Original Article

Psychosocial Stress during Pregnancy and its Relation to Fetal Outcome: A Study from Patan Hospital, Lalitpur, Nepal

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Abstract

Introduction: Psychosocial stress during pregnancy influences birth-weight, gestational age and intrauterine growth. However, it is not known how stress influences pregnancy in Nepalese women.

Methodology: We conducted a cross-sectional prospective observational study among the pregnant women attending Antenatal Checkup (ANC) at the ANC of Patan Hospital using self-administered questionnaire. Stress was measured by 12-item General Health Questionnaire (GHQ-12) and stressful life events by 21 item modified life events inventory. Sample size was 226. Women who delivered at Maternity ward of the hospital after 28 weeks of gestation, irrespective of the outcome were eligible for analysis.

Results: Low Birth Weight (LBW), prematurity and Intrauterine Growth Restriction (IUGR) were 13(5.8%), 28(13%) and 10(4.4%) respectively. LBW, prematurity and IUGR among the stressed women were 15.9%, 7.5% and 7.5% compared to 10.8%, 4.9% and 2.7% respectively among the non-stressed women. Women with >2 stressful life events were likely to have prematurity (p=0.017) and IUGR (p=0.017). These babies were prone for fetal complications. Women with growth restricted fetus had higher maternal complications (p=0.03).

Conclusion: Stress during pregnancy was associated with prematurity and IUGR. These babies were more prone for fetal and maternal complications. Stressful life events affected adverse pregnancy outcome.

Key words: IUGR; LBW; Nepal; pregnancy; prematurity; stress.

Introduction

Psychosocial stress during pregnancy is not limited only to perinatal outcome, but it plays an important for childhood development[1-4]. A woman, stressed in late second and third trimester of pregnancy, is more likely to have babies to borne premature or with low birth weight. Babies with lower birth weight are borne to women, who experience more than two objective major life events[5-7].

Global studies have showed that stress during pregnancy has adverse effects on fetus, which in turn, affect the developmental milestones of the baby. In Nepal, Psychosocial stress, in pregnant woman, is often overlooked. Although few studies have been done in the past, they had either small sample size or have not looked into the eventual pregnancy outcome. Recall bias also played an important role on the validity of the results of the study[8, 9].

In this study, we made an attempt to fulfill this gap of knowledge on the prevalence of stress among the Nepalese women and its effect on pregnancy outcome. We have already reported the first objective of our study, prevalence of stress in Nepalese women, during

pregnancy to be 35%[10]. In this paper, we are looking into the outcome of pregnancy, as a result of stress in these women.

Methodology

A cross-sectional observational study was conducted in the Antenatal Clinic (ANC) of Patan Hospital between March and December 2012. Study population included pregnant women coming to the ANC clinic of Patan Hospital. Women with singleton pregnancy at 12-18 weeks of pregnancy were enrolled in the study. Women with known co-morbidities during the first trimester of pregnancy were excluded. They were well informed about the objectives of the study and about the voluntary participation. They were assured that unwillingness for participation in the study would not affect the quality of care provided by the hospital. If they agreed for participation in the study, a written informed consent was taken. We took the identifiable information from each respondent in a separate sheet, was coded with a unique identification number and kept by the principle investigator. Those respondents who couldn't be traced in the OPD during the second visit in the scheduled date were contacted by telephone and requested to meet the principle researcher for the follow up interview. Women, enrolled in the study, who did not want to participate further, were excluded from the study.

Interview was conducted using the semi-structured questionnaire for assessment of the psychological stress and distress. Principal investigator offered help to those respondents who needed assistance in completing the questionnaire. Stress was measured using the validated Nepalese version of 12 item General Health Questionnaire and 21 item Modified Life Events Inventory twice during pregnancy, first during the late first trimester or early second trimester between 12-20 weeks of pregnancy and then during the third trimester, mostly between 30-36 weeks of pregnancy. Stress was measured in the Likert Score. The minimum score for each statement was "0" and maximum score was "3". With this, we had scores ranging from 0-36. We assumed the mean value as the limiting point for stress. Women scoring more than mean value were considered as "women with stress" and those with scores below the mean value were considered as "women without stress". Stressful life events were identified using modified life events inventory. Among the listed stressful events in that inventory of the events that in particular will not fit into our social custom were removed. Life events as per modified life events inventory was translated into Nepali Language.

