Anxiety and Depression among Pregnant Women and Mothers of Children Under one Year in Sindupalchowk District, Nepal

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ABSTRACT

Background: Common mental disorders such as anxiety and depression among mothers of young children and expectants can silently deteriorate the health of the mother with significant impact on the newborn. The primary aims were to determine the proportion of pregnant women and mothers of children under one year with anxiety and depression and their associated factors in Sindhupalchowk.

Methods: We used the Hopkins Symptom Checklist 25 and a structured questionnaire in a cross-sectional study to collect information from 778 women (164 pregnant women, 614 mothers of children under one year) selected through multi-stage sampling.

Results: Among pregnant women, the study found that 21.3%(95%CI:15.7–28.3) had anxiety and 23.8% (95%CI:17.8–31.0) had depression. Being from the Dalit ethnic group was independently associated with anxiety and depression. Among mothers of children under one year, 18.7% (95%CI:15.7–22.1) had anxiety and 15.2% (95%CI:12.4–18.4) had depression. Among these women, low education level; primary source of family income being agriculture, animal husbandry or labour; history of unplanned pregnancy; and use of tobacco were independently associated with anxiety and history of unplanned pregnancy and use of tobacco were independently associated with depression.

Conclusions: A substantial proportion of women had anxiety and depression with higher odds of anxiety and depression in certain group of women. Targeted health system interventions are needed for improving the psychological well being of women, including pregnant women, as well as newborn health and wellbeing.

Keywords: Anxiety; depression; mothers of children under one year; Nepal; pregnant women.

INTRODUCTION

Antenatal psychological morbidities, especially anxiety and depression are risk factors for adverse obstetric outcomes[1] and neonatal outcomes, especially low birth weight.[2,3] Maternal anxiety can also have distant influences on the newborn, like negative emotionality and poor attention regulation in infants,[4] and maternal depression has been found to be associated with early childhood underweight and stunting.[5] The estimated global prevalence of anxiety disorders is 7.3%.[6] In Nepal, among women aged 18-65 years the prevalence of anxiety is 17.8%, depression 5.4% and co-morbid anxiety and depression 7.5%.[7] However, there are limited studies on anxiety and depression during pregnancy or late postpartum. The primary aims were to determine the proportion of women with anxiety and depression during pregnancy and the year after pregnancy and to identify the factors associated.

METHODS

This study was a part of a broader cross-sectional study on alcohol consumption during pregnancy and in the

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postpartum period among women who were currently pregnant or with a child under one year old.[8]

The geographical area of the study was the rural mountain district of Sindhupalchowk in Nepal, which had the highest prevalence of alcohol drinking among married women of reproductive age.[9] We selected participants through multi-stage sampling, with the purposive selection of 12 village development committees (VDCs) out of a total of 79 VDCs in the first stage to cover three different regions of the district. We then selected four wards from each of the 12 VDCs using a lottery method and we included all the women currently pregnant or with children under one year from these wards in the study using the list prepared with the support of female community health volunteers (FCHVs).

We interviewed a total of 778 women (164 currently pregnant women and 614 mothers of children under one year). Trained health professionals collected the data in personal interviews. We used the Nepali version of the Hopkins Symptom Checklist 25 (HSCL 25), which has already been validated in the Nepalese context[10] to measure anxiety and depression. HSCL 25 has been used several times in Nepal in other studies as well.[11] In addition, we used a structured questionnaire to measure alcohol intake and to capture information related to reproductive health history and background information among participating women. We calculated increased anxiety and depression using the cut off values (see next section) for each among pregnant women and mothers of children under one year separately to present the proportion of women having anxiety and depression according to various background characteristics. The study also looked at the factors associated with anxiety and depression among the two groups of women. The detailed methodology is explained elsewhere.[8]

