

Study to Assess the Role of Sociodemographic Parameters for Development of Chronic Stress in Pregnant Women

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Abstract

Introduction: Stress is defined as a state of psychological and physical tension produced, when individuals perceive that they are unable to cope with the demands imposed on them by the stressor (Hans Selye 1936). Chronic stress may be either because of many stressors or due to the same stressor persistently for a prolonged period, which repeatedly activate the autonomic nervous system as well as hypothalamic-pituitary-adrenal (HPA) axis without relaxation response, so resulting in persistent physiologic effects. Physiologic response in turn leads to malfunctioning of HPA axis and releases excess cortisol, the principle stress hormone. Life events like changes in financial state, dismissal from work, change in eating or sleeping habits, marriage, pregnancy, divorce, death of spouse, marital separation, marital reconciliation, imprisonment etc. are few causes of chronic stress. Pregnancy is recognized as a stressful event in woman's life, as during pregnancy many physiological changes occur, which require huge psychological adjustments. Stress during pregnancy leads to hypertension, diabetes mellitus, preterm delivery and fetal loss.

Materials and methods: In our study, we have assessed stress level in pregnant women by correlative study of Holmes & Rahe scale and serum Cortisol levels. Also parameters included in the study were socio-demographic parameters (social class, educational status, occupation, religion, family type), anthropometric parameters (Height, Weight, BMI), physiological parameters (BP, HR) and hormonal assay.

Results: In our study we found 37.5% pregnant women were mildly stressed, 35.4% were moderately stressed and 27% were severely stressed. Women in nuclear family and joint family had mean stress level of 182.7 ± 68.4 and 220.1 ± 92.0 respectively. Stress level was comparatively higher in women of joint family. We found very small variation in stress levels indicating no much difference in the effect of stress on different religions. 10% of graduates were either moderately or severely stressed, while stress of this severity was prevalent in more than 60% of undergraduates. Education might be helping to develop coping response and ability to decelerate the stress generated by life events. Mean stress levels were 264.3 ± 98.9 and 208.5 ± 87.2 respectively in working and house wives.

Conclusion: Sociodemographic parameters have effective role in development of chronic stress in pregnant women. Formally educated women are well equipped to deal effectively with stress than uneducated women in rural India. It indicates the awareness of well-educated females regarding stress and its adverse effects. Stress is equally prevalent in women of different religious faith. Mean stress in working women is quite higher as compared to house wives. Our findings indicate that cumulative effects of changing life events and daily hassles with failure of coping reflex leads to chronic stress in pregnant women.

Keywords: Chronic stress; Daily hassles; Life events; Pregnancy; Sociodemographic Parameters.

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Introduction

Acute stress is short lived and may be due to an accident or immediate perceived threat. Physiological response to this type of stress causes effective resolution to the stressors. Chronic stress may be a state of on-going physiological arousal as the body of an individual experiences multiple stressors at a time/within less time or a single stressor continuously for long period, so that body does not have the ability or opportunity to activate the relaxation response.¹ Chronic stress may develop in response to the traumatic events in life or due to everyday stressors or stressful situations, which are not managed. It has many negative consequences including suppression of the immune system, increased risk of heart attack, stroke, diabetes, speeding up of process of ageing, infertility etc.² In 1974, Holmes & Masuda have indicated that life-events and 'daily hassles' are the causes for chronic stress.³

Pregnancy is recognized as one of the stressful events in woman's life. It is a time of physiological change that needs huge psychological adjustments.⁴ Women's health care providers have investigated that the chronic stressors i.e. ongoing perceived stress/threat and anxiety are due to poverty, intimate partner violence and experiences of racism. They are associated with an increased incidence of preterm birth, low birth weight of the baby in United States.⁵ Stress during pregnancy is more among teenagers, low educational status, discriminated group of population or with low socioeconomic status.⁶ Presence of major events in the life affects the daily activities of a person. Presence of two or more major life events during pregnancy has been linked to adverse outcomes.^{7,8} Rondo et al in 2003, have reported the prevalence of stress and distress was varying from 22.1 % to 52.9 % in a Brazilian cohort with 865 pregnant women.⁹ Esperat et al in 2007 have indicated that poverty is one of the important stressors. Socio-Economic Status (SES) of an individual can be assessed by taking in to account of educational status, income, occupation and housing conditions. They may be used as proxy measures for assessing the poverty. If there is lack of money during pregnancy, individual may become incapable of utilizing health care facilities. This may lead to

increased percentage of poor maternal outcomes, which in turn may result in increase in morbidity and mortality of both mother and child.¹⁰

