Original Research Article

Significance of stress assessment: cross sectional study of 1000 pregnant women from India

Amrita Singh[1],*, Priyanka Shelkar[1], Kanishk Singh[2], Shailendra Anjankar[3]

[1]Dept. of Obstetrics and Gynecology, LMCH, Nagpur, Maharashtra, India
[2]Dept. of Ophthalmology, All India Institute of Medical Sciences, Nagpur, Maharashtra, India
[3]Dept. of Neurosurgery, Orange City Hospital, Nagpur, Maharashtra, India

A R T I C L E   I N F O

A B S T R A C T

Introduction: Maternal stress has been believed to have effect on the developing embryo and foetus in womb. Measuring and addressing stress is not yet part of structured antenatal protocols for pregnant women. The current study focuses on the association of perceived stress among pregnant women on maternal and foetal outcome.

Materials and Methods: This was an observational cross-sectional study on 1000 pregnant women done during the period Nov 2010 to Nov 2012 at Fernandez Hospital, Hyderabad, India. Associations between maternal stress by PSS score and mode of delivery, duration of labour, and foetal outcomes were assessed. Statistical tools like K-Smirnov test, Fishers exact and Kruksal Wallis test were used wherever appropriate.

Result: Participant mothers ranged in age from 18 to 42 years. 41.4% were postgraduate. 6.6%, 86.6%, 6.8% had preterm, term and post term deliveries respectively. 799, 102, 95 were average for gestational age babies, large for gestational age babies and small for gestational age babies respectively. PSS (Perceived Stress Scale) questionnaire mean score was 30.73 with standard deviation of 2.44. There was no statistical difference with different modes of deliveries and various neonatal outcomes with third trimester PPS stress score in this study.

Conclusion: Adequate counselling is essential to reduces the maternal stress at various stages of pregnancy and delivery. Assessment of stress should be an integral part of antenatal care.

1. Introduction

Womb is the first home of every individual. Maternal stress has been believed to have effect on the developing embryo and foetus in womb. Physiological and hormonal changes in pregnancy, along with pressure of household work and job add to the psychological stress of mothers. Last century has seen dramatic transformation in women's working pattern. It is no longer only home affairs, motherhood and spouse but now they have stepped out of their home, earning the livelihood themselves, had become independent, confident and excelling in all the fields as compared to their male counterparts. India has also witnessed the same change in socioeconomic pattern. Better education opportunities have opened up the doors for women to enter the work force. Employed pregnant women encounter many institutional and physical problems and their social roles are not usually considered, which leads to increased psychological stress and consequently affects the foetus.[1,2]

Perinatal depression and anxiety are common problems, often co-occurring, with combined rates of 16 per cent of women in the first year postpartum and 10 per cent in pregnancy.[3] There is little information on the magnitude of stress and its effects on outcomes of pregnancy in India. Measuring and addressing stress is not yet part of structured antenatal protocols. Pregnant women may even not discuss issues beyond their immediate antenatal care doctors and may not seek such information possibly leading

---

* Corresponding author.
E-mail address: singh.amrita686@gmail.com (A. Singh).

to an accumulation of stressors and stressful situations. Additionally, due to changing trend from joint family to small nuclear families, the natural de-stressing mechanism, sharing of thoughts and caring has suffered, leading to increasing stress in employed mothers in India.

The current study focuses on the magnitude of perceived stress among pregnant women in the third trimester of pregnancy and potential associations of stress with the mode of delivery, duration of labour, and foetal outcomes specifically neonatal morbidity and mortality.

2. Materials and Methods

This was an observational cross-sectional study of pregnant women, done as a part of post graduate dissertation at Fernandez Hospital, Hyderabad, India. The study covered pregnancies and deliveries during the period Nov 2010 to Nov 2012. Sample size calculated using $n=Z^2P(1-P)/d^2$, n is the sample size, Z is the statistic corresponding to level of confidence at 95%, P is expected prevalence and d is precision. 1000 patients were studied.

