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Determinants of Time of Start of Prenatal Care and Number of Prenatal Care Visits During Pregnancy Among Nepalese Women

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Abstract This study is aimed at investigating the factors determining the timing of first prenatal care (PNC) visit and the number of PNC visits among a national representative sample of Nepali women. Data was drawn from the 2006 Nepal Demographic and Health Survey on women age 15–49 years old who had delivery within three years prior to the survey ($N = 4,136$). Multinomial logistic regression was used to study the association between sociodemographic variables and two outcome variables—the timing of first PNC and number of PNC visits. Most of the women (45%) started prenatal care after 3 months of pregnancy while 28% had no care. About 43% of women had 1–3 PNC visits, 29% had more than 3 visits. Age, education, parity and wealth were associated with both the timing of PNC and the number of PNC visits such that older women and those socioeconomically disadvantaged had late and fewer PNC visits compared to the younger ones and those with socioeconomic advantage, respectively. Women with higher parity and those in rural residencies were more likely to delay PNC, have fewer PNC or have no care at all. Majority of Nepali women do not attend prenatal care during the first trimester of pregnancy contrary to the WHO recommendation for women in developing countries. Programmes aimed at improving maternal health in general and participation in PNC in particular should target all Nepali women, especially those: in rural residencies, with no education, with high parity; older women and those from poor households.

Introduction

Utilization of prenatal care (PNC) has been shown to predict several birth outcomes and number of postpartum practices [1–3]. Women who do not adequately utilize PNC may be at higher risk of poor health during pregnancy. Worldwide, over 5 million women die annually from complications during pregnancy, childbirth, or the postpartum period [4]. Pregnancy related causes are among the top reasons for death among women of reproductive age in almost all developing countries [5]. Nearly all of these deaths occur in developing countries, where fertility rates are higher and a woman's life time risk of dying during pregnancy and childbirth is over 400 times higher than in developed countries [4].

Early entry to prenatal care and adherence to the prenatal care visit schedules are commonly associated with higher infant birth weights and lower infant mortality rates [6, 7]. Regular prenatal check up is an important determinant of safe delivery because it offers opportunities to encourage women to deliver with a skilled attendant in a health facility [8]. World health organization (WHO) recommended women in developing country should seek prenatal care within the first four months of pregnancy [9]. In developing countries such as Nepal where most women deliver outside the formal health sector and where the health of women is generally poor, adherence to this recommendation is crucial because prenatal care is important in detecting women with elevated risk of delivery.

The quantity and timing of starting of prenatal care visits also affects the amount and quality of care that a

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pregnant woman receives [10]. A study from Central Africa found that women who receive less prenatal care had higher risk of low birth weight and were associated with premature delivery compared to those who received more/adequate prenatal care [11]. Previous studies have identified that several factors were related to inadequate PNC utilization, including socio-demographic factors such as low educational level, single marital status, low income level etc. [12, 13]. One previous research from China showed that the utilization of prenatal care has increased and maternal health indicators have also improved [14].

Studies from Nepal examining maternal health care in general and prenatal care in particular are scarce. A small study from two neighborhood villages suggests that maternal care is low in Nepal [15]. Previous study from Nepal found that the coverage of prenatal care accounted for only 32% of deliveries within 5 km from the health facilities, which suggests that the underutilization of prenatal care services cannot be simply explained by geographical access to health care alone [16]. This study seeks to use a nationally representative data from the Nepal Demographic Health Survey (NDHS) to investigate factors determining the timing of Nepali women's first visit to PNC and the number of PNC visits during pregnancy. The findings of this study would enlighten our understanding of PNC utilization and would contribute to the promotion of maternal health among the Nepali women.
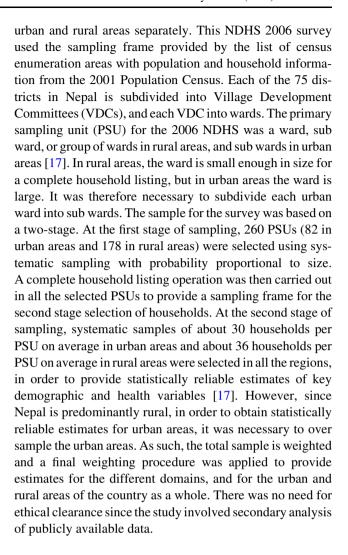
Subjects, Materials and Methods

