Need factors for utilisation of delivery services in Nepal

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004372
Article Type:	Research
Date Submitted by the Author:	31-Oct-2013
Complete List of Authors:	Karkee, Rajendra; BP Koirala Institute of Health Sciences, School of Public Health and Community Medicine Lee, Andy; Curtin University, School of Public Health Khanal, Vishnu; Sanjeevani College of Medical Sciences,
Primary Subject Heading:	Epidemiology
Secondary Subject Heading:	Epidemiology, Public health
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

Need factors for utilisation of delivery services in Nepal

Rajendra Karkee*, Andy H. Lee, Vishnu Khanal

Rajendra Karkee*

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

E-mail: rkarkee@gmail.com

Andy H. Lee

School of Public Health, Curtin University, Perth, WA, Australia

E-mail: Andy.Lee@curtin.edu.au

Vishnu Khanal

Sanjeevani College of Medical Sciences, Butwal, Rupandehi, Nepal

E-mail: khanal.vishnu@gmail.com

*** Corresponding author**

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

Phone: +977 98420 64635

E-mail: rkarkee@gmail.com

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]

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

METHODS

Study setting

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

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 Nepal Health Research Council and data were accessible from MEASURE DHS project on request. Permission to use the data was obtained by the authors. Details of the sampling methodology had been described elsewhere.[6] Briefly, the survey utilised a two-stage cluster sampling method 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.

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 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. 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.

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 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 10^{th} 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
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
	≥ 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

	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 antennal care visits, which suggested that they had no intention or did not perceive the need of giving birth at a heath 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 antennal 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

utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.[16-18]

The findings have important implications for safe motherhood program in Nepal and other developing countries. Because the intention to deliver at a heath 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.

The strength of the present study was the use of a nationally representative large sample of married women with a high response rate. However, information was lacking on some known determinants of facility delivery utilisation, particularly quality of providers and distance and transportation to facility. These variables were unavailable from the 2011 NDHS database and posed as the major limitation. Nevertheless, residential location and region have provided some proxy information to partially compensate the effect of distance and service availability. Delivery services in Terai and urban areas are more physically accessible than in hilly or mountainous parts of the country.

CONCLUSION

Utilisation of delivery services remained low in Nepal. The majority of mothers were not prepared for childbirth and only half the women made the recommended four or more antennal care visits, indicating their perceived lack of need for facility delivery. The national data confirmed the strong associations between such need factors and service utilisation. Therefore, for behavioural interventions such as birth preparedness and complication

readiness to be effective in safe motherhood programs, they must be capable of changing the women's intention to deliver at a health facility.

Acknowledgements

The authors are grateful to the ICF International, Calverton, Maryland, USA, for providing the data for this study.

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.

REFERENCES

1. World Health Organization. *Trends in maternal mortality 1990 to 2010*. WHO, UNICEF, UNFPA and World Bank. WHO, Geneva, Switzerland,2012.
2. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *Lancet* 2006;368(9542):1189-200.
3. Metcalfe R, Adegoke AA. Strategies to increase facility-based skilled birth attendance in South Asia: a literature review. *Int Health* 2013;5(2):96-105.
4. De Brouwere V, Richard F, Witter S. Access to maternal and perinatal health services: lessons from successful and less successful examples of improving access to safe delivery and care of the newborn. *Trop Med Int Health* 2010;15(8):901-9.
5. United Nations. *The Millenium Development goals Report 2013*. New York: United Nations, 2013.
6. MoHP [Nepal], New ERA, ICF International Inc. *Nepal Demographic and Health Survey 2011*. Kathmandu, Nepal and Calverton, Maryland: Ministry of Health and Population [Nepal], New ERA, and ICF International Inc., 2012.
7. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? *J Health Soc Behav* 1995;36(1):1-10.
8. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Soc Sci Med* 1994;38(8):1091-110.
9. Pradhan A, Suvedi BK, Barnett S, et al. *Nepal Maternal Mortality and Morbidity Study 2008/2009*. Ministry of Health and Population, Government of Nepal, Kathmandu, 2010.
10. Agus Y, Shigeko H, Porter SE. Rural Indonesia women's traditional beliefs about antenatal care. *BMC Res Notes* 2012;5:589.

11. Gabrysch S, Campbell OMR. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy Childbirth* 2009;9:34.

12. Karkee R, Lee A, Binns C. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery* 2013;29(10):1206-10.

13. Mpembeni RNM, Killewo JZ, Leshabari MT, et al. Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: Implications for achievement of MDG-5 targets. *BMC Pregnancy Childbirth* 2007;7:29.

14. Magoma M, Requejo J, Campbell O, Cousens S, Filippi V. High ANC coverage and low skilled attendance in a rural Tanzanian district: a case for implementing a birth plan intervention. *BMC Pregnancy Childbirth* 2010;10:13.

