Impact of maternal stress on outcome of new born

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ABSTRACT

Background: Maternal stress which may include emotional, social, health and economy may have impact on newborn. Risks factors predisposing to maternal stress are preventable by taking appropriate measures at right time and hence may have a better outcome of newborn. Maternal risk factors such as stress and depression have been associated with preterm birth and low birth weight. Relatively few studies have been made on impact prenatal maternal stress on neonatal outcome till date. The aim of our study is to assess the impact of maternal stress on fetal outcome.

Methods: This study is an observational clinical study, undertaken in Kempegowda Institute of Medical Sciences hospital, Bangalore, Karnataka, between April 2017 to September 2017. Perceived stress scale(PSS) was used to assess the stress levels of mothers.

Results: The association of moderate stress with low birth weight and preterm gestational age was statistically significant (p value <0.001). The amount of stress in relation to maternal age was highest in 20 to30 years (81.5%) of age group. Primigravida were found to have a statistically significant association with maternal stress (p value-0.022). Higher stress levels were observed in lower middle socioeconomic status which was statistically significant (p value-0.050).

Conclusions: More than 50% of the pregnant women in our setting were exposed to stress. In stressed pregnant mothers, low birth weight and preterm deliveries were the outcome. Lower socioeconomic status was associated significantly with stress. All pregnant mothers should be counselled to consume nutritious diet to deliver a normal healthy baby.

Keywords: Maternal stress, Maternal outcomes, Perinatal outcomes

INTRODUCTION

Maternal stress is exposure of an expectant mother to stress, which can be caused by stressful life events or by environmental hardships. The prenatal period is a crucial time for neurodevelopment of fetus. Prenatal period is a vulnerable during which a range of exposures will exert long term changes on brain development. It is very important to manage the stress level of a pregnant mother. Since ancient time it believed that emotional stress of mother affect outcome of new born. Maternal stress during pregnancy can have both immediate and long-term effects on her offspring.

Maternal stress is associated with increased rates of infant mortality, low birth weight and preterm birth all of which may have long term consequences for health and development throughout childhood to adult hood.

Emotional environment has been found generating perinatal morbidity. More attention has been paid on
mortality rather than morbidity. Strong evidence, however, is being got that certain actions that are inefficient to reduce maternal and perinatal mortality do have significant influence on morbidity, the burden of which is the highest in developing countries.\textsuperscript{2-4}

There are no direct neural pathways between the mother and foetus, so scientists have looked for more indirect pathways to understand how mothers level of stress impact her baby. One possible mechanism is through stress hormones (cortisol and adrenaline). When we are stressed, a series of chemical changes is set off in our body and brain, such as release of cortisol and adrenaline. Normally these chemicals help prepare us for danger and are important for survival. However, if stressed, these stress related hormones can remain high for too long and have effect on our bodies. Stress hormones in the mother’s body do reach the baby. When the pregnant mother is stressed, the baby may be exposed to unhealthy levels of stress hormones, which can impact the development of babies.\textsuperscript{5-9}

Excessive response will result in distress, which is made of sensations meaning that a person perceives that he fails to mobilize personal and/or social resources needed for coping the situation.\textsuperscript{10}

Pregnancy is a complex and dynamic condition. Maternal psychological state changes produce a cascade of reactions, including changes in blood flow to the uterus and alterations to the intrauterine sensory environment experienced by the foetus. Placenta produces free radicals due to its content of transitional metals such as iron, pregnancy represents, mostly by the second trimester, a basic stress condition.\textsuperscript{11-13}

An additional insult (emotional or not) is expected to enhance stress mediators release that in turn is the basis for pluri-visceral damages, alteration of sub-decidual angiogenesis, materno-fetal transfer of stress substances and reduction in intrauterine blood flow.\textsuperscript{11,13-15}

This will lead to myometrial irritability and fetal inflammatory climate, the effects of which are accountable for in reportedly high frequencies of pregnancy loss, shortening of gestational age, prematurity, restriction of birth weight and neonatal intravascular haemorrhage.\textsuperscript{5,7,11,13,14,16-21}

Present study aimed to seek for magnitude of stress conditions among pregnant women in Kempegowda Institute of Medical Sciences hospital, Bangalore and potential influence of stress on both maternal and perinatal outcomes.

