

# Alcohol Consumption during Pregnancy and Postpartum Period and its Predictors in Sindhupalchowk District, Nepal

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## ABSTRACT

**Background:** A substantial proportion of women in Nepal consume alcohol and homebrewed alcoholic beverages are the most common type of alcohol. Alcohol being a part of tradition and culture in Nepal and evidences suggesting even low to moderate dose of alcohol having impacts on the birth outcomes, we aimed at exploring the alcohol consumption pattern during pregnancy and postpartum period along with its predictors.

**Methods:** We studied all pregnant and recently delivered women using quantitative methods in selected wards within selected Village Development Committees of Sindhupalchowk district in Nepal after purposively choosing the district. We present the findings on pregnancy and postpartum period drinking and its predictors as proportion and adjusted odds ratio along with 95% CI.

**Results:** One-third of women drank alcohol during pregnancy and 43% during postpartum period. Nearly all drinking women mostly consumed homebrewed alcoholic beverages such as jaad/chhyang/localraksi. One-third consumed it daily during pregnancy, while three-quarters consumed daily during postpartum. One-fifth of currently drinking women drank  $\geq 5$  standard drinks on average per day in the last 30 days. Illiterate or women with low level of education were three times more likely to consume alcohol during pregnancy than women with secondary level education or higher. Similarly, women who didn't know that alcohol during pregnancy affects mother and child were four and half times more likely to consume alcohol during pregnancy than those who knew about it. Also, being dalits, disadvantaged and janajatis, husband's drinking and home brewing of alcohol were strongly associated with women's drinking during pregnancy and postpartum period.

**Conclusions:** A substantial proportion of women consumed alcohol during pregnancy and postpartum period with high consumption frequency. Findings suggested, increasing awareness about consequences of drinking during pregnancy and postpartum period would be helpful probably as one of the components of routine antenatal care with a special focus to ethnic groups such as dalits, disadvantaged janajatis including relatively advantaged janajatis as well as the women with lower levels of education. Culture sensitive behavior change communication interventions aimed at reducing home brewing and husband's drinking would also be important

**Keywords:** Alcohol consumption; home brewed; Nepal; postpartum period; pregnancy; predictor.

## INTRODUCTION

Alcohol during pregnancy causes harmful effect on mother, but may have devastating effects on the developing fetus.<sup>1</sup> Light to moderate alcohol during pregnancy, and occasional binge drinking, has been associated with, mainly behavioral or intellectual problems, but also with increased chance of fetal death.<sup>1-5</sup> Extreme prematurity has also been associated

with alcohol use during pregnancy.<sup>6</sup> A substantial proportion of pregnant women and women of childbearing age consume alcohol in developed countries<sup>1,7,8</sup> despite alcohol being clearly established as a teratogen since the 19th century. Systematic reviews on low risk drinking by pregnant women shows effect on birth outcome such as intrauterine growth retardation, spontaneous abortion, preterm labour, and gross malformation.<sup>9,10</sup> In Nepal,

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prevalence of current alcohol drinking was 11.8% among married women of reproductive age (MWRA).<sup>11</sup>

Pre-pregnancy alcohol consumption has been consistently identified as predictors of prenatal alcohol use.<sup>12</sup> A large proportion of alcohol users consume home brewed alcoholic beverages<sup>11,13</sup> and many traditional users consume some of the non-distilled alcoholic beverages as food.<sup>14</sup> As the consumption of these beverages is associated with tradition, it is very much likely that women in certain ethnic communities continue drinking these alcoholic beverages to their pregnancy and postpartum period. We aimed at exploring the alcohol consumption practice during pregnancy and postpartum period, and predictors in Sindhupalchowk district, Nepal.

## METHODS

A cross-sectional analytical study was carried out from

the diversity of high mountains to lowlands within a same district. Population characteristics by ethnic groups depicts a high proportion (34%) of Tamang ethnicity, one of the disadvantaged janajatis groups, followed by 18% of Chhetri one of the upper caste groups. The dalits, relatively advantaged janajatis and disadvantaged janajatis in total make up more than 70% among the total population (287,798) of the district.<sup>15</sup>

Out of 79 village development committees (VDCs) in the district, we selected 12 of them purposively from three different areas on the basis of road network. Four VDCs were selected around the district headquarter including Chautara, Batase, Sangachok, Thulosirubari; five VDCs (Fulpingdada, Ramche, Mankha, Tatopani and Thokarpa) from the northern side and three VDCs (Bansbari, BhimtarandBhotasipa) from the southern part of the district. Sample size was calculated using the 12%



Figure 1. Map of Sindhupalchowk district showing the selected VDCs.

December 2014 to March 2015 to assess the alcohol consumption practices of women in Sindhupalchowk district, Nepal during their pregnancy and postpartum period (6 weeks following pregnancy). Sindhupalchowk is one of the districts from mountains ecological belt of Nepal. The elevation of the district from sea level ranges from 300 to more than 5000 meters thus having

prevalence of current drinking among married women of reproductive age (MWRA) in Nepal,<sup>11</sup> 3% margin of error (relative), a design effect of 1.5 and 95% expected response rate resulting to an estimated sample size of 712 using the STEPS sample size calculator of WHO<sup>16</sup> designed for estimating prevalence. However, during the study implementation we could enroll 778 pregnant or

women with under one year child.