Generally, adrenal glands secrete the hormones like DHEA, Aldosterone, Cortisol, Testosterone, Estrogens and Progesterone. All these hormones have common precursor, "Pregnenolone". During chronic stress, there will be hyperstimulation to adrenal glands and the pregnenolone is diverted or stolen from the other pathways to produce the stress hormone, Cortisol in excess. Pregnenolone steal or Cortisol escape mechanism is the body's hormonal response to prolonged periods of stress. So during chronic stress, body utilizes most of pregnenolone for the synthesis of the principal stress hormone, Cortisol.^{11,12} Thus, chronic stress causes HPA axis dysfunction. So, there will be hypercortisolism and also diurnal dysrhythmia.^{13,14,15} This leads to imbalance and deficiency of all other hormones in the body leading to deleterious effects.^{11,12}

Materials and methods

The present study was undertaken to assess the role of sociodemographic parameters for development of chronic stress during pregnancy. Participants were in the reproductive age between 21-45 years. Pregnant women attending the antenatal clinic at Prathima Institute of Medical Sciences, Nagunur, Karimnagar were recruited in the study. Women were divided into 5 age groups. 21-25 years, 26-30 years, 31-35 years, 36-40 years and 41-45 years. A total of 128 pregnant women were included in the study. With 95% confidence level and margin of error of $\pm 10\%$, a sample size of 96 subjects were allowed to participate.

Baseline Medical Examinations

A. *Medical history was obtained.*

B. *Recording of anthropometric parameters.*

- i. **Height:** Height was measured by using stadiometer with subject standing in erect posture without foot wear to the nearest 0.5cm with shoulders in relaxed position, arms hanging freely and expressed in centimeters (cms).
- ii. **Body weight:** Digital weighing machine was

used to measure body weight with an accuracy of $\pm 100\text{g}$. Subjects were weighed without foot wears in light clothing and standing in erect posture.

- iii. **Body mass index (BMI):** BMI of each participant was calculated as body weight in kilograms divided by square of body height in meters. $\text{BMI} = \text{kg}/\text{m}^2$

C. *Recording of physiological parameters*

- i. **Heart rate (HR):** Heart rate of individual participant was recorded in sitting posture. The radial pulse is examined by compressing the radial artery against the head of radius. For elucidation of the pulse, the forearm of the subject should be semipronated and the wrist was slightly flexed. Heart rate was recorded as beats/min.

- ii. **Blood pressure (BP):** Systolic and diastolic blood pressures were recorded (in mmHg) in each subject by using a sphygmomanometer in sitting posture. Three recordings were taken for each subject. Average of 3 measurements was taken for calculation.

- D. **Measurement of stress by Holmes and Rahe stress scale:** The Holmes and Rahe stress scale contains a list of 43 stressful life events which contribute to illness in adults. In 1967, Thomas Holmes and Richard Rahe (psychiatrists) tested about 5,000 medical patients to evaluate whether the stressful events might cause illness and got a positive correlation of 0.118.¹⁶, so this scale is also known as Social Readjustment Rating Scale (SRRS).¹⁷ It is more commonly known as Holmes and Rahe stress scale.¹⁸ Validity of the scale was done in 1970 by Rahe.¹⁹ The scale was also assessed against different population within United States with African, Mexican and white American²⁰, also with Japanese²¹ and Malaysian²² groups. We have used this scale for our study. The number of "Life Change Units" (LCU) that apply to the events happened in the past year of an individual's life were added. The final score of LCU gave an estimate of how stress affects health. Accordingly stress was categorized into 3 levels of stress. LCU <150:Mild stress, LCU 150-299: Moderate stress, LCU >300:Severe stress. We have included questionnaire in regard of life events which occurred in past one year like death of spouse, divorce, marital separation, imprisonment, pregnancy, marriage, marital reconciliation, sexual difficulties, dismissal from work, change in financial

state, change in sleeping or eating habits etc. to estimate the LCU score. Accordingly participants were categorized into mildly, moderately and severely stressed groups.