Pregnant women booked for antenatal care at Fernandez Hospital of gestational age 30-35 weeks with singleton foetus were included in the study. Woman who does not provide informed consent, unable to comprehend the question or those who did not submit the questionnaire were excluded from study. The PSS (Perceived Stress Scale)[4] questionnaire in local vernacular language were given to pregnant women at third trimester consultation visit after obtaining written informed consent. Outcome variables measured at time of delivery were Mode of Delivery (elective caesarean, emergency caesarean, assisted vaginal or normal vaginal delivery), duration of labour in hours, Foetal Outcomes – birth weight, preterm birth, APGAR score, NICU admission, hypoglycaemia, jaundice, congenital malformations, neonatal mortality and neonatal morbidity. The data collected and tabulated using Microsoft Excel software. The study protocol was approved by the Institutional Review Board of Fernandez Hospital, Hyderabad, India (EC Ref # IORG0004763). The study adhered to the tenets of the Declaration of Helsinki.

2.1. Statistical analysis

The Data collected was analysed for determining the prevalence of perceived maternal stress in the third trimester of pregnancy in the studied population, and determining the presence, direction and strength of associations between maternal stress and mode of delivery, duration of labour, and foetal outcomes. Categorical variables were compared using the K-Smirnov test or the Fishers exact test as appropriate and the means of continuous variables were compared using the Kruksal Wallis test or the Analysis of Variance (ANOVA) test. In the analysis, p value of < 0.05 was considered significant.

3. Results

Participant mothers ranged in age from 18 to 42 years (mean = 27). Most of them had booked themselves at around 7 and 8 weeks of gestation (34%). About half the sample was primigravidae (46.90%), and around 30% were primiparous. Only 1.5% had > 3 abortions.[Table 1] 34% (n = 344) were undergraduates and 41.4% (n = 414) were postgraduates. [Figure 1]
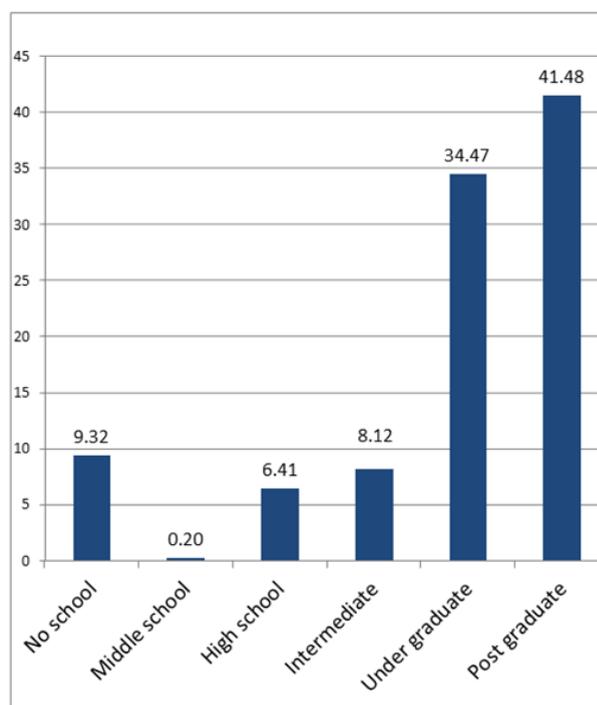

Fig. 1:

With respect to history of pregnancy complications, in previous pregnancies, the most common complication observed were hypothyroidism (9.90%), diabetes mellitus (4.70%) hypertension (1.40%). The most commonly reported medical conditions during the current pregnancy included anaemia (26.7%) (haemoglobin <11gm), diabetes mellitus (15.30%) hypothyroid (15.2%) hypertension (5.30%).