We used all of the 25 questions in the HSCL 25 during data collection, however, we excluded item number 4 in the depression sub-scale of HSCL 25, which asks about loss of sexual desire, from the analysis.[12] The dependent variables were level of anxiety, level of depression, and co-morbid anxiety and depression. We defined them as follows. Using the 10 items in the sub-scale for anxiety in the HSCL 25, we summated the scores in each of the 10 items; and categorized a score of ≥17.5 as 'increased level of anxiety' and a total score below that as 'normal level of anxiety'. Similarly, for depression, we calculated a total score for the 14 items from the sub-scale for depression (excluding the item on sexual desire); and categorized a score of ≥24.5 as 'increased level of depression' and a total score below

that as 'normal level of depression'.[13] The independent variables were age, ethnicity, family type, level of education, primary source of income, previous history of pregnancy wastage (e.g., miscarriage or still birth), current maternal status, planned pregnancy, current drinking, drinking category, and current use of tobacco, plus one composite variable including level of education and primary source of income. Many of these variables are used as per the definition in the previous article.[8] Some of the variables not explained earlier are as follows. Previous history of pregnancy wastage: Yes or no. Planned pregnancy: Recent or current pregnancy planned or not. Current drinking: At least one standard drink of alcohol in the past 30 days, yes or no. Heavy drinking: Average number of standard drinks per day in the past 30 days, heavy drinkers (≥5 drinks on average per day) and non-heavy drinkers (<5 drinks on average per day). Current use of tobacco: Smoking or consuming smokeless tobacco in the past 30 days, yes or no.

The ethical review board of the Nepal Health Research Council (Registration No. 124/2014, approved 31 July 2014) and the Regional Ethics Committee (REK) Norway (REK Number 2014/1243 Sor-ost A) ethically approved the study. Interviewers obtained informed written consent from all the participants in the study before the interviews were conducted and maintained privacy during the interview. We ensured confidentiality and anonymity during the data storage, analysis and presentation.

We entered the data using EpiData Version 3.1, followed by data cleaning in SPSS version 16. We then exported the data to STATA and analysed using STATA SE 14. For the results on anxiety and depression (both proportion and logistic regression), we carried out a separate analysis for pregnant women (n=164) and for mothers of children under one year (n=567). Among mothers of children under one year (614), we excluded 47 women at 2 months postpartum from the analysis to exclude postpartum depression from the results. We included individual independent variables having an association with the dependent variable in uni-variable logistic regression with p value <0.25[14] in the multivariable logistic regression. We tested the goodness of the fit of the model with Hosmer-Lemeshow test. We have presented the results from the logistic regression as adjusted odds ratio with 95% CIs.

RESULTS

Table 1 gives an overview of the background characteristics of the women interviewed and the distribution of the independent variables used in

this study. It also presents the distribution of these characteristics among the different ethnic groups among all women in the study. Of the total women, 67% were aged 16 to 25 years. The age distribution was similar in all three ethnic categories. Two third (67%) women lived in either a joint family or extended family. Just above one third (35%) of the women had high education (defined as ≥10 years/secondary education); however, this varied by ethnic group with Dalit women having lowest proportion with high education. The proportion of women with high education and primary source of income as employment or business was 28%, largely made up of women from upper caste groups (47%). Around 11% of total women had a previous history of pregnancy wastage and a similar proportion of women reported that their current or most recent pregnancy had not been planned. These two factors were slightly higher among Dalit women. Overall, 36% of women reported current drinking in the last 30 days, highest (56%) among disadvantaged and janajati women. A total of 8% of women reported heavy drinking and 7% current use of tobacco.