Research tools were validated among a separate population of the pregnant women attending ANC clinic 15 days before the actual data collection among 25 women (10% of the required sample size). In that pre-test, we found no difficulty in using the questionnaire. The average time taken by the respondents was around 7 minutes (5-11 minutes). We changed some dual meaning words in the final questionnaire to improve the understanding of the respondents. We used the two proportion test formula for the sample size calculation. With a hypothesis of 15% difference in fetal outcome in these two groups of women, and with 95% confidence and a power to detect this difference of 80%, sample required was 226. Data entry was done using the Epi Data 3.1 and analysis was done using the SPSS 18 and R software. Data entry was done separately for the first trimester, third trimester and the pregnancy outcome and later on was merged together to a single file containing all the information. Final data was then exported into R software and analysis was conducted over there. For statistical analysis, chi square test was done when cell value >5 whereas Fischer's exact test was done when cell value <5. Logistic regression was done to look for the independent variables associated with low birth weight, prematurity and IUGR.

Ethical approval was obtained from the Institutional Review Board of National Academy of Medical Sciences (NAMS) and from the Institutional review board of Patan Academy of Health Sciences (PAHS).

Results

Demographic Parameters

Age ranged from 18 years to 44 years. Mean age was 25.96 years (Standard deviation of 4.67 years). Median age of the respondents was 25 years. Approximately 76% of the respondents were 20-29 years. 6% of the respondents were in their teenage. 5% of the respondents were above 35 years of age.

Birth weight of the babies ranged from 1025grams to 4200 grams. Mean weight of the babies born to the respondent was 2909 grams (±456 grams). Majority of the babies (87%) born were of normal birth weight as defined by WHO. About 13% of the babies had low birth weight; one percent of them had very low birth weight. Similarly 5.8% of the babies were born premature and 4.4% of the babies had intrauterine growth restriction (IUGR). Low birth weight among the stressed women was 15.9% compared to 10.8% among the women who were not stressed. Similarly, prematurity was 7.5%

among the stressed women compared to 4.9% among the women who were not stressed. IUGR was 7.5% among the stressed women where as it was 2.7% among the women who were not stressed.

Stress in relation to fetal outcome:

Low birth weight occurred more in stressed women compared to women who were not stressed but it was not statistically significant. Similarly, prematurity and IUGR were also higher among the stressed women in comparison to women who were not stressed (Table 1). Presence of more than two stressful life events during first trimester of pregnancy was associated with prematurity (p=0.017) and IUGR (p=0.017) compared to women who experienced two or less stressful life events. Presence of more than two stressful life events in the third trimester was related to prematurity (p=0.037). (Table 1)

Table 1 Stress in relation with LBW, prematurity and IUGR

Stress in relation to fetal Outcome												
	Low birth weight				Prematurity				IUGR			
	Yes	No	Total	P-value	Yes	No	Total	P-value	Yes	No	Total	P-value
First trimester of pregnancy												
Stressed	12	67	79	0.349	6	73	79	0.383	6	73	79	0.089
Non-stressed	16	131	147		7	140	147		4	143	147	
Third trimester of pregnancy												
Stressed	11	66	77	0.534	6	71	77	0.344	4	73	77	0.686
Non-stressed	17	132	149		7	142	149		6	143	149	
Stressful Life Events in relation to fetal outcome:												
	Low birth weight				Prematurity				IUGR			
	Yes	No	Total	P-value	Yes	No	Total	P-value	Yes	No	Total	P-value*
First trimester of pregnancy												
MLI ≤2	20	160	180	0.24	7	173	180	**0.017**	5	175	180	**0.017**
MLI>2	8	38	46		6	40	46		5	41	46	
Third trimester of pregnancy												
MLI ≤2	20	167	187	0.09	8	179	187	**0.037**	6	181	187	0.073
MLI>2	8	31	39		5	34	39		4	35	39	

LBW babies were at risk for fetal complications compared to average weight babies (p=0.001). Premature and IUGR babies were prone for fetal complications compared to term babies (p< 0.001). and normally growing babies (p=0.015) respectively. (Table 2) Maternal complication was significantly associated with intrauterine growth restriction. Women with growth restriction during pregnancy had maternal complications than those without any growth restriction (p=0.03). There was no statistically significant association between maternal complications with prematurity (p=0.07) and low birth weight (p=0.17). (Table 2)

Table 2: Association of Adverse pregnancy outcome with fetal and maternal complications:

	Low birth weight				**Prematurity**				**IUGR**			
	Yes	**No**	**Total**	**P-value**	**Yes**	**No**	**Total**	**P-value**	**Yes**	**No**	**Total**	**P-value**
Fetal complications												
Yes	13	32	45	**0.001**	9	36	45	**<0.001**	5	40	45	**0.015**
No	15	166	181		4	177	181		5	176	181	
Maternal Complications												
MLI ≤2	6	24	30	0.17	4	26	30	0.07	4	26	30	**0.03**
MLI>2	22	174	196		9	187	196		6	190	196	

In our study, pregnant women with less formal education were likely to have IUGR. (Fischer's exact test 0.05). However, there was no association of level of education of the spouse of the respondents with LBW, prematurity and IUGR. Premature rupture of membranes (PROM) was higher in women with stress during 1st trimester but we couldn't have a statistically significant relation between the two variables. Stress during 3rd trimester was related

to IUGR (Table 1). In addition, there was no gestational age specific difference of premature rupture of membrane among these two groups of pregnant women.

A logistic regression predicting low birth weight showed that smoking and drinking alcohol had statistically significant effect on Low birth weight when other parameters were adjusted (Table 3).

Table 3: Logistic regression predicting LBW

	Crude OR(95%CI)	Adj. OR(95%CI)	P(Wald's test)	P(LR-test)
Age (Reference group: <18 years)				0.23
20-34	2.94 (0.86, 10.04)	3.21 (0.84, 12.29)	0.088	
>34	1.64 (0.24, 11.08)	1.64 (0.18, 15.27)	0.662	
Smoking (Reference group: No)				**0.004***
Sometimes	0.52 (0.06, 4.87)	0.08 (0, 1.53)	0.093	
Left after being pregnant	0.2 (0.03, 1.23)	0 (0, 0.2)	0.005	
Alcohol Consumption (Reference Group; No)				**0.009***
Sometimes	3.17 (0.72, 13.98)	13.88 (0.98, 196.46)	0.052	
Left after being pregnant	2.57 (0.32, 20.32)	26.33 (0.69, 1004.84)	0.078	
Standing Hours of Work (Reference Group <4 hours/day)				**0.021***
>4 hours	1.85 (0.53, 6.47)	4.86 (1.05, 22.61)	0.044	
Stress during Pregnancy				
1st Trimester	0.68 (0.31, 1.52)	0.53 (0.18, 1.59)	0.258	0.262
3rd Trimester	0.77 (0.34, 1.74)	1.23 (0.42, 3.64)	0.707	0.706
(Log-likelihood = -72.4093; No. of observations = 226; AIC value = 166.8186)				

Similarly it showed that need of standing work have statistically significant effect on prematurity when other parameters were adjusted but there was no statistically significant relation with need of standing work, hour work, maternal or paternal education, caste, income, family setup, age of the mother, parity etc. A logistic regression of prematurity with the dependent variables showed that need of standing work have statistically significant effect on prematurity when other parameters are adjusted (Table 4), but, there were no statistically significant relation between prematurity and smoking, drinking alcohol, hour work, maternal or paternal education, caste, income, family setup, age of the mother, parity etc. Similarly, logistic regression shows that maternal education, smoking, occupation and need of standing work have statistically significant effect on IUGR when other parameters are adjusted (Table 5).

Table 4: Logistic regression predicting PREMATURY:

	Crude OR (95%CI)	Adj. OR (95%CI)	P(Wald's test)	P(LR-test)
Age (Reference group: <18 years)				0.271
20-34	3.26 (0.64, 16.7)	3.11 (0.54, 17.8)	0.202	
>34	0.69 (0.08, 5.86)	0.88 (0.08, 9.78)	0.915	
Need of Standing Work (Reference Group: No)				
Yes	9.66 (1.23, 75.63)	8.51 (1.05, 69.34)	0.045	**0.01***
Stress during Pregnancy				
1st Trimester	0.61 (0.2, 1.88)	0.63 (0.14, 2.95)	0.558	0.561
3rd Trimester	0.58 (0.19, 1.8)	0.95 (0.21, 4.3)	0.942	0.942
(Log-likelihood = -41.9574; No. of observations = 226; AIC value = 99.9148)				