Labour Outcomes: 35% of women were induced due to various medical reasons. Of the total 1000 deliveries (65%) had spontaneous vaginal deliveries, (17%) had assisted vaginal deliveries, (7.5%) had elective caesarean sections and (9.5%) had emergency caesarean sections. (n = 66) 6.6% had preterm deliveries. (< 36 weeks). Duration of labour by quantiles and active phase of labour minutes by quantiles had p=0.5532 and p=0.54 respectively. 86.6% (n = 866) had term deliveries (from 37 weeks to 40 weeks). 6.8% (n = 68) had deliveries at 41 weeks. [Figure 2]
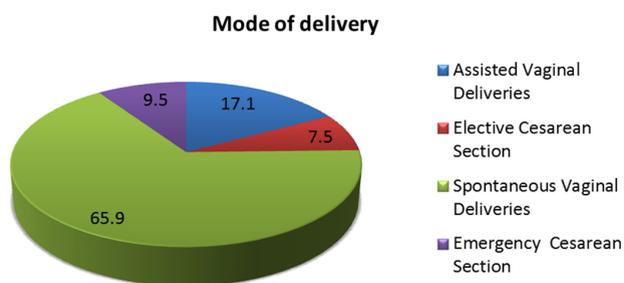
Mode of delivery

Fig. 2:

Neonatal Outcomes: 280 women (28%) delivered at 38 weeks, 66 (6.6%) had preterm deliveries. Out of these approximately 80% (n= 799) were average for gestational age babies, 10.2% (n= 102) were large for gestational age babies and 9.5% (n= 95) were small for gestational age babies. Mean birth weight in grams was 3024.50 grams and Mean APGAR at 5 minutes was 8 (p=0.30). 6% of children had congenital anomalies. 46% of babies had jaundice, 10.9% babies required NICU admissions. [Table 2]

3.1. Stress scores

Age and Educational status didn't affect the stress scores assessed by PSS (Perceived Stress Scale) questionnaire. Mean score was 30.73 with standard deviation of 2.44. Median score 31, range 18 to 41. Kruksal Wallis test p value for age was P = 0.34, and similarly for Education P value was 0.82. Also, none of the current and past medial co morbidities like anaemia, hypertension, diabetes and hypothyroidism had any effect on the total stress scores. PSS score was analysed by quantiles and divided in two categories, with total questionnaire score less than 75 centiles and score more than 75 centiles, to check its significance on maternal labour and foetal outcomes.

There was no statistical difference with different modes of deliveries with third trimester PPS stress score in this study, Fisher's Exact = 0.620. [Table 3] Similarly, we could not find any statistically significance between various neonatal outcomes like birth weight, NICU admission, hypoglycaemia, jaundice congenital malformations in babies after birth and even neonatal mortality with maternal third trimester PPS stress score. [Table 4]

4. Discussion

Prenatal maternal stress, measured in a variety of ways across the literature, is associated with adverse reproductive outcomes including labour and delivery complications, reductions in birth weight, decreases in gestation, postpartum depression, and difficult infant temperament.[5–9] However, our study did not find any significant association between various maternal and foetal

outcomes with the maternal stress in third trimester. This goes in concurrent with the study done by Hoffman and Hatch, wherein they found there was no association between depressive symptoms and foetal growth or duration of gestation.[10] Despite the fact the depression in pregnancy is more common than gestational diabetes; meagre efforts are taken to address this alarming pandemic.[11] There are millions of working pregnant women in India at a given time, but still there is only couple of article on this serious issue.[8,9]

In the present study, multidisciplinary team approach was adopted for all pregnancies complicated including those with co-morbidities to ensure their optimal control. When any complications were encountered during the course of antenatal care, not only the patient but her family as a whole was counselled at regular intervals which provided a wider base of social and emotional support to the affected woman, there by which the woman is able to handle the stress more effectively. Multidisciplinary approach for combating stress is important for better outcome. Like, the birthing issues are to be discussed with the patient and her family and a birth plan to be drafted on individual basis. Husbands are also encouraged to be present at the time of delivery. Trained midwives provide additional support at the time of labour and delivery. A good neonatal back up also helps in improving the neonatal outcome. Woman with growth affected babies were should be counselled by the neonatologist prior to delivery which helped them in understanding the disease and thus reduced their stress level so that they are prepared for the results. Provision of labour analgesia abolishes the anxiety and fear associated with labour pains which also contribute to lower stress level. This can explain probably the reason for no significant association between stress and neonatal outcomes in this study.

