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PREVALENCE AND ASSOCIATED FACTORS OF ANTENATAL ANXIETY SYMPTOMS IN BANGLADESH: A REPEATED MEASURES CLUSTER DATA ANALYSIS

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SUMMARY

Background: *Antenatal Anxiety affects the mothers and their child. Spontaneous abortion, preeclampsia, preterm birth, and low birth weight are the most common consequences. In Bangladesh, we have very limited understanding about the burden of antenatal anxiety and its associated factors. We conducted a prospective longitudinal study to estimate the prevalence of anxiety symptoms and identify associated factors in pregnant women.*

Subjects and methods: *A total of 1360 pregnant women were enrolled from 14 antenatal care (ANC) hospitals during September 2015 to August 2017. All selected women were assessed longitudinally at first, second and third trimesters of pregnancy. The State Anxiety Inventory (STAI-S) scale was used to measure the antenatal anxiety symptom. Generalize estimating equations (GEE) and alternating logistic regression (ALR) model were used to measure the risk factors and repetitive anxiety symptom measurements, respectively.*

Results: *Over the study period, more than half (53.18%) of the women reported anxiety in at least one antenatal assessment. The prevalence of anxiety symptom in the first, second, and third trimesters was 29.5%, 23.5%, and 37.5%, respectively. Maternal anxiousness was significantly associated with the trimester, poor education, low blood hemoglobin, and low family income.*

Conclusion: *Women were at high risk of getting anxious during first and third trimesters of pregnancy. Findings of the study can be useful in developing and designing intervention to reduce anxiety in women during pregnancy.*

Key words: *antenatal anxiety - prevalence - pregnancy - repeated measures - Bangladesh*

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INTRODUCTION

Anxiety during pregnancy has terrible consequences for the mothers and child, such as spontaneous abortion, preeclampsia, preterm birth, and low birth weight (Zhong et al. 2015, Schetter and Tanner 2012). The prevalence of maternal anxiety were higher (15 to 39%) in low and middle-income countries (Fadzil et al. 2013). The anxiety prevalence was 49% in Pakistan and 28.4% in India (Waqas et al. 2015, Priyambada et al. 2017). In Bangladesh, a cross sectional study reported 29% antenatal anxiety symptoms in two rural communities (Nasreen et al. 2011). Depending on setting and culture, antenatal anxiety may vary in pregnant women (Kang et al. 2016). In Bangladesh, majority of the pregnant women receive primary care from the non-government hospitals.

Focusing on different time points of pregnancy, the rates of anxiety was higher (18.2%) in the third trimester followed by the first trimester (13.1%) and the second trimester (12.2%) (Figueiredo & Conde 2011). However, a reverse trend in the first trimester (19.5%), third trimesters (17.2%), and second trimesters (16.6%) was observed in Spain (Soto-Balbuena et al. 2018). The severe anxiety in India was 48.4%, 11.2%, and 29%, while mild anxiety was 48.6%, 60.6%, and 71% separately in the first, second, and third trimester (Madhavanprabhakaran et al. 2015). As data are unavailable, periodic rates may indicate the more crucial time to take special care of prenatal anxiousness in Bangladesh.

The factors of antenatal anxiety differed in different settings and cultures (Kang et al. 2016). Prenatal anxiety was associated with maternal age, education, employment status, income and ethnicity, lack of support, unwanted pregnancy, psychiatric history, and social conflict (Biaggi et al. 2016). Poor adherence to medical advice, improper nutrition, and resource loss also influenced the prenatal anxiousness (Schetter and Tanner 2012). Another study stated that anemia and hypertension during pregnancy caused prenatal anxiety (Kang et al. 2016). In Bangladesh, a study reported that anxiety was related to illiteracy, weak household economy, lack of practical support, and poor partner relationship (Nasreen et al. 2011).

