



Need factors for utilisation of delivery services in Nepal

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Need factors for utilisation of delivery services in Nepal

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ABSTRACT

Objectives: This study aims to assess the role of need factors with respect to the utilisation of delivery services in Nepal.

Design: An analytic study was conducted using a subset of 4079 ever married women from the 2011 Nepal Demographic and Health Survey, which utilised two-stage cluster sampling.

Outcome measures: perceived need assessed by frequency of antenatal care visits and birth preparedness activities

Results: Overall facility delivery rate was low at 36.9%. Only half (50.1%) of the women made four or more antenatal care visits while 62.9% did not indicate any of the four birth preparation activities. Women who made more than four antenatal care visits were five times more likely to deliver at a health facility when compared to those who paid no visit (adjusted OR 4.94, 95% CI 3.14 to 7.76). Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities compared to their counterparts who made no preparation (adjusted OR 3.41, 95% CI 2.01 to 5.58).

Conclusion: The perceived need, as expressed by the frequency of antenatal care visits and birth preparedness activities, plays an important role in delivery service utilisation for Nepalese women. For behavioural interventions to be effective in safe motherhood programs, they must be capable of convincing the women to give birth at a health facility.

Article Summary

Strength and limitations

- This study used the nationally representative large sample of married women from 2011 NDHS survey with a high response rate.
- A major limitation of this study is that information was not available on some known determinants of facility delivery utilisation, particularly quality of providers and distance and transportation to facility.
- Perceived need of facility delivery was assessed by antenatal visits and birth preparedness activities, which were positively associated with facility delivery utilisation.

INTRODUCTION

Globally, nearly all (99%) maternal deaths occur in developing countries, mainly caused by non-utilisation of available delivery services or delays in accessing such services.^{1,2} A number of interventions have been implemented to increase the rate of facility delivery and access to emergency obstetric care, including the establishment of birth centres and maternity waiting homes, reduction of user fees, provision of incentives and birth preparedness packages.^{3,4} However, about half of all births in South Asia still occur at home.⁵ In particular, 65% of births take place at home in Nepal.⁶

According to the behavioural model proposed by Andersen, need factors are fundamental to healthcare seeking behaviour; that is, one should perceive a condition as susceptible and severe enough before seeking care to gain benefits.⁷ For delivery service utilisation, this means the pregnant woman and her family must recognise pregnancy and childbirth as abnormal events, so that life threatening situations may arise without any prediction.⁸ In many developing countries including Nepal, pregnancy and child birth are often perceived as normal life events without justification to seek professional help.^{9,10} In fact, need factors can be driven by pregnancy related factors such as awareness, health knowledge of pregnancy and risk, importance given to pregnancy, community customs, previous facility use, parity, and pregnancy complications.¹¹ Those women who perceive the need of professional help and recognise the risk of pregnancy and delivery are expected to make antenatal visits and prepare and arrange for childbirth. Besides the immediate need, utilisation of delivery service can be affected by predisposing and enabling factors as well as external environment factors, as depicted by the conceptual framework in Figure 1, which is adapted from Andersen's behavioural model for the utilisation of health services.⁷

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3 Despite the important role of need factors, their effect on utilisation of delivery service has
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5 seldom been investigated in the context of safe motherhood programs. The aim of the present
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7 study is to assess the contribution of need factors with respect to the utilisation of delivery
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9 service in Nepal, using data from the national Nepal Demographic Health Survey (NDHS).
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12 13 14 **METHODS**

15 16 **Study setting**

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18 Nepal, with a population of 27.5 million, is divided into five developmental regions, each
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20 extending from north to south. The country has also three ecological zones across east to
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22 west: Terai, Hill and Mountain. These 15 sub-ecological regions are further divided into
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24 smaller districts. Typically, each district has Village Development Committees (VDC) in
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26 rural areas and municipalities in urban areas. Each VDC or municipality in turn consists of
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28 small administrative units known as wards.
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34 35 **Data and sampling**

36
37 The data for this study were obtained from the 2011 NDHS conducted by the Ministry of
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39 Health and Population. The 2011 NDHS survey was approved by Nepal Health Research
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41 Council and data were accessible from MEASURE DHS project on request. Permission to
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43 use the data was obtained by the authors. Details of the sampling methodology had been
44
45 described elsewhere.⁶ Briefly, the survey utilised a two-stage cluster sampling method with
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47 wards (enumeration areas) being the primary sampling units. The wards were stratified by
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49 sub-ecological domains and by rural-urban residency. In total, 11,085 households were
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51 selected as listing units from these 289 wards. Among them, 12,961 women aged 15-49 years
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53 were identified as eligible but individual interviews were only completed for 12,699 women,
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3 giving a response rate of 98%. This study focused on the subset of 4079 ever married women
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5 who had given birth within the past five years preceding the survey.
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8 9 10 **Statistical analysis**

11 The outcome variable was ‘place of delivery’: home versus facility (private or public). This
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13 binary variable was chosen instead of ‘assisted deliveries’ to emphasize the use of delivery
14
15 services and to avoid potential problem of inaccurate reporting of birth attendant skills.
16
17 Perceived need factors investigated were (1) frequency of antenatal care visits and (2) birth
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19 preparedness. The latter referred to four preparation activities, namely, planning for a birth
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21 attendant, saving money, arrangement for transportation, and identification of potential blood
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23 donator. Although the 2011 NDHS collected information on planning activities related to
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25 preparation of clothes, delivery kit and food, these activities did not necessarily imply the
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27 need for facility delivery; consequently, they were not considered as need factors.
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33
34 Table 1 gives the classification of variables used in this study. These variables were chosen in
35
36 view of the conceptual framework of factors associated with utilisation of delivery services
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38 (Figure 1). NDHS applied principal component analysis of a range of household assets to
39
40 generate wealth quintiles. Ethnicity was categorised by three groups: upper caste (Hill
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42 Brahmin, Hill Cheetri, Terai Brahmin, Terai Cheetri), lower caste (Hill Dalit, Terai Dalit) and
43
44 other (all other recorded ethnicities). Education was classified as none, primary (1-5 grade),
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46 secondary (6-10 grade), and higher (after 10th grade).
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52 In the 2011 NDHS, enumeration areas were not allocated proportional to their population
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54 size, thus requiring adjustment by sampling weights prior to analysis. Such sampling weights
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56 were provided by the survey to account for cluster level variables and strata (domain) level
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variables. Based on these sampling weights, a complex sampling plan file was then prepared to perform logistic regression modelling, with need factors and other confounding factors listed in Table 1. All statistical analyses were conducted in the SPSS package version 21.

Table 1: Classification of variables used in the analysis (n=4079)

| Variables | categories | Weighted percentage |
|------------------------------|------------|---------------------|
| Place of delivery | Home | 63.1 |
| | Facility | 36.9 |
| Antenatal care visits | 0 | 15.2 |
| | 1 | 6.1 |
| | 2 | 12.2 |
| | 3 | 16.4 |
| | 4 | 19.7 |
| Birth preparedness | ≥ 5 | 30.4 |
| | 0 | 62.9 |
| | 1 | 33.3 |
| Age (years) | ≥ 2 | 3.8 |
| | 15-19 | 7.1 |
| | 20-24 | 33.4 |
| | 25-29 | 32.2 |
| Education | 30-49 | 27.3 |
| | None | 47.3 |
| | Primary | 20.0 |
| | Secondary | 27.2 |

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|-----------------------------|-------------|------|
| | Higher | 5.5 |
| Partner Education | None | 23.2 |
| | Primary | 24.5 |
| | Secondary | 42.1 |
| | Higher | 10.2 |
| Parity | 1 | 24.2 |
| | 2 | 30.6 |
| | 3 | 19.3 |
| | 4 | 10.8 |
| | ≥ 5 | 15.1 |
| Wealth quintiles | 1 | 25.8 |
| | 2 | 21.9 |
| | 3 | 21.0 |
| | 4 | 17.4 |
| | 5 | 13.9 |
| Ethnicity | Other | 52.1 |
| | Lower caste | 17.8 |
| | Upper caste | 30.1 |
| Region | Mountain | 7.9 |
| | Hill | 39.5 |
| | Terai | 52.6 |
| Residential location | Rural | 90.7 |
| | Urban | 9.3 |

RESULTS

Table 1 shows the characteristics of the 4079 eligible women. About half of the participants had no education (47.3%) and came from the Terai region (52.6%). Almost two-third of them were between 20-29 years of age. Although half (50.1%) of the women made four or more antenatal care visits, 15.2% of women never visited a health facility before giving birth. The majority of mothers (62.9%) did not indicate any of the four birth preparation activities, while no women prepared for all four activities.

The overall facility delivery rate was found to be 36.9%. Table 2 presents the results of logistic regression analysis. Both need factors were positively associated with the facility delivery status. Even after adjusting the effects of predisposing, enabling, and external environment factors, the two need factors remained statistically significant ($p < 0.001$). In particular, women who made five or more antenatal care visits were almost five times more likely to deliver at a health facility when compared to those who paid no visit prior to delivery (adjusted odds ratio (OR) 4.94, 95% confidence interval (CI) 3.14 to 7.76). Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities, relative to their counterparts who chose to make no preparation (adjusted OR 3.41, 95% CI 2.01 to 5.58).

Table 2 Crude and adjusted odds ratio of facility delivery, NDHS 2011 (n=4079)

| | Crude OR (95% CI) | Adjusted OR [#] (95% CI) | p |
|------------------------------|----------------------|-----------------------------------|---------|
| Antenatal care visits | | | |
| 0 | 1 | 1 | < 0.001 |
| 1 | 1.79 (1.03, 3.10) | 1.30 (0.72, 2.34) | |
| 2 | 2.58 (1.62, 4.10) | 1.75 (1.07, 2.93) | |
| 3 | 4.18 (2.69, 6.50) | 2.21 (1.39, 3.43) | |
| 4 | 8.71 (5.40, 14.05) | 4.13 (2.51, 6.44) | |
| ≥ 5 | 17.89 (11.23, 28.51) | 4.94 (3.14, 7.76) | |
| Birth preparedness | | | |
| 0 | 1 | 1 | < 0.001 |
| 1 | 2.68 (2.18, 3.30) | 1.52 (1.19, 1.88) | |
| ≥ 2 | 9.31 (5.71, 15.17) | 3.41 (2.01, 5.58) | |

[#] adjusted for age, education, partner education, parity, wealth quintiles, ethnicity, region and residential location.

DISCUSSION

The national survey data revealed the majority of Nepalese mothers did not prepare any of the four activities and only half of the women made the recommended 4 or more antenatal care visits, which suggested that they had no intention or did not perceive the need of giving birth at a health facility. Indeed, the facility delivery rate was found to be only 36.9%. In the traditional Nepalese society, childbirth continues to take place at home, while many women still hold the view that facility delivery is unnecessary. On the other hand, those women who were prepared and made antenatal visits tended to give birth at facilities. Our results confirmed the strong contribution by these need factors to actual facility utilisation irrespective of predisposing, enabling, and external environment factors.

Although the frequency of antenatal care visits was associated with subsequent facility delivery, the relationship appeared to be dose-dependent,^{11, 12} as in the case of the present study whereby making a single visit induced no significant impact; whereas previous studies undertaken in Tanzania observed high use of antenatal care but low use of facility delivery.^{13, 14} Making the recommended four or more antenatal care visits might reflect the woman's concern of her pregnancy, pregnancy complications and the need for professional help.