Table 1. Background characteristics by ethnicity.								
	Total women (n=772ᵃ)		Upper caste (n=268)		Dalits (n=79)		Disadvantaged & janajatis (n=425)	
Age category	%	95% CI	%	95% CI	%	95% CI	%	95% CI
16-25 years	67.1	63.7-70.3	67.5	61.7-72.9	67.1	55.9-76.6	66.6	62.0-70.9
26-45 years	32.9	29.7-36.3	32.5	27.1-38.3	32.9	23.4-44.0	33.4	29.1-38.0
Family type								
Joint or extended	66.8	63.4-70.0	69.0	63.2-74.3	48.1	37.3-59.1	69.6	65.1-73.8
Nuclear	33.2	29.9-36.6	31.0	25.7-36.8	51.9	40.9-62.7	30.4	26.2-34.9
Level of education								
High (equal to or more than 10 years/secondary education)	34.6	31.3-38.0	57.1	51.1-62.9	7.6	3.4-16.0	25.4	21.5-29.8
Low (illiterate, informal education, less than 10 years/secondary education)	65.4	62.0-68.7	42.9	37.1-48.9	92.4	84.0-96.6	74.6	70.2-78.5
Primary source of income								
Employment, including self-owned business and foreign employment	62.6	59.1-65.9	73.9	68.3-78.8	49.4	38.5-60.3	57.4	52.6-62.0
Agriculture, including animal husbandry and labour	37.4	34.1-40.9	26.1	21.1-31.7	50.6	39.7-61.5	42.6	37.9-47.4
Previous history of pregnancy wastage								
Having a previous history of pregnancy wastage	10.5	8.6-12.9	9.0	6.1-13.0	15.2	8.8-25.0	10.4	7.8-13.6
Planned pregnancy (current or last pregnancy)								
Unplanned pregnancy	11.4	9.4-13.9	11.2	7.9-15.6	17.7	10.7-27.8	10.4	7.8-13.6
Current drinking (drank in last 30 days)								
Current alcohol drinking	35.5	32.2-38.9	3.7	2.0-6.8	36.7	26.8-47.9	55.8	51.0-60.4
Heavy drinking (drank >= 5 drinks on average per day) based on last 30 days drinking								
Heavy drinking	7.6	5.9-9.7	1.1	0.4-3.4	5.1	1.2-12.8	12.2	9.4-15.7
Current use of tobacco (smoke or smokeless)								
Current use of tobacco	6.9	5.4-9.0	4.1	2.3-7.3	12.7	6.9-22.0	7.8	5.6-10.7
Education secondary or above and primary source of income employment/business								
Yes	28.3	25.2-31.6	47.4	41.5-53.4	7.6	3.4-16.0	20.0	16.5-24.1

ᵃSix participants were excluded (five belonging to the non-Dalit Tarai caste groups and one from Muslim and other religious minorities); of these, one was a pregnant woman and five were women with children under 1 year.

Of the pregnant women interviewed, 21% had an increased level of anxiety and 24% had an increased level of depression (Table 2). The proportion of pregnant women having co-morbid anxiety and depression was 14.6% (95%CI:10.0-21.0) (table not shown). A higher proportion (27%) of women aged 26-45 years had anxiety, while depression was higher (25%) among the younger women (16-25 years). A high proportion of Dalit women were found to have an increased level of anxiety (44%) and depression (50%)(Figure 1).
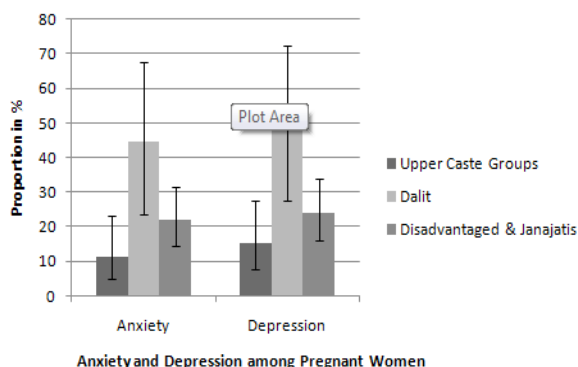

Figure 1. Proportion of pregnant women with anxiety and depression by ethnicity

A higher proportion of women with low education, previous history of pregnancy wastage, unplanned pregnancy or who reported current drinking had increased levels of anxiety and depression compared to their counterparts. The prevalence of anxiety was higher among pregnant women who were current users of tobacco and depression was slightly higher among those who did not consume tobacco (Table 2).

Among the mothers of children under one year, 19% had an increased level of anxiety and 15% had an increased level of depression (Table 2). Co-morbid anxiety and depression was found among 11.5% (95% CI: 9.1-14.4) (table not shown). A higher proportion of mothers of the older age group (26 to 45 years) had anxiety. Like the results for pregnant women, a higher proportion of Dalit women had increased levels of anxiety and depression. Anxiety was also higher among mothers living in a nuclear family and those with a low level of education.
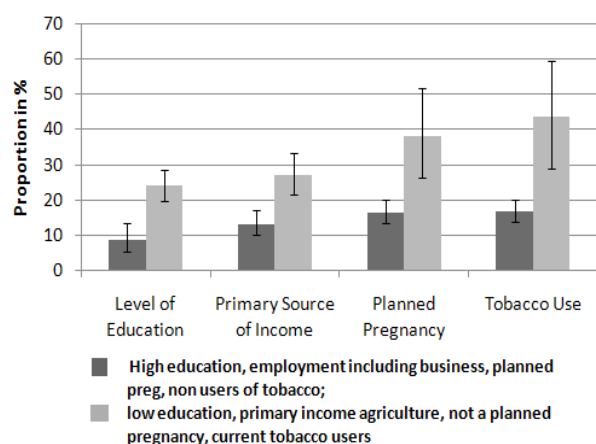
Pregnant women from the Dalit ethnic group had nearly seven times higher odds of having an increased level of anxiety and nearly five times higher odds of having an increased level of depression than those from upper caste groups (Table 3).