\textbf{METHODS}

This study was carried out in Kempegowda Institute of Medical Sciences hospital, Bengaluru which is one among the largest teaching hospital in this region. Descriptive and inferential statistical analysis has been carried out in the present study. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. The statistical software named SPSS 18.0 and R environment version 3.2.2 were used for the analysis of the data and Microsoft word and excel have been used to generate graphs, tables etc.

All third trimester pregnant women admitted for delivery in Kempegowda Institute of Medical Sciences hospital for during the period of April 2017 to September 2017. A total of 200 pregnant mothers were included in the study.

\textbf{Inclusion criteria}

Consenting women having given birth in our hospital.

\textbf{Exclusion criteria}

Multiple pregnancy, non-consenting women, and those failing to answer some items in questionnaire.

\textbf{Study procedure}

The study sample consisted of mother-infant pairs registered in the sites of the study. Stress scores were established using perceived stress scale (PSS) 22.

PSS was based on quantification of 10 items through a questionnaire to be filled once (within one week after delivery) for every significant life event experienced not only during the last month (as originally recommended) but since the start of pregnancy.

Each event was quoted from 0 to 4 according to recurrence of reminding that reflects the stress intensity. The final score ranges from 0 to 40, General characteristics studied were: age (years), marital status, parity, gravidity, gestational age at confinement (in weeks derived from the last menstrual period, the earliest ultrasound and neonatal age according to pediatrician assessment).

\textbf{Perceived stress scale}

For each question choose from the following alternatives (0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often):

- In the last month, how often have you been upset because of something that happened unexpectedly?
- In the last month, how often have you felt that you were unable to control the important things in your life?
- In the last month, how often have you felt nervous and stressed?
- In the last month, how often have you felt confident about your ability to handle your personal problems?
• In the last month, how often have you felt that things were going your way?
• In the last month, how often have you found that you could not cope with all the things that you had to do?
• In the last month, how often have you been able to control irritations in your life?
• In the last month, how often have you felt that you were on top of things?
• In the last month, how often have you been angered because of things that happened that were outside of your control?
• In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

**Figuring your PSS score**

- Scores ranging from 0-13 would be considered low stress.
- Scores ranging from 14-26 would be considered moderate stress.
- Scores ranging from 27-40 would be considered high perceived stress

**RESULTS**

Descriptive and inferential statistical analysis has been carried out in the present study. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

The statistical software named SPSS 18.0 and R environment ver3.2.2 were used for the analysis of the data and Microsoft word and excel have been used to generate graphs, tables etc.

| Stress | No. of patients | % |
|--------|-----------------|---|
| Low    | 88              | 44.0 |
| Moderate | 110            | 55.0 |
| High   | 2               | 1.0  |
| Total  | 200             | 100.0 |

**Table 2: Correlation of Birth weight and gestational age with stress.**

| Variables | Stress | Low (n=88) | Moderate (n=110) | High (n=2) | Total (n=200) |
|-----------|--------|------------|------------------|------------|---------------|
| Birth Weight (kg) |        |            |                  |            |               |
| <2500     |        | 0(0%)      | 52(47.3%)        | 0(0%)      | 52(26%)       |
| 2500-3500 |        | 79(89.8%)  | 58(52.7%)        | 2(100%)    | 139(69.5%)    |
| >3500     |        | 9(10.2%)   | 0(0%)            | 0(0%)      | 9(4.5%)       |
| Gestation age (weeks) |        |            |                  |            |               |
| <37       |        | 6(6.8%)    | 38(34.5%)        | 0(0%)      | 44(22%)       |
| ≥37       |        | 82(93.2%)  | 72(65.5%)        | 2(100%)    | 156(78%)      |

**Table 3: Maternal age in years in correlation with stress.**

| Maternal age | Stress | Low | Moderate | High | Total (n=200) |
|--------------|--------|-----|----------|------|---------------|
| <20          |        | 6(6.8%) | 10(9.1%) | 0(0%) | 16(8%)        |
| 20-30        |        | 69(78.4%) | 92(83.6%) | 2(100%) | 163(81.5%)    |
| 31-40        |        | 11(12.5%) | 7(6.4%)  | 0(0%)  | 18(9%)        |
| >40          |        | 2(2.3%)  | 1(0.9%)  | 0(0%)  | 3(1.5%)       |
| Total        |        | 88(100%) | 110(100%) | 2(100%) | 200(100%)     |
| Mean±SD      |        | 25.64±4.96 | 24.61±4.42 | 27.00±2.83 | 25.09±4.68    |