Study done by Li et al. found that depressive symptoms on birth outcomes were particularly pronounced in women with low educational attainment.[12] Majority of the woman enrolled in the present study were well-educated and also the fact the patient information leaflets were provided in local vernacular languages, helped to enhance the awareness regarding antenatal care, which in turn might have helped them to cope up better with the stress related to pregnancy and delivery. In a recent study, Wu et al. noticed high maternal psychological distress in healthy, well-educated, and employed pregnant women and was associated with impaired foetal brain biochemistry and hippocampal growth as well as accelerated cortical folding.[13] Glynn et al. found out that the majority of women who delivered at term had less stress and anxiety than those who delivered preterm.[14] Despite converging evidence from multiple studies, many questions remain to be answered regarding the impact of prenatal maternal distress on birth outcomes.

Table 1: Gravid, parity and abortion status of mothers in the study group

Gravida	1	2	3	4	5	6	7	Total
Number	469	281	143	76	21	8	2	1000
%	46.90	28.10	14.30	7.60	2.10	0.80	0.20	100
Parity	0	1	2	3	4	-	-	**Total**
Number	589	304	82	20	5	-	-	1000
%	58.90	30.40	8.20	2.00	0.50	-	-	100
Abortion	0	1	2	3	4	5	6	**Total**
Number	718	205	59	15	1	0	2	1000
%	71.80	20.50	5.90	1.50	0.10	0.00	0.20	100

Table 2: Neonatal categorization and foetal outcome percentage in the study

Neonatal categorization	Appropriate for Gestational Age	Large for Gestational Age	Small for Gestational Age	Total
Number	799	102	95	996
%	80.22	10.24	9.54	100
Foetal Outcomes	**NICU admissions**	**Hypoglycaemia**	**Polycythaemia**	**Jaundice**
Number	109	8	0	466
%	10.90	0.80	0	46.60

Table 3: Correlation of different modes of deliveries with third trimester PPS stress score

Mode of delivery	PSS score <75 centiles	PSS score >75 centiles	Statistical analysis
Spontaneous vaginal delivery	507	152	
Assisted vaginal delivery	132	39	
Elective Caesarean section	61	14	Fisher's Exact = 0.620
Emergency Caesarean section	69	26	
Total	769	231	

Table 4: Correlation of neonatal outcomes with maternal third trimester PPS stress score

Neonatal Categorization	PSS score <75 centiles	PSS score >75 centiles	Statistical analysis
Appropriate for Gestational Age	612	187	
Large for Gestational Age	76	26	Fisher's Exact = 0.410
Small for Gestational Age	78	17	
NICU Admission			
No	694	197	K-SMIRNOV test p = 0.35
Yes	75	34	
Hypoglycaemia			
No	764	228	K-SMIRNOV test p = 0.99
Yes	5	3	
Jaundice			
No	409	125	K-SMIRNOV test p = 1.00
Yes	360	106	
Congenital Malformation			
No	723	217	K-SMIRNOV test p = 1.00
Yes	46	14	
Neonatal Mortality			
No	765	230	K-SMIRNOV test p = 1.00
Yes	4	1	
Total	769	231	

One of the most pressing unresolved issues in the literature involves the nature of the stress pattern, what precisely is being measured across studies, and which aspects of the stress is important in predicting birth outcomes. Even till date less is known about the possible mechanisms that account for the effect of prenatal maternal distress on birth outcomes. Abnormal elevations in corticotrophin-releasing hormone (CRH), as a stressors response was proposed by Majzoub et al., which may prove to participate in the premature onset of parturition.[15] Whereas Kramer et al. found out that there is no association between CRH and stress in pregnancy.[16]

Many investigators postulated mechanisms by which the negative impact of prenatal maternal distress may be moderated. Wadhawa et al. highlight the need to identify which subgroups of mothers would be vulnerable to the potentially detrimental effects of maternal stress.[17] In this regard, maternal psychosocial resources such as social support from partners and networks, along with the ability to utilize adaptive coping strategies have been targeted as potential moderators, yet few studies have addressed this issue.