Table 2. Proportion of anxiety and depression by various categories.						
		Pregnant women (n=164[a])			Mothers of children under 1 year (n=567[a])		
		n	Anxiety % (95% CI)	Depression % (95% CI)	n	Anxiety % (95% CI)	Depression % (95% CI)
Total		164	21.3(15.7-28.3)	23.8(17.8-31.0)	567	18.7 (15.7-2.1)	15.2(12.4-18.4)
Age	16-25 years	123	19.5(13.4-27.6)	25.2(18.2-33.7)	367	15.5(12.2-19.6)	13.3(10.2-17.2)
	26-45 years	41	26.8(15.3-42.6)	19.5(9.9-34.8)	200	24.5(19.0-31.0)	18.5(13.7-24.5)
Ethnicity [b]	Upper caste	53	11.3(5.1-23.2)	15.1(7.6-27.6)	193	15.0(10.6-20.8)	12.9(8.9-18.5)
	Dalits	18	44.4 (23.4-67.7)	50.0(27.7-72.3)	56	35.7(24.2-49.1)	25.0(15.3-38.1)
	Disadvantaged & janajatis	92	21.7 (14.4-31.4)	23.9(16.2-33.8)	313	18.2(14.3-22.9)	15.0(11.4-19.4)
Family type	Joint or extended	114	21(14.5-29.6)	25.4(18.2-34.3)	378	15.6(12.3-19.6)	15.1(11.8-19.1)
	Nuclear	50	22.0(12.5-35.8)	20.0(11.0-33.6)	189	24.9(19.2-31.5)	15.3(10.8-21.2)
Level of education	High (≥10 years/ secondary education)	56	17.9(9.8-30.3)	17.8(9.8-30.3)	196	8.7(5.4-13.5)	8.2(5.0-12.9)
	Low (illiterate, informal education, <10 years education)	108	23.1(16.1-32.1)	26.8(19.3-36.1)	371	24.0(19.9-28.6)	18.9(15.2-23.2)
Primary source of income	Employment, including self-owned business and foreign employment	114	22.8(15.9-31.5)	25.4(18.2-34.3)	346	13.3(10.1-17.3)	11.3(8.3-15.1)
	Agriculture, including animal husbandry and labour	60	18.0(9.5-31.4)	20.0(11.0-33.6)	221	27.1(21.7-33.4)	21.3(16.3-27.2)

Previous history of pregnancy wastage	Yes	22	31.8(15.6-54.1)	36.4(18.9-58.3)	56	19.6(11.1-32.2)	8.9(3.7-19.3)
	No	142	19.7(13.9-27.2)	21.8(15.7-29.5)	511	18.6(15.4-22.2)	15.8(12.9-19.3)
Planned pregnancy (current or last pregnancy)	Yes	140	20.0(14.1-27.5)	22.8(16.6-30.6)	512	16.6(13.6-20.1)	12.7(10.1-15.9)
	No	24	29.2(14.3-50.5)	29.2(14.3-50.5)	55	38.2(26.3-51.7)	38.2(26.3-51.7)
Current drinking (drank in last 30 days)	Yes	51	25.4(15.3-39.4)	29.4(18.4-43.4)	206	22.3(17.1-28.5)	19.4(14.5-25.4)
	No	113	19.5(13.1-27.9)	21.2(14.6-29.8)	361	16.6(13.1-20.8)	12.7(9.7-16.6)
Heavy drinking (drank >= 5 drinks on average per day) based on last 30 days drinking	Heavy drinking	8	25.0(5.6-65.1)	12.5(1.5-57.7)	45	26.7(15.7-41.5)	28.9(17.4-43.8)
	No heavy drinking	156	21.1(15.4-28.3)	24.3(18.2-31.8)	522	18.0(14.9-21.5)	14.0(11.2-17.2)
Current use of tobacco (smoke or smokeless)	Yes	10	30.0(9.2-64.3)	20.0(4.6-56.4)	39	43.6(28.9-59.5)	35.9(22.4-52.1)
	No	154	20.8(15.0-28.0)	24.0(17.9-31.5)	528	16.8(13.9-20.3)	13.6(10.9-16.8)
Education secondary or above and primary source of income employment/ business	Yes	47	21.3(11.7-35.5)	19.1(10.1-33.2)	161	22.4(18.6-26.7)	18.2(14.7-22.3)
	No	117	21.4(14.8-29.8)	25.6(18.5-34.4)	406	9.3(5.7-14.9)	7.4(4.3-12.7)