**Table 4: Gravida distribution in correlation with stress.**

| Gravida | Stress | Low | Moderate | High | Total (n=200) |
|---------|--------|-----|----------|------|---------------|
| 1       |        | 29(33%) | 54(49.1%) | 0(0%) | 83(41.5%)     |
| 2       |        | 37(42%) | 29(26.4%) | 1(50%) | 67(33.5%)     |
| 3       |        | 9(10.2%) | 18(16.4%) | 0(0%) | 27(13.5%)     |
| 4       |        | 8(9.1%)  | 6(5.5%)  | 1(50%) | 15(7.5%)      |
| 5       |        | 5(5.7%)  | 2(1.8%)  | 0(0%)  | 7(3.5%)       |
| 8       |        | 0(0%)    | 1(0.9%)  | 0(0%)  | 10(5.0%)      |
| Total   |        | 88(100%) | 110(100%) | 2(100%) | 200(100%)     |
In present study 200 pregnant mothers were enrolled out of which 44% had low stress, 55% moderate and 1% had documented high stress according to PSS assessment. Present study has sample aged (25.09±4.68). Majority of study sample were married (99.5%) and of lower class (91.5%). The association of moderate stress with low birth weight and preterm gestational age was statistically significant (p value <0.001). The amount of stress in relation to maternal age was highest in 20 to 30 years (81.5%) of age group followed by 31 to 40 years (9%).

Primigravida were found to have a statistically significant association with maternal stress (p value 0.022). Higher stress levels were observed in lower middle socioeconomic status women which was statistically significant (p value 0.050). Stress levels were high in hindu mothers compared to other religion (p value-0.007). However, in view of more Hindu patients (82%) and muslim patients (18%) being admitted to our hospital it can’t be commented on association between maternal stress and religion. No significant statistical correlation was found between maternal stress and mode delivery and sex of the baby. It was found that maternal stress had correlation with organic (gastritis and hypertension) and non-organic (insomnia) outcomes but no statistical significance has been found. Results of present study are consistent with suggested roles, supporting stress related pathways during pregnancy involving mother and off springs.

For those planning to promote maternal health, this finding helps in prevention of maternal adverse outcomes.

**DISCUSSION**

Pregnancy is supposed to be one of the happiest times of a women’s life, but for many women this is a time of confusion, fear, stress and even depression. The peak period for onset of stress occurs during child bearing years and its impact extends to the offspring’s of affected women as well as their family. Maternal stress being a cause of neonatal morbidity which leads to various sequelae and therefore it is essential to identify the risk factors in order to prevent poor outcome of the newborn.

In present study 200 pregnant mothers were included in present study. More than half of the pregnant women in our setting were exposed to stress. Low birth weight and preterm deliveries were associated with stress. Lower socioeconomic status was associated significantly with stress. Infant morbidity made of shorting of gestational age and restriction of birth weight makes maternal stress an additional factor to explain perinatal death. High stress conditions in present study were secondary to death of husband in second trimester. Medium level stress was due to low economic status and low educational status. Organic outcomes such as gastritis and hypertensive disorders and non-organic ones such as insomnia were significantly high among stressed women.

Dole et al mentioned medical co-morbidities to anxiety in its association to preterm and Teghethoff et al included hypertension and diabetes during pregnancy among major potential confounders to explain perinatal outcomes. Present study is one of those supporting stress related morbidity during pregnancy involving both newborn and mother. The results confirm findings of previous studies which report high incidence of morbidity in terms of shortening of gestational age, prematurity and restriction of birth weight due to effect of stress mediators on myometrial irritability and materno-fetal inflammatory climate.

Managing maternal stress is very crucial for a good neonatal outcome. Pregnant women need to be psychologically supported by her family and friends. Special focus should be given on controlling of stressful situations, prenatal care, regular light exercises, adequate rest, entertainment, her healthy eating habits and avoiding alcohol, tobacco, and drugs. Counselling by counsellor during regular antenatal check-ups regarding the mode of delivery, wellbeing of mother and foetus, significance of breast feeding would be helpful in reducing maternal stress. All pregnant mothers should be counselled for proper intake of nutritious diet for a better outcome of the newborn. Hence lower socioeconomic status should not be a risk factor for maternal stress.
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