Research Paper

Antenatal Psychosocial Stress Forecasts Pregnancy Outcome: Deposition from a Cohort Study.

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ABSTRACT
Pregnancy is a realignment span in which any derangement can result in maternal stress and it leads to adverse pregnancy outcomes. The primary objective of the investigation was to ascertain the influence of antenatal stress on pregnancy outcome. Prospective Cohort design was adopted for the investigation. The setting was government hospitals rendering both antenatal and delivery services. In the first phase, the data were collected from 360 antenatal women in the gestational age of 20 to 24 weeks using Antenatal Psychosocial Stress Scale. Stress was measured again at 30-34 weeks of gestation. Data on pregnancy outcome were collected through telephone interview, two weeks after their expected date of confinement and verified from hospital records. Results showed that high stress during gestation contributes for an increased risk for preterm labour (RR 2.17, 95% CI : 1.07- 4.42), low birth weight (RR 2.78, 95% CI: 1.78- 4.36), poor neonatal response immediately after delivery (RR 1.97, 95% CI: 1.02-3.81) and NICU admission of newborns (RR 1.69, 95% CI: 1.01 - 2.81). The present study revealed the impact of antenatal stress on pregnancy outcome. The study highlights the need of routine screening for stress during antenatal assessment and professional support for the vulnerable group for beneficial gestational sequels.
KEY WORDS: *Antenatal stress, influence, pregnancy outcome.*

I. INTRODUCTION

A growing body of knowledge is accessible showing the different adverse effects of stress on various spheres of human health, growth and development. Stress affecting the women during her gestation has negative impacts on not only for herself, but it causes long lasting effects on the fetus and newborn.

Stress is defined as a nonspecific response of the body to any kind of demands applied on it.[1] When a locus is explicated as being stressful, it sets off the incitement of hypothalami – pituitary – adrenal (HPA) axis and the neurons in the hypothalamus release corticotrophin – releasing hormone (CRH). The emission of CRH sparks the ensuing production and discharge of adrenocorticortophin (ACTH) from the pituitary gland. ACTH reaches the adrenal glands and sets off production of stress hormones. Two important stress hormones, glucocortocoids (cortisol) and the catecholamines (epinephrine and noreepinephrine) act in the body to arouse stress response. The acute stress response is reduced by the action of cortisol because it suppresses continued release of ACTH from pituitary and inhibits CRH secretion by hypothalamus. But during chronic stress, the above mechanisms fail which leads to chronic elevation of cortisol.[2]

During pregnancy glucocorticoids stimulate gene expression in the placenta. It results in a positive feedback loop which causes a progressive 20-fold increase is CRH levels from placenta throughout pregnancy. In addition to this as the level of CRH – binding protein increases & the bioavalability of free CRH reduces.[3] Premature increases in CRH gene expression can activate a series of endocrine events which prepare fetus and uterus for childbirth. Elevated CRH levels from the placenta enter fetal circulation and causes production of ACTH, cortisol and dehydro epiandrosterone, an estrogen precursor. Corticosteroids and catecholamine exert significant effects in the tone of peripheral blood vessels. Activation of sympathetic nervous system during stress is followed by decreased blood flow to the uterus and fetus and may result in fetal growth restriction. Doppler blood flow studies have revealed elevated resistance of uterine artery in antenatal women with more anxiety scores by 34 weeks of pregnancy .[4]

Increased fetal cortisol may affect growth and development of fetal nervous system, may deleteriously affect the brain and may have a programming or organizing effect on the fetal neuroendocrine system which will end up in permanent central nervous system disorders.[5] Antenatal stress is connected with low birth weight and

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prematurity. [6] Antenatal stress was more for women who had preterm delivery compared to women who had term delivery. Premature delivery turned out for 54% of women with stress while the percentage of preterm labour in common women is only 23%. This show that stress increases risk for preterm labour. So in order to lessen the rate of preterm birth, exposure to stress should be minimized during pregnancy. [7]

Independent association was seen between poorer temperamental status of infants at 6 months with disaster – related antenatal stress and maternal diseases during gestation.[8] Exposure to high antenatal stress, especially during early pregnancy may adversely influence brain development of fetus, resulting in reduced general intelligence and linguistic abilities in the toddlers .[9] Serotonin is a mediator of antenatal stress induced effects on the baby's neurocognitive and behavioral development. Exposure to elevated serotonin in the prenatal period is associated with deviations in many neuronal processes which lead to aberrations in offspring behavior .[10]