The link between birth preparedness activities and facility delivery was supported by recent literature. A prospective cohort study of 701 pregnant women in the Kaski district of Nepal found preparation activities could increase the facility delivery rate.¹² Similarly, a randomised trial in Tanzania demonstrated that skilled delivery care uptake was 16.8% higher among women who had been counselled on promotion of birth plan than others without such counselling.¹⁵ Raising awareness and help for birth plan also led to increased facility

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3 utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.

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10 The findings have important implications for safe motherhood program in Nepal and other
11 developing countries. Because the intention to deliver at a health facility can be largely
12 influenced by need factors, women should be extensively counselled and convinced of the
13 benefits and safety of facility delivery. Any behavioural intervention such as birth
14 preparedness package and complication readiness is unlikely to be successful unless attaining
15 a high level capable to change the women's attitude and intention.
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25 The strength of the present study was the use of a nationally representative large sample of
26 married women with a high response rate. However, information was lacking on some known
27 determinants of facility delivery utilisation, particularly quality of providers and distance and
28 transportation to facility. These variables were unavailable from the 2011 NDHS database
29 and posed as the major limitation. Nevertheless, residential location and region have provided
30 some proxy information to partially compensate the effect of distance and service
31 availability. Delivery services in Terai and urban areas are more physically accessible than in
32 hilly or mountainous parts of the country.
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45 **CONCLUSION**

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47 Utilisation of delivery services remained low in Nepal. The majority of mothers were not
48 prepared for childbirth and only half the women made the recommended four or more
49 antenatal care visits, indicating their perceived lack of need for facility delivery. The national
50 data confirmed the strong associations between such need factors and service utilisation.
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56 Therefore, for behavioural interventions such as birth preparedness and complication
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3 readiness to be effective in safe motherhood programs, they must be capable of changing the
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5 women's intention to deliver at a health facility.
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8 9 **Acknowledgements**

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11
12 the data for this study.
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15 16 **Contributors**

17 RK conceived the study design, did data analysis and drafted the paper. AHD assisted in data
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19 analysis and revision of the paper. VK assisted in data archive and provided comments. All
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21 the three authors read and approved the final version.
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27 28 **Competing Interests**

29 None declared for all authors.
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34 35 **Data sharing statement**

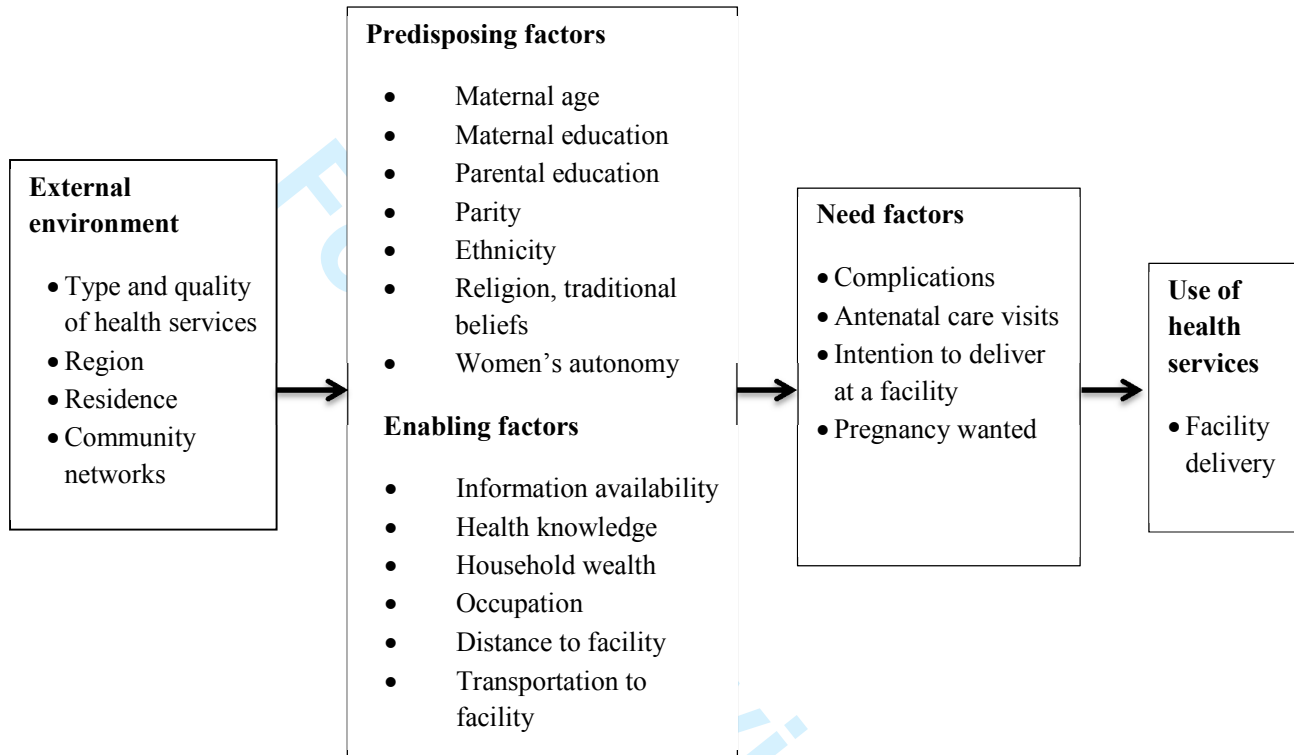
36 Data of 2011 Nepal Demographic and Health Survey can be obtained from MEASURE DHS
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38 ICF International, Calverton, Maryland, USA.
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Figure 1: Conceptual framework of factors associated with the utilisation of delivery services





**Need factors for utilisation of institutional delivery services
in Nepal: an analysis from Nepal Demographic and Health
Survey, 2011**

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ABSTRACT

Objectives: This study aims to assess the role of need factors with respect to the utilisation of institutional delivery services in Nepal.

Design: An analytic study was conducted using a subset of 4079 ever married women from the 2011 Nepal Demographic and Health Survey, which utilised two-stage cluster sampling. Logistic regression was used to evaluate the effects of antenatal care visits and birth preparedness activities on facility delivery using complex sample analysis.

Outcome measures: facility delivery

Results: Overall facility delivery rate was low at 36.9% (95% CI 33.5% to 40.2%, SE 1.69). Only half (50.1%) of the women made four or more antenatal care visits while 62.9% (95% CI 59.9% to 65.8%, SE 1.51) did not indicate any of the four birth preparation activities. After adjusting for external, predisposing and enabling factors, women who made more than four antenatal care visits were five times more likely to deliver at a health facility when compared to those who paid no visit (adjusted OR 4.94, 95% CI 3.14 to 7.76). Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities compared to their counterparts who made no preparation (adjusted OR 3.41, 95% CI 2.01 to 5.58).

Conclusion: The perceived need, as expressed by the frequency of antenatal care visits and birth preparedness activities, plays an important role in institutional delivery service utilisation for Nepalese women. These findings have implications for behavioural interventions such as birth preparedness and complication readiness, which aims to change women's intention to deliver at a health facility.

Article Summary

Strength and limitations

- This study used the nationally representative large sample of married women from 2011 NDHS survey with a high response rate.
- A major limitation of this study is that information was not available on some known determinants of facility delivery utilisation, particularly quality of providers and distance and transportation to facility.
- Perceived need of facility delivery was assessed by antenatal visits and birth preparedness activities, which were positively associated with facility delivery utilisation.

INTRODUCTION

Globally, nearly all (99%) maternal deaths occur in low income countries, mainly caused by non-utilisation of available delivery services or delays in accessing such services.^{1,2} Indeed, about half of all births in South Asia still occur at home.³ A number of interventions have been implemented to increase the rate of facility delivery and access to emergency obstetric care, including the establishment of birth centres and maternity waiting homes, reduction of user fees, provision of incentives and birth preparedness packages.^{4,5} The 'safer mother programme' in Nepal provides free delivery services with delivery incentives to women who deliver in a designated health facility.⁶

Although there is a substantial reduction of maternal mortality from 539 maternal deaths per 100000 live births in 1996 to 281 in 2006 in Nepal, there has not been proportionate increase in utilisation of institutional delivery service.⁷ The recent demography survey in 2011 reported that still about 65% of women deliver at homes and only 36% of births occur in presence of skilled birth attendants⁸, whereas the national target is to achieve 60% of births by skilled birth attendants by 2015 to meet the Millennium Development Goal 5 target of 134 per 100000 live births.⁹ Thus, utilisation of institutional delivery service is a major concern in Nepal.

According to the behavioural model proposed by Andersen, need factors are fundamental to healthcare seeking behaviour; that is, one should perceive a condition as susceptible and severe enough before seeking care to gain benefits.¹⁰ For institutional delivery service utilisation, this means the pregnant woman and her family must recognise pregnancy and childbirth as abnormal events, so that life threatening situations may arise without any prediction.¹¹ In many low income countries including Nepal, pregnancy and child birth are

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5 fact, need factors can be driven by pregnancy related factors such as awareness, health
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38 preparedness activities as available in NDHS 2011 data.
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45 **METHODS**

46 **Study setting**

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48 Nepal, with a population of 27.5 million, is divided into five developmental regions, each
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50 extending from north to south. The country has also three ecological zones across east to
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52 west: Terai, Hill and Mountain. These 15 sub-ecological regions are further divided into
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54 smaller districts. Typically, each district has Village Development Committees (VDC) in
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3 rural areas and municipalities in urban areas. Each VDC or municipality in turn consists of
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5 small administrative units known as wards.
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8 9 **Data and sampling**

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11 The data for this study were obtained from the 2011 NDHS conducted by the Ministry of
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13 Health and Population. The 2011 NDHS survey was approved by Nepal Health Research
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15 Council and data were accessible from MEASURE DHS project on request.¹⁶ Permission to
16
17 use the data was obtained by the authors. Details of the sampling methodology had been
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19 described elsewhere.⁸ Briefly, the survey utilised a two-stage cluster sampling method with
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21 wards (enumeration areas) being the primary sampling units. The wards were stratified by
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23 sub-ecological domains and by rural-urban residency. In total, 11,085 households were
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25 selected as listing units from these 289 wards. Among them, 12,961 women aged 15-49 years
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27 were identified as eligible but individual interviews were only completed for 12,699 women,
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29 giving a response rate of 98%. This study focused on the subset of 4079 ever married women
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31 who had given birth within the past five years preceding the survey and who provided
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33 information on antenatal visits and preparation activities.
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40 41 **Statistical analysis**

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43 The outcome variable was 'place of delivery': home versus facility (private or public). This
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45 binary variable was chosen instead of 'assisted deliveries' to emphasize the use of
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47 institutional delivery services and to avoid potential problem of inaccurate reporting of birth
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49 attendant skills. Perceived need factors investigated were (1) frequency of antenatal care
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51 visits and (2) birth preparedness. The latter referred to four preparation activities, namely,
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53 planning for a birth attendant, saving money, arrangement for transportation, and
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55 identification of potential blood donator.¹⁷ Although the 2011 NDHS collected information
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on planning activities related to preparation of clothes, delivery kit and food, these activities did not necessarily imply the need for facility delivery; consequently, they were not considered as need factors of institutional delivery service use.

Table 1 gives the classification of variables used in this study. These variables were chosen in view of the conceptual framework of factors associated with utilisation of institutional delivery services (Figure 1). NDHS applied principal component analysis of a range of household assets to generate wealth quintiles. Ethnicity was categorised by three groups: upper caste (Hill Brahmin, Hill Cheetri, Terai Brahmin, Terai Cheetri), lower caste (Hill Dalit, Terai Dalit) and other (all other recorded ethnicities). Education was classified as none, primary (1-5 grade), secondary (6-10 grade), and higher (after 10th grade).