Following the selection of the VDCs we selected four wards from each of the VDC using a lottery method out of the nine wards. VDCs are administrative structures below the district level and wards are the lowest administrative unit in Nepalese administrative structure and each VDC is composed of nine wards. Within the selected wards, we obtained the list of women currently pregnant and with less than one year child and enrolled all of them who consented to participate in the study accordingly leading to a total of 778 women being interviewed on alcohol consumption practices and related factors.

University degree holders in public health and nursing were trained on sampling techniques, interview technique including measurement of amount of alcohol intake in order to carry out the study participant selection and interviews. For the alcohol consumption related information major section of the questionnaire was adopted from a previous national survey in Nepal with similar population<sup>11</sup> and WHO NCD STEPS instrument version 2.2.<sup>17</sup> Alcohol consumption during pregnancy and postpartum period (birth to 6 weeks post-delivery) was assessed in terms of alcohol types, amount, pattern and frequency. On the other hand, the amount of alcohol consumed was measured using a measuring jar and the utensil commonly used by the women to consume alcoholic beverages at home. Once the amount of alcohol consumed was identified, it was converted to standard drinks by considering alcohol concentration by volume as 5.2% for non-distilled alcohols (Jaad/Chhyang/Tongba) and 14% for distilled alcohol (local raksi) as identified by earlier study.<sup>18</sup> Environmental factors related to alcohol consumption such as home brewing, local availability, and husbands' drinking status was also measured by the use of structured interviewer administered questionnaire.

For the analysis purpose, age in completed years was categorized to 15-19 years, 20-30 years and 31-45 years. The commonly used ethnic classification has 6 categories: Dalit (marginalized group of population relatively with lower socio economic and education status), Disadvantaged Janajatis (Disadvantaged group of people and also indigenous group of population relatively with lower socio economic and education status), Disadvantaged non Dalit Terai Caste Groups (Disadvantaged group of people from the Terai, the lowlands, relatively with lower socio economic and education status but not the dalit groups), Religious Minorities (Muslims, Christians etc), Relatively advantaged Janajatis (Indigenous group of people however with relatively higher socio economic status such as Newars, Thakalis, Gurungs) and Upper Caste Groups (Population with relatively higher socio

economic and education status and mostly Brahmins, Chhetris, Thakuris). However, in this study we combined disadvantaged janajatis and relatively advantaged janajatis to a single group of janajatis. In the analysis, where ethnic classification is used, six participants were marked missing and they belonged to non-dalit terai caste groups (five) and muslims the religious minorities (one).

We recorded type of family in three categories. Nuclear meant only parents and children, joint meant grandparents, parents and children while extended meant including families of brothers as well as grandparents and children. For the analysis purpose joint and extended family type were combined together. Education level was defined based on the literacy status. Illiterate women, women with informal education (those who could read and write but without any formal education such as taken some adult education classes) and women with less than primary education (five years of schooling) were combined together as one category. The next category included women with primary education (completed five years of schooling) to less than secondary education (10 years of schooling). And the rest (completed secondary education - 10 years of schooling and above) were categorized into the third category.

The primary/main source of family income was asked with different options. For the analysis purpose the following categories were formed: employment of either husband, wife or both including self owned business, foreign employment of husband, agriculture including animal husbandry and daily labor either of husband or wife or both.

Alcohol consumption status of husband, home brewing of alcohol and knowledge that alcohol affects the health of mother and child had binary outcomes as yes or no.

Alcohol consumption in this study meant consumption of at least one alcoholic drink and based on the time we have considered three different variables for this. Current drinking meant consumption of at least one alcoholic drink in the last 30 days. Drinking during pregnancy meant consumption of at least one alcoholic drink during current pregnancy for currently pregnant women and during the most recent pregnancy for women with under 1 year children. Drinking during postpartum period meant consumption of at least one alcoholic drink during the most recent postpartum period. Postpartum drinking was thus analyzed for only those women with under one-year children and it captured the information for most recent postpartum period. Frequency of drinking during pregnancy and postpartum period was categorized as daily, one to four days a week, one to three days a month and less than once a month. Frequency of

drinking five to six times a week was merged to daily drinking at the analysis phase, though it was collected separately during data collection. Frequency of five or more standard drinks during pregnancy and postpartum period was categorized as did not drink, several times a week, once a week, one to three days a month and less than once a month. Similarly, type of alcohol mostly consumed during pregnancy and postpartum period was categorized as Jaad/Chhyang/Tongba which are the local terminologies used for non-distilled home brewed alcoholic beverages, local Raksi which is the distilled type of home brewed alcoholic beverages, beer and rum or whisky.

This study was ethically approved from the ethical review board of the Nepal Health Research Council (Registration No. 124/2014, Date of Approval: 31 July 2014) and from the Regional Ethics Committee (REK) Norway (REK Number 2014/1243 Sor-ost A). An informed written consent was obtained from all the participants before the interview. The issue of sensitivity was handled carefully during data collection period. Pregnant women who have been drinking and women with under one-year child drinking heavily were counselled on its negative impacts. Confidentiality was maintained by preserving the collected data with access only to the researcher.