Perceived stress at 16 weeks of gestation was linked with second trimester cortisol concentration and preterm delivery. Gestational age at delivery was inversely correlated with cortisol concentration in the second trimester. Second trimester cortisol concentration was more in preterm compared with term delivered women.[11] Primary focus of the present study was to disclose the association between psychosocial stress during antenatal period and the neonatal outcomes of pregnancy. Evidence generated from the present study is anticipated to highlight the role of psychosocial interventions necessary for a favourable pregnancy outcome.

II.   MATERIALS AND METHODS

The present study is aimed at revealing the influence of high antenatal psychosocial stress on neonatal outcomes of pregnancy. Prospective Cohort design was used for evaluating the influence of stress during pregnancy on pregnancy outcome. Exposure variable was antenatal Stress. Outcome variables were neonatal pregnancy outcomes which included preterm birth, low birth weight, response of newborn immediately after birth, congenital anomalies of baby and NICU admission of newborn. Inclusion criteria for samples were pregnant women who were willing to participate in the study, who could understand Malayalam or English, in the gestation age of 20-24 weeks, who were willing to follow up and who could communicate through telephone. Women who were too sick to participate in the study were excluded from the study. Other exclusion criteria included multiple pregnancy, cardiac disease complicating pregnancy, uterine anomalies and pre-existing anemia. Total number of sample required were 300. By adding allocation of 20% (No: 60) for loss to follow up, sample size determined was 360. Stratified sampling method was used to select samples from a tertiary level hospital and selected hospitals in secondary level. Secondary level hospitals include one specialty hospital, three district level hospitals, five taluk level hosptals & 23 community health centers. One hospital from each level was selected randomly.

Interview technique was used for data collection. Tools included Antenatal psychosocial stress scale (APSS) and pregnancy outcome checklist. Stress during pregnancy was measured using Antenatal Psychosocial Stress Scale (APSS). The scale consists of 10 items with 3 levels of measurement of stress (developed by Dr. Devisree, 2018). This instrument was developed and validated among similar antenatal population. In the study stress was measured twice that is between 20-24 weeks of gestation and in the first follow up (30-34 weeks of gestation). The mean score obtained in these two measurements were taken in account of classifying the participants into different stress level categories.

Pregnancy outcome checklist was used to collect data on pregnancy outcome. It consists of information regarding type of delivery, gestational age at birth, birth weight, immediate response of the newborn after delivery, congenital anomalies of baby and neonatal intensive care unit (NICU) admission to newborn.

Data were collected from women attending antenatal outpatient   clinics of selected hospitals. After initial screening the investigator selected the subjects who were found to satisfy inclusion and exclusion criteria. An explanation about the objectives of the study was given; confidentiality of the data were ensured and consents were taken from the selected women. Participant information sheets were provided to them. After establishing rapport with them, the tool for assessment of antenatal stress was administered as one to one basis. An appointment slip was given and informed to meet the investigator 10 weeks later in the OPD. A log of these 360 samples was maintained for ensuring legitimate follow up. Log consisted of code number, name, phone number, name of hospital, date of first follow up and expected date of delivery.

Stress of subjects were again measured using Antenatal Psychosocial Stress Scale, 10 weeks after first assessment. This part of the data collection was also done at the antenatal clinics. Subjects were given reminder calls to ensure their availability in the OPD. Data for first follow up were collected from 331 participants. Twenty nine participants were lost in first follow up. Cohort samples were again contacted through telephone two weeks after expected date of confinement (EDC). Data regarding pregnancy outcome were collected through telephonic interview. Three hundred and twelve participants in the cohort phase completed second follow up phase of the study. Data were verified by review of patient records from the hospital medical records department. The data collected were analyzed by carrying out descriptive and inferential statistics using SPSS

version 16. Sample characteristics were analyzed using frequencies and percentages. Influence of antenatal stress on pregnancy outcome was evaluated by finding out the relative risk.

III.   RESULTS

Sociodemographic Characteristics of Antenatal Women:

Most of the participants (76.60%) belonged to 21-30 years of age group. Among the participants, 66.67% of the sample resided in rural areas, 66.35% belonged to BPL income category and 44.87% of the women were primigravida. Distribution of participants based on socio demographic and clinical characteristics are shown in table 1.