[a] Forty-seven women at two months postpartum were excluded from the analysis to exclude postpartum depression from the results. [b] Six participants were excluded (five belonging to the non-Dalit Tarai caste groups and one from Muslim and other religious minorities); of these, one was a pregnant woman and five were women with children under 1 year.

Figure 2. Proportion of mothers of children under one year with anxiety according to education, primary income source, planned pregnancy and tobacco

Mothers of children under one year who had a low level of education (illiterate, informal education or less than secondary level education) had five times higher odds of having an increased level of anxiety compared to those with secondary level education or higher. Similarly, the odds of having an increased level of anxiety was nearly two times higher among mothers who had agriculture, animal husbandry or labour as their primary source of income, compared to those with employment, self-owned business or husband's foreign employment as their primary source of income (Table 4).

Mothers of children under one year whose last pregnancy was not planned had two and half times higher odds of having an increased level of anxiety and three and half times higher odds of having an increased level of depression than those who had had a planned pregnancy. Mothers who were current users of tobacco (either smoking or smokeless) had two and half times higher odds of having an increased level of anxiety as well as an increased level of depression, compared to those not using tobacco (Table 4).

Table 3. Logistic regression of factors associated with anxiety and depression among pregnant women (n=164).

	n	Anxiety		Depression	
	164	aOR[a]	95% CI	aOR[a]	95% CI
Ethnicity[b]					
Upper caste	53	1	1	1	1
Dalit	18	**6.65**	**1.69-26.32**	**4.79**	**1.31-17.34**
Disadvantaged &janajatis	92	2.29	0.78-6.71	1.56	0.59-4.14
Level of education					
High (equal to or more than 10 years/ secondary education)	56	1	1	1	1
Low (Illiterate, Informal education, less than 10 years/secondary education)	108	0.78	0.30-1.99	1.17	0.47-2.89
Previous history of pregnancy wastage					
No	142	1	1	1	1
Yes	22	1.65	0.59-4.63	1.68	0.62-4.57

[a] Adjusted for all covariates used in the table, [b]One case was excluded from ethnicities(from Muslim and other religious minorities).
Note: Only 3 variables had p<0.25 in bivariate analysis; hence, they are taken to the model. The goodness of fit was tested with Hosmer-Lemeshow test. Significant adjusted odds ratios are presented in bold letters

Table 4. Logistic regression of factors associated with anxiety and depression among mothers of children under one year, excluding the 47 women in postpartum period (n=567).

	N	Anxiety		Depression	
	567[a]	aOR[b]	95% CI	aOR[b]	95% CI
Age category					
16-25 years	367	1	1	1	1
26-45 years	200	1.23	0.76-2.02	0.94	0.55-1.59
Ethnicity[c]					
Upper caste	193	1	1	1	1
Dalits	56	1.73	0.80-3.73	1.28	0.55-2.98
Disadvantaged & janajatis	313	1.06	0.58-1.95	0.88	0.45-1.69
Family type					
Joint or extended	378	1	1	-	-
Nuclear	189	1.45	0.90-2.33	-	-
Level of education					
High (equal to or more than 10 years/secondary education)	196	1	1	1	1
Low (illiterate, informal education, less than 10 years/secondary education)	371	**4.99**	**1.12-22.23**	1.56	0.49-4.93
Primary source of income					
Employment, including self-owned business and foreign employment	346	1	1	1	1
Agriculture, including animal husbandry and labour	221	**1.84**	**1.08-3.12**	1.30	0.73-2.32
Planned pregnancy (current or last pregnancy)					
Yes	512	1	1	1	1
No	55	**2.44**	**1.26-4.70**	**3.43**	**1.78-6.62**
Current drinking (drank in last 30 days)					