Data entry was done using EpiData version 3.1, followed by data cleaning in SPSS version 16. The analysis of proportions with 95% CI was done in Epi Info version 3.5.4 while the logistic regression was carried out in STATA SE 14. Binary logistic regression with a single covariate for alcohol consumption during pregnancy and during postpartum followed by multivariable logistic regression was done to find out the predictors of alcohol consumption during pregnancy, postpartum and current drinking. We identified the covariates to be used in the multivariable logistic regression based on previous literatures and logical rationalization. Variables used in the multivariable logistic regression are: age category, ethnicity, family type, education level, primary source of income of the family, husband's drinking behavior, home brewing of alcohol and knowledge of negative effects of alcohol during pregnancy on mother and child. After completing the logistic regression for each of the variables individually, we then used all the above variables at once in the next step of logistic regression to produce adjusted odds ratio (aOR). The variables with a significance level below 0.25 in univariate analysis were taken to the logistic regression model for all three dependent variables.<sup>2</sup> The results from logistic regression are presented with crude odds ratio (OR) and aOR with 95% Confidence Intervals (CIs).

## RESULTS

Three out of ten (33.8%; 95% CI: 30.5-37.3) women had consumed alcoholic beverages during pregnancy (current pregnancy for pregnant women and recent pregnancy for women with under one year children), while the proportion of women consuming alcoholic beverages during postpartum period was (43.3%; 95% CI: 39.4-47.4). Similarly, one-third (35.5%; 95% CI: 32.1-39.0) women were current drinkers (Table 1). Among the current drinkers (n=276), 21.4% (95% CI: 16.7-26.7) women drank more than or equal to five standard drinks (heavy drinking) on average per day in the last 30 days, while the proportion of heavy drinkers among the total respondents (n=778) was 7.6% (95% CI: 5.9-9.7) (Table not shown).

Of the drinkers during pregnancy (n=263), a third (35.0%; 95% CI: 29.2-41.1) acknowledged daily drinking. Every one among five women (21.7%, 95% CI: 16.8-27.1) drank five or more standard drinks several times a week during pregnancy. A huge majority of women (90.1%; 95% CI: 85.9-93.4) mostly consumed non-distilled alcohol (jaad/chhyang/tongba) during pregnancy (Table 2).

Three-fourth of the women (74.4%; 95% CI: 68.8-79.6) consumed alcoholic beverages on a daily basis during postpartum period. Out of those drinking during postpartum period (n=266), 22.6% (95% CI: 17.7-28.1) had consumed five or more standard drinks several times a week. And, 69.9% (95% CI: 64.0-75.4) of these women mostly consumed non-distilled alcohol (jaad/chhyang/tongba) while 29.3% (95% CI: 23.9-35.2) mostly consumed distilled alcohol (local raksi) during postpartum period (Table 2).

When it came to proportion of drinkers across various socio-demographic strata, highest proportion of women consuming alcoholic beverages were in the age group 31-45 [during pregnancy (55.4%; 95% CI: 44.2-66.3) and during postpartum period (63.5%; 95% CI: 51.5-74.4)]. Similarly, illiterate women or women with informal/less than primary education were the most to consume alcoholic beverages: 54.9% (95% CI: 49.0-60.7) (during pregnancy) and 64.4% (95% CI: 57.9-70.5) (during postpartum period). A similar pattern was seen among current drinkers as well (Table 1).

Among the women whose husbands drink, nearly half (48.2%; 95% CI: 43.4-53.0) consumed alcohol during pregnancy and 59.9% (95% CI: 54.5-65.2) consumed alcohol during postpartum period. Among those women who brewed alcohol at home, 55.8% (95% CI: 50.8-60.7) of them consumed alcohol during pregnancy and 70.7% (95% CI: 65.2-75.7) of them consumed alcohol during postpartum period. Likewise, drinking during pregnancy and postpartum period was quite prevalent among those who did not know that the alcohol consumption during pregnancy affects mother and child (Table 1).