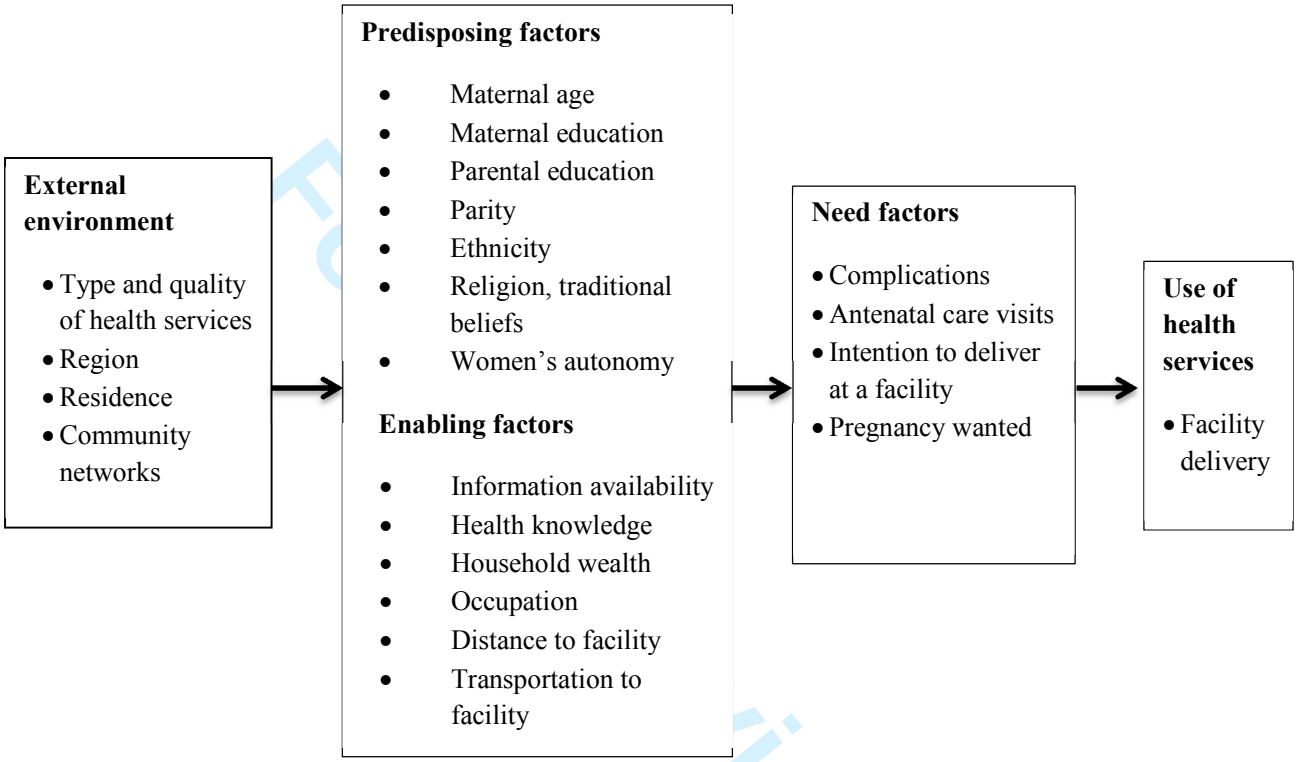
15. Magoma M, Requejo J, Campbell O, Cousens S, Merialdi M, Filippi V. The effectiveness of birth plans in increasing use of skilled care at delivery and postnatal care in rural Tanzania: a cluster randomised trial. *Trop Med Int Health* 2013;18(4):435-43.

16. Brazier E, Andrzejewski C, Perkins ME, Themmen EM, Knight RJ, Bassane B. Improving poor women's access to maternity care: Findings from a primary care intervention in Burkina Faso. *Soc Sci Med* 2009;69(5):682-90.

17. Hossain J, Ross SR. The effect of addressing demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh. *Int J Gynecol Obstet* 2006;92(3):320-28.

18. Turan JM, Tesfagiorghis M, Polan ML. Evaluation of a Community Intervention for Promotion of Safe Motherhood in Eritrea. *J Midwifery Womens Health* 2011;56(1):8-17.

Figure 1: Conceptual framework of factors associated with the utilisation of delivery services



BMJ open

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

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004372.R1
Article Type:	Research
Date Submitted by the Author:	28-Jan-2014
Complete List of Authors:	Karkee, Rajendra; BP Koirala Institute of Health Sciences, School of Public Health and Community Medicine Lee, Andy; Curtin University, School of Public Health Khanal, Vishnu; Sanjeevani College of Medical Sciences,
Primary Subject Heading:	Epidemiology
Secondary Subject Heading:	Epidemiology, Public health
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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

Rajendra Karkee*, Andy H. Lee, Vishnu Khanal

Rajendra Karkee*

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

E-mail: rkarkee@gmail.com

Andy H. Lee

School of Public Health, Curtin University, Perth, WA, Australia

E-mail: Andy.Lee@curtin.edu.au

Vishnu Khanal

Sanjeevani College of Medical Sciences, Butwal, Rupandehi, Nepal

E-mail: khanal.vishnu@gmail.com

*** Corresponding author**

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

Phone: +977 98420 64635

E-mail: rkarkee@gmail.com

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

Word count: 2319

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 attendants[8], 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

often perceived as normal life events without justification to seek professional help.[12, 13] 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.[14] 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.[15] Besides the immediate need, utilisation of institutional 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.[10]

Despite the important role of need factors, their effect on utilisation of institutional delivery service has seldom been investigated in the context of safe motherhood programs. The aim of the present study is to assess the contribution of need factors with respect to the utilisation of institutional delivery service in Nepal, using data from the national Nepal Demographic Health Survey (NDHS). The need factors were assessed by antenatal care visits and birth preparedness activities as available in NDHS 2011 data.

METHODS

Study setting

Nepal, with a population of 27.5 million, is divided into five developmental regions, each extending from north to south. The country has also three ecological zones across east to west: Terai, Hill and Mountain. These 15 sub-ecological regions are further divided into smaller districts. Typically, each district has Village Development Committees (VDC) in

rural areas and municipalities in urban areas. Each VDC or municipality in turn consists of small administrative units known as wards.

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 Nepal Health Research Council and data were accessible from MEASURE DHS project on request.[16] Permission to use the data was obtained by the authors. Details of the sampling methodology had been described elsewhere.[8] Briefly, the survey utilised a two-stage cluster sampling method 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 10^{th} 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

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% (CI 33.5% to 40.2%, SE 1.69). 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 ($p<0.001$). The confounders were adjusted simultaneously and included women's age, women's education, partner education, parity, wealth quintiles, ethnicity, region and residential location as presented in Table 1 and as available from the NDHS 2011 data set. 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[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

care visits, which suggested that they might have no intention or might not perceive the need of giving birth at a heath facility. Such perception of need can also be influenced by distance and quality of maternity services. 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,[14, 18] 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 antennal care but low use of facility delivery.[19, 20] 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.[14, 21]Consequently, informing women about danger signs and providing qualitative antenatal care with provision of iron tablets and blood check might encourage women to go for antenatal visits.