Given the high prevalence of antenatal anxiety, remarkable variation among trimesters, and economic and cultural practices of setting, and possible adverse outcomes, this study explores the prevalence of anxiety in all three trimesters and risk factors of mothers under antenatal hospital care. The periodic prevalence and the associated nutritional and physiological factors of antenatal

anxiety are not well understood. Extensive and all the topographic data may provide a better picture of anxiety prevalence among pregnant women in this country. Findings of this study would be useful to frame the control measure to reduce anxiety and improve pregnancy outcome. Considering the facts, this study was aimed to estimate the prevalence and associated risk factors of antenatal anxiety symptoms in pregnant women.

SUBJECTS AND METHODS

Study setting and design

This study was conducted among the mothers under antenatal care (ANC) in the 14 community clinics at four districts (Chattogram, Rangamati, Patuakhali, and Barguna) of Bangladesh from September 2015 to August 2017. Chattogram and Rangamati located in the southeastern part, and others in the southwestern regions of Bangladesh. All the ANC units provide low-cost services to the peoples. Some non-governmental organizations (NGOs) operated the clinics, where trained community health promoters (CHPs) provided care to the mothers. Mothers from rural and poor households usually visit clinic for ANC. A two-stage cluster sampling with the proportional allocation method was used to select the clinics and the study participants. Pregnant women of 8 to 12 weeks of gestation were selected randomly from the ANC register for follow up.

Study procedure and ethics

The study protocol was reviewed and approved by the Department of Statistics, University of Chittagong (approval no. 01/09/2015_01). Written permission and the ethical clearance obtained from the authorities of the clinics. All the ethical procedures were performed following the 1964 Helsinki declaration and its later amendments. Written consent obtained from the agreed pregnant mothers after discussing the purpose of the study and confirming the confidentiality of their data. Considering the highest rate of pregnancy psychiatry like anxiety (29%) (Nasreen et al. 2011) and depression (18%, 33%) (Nasreen et al. 2011, Gausia et al. 2009) in earlier research in Bangladesh, taking 5% level of significance, Z value = 1.96 (5% precision), a power of 80%, and the margin of error 2.5%, a single population proportion test was calculated and estimated sample size was 1360. The inclusion criteria was only willing women with gestational age 8 to 12 weeks to the date of first contact. Unwilling women and having any chronic diseases were excluded. We used a pre-structured questionnaire to collect the mothers' information. The prepared questionnaire translated from English to the Bangla version. Initially, data were collected for first trimester of gestation (8 to 12 weeks). The selected women were requested to visit the clinics again during the second (13 to 28 weeks of gestation) and third (29 to 40 weeks of gestation) trimesters.

Study variables

The hypothesized socio-demographic and physiological predictors of anxiety symptom were trimester, mother's age, age of marrying, education, family income, professional status, parity, pregnancy type, and gravida since there was a potential association between antenatal anxiety symptom and age, education, professional status, income, maternal parity, unwanted pregnancy (Nasreen et al. 2011, Brittain et al. 2015) and systolic and diastolic blood pressure (Hildrum 2007). The expected nutritional parameters were mid-upper arm circumference (MUAC), body mass index (BMI), and hemoglobin (Hb) because antenatal anxiety has already found to be associated with inadequate nutrition (Biaggi et al. 2016, van Heyningen et al. 2017).

Assessment of nutritional parameters

MUAC was measured with the Talc insertion tape at the left arm on the freely hanging position midpoint between the acromial process of the scapula and the olecranon processes of the ulna. MUAC was classified into ≤ 24 cm (wasting) and > 24 cm (normal) (Sellen 1995). The self-reported pre-pregnancy weight was obtained during the first-trimester visit and verified in the second-trimester visit to the clinics. The height was measured with a portable Harpenden stadiometer (Holtain Ltd, London, UK). BMI of mothers was calculated using the formula weight/height^2, and classified into underweight (<18.5 kg/m^2), normal (18.5 to 24.9 kg/m^2), overweight (25 to 29.9 kg/m^2) and obese (≥30 kg/m^2) (WHO 2003). Hemoglobin (Hb) level was recoded from the diagnostic report and categorized it as anemic (<11 g/dL) and normal (≥11 g/dL) (WHO 2011).