**Table 1. Alcohol consumption by the women.**

	N	Current drinking (n=778)		Drank alcohol in pregnancy (n=778)		n	Drank alcohol in postpartum period <sup>#</sup> (n=614)	
		% <sup>*</sup>	95% CI	% <sup>*</sup>	95% CI		% <sup>*</sup>	95% CI
<b>Age in Category</b>								
15 to 19 Years	120	35.8	27.3-45.1	33.3	25.0-42.5	82	45.1	34.1-56.5
20 to 30 Years	575	31.8	28.1-35.8	30.8	27.1-34.8	458	39.7	35.3-44.4
31 to 45 Years	83	60.2	48.9-70.8	55.4	44.2-66.3	74	63.5	51.5-74.4
<b>Ethnicity</b>								
Upper caste groups	268	3.7	1.8-6.8	3.0	1.3-5.8	215	4.7	2.3-8.4
Dalit	79	36.7	26.1-48.3	44.3	33.1-55.9	61	52.5	39.3-65.4
Janajatis including both disadvantaged & relatively advantaged	425 <sup>a</sup>	55.8	50.9-60.5	51.5	46.7-56.4	333 <sup>b</sup>	67.3	61.9-72.3
<b>Family Type</b>								
Joint and extended	520	32.3	28.3-36.5	30.8	26.9-35.0	406	39.2	34.4-44.1
Nuclear	258	41.9	35.8-48.1	39.9	33.9-46.2	208	51.4	44.4-58.4
<b>Level of Education</b>								
Secondary completed and above	269	17.8	13.5-23.0	14.1	10.2-18.9	213	23.0	17.5-29.2
Primary completed to less than secondary	214	33.2	26.9-39.9	29.4	23.4-36.0	165	39.4	31.9-47.3
Illiterate/Informal/Less than primary education	295	53.2	47.3-59.0	54.9	49.0-60.7	236	64.4	57.9-70.5
<b>Primary Source of Income</b>								
Employment including self owned business(Own/ Husband)	331	27.8	23.1-33.0	29.3	24.5-34.6	252	33.7	27.9-39.9
Foreign employment (husband)	156	30.1	23.1-38.0	26.9	20.1-34.6	121	36.4	27.8-45.6
Agriculture including animal husbandry	180	40.6	33.3-48.1	35.6	28.6-43.0	155	51.6	43.5-59.7
Daily Labor (Self/Husband)	111	57.7	47.9-67.0	54.1	44.3-63.6	86	66.3	55.3-76.1
<b>Women's drinking behavior by alcohol consumption status of husband</b>								
None drinking husband	344	16.6	12.9-21.0	15.7	12.1-20.1	277	23.1	18.3-28.5
Drinking husband	434	50.5	45.7-55.3	48.2	43.4-53.0	337	59.9	54.5-65.2
<b>Home brewing of alcoholic beverages</b>								
Not brewing alcohol at home	382	11.5	8.6-15.3	11.0	8.1-14.7	307	16.0	12.1-20.7
Brewing alcohol at home	396	58.6	53.5-63.5	55.8	50.8-60.7	307	70.7	65.2-75.7
<b>Knows alcohol consumption during pregnancy affects mother and child</b>								
Yes	731	33.1	29.7-36.7	30.9	27.6-34.4	578	40.7	36.6-44.8
No	47	72.3	57.4-84.4	78.7	64.3-89.3	36	86.1	70.5-95.3
<b>Total</b>	<b>778</b>	<b>35.5</b>	<b>32.1-39.0</b>	<b>33.8</b>	<b>30.5-37.3</b>	<b>614</b>	<b>43.3</b>	<b>39.4-47.4</b>

<sup>#</sup>Only women with under one year child and not the pregnant women included to capture drinking behavior in recent postpartum period

<sup>\*</sup>row percentage

<sup>a</sup>6 cases which belonged to terai caste groups and religious minorities were excluded from the analysis

<sup>b</sup>5 cases which belonged to terai caste groups and religious minorities were excluded from the analysis

Table 2. Pattern of alcohol consumption.		
Variables	%	95% CI
Frequency of Drinking during Pregnancy (n=263)		
Daily	35.0	29.2-41.1
1-4 days a week	33.1	27.4-39.1
1-3 days a month	27.8	22.4-33.6
Less than once a month	3.4	1.6-6.4
Don't Know	0.8	0.1-2.7
Frequency of 5 or more standard drinks during pregnancy (n= 263)		
Did not drink	68.4	62.4-74.0
Several times a week	21.7	16.8-27.1
1-3 days a month	6.8	4.1-10.6
Once a week	1.1	0.2-3.3
Less than once a month	1.1	0.2-3.3
Don't Know	0.8	0.1-2.7
Type of alcohol mostly consumed during pregnancy (n=263)		
Jaad/Chhyang/Tongba	90.1	85.9-93.4
Local Raksi	8.7	5.6-12.8
Beer	0.8	0.8-99.6
Others	0.4	0.4-100.0
Frequency of Drinking during Postpartum (n=266)		
Daily	74.4	68.8-79.6
1-4 days a week	15.0	11.0-19.9
1-3 days a month	7.9	5.0-11.8
Less than once a month	2.6	1.1-5.3
Frequency of 5 or more standard drinks during pregnancy (n= 266)		
Did not drink	75.6	69.9-80.6
Several times a week	22.6	17.7-28.1
Once a week	1.1	0.2-3.3
1-3 days a month	0.4	0.0-2.1
Less than once a month	0.4	0.0-2.1
Type of alcohol mostly consumed during postpartum (n=266)		
Jaad/Chhyang/Tongba	69.9	64.0-75.4
Local Raksi	29.3	23.9-35.2
Beer	0.4	0.0-2.1
Rum/Whisky	0.4	0.0-2.1

After running bivariate and multivariable analysis, women from the dalit as well janajatis (including disadvantaged janajatis and relatively advantaged janajatis) ethnicity were more likely to consume alcohol than the upper caste groups with statistically significant difference even after adjusting for other covariates. Illiterate/informal/less than primary education holders were nearly three times (aOR=2.87; 95%CI: 1.68-4.90) more likely to consume alcoholic beverages during pregnancy than those holding secondary and above education. Similarly, the women whose husbands drink were more than two times likely to be a current drinker (aOR 2.39, 95% CI: 1.58-3.61), consume alcohol during pregnancy (aOR 2.40, 95% CI: 1.57-3.68) as well as postpartum period (aOR 2.02, 95%

CI: 1.27-3.21) compared to the women whose husbands did not drink. Also women who brewed alcohol at home were more likely to be drinking alcohol during pregnancy (aOR=4.12; 95%CI: 2.44-6.95) and postpartum period (aOR=4.73; 95%CI: 2.67-8.39) in relation to those who did not brew alcohol at home. Likewise, those women who did not know alcohol consumption during pregnancy affects mother and child were more likely to consume alcoholic beverages during pregnancy (aOR=4.48; 95%CI: 1.93-10.43) and postpartum period (aOR=4.43; 95% CI: 1.36-14.40) compared to those who knew. There was a similar pattern of relationship with current drinking behavior of women in the study (Table 3).