E. **Socio-demographic parameters**

Participants were asked about

- i. **Social class**²³ Economic status of the participant was assessed. Basing on per capita income, subjects were categorized into class-I to class-V. The B. G. Prasad's scale first appeared in the Journal of Indian Medical Association in the year 1961. It was based on the consumer price index of 1960.²⁴ In India, B. G. Prasad's classification is one of the most commonly used scales for determining the socioeconomic class of an individual by researchers. Socio Economic Status is regarded as one of the important determinants of health, nutritional status and morbidity and mortality of an individual.²⁵ This is a classification based on per capita income of an individual. Hence it has to be constantly updated to take into account of inflation and depreciation of rupee. It can be applied to both urban as well as rural participants. The Consumer Price Index (CPI) for Industrial Workers (IW) is used to calculate the updated income categories. The Consumer Price Index should be updated every month. This is available at the Labour Bureau of India website on the last day of every month. There are state-specific CPI values, which are also available on the Department of Labour website. It should be used to determine more accurate income categories for the required study area and population.²³
- ii. **Educational status:** divided into <10th standard, <12th standard, graduation and above.
- iii. **Occupation:** divided into house wife, working women.
- iv. **Religion:** categorized into Hindu, Muslim and Christian.
- v. **Family type:** number of persons in the family was noted and categorized into joint and nuclear family.
- F. **Estimation of serum cortisol level:** Objective measurement was done by measuring the serum cortisol levels in all the three trimesters of pregnancy and postpartum. Blood samples (5-7ml) were collected by venepuncture between 8.30am-10.30am with standard aseptic precautions. Serum samples were frozen at -20°C . Elecsys corti-

sol reagent kit, Cat. No. 11875116 was used for quantitative determination of Serum cortisol by electrochemiluminescence immunoassay.

Statistical analysis

Results were recorded. Data was analyzed. All characteristics were summarized descriptively. For all continuous variables, the summary statistics of N, mean and standard deviation (SD) were used. For all categorical data, numbers and percentages (%) were used in the data summaries. If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analyzed using SPSS software v.23.0. and Microsoft office.

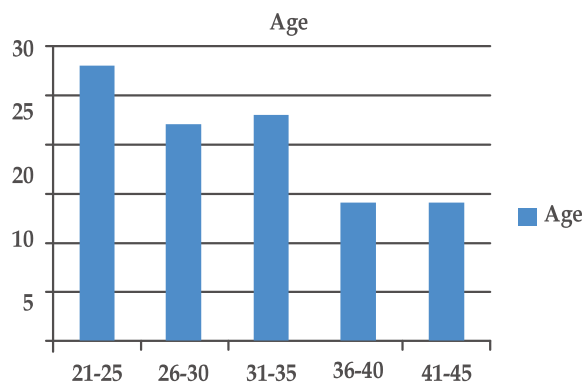
Results

Study participants were divided into 5 age groups.

Table 1: Age-wise distribution of pregnant women included in the study.

Age Groups (Yrs)	No. of Subjects
21-25	28
26-30	22
31-35	23
36-40	14
41-45	9
Total	96

Graph 1: No. of Pregnant Wand Age Wise Distribution.

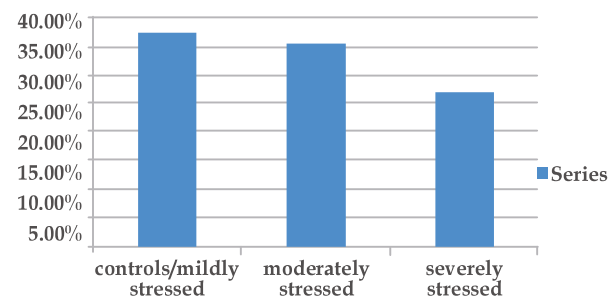


Among 96 participants, in the age group 21-25 years, the number of subjects were 28. In the age group 26-30 years, subjects were 22. In the age group 31-35 years, subjects were 23. In the age group 36-40 years, subjects were 14. In the age group 41-45 years, subjects were 9.

Table 2: Stress levels in different age groups.