Table 5: Logistic regression predicting IUGR: No vs Yes

	Crude OR(95%CI)	Adj. OR(95%CI)	P(Wald's test)	P(LR-test)
Ethnicity: (Reference Group: Brahmin)				**0.035**
Chhetri	3.11 (0.35, 27.54)	8.03 (0.62, 104.47)	0.112	
Ethnic group	1.76 (0.46, 6.81)	3.56 (0.53, 23.94)	0.191	
Dalit	8761272.18 (0,∞)	6056022957.8 (0,∞)	0.998	
Education: (Reference Group: No Education)				**0.02***
Secondary	0.7 (0.16, 3.11)	0.8 (0.12, 5.25)	0.818	
HIgher secondary	3.72 (0.37, 36.94)	15.02 (1.01, 222.34)	0.049	
Higher secondary	2.61 (0.26, 26.08)	12.5 (0.33, 476.14)	0.174	
Bachelors and above	7542312.57 (0, ∞)	3185819924.59 (0, ∞)	0.998	
Smoking (Reference Group: No)				**0.04***
Sometimes	0.17 (0.02, 1.72)	0 (0,∞)	0.995	
Left after being pregnant	1849774.45 (0,∞)	1.13 (0,∞)	1	
Occupation (Reference Group: Housewife)				**0.007***
Job	20614164.81 (0,∞)	7837305919334117 (0,∞)	0.995	
Business	1.11 (0.23, 5.5)	2.94 (0.4, 21.8)	0.291	
Need of Standing Work (Reference Group: No)				
Yes	7.07 (0.88, 56.75)	37.23 (2.09, 663.25)	0.014	**< 0.001***
Stress during Pregnancy				
1st Trimester	0.34 (0.09, 1.24)	0.11 (0.01, 1.31)	0.081	0.081
3rd Trimester	0.77 (0.21, 2.8)	17.18 (0.99, 297.09)	0.05	**0.035**
(Log-likelihood = -21.7728, No. of observations = 226, AIC value = 77.5456)				

Discussion

The incidence of prematurity, LBW and IUGR were 13 (5.8%), 28 (13%) and 10 (4.4%) respectively. In a study conducted in Brazil, the incidence of prematurity, LBW and IUGR were 4.2%, 6.5% and 10.8% respectively[6]. The difference in the cultural context, family support and nutrition may have yielded this variation in the results.

Stress and pregnancy outcome:

In our study, Low birth weight, prematurity and IUGR were higher among the stressed women compared to the women who were not stressed. Findings from our study were consistent with those from other studies conducted in Goa[11] and Copenhagen[12]. LBW, prematurity and IUGR were more common in respondents with education of intermediate or less compared to those with an education of under-graduation or more. LBW being 14.8% compared to 10.1%, prematurity being 8.3% compared to 3.3% and IUGR being 7.4% compared to 1.7% (p=0.05) among these groups. There was a statistically significant co-relation of IUGR with the level of education of the respondent. Many researchers have found that lower the level of the maternal education, higher are the rates of LBW and prematurity. This may be accountable to many reasons; these women are less aware about the pregnancy and its consequences, less aware about dietary requirements during pregnancy and are less likely to seek health care at the health institutions.

Premature Rupture of Membrane was higher among the women with stress during third trimester of pregnancy, (15.5% compared to 13.4% in women who did not had stress). Studies have shown mixed association between maternal stress and birth weight[13]. Our results were consistent with results from studies conducted in the other parts of the globe[5, 6, 14]. Consumption of alcohol and smoking, which occur as a result of coping to stress has an

influence in LBW and IUGR[6, 15]. Our study too showed an association of alcohol consumption with LBW and smoking with LBW and prematurity. In our study, low birth weight was more common among respondents with >2 stressful life events compared to respondents with <2 stressful life events (17.4% and 11.1% respectively). Women with >2 stressful life events had more prematurity (p=0.017) and IUGR (p=0.017) compared to women having <2 stressful life events. Our study followed findings from the other studies where women with stressful life events had higher adverse fetal outcomes[16-18].

Conclusion

The incidence of prematurity, LBW and IUGR were higher among the stressed women compared to women who were not stressed during pregnancy. Women with >2 stressful life events had prematurity and IUGR. LBW, prematurity and IUGR were more common in respondents with education of intermediate or less compared to those with an education of under-graduation or more. There was a statistically significant co-relation of IUGR with the level of education of the respondent. Level of paternal education also had similar results but those findings are not statistically significant. LBW babies were more prone for fetal complications compared to average weight babies as were the premature babies and growth restricted babies. With growth restriction during pregnancy, women were more prone for maternal complications than those without any growth restriction. There was no statistically significant association between low birth weight and maternal complications.

