



A Cross-sectional study on Metamemory in Primigravid Women of South Indian population

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Authors' contributions

This work was carried out in collaboration among all authors. Author AS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors GP and MK managed the analyses of the study. Author TH and BV managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Metamemory awareness refers to our feelings or experiences of our own memory. For example, if a person feels certain that he or she will remember later something just learned now, that person is having a metamemory experience. Metamemory is a subarea of metacognitions.

Aim: The aim is to assess metamemory in primigravid individuals.

Materials and methods: A study was conducted among 120 pregnant female of south Indian population. The participants were asked to complete a self-reported questionnaire on metamemory. It includes multifactorial memory questionnaire (MMQ), developed to assess separate dimensions of memory ratings that are applicable to clinical assessment and intervention, includes scales of Contentment, Ability, and Strategy.

Results: Association between corresponding subscale scores and gestational period indicates a

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weak correlation for satisfaction ($r = -.09$), ability ($r = -.12$) and strategy ($r = -.17$). In addition, the MMQ subscales and the total score showed good internal consistency ($\alpha = 0.81-0.89$). **Conclusion:** The results would conclude metamemory components were found to be generally poorer in pregnancy particularly less in third trimester. These impact in pregnant female on quality of life and everyday functioning requires further investigation.

Keywords: Metamemory; pregnancy; dementia; physical activity; hormones.

1. INTRODUCTION

Metamemory or Socratic awareness, a type of metacognition, is both the introspective knowledge of one's own memory capabilities and the processes involved in memory self-monitoring. This self-awareness of memory has important implications for how people learn and use memories. Metamemory includes two aspects: the knowledge about memory processes and their awareness [1-4]. Metamemory awareness rather corresponds to the monitoring and regulation of memory. Metamemory awareness develops late and incrementally yet has an important impact on cognitive performance and its components. Metamemory is not linked strongly to other cognitive factors such as intelligence and memory capacity. Rather, it develops as a function of experience, guided modeling and feedback, and individual and group reflection [5]. Metamemory research is a vibrant and growing area of study [6].

A recent study has found that as many as 50 percent to 80 percent of pregnant women report experiencing memory problems during pregnancy. However, reports of memory problems during pregnancy are likely more common than the presence of actual memory deficits [7]. During pregnancy and the postpartum periods, a considerable number of women experience some degree of cognitive change that has come to be colloquially called "pregnancy brain." The symptoms most frequently reported by women during these reproductive periods are forgetfulness and memory disturbances [8,9]. Pregnant women do experience a slight loss of memory -- and in many cases, the forgetfulness continues after birth. It is suspected that some additional factors for pregnant women's forgetfulness stems from hormone shifts and lifestyle changes [10]. Therefore it is important to evaluate the state of metamemory in pregnant female and the purpose of this study is to investigate and understand the relation and impact of metamemory in primigravid female.

2. MATERIALS AND METHODS

2.1 Study Setting and Design

This was a cross-sectional, descriptive correlational study. This standard questionnaire was done by 120 primigravid individuals who volunteered to participate in this study. A convenience sample of participants from 25 to 35 years old female individuals were recruited from OP, Saveetha Hospitals. The questionnaire was administered through face-to-face contact by the investigator with potential participants. Potential participants who expressed interest in the study were screened for eligibility based on the inclusion/exclusion criteria. Inclusion criteria were as follows: ages from 25 to 35; have a healthy primigravid pregnancy; ability to read, speak, and understand English. Participants with comorbidities like diabetes mellitus, hypertension and hyperlipidemia were excluded. Individuals with cognitive impairment (Alzheimer's disease), having experienced more than three prior miscarriages (to control for possible endocrine irregularities), current use of hormonal preparations, chronic medical or neurological disorders, psychiatric illness (e.g., major depressive disorder), current use of psychotropic medications, smoking or alcoholic, history of head injury that resulted in loss of consciousness, pregnancy complications (e.g., preeclampsia, cervical insufficiency), and thrombotic problems during late pregnancy or delivery. After the inclusion/exclusion criteria were applied, 120 participants have received paper copies of the study's survey instrument.

2.1.1 Procedure

2.1.1.1 Perceived memory

The multifactorial memory questionnaire is a standard metamemory questionnaire (MMQ) which helps to assess a Metamemory of a person. It consists of three scales measuring separate aspects of metamemory. Items are rated on a 5-point Likert scale (0 = strongly agree, 1 = agree, 2 = undecided, 3 = disagree, 4 =

strongly disagree) based on the test's takers experiences. The three MMQ scales and their respective metamemory domains include: MMQ-Satisfaction (formerly called MMQ-Contentment). This scale measures satisfaction, concern, and overall appraisal of one's own memory. Each of 18 statements is rated based on degree of agreement. The score range is 0 to 72, with higher scores indicating a higher degree of satisfaction. MMQ-Ability. This scale measures self-perception of everyday memory ability. Respondents rate how often they experienced each of 20 common memory mistakes over the previous two weeks. The score range is 0 to 80, with higher scores indicating better self-reported memory ability. MMQ-Strategy. This scale measures the use of practical memory strategies and aids in day-to-day life. Respondents rate how often they used each of 19 memory strategies over the previous two weeks. The score range is 0 to 76, with higher scores indicating greater use of memory strategies. Based on questionnaire data total score ranges are measured. Using a method formula; Prorated Score = Number of possible items X (Obtained score/ Number of completed items).