No	361	1	1	1	1
Yes	206	0.89	0.50-1.57	1.12	0.60-2.08
Heavy drinking (drank >= 5 drinks on average per day) based on last 30 days drinking					
No heavy drinking	522	1	1	1	1
Heavy drinking	45	0.74	0.31-1.75	1.19	0.51-2.81
Current use of tobacco (smoke or smokeless)					
No	528	1	1	1	1
Yes	39	2.49	1.15-5.39	2.45	1.10-5.46
Education secondary or above and primary source of income employment/business					
Yes	161	1	1	1	1
No	406	0.32	0.06-1.62	1.20	0.31-4.57

[a] 47 women in their postpartum period were excluded from the analysis, [b] Adjusted for all covariates used in the table, [c] Five cases were excluded from ethnicities (belonging to non-Dalit Tarai caste groups).
Note: Only the variables had p<0.25 in bivariate analysis, has been used in the model. The goodness of fit was tested with Hosmer-Lemeshow test. Figures in bold indicate significant relationship.

DISCUSSION

This study found that around one in every five pregnant women in Sindhupalchowk had increased level of anxiety and nearly one in four had increased level of depression. Being from the Dalit ethnic group was independently associated with both anxiety and depression. Nearly one in five mothers of children under one year old had anxiety and 15% depression. The factors independently associated with anxiety among these women were low level of education; primary source of income being agriculture, animal husbandry or labour; history of unplanned pregnancy; and tobacco use.

The prevalence of anxiety in this study is similar to the national prevalence of anxiety (18%)in Nepal among women(18-65 years). However, the prevalence of depression appears to be much higher, than the national prevalence of depression (5%) among women (18-65 years).[7] This could be due to methodological differences between this study and the national survey, as well as the limited geographical focus of this study (only one district). A recent systematic review of common mental disorders including anxiety and depression in low and middle-income countries found their prevalence to be 16% during pregnancy and 20% during the postpartum period.[15]

The prevalence of anxiety and depression were both higher among pregnant women, than during the post-delivery period. This could be because women with two months post partum were exclude from the analysis(and most of those included were more than six months postpartum),so any initial anxiety and depression related to motherhood would have come down. These results are higher than found by a study on the prevalence of antenatal depression (9%) among women attending an antenatal clinic in India.[16] They are also higher than the results found by a study involving pregnant women from multi-ethnic populations attending an antenatal clinic in Oslo between 2008 and 2010, which found the prevalence of depression to be 17.5% among South-Asian women.[17]

The prevalence of co-morbid anxiety and depression (12%) among mothers with children under one year, is lower than the prevalence of common mental disorders among mothers with children under one year visiting a child health clinic in Malawi (30%),[18] a low-income country in Africa. Similarly, another study among mothers of children aged 0-36 months in Tanzania another low income country similar to Nepal showed a higher prevalence of common mental disorders (29%).[19]

Psychological conditions among women during their pregnancy and in the postpartum period pose a challenge in countries like Nepal where the health systems are not yet prepared to provide mental health services to the population as they lack specialist mental health professionals and a reliable supply of medication.[20] In 2016, 69% of pregnant women made 4+ antenatal care (ANC) visits for their last birth in Nepal.[21] And those not visiting the health facility during their pregnancy pose further challenge. This increases the complexity of addressing the need for mental health services in countries like Nepal, especially for vulnerable groups such as pregnant women.

Dalits in Nepal are still subjected to caste-based discrimination and, generally have a relatively low socioeconomic status.[22] People from this ethnicity are regarded as 'untouchable', even though such

discrimination is illegal in Nepal. In this study, Dalit women were nearly seven times at higher odds of having anxiety and nearly five times higher odds of having depression than women from upper caste groups. This is consistent with another study from Nepal, which found anxiety to be almost five times higher among Dalits than people from other ethnic groups. And it also showed that the association between belonging to the Dalit ethnic group and depression was explained by mediators such as stressful life events, number of livestock and household income.[23] Global literature also depicts a strong relationship between lower socioeconomic status and depression[24] and the frequent occurrence of common mental disorders among socially-disadvantaged groups of people.[25]