In the 2011 NDHS, enumeration areas were not allocated proportional to their population size, thus requiring adjustment by sampling weights prior to analysis. Such sampling weights were provided by the survey to account for cluster level variables and strata (domain) level variables. Based on these sampling weights, a complex sampling plan file was then prepared to perform logistic regression modelling, with need factors and other confounding factors listed in Table 1. All statistical analyses were conducted in the SPSS package version 21.

Table 1: Classification of variables used in the analysis (n=4079)

| Variables | categories | Weighted percentage | Unweighted count |
|--------------------------|------------|---------------------|------------------|
| Place of delivery | Home | 63.1 | 2397 |

| | | | |
|---------------------------------------|-----------|------|------|
| | Facility | 36.9 | 1682 |
| Antenatal care visits | 0 | 15.2 | 611 |
| | 1 | 6.1 | 234 |
| | 2 | 12.2 | 426 |
| | 3 | 16.4 | 657 |
| | 4 | 19.7 | 901 |
| | ≥ 5 | 30.4 | 1250 |
| Birth preparedness[#] | 0 | 62.9 | 2476 |
| | 1 | 33.3 | 1440 |
| | ≥ 2 | 3.8 | 163 |
| Women's age (years) | 15-19 | 7.1 | 306 |
| | 20-24 | 33.4 | 1273 |
| | 25-29 | 32.2 | 1335 |
| | 30-49 | 27.3 | 1165 |
| Women's education | None | 47.3 | 1765 |
| | Primary | 20.0 | 817 |
| | Secondary | 27.2 | 1225 |
| | Higher | 5.5 | 272 |
| Partner Education | None | 23.2 | 745 |
| | Primary | 24.5 | 989 |
| | Secondary | 42.1 | 1815 |
| | Higher | 10.2 | 514 |
| Parity | 1 | 24.2 | 1248 |
| | 2 | 30.6 | 1157 |
| | 3 | 19.3 | 690 |

| | | | |
|-----------------------------|-------------|------|------|
| | 4 | 10.8 | 440 |
| | ≥ 5 | 15.1 | 544 |
| Wealth quintiles | 1 | 25.8 | 1160 |
| | 2 | 21.9 | 832 |
| | 3 | 21.0 | 739 |
| | 4 | 17.4 | 677 |
| | 5 | 13.9 | 671 |
| Ethnicity | Other | 52.1 | 1813 |
| | Lower caste | 17.8 | 703 |
| | Upper caste | 30.1 | 1552 |
| Region | Mountain | 7.9 | 742 |
| | Hill | 39.5 | 1656 |
| | Terai | 52.6 | 1681 |
| Residential location | Rural | 90.7 | 3182 |
| | Urban | 9.3 | 897 |

[#]Birth preparedness consists of four preparation activities (planning for a birth attendant, saving money, arrangement for transportation, and identification of potential blood donator)

RESULTS

Table 1 shows the characteristics of the 4079 eligible women. About half of the participants had no education (47.3%) and came from the Terai region (52.6%). Almost two-third of them were between 20-29 years of age. Although half (50.1%) of the women made four or more antenatal care visits, 15.2% of eligible women never visited a health facility before giving birth. The majority of mothers (62.9% with CI 59.9% to 65.8% and SE 1.51) did not

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2
3 indicate any of the four birth preparation activities, while no women prepared for all four
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5 activities.
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10 The overall facility delivery rate was found to be 36.9% (CI 33.5% to 40.2%, SE 1.69). Table
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12 2 presents the results of logistic regression analysis. Both need factors were positively
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14 associated with the facility delivery status. Even after adjusting the effects of predisposing,
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16 enabling, and external environment factors, the two need factors remained statistically
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18 significant ($p < 0.001$). The confounders were adjusted simultaneously and included women's
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20 age, women's education, partner education, parity, wealth quintiles, ethnicity, region and
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22 residential location as presented in Table 1 and as available from the NDHS 2011 data set. In
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24 particular, women who made five or more antenatal care visits were almost five times more
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26 likely to deliver at a health facility when compared to those who paid no visit prior to
27
28 delivery (adjusted odds ratio (OR) 4.94, 95% confidence interval (CI) 3.14 to 7.76) .
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30 Similarly, the likelihood for facility delivery increased by 3.4 fold among women who
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32 prepared for at least two of the four activities, relative to their counterparts who chose to
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34 make no preparation (adjusted OR 3.41, 95% CI 2.01 to 5.58).
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Table 2 Crude and adjusted odds ratio of facility delivery, NDHS 2011 (n=4079)

| | Crude OR (95% CI) | Adjusted OR ^a (95% CI) | p |
|------------------------------|----------------------|-----------------------------------|---------|
| Antenatal care visits | | | |
| 0 | 1 | 1 | < 0.001 |
| 1 | 1.79 (1.03, 3.10) | 1.30 (0.72, 2.34) | |
| 2 | 2.58 (1.62, 4.10) | 1.75 (1.07, 2.93) | |
| 3 | 4.18 (2.69, 6.50) | 2.21 (1.39, 3.43) | |
| 4 | 8.71 (5.40, 14.05) | 4.13 (2.51, 6.44) | |
| ≥ 5 | 17.89 (11.23, 28.51) | 4.94 (3.14, 7.76) | |
| Birth preparedness | | | |
| 0 | 1 | 1 | < 0.001 |
| 1 | 2.68 (2.18, 3.30) | 1.52 (1.19, 1.88) | |
| ≥ 2 | 9.31 (5.71, 15.17) | 3.41 (2.01, 5.58) | |

^a Adjusted for variables age, education, partner education, parity, wealth quintiles, ethnicity, region and residential location as shown in Table 1.

DISCUSSION

The national survey data revealed the majority of Nepalese mothers did not prepare any of the four activities and only half of the women made the recommended 4 or more antenatal

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3 care visits, which suggested that they might have no intention or might not perceive the need
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5 of giving birth at a health facility. Such perception of need can also be influenced by distance
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7 and quality of maternity services. Indeed, the facility delivery rate was found to be only
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9 36.9%. In the traditional Nepalese society, childbirth continues to take place at home, while
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11 many women still hold the view that facility delivery is unnecessary. On the other hand, those
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13 women who were prepared and made antenatal visits tended to give birth at facilities. Our
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15 results confirmed the strong contribution by these need factors to actual facility utilisation
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17 irrespective of predisposing, enabling, and external environment factors.
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22 Although the frequency of antenatal care visits was associated with subsequent facility
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24 delivery, the relationship appeared to be dose-dependent,^{14, 18} as in the case of the present
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26 study whereby making a single visit induced no significant impact; whereas previous studies
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28 undertaken in Tanzania observed high use of antenatal care but low use of facility delivery.^{19,}
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30 ²⁰ Making the recommended four or more antenatal care visits might reflect the woman's
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32 concern of her pregnancy, pregnancy complications and the need for professional help.^{14,}
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34 ²¹ Consequently, informing women about danger signs and providing qualitative antenatal
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36 care with provision of iron tablets and blood check might encourage women to go for
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38 antenatal visits.
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46 The link between birth preparedness activities and facility delivery was supported by recent
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48 literature. A prospective cohort study of 701 pregnant women in the Kaski district of Nepal
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50 found preparation activities could increase the facility delivery rate.¹⁸ Similarly, a
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52 randomised trial in Tanzania demonstrated that skilled delivery care uptake was 16.8% higher
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54 among women who had been counselled on promotion of birth plan than others without such
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56 counselling.²² Raising awareness and help for birth plan also led to increased facility
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3 utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.
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5 ²³⁻²⁵. However, two previous pre-post evaluation studies of birth preparedness in southern
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7 districts of Nepal reported that increased preparedness level was not significantly translated
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9 into increased facility delivery.^{26, 27}
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14 The findings have important implications for safe motherhood program in Nepal and other
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16 low income countries. Because the intention to deliver at a health facility can be largely
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18 influenced by need factors, women should be extensively counselled and convinced of the
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20 benefits and safety of facility delivery. Any behavioural intervention such as birth
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22 preparedness package and complication readiness is unlikely to be successful unless attaining
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24 a high level capable to change the women's attitude and intention. Counselling can be
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26 performed by health worker, preferably female health workers, at a health facility or by
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28 female community health volunteers at household visits. Further, local teachers and social
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30 workers can also be involved in awareness raising campaign. Community networks and
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32 mother clubs can also support in preparation activities such as money and transport
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34 management.
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41 The strength of the present study was the use of a nationally representative large sample of
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43 married women with a high response rate. However, information was lacking on some known
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45 determinants of facility delivery utilisation, particularly quality of providers and distance and
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47 transportation to facility. These variables were unavailable from the 2011 NDHS database
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49 and posed as the major limitation. Nevertheless, the external factors 'residential location' and
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51 'region' have provided some proxy information to partially compensate the effect of distance
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53 and service availability. Institutional delivery services in Terai and urban areas are more
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55 physically accessible than in hilly or mountainous parts of the country. The regression model
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3 used 'region' and 'residence' as confounders together with other known predisposing and
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5 enabling factors that include women's age, education, partner education, parity, wealth
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7 quintiles and ethnicity.
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10 11 12 **CONCLUSION**

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14 Utilisation of institutional delivery services remained low in Nepal. The majority of mothers
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16 were not prepared for childbirth and only half the women made the recommended four or
17
18 more antenatal care visits, indicating their perceived lack of need for facility delivery. The
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20 national data confirmed the strong associations between such need factors and institutional
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22 delivery service utilisation. This strong association has implications for behavioural
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24 interventions such as birth preparedness and complication readiness, which aims to change
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26 women's intention to deliver at a health facility.
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Contributors

RK conceived the study design, did data analysis and drafted the paper. AHD assisted in data analysis and revision of the paper. VK assisted in data archive and provided comments. All the three authors read and approved the final version.

Competing Interests

None declared for all authors.

Data sharing statement

Data of 2011 Nepal Demographic and Health Survey can be obtained from MEASURE DHS ICF International, Calverton, Maryland, USA.

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Need factors for utilisation of delivery services in Nepal

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Keywords: birth preparedness, facility delivery, maternity service, need factors, Nepal

Word count: 2149

ABSTRACT

Objectives: This study aims to assess the role of need factors with respect to the utilisation of delivery services in Nepal.

Design: An analytic study was conducted using a subset of 4079 ever married women from the 2011 Nepal Demographic and Health Survey, which utilised two-stage cluster sampling.

Outcome measures: perceived need assessed by frequency of antenatal care visits and birth preparedness activities

Results: Overall facility delivery rate was low at 36.9%. Only half (50.1%) of the women made four or more antenatal care visits while 62.9% did not indicate any of the four birth preparation activities. Women who made more than four antenatal care visits were five times more likely to deliver at a health facility when compared to those who paid no visit (adjusted OR 4.94, 95% CI 3.14 to 7.76). Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities compared to their counterparts who made no preparation (adjusted OR 3.41, 95% CI 2.01 to 5.58).

Conclusion: The perceived need, as expressed by the frequency of antenatal care visits and birth preparedness activities, plays an important role in delivery service utilisation for Nepalese women. For behavioural interventions to be effective in safe motherhood programs, they must be capable of convincing the women to give birth at a health facility.

Article Summary

Strength and limitations

- This study used the nationally representative large sample of married women from 2011 NDHS survey with a high response rate.
- A major limitation of this study is that information was not available on some known determinants of facility delivery utilisation, particularly quality of providers and distance and transportation to facility.
- Perceived need of facility delivery was assessed by antenatal visits and birth preparedness activities, which were positively associated with facility delivery utilisation.