Data Source

This study analyzes data from the 2006 NDHS, which was carried out under the aegis of the Population Division of the Ministry of Health and Population and was implemented by New ERA, a local research organization. Macro International Inc. provided technical assistance through its MEASURE DHS project. This study employed a nationally representative sample from the selected households. A total of 10,973 women were identified as eligible for the individual interview but the interviews were completed for 10,793 ever-married women aged 15–49, yielding a response rate of 98 percent. The present analysis is restricted to the 4,136 women who had given birth in the three years time preceding the survey.

Brief Description of Survey

The primary focus of the 2006 NDHS was to provide estimates of key population and health indicators, including fertility and mortality rates, for the country as a whole and for urban and rural areas separately. This NDHS 2006 survey used the sampling frame provided by the list of census enumeration areas with population and household information from the 2001 Population Census. Each of the 75 districts in Nepal is subdivided into Village Development Committees (VDCs), and each VDC into wards. The primary sampling unit (PSU) for the 2006 NDHS was a ward, sub ward, or group of wards in rural areas, and sub wards in urban areas [17]. In rural areas, the ward is small enough in size for a complete household listing, but in urban areas the ward is large. It was therefore necessary to subdivide each urban ward into sub wards. The sample for the survey was based on a two-stage. At the first stage of sampling, 260 PSUs (82 in urban areas and 178 in rural areas) were selected using systematic sampling with probability proportional to size. A complete household listing operation was then carried out in all the selected PSUs to provide a sampling frame for the second stage selection of households. At the second stage of sampling, systematic samples of about 30 households per PSU on average in urban areas and about 36 households per PSU on average in rural areas were selected in all the regions, in order to provide statistically reliable estimates of key demographic and health variables [17]. However, since Nepal is predominantly rural, in order to obtain statistically reliable estimates for urban areas, it was necessary to over sample the urban areas. As such, the total sample is weighted and a final weighting procedure was applied to provide estimates for the different domains, and for the urban and rural areas of the country as a whole. There was no need for ethical clearance since the study involved secondary analysis of publicly available data.

Outcome Variables

Timing of Initiation of Prenatal Care

The timing of initiation of prenatal care was determined by the month prenatal care was started. It was assessed by the question "How many months pregnant were you when you first received antenatal care for this pregnancy?" and categorized in the present analysis as follows; as "No care" for those who did not receive PNC at all; "Late" (>3 months) when the visit took place during the second or third trimester, and "Early" (<3 months) when it occurred during the first trimester.

Number of Prenatal Care Visits

There is no consensus about the optimal number of prenatal visits; it is provided that inadequate prenatal care is related to a worse pregnancy outcome [18, 19]. Number of prenatal visits in this study varied from 0 (no visits) to

maximum 19 visits depending upon women with pregnancy related illness. However, three categories (no visits, ≤3 visits and >3 visits) were made for the statistical analysis according to the distribution of the variable.

Socio-Demographic Determinants

Socio-demographic variables considered in this study include; age (15–20, 21–25, 26–30, >30 years), place of residence (rural, urban), educational level (no education, primary, secondary, higher), number of children (parity) (one, two, three, four, more than four), occupation (farmer, non-farmer, not working), religion (Hindu, non-Hindu), smoking status during pregnancy (no, yes), and wealth index. Education and occupation variables were re-categorized for multinomial logistic regression analysis. Two categories of education was made; "No education" and "Primary education more". Similarly, farmer as one and all others were added to non-farmer category to keep the analysis simple and understanding. The wealth index was calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles, materials used for housing construction and types of water access and sanitation facilities. The wealth index was generated from principal components analysis. It places individual households on a continuous scale of relative wealth. It was then categorized into five (poorest, poorer, middle, richer, and richest). The details of this questionnaire can be found at http://www.measuredhs.com/pubs/pdf/FR191/FR191.pdf.