2.2 Data Analysis

Statistical analysis was done using SPSS Version 25.0. Descriptive variables were reported (Mean with standard deviation, Percentage) for all demographic variables. Pearson's correlation analysis was used to assess correlations between gestational age and the survey scores (Satisfaction, ability and strategy) and Cronbach's alpha was calculated to measure internal consistency among the individual scores [11]. The significance level was set at 0.05.

3. RESULTS

Among the 120 participants, the mean and SD for age, height & weight were calculated (Table 1). Mean and SD for gestational age and MMQ Subscale scores (Satisfaction, ability and strategy) are given in Table 2. Gestational age and BMI were correlated with MMQ subcomponents (Table 3). The internal consistency of subscale scores are measured by cronbach's alpha to check the reliability. There was a weak negative relationship between gestational age and MMQ subscales (Satisfaction, ability and strategy). This relationship suggests that in primigravid individuals, increasing gestational age is associated with decreased satisfaction and

strategy. Based on MMQ subcomponent scores the study participants were found to have more worries about their memory (MMQ-contentment), reported significantly more instances of forgetfulness (MMQ-ability), and use less memory aid strategies in their day-to-day activities (MMQ-strategy) (Table 2 & 3). Gestational age had a weak negative correlation with MMQ-contentment ($r = -.09$) or MMQ-ability ($r = -.12$) or MMQ-strategy ($r = .17$). In our evaluation with a sample of 120 individuals analyses using Cronbach's alpha indicated good internal consistency for the Satisfaction ($\alpha = .89$), Ability ($\alpha = .81$), and Strategy ($\alpha = .82$) scales (Table 3).

Table 1. Demographic characteristics of the participants

	Mean	SD	Range
Age (yrs)	33.51	8.2	24 - 40
Height (cms)	153.15	10.9	142 - 165
Weight (kgs)	84.14	11.3	65 - 95

Table 2. Summary statistics for gestational age and MMQ raw scores

Scale	Mean	SD	SEM
Gestational age (Weeks)	21.2	6.6	0.24
Satisfaction	46.14	5.5	2.1
Ability	39.23	9.4	1.4
Strategy	51.65	6.5	2.2

Table 3. Correlations between demographic characteristics and cognitive variables & internal consistency of MMQ subscales

Scale	Gestational age	Cronbach's α
Satisfaction	$r = -.09$.89
Ability	$r = -.12$.81
Strategy	$r = -.17$.82

4. DISCUSSION

The present study has revealed that increase in gestational age showed a negative correlation on all the metacognitive components particularly the metamemory scores found to be significantly lower in third trimester of primigravid women. Simply, the study has reported that primigravid women had more worries about their memory, more forgetful-ness, and more use of strategies to ameliorate memory difficulties during third trimester compared to first trimester. Majority of women believe their memory to be impaired during pregnancy. Objectively, during pregnancy

there is significant loss of memory as tested by recall or by priming, but not by recognition [12]. As shown in the rat experiments, the neural plasticity associated with pregnancy and the postpartum period may result in long-lasting advantages in some cognitive domains [13,14]. Cognitive changes during pregnancy and the postpartum period may also be related to gestational and postpartum neuronal plasticity. In female rats, spine density in the CA1 region of the hippocampal formation was significantly higher during late pregnancy and lactation compared with nulliparous female rats [15]. Future research could investigate alternatives to actual cognitive impairment in order to explain the observed performance deficits.

5. CONCLUSION

The study would help the pregnant individuals to identify any early stage of cognitive impairment and create an awareness to delay or prevent any further metacognitive dysfunction during third trimester. It is recommended that future research adopt a longitudinal design to clarify the progression of these cognitive differences during pregnancy, and to establish their impact on the day-to-day cognitive functioning of pregnant women. Regular physical activity and exercise would benefit both cognition and motor behaviours.

6. LIMITATIONS

Physical activity of each pregnant women was not evaluated. Future research is needed to investigate relationships between these metacognition variables, objective neuropsychological tests, and functional MRI imaging.

CONSENT AND ETHICAL CONSIDERATION

The study proposal was approved by the board of the Saveetha medical college and hospitals (IRB No. SMC/IEC/2020/03/030). The purpose and objective of the study was clearly explained to the participants through an information sheet. It was emphasized that their participation was optional and the confidentiality of data was assured. The participants were requested to sign a consent form attached with the questionnaire, to ensure their willingness to participate in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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