Limitations of the study

Study was carried out in the general ANC clinic of Patan Hospital and was not done among the women attending ANC at the private clinics of same Hospital. General Health Questionnaire-12 measures perceived stress; these respondents weren't reviewed by a psychiatrist. So, we couldn't really tell whether they have had a psychiatric morbidity. We got a very few number of premature and IUGR babies. As a result, we were not able to establish relations hip with few of the established factors. Our study was conducted in one of the advanced center in the readily accessible areas of the country. The real scenario of Nepal, where there are few advanced maternal and neonatal care centers and very limited available resources, might be even worse. Further research need to be conducted, in similar settings and with greater sample size in order to determine the clear picture of the association of the stress with fetal outcome in Nepalese women.

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References

1. Kelly Y, Panico L, Bartley M, Mammot M, Najroo J, Sacher A. Why does birthweight vary among ethnic groups in the UK? Findings from the Millennium Cohort Study. J Public Health. 2009;31(1):321-7.
2. Huizink AC, deMedina PSG, Visser HA, Buitelaar JK. Stress during pregnancy is associated with developmental outcome in infancy. Journal of Child Psychology and Psychiatry. September 2003;44(6):810-18.
3. Kajantie E, Raikkonen K. Early life predictors of the physiological stress response later in life. Neurosci Biobehav Rev.35(1):23-32.
4. Rona RJ, Gulliford MC, Chinn S. Effects of prematurity and intrauterine growth on respiratory health and lung function in childhood. BMJ. 1993;306(6881):817-20.
5. Newton RW, Hunt LP. Psychosocial stress in pregnancy and its relation to low birth weight. Br Med J (Clin Res Ed). 1984;288(6425):1191-4.
6. Rondo PHC, Ferreira RF, Nogueria F, Riberio MCN, Lobert H, Artes R. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. European Journal of Clinical Nutrition. 2003;57:266-72.
7. Hedegaard M, Henriksen TB, Secher NJ, Hatch MC, Sabroe S. Do Stressful Life Events Affect Duration of Gestation and Risk of Preterm Delivery? Epidemiology. July 1996;7(4):339-45.
8. Shakya R, Sitaula S, Shyangwa PM. Depression during pregnancy in a tertiary care center of eastern Nepal. Journal of Nepal Medical Association. 2008;47(171).
9. Regmi S, Sligl W, Carter D, Grut W, Seear M. A controlled study of postpartum depression among Nepalese women:

validation of the Edinburgh Postpartum Depression Scale in Kathmandu. Tropical Medicine & International Health. 2002;7(4):378-82.

10. Pantha S, Hayes B, Yadav BK, Sharma P, Shrestha A, Gartoulla P. Prevalence of Stress among Pregnant Women Attending Antenatal Care in a Tertiary Maternity Hospital in Kathmandu. Journal of Womens Health Care. 2014;2014.
11. Patel V, Prince M. maternal psychosocial morbidity and low birth weight in India. British Journal of Psychiatry. 2006;188:284-5.
12. Nordentoft M, Lou HC, Hansen D, Nim J, Pryds O, Rubin P, et al. Intrauterine growth retardation and premature delivery: the influence of maternal smoking and psychosocial factors. Am J Public Health. 1996;86(3):347-54.
13. Istvan J. Stress, anxiety, and birth outcomes: a critical review of the evidence. Psychol Bull. 1986;100(3):331-48.
14. Wisborg K, Barklin A, Hedegaard M, Henriksen TB. Psychological stress during pregnancy and stillbirth: prospective study. BJOG. 2008;115(7):882-5.
15. McAnarney ER, Stevens-Simon C. Maternal psychological stress/depression and low birth weight. Is there a relationship? Am J Dis Child. 1990;144(7):789-92.
16. Lobel M, Dunkel-Schetter C, Scrimshaw SC. Prenatal maternal stress and prematurity: a prospective study of socioeconomically disadvantaged women. Health Psychol. 1992;11(1):32-40.
17. Paarlberg KM, Vingerhoets AJ, Passchier J, Dekker GA, Van Geijn HP. Psychosocial factors and pregnancy outcome: a review with emphasis on methodological issues. J Psychosom Res. 1995;39(5):563-95.
18. Rini CK, Dunkel-Schetter C, Wadhwa PD, Sandman CA. Psychological adaptation and birth outcomes: the role of personal resources, stress, and sociocultural context in pregnancy. Health Psychol. 1999;18(4):333-45.