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.[18] 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.[22] Raising awareness and help for birth plan also led to increased facility

utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea. [23-25]. However, two previous 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.[26, 27]

The findings have important implications for safe motherhood program in Nepal and other low income countries. Because the intention to deliver at a heath 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 worker, preferably female health workers, at a health facility or by female community health volunteers at household visits. Further, local teachers and social workers can also be involved in awareness raising campaign. Community networks and mother clubs can also support in preparation activities such as money and transport management.

The strength of the present study was the use of a nationally representative large sample of married women with a high response rate. However, information was lacking on some known determinants of facility delivery utilisation, particularly quality of providers and distance and transportation to facility. These variables were unavailable from the 2011 NDHS database and posed as the major limitation. Nevertheless, the external factors 'residential location' and 'region' have provided some proxy information to partially compensate the effect of distance and service availability. Institutional delivery services in Terai and urban areas are more physically accessible than in hilly or mountainous parts of the country. The regression model

used ‘region’ and ‘residence’ as confounders together with other known predisposing and enabling factors that include women’s age, education, partner education, parity, wealth quintiles and ethnicity.

CONCLUSION

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

Acknowledgements

The authors are grateful to the ICF International, Calverton, Maryland, USA, for providing the data for this study.

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.

REFERENCES

1. World Health Organization. *Trends in maternal mortality 1990 to 2010*. WHO, UNICEF, UNFPA and World Bank. WHO, Geneva, Switzerland,2012.
2. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *The Lancet* 2006;368(9542):1189-200.
3. United Nations. *The Millenium Development goals Report 2013*. New York: United Nations,2013.
4. Metcalfe R, Adegoke AA. Strategies to increase facility-based skilled birth attendance in South Asia: a literature review. *International Health* 2013;5(2):96-105.
5. De Brouwere V, Richard F, Witter S. Access to maternal and perinatal health services: lessons from successful and less successful examples of improving access to safe delivery and care of the newborn. *Tropical Medicine and International Health* 2010;15(8):901-9.
6. Karkee R, Binns C, Lee A. Determinants of facility delivery after implementation of safer mother programme in Nepal: a prospective cohort study. *BMC Pregnancy and Childbirth* 2013;13(1):193.
7. Karkee R. How did Nepal reduce the maternal mortality? A result from analysing the determinants of maternal mortality. *Journal of Nepal Medical Association* 2012;52(186):88-94.
8. MoHP [Nepal], New ERA, ICF International Inc. *Nepal Demographic and Health Survey 2011*. Kathmandu, Nepal and Calverton, Maryland: Ministry of Health and Population [Nepal], New ERA, and ICF International Inc.,2012.
9. National Planning Commission/UN Country Team of Nepal. *Nepal Millennium Development Goals Progress Report 2010*. Kathmandu: National Planning Commission, Government of Nepal/UN Country Team of Nepal,2010.
10. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? *Journal of Health and Social Behavior* 1995;36(1):1-10.

11. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Social Science and Medicine* 1994;38(8):1091-110.

12. Pradhan A, Suvedi BK, Barnett S, et al. *Nepal Maternal Mortality and Morbidity Study 2008/2009.* Ministry of Health and Population, Government of Nepal, Kathmandu 2010.

13. Agus Y, Shigeko H, Porter SE. Rural Indonesia women's traditional beliefs about antenatal care. *BMC Research Notes* 2012589.

14. Gabrysch S, Campbell OMR. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy and Childbirth* 2009;934.

15. JHPIEGO. *Behaviour change intervention for safe motherhood: common problems, unique solutions*. Baltimore: 2004.

16. MEASURE DHS/ ICF International. http://www.measuredhs.com/data/dataset/Nepal_Standard-DHS_2011.cfm?flag=0 (accessed 15 Jan 2014),

17. JHPIEGO. *Monitoring birth preparedness and complication readiness, tools and indicators for maternal and newborn health*. Baltimore: 2004.

18. Karkee R, Lee A, Binns C. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery* 2013;29(10):1206-10.

19. Mpembeni RNM, Killewo JZ, Leshabari MT, et al. Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: Implications for achievement of MDG-5 targets. *BMC Pregnancy and Childbirth* 2007;7.

20. Magoma M, Requejo J, Campbell O, et al. High ANC coverage and low skilled attendance in a rural Tanzanian district: a case for implementing a birth plan intervention. *BMC Pregnancy and Childbirth* 2010;10(1):13.

21. Titaley C, Dibley M, Roberts C. Factors associated with underutilization of antenatal care services in Indonesia: results of Indonesia Demographic and Health Survey 2002/2003 and 2007. *BMC Public Health* 2010;10(1):485.

22. Magoma M, Requejo J, Campbell O, et al. The effectiveness of birth plans in increasing use of skilled care at delivery and postnatal care in rural Tanzania: a cluster randomised trial. *Tropical Medicine and International Health* 2013;18(4):435-43.

23. Brazier E, Andrzejewski C, Perkins ME, et al. Improving poor women's access to maternity care: Findings from a primary care intervention in Burkina Faso. *Social Science and Medicine* 2009;69(5):682-90.

24. Hossain J, Ross SR. The effect of addressing demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh. *International Journal of Gynecology & Obstetrics* 2006;92(3):320-28.

25. Turan JM, Tesfagiorghis M, Polan ML. Evaluation of a Community Intervention for Promotion of Safe Motherhood in Eritrea. *The Journal of Midwifery & Women⃞ s Health* 2011;56(1):8-17.