INTRODUCTION

Globally, nearly all (99%) maternal deaths occur in developing countries, mainly caused by non-utilisation of available delivery services or delays in accessing such services.^{1,2} A number of interventions have been implemented to increase the rate of facility delivery and access to emergency obstetric care, including the establishment of birth centres and maternity waiting homes, reduction of user fees, provision of incentives and birth preparedness packages.^{3,4} However, about half of all births in South Asia still occur at home.⁵ In particular, 65% of births take place at home in Nepal.⁶

According to the behavioural model proposed by Andersen, need factors are fundamental to healthcare seeking behaviour; that is, one should perceive a condition as susceptible and severe enough before seeking care to gain benefits.⁷ For delivery service utilisation, this means the pregnant woman and her family must recognise pregnancy and childbirth as abnormal events, so that life threatening situations may arise without any prediction.⁸ In many developing countries including Nepal, pregnancy and child birth are often perceived as normal life events without justification to seek professional help.^{9,10} In fact, need factors can be driven by pregnancy related factors such as awareness, health knowledge of pregnancy and risk, importance given to pregnancy, community customs, previous facility use, parity, and pregnancy complications.¹¹ Those women who perceive the need of professional help and recognise the risk of pregnancy and delivery are expected to make antenatal visits and prepare and arrange for childbirth. Besides the immediate need, utilisation of delivery service can be affected by predisposing and enabling factors as well as external environment factors, as depicted by the conceptual framework in Figure 1, which is adapted from Andersen's behavioural model for the utilisation of health services.⁷

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3 Despite the important role of need factors, their effect on utilisation of delivery service has
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5 seldom been investigated in the context of safe motherhood programs. The aim of the present
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7 study is to assess the contribution of need factors with respect to the utilisation of delivery
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9 service in Nepal, using data from the national Nepal Demographic Health Survey (NDHS).
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12 13 **METHODS**

14 **Study setting**

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16 Nepal, with a population of 27.5 million, is divided into five developmental regions, each
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18 extending from north to south. The country has also three ecological zones across east to
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20 west: Terai, Hill and Mountain. These 15 sub-ecological regions are further divided into
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22 smaller districts. Typically, each district has Village Development Committees (VDC) in
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24 rural areas and municipalities in urban areas. Each VDC or municipality in turn consists of
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26 small administrative units known as wards.
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32 **Data and sampling**

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34 The data for this study were obtained from the 2011 NDHS conducted by the Ministry of
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8 9 **Statistical analysis**

10 The outcome variable was 'place of delivery': home versus facility (private or public). This
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12 binary variable was chosen instead of 'assisted deliveries' to emphasize the use of delivery
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14 services and to avoid potential problem of inaccurate reporting of birth attendant skills.
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16 Perceived need factors investigated were (1) frequency of antenatal care visits and (2) birth
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20 attendant, saving money, arrangement for transportation, and identification of potential blood
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24 preparation of clothes, delivery kit and food, these activities did not necessarily imply the
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26 need for facility delivery; consequently, they were not considered as need factors.
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33 Table 1 gives the classification of variables used in this study. These variables were chosen in
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35 view of the conceptual framework of factors associated with utilisation of delivery services
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37 (Figure 1). NDHS applied principal component analysis of a range of household assets to
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39 generate wealth quintiles. Ethnicity was categorised by three groups: upper caste (Hill
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41 Brahmin, Hill Cheetri, Terai Brahmin, Terai Cheetri), lower caste (Hill Dalit, Terai Dalit) and
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43 other (all other recorded ethnicities). Education was classified as none, primary (1-5 grade),
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45 secondary (6-10 grade), and higher (after 10th grade).
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53 size, thus requiring adjustment by sampling weights prior to analysis. Such sampling weights
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55 were provided by the survey to account for cluster level variables and strata (domain) level
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variables. Based on these sampling weights, a complex sampling plan file was then prepared to perform logistic regression modelling, with need factors and other confounding factors listed in Table 1. All statistical analyses were conducted in the SPSS package version 21.

Table 1: Classification of variables used in the analysis (n=4079)

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| | 2 | 12.2 |
| | 3 | 16.4 |
| | 4 | 19.7 |
| | ≥ 5 | 30.4 |
| Birth preparedness | 0 | 62.9 |
| | 1 | 33.3 |
| | ≥ 2 | 3.8 |
| Age (years) | 15-19 | 7.1 |
| | 20-24 | 33.4 |
| | 25-29 | 32.2 |
| | 30-49 | 27.3 |
| Education | None | 47.3 |
| | Primary | 20.0 |
| | Secondary | 27.2 |

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| | | |
|-----------------------------|-------------|------|
| | Higher | 5.5 |
| Partner Education | None | 23.2 |
| | Primary | 24.5 |
| | Secondary | 42.1 |
| | Higher | 10.2 |
| Parity | 1 | 24.2 |
| | 2 | 30.6 |
| | 3 | 19.3 |
| | 4 | 10.8 |
| | ≥ 5 | 15.1 |
| Wealth quintiles | 1 | 25.8 |
| | 2 | 21.9 |
| | 3 | 21.0 |
| | 4 | 17.4 |
| | 5 | 13.9 |
| Ethnicity | Other | 52.1 |
| | Lower caste | 17.8 |
| | Upper caste | 30.1 |
| Region | Mountain | 7.9 |
| | Hill | 39.5 |
| | Terai | 52.6 |
| Residential location | Rural | 90.7 |
| | Urban | 9.3 |

RESULTS

Table 1 shows the characteristics of the 4079 eligible women. About half of the participants had no education (47.3%) and came from the Terai region (52.6%). Almost two-third of them were between 20-29 years of age. Although half (50.1%) of the women made four or more antenatal care visits, 15.2% of women never visited a health facility before giving birth. The majority of mothers (62.9%) did not indicate any of the four birth preparation activities, while no women prepared for all four activities.

The overall facility delivery rate was found to be 36.9%. Table 2 presents the results of logistic regression analysis. Both need factors were positively associated with the facility delivery status. Even after adjusting the effects of predisposing, enabling, and external environment factors, the two need factors remained statistically significant ($p < 0.001$). In particular, women who made five or more antenatal care visits were almost five times more likely to deliver at a health facility when compared to those who paid no visit prior to delivery (adjusted odds ratio (OR) 4.94, 95% confidence interval (CI) 3.14 to 7.76). Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities, relative to their counterparts who chose to make no preparation (adjusted OR 3.41, 95% CI 2.01 to 5.58).

Table 2 Crude and adjusted odds ratio of facility delivery, NDHS 2011 (n=4079)

| | Crude OR (95% CI) | Adjusted OR [#] (95% CI) | p |
|------------------------------|----------------------|-----------------------------------|---------|
| Antenatal care visits | | | |
| 0 | 1 | 1 | < 0.001 |
| 1 | 1.79 (1.03, 3.10) | 1.30 (0.72, 2.34) | |
| 2 | 2.58 (1.62, 4.10) | 1.75 (1.07, 2.93) | |
| 3 | 4.18 (2.69, 6.50) | 2.21 (1.39, 3.43) | |
| 4 | 8.71 (5.40, 14.05) | 4.13 (2.51, 6.44) | |
| ≥ 5 | 17.89 (11.23, 28.51) | 4.94 (3.14, 7.76) | |
| Birth preparedness | | | |
| 0 | 1 | 1 | < 0.001 |
| 1 | 2.68 (2.18, 3.30) | 1.52 (1.19, 1.88) | |
| ≥ 2 | 9.31 (5.71, 15.17) | 3.41 (2.01, 5.58) | |

[#] adjusted for age, education, partner education, parity, wealth quintiles, ethnicity, region and residential location.

DISCUSSION

The national survey data revealed the majority of Nepalese mothers did not prepare any of the four activities and only half of the women made the recommended 4 or more antenatal care visits, which suggested that they had no intention or did not perceive the need of giving birth at a health facility. Indeed, the facility delivery rate was found to be only 36.9%. In the traditional Nepalese society, childbirth continues to take place at home, while many women still hold the view that facility delivery is unnecessary. On the other hand, those women who were prepared and made antenatal visits tended to give birth at facilities. Our results confirmed the strong contribution by these need factors to actual facility utilisation irrespective of predisposing, enabling, and external environment factors.

Although the frequency of antenatal care visits was associated with subsequent facility delivery, the relationship appeared to be dose-dependent,^{11, 12} as in the case of the present study whereby making a single visit induced no significant impact; whereas previous studies undertaken in Tanzania observed high use of antenatal care but low use of facility delivery.^{13, 14} Making the recommended four or more antenatal care visits might reflect the woman's concern of her pregnancy, pregnancy complications and the need for professional help.

The link between birth preparedness activities and facility delivery was supported by recent literature. A prospective cohort study of 701 pregnant women in the Kaski district of Nepal found preparation activities could increase the facility delivery rate.¹² Similarly, a randomised trial in Tanzania demonstrated that skilled delivery care uptake was 16.8% higher among women who had been counselled on promotion of birth plan than others without such counselling.¹⁵ Raising awareness and help for birth plan also led to increased facility

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3 utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.

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10 The findings have important implications for safe motherhood program in Nepal and other
11 developing countries. Because the intention to deliver at a health facility can be largely
12 influenced by need factors, women should be extensively counselled and convinced of the
13 benefits and safety of facility delivery. Any behavioural intervention such as birth
14 preparedness package and complication readiness is unlikely to be successful unless attaining
15 a high level capable to change the women's attitude and intention.
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25 The strength of the present study was the use of a nationally representative large sample of
26 married women with a high response rate. However, information was lacking on some known
27 determinants of facility delivery utilisation, particularly quality of providers and distance and
28 transportation to facility. These variables were unavailable from the 2011 NDHS database
29 and posed as the major limitation. Nevertheless, residential location and region have provided
30 some proxy information to partially compensate the effect of distance and service
31 availability. Delivery services in Terai and urban areas are more physically accessible than in
32 hilly or mountainous parts of the country.
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45 **CONCLUSION**

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47 Utilisation of delivery services remained low in Nepal. The majority of mothers were not
48 prepared for childbirth and only half the women made the recommended four or more
49 antenatal care visits, indicating their perceived lack of need for facility delivery. The national
50 data confirmed the strong associations between such need factors and service utilisation.
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56 Therefore, for behavioural interventions such as birth preparedness and complication
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3 readiness to be effective in safe motherhood programs, they must be capable of changing the
4
5 women's intention to deliver at a health facility.
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8 9 **Acknowledgements**

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11
12 the data for this study.
13
14

15 16 **Contributors**

17 RK conceived the study design, did data analysis and drafted the paper. AHD assisted in data
18
19 analysis and revision of the paper. VK assisted in data archive and provided comments. All
20
21 the three authors read and approved the final version.
22
23
24

25 26 27 **Competing Interests**

28 None declared for all authors.
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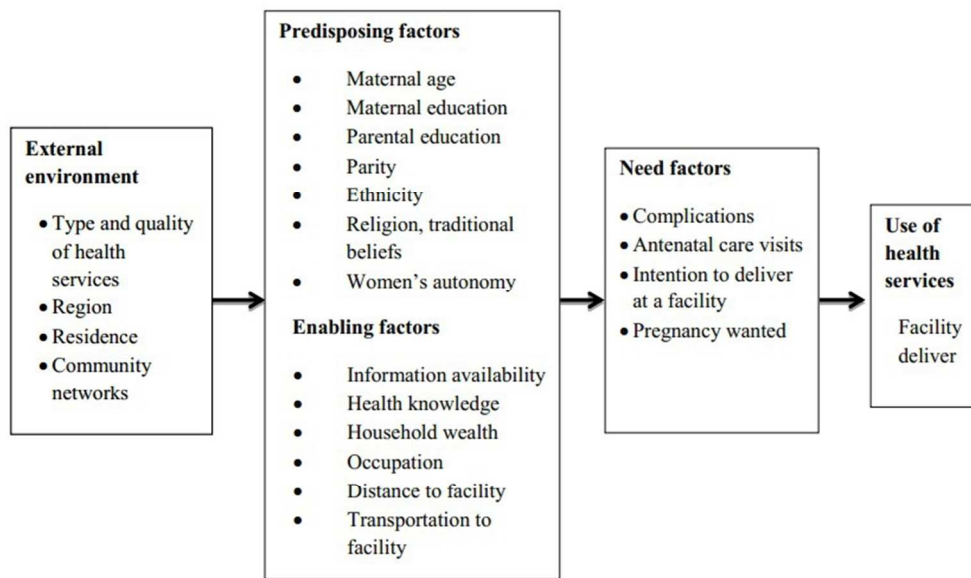
33 34 **Data sharing statement**

35 Data of 2011 Nepal Demographic and Health Survey can be obtained from MEASURE DHS
36
37 ICF International, Calverton, Maryland, USA.
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27 Conceptual framework of factors associated with the utilisation of institutional delivery services
28 223x131mm (96 x 96 DPI)

review only



**Need factors for utilisation of institutional delivery services
in Nepal: an analysis from Nepal Demographic and Health
Survey, 2011**

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3 **Need factors for utilisation of institutional delivery services in Nepal: an**
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5 **analysis from Nepal Demographic and Health Survey, 2011**
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57 **Word count:** 2896
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ABSTRACT

Objectives: This study aims to assess the role of need factors with respect to the utilisation of institutional delivery services in Nepal.

