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STUDY OF CHRONIC STRESS IN PREGNANT WOMEN

VANDALI JYOTHI[1]*, MANJUNATH AITHALA[1] AND NEERJA SHASTRI[2]

[1]Department of Physiology, BLDE university, Bijapur, Karnataka, India.*
[2]Department of Physiology, PIMS, Karimnagar, India.

ABSTRACT

Chronic stress is one of the biopsychosocial factors that contributes to adverse pregnancy outcomes such as preterm labor, aborted fetus, delayed fetal growth, low birth weight baby etc. Chronic stress can be either due to many stressors or due to same stressor continuously for a prolonged period, which repeatedly activates autonomic nervous system and hypothalamic-pituitary-adrenal (HPA) axis without relaxation response, resulting in persistent physiologic effects. Physiologic response in turn causes malfunctioning of HPA axis to release excess cortisol, the principle stress hormone. The present study was conducted to assess the relation between the chronic stress and cortisol during pregnancy. Pregnant women were assessed for the level of stress with the help of Holmes and Rahe stress scale. 96 pregnant women were selected for the study. Equal number of non-pregnant women were included in the study as a control group. Objective measurement was done by analysing the serum cortisol levels by electrochemiluminescence immunoassay. Among 96 subjects 36 (37.5%) were mildly stressed, 34 (35.41%) were moderately stressed and 26 (27.08%) were severely stressed. There was significant increase in serum cortisol levels in stressed pregnant women when compared with the cortisol levels of nonpregnant women. Level of significance was with $p< 0.05$.

KEYWORDS：Serum cortisol, chronic stress, HPA axis, pregnancy.

VANDALI JYOTHI
Vandali Jyothi, PhD scholar, Department of Physiology,
BLDE university, Bijapur, Karnataka, India.

INTRODUCTION

Stress is an integral part of our lives. Stress is defined as an internal process that occurs when a person is faced with a demand that is perceived to exceed the resources available to effectively respond to it and where failure to effectively deal with the demand has important undesirable consequences.[1] Stress can be acute or chronic. Acute stress is short term stress and is experienced in response to immediate perceived threat. While chronic stress is long term stress, generally lasting weeks to months. The concept of chronic stress is based on how frequently the stressors appear.[2] So chronic stress is a state of on-going physiological arousal. This occurs when the body experiences several stressors or a single stressor continuously, that it does not have the ability or opportunity to activate the relaxation response. It can develop in response to everyday stressors which are ignored or poorly managed or in response to traumatic events.[3] Studies indicate that prevalence of stress during pregnancy has been found to range from 6% to as high as 52.9% in developing countries.[4,5] Neilsen's study of chronic stress in Indian women reveals that 87% of women are stressed severely. Short term stress is not detrimental to health as it can actually be beneficial in certain circumstances (as it can increase alertness and performance), but prolonged periods of stress (chronic stress) have been linked to negative health consequences and stress hormones are to blame.[6] Pregnancy is recognized as a stressful event in woman's life, as it is a time of physiological change that needs huge psychological adjustment.[7] Studies indicate that pregnant women with high stress and anxiety levels are at increased risk for preeclampsia, spontaneous abortion, preterm labor, for having a malformed or growth-retarded baby and may also affect the lactogenesis.[8,9] Maternal stress has been defined as a potential predictor and the causes include mostly social support, quality of life, socioeconomic status.[10] Identification of the affecting factor is essential for improved pregnancy outcomes. Physiologic stress response involves activation of autonomic nervous system and HPA axis, which originate in brain.[11] With chronic stress both systems are repetitively activated, thus resulting in persistent physiologic effects.[12] Severe stress alters HPA axis, malfunctions negative feedback loop resulting in excess production of CRH from hypothalamus, which stimulates anterior pituitary for the systemic release of ACTH (adrenocorticotrophic hormone), which subsequently signals the adrenal glands to release glucocorticoids predominantly cortisol.[13,14] Serum cortisol levels were gradually increased from 6 weeks to 40 weeks of pregnancy and a sharp rise was noted two weeks before the onset of labor. Cortisol levels may be a more objective measure of chronic stress during pregnancy. High cortisol levels in pregnancy has been associated with adverse pregnancy outcomes like aborted fetus, delayed fetal growth etc.[15,16] The study was conducted to assess the level of stress in 1st, 2nd and 3rd trimesters of pregnancy. Also to correlate the interaction between chronic stress and cortisol in all the three trimesters of pregnancy.