Statistical Analysis

Pearson's Chi-square test was used to study the relationship between socio-demographic factors and the timing and number of PNC visits. Multinomial logistic regression was used to study the associations between socio-demographic variables and the two outcome variables. The associations between socio-demographic factors and the timing and number of PNC visits were studied univariately (Model I). Then two adjusted models were computed. In first, all the demographic variables were simultaneously adjusted in relation to the outcomes (Model II). In the second, in addition to the predictor variables in Model II, the quantity of care and timing of first prenatal care visits were adjusted for the models that predicted timing of first PNC (Table 3, Model III) and the number of PNC visits (Table 4, Model III), respectively. The odds ratios with their 95% confidence intervals (CI) were calculated. Statistical significance was defined as a two-sided *P* value <0.05 in all analyses. The SPSS software package version 15 was used for the statistical analyses.

Results

About 12% of the women were between the ages of 15–20 years, 34% were between the ages of 21–25 years, 26% between the ages of 26–30 years and 25% were above 30 years old. Majority of them were farmer (67%), and almost one-fifth were not working. There were more Hindu women (87%) than non-Hindu. Having one or two children was common (about 28%), similarly more than one tenth had 4 or more children. Almost two-thirds of the women had no-education, while only 3% had completed higher education. Among them, 76% lived in rural parts of the country. One-fourth of the women were in the poorest category according to wealth index and 16% were richest. Majority of women were non-smokers (85%). Most of the women (45%) started prenatal care after 3 months of pregnancy while 28% had no care. About 43% of women had 1–3 PNC visits, 29% had more than 3 visits, 28% had no visits at all.

All the background variables were statistically significantly related with both time of start of prenatal care and the number of prenatal care visits (Tables 1, 2).

All the socio-demographic variables except religion were associated with the timing of prenatal care among Nepali women (Table 3, Model I), however, only the following shown independent association: age, education, parity, occupation and wealth index after adjusting for each of the socio-demographic factors and the number of prenatal visits (Table 3, Model II and III). Women with no education had higher probability of late prenatal care visits (>3 months) and had almost seven-fold the risk of no care than those who had at least some education. In the same way, number of children predicted late prenatal care visits (>3 months) and no care. Farmers were more likely to delay prenatal care (OR = 1.67, CI = 1.43–1.94) or have no care at all (OR = 3.24, CI = 2.69–3.89) compared to non-farmers or those without jobs. This association however, lost its statistical significance when the other socio-demographic factors were adjusted for. Additionally, the poorer a woman, the higher the likelihood that she would start prenatal care late (OR = 3.55, CI = 2.78–4.54, for the poorest compared to the richest) or would not attend at all (OR = 30.42, CI = 21.19–43.66, for the poorest compared to the richest).

In the like manner, all the socio-demographic factors were associated with the number of prenatal visits but when the effects of each variable were controlled for, only education, parity and wealth index retained their statistical significant associations; and after controlling for the other socio-demographic factors and the timing of prenatal visits (Table 4, Model II and III). Rural residency increased the probability of fewer prenatal care visits (OR = 1.28,

Table 1 Distribution of maternal background characteristics by timing of start of prenatal care (N = 4182)