Design: An analytic study was conducted using a subset of 4079 ever married women from the 2011 Nepal Demographic and Health Survey, which utilised two-stage cluster sampling. Logistic regression with complex sample analysis was performed to evaluate the effects of antenatal care visits and birth preparedness activities on facility delivery.

Outcome measures: facility delivery

Results: Overall facility delivery rate was low at 36.9% (95% CI 33.5% to 40.2%, SE 1.69).

Only half (50.1%) of the women made four or more antenatal care visits while 62.9% (95% CI 59.9% to 65.8%, SE 1.51) did not indicate any of the four birth preparation activities.

After adjusting for external, predisposing and enabling factors, women who made more than four antenatal care visits were five times more likely to deliver at a health facility when compared to those who paid no visit (adjusted odds ratio 4.94, 95% CI 3.14 to 7.76).

Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities compared to their counterparts who made no preparation (adjusted odds ratio 3.41, 95% CI 2.01 to 5.58).

Conclusion: The perceived need, as expressed by the frequency of antenatal care visits and birth preparedness activities, plays an important role in institutional delivery service utilisation for Nepalese women. These findings have implications for behavioural interventions to change their intention to deliver at a health facility.

Article Summary

Strength and limitations

- This study used the nationally representative large sample of married women from the 2011 Nepal Demographic and Health Survey with a high response rate.
- Information was not available on some known determinants of facility delivery utilisation, particularly quality of providers, and distance and transportation to facility.
- Perceived need of facility delivery was assessed by antenatal visits and birth preparedness activities, which were positively associated with facility delivery utilisation.

INTRODUCTION

Globally, nearly all (99%) maternal deaths occur in low income countries, mainly caused by non-utilisation of available delivery services or delays in accessing such services.^{1,2} Indeed, about half of all births in South Asia still occur at home.³ A number of interventions have been implemented to increase the rate of facility delivery and access to emergency obstetric care, including the establishment of birth centres and maternity waiting homes, reduction of user fees, provision of incentives and birth preparedness packages.^{4,5} The 'safer mother programme' in Nepal provides free delivery services with incentives to women who deliver in a designated health facility.⁶

In Nepal, despite a substantial reduction in maternal mortality from 539 deaths per 100,000 live births in 1996 to 281 deaths per 100,000 in 2006, there has been no proportionate increase in utilisation of institutional delivery service.⁷ The 2011 national survey reported that 65% of women still delivered at home and only 36% of births occurred in the presence of a skilled birth attendant,⁸ whereas the national target is to achieve 60% of births via skilled birth attendants by 2015, in order to meet the Millennium Development Goal 5 target of 134 per 100,000 live births.⁹ Therefore, utilisation of institutional delivery service is a major concern in Nepal.

According to the behavioural model proposed by Andersen, need factors are fundamental to healthcare seeking behaviour; that is, one should perceive a condition as susceptible and severe enough before seeking care to gain benefits.¹⁰ For institutional delivery service utilisation, this means the pregnant woman and her family must recognise pregnancy and childbirth as abnormal events, so that life threatening situations may arise without any prediction.¹¹ In many low income countries including Nepal, pregnancy and childbirth are

1
2
3 often perceived as normal life events without justification to seek professional help.^{12, 13} In
4
5 fact, need factors can be driven by pregnancy related factors such as awareness, health
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7 knowledge of pregnancy and risk, importance given to pregnancy, community customs,
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9 previous facility use, parity, and pregnancy complications.¹⁴ Those women who perceive the
10
11 need for professional help and recognise the risk of pregnancy and delivery are expected to
12
13 make antenatal visits and prepare and arrange for childbirth.¹⁵ Besides the immediate need,
14
15 utilisation of institutional delivery service can be affected by predisposing and enabling
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17 factors as well as external environment factors. Figure 1 depicts the conceptual framework,
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19 which is adapted from Andersen's behavioural model for the utilisation of health services.¹⁰
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25 Despite the important role of need factors, their effect on utilisation of institutional delivery
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27 service has seldom been investigated in the context of safe motherhood programs. The aim of
28
29 the present study is to assess the contribution of need factors with respect to the utilisation of
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31 institutional delivery service in Nepal, using data from the national Nepal Demographic
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33 Health Survey (NDHS). Need factors were assessed by antenatal care visits and birth
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35 preparedness activities.
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39

40 **METHODS**

41 **Study setting**

42
43 Nepal, with a population of 27.5 million, is divided into five developmental regions, each
44
45 extending from north to south. The country has also three ecological zones across east to
46
47 west: Terai, Hill and Mountain. These 15 sub-ecological regions are further divided into
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49 smaller districts. Typically, each district has Village Development Committees (VDC) in
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51 rural areas and municipalities in urban areas. Each VDC or municipality in turn consists of
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53 small administrative units known as wards.
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Data and sampling

The data for this study were obtained from the 2011 NDHS conducted by the Ministry of Health and Population. The 2011 NDHS survey was approved by the Nepal Health Research Council and data were accessible from MEASURE DHS project on request.¹⁶ Details of the sampling methodology had been described elsewhere.⁸ Briefly, the survey utilised a two-stage cluster sampling design with wards (enumeration areas) being the primary sampling units. The wards were stratified by sub-ecological domains and by rural-urban residency. In total, 11,085 households were selected as listing units from these 289 wards. Among them, 12,961 women aged 15-49 years were identified as eligible but individual interviews were only completed for 12,699 women, giving a response rate of 98%. This study focused on the subset of 4079 ever married women who had given birth within the past five years preceding the survey and who provided information on antenatal visits and preparation activities.

Statistical analysis

The outcome variable was 'place of delivery': home versus facility (private or public). This binary variable was chosen instead of 'assisted deliveries' to emphasize the use of institutional delivery services and to avoid potential problem of inaccurate reporting of birth attendant skills. Perceived need factors investigated were (1) frequency of antenatal care visits and (2) birth preparedness. The latter referred to four preparation activities, namely, planning for a birth attendant, saving money, arrangement for transportation, and identification of potential blood donator.¹⁷ Although the 2011 NDHS collected information on planning activities related to preparation of clothes, delivery kit and food, these activities did not necessarily imply the need for facility delivery; consequently, they were not considered as need factors of institutional delivery service use.

Table 1 gives the classification of variables used in this study. These variables were chosen in view of the conceptual framework of factors associated with utilisation of institutional delivery services (Figure 1). NDHS applied principal component analysis of a range of household assets to generate wealth quintiles. Ethnicity was categorised by three groups: upper caste (Hill Brahmin, Hill Cheetri, Terai Brahmin, Terai Cheetri), lower caste (Hill Dalit, Terai Dalit) and other (all other recorded ethnicities). Education was classified as none, primary (1-5 grade), secondary (6-10 grade), and higher (after 10th grade).

In the 2011 NDHS, enumeration areas were not allocated proportional to their population size, thus requiring adjustment by sampling weights prior to analysis. Such sampling weights were provided by the survey to account for cluster level variables and strata (domain) level variables. Based on these sampling weights, a complex sampling plan file was then prepared to perform logistic regression modelling, with need factors and other confounding factors listed in Table 1. All statistical analyses were conducted in the SPSS package version 21.

Table 1: Classification of variables used in the analysis (n = 4079)

| Variables | Categories | Weighted percentage | Unweighted count |
|------------------------------|------------|---------------------|------------------|
| Place of delivery | Home | 63.1 | 2397 |
| | Facility | 36.9 | 1682 |
| Antenatal care visits | 0 | 15.2 | 611 |
| | 1 | 6.1 | 234 |
| | 2 | 12.2 | 426 |
| | 3 | 16.4 | 657 |

| | | | |
|---------------------------------------|-----------|------|------|
| | 4 | 19.7 | 901 |
| | ≥ 5 | 30.4 | 1250 |
| Birth preparedness[#] | 0 | 62.9 | 2476 |
| | 1 | 33.3 | 1440 |
| | ≥ 2 | 3.8 | 163 |
| Women's age (years) | 15-19 | 7.1 | 306 |
| | 20-24 | 33.4 | 1273 |
| | 25-29 | 32.2 | 1335 |
| | 30-49 | 27.3 | 1165 |
| Women's education | None | 47.3 | 1765 |
| | Primary | 20.0 | 817 |
| | Secondary | 27.2 | 1225 |
| | Higher | 5.5 | 272 |
| Partner's education | None | 23.2 | 745 |
| | Primary | 24.5 | 989 |
| | Secondary | 42.1 | 1815 |
| | Higher | 10.2 | 514 |
| Parity | 1 | 24.2 | 1248 |
| | 2 | 30.6 | 1157 |
| | 3 | 19.3 | 690 |
| | 4 | 10.8 | 440 |
| | ≥ 5 | 15.1 | 544 |
| Wealth quintiles | 1 | 25.8 | 1160 |
| | 2 | 21.9 | 832 |
| | 3 | 21.0 | 739 |

| | | | |
|-----------------------------|-------------|------|------|
| | 4 | 17.4 | 677 |
| | 5 | 13.9 | 671 |
| Ethnicity | Other | 52.1 | 1813 |
| | Upper caste | 30.1 | 1552 |
| | Lower caste | 17.8 | 703 |
| Region | Mountain | 7.9 | 742 |
| | Hill | 39.5 | 1656 |
| | Terai | 52.6 | 1681 |
| Residential location | Rural | 90.7 | 3182 |
| | Urban | 9.3 | 897 |

Birth preparedness consists of four preparation activities (planning for a birth attendant, saving money, arrangement for transportation, and identification of potential blood donator)

RESULTS

Table 1 shows the characteristics of the 4079 eligible women. About half of the participants had no education (47.3%) and came from the Terai region (52.6%). Almost two-third of them were between 20-29 years of age. Although half (50.1%) of the eligible women made four or more antenatal care visits, but 15.2% never visited a health facility before giving birth. The majority of mothers (62.9%) did not indicate any of the four birth preparation activities, while no women prepared for all four activities.