Table 3. Predictors of alcohol consumption.								
	n	Current Drinking (n=778)		Drank alcohol in pregnancy (n=778)		n	Drank alcohol in postpartum*(n=614)	
		Crude OR	Adjusted OR <sup>#</sup>	Crude OR	Adjusted OR <sup>#</sup>		Crude OR	Adjusted OR <sup>#</sup>
<b>Age in Category</b>								
15 to 19 Years	120	1	1	1	1	82	1	1
20 to 30 Years	575	0.83(0.55-1.26)	1.07(0.64-1.80)	0.89(0.58-1.35)	0.99(0.58-1.67)	458	0.80(0.50-1.29)	1.40(0.75-2.60)
31 to 45 Years	83	2.71(1.52-4.83)	2.20(1.02-4.74)	2.49(1.40-4.42)	1.48(0.68-3.18)	74	2.12(1.11-4.02)	1.39(0.58-3.32)
<b>Ethnicity</b>								
Upper Caste Groups	268	1	1	1	1	215	1	1
Dalit	79	14.96(6.86-32.64)	5.35(2.24-12.76)	25.85(11.25-59.40)	9.30(3.72-23.21)	61	22.62(10.07-50.83)	7.83(3.10-19.78)
Janajatis including both disadvantaged & relatively advantaged	425 <sup>a</sup>	32.52(16.81-62.93)	10.43(4.95-22.00)	34.55(16.67-71.61)	10.00(4.43-22.59)	333 <sup>b</sup>	42.13(21.45-82.72)	13.73(6.33-29.78)
<b>Family Type</b>								
Joint or extended	520	1	1	1	1	208	1	1
Nuclear	258	1.51(1.11-2.05)	1.68(1.08-2.60)	1.49(1.09-2.04)	1.50(0.96-2.33)	406	1.64(1.17-2.30)	2.35(1.36-4.05)
<b>Level of Education</b>								
Secondary completed and above	269	1	1	1	1	213	1	1
Primary to less than secondary	214	2.28(1.50-3.49)	1.12(0.66-1.92)	2.54(1.61-3.98)	1.25(0.72-2.19)	165	2.17(1.39-3.40)	1.11(0.60-2.04)
Illiterate/ Informal/Less than primary education	295	5.24(3.56-7.71)	1.57(0.94-2.63)	7.40(4.90-11.19)	2.87(1.68-4.90)	236	6.06(4.00-9.18)	1.92(1.06-3.51)
<b>Primary Source of Income</b>								
Employment (Own/Husband) Foreign	331	1	1	1	1	252	1	1
Employment (Husband) Agriculture including animal husbandry	156	1.12(0.74-1.70)	0.70(0.41-1.20)	0.89(0.58-1.36)	0.46(0.26-0.80)	121	1.12(0.71-1.77)	0.65(0.34-1.22)
Daily Labor (Self/Husband)	180	1.77(1.21-2.60)	0.81(0.49-1.34)	1.33(0.90-1.96)	0.45(0.26-0.77)	155	2.09(1.39-3.15)	0.94(0.52-1.72)
	111	3.54(2.26-5.53)	1.45(0.82-2.587)	2.83(1.82-4.41)	0.83(0.46-1.48)	86	3.86(2.30-6.48)	1.44(0.70-2.94)
<b>Women's drinking behavior by alcohol consumption status of husband</b>								
None drinking husband	344	1	1	1	1	277	1	1
Drinking husband	434	5.13(3.65-7.21)	2.39(1.58-3.61)	4.99(3.53-7.05)	2.40(1.57-3.68)	337	4.98(3.49-7.10)	2.02(1.27-3.21)
<b>Home brewing of alcoholic beverages</b>								
Not brewing alcohol at home	382	1	1	1	1	307	1	1
Brewing alcohol at home	396	10.87(7.49-15.77)	3.73(2.26-6.15)	10.22(7.01-14.90)	4.12(2.44-6.95)	307	12.69(8.58-18.79)	4.73(2.67-8.39)

Knows alcohol consumption during pregnancy affects mother and child									
Yes	731	1	1	1	1	578	1	1	1
No	47	5.28(2.74-10.20)	2.50(1.17-5.33)	8.27(4.04-16.92)	4.48(1.93-10.43)	36	9.05(3.47-23.61)	4.43(1.36-14.40)	

Note: Significant values with 95% CI are in bold

\*Only women with under one year child and not the pregnant women included to capture drinking behavior in recent postpartum period

<sup>a</sup>All the variables presented in the tables were included in the logistic regression model to adjust for each other

<sup>b</sup>6 cases which belonged to terai caste groups and religious minorities were excluded from the analysis

<sup>c</sup>5 cases which belonged to terai caste groups and religious minorities were excluded from the analysis

## DISCUSSION

With the established fact of drinking during pregnancy and its adverse birth outcomes,<sup>1-6,9,10</sup> studies concerning drinking behavior during pregnancy and postpartum period are of utmost importance. Having a significant implication on maternal and neonatal health promotion, findings of the current study could aid in shedding light on designing of alcohol interventions for the at-risk group: pregnant and lactating women.