	N = 4182	Time of starts of prenatal care, n (%)			P value
		≤3 months	>3 months	No care	
Mother's age (years)					
15–20	506	169 (33)	246 (49)	91 (18)	<0.01
21–25	1438	438 (31)	689 (48)	311 (22)	
26–30	1117	292 (26)	516 (46)	309 (28)	
>30	1075	209 (19)	425 (40)	441 (41)	
Residence					
Urban	988	400 (41)	445 (45)	143 (15)	<0.01
Rural	3148	708 (22)	1431 (46)	1009 (32)	
Education					
No education	2426	410 (17)	1072 (44)	944 (39)	<0.01
Primary	731	222 (30)	364 (50)	145 (20)	
Secondary	854	385 (45)	406 (47)	63 (8)	
Higher	125	91 (73)	34 (27)	0 (0)	
Parity					
1	1159	449 (39)	518 (45)	192 (17)	<0.01
2	1180	350 (30)	567 (48)	263 (22)	
3	752	164 (22)	356 (47)	232 (31)	
4	508	79 (16)	237 (48)	192 (38)	
>4	537	66 (12)	198 (37)	273 (51)	
Occupation					
Farmer	2752	598 (22)	1242 (45)	912 (33)	<0.01
Non-farmer	640	204 (32)	302 (47)	134 (21)	
Not working	744	306 (41)	332 (45)	106 (14)	
Wealth index					
Poorest	1102	148 (13)	405 (37)	549 (50)	<0.01
Poorer	854	179 (21)	407 (48)	268 (31)	
Middle	738	176 (23)	389 (53)	173 (24)	
Richer	765	248 (32)	399 (52)	118 (15)	
Richest	677	357 (53)	276 (41)	44 (7)	
Religion					
Hindu	3591	980 (27)	1632 (46)	979 (27)	0.04
Non-Hindu	545	128 (23)	244 (45)	173 (32)	
Smoking					
No	3511	1018 (29)	1663 (48)	830 (24)	<0.01
Yes	625	90 (15)	213 (34)	322 (52)	

CI = 1.04–1.58) and or no visits (OR = 1.37, CI = 1.05–1.78). Having no education increased the chances of having fewer prenatal care visits compared to having at least some form of education (OR = 2.04, CI = 1.69–2.47). Furthermore, the higher the number of birth a woman had, the more likely that she would have fewer prenatal visits. With regards to religion, it was found that non-Hindu women were more likely to have no care or no visits compared to Hindu women. However the statistical significance of the association disappeared when all the demographic variables were adjusted simultaneously.

Discussion

This study revealed that majority of Nepali women does not attend prenatal care during the first trimester of their pregnancies. We also found that the timing of the start of prenatal care and the numbers of prenatal visits in Nepal were associated with a range of socio-economic and demographic factors. Mother's education, parity and wealth index were significantly associated with timing and number of prenatal visits. Besides these factors, mother's age, residence, smoking status and religion were also

Table 2 Distribution of maternal background characteristics by quantity of prenatal care (N = 4182)

	N = 4182	Number of prenatal care, n (%)			P value
		No visits	≤3 visits	>3 visits	
Mother's age (years)					
15–20	506	90 (18)	221 (44)	195 (39)	<0.01
21–25	1438	311 (22)	593 (41)	534 (37)	
26–30	1117	307 (28)	503 (45)	307 (28)	
>30	1075	440 (41)	472 (44)	163 (15)	
Residence					
Urban	988	143 (15)	385 (39)	460 (47)	<0.01
Rural	3148	1005 (32)	1404 (45)	739 (24)	
Education					
No education	2426	941 (39)	1125 (46)	360 (15)	0.003
Primary	731	144 (20)	332 (45)	255 (35)	
Secondary	854	63 (7)	315 (37)	476 (56)	
Higher	125	0 (0)	17 (14)	108 (86)	
Parity					
1	1159	191 (17)	440 (38)	528 (46)	<0.01
2	1180	263 (22)	522 (44)	395 (34)	
3	752	231 (31)	355 (47)	166 (22)	
4	508	191 (38)	252 (50)	65 (13)	
>4	537	272 (51)	220 (41)	45 (8)	
Occupation					
Farmer	2752	908 (33)	1193 (43)	651 (24)	<0.01
Non-farmer	640	134 (21)	295 (46)	211 (33)	
Not working	744	106 (14)	301 (41)	337 (45)	
Wealth index					
Poorest	1102	548 (50)	447 (40)	107 (10)	<0.01
Poorer	854	267 (31)	416 (49)	171 (20)	
Middle	738	172 (23)	359 (49)	207 (28)	
Richer	765	117 (15)	347 (46)	301 (39)	
Richest	677	44 (7)	220 (32)	413 (61)	
Religion					
Hindu	3591	976 (27)	1542 (43)	1073 (30)	<0.01
Non-Hindu	545	172 (32)	247 (45)	126 (23)	
Smoking					
No	3511	826 (24)	1548 (44)	1137 (32)	<0.01
Yes	625	322 (51)	241 (39)	62 (10)	

related with timing of start of prenatal care and number of visits.