The overall facility delivery rate was found to be 36.9% (95% confidence interval (CI) 33.5% to 40.2%, SE 1.69). Table 2 presents the results of logistic regression analysis. The confounding factors used were women's age, women's education, partner's education, parity,

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2
3 wealth quintiles, ethnicity, region and residential location from the NDHS 2011 data set. Both
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5 need factors were positively associated with the facility delivery status. Even after
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7 simultaneously adjusting the effects of predisposing, enabling, and external environment
8
9 factors, the two need factors remained statistically significant ($p < 0.001$). In particular,
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11 women who made five or more antenatal care visits were almost five times more likely to
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13 deliver at a health facility when compared to those who paid no visit prior to delivery
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15 (adjusted odds ratio (OR) 4.94, 95% CI 3.14 to 7.76). Similarly, the likelihood for facility
16
17 delivery increased by 3.4 fold among women who prepared for at least two of the four
18
19 activities, relative to their counterparts who chose to make no preparation (adjusted OR 3.41,
20
21 95% CI 2.01 to 5.58). The multivariable logistic regression analysis also confirmed that
22
23 wealth quintiles, residential location and higher parity were significantly associated with
24
25 place of delivery.
26
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28
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31

32 Table 2: Crude and adjusted odds ratios of facility delivery from logistic regression with
33
34 complex sampling analysis (n = 4079)
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| | Crude odds ratio (95% CI) | Adjusted odds ratio (95% CI) | P* |
|------------------------------|---------------------------|------------------------------|---------|
| Need Factors | | | |
| Antenatal care visits | | | < 0.001 |
| 0 | 1 | 1 | |
| 1 | 1.79 (1.03, 3.10) | 1.30 (0.72, 2.34) | |
| 2 | 2.58 (1.62, 4.10) | 1.75 (1.07, 2.93) | |
| 3 | 4.18 (2.69, 6.50) | 2.21 (1.39, 3.43) | |
| 4 | 8.71 (5.40, 14.05) | 4.13 (2.51, 6.44) | |

| | | | | |
|----|---------------------------------------|----------------------|-------------------|---------|
| 1 | | | | |
| 2 | | | | |
| 3 | ≥ 5 | 17.89 (11.23, 28.51) | 4.94 (3.14, 7.76) | |
| 4 | | | | |
| 5 | Birth preparedness[#] | | | < 0.001 |
| 6 | | | | |
| 7 | 0 | 1 | 1 | |
| 8 | | | | |
| 9 | 1 | 2.68 (2.18, 3.30) | 1.52 (1.19, 1.88) | |
| 10 | | | | |
| 11 | ≥ 2 | 9.31 (5.71, 15.17) | 3.41 (2.01, 5.58) | |
| 12 | | | | |
| 13 | | | | |
| 14 | Confounding Factors | | | |
| 15 | | | | |
| 16 | Women's age (years) | | | 0.083 |
| 17 | | | | |
| 18 | 15-19 | 1 | 1 | |
| 19 | | | | |
| 20 | 20-24 | 0.65 (0.49, 0.86) | 0.65 (0.44, 0.97) | |
| 21 | | | | |
| 22 | 25-29 | 0.56 (0.42, 0.75) | 0.69 (0.48, 1.00) | |
| 23 | | | | |
| 24 | 30-49 | 0.36 (0.26, 0.49) | 0.80 (0.49, 1.32) | |
| 25 | | | | |
| 26 | | | | |
| 27 | Women's education | | | 0.216 |
| 28 | | | | |
| 29 | None | 1 | 1 | |
| 30 | | | | |
| 31 | Primary | 1.91 (1.46, 2.51) | 1.08 (0.82, 1.42) | |
| 32 | | | | |
| 33 | Secondary | 5.35 (4.25, 6.72) | 1.29 (0.97, 1.71) | |
| 34 | | | | |
| 35 | Higher | 20.28 (12.22, 33.65) | 1.67 (0.89, 3.12) | |
| 36 | | | | |
| 37 | | | | |
| 38 | Partner's education | | | 0.467 |
| 39 | | | | |
| 40 | None | 1 | 1 | |
| 41 | | | | |
| 42 | Primary | 1.61 (1.17, 2.21) | 0.94 (0.67, 1.30) | |
| 43 | | | | |
| 44 | Secondary | 3.62 (2.63, 4.98) | 0.95 (0.67, 1.33) | |
| 45 | | | | |
| 46 | Higher | 11.19 (7.34, 17.04) | 1.28 (0.78, 2.09) | |
| 47 | | | | |
| 48 | | | | |
| 49 | Parity | | | <0.001 |
| 50 | | | | |
| 51 | 1 | 1 | 1 | |
| 52 | | | | |
| 53 | 2 | 0.44 (0.35, 0.54) | 0.44 (0.34, 0.58) | |
| 54 | | | | |
| 55 | 3 | 0.21 (0.16, 0.28) | 0.39 (0.28, 0.54) | |
| 56 | | | | |
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|--|-----------------------------|----------------------|-------------------|--------|
| | 4 | 0.18 (0.13, 0.25) | 0.42 (0.28, 0.63) | |
| | ≥ 5 | 0.08 (0.06, 0.12) | 0.30 (0.19, 0.49) | |
| * From | Wealth quintiles | | | <0.001 |
| multivariable logistic regression model | 1 | 1 | 1 | |
| | 2 | 2.14 (1.68, 2.73) | 1.58 (1.19, 2.11) | |
| | 3 | 3.73 (2.80, 4.96) | 2.03 (1.44, 2.86) | |
| | 4 | 7.25 (5.33, 9.88) | 2.73 (1.90, 3.94) | |
| # Birth preparedness consists of four preparation activities (planning for a birth attendant, saving money, arrangements for | 5 | 24.17 (17.51, 33.35) | 6.17 (3.94, 9.67) | |
| | Ethnicity | | | 0.607 |
| | Other | 1 | 1 | |
| | Upper caste | 1.56 (1.22, 2.01) | 1.08 (0.81, 1.42) | |
| | Lower caste | 0.72 (0.57, 0.92) | 1.16 (0.85, 1.59) | |
| | Region | | | 0.244 |
| | Mountain | 1 | 1 | |
| | Hill | 1.94 (1.28, 2.95) | 1.28 (0.86, 1.92) | |
| | Terai | 2.78 (1.86, 4.14) | 1.43 (0.94, 2.19) | |
| | Residential Location | | | <0.001 |
| | Rural | 1 | 1 | |
| | Urban | 5.19 (3.99, 6.75) | 2.42 (1.83, 3.19) | |

transportation, and identification of potential blood donor)

DISCUSSION

The national survey data revealed the majority of Nepalese mothers did not prepare any of the four activities and only half of the women made the recommended 4 or more antenatal

1
2
3 care visits, despite birth preparedness has been incorporated into the national safe
4
5 motherhood program since 2009.¹² Female community health volunteers and facility-based
6
7 health workers use pictorial charts to educate women on obstetric danger signs. While
8
9 preparedness level can be high in some districts,¹⁸ overall birth preparedness is still low. The
10
11 variations between districts may be attributed to differences in human development indexes
12
13 including adult literacy, women empowerment and physical accessibility to health facilities.
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18 Overall, the preparation and antenatal visit record suggested that women might have no
19
20 intention or might not perceive the need of giving birth at a health facility. Such perception of
21
22 need can also be influenced by distance and quality of maternity services.^{14,19} Indeed, the
23
24 facility delivery rate was found to be only 36.9%. In the traditional Nepalese society,
25
26 childbirth continues to take place at home, while many women still hold the view that facility
27
28 delivery is unnecessary. On the other hand, those women who were prepared and made
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30 antenatal visits tended to give birth at facilities. Our results confirmed the strong contribution
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32 by these need factors to actual facility utilisation irrespective of predisposing, enabling, and
33
34 external environment factors. Apart from the need factors, parity, wealth status and
35
36 residential location also play a significant role in the choice of delivery place.
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43 Although the frequency of antenatal care visits was associated with subsequent facility
44
45 delivery, the relationship appeared to be dose-dependent,^{14, 18} as in the case of the present
46
47 study whereby making a single visit induced no significant impact; whereas previous studies
48
49 undertaken in Tanzania observed high use of antenatal care but low use of facility delivery.^{20,}
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51
52 ²¹ Making the recommended four or more antenatal care visits might reflect the woman's
53
54 concern of her pregnancy, pregnancy complications and the need for professional help.^{14, 22}
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3 Consequently, informing women about danger signs and providing quality antenatal care with
4 provision of iron tablets and blood check might encourage women to attend antenatal visits.
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10 The link between birth preparedness activities and facility delivery was supported by recent
11 literature. A prospective cohort study of 701 pregnant women in the Kaski district of Nepal
12 found preparation activities could increase the facility delivery rate.¹⁸ Similarly, a
13 randomised trial in Tanzania demonstrated that skilled delivery care uptake was 16.8% higher
14 among women who had been counselled on promotion of birth plan than others without such
15 counselling.²³ Raising awareness and help for birth plan also led to increased facility
16 utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.
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24-26. However, two pre-post evaluation studies of birth preparedness in southern districts of
Nepal reported that increased preparedness level was not significantly translated into
increased facility delivery.^{27, 28}

The findings have important implications for safe motherhood program in Nepal and other
low income countries. Because the intention to deliver at a health facility can be largely
influenced by need factors, women should be extensively counselled and convinced of the
benefits and safety of facility delivery. Any behavioural intervention such as birth
preparedness package and complication readiness is unlikely to be successful unless attaining
a high level capable to change the women's attitude and intention. Counselling can be
performed by health professionals, preferably female health workers at a health facility or by
female community health volunteers at household visits. Further, local teachers and social
workers can be involved in awareness raising campaigns. Community networks and mother
clubs can also provide support in terms of money and transport management.

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3 The strength of the present study was the use of a nationally representative large sample of
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5 married women with a high response rate. However, information was lacking on some known
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7 determinants of facility delivery utilisation, particularly quality of providers and distance and
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9 transportation to facility. These variables were unavailable from the NDHS 2011 database
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11 and posed as the major limitation. Nevertheless, the external factors 'residential location' and
12
13 'region' have provided some proxy information to partially compensate the effect of distance
14
15 and service availability. Institutional delivery services in Terai and urban areas are more
16
17 physically accessible than in hilly or mountainous parts of the country. The regression model
18
19 has accounted for region and location as well as other known predisposing and enabling
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21 factors.
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27 **CONCLUSION**

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29 Utilisation of institutional delivery services remained low in Nepal. The majority of mothers
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31 were not prepared for childbirth and only half the women made the recommended four or
32
33 more antenatal care visits, indicating their perceived lack of need for facility delivery. The
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35 national data confirmed the strong associations between such need factors and institutional
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37 delivery service utilisation. This has implications for behavioural interventions such as birth
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39 preparedness and complication readiness, which aim to change their intention to deliver at a
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41 health facility. Birth preparedness packages in Nepal should be continued and future
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43 interventions should target the need factors.
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Contributors

RK conceived the study design, performed data analysis and drafted the manuscript. AHL supervised the statistical analysis and revised the paper. VK prepared the data set and assisted with interpretation of the data. All three authors have read and approved the final version for publication.

Competing Interests

None declared for all authors.

Data sharing statement

Data of 2011 Nepal Demographic and Health Survey can be obtained from MEASURE DHS ICF International, Calverton, Maryland, USA.

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For peer review only

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3 **Need factors for utilisation of institutional delivery services in Nepal: an**
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5 **analysis from Nepal Demographic and Health Survey, 2011**
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55 **Keywords:** birth preparedness, facility delivery, maternity service, need factors, Nepal

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57 **Word count:** 2896
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ABSTRACT

Objectives: This study aims to assess the role of need factors with respect to the utilisation of institutional delivery services in Nepal.