Age groups (yrs)	Control or 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	9	6	23
36 - 40	4	7	3	14
41 - 45	2	3	4	9
	36(37.5%)	35 (36.5%)	25 (26%)	96

Graph 2: Number of subjects (%) at different stress levels.

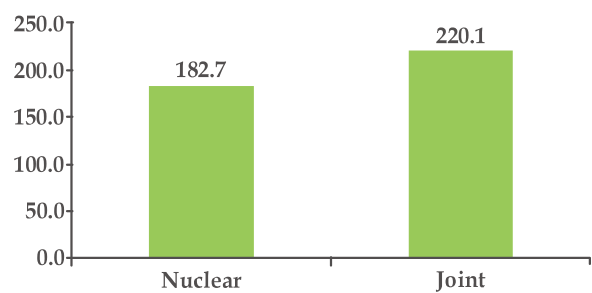


Subjects were categorized into groups as per Holmes and Rahe stress scale. As pregnancy itself can cause stress, mildly stressed women are considered as control (n = 36). Among total number of study subjects 37.5% were mildly stressed, 36.5% were moderately stressed and 26 % were severely stressed.

Relation between Socio-demographic Parameters and Stress:

Family Type (Nuclear/ Joint)

Table 3: Relation between family type (Nuclear/ Joint) and Stress.



Based on the number of members in the family and their relationship, women were categorized into two groups ie, nuclear and joint. Mean and standard deviation of the level of stress in both types were estimated. Nuclear family women had the mean stress level of 182.7±68.4, joint family women had the stress level of 220.1±92.0. Stress level was comparatively higher in women of joint family when compared to women of nuclear family. But no

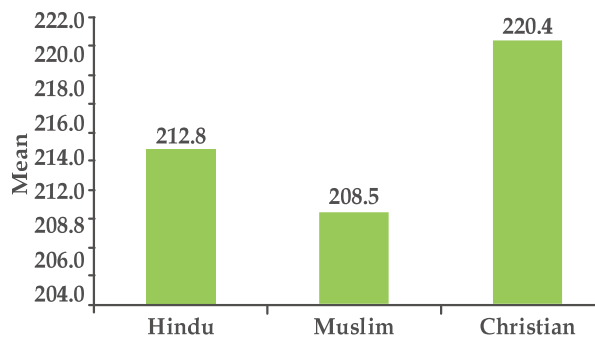
significant difference was observed ie, no significant effect of stress was observed between the two family types.

Religion

Table 4: Relation between religion and stress.

Religion	No. of subjects	Min	Max	Mean	SD	F value	p value
Hindu	48 (50%)	100	408	212.8	96.2		
Muslim	28 (29%)	100	340	208.5	86.6	0.1	0.902
Christian	20 (21%)	120	372	220.4	77.2		

Graph 4: Mean Stress level between Religions.



Graph 4: Mean Stress level between Religions.

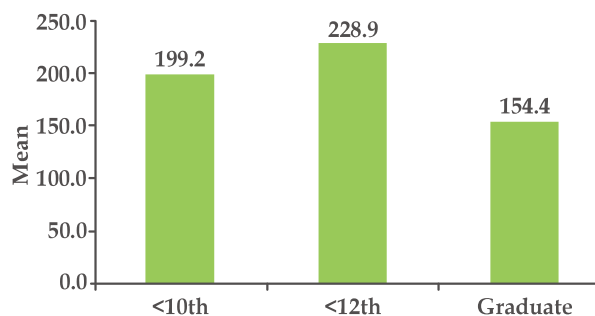
Participants were asked about their religion and categorized into Hindus, Muslims and Christians. The mean stress level in Hindu females was 212.8±96.2, Muslim was 208.5±86.6 and Christian was 220.4±77.2. Very small variation indicates no much difference in the effect of stress on different religions.

Education

Table 5: Relation between educational status and stress.

Education	No. of subjects	Min	Max	Mean	SD	F value	Anova p value
<10th	31 (32%)	104	408	199.2	84.5		
<12th	57 (60%)	100	402	228.9	90.3	3.16	0.047*
Graduate & above.	8 (8%)	100	310	154.4	68.8		

Graph 5: Mean Stress level at different education levels.