The influence of mother's age on the timing of prenatal care shows a trend towards late prenatal visits in older age women. Petrou et al. [20] also observed that number of prenatal care visits were associated with increasing age. On contrary, some studies have found no association of number of visits with age [21, 22].

Our study suggests that timing of start of prenatal care either late or no prenatal care and number of prenatal visits in rural residence is low in general. It explains that the place of residence (rural/urban) can also act as proxy for access to health services. Many developing countries including Nepal have uneven distribution of health services in favor of urban residence. However, even in urban residence there is wide variability [23] in timing of start of prenatal care and number of prenatal visits. This demonstrates that given the distribution of maternal health services, it is possible that women in rural setting can increase their use of these services. Apart from the infrastructure advantage of urban women, it is also possible that the rural–urban differences in PNC use seen in this study result from the difference in exposure to health information these groups [24].

Table 3 Odds ratios (OR) and 95% confidence intervals (CI) for factors associated with late starts of prenatal care and no care

	Model I[a]		Model II[b]		Model III[c]
	Starts of prenatal care >3 months	No care	Starts of prenatal care >3 months	No care	Starts of prenatal care >3 months
Mother's age (years)					
>30	1.0	1.0	1.0	1.0	1.0
26–30	1.08 (0.85–1.36)	1.31 (0.98–1.76)	1.42 (1.09–1.84)	1.40 (1.04–1.89)	1.41 (1.07–1.86)
21–25	1.21 (0.95–1.54)	1.96 (1.45–2.65)	1.65 (1.25–2.18)	1.48 (1.06–2.05)	1.70 (1.27–2.28)
15–20	1.39 (1.08–1.80)	3.91 (2.89–5.30)	1.82 (1.29–2.58)	1.51 (0.97–2.34)	1.73 (1.20–2.49)
Residence					
Urban	1.0	1.0	1.0	1.0	1.0
Rural	1.81 (1.54–2.13)	3.98 (3.21–4.93)	1.12 (0.92–1.36)	1.37 (1.05–1.78)	1.05 (0.86–1.29)
Education					
Primary education more[d]	1.0	1.0	1.0	1.0	1.0
No education	2.27 (1.94–2.64)	7.72 (6.36–9.37)	1.60 (1.34–1.91)	3.20 (2.56–4.00)	1.27 (1.05–1.54)
Parity					
1	1.0	1.0	1.0	1.0	1.0
2	1.40 (1.16–1.68)	1.75 (1.39–2.21)	1.51 (1.22–1.85)	1.64 (1.25–2.17)	1.32 (1.06–1.64)
3	1.88 (1.50–2.35)	3.30 (2.54–4.29)	1.92 (1.47–2.50)	2.38 (1.71–3.32)	1.58 (1.19–2.09)
4	2.60 (1.91–3.53)	5.68 (4.16–7.76)	2.63 (1.86–3.72)	3.08 (2.05–4.63)	1.99 (1.38–2.86)
>4	2.60 (1.95–3.45)	9.67 (7.0–13.28)	2.75 (1.84–4.10)	4.64 (2.96–7.27)	2.08 (1.37–3.16)
Occupation					
Non-farmer or no work	1.0	1.0	1.0	1.0	1.0
Farmer	1.67 (1.43–1.94)	3.24 (2.69–3.89)	1.16 (0.97–1.39)	1.37 (1.09–1.71)	1.23 (1.02–1.48)
Wealth index					
Richest	1.0	1.0	1.0	1.0	1.0
Richer	2.10 (1.68–2.62)	3.86 (2.63–5.65)	1.62 (1.27–2.07)	2.08 (1.37–3.14)	1.45 (1.12–1.88)
Middle	2.92 (2.30–3.70)	8.32 (5.71–12.11)	1.98 (1.50–2.60)	3.27 (2.14–4.98)	1.65 (1.23–2.21)
Poorer	2.95 (2.33–3.73)	12.13 (8.42–17.48)	1.95 (1.48–2.57)	4.39 (2.91–6.63)	1.45 (1.08–1.95)
Poorest	3.55 (2.78–4.54)	30.42 (21.19–43.66)	2.19 (1.62–2.97)	8.55 (5.58–13.11)	1.48 (1.07–2.05)
Religion					
Hindu	1.0	1.0	1.0	1.0	1.0
Non-Hindu	1.14 (0.91–1.43)	1.35 (1.06–1.72)	1.12 (0.88–1.42)	1.35 (1.02–1.78)	1.05 (0.81–1.35)
Smoking					
No	1.0	1.0	1.0	1.0	1.0
Yes	1.42 (1.10–1.84)	4.34 (3.38–5.57)	0.87 (0.66–1.16)	1.42 (1.07–1.89)	0.81 (0.60–1.08)