Design: An analytic study was conducted using a subset of 4079 ever married women from the 2011 Nepal Demographic and Health Survey, which utilised two-stage cluster sampling. Logistic regression with complex sample analysis was performed to evaluate the effects of antenatal care visits and birth preparedness activities on facility delivery.

Outcome measures: facility delivery

Results: Overall facility delivery rate was low at 36.9% (95% CI 33.5% to 40.2%, SE 1.69).

Only half (50.1%) of the women made four or more antenatal care visits while 62.9% (95% CI 59.9% to 65.8%, SE 1.51) did not indicate any of the four birth preparation activities.

After adjusting for external, predisposing and enabling factors, women who made more than four antenatal care visits were five times more likely to deliver at a health facility when compared to those who paid no visit (adjusted odds ratio 4.94, 95% CI 3.14 to 7.76).

Similarly, the likelihood for facility delivery increased by 3.4 fold among women who prepared for at least two of the four activities compared to their counterparts who made no preparation (adjusted odds ratio 3.41, 95% CI 2.01 to 5.58).

Conclusion: The perceived need, as expressed by the frequency of antenatal care visits and birth preparedness activities, plays an important role in institutional delivery service utilisation for Nepalese women. These findings have implications for behavioural interventions to change their intention to deliver at a health facility.

Article Summary

Strength and limitations

- This study used the nationally representative large sample of married women from the 2011 Nepal Demographic and Health Survey with a high response rate.
- Information was not available on some known determinants of facility delivery utilisation, particularly quality of providers, and distance and transportation to facility.
- Perceived need of facility delivery was assessed by antenatal visits and birth preparedness activities, which were positively associated with facility delivery utilisation.

INTRODUCTION

Globally, nearly all (99%) maternal deaths occur in low income countries, mainly caused by non-utilisation of available delivery services or delays in accessing such services.^{1,2} Indeed, about half of all births in South Asia still occur at home.³ A number of interventions have been implemented to increase the rate of facility delivery and access to emergency obstetric care, including the establishment of birth centres and maternity waiting homes, reduction of user fees, provision of incentives and birth preparedness packages.^{4,5} The 'safer mother programme' in Nepal provides free delivery services with incentives to women who deliver in a designated health facility.⁶

In Nepal, despite a substantial reduction in maternal mortality from 539 deaths per 100,000 live births in 1996 to 281 deaths per 100,000 in 2006, there has been no proportionate increase in utilisation of institutional delivery service.⁷ The 2011 national survey reported that 65% of women still delivered at home and only 36% of births occurred in the presence of a skilled birth attendant,⁸ whereas the national target is to achieve 60% of births via skilled birth attendants by 2015, in order to meet the Millennium Development Goal 5 target of 134 per 100,000 live births.⁹ Therefore, utilisation of institutional delivery service is a major concern in Nepal.

According to the behavioural model proposed by Andersen, need factors are fundamental to healthcare seeking behaviour; that is, one should perceive a condition as susceptible and severe enough before seeking care to gain benefits.¹⁰ For institutional delivery service utilisation, this means the pregnant woman and her family must recognise pregnancy and childbirth as abnormal events, so that life threatening situations may arise without any prediction.¹¹ In many low income countries including Nepal, pregnancy and childbirth are

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3 often perceived as normal life events without justification to seek professional help.^{12, 13} In
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5 fact, need factors can be driven by pregnancy related factors such as awareness, health
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7 knowledge of pregnancy and risk, importance given to pregnancy, community customs,
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9 previous facility use, parity, and pregnancy complications.¹⁴ Those women who perceive the
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11 need for professional help and recognise the risk of pregnancy and delivery are expected to
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13 make antenatal visits and prepare and arrange for childbirth.¹⁵ Besides the immediate need,
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15 utilisation of institutional delivery service can be affected by predisposing and enabling
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17 factors as well as external environment factors. Figure 1 depicts the conceptual framework,
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19 which is adapted from Andersen's behavioural model for the utilisation of health services.¹⁰
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25 Despite the important role of need factors, their effect on utilisation of institutional delivery
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27 service has seldom been investigated in the context of safe motherhood programs. The aim of
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29 the present study is to assess the contribution of need factors with respect to the utilisation of
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31 institutional delivery service in Nepal, using data from the national Nepal Demographic
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33 Health Survey (NDHS). Need factors were assessed by antenatal care visits and birth
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35 preparedness activities.
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40 **METHODS**

41 **Study setting**

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43 Nepal, with a population of 27.5 million, is divided into five developmental regions, each
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45 extending from north to south. The country has also three ecological zones across east to
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47 west: Terai, Hill and Mountain. These 15 sub-ecological regions are further divided into
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49 smaller districts. Typically, each district has Village Development Committees (VDC) in
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51 rural areas and municipalities in urban areas. Each VDC or municipality in turn consists of
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53 small administrative units known as wards.
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Data and sampling

The data for this study were obtained from the 2011 NDHS conducted by the Ministry of Health and Population. The 2011 NDHS survey was approved by the Nepal Health Research Council and data were accessible from MEASURE DHS project on request.¹⁶ Details of the sampling methodology had been described elsewhere.⁸ Briefly, the survey utilised a two-stage cluster sampling design with wards (enumeration areas) being the primary sampling units. The wards were stratified by sub-ecological domains and by rural-urban residency. In total, 11,085 households were selected as listing units from these 289 wards. Among them, 12,961 women aged 15-49 years were identified as eligible but individual interviews were only completed for 12,699 women, giving a response rate of 98%. This study focused on the subset of 4079 ever married women who had given birth within the past five years preceding the survey and who provided information on antenatal visits and preparation activities.

Statistical analysis

The outcome variable was 'place of delivery': home versus facility (private or public). This binary variable was chosen instead of 'assisted deliveries' to emphasize the use of institutional delivery services and to avoid potential problem of inaccurate reporting of birth attendant skills. Perceived need factors investigated were (1) frequency of antenatal care visits and (2) birth preparedness. The latter referred to four preparation activities, namely, planning for a birth attendant, saving money, arrangement for transportation, and identification of potential blood donator.¹⁷ Although the 2011 NDHS collected information on planning activities related to preparation of clothes, delivery kit and food, these activities did not necessarily imply the need for facility delivery; consequently, they were not considered as need factors of institutional delivery service use.

Table 1 gives the classification of variables used in this study. These variables were chosen in view of the conceptual framework of factors associated with utilisation of institutional delivery services (Figure 1). NDHS applied principal component analysis of a range of household assets to generate wealth quintiles. Ethnicity was categorised by three groups: upper caste (Hill Brahmin, Hill Cheetri, Terai Brahmin, Terai Cheetri), lower caste (Hill Dalit, Terai Dalit) and other (all other recorded ethnicities). Education was classified as none, primary (1-5 grade), secondary (6-10 grade), and higher (after 10th grade).

In the 2011 NDHS, enumeration areas were not allocated proportional to their population size, thus requiring adjustment by sampling weights prior to analysis. Such sampling weights were provided by the survey to account for cluster level variables and strata (domain) level variables. Based on these sampling weights, a complex sampling plan file was then prepared to perform logistic regression modelling, with need factors and other confounding factors listed in Table 1. All statistical analyses were conducted in the SPSS package version 21.

Table 1: Classification of variables used in the analysis (n = 4079)

| Variables | Categories | Weighted percentage | Unweighted count |
|------------------------------|------------|---------------------|------------------|
| Place of delivery | Home | 63.1 | 2397 |
| | Facility | 36.9 | 1682 |
| Antenatal care visits | 0 | 15.2 | 611 |
| | 1 | 6.1 | 234 |
| | 2 | 12.2 | 426 |
| | 3 | 16.4 | 657 |

| | | | |
|---------------------------------------|-----------|------|------|
| | 4 | 19.7 | 901 |
| | ≥ 5 | 30.4 | 1250 |
| Birth preparedness[#] | 0 | 62.9 | 2476 |
| | 1 | 33.3 | 1440 |
| | ≥ 2 | 3.8 | 163 |
| Women's age (years) | 15-19 | 7.1 | 306 |
| | 20-24 | 33.4 | 1273 |
| | 25-29 | 32.2 | 1335 |
| | 30-49 | 27.3 | 1165 |
| Women's education | None | 47.3 | 1765 |
| | Primary | 20.0 | 817 |
| | Secondary | 27.2 | 1225 |
| | Higher | 5.5 | 272 |
| Partner's education | None | 23.2 | 745 |
| | Primary | 24.5 | 989 |
| | Secondary | 42.1 | 1815 |
| | Higher | 10.2 | 514 |
| Parity | 1 | 24.2 | 1248 |
| | 2 | 30.6 | 1157 |
| | 3 | 19.3 | 690 |
| | 4 | 10.8 | 440 |
| | ≥ 5 | 15.1 | 544 |
| Wealth quintiles | 1 | 25.8 | 1160 |
| | 2 | 21.9 | 832 |
| | 3 | 21.0 | 739 |

| | | | |
|-----------------------------|-------------|------|------|
| | 4 | 17.4 | 677 |
| | 5 | 13.9 | 671 |
| Ethnicity | Other | 52.1 | 1813 |
| | Upper caste | 30.1 | 1552 |
| | Lower caste | 17.8 | 703 |
| Region | Mountain | 7.9 | 742 |
| | Hill | 39.5 | 1656 |
| | Terai | 52.6 | 1681 |
| Residential location | Rural | 90.7 | 3182 |
| | Urban | 9.3 | 897 |

Birth preparedness consists of four preparation activities (planning for a birth attendant, saving money, arrangement for transportation, and identification of potential blood donator)

RESULTS

Table 1 shows the characteristics of the 4079 eligible women. About half of the participants had no education (47.3%) and came from the Terai region (52.6%). Almost two-third of them were between 20-29 years of age. Although half (50.1%) of the eligible women made four or more antenatal care visits, but 15.2% never visited a health facility before giving birth. The majority of mothers (62.9%) did not indicate any of the four birth preparation activities, while no women prepared for all four activities.