26. McPherson R, Khadka N, Moore J, et al. Are birth-preparedness programmes effective? Results from a field trial in Siraha district, Nepal. *J Health Popul Nutr* 2006;24479-88.

27. Hodgins S, McPherson R, Suvedi BK, et al. Testing a scalable community-based approach to improve maternal and neonatal health in rural Nepal. *Journal of Perinatology* 2010;30(6):388-95.

Need factors for utilisation of delivery services in Nepal

Rajendra Karkee*, Andy H. Lee, Vishnu Khanal

Rajendra Karkee*

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

E-mail: rkarkee@gmail.com

Andy H. Lee

School of Public Health, Curtin University, Perth, WA, Australia

E-mail: Andy.Lee@curtin.edu.au

Vishnu Khanal

Sanjeevani College of Medical Sciences, Butwal, Rupandehi, Nepal

E-mail: khanal.vishnu@gmail.com

*** Corresponding author**

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

Phone: +977 98420 64635

E-mail: rkarkee@gmail.com

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]

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

METHODS

Study setting

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

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 Nepal Health Research Council and data were accessible from MEASURE DHS project on request. Permission to use the data was obtained by the authors. Details of the sampling methodology had been described elsewhere.[6] Briefly, the survey utilised a two-stage cluster sampling method 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.

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 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. 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.

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 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 10^{th} 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
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
	≥ 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

	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 antennal care visits, which suggested that they had no intention or did not perceive the need of giving birth at a heath 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 antennal 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

utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea.[16-18]

The findings have important implications for safe motherhood program in Nepal and other developing countries. Because the intention to deliver at a heath 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.

The strength of the present study was the use of a nationally representative large sample of married women with a high response rate. However, information was lacking on some known determinants of facility delivery utilisation, particularly quality of providers and distance and transportation to facility. These variables were unavailable from the 2011 NDHS database and posed as the major limitation. Nevertheless, residential location and region have provided some proxy information to partially compensate the effect of distance and service availability. Delivery services in Terai and urban areas are more physically accessible than in hilly or mountainous parts of the country.

CONCLUSION

Utilisation of delivery services remained low in Nepal. The majority of mothers were not prepared for childbirth and only half the women made the recommended four or more antennal care visits, indicating their perceived lack of need for facility delivery. The national data confirmed the strong associations between such need factors and service utilisation. Therefore, for behavioural interventions such as birth preparedness and complication

readiness to be effective in safe motherhood programs, they must be capable of changing the women's intention to deliver at a health facility.

Acknowledgements

The authors are grateful to the ICF International, Calverton, Maryland, USA, for providing the data for this study.

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.

REFERENCES

1. World Health Organization. *Trends in maternal mortality 1990 to 2010*. WHO, UNICEF, UNFPA and World Bank. WHO, Geneva, Switzerland,2012.
2. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *Lancet* 2006;368(9542):1189-200.
3. Metcalfe R, Adegoke AA. Strategies to increase facility-based skilled birth attendance in South Asia: a literature review. *Int Health* 2013;5(2):96-105.
4. De Brouwere V, Richard F, Witter S. Access to maternal and perinatal health services: lessons from successful and less successful examples of improving access to safe delivery and care of the newborn. *Trop Med Int Health* 2010;15(8):901-9.
5. United Nations. *The Millenium Development goals Report 2013*. New York: United Nations, 2013.
6. MoHP [Nepal], New ERA, ICF International Inc. *Nepal Demographic and Health Survey 2011*. Kathmandu, Nepal and Calverton, Maryland: Ministry of Health and Population [Nepal], New ERA, and ICF International Inc., 2012.
7. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? *J Health Soc Behav* 1995;36(1):1-10.
8. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Soc Sci Med* 1994;38(8):1091-110.
9. Pradhan A, Suvedi BK, Barnett S, et al. *Nepal Maternal Mortality and Morbidity Study 2008/2009*. Ministry of Health and Population, Government of Nepal, Kathmandu, 2010.
10. Agus Y, Shigeko H, Porter SE. Rural Indonesia women's traditional beliefs about antenatal care. *BMC Res Notes* 2012;5:589.

11. Gabrysch S, Campbell OMR. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy Childbirth* 2009;9:34.

12. Karkee R, Lee A, Binns C. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery* 2013;29(10):1206-10.

13. Mpembeni RNM, Killewo JZ, Leshabari MT, et al. Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: Implications for achievement of MDG-5 targets. *BMC Pregnancy Childbirth* 2007;7:29.

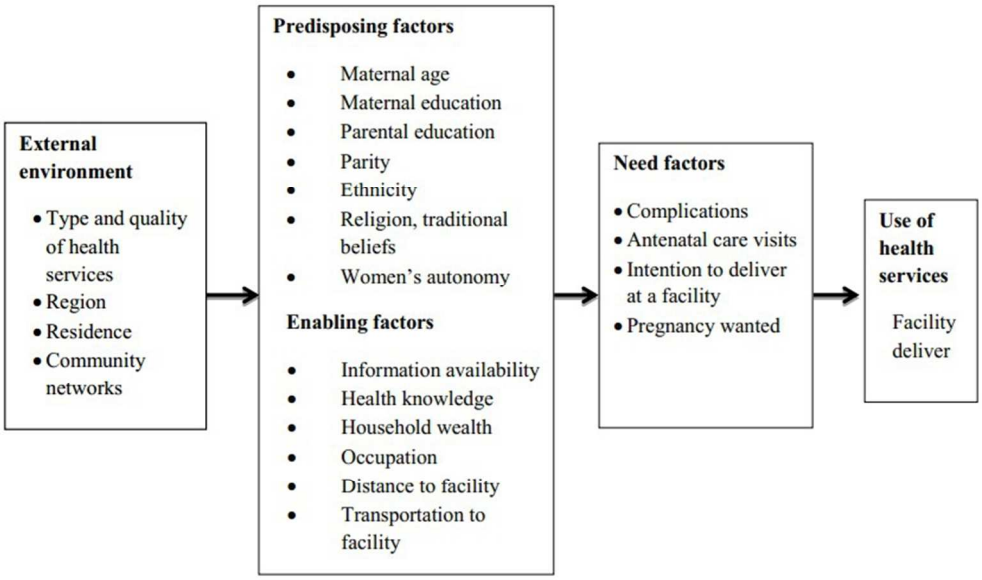
14. Magoma M, Requejo J, Campbell O, Cousens S, Filippi V. High ANC coverage and low skilled attendance in a rural Tanzanian district: a case for implementing a birth plan intervention. *BMC Pregnancy Childbirth* 2010;10:13.