Assessment of blood pressure

The respondents' blood pressure (BP) examined using a sphygmomanometer in the three trimesters in the resting position of the participants. All measurements were recorded twice, and a confirmatory check was done with a digital BP monitor (Omron, Japan). The average of two readings was considered as final. Women were given 5 minutes rest, before and after the first blood pressure. High normal and normal blood pressure were classified as systolic blood pressure of ≥ 130 mmHg and <130 mmHg, and diastolic blood pressure of ≥85 mmHg and <85 mmHg, respectively (Williams et al. 2004).

Measurements of maternal prenatal anxiety

The State Anxiety Inventory(STAI-S) scale was used to assess mothers' state anxiety, consisting of twenty items self-report questions (Spielberger et al. 1983). All responses were assessed the intensity of current feelings 'at this moment' valued as 1 = not at all, 2 = somewhat, 3 = moderately, and 4 = very much. The anxiety score

range is between 20 and 80. The score was calculated by summing the scores of all the twenty questions. A cut off score of ≥ 45 considered as anxious and < 45 as not-anxious states (Nasreen et al. 2011). The score of the State Anxiety Scale (S-Anxiety) showed right internal consistency in the present study with a Cronbach's alpha of 0.81. The STAI-S has been proven to be reliable and relevant for assessing antenatal anxiety in Bangladeshi women (Nasreen et al. 2011).

Statistical analysis

Descriptive analysis was done to calculate the percentages, mean, standard deviation, and 95% CI of targeted parameters. All continuous variables, except trimester were transformed into the categorical variables for easy interpretation. Cochran's Q statistic for K related samples was used to analyze time differences between trimesters for rates of STAI-S ≥ 45. The generalized estimating equation (GEE) was used to find out the significant parameters of binary anxiety symptom using logit link function. A non-likelihood marginal model deals clustered and longitudinal data using a working correlation structure to capture association within the repeated measures (Liang & Zeger 1986). Three working correlation assumptions, namely unstructured, autoregressive first order or, AR(1) and exchangeability were applied in GEE and compared. The closest standard error of the empirical and model-based estimate will reflect the 'truth' working correlation structure of GEE. Alternating logistic regression (ALR) model was employed to make inferences about the associations through odds ratio (Carey et al. 1993). All analysis was done using the statistical software SAS 9.3 and 5% level of significance was considered with two tailed test.

RESULTS

As shown in table 1 a majority (86.2%) of the mothers were in the age between 19 and 30 years (mean, 24.08 years). Over half (50.2%) of them completed lower secondary education. Most (90.4%) of them were housewives. The family of 52.3% of participants earned ≤ 10,000 BD taka (Bangladesh currency) per month. Less than half (41.8%) of the respondents lived with partners and their families. Just 53.1% had a sufficient arrangements for their delivery. The multigravida mothers were 55.4%, and the nulliparous were 48.8%. Women had the plan to be pregnant were 919 (67.6%). The proportion of women with healthy BMI was 47.5%, and normal MUAC was 55.6%. The majority (61%) of the preganant women were anemic. Mean systolic and diastolic blood pressure were 113.66 (SD 13.16) and 76.06 (SD 9.66), respectively. There are some missing observations occurred in some parameters may be due to personal error of investigators or respondents, unaware of respondents, and any other causes.

Prevalence of anxiety symptom

More than half (53.18%) of the women had antenatal anxiety in at least one trimester. The point prevalence of 1st, 2nd and 3rd trimesters' anxiety was 29.5% (95% CI: 27.07% - 31.99%), 23.5% (95% CI: 21.30% - 25.88%) and 37.5% (95% CI: 34.92% - 40.13%) respectively. Regarding rates of STAI-S ≥ 45, significant differences were found between trimesters [Q(2)=143.52, P<0.001]. The average anxiety score was highest in third trimester (45.50±4.57) followed by first trimester (44.05±3.97) and second trimester (42.49±4.92). The pairwise correlation measurement within patient showed significant association (P<0.01) of anxiety symptom between the first and second (0.39); second and third (0.42); and third and first (0.57) trimesters. This correlation structure may support either one of the aforesaid working correlation assumptions.