Table 1
Socio demographic Characteristics of Antenatal Women
N-312

Characteristics	Frequency	Percentage
Age		
18-20	36	11.54
21-30	239	76.60
30-39	37	11.86
Place of residence		
Urban	104	33.33
Rural	208	66.67
Economic status		
APL	105	33.65
BPL	207	66.35
Education		
Up to upper primary	2	0.64
High school	96	30.77
Higher secondary	88	28.21
Degree, PG	89	28.53
Professional	37	11.86
Occupation		
Home makers	255	11.86
Labourers	12	81.73
Office Job	6	3.85
Business	8	1.92
Professional	30	2.56
Type Of family		
Nuclear	170	54.49
Joint	7	2.24
Extended	135	43.27
Parity		
Primi	140	44.87
Multi	172	55.13

Characteristics of participants related to pregnancy outcome

Distribution of Participants According to Neonatal Outcome is shown in table 2. It is evident that 9.29% of babies were born preterm, 18.27% of them were belonging to low birth weight category, 10.9% of the babies had not cried soon after birth, 6.4% of the babies were having congenital anomalies and 7.6% of them were admitted in NICU in the first 2 weeks of newborn period.

Table 2
Distribution of Participants According to Neonatal Outcome
n = 312

Characteristics		Frequency	Percentage
Gestational age on delivery	<37 weeks	29	9.29
	≥37 weeks	283	90.71
Birth weight of baby	<2.5 Kg	57	18.27
	≥2.5Kg	255	81.73
Baby cried soon after birth	Yes	278	89.1
	No	34	10.9

Congenital anomalies of baby	Yes	20	6.4
	No	292	93.6
NICU admission to baby	Yes	55	17.6
	No	257	82.4

Distribution of Subjects According to Exposure to Stress

Exposure status to high stress was ascertained based on the average scores obtained for APSS measurements at 20-24 weeks and 30-34 weeks of gestation. Distribution of subjects based on the exposure status is shown in the Table 3. Among the participants in the cohort group, 19.6% had high stress considering the mean APSS scores in second and third trimesters.

Table 3
Distribution of Participants in Cohort Group According to Exposure to Stress
n =312

Stress level	Frequency	Percentage	95% CI
High Stress	61	19.6	15.1 - 24.4
Low & moderate stress	251	80.4	75.6 - 84.9
Total	312	100	

Analysis related to influence of stress during pregnancy on pregnancy outcome

Risk Analysis of Antenatal Stress on Preterm birth is shown in table 4. From the table it is clear that high stress during pregnancy is a risk factor for preterm labour as the relative risk is 2.17, 95% CI : 1.07- 4.42.

Table4
Risk Analysis of Antenatal Stress on Preterm birth
n = 312

High Stress	Preterm Labour				Relative risk	95% CI
	Yes		No			
	N	%	N	%		
Yes	10	16.4	51	83.6		
No	19	7.6	232	92.4	2.17	1.06-4.42
Total	29	9.3	283	81.7		

Risk Analysis of Antenatal Stress on Low Birth Weight is shown in table 5. It is evident that high stress during pregnancy is associated with an increased risk for having low birth weight babies as the relative risk is 2.78, 95% CI: 1.78- 4.36.

Table 5
Risk Analysis of Antenatal Stress on Low Birth Weight
n = 312

High Stress	Low Birth weight				Relative risk	95% CI
	Yes		No			
	N	%	N	%		
Yes	23	37.7	38	62.3		
No	34	13.5	217	86.5	2.78	1.78-4.36
Total	57	18.3	255	81.7		

Risk Analysis of Antenatal Stress on Low Response of Baby Soon After Birth is shown in table 6. It is evident that high stress during gestation contributes for an increased risk for poor neonatal response immediately after birth. Relative risk is 1.97, 95% CI: 1.02-3.81.