The current population-based study reported a substantial proportion of drinkers in Sindhupalchowk district; three out of ten women consumed alcohol during pregnancy, and four out of ten women did so during postpartum period (Table 1). On top of that, the statistics of considerable figure of heavy drinking, one-fourth among the current drinkers, demands urgent need of targeted and tailored intervention. As the communities following liberal norms and attitudes towards drinking tend to be more frequent heavy drinkers than those holding dry culture,<sup>19</sup> culture sensitive and specific interventions are highly needed in Sindhupalchowk district, on account of the district being a home to most of the disadvantaged janajatis, for whom alcohol is a part of their culture. Alcohol consumption at higher levels especially when the drinking pattern is heavy or binge drinking, it increased the risk of preterm birth even when drinking was ceased before the second trimester.<sup>20</sup> Heavy alcohol use significantly increased the likelihood of very preterm birth even after controlling for socio-demographic confounding factors.<sup>8</sup> Effects of heavy prenatal alcohol exposure have also been shown on prenatal growth restriction, which persists through nine years of age with an additional delay in weight gain during infancy.<sup>21</sup>

Findings depicted by this study are not in accordance with earlier studies as summarized in this paragraph. The corresponding figures of drinkers during pregnancy vary across the nations, with 29% in Australia,<sup>22</sup> 30.3% in the United States of America,<sup>7</sup> 12% in Sweden,<sup>23</sup> 81% in Ireland,<sup>8</sup> and 42.8% in Western Cape, Africa.<sup>24</sup> This was 59.3% in Nigeria,<sup>25</sup> 17.7% in an Italian population,<sup>26</sup> and 20.2% (at least one episode of five or more drinks) in Russia.<sup>19</sup> While for drinking during postpartum phase, it was 43% in Australia<sup>22</sup> and 72% in New Zealand.<sup>27</sup> It was

reported that 36% breast feeding women (three months postpartum) drinking alcohol in one of the studies in the United States.<sup>28</sup> Likewise, 46.7% and 47.4% of breast feeding women at four and six months of postpartum in drank as seen a study from Perth, Australia.<sup>29</sup> Similarly, 89% women in Oslo consumed alcohol pre-pregnancy, while 23% of them consumed alcohol after pregnancy week 12.<sup>30</sup> Owing to the variation in study methodology, timing, nature of samples, and socio-cultural differences, findings might have been differed.

Likewise, home brewed alcoholic beverages (jaad/chhyang/raksi) were most commonly consumed (Table 2). Sindhupalchowk is heavily populated with disadvantaged janajatis, especially Tamang community,<sup>15</sup> where drinking is socially approved, making it common to brew alcoholic beverages in household level, thus increasing the accessibility. As is unfolded by the current study, one-third (35%) women drank daily during pregnancy and a huge proportion acknowledged daily drinking (three-quarters) during delivery/postpartum/lactation (Table 1). And drinking appears to be common among the ethnic groups disadvantaged and janajatis followed by dalits (Table 1). This could be explained in view of socio-cultural perspective, as practice of drinking during postpartum period as the method of heating the body in certain ethnic communities could be the result of a common belief especially among the people of these ethnic groups. With regards to the type of alcohol consumed during pregnancy and postpartum, we can note a changing trend from pregnancy to postpartum period with 9% women consuming distilled alcoholic beverages during pregnancy which increases to 29% during postpartum period. Women seem to have a belief that non-distilled alcoholic beverages are cold in nature and hence a higher proportion tend to consume distilled one during postpartum period to protect the recently delivered child and mother itself from cold. This could be a paradox, as women end up consuming distilled alcohol, which has in fact high ethanol concentration than the non-distilled one.<sup>18</sup>

Disadvantaged janajatis, 31-45 years age group, and illiterate/informal/less than primary education holders shared the highest proportion of drinkers during both

pregnancy and postpartum period (Table 1). The highest numeral of drinkers from disadvantaged janajatis could be viewed as an obvious finding, as drinking is social activity in this group.<sup>14</sup> On the other hand, minimal proportion of drinkers from the upper caste group (Table 1) could be due to its inexistence in those ethnic groups, while we also cannot deny the chances of underreporting of drinking, pertaining to social desirability bias towards drinking in this group. And the odds of drinking is also higher among the two ethnic groups (dalits and disadvantaged and janajatis) even after controlling for other covariates in the logistic regression, which shows that the ethnicity is an independent predictor of alcohol consumption among women even during their pregnancy and postpartum period. There is concentration of more drinkers in older age group (Table 1), though not statistically significant which may be due to small number of women in the age group. And this is in line with previous study that reported continuation of drinking during pregnancy in the older age group.<sup>31</sup>

Being illiterate or holding less than primary education was found to increase the likelihood of drinking especially during pregnancy compared to secondary and above education achievers (Table 3). This was in contrary to previous study.<sup>32</sup> This together with the rising likelihood of drinking during pregnancy in those without knowledge on effect of alcohol consumption during pregnancy on mother and child compared to those with knowledge (Table 3) calls for specific educational interventions for the pregnant women. In addition, this study showed that the social environment such as husbands' drinking behavior and brewing of alcohol at home were strong independent predictors of women's alcohol consumption be it current drinking, drinking during pregnancy or postpartum drinking (Table 3). With this we could not deny the fact that women especially when they already have culture and tradition supporting drinking behavior, the behavior gets further enabling environment such as other drinking member in the family especially husband as well as home brewing of alcohol.