[a] Unadjusted odds ratios

[b] Simultaneous adjustment of the all the factors at the unadjusted model

[c] In addition to the simultaneous adjustment in Model I, number of prenatal care visits was added in the Model II

[d] Primary education more includes the people of primary, secondary and higher education

The household socio-economic status (wealth index), occupational status and religion were observed to be associated with the timing of prenatal care. The wealth index of the household is particularly important, influencing both timing of start of prenatal care and number of prenatal care visits with graded association. Women from higher wealth index household were more likely to start prenatal care before 3 months and had more number of prenatal care visits compared with those from lower wealth index households. This finding accords with a recent

finding from Kenya [10] and supports other studies that have also demonstrated less likelihood use of health care services among women of lower socioeconomic status (SES) compared to those with higher socioeconomic status [25, 26]. Affordability among women of higher SES as well as higher likelihood of health information among those compared to their lower SES counterparts may explain this association.

Women with no education had higher probability of having no prenatal care or no visits at all compared to

Table 4 Odds ratios (OR) and 95% confidence intervals (CI) for factors associated with inadequate prenatal care and no care

	Model I[a]		Model II[b]		Model III[c]
	≤3 visits	No visits	≤3 visits	No visits	≤3 visits
Mother's age (years)					
>30	1.0	1.0	1.0	1.0	1.0
26–30	0.98 (0.78–1.22)	1.26 (0.94–1.68)	0.76 (0.59–0.98)	0.89 (0.63–1.26)	0.76 (0.58–1.00)
21–25	1.44 (1.13–1.83)	2.16 (1.61–2.91)	0.83 (0.62–1.12)	0.99 (0.67–1.46)	0.91 (0.66–1.24)
15–20	2.55 (1.96–3.32)	5.84 (4.30–7.95)	0.78 (0.54–1.12)	0.88 (0.56–1.37)	0.99 (0.68–1.45)
Residence					
Urban	1.0	1.0	1.0	1.0	1.0
Rural	2.27 (1.93–2.66)	4.37 (3.54–5.39)	1.27 (1.04–1.55)	1.49 (1.14–1.94)	1.28 (1.04–1.58)
Education					
Primary education more[d]	1.0	1.0	1.0	1.0	1.0
No education	3.94 (3.37–4.61)	10.59 (8.71–12.87)	2.21 (1.85–2.64)	3.91 (3.13–4.89)	2.04 (1.69–2.47)
Parity					
1	1.0	1.0	1.0	1.0	1.0
2	1.58 (1.32–1.90)	1.84 (1.46–2.31)	1.66 (1.34–2.05)	1.74 (1.31–2.29)	1.52 (1.21–1.90)
3	2.56 (2.05–3.20)	3.84 (2.96–4.98)	2.13 (1.62–2.80)	2.52 (1.80–3.52)	1.83 (1.38–2.44)
4	4.65 (3.44–6.28)	8.12 (5.86–11.25)	3.02 (2.09–4.35)	3.43 (2.24–5.24)	2.27 (1.55–3.34)
>4	5.86 (4.15–8.28)	16.70 (11.70–23.85)	3.26 (2.10–5.05)	5.39 (3.31–8.78)	2.38 (1.51–3.77)
Occupation					
Non-farmer or no work	1.0	1.0	1.0	1.0	1.0
Farmer	1.68 (1.45–1.95)	3.18 (2.65–3.82)	0.91 (0.76–1.10)	1.14 (0.90–1.44)	0.87 (0.71–1.06)
Wealth index					
Richest	1.0	1.0	1.0	1.0	1.0
Richer	2.16 (1.72–2.71)	3.64 (2.50–5.32)	1.63 (1.27–2.10)	1.97 (1.30–2.98)	1.45 (1.11–1.89)
Middle	3.25 (2.57–4.12)	7.79 (5.38–11.30)	2.06 (1.56–2.73)	3.14 82.06–4.79)	1.71 (1.27–2.30)
Poorer	4.56 (3.58–5.81)	14.65 (10.17–21.11)	2.73 (2.05–3.63)	5.23 (3.46–7.92)	2.28 (1.69–3.09)
Poorest	7.84 (6.00–10.24)	48.07 (33.08–69.84)	4.28 (3.09–5.91)	13.39 (8.63–20.78)	3.73 (2.65–5.24)
Religion					
Hindu	1.0	1.0	1.0	1.0	1.0
Non-Hindu	1.36 (1.08–1.71)	1.50 (1.17–1.91)	1.26 (0.99–1.62)	1.47 (1.10–1.96)	1.26 (0.97–1.64)
Smoking					
No	1.0	1.0	1.0	1.0	1.0
Yes	2.85 (2.13–3.81)	7.14 (5.37–9.51)	1.14 (0.83–1.57)	1.78 (1.28–2.46)	1.13 (0.81–1.58)