Results of prospective study done by Campos B et al. and French KA et al. l have also found that social support was significant predictor of stress scores and its beneficial effect on outcomes, whereas Hedegaard et al. and Berle et al. didn't find any buffering effect of social support in their study.[18–21] Authors suggests that social support groups of females, counsellors, easy approachability for mental health care and physicians should be encouraged at workplace, offices and factories. Moreover, husband's and other family members' support is anticipated for reducing stress of the mother during pregnancy in this changing nuclear family trend. Long term effect of the stress on foetus including the fertility is still to be studied, so it is sagacious to elevate stress of mothers for a better future generation.

A great deal of attention has been paid to the impact of prenatal maternal stress on birth outcomes, with a relative dearth of data to address which factors may decrease the risk of adverse birth outcomes or increase the likelihood of optimal birth outcomes.

Stress assessment should be integral part of routine obstetric care. Further research is required to ascertain and confirm the relationship between maternal stress and neonatal outcome, in a culturally diverse country like India wherein traditions and family structure are assumed to plays an important role in reducing the stress on mothers.

Limitations of this article are that we have studied the association in a tertiary care hospital setup, so there might be bias due to this factor. Moreover, most of the participants in the study were well-educated, the educational material and regular counselling by experts may have decreasing stress effect on them. Although, most of the participants were working mothers on maternity leave we have not taken socioeconomic status, family structure and interpersonal relationship and previous working pattern with working hours into consideration which can have impact on stress on the mothers.

5. Conclusions

Adequate counselling is essential to reduce the maternal stress at various stages of pregnancy and delivery. Family and spouse support at home; female social support group, mental health care and counselling at workplace is expedient for better development of the next generation present in womb. Assessment of stress should be an integral part of antenatal care.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Roudsari RL, Arghavanian FE, Heydari A, Bahmani MND. Pregnant women's experiences of social roles: An ethnophenomenological study. *Iran J Nurs Midwifery Res.* 2020;25:31. doi:10.4103/ijnmr.ijnmr_54_19.
2. Reddy NK, Vranda MN, Ahmed A, Nirmala BP, Siddaramu B. Work-Life Balance among Married Women Employees. *Indian J Psychol Med.* 2010;32(2):112–8. doi:10.4103/0253-7176.78508.
3. Gelaye B, Rondon MB, Araya R, Williams MA. Epidemiology of maternal depression, risk factors, and child outcomes in low-income and middle-income countries. *Lancet Psychiatry.* 2016;3(10):973–82. doi:10.1016/s2215-0366(16)30284-x.
4. Cohen S, Kamarck T, Mermelstein R. Perceived stress scale. Measuring stress: A guide for health and social scientists; 1994.
5. Dole N. Maternal Stress and Preterm Birth. *Am J Epidemiol.* 2003;157(1):14–24. doi:10.1093/aje/kwf176.
6. Rondó PHC, Ferreira RF, Nogueira F, Ribeiro MCN, Lobert H, Artes R. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *Eur J Clin Nutr.* 2003;57:266–72. doi:10.1038/sj.ejcn.1601526.
7. Torche F. The Effect of Maternal Stress on Birth Outcomes: Exploiting a Natural Experiment. *Demography.* 2011;48(4):1473–91. doi:10.1007/s13524-011-0054-z.
8. Aneja J, Chavan BS, Huria A, Goel P, Kohli N, Chhabra P. Perceived stress and its psychological correlates in pregnant women: an Indian study. *Int J Culture Mental Health.* 2018;11(3):268–79. doi:10.1080/17542863.2017.1364284.
9. Rajeswari S, SanjeevaReddy N. Efficacy of progressive muscle relaxation on pregnancy outcome among anxious indian primi mothers. *Iran J Nurs Midwifery Res.* 2020;25(1):23. doi:10.4103/ijnmr.ijnmr_207_18.
10. Hoffman S, Hatch MC. Depressive symptomatology during pregnancy: Evidence for an association with decreased fetal growth in pregnancies of lower social class women. *Health Psychol.* 2000;19:535. doi:10.1037/0278-6133.19.6.535.
11. Kinsella MT, Monk C. Impact of Maternal Stress, Depression and Anxiety on Fetal Neurobehavioral Development. *Clin Obstet Gynecol.* 2009;52:425–40. doi:10.1097/grf.0b013e3181b52df1.
12. Li D, Liu L, Odouli R. Presence of depressive symptoms during early pregnancy and the risk of preterm delivery: a prospective cohort study. *Human Reprod.* 2008;24:146–53. doi:10.1093/humrep/den342.