15. Magoma M, Requejo J, Campbell O, Cousens S, Merialdi M, Filippi V. The effectiveness of birth plans in increasing use of skilled care at delivery and postnatal care in rural Tanzania: a cluster randomised trial. *Trop Med Int Health* 2013;18(4):435-43.

16. Brazier E, Andrzejewski C, Perkins ME, Themmen EM, Knight RJ, Bassane B. Improving poor women's access to maternity care: Findings from a primary care intervention in Burkina Faso. *Soc Sci Med* 2009;69(5):682-90.

17. Hossain J, Ross SR. The effect of addressing demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh. *Int J Gynecol Obstet* 2006;92(3):320-28.

18. Turan JM, Tesfagiorghis M, Polan ML. Evaluation of a Community Intervention for Promotion of Safe Motherhood in Eritrea. *J Midwifery Womens Health* 2011;56(1):8-17.



Conceptual framework of factors associated with the utilisation of institutional delivery services
223x131mm (96 x 96 DPI)

BMJ open

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

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004372.R2
Article Type:	Research
Date Submitted by the Author:	23-Feb-2014
Complete List of Authors:	Karkee, Rajendra; BP Koirala Institute of Health Sciences, School of Public Health and Community Medicine Lee, Andy; Curtin University, School of Public Health Khanal, Vishnu; Sanjeevani College of Medical Sciences,
Primary Subject Heading:	Epidemiology
Secondary Subject Heading:	Epidemiology, Public health, Health services research
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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

Rajendra Karkee*, Andy H. Lee, Vishnu Khanal

Rajendra Karkee*

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

E-mail: rkarkee@gmail.com

Andy H. Lee

School of Public Health, Curtin University, Perth, WA, Australia

E-mail: Andy.Lee@curtin.edu.au

Vishnu Khanal

Sanjeevani College of Medical Sciences, Butwal, Rupandehi, Nepal

E-mail: khanal.vishnu@gmail.com

*** Corresponding author**

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

Phone: +977 98420 64635 E-mail: rkarkee@gmail.com

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

Word count: 2896

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

often perceived as normal life events without justification to seek professional help.[12, 13] 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.[14] Those women who perceive the need for professional help and recognise the risk of pregnancy and delivery are expected to make antenatal visits and prepare and arrange for childbirth.[15] Besides the immediate need, utilisation of institutional delivery service can be affected by predisposing and enabling factors as well as external environment factors. Figure 1 depicts the conceptual framework, which is adapted from Andersen's behavioural model for the utilisation of health services.[10]

Despite the important role of need factors, their effect on utilisation of institutional delivery service has seldom been investigated in the context of safe motherhood programs. The aim of the present study is to assess the contribution of need factors with respect to the utilisation of institutional delivery service in Nepal, using data from the national Nepal Demographic Health Survey (NDHS). Need factors were assessed by antenatal care visits and birth preparedness activities.

METHODS

Study setting

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

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 10^{th} 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,

wealth quintiles, ethnicity, region and residential location from the NDHS 2011 data set. Both need factors were positively associated with the facility delivery status. Even after simultaneously 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% 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). The multivariable logistic regression analysis also confirmed that wealth quintiles, residential location and higher parity were significantly associated with place of delivery.

Table 2: Crude and adjusted odds ratios of facility delivery from logistic regression with complex sampling analysis (n = 4079)

	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)	

≥ 5	17.89 (11.23, 28.51)	4.94 (3.14, 7.76)	
Birth preparedness[#]			< 0.001
0	1	1	
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)	
Confounding Factors			
Women's age (years)			0.083
15-19	1	1	
20-24	0.65 (0.49, 0.86)	0.65 (0.44, 0.97)	
25-29	0.56 (0.42, 0.75)	0.69 (0.48, 1.00)	
30-49	0.36 (0.26, 0.49)	0.80 (0.49, 1.32)	
Women's education			0.216
None	1	1	
Primary	1.91 (1.46, 2.51)	1.08 (0.82, 1.42)	
Secondary	5.35 (4.25, 6.72)	1.29 (0.97, 1.71)	
Higher	20.28 (12.22, 33.65)	1.67 (0.89, 3.12)	
Partner's education			0.467
None	1	1	
Primary	1.61 (1.17, 2.21)	0.94 (0.67, 1.30)	
Secondary	3.62 (2.63, 4.98)	0.95 (0.67, 1.33)	
Higher	11.19 (7.34, 17.04)	1.28 (0.78, 2.09)	
Parity			<0.001
1	1	1	
2	0.44 (0.35, 0.54)	0.44 (0.34, 0.58)	
3	0.21 (0.16, 0.28)	0.39 (0.28, 0.54)	

	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 multivariable logistic regression model	**Wealth quintiles**			<0.001
	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)	
	5	24.17 (17.51, 33.35)	6.17 (3.94, 9.67)	
# Birth preparedness consists of four preparation activities (planning for a birth attendant, saving money, arrangement for transportation, and identification of potential blood donator)	**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)	

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, despite birth preparedness has been incorporated into the national safe motherhood program since 2009.[12] Female community health volunteers and facility-based health workers use pictorial charts to educate women on obstetric danger signs. While preparedness level can be high in some districts,[18] overall birth preparedness is still low. The variations between districts may be attributed to differences in human development indexes including adult literacy, women empowerment and physical accessibility to health facilities.