This population-based study made use of standard instruments for data collection by a group of trained public health and nursing graduates under close supervision of the authors. The main strength of this study was that we used measuring jars to identify the correct amount of alcohol consumed by the women. The women who reported drinking were asked to provide the vessel (bowl/glass) that they most commonly used for drinking alcohol and the volume measured for that particular vessel to find out the total amount of alcohol consumed. This is otherwise done using showcards containing pictures of different types of bowls and

glasses with their volume specified,<sup>33</sup> which we believe may not help us to identify the correct amount of alcohol that the respondents consume. However, the study was bound to suffer with some limitations. The district being purposively chosen limited the external validity of the study. Similarly, study results might have been affected by intentional recall bias when it came to drinking behavior, especially in upper caste group. Likewise, possibility of unintentional recall bias could not be denied in questions such as type, amount, pattern, and frequency of drinking. While we state this, we also admit that the information was collected immediately before the devastating Nepal Earthquake 2015 in April 2015; the situation may be slightly different post-earthquake. Many people have lost their lives as well as houses in the villages where we conducted our study and there could be many other factors as well to affect the women's behavior, when we recommend specific sets of interventions based on the findings from this study.

Still, findings left significant implication for the promotion of maternal and neonatal health. Standing on the ground of findings of sizeable drinkers, this draws the attention of the concerned stakeholders regarding alcohol interventions. As of now, targeted interventions to pregnant women is limited to general behavior change communication strategies such as health effects of tobacco and alcohol use and is not delivered as a routine component of antenatal care. Specific recommendation would be culture specific behavior change communication intervention for pregnant and lactating women including their spouse as well, as the evidence suggests reduction of drinking among the pregnant women through the educational intervention involving their partner.<sup>34</sup> With the global evidences of very early binge exposure predicting a number of poor birth outcomes,<sup>2</sup> it is also high time to educate women planning their pregnancy to prevent oneself from early exposure to alcohol.

## CONCLUSIONS

The study revealed a high proportion of drinkers during pregnancy and postpartum period with high frequency of consumption along with a substantial proportion of heavy drinking. Ethnicity (dalit, disadvantaged janajatis) appears to be a strong driver of alcohol consumption by women including during pregnancy and postpartum period in addition to low level of education, not being aware of health effects of alcohol during pregnancy and environmental factors such as husband's drinking and home brewing of alcohol. Educating and increasing awareness about health effects of alcohol during pregnancy probably as a routine component of antenatal

care should be a top priority. In addition, there is a need to plan culture sensitive interventions targeting to improve environmental factors especially with a focus to the ethnic groups such as dalits, disadvantaged janajatis including relatively advantaged janajatis.