13. Wu Y, Lu YC, Jacobs M, Pradhan S, Kapse K, Zhao L, et al. Association of Prenatal Maternal Psychological Distress With Fetal Brain Growth, Metabolism, and Cortical Maturation. *JAMA Netw Open*. 2020;3(1). doi:0.1001/jamanetworkopen.2019.19940..

14. Glynn LM, Schetter CD, Hobel CJ, Sandman CA. Pattern of perceived stress and anxiety in pregnancy predicts preterm birth. *Health Psychol*. 2008;27:43–51. doi:10.1037/0278-6133.27.1.43.

15. Majzoub JA, McGregor JA, Lockwood CJ, Smith R, Taggart MS, Schulkin J. A central theory of preterm and term labor: Putative role for corticotropin-releasing hormone. *Am J Obstet Gynecol*. 1999;180:S232–41. doi:10.1016/s0002-9378(99)70707-6.

16. Kramer MS, Lydon J, Seguin L, Goulet L, Kahn SR, McNamara H, et al. Stress Pathways to Spontaneous Preterm Birth: The Role of Stressors, Psychological Distress, and Stress Hormones. *Am J Epidemiol*. 2009;169:1319–26. doi:10.1093/aje/kwp061.

17. Wadhwa PD, Entringer S, Buss C, Lu MC. The Contribution of Maternal Stress to Preterm Birth: Issues and Considerations. *Clin Perinatol*. 2011;38(3):351–84. doi:10.1016/j.clp.2011.06.007.

18. Campos B, Schetter CD, Abdou CM, Hobel CJ, Glynn LM, Sandman CA. Familialism, social support, and stress: Positive implications for pregnant Latinas. *Cult Divers Ethn Minority Psychol*. 2008;14:155–62. doi:10.1037/1099-9809.14.2.155.

19. French KA, Dumani S, Allen TD, Shockley KM. A meta-analysis of work–family conflict and social support. *Psychol Bull*. 2018;144:284–314. doi:10.1037/bul0000120.

20. Hedegaard M, Henriksen TB, Secher NJ, Hatch MC, Sabroe S. Do Stressful Life Events Affect Duration of Gestation and Risk of Preterm Delivery? *Epidemiol*. 1996;7(4):339–45. doi:10.1097/00001648-199607000-00001.

21. Berle JØ, Mykletun A, Daltveit AK, Rasmussen S, Holsten F, Dahl AA. Neonatal outcomes in offspring of women with anxiety and depression during pregnancy. *Arch Womens Mental Health*. 2005;8:181–9. doi:10.1007/s00737-005-0090-z.

Author biography

Amrita Singh, Assistant Professor

Priyanka Shelkar, Senior Resident

Kanishk Singh, Assistant Professor

Shailendra Anjankar, Consultant