Overall, the preparation and antenatal visit record suggested that women might have no intention or might not perceive the need of giving birth at a heath facility. Such perception of need can also be influenced by distance and quality of maternity services.[14,19] 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. Apart from the need factors, parity, wealth status and residential location also play a significant role in the choice of delivery place.

Although the frequency of antenatal care visits was associated with subsequent facility delivery, the relationship appeared to be dose-dependent,[14, 18] 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 antennal care but low use of facility delivery.[20, 21] 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.[14, 22]

Consequently, informing women about danger signs and providing quality antenatal care with provision of iron tablets and blood check might encourage women to attend antenatal visits.

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.[18] 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.[23] Raising awareness and help for birth plan also led to increased facility utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea. [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 heath 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.

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

CONCLUSION

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

Acknowledgements

The authors are grateful to the ICF International, Calverton, Maryland, USA, for providing the data for this study.

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.

REFERENCES

1. World Health Organization. *Trends in maternal mortality 1990 to 2010*. WHO, UNICEF, UNFPA and World Bank. WHO, Geneva, Switzerland,2012.
2. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *The Lancet* 2006;368(9542):1189-200.
3. United Nations. *The Millenium Development goals Report 2013*. New York: United Nations,2013.
4. Metcalfe R, Adegoke AA. Strategies to increase facility-based skilled birth attendance in South Asia: a literature review. *International Health* 2013;5(2):96-105.
5. De Brouwere V, Richard F, Witter S. Access to maternal and perinatal health services: lessons from successful and less successful examples of improving access to safe delivery and care of the newborn. *Trop Med Int Health* 2010;15(8):901-9.
6. Karkee R, Lee A, Binns C. Determinants of facility delivery after implementation of safer mother programme in Nepal: a prospective cohort study. *BMC Pregnancy Childbirth* 2013;13(1):193.
7. Karkee R. How did Nepal reduce the maternal mortality? A result from analysing the determinants of maternal mortality. *Journal of Nepal Medical Association* 2012;52(186):88-94.
8. MoHP [Nepal], New ERA, ICF International Inc. *Nepal Demographic and Health Survey 2011*. Kathmandu, Nepal and Calverton, Maryland: Ministry of Health and Population [Nepal], New ERA, and ICF International Inc.,2012.
9. National Planning Commission/UN Country Team of Nepal. *Nepal Millennium Development Goals Progress Report 2010*. Kathmandu: National Planning Commission, Government of Nepal/UN Country Team of Nepal,2010.

10. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? *J Health Soc Behav* 1995;36(1):1-10.

11. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Social Science and Medicine* 1994;38(8):1091-110.

12. Pradhan A, Suvedi BK, Barnett S, et al. Nepal Maternal Mortality and Morbidity Study 2008/2009.: Ministry of Health and Population, Government of Nepal, Kathmandu,2010.

13. Agus Y, Shigeko H, Porter SE. Rural Indonesia women's traditional beliefs about antenatal care. *BMC Res Notes* 2012589.

14. Gabrysch S, Campbell OMR. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy Childbirth* 2009;934.

15. JHPIEGO. *Behaviour change intervention for safe motherhood: common problems, unique solutions*. Baltimore: JHPIEGO, Maternal and Neonatal Health Programme,2004.

16. MEASURE DHS/ ICF International. http://www.measuredhs.com/data/dataset/Nepal_Standard-DHS_2011.cfm?flag=0 (accessed 15 Jan 2014),

17. JHPIEGO. Monitoring birth preparedness and complication readiness, tools and indicators for maternal and newborn health. Baltimore: JHPIEGO, Maternal and Neonatal Health Programme; 2004.

18. Karkee R, Lee A, Binns C. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery* 2013;29(10):1206-10.

19. Acharya LB, Cleland J. Maternal and child health services in rural Nepal: does access or quality matter more? *Health Policy Plan* 2000;15(2):223-29.

20. Mpembeni RNM, Killewo JZ, Leshabari MT, et al. Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: Implications for achievement of MDG-5 targets. *BMC Pregnancy Childbirth* 2007;7.

21. Magoma M, Requejo J, Campbell O, et al. High ANC coverage and low skilled attendance in a rural Tanzanian district: a case for implementing a birth plan intervention. *BMC Pregnancy Childbirth* 2010;10(1):13.

22. Titaley C, Dibley M, Roberts C. Factors associated with underutilization of antenatal care services in Indonesia: results of Indonesia Demographic and Health Survey 2002/2003 and 2007. *BMC Public Health* 2010;10(1):485.

23. Magoma M, Requejo J, Campbell O, et al. The effectiveness of birth plans in increasing use of skilled care at delivery and postnatal care in rural Tanzania: a cluster randomised trial. *Trop Med Int Health* 2013;18(4):435-43.

24. Brazier E, Andrzejewski C, Perkins ME, et al. Improving poor women's access to maternity care: Findings from a primary care intervention in Burkina Faso. *Social Science and Medicine* 2009;69(5):682-90.

25. Hossain J, Ross SR. The effect of addressing demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh. *International Journal of Gynecology & Obstetrics* 2006;92(3):320-28.

26. Turan JM, Tesfagiorghis M, Polan ML. Evaluation of a Community Intervention for Promotion of Safe Motherhood in Eritrea. *The Journal of Midwifery & Women's Health* 2011;56(1):8-17.

27. McPherson R, Khadka N, Moore J, et al. Are birth-preparedness programmes effective? Results from a field trial in Siraha district, Nepal. *Journal Health Population Nutrition* 2006;24479-88.

28. Hodgins S, McPherson R, Suvedi BK, et al. Testing a scalable community-based approach to improve maternal and neonatal health in rural Nepal. *J Perinatol* 2010;30(6):388-95.