Generalized estimating equation (GEE) and alternating logistic regression (ALR) model

Comparing the three working correlation assumptions, the exchangeable correlation structure gave the closest standard error of empirical and model based standard error. As shown in table 2, maternal anxiety was significantly associated with the trimester, education, family income, and the hemoglobin. Anxiety score was (exp (2.1787) or 8.83), (exp (0.7674) or 2.15), (exp (0.8462) or 2.33), 8.83, 2.15, and 2.33 times higher for women with low-level education (≤ 8), family income less than 10,000 BD TK and anemia (Hb, ≤ 11 gm/dL) than those with higher education (>8), more than 10,000 BD TK family income and non-anemic condition (≥11 gm/dL), respectively. The ALR model estimates the association of repeated measures 'alpha1' through odds ratio and found significant. The log odds ratio for any pair of measurement within patient was 1.38. In GEE, the association parameters works as a nuisance and ALR estimates the association parameters of exchangeable working correlation only.

DISCUSSION

Pregnancy anxiety increases the health risk for mothers and their newborns. This study investigates the rates of anxiety symptom throughout the pregnancy and the pertinent risk factors. The factors identified for anxiety symptom were the trimester, education, family income, and hemoglobin.

Research on the prevalence of antenatal anxiety symptom in three trimesters was found very rare, particularly in developing areas. We found U pattern of anxiety rates throughout pregnancy, which was similar in the previous studies (Figueiredo & Conde 2011, Madhavanprabhakaran et al. 2015, Teixeira et al. 2009).

Table 1. Socio-demographic, socioeconomic, obstetric profile of pregnant mothers in ANC hospitals in four districts, Bangladesh, (n=1360)

Parameters	N	%	95% CI	Mean (SD)	Missing (%)
Socio-demographic variables					
Age (in years)					-
≤18 years	107	7.9	6.53; 9.46	24.05 (4.17)	
19-24 years	630	46.3	43.67; 49.04		
25-30	544	40.0	37.38; 42.66		
>30	79	5.8	4.64; 7.21		
Total	1360				
Marital age (in years)					4.6
≤18	697	51.2	48.56; 53.94	18.84 (3.03)	
>18	601	44.2	41.53; 46.88		
Total	1298				
Household living					15.9
With partner	576	42.3	39.71; 45.03		
Partner & family	568	41.8	39.13; 44.44		
Total	1144				
Socioeconomic variables					
Education					15.9
Junior (≤8)	683	50.2	47.53; 52.91		
Higher than junior (>8)	461	33.9	31.38; 36.48		
Total	1144				
Occupation					-
Employed	130	9.6	8.05; 11.26		
Unemployed	1230	90.4	88.75; 91.95		
Total	1360				
Family income (monthly)					19.1
≤10,000 taka	711	52.3	49.59; 54.96	12340 (14336)	
>10000 taka	389	28.6	26.21; 31.09		
Total	1100				
Obstetric variables					
Gravidity					-
Primigravida	606	44.6	41.97; 47.32		
Multigravida	754	55.4	52.68; 58.03		
Total	1360				
Parity					-
Nulliparous	663	48.8	46.06; 51.44		
Primiparous	512	37.6	35.06; 40.28		
Multiparous	185	13.6	11.82; 15.54		
Total	1360				
Conception					15.6
Planned	919	67.6	65.01; 70.06		
Unplanned	229	16.8	14.89; 18.93		
Total	1148				

SD = Standard deviation

Table 2. Parameter estimates of GEE with exchangeable working correlation

Parameters	Estimate	Standard Error	P value
Intercept	-0.8559	0.3449	0.0131
Trimester	0.4078	0.1120	0.0003
Education (≤8 vs.>8)	2.1787	0.7611	0.0042
Family income (BDT) (≤10 thu vs >10 thu)	0.7674	0.3257	0.0185
Hemoglobin (anemic vs. non-anemic)	0.8462	0.3274	0.0098
Alpha1	1.3833	0.3434	<0.0001

Thu = thousand; BDT=Bangladesh Taka; 1 USD = 83 BDT; Alpha1 means the correlation between repeated measures over time within one patient

Another study also reported the relatively high burden of anxiety in the first and third trimesters (Lee et al. 2007). Our study found that more than half of women had antenatal anxiety in at least one trimester which was supported by the Hongkong study (Lee et al. 2007).