The overall facility delivery rate was found to be 36.9% (95% confidence interval (CI) 33.5% to 40.2%, SE 1.69). Table 2 presents the results of logistic regression analysis. The confounding factors used were women's age, women's education, partner's education, parity,

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3 wealth quintiles, ethnicity, region and residential location from the NDHS 2011 data set. Both
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5 need factors were positively associated with the facility delivery status. Even after
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7 simultaneously adjusting the effects of predisposing, enabling, and external environment
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9 factors, the two need factors remained statistically significant ($p < 0.001$). In particular,
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11 women who made five or more antenatal care visits were almost five times more likely to
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13 deliver at a health facility when compared to those who paid no visit prior to delivery
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15 (adjusted odds ratio (OR) 4.94, 95% CI 3.14 to 7.76). Similarly, the likelihood for facility
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17 delivery increased by 3.4 fold among women who prepared for at least two of the four
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19 activities, relative to their counterparts who chose to make no preparation (adjusted OR 3.41,
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21 95% CI 2.01 to 5.58). **The multivariable logistic regression analysis also confirmed that**
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23 **wealth quintiles, residential location and higher parity were significantly associated with**
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25 **place of delivery.**
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32 Table 2: Crude and adjusted odds ratios of facility delivery from logistic regression with
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34 complex sampling analysis (n = 4079)
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| | Crude odds ratio (95% CI) | Adjusted odds ratio (95% CI) | P* |
|------------------------------|---------------------------|------------------------------|---------|
| Need Factors | | | |
| Antenatal care visits | | | < 0.001 |
| 0 | 1 | 1 | |
| 1 | 1.79 (1.03, 3.10) | 1.30 (0.72, 2.34) | |
| 2 | 2.58 (1.62, 4.10) | 1.75 (1.07, 2.93) | |
| 3 | 4.18 (2.69, 6.50) | 2.21 (1.39, 3.43) | |
| 4 | 8.71 (5.40, 14.05) | 4.13 (2.51, 6.44) | |

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|----|---------------------------------------|----------------------|-------------------|---------|
| 1 | | | | |
| 2 | | | | |
| 3 | ≥ 5 | 17.89 (11.23, 28.51) | 4.94 (3.14, 7.76) | |
| 4 | | | | |
| 5 | Birth preparedness[#] | | | < 0.001 |
| 6 | | | | |
| 7 | 0 | 1 | 1 | |
| 8 | | | | |
| 9 | 1 | 2.68 (2.18, 3.30) | 1.52 (1.19, 1.88) | |
| 10 | | | | |
| 11 | ≥ 2 | 9.31 (5.71, 15.17) | 3.41 (2.01, 5.58) | |
| 12 | | | | |
| 13 | | | | |
| 14 | Confounding Factors | | | |
| 15 | | | | |
| 16 | Women's age (years) | | | 0.083 |
| 17 | | | | |
| 18 | 15-19 | 1 | 1 | |
| 19 | | | | |
| 20 | 20-24 | 0.65 (0.49, 0.86) | 0.65 (0.44, 0.97) | |
| 21 | | | | |
| 22 | 25-29 | 0.56 (0.42, 0.75) | 0.69 (0.48, 1.00) | |
| 23 | | | | |
| 24 | 30-49 | 0.36 (0.26, 0.49) | 0.80 (0.49, 1.32) | |
| 25 | | | | |
| 26 | | | | |
| 27 | Women's education | | | 0.216 |
| 28 | | | | |
| 29 | None | 1 | 1 | |
| 30 | | | | |
| 31 | Primary | 1.91 (1.46, 2.51) | 1.08 (0.82, 1.42) | |
| 32 | | | | |
| 33 | Secondary | 5.35 (4.25, 6.72) | 1.29 (0.97, 1.71) | |
| 34 | | | | |
| 35 | Higher | 20.28 (12.22, 33.65) | 1.67 (0.89, 3.12) | |
| 36 | | | | |
| 37 | | | | |
| 38 | Partner's education | | | 0.467 |
| 39 | | | | |
| 40 | None | 1 | 1 | |
| 41 | | | | |
| 42 | Primary | 1.61 (1.17, 2.21) | 0.94 (0.67, 1.30) | |
| 43 | | | | |
| 44 | Secondary | 3.62 (2.63, 4.98) | 0.95 (0.67, 1.33) | |
| 45 | | | | |
| 46 | Higher | 11.19 (7.34, 17.04) | 1.28 (0.78, 2.09) | |
| 47 | | | | |
| 48 | | | | |
| 49 | Parity | | | <0.001 |
| 50 | | | | |
| 51 | 1 | 1 | 1 | |
| 52 | | | | |
| 53 | 2 | 0.44 (0.35, 0.54) | 0.44 (0.34, 0.58) | |
| 54 | | | | |
| 55 | 3 | 0.21 (0.16, 0.28) | 0.39 (0.28, 0.54) | |
| 56 | | | | |
| 57 | | | | |
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| 59 | | | | |
| 60 | | | | |

| | | | | |
|---|-----------------------------|----------------------|-------------------|--------|
| | 4 | 0.18 (0.13, 0.25) | 0.42 (0.28, 0.63) | |
| | ≥ 5 | 0.08 (0.06, 0.12) | 0.30 (0.19, 0.49) | |
| * From | Wealth quintiles | | | <0.001 |
| multivariable logistic regression model | 1 | 1 | 1 | |
| | 2 | 2.14 (1.68, 2.73) | 1.58 (1.19, 2.11) | |
| | 3 | 3.73 (2.80, 4.96) | 2.03 (1.44, 2.86) | |
| | 4 | 7.25 (5.33, 9.88) | 2.73 (1.90, 3.94) | |
| # Birth preparedness consists of four preparation activities (planning for a birth attendant, saving money, arrangements for transportation, and identification of potential blood donor) | 5 | 24.17 (17.51, 33.35) | 6.17 (3.94, 9.67) | |
| | Ethnicity | | | 0.607 |
| | Other | 1 | 1 | |
| | Upper caste | 1.56 (1.22, 2.01) | 1.08 (0.81, 1.42) | |
| | Lower caste | 0.72 (0.57, 0.92) | 1.16 (0.85, 1.59) | |
| | Region | | | 0.244 |
| | Mountain | 1 | 1 | |
| | Hill | 1.94 (1.28, 2.95) | 1.28 (0.86, 1.92) | |
| | Terai | 2.78 (1.86, 4.14) | 1.43 (0.94, 2.19) | |
| | Residential Location | | | <0.001 |
| | Rural | 1 | 1 | |
| | Urban | 5.19 (3.99, 6.75) | 2.42 (1.83, 3.19) | |

transportation, and identification of potential blood donor)

DISCUSSION

The national survey data revealed the majority of Nepalese mothers did not prepare any of the four activities and only half of the women made the recommended 4 or more antenatal

1
2
3 care visits, despite birth preparedness has been incorporated into the national safe
4
5 motherhood program since 2009.¹² Female community health volunteers and facility-based
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7 health workers use pictorial charts to educate women on obstetric danger signs. While
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9 preparedness level can be high in some districts,¹⁸ overall birth preparedness is still low. The
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11 variations between districts may be attributed to differences in human development indexes
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13 including adult literacy, women empowerment and physical accessibility to health facilities.
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18 Overall, the preparation and antenatal visit record suggested that women might have no
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20 intention or might not perceive the need of giving birth at a health facility. Such perception of
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22 need can also be influenced by distance and quality of maternity services.^{14,19} Indeed, the
23
24 facility delivery rate was found to be only 36.9%. In the traditional Nepalese society,
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26 childbirth continues to take place at home, while many women still hold the view that facility
27
28 delivery is unnecessary. On the other hand, those women who were prepared and made
29
30 antenatal visits tended to give birth at facilities. Our results confirmed the strong contribution
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32 by these need factors to actual facility utilisation irrespective of predisposing, enabling, and
33
34 external environment factors. Apart from the need factors, parity, wealth status and
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36 residential location also play a significant role in the choice of delivery place.
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43 Although the frequency of antenatal care visits was associated with subsequent facility
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45 delivery, the relationship appeared to be dose-dependent,^{14, 18} as in the case of the present
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47 study whereby making a single visit induced no significant impact; whereas previous studies
48
49 undertaken in Tanzania observed high use of antenatal care but low use of facility delivery.^{20,}

50
51 ²¹ Making the recommended four or more antenatal care visits might reflect the woman's
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53 concern of her pregnancy, pregnancy complications and the need for professional help.^{14, 22}
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3 Consequently, informing women about danger signs and providing quality antenatal care with
4 provision of iron tablets and blood check might encourage women to attend antenatal visits.
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10 The link between birth preparedness activities and facility delivery was supported by recent
11 literature. A prospective cohort study of 701 pregnant women in the Kaski district of Nepal
12 found preparation activities could increase the facility delivery rate.¹⁸ Similarly, a
13 randomised trial in Tanzania demonstrated that skilled delivery care uptake was 16.8% higher
14 among women who had been counselled on promotion of birth plan than others without such
15 counselling.²³ Raising awareness and help for birth plan also led to increased facility
16 utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.
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24-26. However, two pre-post evaluation studies of birth preparedness in southern districts of
Nepal reported that increased preparedness level was not significantly translated into
increased facility delivery.^{27, 28}

The findings have important implications for safe motherhood program in Nepal and other
low income countries. Because the intention to deliver at a health facility can be largely
influenced by need factors, women should be extensively counselled and convinced of the
benefits and safety of facility delivery. Any behavioural intervention such as birth
preparedness package and complication readiness is unlikely to be successful unless attaining
a high level capable to change the women's attitude and intention. Counselling can be
performed by health professionals, preferably female health workers at a health facility or by
female community health volunteers at household visits. Further, local teachers and social
workers can be involved in awareness raising campaigns. Community networks and mother
clubs can also provide support in terms of money and transport management.

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3 The strength of the present study was the use of a nationally representative large sample of
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5 married women with a high response rate. However, information was lacking on some known
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7 determinants of facility delivery utilisation, particularly quality of providers and distance and
8
9 transportation to facility. These variables were unavailable from the NDHS 2011 database
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11 and posed as the major limitation. Nevertheless, the external factors 'residential location' and
12
13 'region' have provided some proxy information to partially compensate the effect of distance
14
15 and service availability. Institutional delivery services in Terai and urban areas are more
16
17 physically accessible than in hilly or mountainous parts of the country. The regression model
18
19 has accounted for region and location as well as other known predisposing and enabling
20
21 factors.
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27 CONCLUSION

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29 Utilisation of institutional delivery services remained low in Nepal. The majority of mothers
30
31 were not prepared for childbirth and only half the women made the recommended four or
32
33 more antenatal care visits, indicating their perceived lack of need for facility delivery. The
34
35 national data confirmed the strong associations between such need factors and institutional
36
37 delivery service utilisation. This has implications for behavioural interventions such as birth
38
39 preparedness and complication readiness, which aim to change their intention to deliver at a
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41 health facility. **Birth preparedness packages in Nepal should be continued and future**
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43 **interventions should target the need factors.**
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Contributors

RK conceived the study design, performed data analysis and drafted the manuscript. AHL supervised the statistical analysis and revised the paper. VK prepared the data set and assisted with interpretation of the data. All three authors have read and approved the final version for publication.

Competing Interests

None declared for all authors.

Data sharing statement

Data of 2011 Nepal Demographic and Health Survey can be obtained from MEASURE DHS ICF International, Calverton, Maryland, USA.

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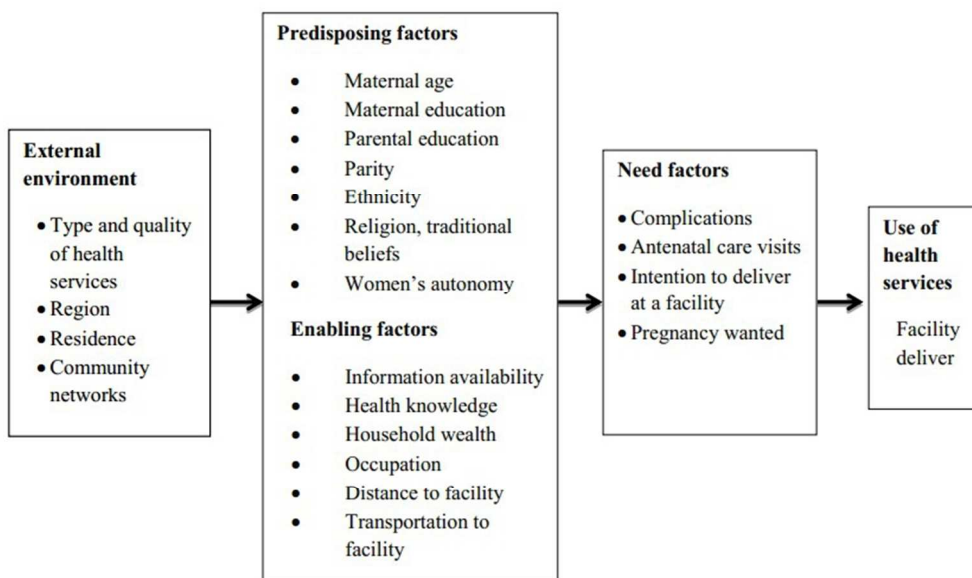
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Conceptual framework of factors associated with the utilisation of institutional delivery services
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