Based on education, women were categorized into <10th class, <12th standard and graduates & above. The mean stress levels were 199.2±84.5, 228.9±90.3 and 154.4±68.8 respectively. Stress level was significantly lower in graduates when compared with other categories. It indicates the awareness of well-educated females regarding stress and its adverse effects.

Economic Status

Table 6: Relation between different social class and stress.

Economic status	No. of subjects	Min	Max	Mean	SD	F value	p value
Class I	23 (24%)	100	408	199.3	89.0		
Class II	59 (61%)	100	402	227.5	90.0	2.40	0.097
Class III-V	14 (15%)	104	324	175.1	73.8		

Graph 6: Mean stress level and economic status of subjects.



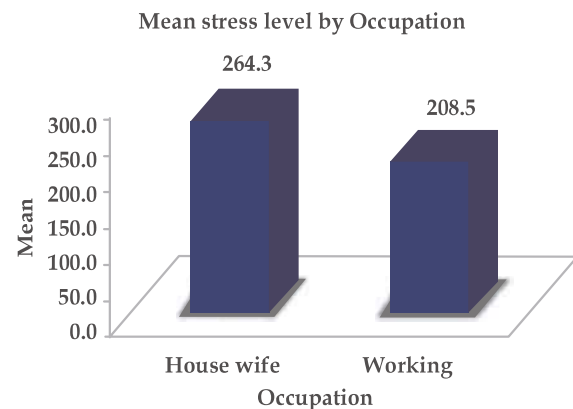
The mean stress level in class I was 199.3±89.0, in class-II was 227.5±90.0 and class III-V was 175.1±73.8. Mean stress in class III-V females was less but was statistically insignificant.

Occupation

Table 7: Relation between occupation of subjects and stress.

Occupation	No. of subjects	Min	Max	Mean	SD	t value	p value
Working	8(8%)	112	394	264.3	98.9		
House wife	88(92%)	100	408	208.5	87.2	-1.7	0.09

Graph 7: Mean stress level vs occupation.



Participants were categorized into working and non-working group. The mean stress levels were 264.3 ± 98.9 and 208.5 ± 87.2 respectively indicating no significant difference. So occupation status may not affect the stress.

Discussion

Studies indicate that about 20% of pregnant women experience severe stress due to marital difficulties, lack of partner, socio-demographic parameters such as low socioeconomic status, occupational status, low literacy rate etc.^{26,27} Our observations revealed that joint and nuclear family patterns do not bear any significant difference in stress levels (table-3). Women belonging to different religious faiths such as Hindu, Muslim and Christian bear the same stress level due to life events, as they have almost same way of living (table-4). In our study we found that formally educated (graduation and above) women are able to deal appropriately with stressful conditions. As only 10% of graduates are either moderately or severely stressed, while stress of this severity is prevalent in more than 60% of the undergraduates (table-5). Education might be helping them to develop coping response or ability to decelerate the stress generated by life events. Though the stressful situations in the life of economically sound and economically poor women are different, the overall stress experienced by women of both economical strata is same. Women of middle economical group experience slightly higher stress, but statistically difference is insignificant (table-6). Mean stress in working women is quite higher as compared to house wives. This might be because working women have to carry out multitasking and meet the professional stress (table-7). Studies indicate that about 20% of pregnant women experience severe stress due to marital difficulties, lack of partner, socio-demographic parameters such as low socioeconomic status, occupational status, low literacy rate etc.^{26,27} Our observations revealed that joint and nuclear family patterns do not bear any significant difference in stress levels (table-3). Women belonging to different religious faiths such as Hindu, Muslim and Christian bear the same stress level due to life events, as they have almost same way of living (table-4). In our study we found that formally educated (graduation and above) women are able to deal appropriately with stressful conditions. As only 10% of graduates are either moderately or severely stressed, while stress of this severity is prevalent in more than 60% of the undergraduates (table-5). Education might be helping them to develop coping response/ability to decelerate the stress generated by life events. Though

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Summary and Conclusion

62.49 % of Indian women are living with stress, of which 35.41% are moderately and 27.08% are severely stressed. Stress is equally prevalent in women of different religious faith. Formally educated women are well equipped to deal effectively with stress than uneducated women in rural India. Mean stress in working women is quite higher as compared to house wives. Chronically stressed women remain in the same stressed state even in the postpartal period.

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