The previous research stated rates of anxiety differ in the different trimesters (Teixeira et al. 2009). There are fewer longitudinal investigations on the changing pattern of anxiety during the trimesters of pregnancy. In this study, the point prevalence of anxiety symptom was 29.5%, 23.5%, and 37.5% in first, second, and third trimesters, respectively, which was lower in Portugal (13.1%, 12.2%, and 18.2%) (Figueiredo & Conde 2011), and Spain (19.5%, 16.6%, and 17.2%) (Soto-Balbuena et al. 2018). This lower burden may be due to the high socioeconomic status of the respondents. Regarding the cross-sectional study, the prevalence was highest (40.8%) in second trimester and followed by third trimester (31.4%) and first trimester (27.8%) in India (Priyambada et al. 2017). The prevalence findings are different due to the measuring scale, cut off value, and other factors. The mean anxiety score of our study was higher in third (45.50) trimester compared to first (44.05) and second (42.49) trimesters, which pattern was in accordance with earlier studies (Madhavanprabhakaran et al. 2015, Teixeira et al. 2009).

Antenatal anxiety seems more common in women with low educational achievements (Abuidhail & Abujilban 2014). We found that the education was inversely associated with anxiety, which was in lines of other studies (Nasreen et al. 2011, Kang et al. 2016, Faisal-Cury & Menezes 2007). On the contrary, a study reported women with more years of schooling showed higher anxiety (Karmaliani et al. 2009). However, another research found the level of education was not related to anxiety during pregnancy (van Heyningen et al. 2017). Low-educated women typically get less access to knowledge and support to manage the pregnancy which may increases the level of anxiety. Our study found that the women's family income was inversely associated with the anxiety, which agrees with the findings of other researchers (Nasreen et al. 2011, Verbeek et al. 2019). However, another investigation did not find any association between income and anxiety symptom (Faisal-Cury & Menezes 2007). The family economy is the main driver for purchasing the facilities and goods to maintain pregnancy, and delivery that may reduce the anxiousness among incumbents. Nearly two-thirds of the pregnant women in the developing areas suffer from anemia with poor implications (Vindhya et al. 2019). We found more anxiety among the anemic mothers, which agrees with a Chinese study (Kang et al. 2016). Anemia causes physical weakness and discomfort in mind that may lead to anxiousness. But, another study found no association of anemia with anxiety (Vindhya et al. 2019). Proper monitoring the hemoglobin level and according treatment may semultaneouly reduce the burden of anemia and anxiety of pregnant mothers.

This study is not free from limitations. First, this study conducted in the few community health clinics; therefore, the generalizability of the results is limited. Second, the self-reported anxiety symptom might differ from the clinically-diagnosed anxiety symptom which may increases the chances of overestimation.

CONCLUSION

Anxiety were relatively higher in first and third trimester of pregnancy. Gestational age, education, family income. and hemoglobin were the significant risk factors for determining the antenatal anxiety symptom. Therefore, it is necessary to recognize at-risk women and reduce antenatal anxiety through increasing awareness, educational achievement, economic solvency, and adequate nutrition.

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Contribution of individual authors:

Musammet Rasheda Begum: conceptualization, methodology, investigation, software, formal analysis, original draft preparation, reviewing and editing, visualization and accept final manuscript.

Soma Chowdhury Biswas: conceptualization, methodology, supervision, reviewing and editing, visualization and accept final manuscript.

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