Table 6
Risk Analysis of Antenatal Stress on Low Response of Baby Soon After Birth

n = 312

High Stress	Baby cried soon after the birth				Relative risk	95% CI
	No		Yes			
	N	*%*	*N*	*%*		
Yes	11	18	50	82		
No	23	9.2	228	90.8	1.97	1.02-3.81
Total	34	10.9	278	89.1		

Risk of Antenatal Stress on Congenital Anomalies to Baby is shown in table 7. It is clear that high stress in pregnancy is not a significant risk factor for the development of congenital anomalies to newborn. Relative risk is 1.37, 95% CI: 0.52 – 3.63.

Table 7
Risk of Antenatal Stress on Congenital Anomalies to Baby

n = 312

High Stress	Congenital anomalies to baby				Relative risk	95%CI
	Yes		No			
	N	*%*	*N*	*%*		
Yes	5	8.2	56	91.8		
No	15	6	236	94	1.37	0.52 – 3.63
Total	20	6.4	292	93.6		

Risk of Antenatal Stress on NICU Admission of Newborn is given in table 8. It is evident that high stress during gestation contributes for an increased risk for NICU admission of newborns. Relative risk is 1.69, 95% CI: 1.01 – 2.81.

Table 8
Risk of Antenatal Stress on NICU Admission of Newborn

n= 312

High Stress	NICU admission of newborn				Relative risk	95%CI
	Yes		No			
	N	*%*	*N*	*%*		
Yes	16	26.2	45	73.8		
No	39	15.5	212	84.5	1.69	1.01 – 2.81
Total	55	17.6	257	82.4		

IV.   DISCUSSION

Present study reveals that antenatal stress increases risk for preterm labour. This finding is supported by a study in Demark by Hedegaard, M. et al., which showed that psychological distress during pregnancy is associated with increased risk of preterm delivery (*RR* = 1.2, 95% CI 0.84 -1.79).[12] Wadhwa (1993) had raised similar findings from a study based on California which has shown that antenatal anxiety is significantly associated with clinical incidence of preterm labor.[13] Orr (2007) found out that score of anxiety during pregnancy has a positive relation with risk of preterm labor.[14] Loomans (2013) reported that women with high depression and anxiety during pregnancy had an increased risk of preterm labor.[15]   Contradictory finding was given by Faisal – Cury (2010) in a study from Brazil which has shown that there was no significant association between common mental disorders during pregnancy and preterm labor (adjusted *OR* 1.03, 95% CI: 0.57-1.88).[16] Cole lewis (2014) reported that 2nd trimester pregnancy specific stress was not related with preterm birth. Third trimester pregnancy specific stress was related with preterm birth.[17]

There is increased risk for low birth weight for women with high antenatal stress, as per the results of present study. Findings of a meta analysis by Littleton (2010) has shown significant association between antenatal stress and low birth weight [*r* (5)=0.07, CI 0.03-0.1).[18] Significant association between antennal stress and low birth weight is found out by Wadhwa (1993). [13] Hernandez – Martinez (2011) reported that anxiety

during pregnancy is associated with low birth weight.[19] Loomans (2013) reported that antenatal women with high depression, anxiety and job strain had low birth weight babies.[15] Contradictory finding is reported by Faisal –Cury (2010) in a study from Brazil which reported that common mental disorders during pregnancy is not associated with low birth weight (*AOR*: 1.09, 95% *CI* 0.62-1.91).[16]

Present study revealed that antenatal stress increases the risk for NICU admission of newborns. As per the findings from a study by Latendresse stress during gestation has no risk for NICU admission to newborns, but presence of depression during and before pregnancy has an effect on NICU admission (*AOR* =1.66 - 2.48, *p* <.001).[20] Similar finding was available from a study conducted which showed that concerns about birth and the health of the baby at 29-34 weeks were associated with increased odds of NICU admission (*OR* 1. 96, 95% *CI* 1.023 to 1.175) (Levine, et al., 2017).[21]

V.   CONCLUSION:

The study highlights the association between stress and pregnancy outcome. As preterm labour and low birth weight are the two important determinants of child health, promotion must be raised towards the maternal psychological health during pregnancy. Essentiality of emotional and social wellness during pregnancy should be accentuated. Psychological health of antenatal women for the positive pregnancy outcome including newborn status and better development of the child should be targeted by maternal health services. A system for regular assessment for psychological health during gestation and prerequisites for at risk group for the support should be introduced and maintained. Propensities for antenatal counseling and afloat footing during gestation must be warranted. Social support networks or web based services for the ongoing backing of antenatal women should be initiated.

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