[a] Unadjusted odds ratios

[b] Simultaneous adjustment of the all the factors at the unadjusted model

[c] In addition to the simultaneous adjustment in Model I, the timing of starts of prenatal care was added in the Model II

[d] Primary education more includes the people of primary, secondary and higher education

women who had at least some education. Some previous studies have also found a significant association between education and the use of maternity services [27, 28]. In this study, the proportion of women with no education was higher and among them majority (39%) had no prenatal care visits.

This study confirms findings in other studies that women with higher parity are less likely to initiate prenatal care early or more likely to have less number of prenatal care visits [10, 24, 29]. Women with high parity might tend to rely on their experiences from previous pregnancies and

therefore do not feel the need for prenatal check-ups [30, 31]. However, with regard to pregnancy-related determinants, the differences in the number of prenatal care visits related to parity were in line with prenatal care guidelines. More visits are recommended in primiparae [32].

As expected, women who smoked were more likely to have no prenatal care or start prenatal care after 3 months. They were also more likely to have no visits and have 3 or less prenatal care visits compared to non-smoking women. However, the effects of smoking were lost when the models were adjusted for the other socio-demographic

factor. Previous studies have shown that smokers practice less healthy care behaviors in general and in prenatal care in particular [33, 34]. On the contrary, it seems that among Nepali women smoking does not play a significant role in participation in prenatal care.

The large sample size, the representativeness and nationwide nature of our data presents a unique opportunity in assessing the factors relating to timing of prenatal care and the number of visits and the extrapolation of the findings to the entire Nepali women population. Despite these compelling strengths of the study some limitations need to be acknowledged. The data was self-reported, also as information on visit were collected retrospectively there could be recall bias.

Conclusions

Majority of Nepali women delay prenatal care to the second trimester despite the WHO recommendation that women in developing countries should seek prenatal care within the first trimester of pregnancy. Age, education, parity and wealth were associated with both the timing of prenatal care and the number of prenatal visits such that older women and those socioeconomically disadvantaged (as measured by wealth index and education) had late and fewer prenatal visits compared to the younger ones and those with socioeconomic advantage, respectively. This study also revealed that women with higher parity and those in rural residencies were more likely to delay prenatal care, have fewer prenatal or have no care at all compared to their counterparts who were primiparae and those who lived in urban areas, respectively. Over all, the findings of this study suggest that many Nepali women are missing out the opportunity that prenatal care offers (especially early prenatal care) in detecting complications during pregnancy as well as other psychological and clinical advantages that a woman would receive during prenatal care. Programmes aimed at improving maternal health in general and participation in prenatal care in particular should target all Nepali women, especially those in rural residencies, those with no education, those who have high parity, older women and those from poor households.

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