## REFERENCES

- Mukherjee RA, Hollins S, Turk J. Fetal alcohol spectrum disorder: an overview. *J R Soc Med.* 2006;99(6):298-302.
- Alvik A, Aalen OO, Lindemann R. Early fetal binge alcohol exposure predicts high behavioral symptom scores in 5.5-year-old children. *Alcohol Clin Exp Res.* 2013;37(11):1954-62.
- Flak AL, Su S, Bertrand J, Denny CH, Kesmodel US, Cogswell ME. The association of mild, moderate, and binge prenatal alcohol exposure and child neuropsychological outcomes: a meta-analysis. *Alcohol Clin Exp Res.* 2014;38(1):214-26.
- Mattson SN, Riley EP. A review of the neurobehavioral deficits in children with fetal alcohol syndrome or prenatal exposure to alcohol. *Alcohol Clin Exp Res.* 1998;22(2):279-94.
- Sood B, Delaney-Black V, Covington C, Nordstrom-Klee B, Ager J, Templin T, et al. Prenatal alcohol exposure and childhood behavior at age 6 to 7 years: I. dose-response effect. *Pediatrics.* 2001;108(2):E34.
- Sokol RJ, Janisse JJ, Louis JM, Bailey BN, Ager J, Jacobson SW, et al. Extreme prematurity: an alcohol-related birth effect. *Alcohol Clin Exp Res.* 2007;31(6):1031-7.
- Ethen MK, Ramadhani TA, Scheuerle AE, Canfield MA, Wyszynski DF, Druschel CM, et al. Alcohol consumption by women before and during pregnancy. *Matern Child Health J.* 2009;13(2):274-85.
- Mullally A, Cleary BJ, Barry J, Fahey TP, Murphy DJ. Prevalence, predictors and perinatal outcomes of periconceptional alcohol exposure-retrospective cohort study in an urban obstetric population in Ireland. *BMC Pregnancy Childbirth.* 2011;11:27.
- Carson G, Cox LV, Crane J, Croteau P, Graves L, Kluka S, et al. Alcohol use and pregnancy consensus clinical guidelines. *J Obstet Gynaecol Can.* 2010;32(8 Suppl 3):S1-31.
- Henderson J, Gray R, Brocklehurst P. Systematic review of effects of low-moderate prenatal alcohol exposure on pregnancy outcome. *BJOG.* 2007;114(3):243-52.
- Thapa N, Aryal KK, Puri R, Shrestha S, Thapa P, Mehata S, et al. Alcohol consumption practices among married women of reproductive age in Nepal: a population based household survey. *PLoS One.* 2016;11(4):e0152535.
- Skagerstrom J, Chang G, Nilsen P. Predictors of drinking during pregnancy: a systematic review. *J Womens Health (Larchmt).* 2011;20(6):901-13.
- Ministry of Health and Population (Nepal), SOLID Nepal, WHO. WHO STEPS Surveillance: Nepal Non Communicable Diseases Risk Factors Survey 2008. Kathmandu, Nepal: Ministry of Health and Population, SOLID Nepal, and World Health Organization. 2008.
- Dhital R, Subedi G, Gurung YB, Hamal P. Alcohol and Drug Use in Nepal with Reference to Children. Kathmandu: Child Workers in Nepal Concerned Centre (CWIN)2001.
- CBS. National Population and Housing Census 2011, Social Characteristics Tables (Caste/Ethnicity, Mother Tongue and Second Language). Kathmandu: Central Bureau of Statistics 2014.
- WHO. STEPS Sample Size Calculator and Sampling Spreadsheet. Geneva: World Health Organization; 2016 [cited 2016 November 24]; Available from: <http://www.who.int/chp/steps/resources/sampling/en/>.
- WHO. The STEPS Instrument and Support Materials. Geneva: World Health Organization; 2014 [cited 2014 November 22]; Available from: <http://www.who.int/chp/steps/instrument/en/>.
- Thapa N, Aryal KK, Paudel M, Puri R, Thapa P, Shrestha S, et al. Nepalese homebrewed alcoholic beverages: types, ingredients, and ethanol concentration from a nation wide survey. *J Nepal Health Res Counc.* 2015;13(29):59-65.
- Chambers CD, Kavteladze L, Joutchenko L, Bakhireva LN, Jones KL. Alcohol consumption patterns among pregnant women in the Moscow region of the Russian Federation. *Alcohol.* 2006;38(3):133-7.
- O'Leary CM, Nassar N, Kurinczuk JJ, Bower C. The effect of maternal alcohol consumption on fetal growth and preterm birth. *BJOG.* 2009;116(3):390-400.
- Carter RC, Jacobson JL, Molteno CD, Jiang H, Meintjes EM, Jacobson SW, et al. Effects of heavy prenatal alcohol exposure and iron deficiency anemia on child growth and body composition through age 9 years. *Alcohol Clin Exp Res.* 2012;36(11):1973-82.
- Maloney E, Hutchinson D, Burns L, Mattick RP, Black E. Prevalence and predictors of alcohol use in pregnancy and breastfeeding among Australian women. *Birth.* 2011;38(1):3-9.
- Comasco E, Hallberg G, Helander A, Orelund L, Sundelin-Wahlsten V. Alcohol consumption among pregnant women in a Swedish sample and its effects on the newborn outcomes. *Alcohol Clin Exp Res.* 2012;36(10):1779-86.
- Croxford J, Viljoen D. Alcohol consumption by pregnant

- women in the Western Cape. *SAfr Med J*. 1999;89(9):962-5.
25. Ordinioha B, Brisibe S. Alcohol consumption among pregnant women attending the ante- natal clinic of a tertiary hospital in South- South Nigeria. *Niger J Clin Pract*. 2015;18(1):13-7.
  26. De Santis M, De Luca C, Mappa I, Quattrocchi T, Angelo L, Cesari E. Smoke, alcohol consumption and illicit drug use in an Italian population of pregnant women. *Eur J Obstet Gynecol Reprod Biol*. 2011;159(1):106-10.
  27. Parackal S, Ferguson E, Harraway J. Alcohol and tobacco consumption among 6–24-months post-partum New Zealand women. *Matern Child Nutr*. 2007;3(1):40-51.
  28. Breslow RA, Falk DE, Fein SB, Grummer-Strawn LM. Alcohol consumption among breastfeeding women. *Breastfeed Med*. 2007;2(3):152-7.
  29. Giglia R, Binns C. Patterns of alcohol intake of pregnant and lactating women in Perth, Australia. *Drug Alcohol Rev*. 2007;26(5):493-500.
  30. Alvik A, Heyerdahl S, Haldorsen T, Lindemann R. Alcohol use before and during pregnancy: a population-based study. *Acta Obstet Gynecol Scand*. 2006;85(11):1292-8.
  31. Nilsen P, Holmqvist M, Hultgren E, Bendtsen P, Cedergren M. Alcohol use before and during pregnancy and factors influencing change among Swedish women. *Acta Obstet Gynecol Scand*. 2008;87(7):768-74.
  32. Göransson M, Magnusson Å, Bergman H, Rydberg U, Heilig M. Fetus at risk: prevalence of alcohol consumption during pregnancy estimated with a simple screening method in Swedish antenatal clinics. *Addiction*. 2003;98(11):1513-20.
  33. Aryal KK, Neupane S, Mehata S, Vaidya A, Singh S, Paulin F, et al. Non Communicable Diseases Risk Factors: STEPS Survey Nepal 2013. Kathmandu: Nepal Health Research Council. 2014.
  34. Chang G, McNamara TK, Orav EJ, Koby D, Lavigne A, Ludman B, et al. Brief intervention for prenatal alcohol use: a randomized trial. *Obstet Gynecol*. 2005;105(5 Pt 1):991-8.