Among mothers of children under one year, we found low education to be associated with anxiety. Perhaps a higher level of education would have led to more financial security or could have helped these women to better manage the factors associated with their anxiety. Similarly, primary source of income was also linked to anxiety, with those having agriculture, animal husbandry or labour as their primary source of income being more likely to have anxiety than those who had employment, self-owned business or foreign employment as their primary source. This finding is supported by a systematic review of common perinatal mental disorders among women in low and middle-income countries, which also found socioeconomic disadvantage to be one of the risk factors for anxiety.[15] These two factors however, in the current study, were associated only with anxiety and not with depression, which could be because of small sample size as well as other socio-cultural factors that are not measured in the study.

We found that women whose pregnancies were not planned had nearly three and half times higher odds of having depression and two and a half times higher odds of having anxiety than those who had planned pregnancies. This is supported by other studies. One study found that unplanned pregnancy (nearly twice as likely) and poorly-timed pregnancy (nearly three and half times) were significantly associated with major depressive episodes, even after adjusting for the covariates.[26] Similarly, findings from a study using a subset of birth records from the New York state-wide perinatal data system showed that women with unintended pregnancies were more likely to report severe or moderate prenatal depression symptoms.[27] Still further studies have reported a greater likelihood of depressive symptoms among women who have unintended pregnancies.[28]

Among mothers of children under one year, we found tobacco use (smoking or smokeless) to be associated with anxiety. This finding is similar to a study carried out by the Pregnancy Risk Assessment Monitoring System in the United States using 2009–2011 population-based data on women with live births, which found that women who currently had anxiety or depression were more likely to have smoked pre-pregnancy or prenatally.[29] A multi-centre study in France among pregnant women found depressive disorders to be more frequent among smokers compared to non-smokers.[30] Higher depression scores were independently associated with increased odds of continued smoking in pregnancy in a study conducted on university-based outpatient research clinic in the United States.[31] Although only a small number of women consumed tobacco in this study, the findings are consistent with the global evidence.

Although alcohol was found to affect anxiety and depression in several other studies,[32,33] this link was not found in this study. This could be because alcohol consumption in the Nepalese context is largely determined by ethnicity and socio-cultural factors, as seen in other studies where being from a Dalit group or disadvantaged ethnic group independently predicted alcohol consumption by women.[9]

This study had certain strengths and limitations. In terms of strengths, the study made use of standard instruments for data collection by a group of trained public health and nursing graduates under the close supervision of the authors. Data collection was done by female enumerators to ensure that the participants were comfortable and to maximise the accuracy of the responses. Alike other studies, this research also has some limitations. The external validity of the study is limited as it was conducted in a purposively-selected district. The data collection for this study was carried out just before the Nepal Earthquake in April 2015, and the study district of Sindhupalchowk was one of the hardest hit; hence, the psychological wellbeing of the people who survived may be different now and specific sets of interventions based on the findings from this study might not match current needs. Furthermore, this research has not captured other factors such as husband's characteristics including education, age at marriage, age at pregnancy, family income, husband's support during pregnancy which might affect mental conditions such as anxiety and depression, and are the limitations. These might be the scope of further research. Nevertheless, the findings of this study may be useful in designing interventions for pregnant women and mothers of children under one year in Nepal, although further research would be needed to

test the suitability of such interventions. At a minimum, the study establishes a need for interventions to address anxiety and depression in such women.

CONCLUSIONS

This study found that a substantial proportion of pregnant women and mothers of children under one year from the mountainous district of Sindhupalchowk in Nepal had an increased level of anxiety and depression. Ethnicity appears to be a crucial factor associated with anxiety and depression in this study among pregnant women. Low education, primary source of income being agriculture, animal husbandry or labour, a history of unplanned pregnancy and tobacco use were factors independently associated with anxiety and depression among mothers of children under one year. Based on the findings of numerous studies around the globe, anxiety and depression has a serious impact on the health of the mother and child, especially around during the perinatal period. Targeted health interventions, especially for women from marginalized groups, areneeded to promote maternal and newborn health and wellbeing in Nepal. Antenatal and postnatal screening for anxiety and depression with targeted awareness as well as behaviour change interventions could be useful as part of health system interventions for improving the psychological wellbeing of women, including pregnant women, as well as newborn health and wellbeing.

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