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

Rajendra Karkee*, Andy H. Lee, Vishnu Khanal

Rajendra Karkee*

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

E-mail: rkarkee@gmail.com

Andy H. Lee

School of Public Health, Curtin University, Perth, WA, Australia

E-mail: Andy.Lee@curtin.edu.au

Vishnu Khanal

Sanjeevani College of Medical Sciences, Butwal, Rupandehi, Nepal

E-mail: khanal.vishnu@gmail.com

*** Corresponding author**

School of Public Health and Community Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

Phone: +977 98420 64635 E-mail: rkarkee@gmail.com

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

Word count: 2896

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

often perceived as normal life events without justification to seek professional help.[12, 13] 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.[14] Those women who perceive the need for professional help and recognise the risk of pregnancy and delivery are expected to make antenatal visits and prepare and arrange for childbirth.[15] Besides the immediate need, utilisation of institutional delivery service can be affected by predisposing and enabling factors as well as external environment factors. Figure 1 depicts the conceptual framework, which is adapted from Andersen's behavioural model for the utilisation of health services.[10]

Despite the important role of need factors, their effect on utilisation of institutional delivery service has seldom been investigated in the context of safe motherhood programs. The aim of the present study is to assess the contribution of need factors with respect to the utilisation of institutional delivery service in Nepal, using data from the national Nepal Demographic Health Survey (NDHS). Need factors were assessed by antenatal care visits and birth preparedness activities.

METHODS

Study setting

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

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 10^{th} 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,

wealth quintiles, ethnicity, region and residential location from the NDHS 2011 data set. Both need factors were positively associated with the facility delivery status. Even after simultaneously 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% 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). The multivariable logistic regression analysis also confirmed that wealth quintiles, residential location and higher parity were significantly associated with place of delivery.

Table 2: Crude and adjusted odds ratios of facility delivery from logistic regression with complex sampling analysis (n = 4079)

	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)	

≥ 5	17.89 (11.23, 28.51)	4.94 (3.14, 7.76)	
Birth preparedness[#]			< 0.001
0	1	1	
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)	
Confounding Factors			
Women's age (years)			0.083
15-19	1	1	
20-24	0.65 (0.49, 0.86)	0.65 (0.44, 0.97)	
25-29	0.56 (0.42, 0.75)	0.69 (0.48, 1.00)	
30-49	0.36 (0.26, 0.49)	0.80 (0.49, 1.32)	
Women's education			0.216
None	1	1	
Primary	1.91 (1.46, 2.51)	1.08 (0.82, 1.42)	
Secondary	5.35 (4.25, 6.72)	1.29 (0.97, 1.71)	
Higher	20.28 (12.22, 33.65)	1.67 (0.89, 3.12)	
Partner's education			0.467
None	1	1	
Primary	1.61 (1.17, 2.21)	0.94 (0.67, 1.30)	
Secondary	3.62 (2.63, 4.98)	0.95 (0.67, 1.33)	
Higher	11.19 (7.34, 17.04)	1.28 (0.78, 2.09)	
Parity			<0.001
1	1	1	
2	0.44 (0.35, 0.54)	0.44 (0.34, 0.58)	
3	0.21 (0.16, 0.28)	0.39 (0.28, 0.54)	

	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, arrangement for transportation, and identification of potential blood donator)	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)	

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, despite birth preparedness has been incorporated into the national safe motherhood program since 2009.[12] Female community health volunteers and facility-based health workers use pictorial charts to educate women on obstetric danger signs. While preparedness level can be high in some districts,[18] overall birth preparedness is still low. The variations between districts may be attributed to differences in human development indexes including adult literacy, women empowerment and physical accessibility to health facilities.

Overall, the preparation and antenatal visit record suggested that women might have no intention or might not perceive the need of giving birth at a heath facility. Such perception of need can also be influenced by distance and quality of maternity services.[14,19] 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. Apart from the need factors, parity, wealth status and residential location also play a significant role in the choice of delivery place.

Although the frequency of antenatal care visits was associated with subsequent facility delivery, the relationship appeared to be dose-dependent,[14, 18] 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 antennal care but low use of facility delivery.[20, 21] 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.[14, 22]

Consequently, informing women about danger signs and providing quality antenatal care with provision of iron tablets and blood check might encourage women to attend antenatal visits.

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.[18] 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.[23] Raising awareness and help for birth plan also led to increased facility utilisation in other intervention studies conducted in Burkina Faso, Bangladesh and Eritrea. [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 heath 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.

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

CONCLUSION

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

Acknowledgements

The authors are grateful to the ICF International, Calverton, Maryland, USA, for providing the data for this study.

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.

REFERENCES

1. World Health Organization. *Trends in maternal mortality 1990 to 2010*. WHO, UNICEF, UNFPA and World Bank. WHO, Geneva, Switzerland,2012.
2. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *The Lancet* 2006;368(9542):1189-200.
3. United Nations. *The Millenium Development goals Report 2013*. New York: United Nations,2013.
4. Metcalfe R, Adegoke AA. Strategies to increase facility-based skilled birth attendance in South Asia: a literature review. *International Health* 2013;5(2):96-105.
5. De Brouwere V, Richard F, Witter S. Access to maternal and perinatal health services: lessons from successful and less successful examples of improving access to safe delivery and care of the newborn. *Trop Med Int Health* 2010;15(8):901-9.
6. Karkee R, Lee A, Binns C. Determinants of facility delivery after implementation of safer mother programme in Nepal: a prospective cohort study. *BMC Pregnancy Childbirth* 2013;13(1):193.
7. Karkee R. How did Nepal reduce the maternal mortality? A result from analysing the determinants of maternal mortality. *Journal of Nepal Medical Association* 2012;52(186):88-94.
8. MoHP [Nepal], New ERA, ICF International Inc. *Nepal Demographic and Health Survey 2011*. Kathmandu, Nepal and Calverton, Maryland: Ministry of Health and Population [Nepal], New ERA, and ICF International Inc.,2012.
9. National Planning Commission/UN Country Team of Nepal. *Nepal Millennium Development Goals Progress Report 2010*. Kathmandu: National Planning Commission, Government of Nepal/UN Country Team of Nepal,2010.

10. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? *J Health Soc Behav* 1995;36(1):1-10.

11. Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Social Science and Medicine* 1994;38(8):1091-110.

12. Pradhan A, Suvedi BK, Barnett S, et al. Nepal Maternal Mortality and Morbidity Study 2008/2009.: Ministry of Health and Population, Government of Nepal, Kathmandu,2010.

13. Agus Y, Shigeko H, Porter SE. Rural Indonesia women's traditional beliefs about antenatal care. *BMC Res Notes* 2012589.

14. Gabrysch S, Campbell OMR. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy Childbirth* 2009;934.

15. JHPIEGO. *Behaviour change intervention for safe motherhood: common problems, unique solutions*. Baltimore: JHPIEGO, Maternal and Neonatal Health Programme,2004.

16. MEASURE DHS/ ICF International. http://www.measuredhs.com/data/dataset/Nepal_Standard-DHS_2011.cfm?flag=0 (accessed 15 Jan 2014),

17. JHPIEGO. Monitoring birth preparedness and complication readiness, tools and indicators for maternal and newborn health. Baltimore: JHPIEGO, Maternal and Neonatal Health Programme; 2004.

18. Karkee R, Lee A, Binns C. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery* 2013;29(10):1206-10.

19. Acharya LB, Cleland J. Maternal and child health services in rural Nepal: does access or quality matter more? *Health Policy Plan* 2000;15(2):223-29.

20. Mpembeni RNM, Killewo JZ, Leshabari MT, et al. Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: Implications for achievement of MDG-5 targets. *BMC Pregnancy Childbirth* 2007;7.

21. Magoma M, Requejo J, Campbell O, Cousens S, Filippi V. High ANC coverage and low skilled attendance in a rural Tanzanian district: a case for implementing a birth plan intervention. *BMC Pregnancy Childbirth* 2010;10(1):13.

22. Titaley C, Dibley M, Roberts C. Factors associated with underutilization of antenatal care services in Indonesia: results of Indonesia Demographic and Health Survey 2002/2003 and 2007. *BMC Public Health* 2010;10(1):485.

23. Magoma M, Requejo J, Campbell O, Cousens S, Merialdi M, Filippi V. The effectiveness of birth plans in increasing use of skilled care at delivery and postnatal care in rural Tanzania: a cluster randomised trial. *Trop Med Int Health* 2013;18(4):435-43.

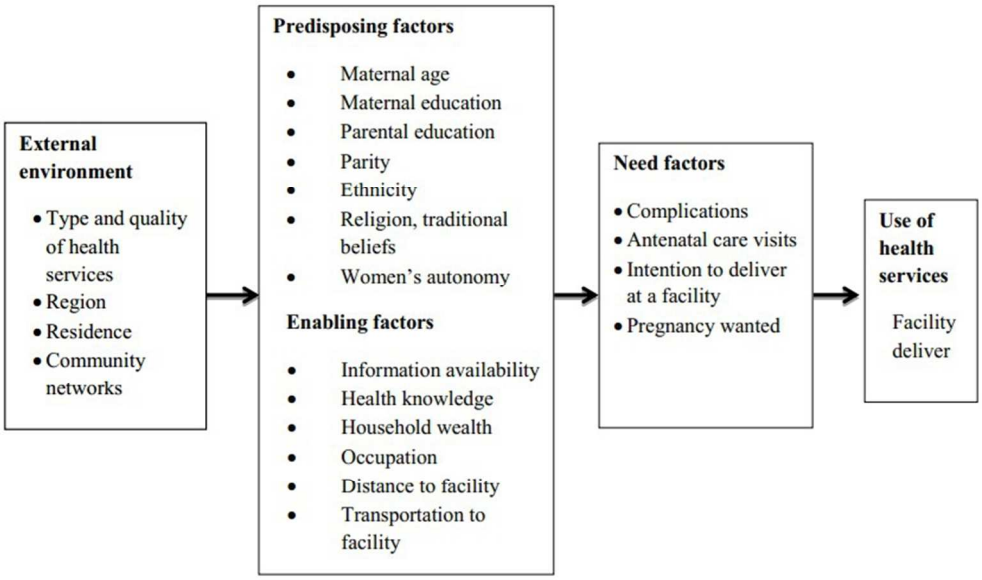
24. Brazier E, Andrzejewski C, Perkins ME, Themmen EM, Knight RJ, Bassane B. Improving poor women's access to maternity care: Findings from a primary care intervention in Burkina Faso. *Social Science and Medicine* 2009;69(5):682-90.

25. Hossain J, Ross SR. The effect of addressing demand for as well as supply of emergency obstetric care in Dinajpur, Bangladesh. *International Journal of Gynecology & Obstetrics* 2006;92(3):320-28.

26. Turan JM, Tesfagiorghis M, Polan ML. Evaluation of a Community Intervention for Promotion of Safe Motherhood in Eritrea. *The Journal of Midwifery & Women's Health* 2011;56(1):8-17.

27. McPherson R, Khadka N, Moore J, Sharma M. Are birth-preparedness programmes effective? Results from a field trial in Siraha district, Nepal. *Journal Health Population Nutrition* 2006;24479-88.

28. Hodgins S, McPherson R, Suvedi BK, et al. Testing a scalable community-based approach to improve maternal and neonatal health in rural Nepal. *J Perinatol* 2010;30(6):388-95.



Conceptual framework of factors associated with the utilisation of institutional delivery services
223x131mm (96 x 96 DPI)