MATERIALS AND METHODS

The study was conducted in Karimnagar, which is one of the fast developing part of Telangana state. 96 pregnant women in the reproductive age (21-45 yrs) attending the antenatal clinic of Prathima institute of medical sciences were enrolled for the study. Equal number of non pregnant females were included in the study as controls. The study was designed and got approved by the ethical committee of the institution. Participants were informed about the purpose of study, their role in the study and were asked to sign the consent form if were willing to take a part. A proforma was obtained consisting of clinical and other details of the pregnant women. They were assured that despite entering in the study they could withdraw any time if they wished and their information would be kept confidential. Participants included were non-smokers, with no history of diabetes mellitus, with no h/o major endocrine abnormalities. Pregnant women at different age groups were assessed for the level of stress by asking questionnaire as per Holmes and Rahe stress scale and categorised into mildly, moderately, severely stressed groups based on LCU. The number of Life Change Units (LCU) apply to events in the past year of an individual's life. The final score had shown the estimate of level of stress. Mild stress; LCU<150, moderate stress; LUC150-299, severe stress; LCU≥ 300. Objective measurement was done by analyzing the serum cortisol levels in all the three trimesters of pregnancy. Blood samples (5-7ml) were collected by venipuncture between 8.30am – 10.30am with all sterile precautions, placed in evacuated tubes and then taken to laboratory in ice box, centrifuged at 1300 x g for 20 min at 4ºC in a refrigerated table top centrifuge. Serum samples for hormone assays were frozen at -20ºC until analyzed. Elecsys cortisol reagent kit,Cat. No. 11875116 was used for Serum cortisol quantitative determination by electrochemiluminescence immunoassay (Roche Elecsys 1010/2010). Results were recorded and data analysis was done. Cortisol levels of study groups were compared with the cortisol levels of controls. The software SPSS16.0 was used for data analysis.

RESULTS

Table I

Age wise distribution of pregnant women with educational status

Sl no	Age groups (yrs)	Under graduates	Graduates	Post graduates	Total
1	21-25	09	18	01	28
2	26-30	10	10	02	22
3	31-35	08	14	01	23
4	36-40	02	09	03	14
5	41-45	03	05	01	09
		32 (33.3%)	56 (58.3%)	08 (8.3%)	96

The study group of 96 pregnant women were divided into five age groups and their qualification levels were noted to predict the mostly affecting factor of stress. The age group 21-25 yrs included 28women, 26-30 yrs included 22 women, 31-35 yrs included 23 women, 36-40 yrs included 14 women and 41-45 yrs included 9 women in the study. As the area is still developing, only 8 (8.3%) women were postgraduates (Table-I).

Table II
Stress levels in different age groups

Age groups (yrs)	Mildly stressed (<150)	Moderately stressed (150-299)	Severely stressed (>300)	Total
20 – 25	14	7	7	28
26 – 30	8	9	5	22
31 – 35	8	8	7	23
36 – 40	4	7	3	14
41 – 45	2	3	4	9
	36(37.5%)	34(35.41%)	26(27.08%)	96

Among 96 pregnant women 37.5% were with mild stress, 35.41% were with moderate stress and 27.08% were with severe stress.

Table III
Cortisols at different stress levels during pregnancy

	1st trimester	2nd trimester	3rd trimester
Mean cortisol in µg/dl with SD at stress<150, n=36	14.15±1.92	22.58±2.00	27.40±2.54
Mean cortisol in µg/dl with SD at stress 150-299, n=34	20.44±1.33	26.26±1.48	30.40±2.46
Mean cortisol in µg/dl with SD at stress >300, n=26	23.10±2.53	27.64±3.11	33.02±2.95

The cortisol levels were highly significant with p≤ 0.05 when compared with controls (9.6-14.0 µg/dl).

The mean and SD of serum cortisol levels in nonpregnant women (controls) were 12.3±3.8 There were 96 pregnant women in the study group, in the age range of 21-45 yrs. It was observed that 36 (37.5%) women were in mild stress, 34 (35.41%) women were moderately stressed and 26 (27.08%) women were severely stressed (Table-II). It was observed that mean cortisol levels were higher in moderately and severely stressed women than in the controls. It was observed that women of age group 21-25 yrs with <150 LCU were having almost normal or more than normal levels of cortisol. Women of age group 36 -40 yrs were having very high levels of serum cortisol because of their declining reproductive age. It was observed that serum cortisol levels of stressed subjects were increased in 2nd trimester than that in 1st trimester, also reached to peak levels in 3rd trimester (Table-III).

DISCUSSION

In the study of Harvaline *etal* in chronically stressed subjects there was increased cortisol, which is similar to the present study. [17] Similar observations were seen by Obel etal that, higher cortisol levels were there in subjects with chronic stress.[18] Similar results were observed in the study of Dallman *etal*, ie, chronic mild stress leads to increased trough levels of plasma cortisol while chronic severe stress results in around the clock elevation in both plasma ACTH and cortisol. [14] In our study women with mild stress were having almost normal levels of serum cortisol. Most of them were newly married and their economic condition was good. Moderately and severely stressed women were having very high levels of serum cortisol when they reached 3rd trimester. Few were in elderly maternal age, few had bad obstretic history, few women were highly in need of male child, few had large number of persons in the family but common factor was poor socioeconomic status. Maternal anxiety is one of the predictors of chronic stress.

CONCLUSION

Chronic stress may lead to negative consequences like preeclampsia, spontaneous abortion, preterm labor, for having a malformed or growth-retarded baby etc. Therefore, it is necessary to bring awareness in the population and further studies are required to observe chronic stress status during pregnancy in larger population.

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