prenatal and postpartum care, should be routinely evaluated for the mental health of pregnant mothers.

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Conflict of interests

The authors have no financial interest related to this article

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