Inequality in institutional delivery of the recent birth among married women in Nepal: a trend analysis

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Research article

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Abstract

Background The huge discrepancy in health statistics between developed and developing countries occur in the area of maternal mortality, with developing countries contributing most of the figures. Nepal has higher maternal mortality ratio than its South Asian neighbors. This study assesses the trend of institutional delivery of recent birth and compared the inequalities with associated factors that affect institutional delivery in Nepal.

Methods The data for this study was obtained from three sequential Nepal Demographic and Health Surveys [NDHS] of 2006, 2011, and 2016. The information was collected from mothers having a child within last five years preceding the survey years. The total number of such mothers was 4066, 4148, and 3998 respectively in the survey of 2006, 2011, and 2016. The association between institutional delivery and the explanatory variables was assessed via bivariate analysis (chi-square test) and multivariate analysis (binary logistic regression).

Results The utilization of health service during delivery stepped up from 21% in 2006 to 62% in 2016. Although the proportion of delivery in health facility increased among poorest over the period of 10 years, the disparity between richest and poorest still persisted from 2006 to 2016 and the association was highly significant in all the surveys. Although, government of Nepal has launched the maternity incentive scheme through safe delivery incentive program in 2005, poor women are still deprived from utilizing the service. Poorest and poorer women were 78 percent \( (aOR = 0.22, 95\% CI 0.17–0.27) \) and 71 Percent \( (aOR = 0.23, 95\% CI 0.23–0.35) \) respectively less likely to have institutional delivery than the richest women after controlling the other socio-demographic and culture factors. Furthermore, this study found that education, place of residence, women's autonomy, religion, number of ANC visits, exposure to newspaper and TV were significant predictors for place of delivery.

Conclusion Although there has been three-fold increment in utilization of health services during delivery over the period of 10 years, the discrepancy between rich and poor, educated and uneducated and urban and rural area is highly evident. Overall, our study highlights the necessity of interventions to promote institutional delivery with greater focus on poor, uneducated, and rural women.

Background

One of the major area of discrepancy in health status between developed and developing nations, is maternal health as developing countries contribute most of the figures of maternal mortality. \(^1\) Thousands of women die annually from complications during pregnancy, childbirth, or postpartum period, and most of these deaths occur in developing countries. \(^2\) Globally, about 295,000 women died during delivery or during postpartum period in 2017. Most of these deaths (94%) occurred in low income countries, and most of them could be prevented. \(^3\) Sub-Saharan Africa and Southern Asia accounted for approximately 86% (254 000) of the estimated global maternal deaths in 2017. Due to availability of advanced health care facilities nowadays, many maternal deaths are preventable. In many high income and upper middle
income countries, more than nine out of ten births are attended by skilled health care professionals. In contrast, less than half of all births in many low income and lower-middle-income countries are assisted by such skilled health personnel 4,5,6. Study shows that high-quality, obstetric and neonatal care during delivery is one of the major priorities to reduce illness and death in mothers and newborns.7

The maternal mortality ratio of Nepal is 258 per 100,000 live births, which is higher than other South Asian countries like Sri Lanka, India, Bhutan, Bangladesh etc. It is of paramount importance to receive antenatal care (ANC) on specified months as per national protocol, deliver at health facilities or being assisted by skilled birth attendants (SBA) at health institutions and at home, and to receive postnatal care (PNC) to prevent maternal and newborn deaths.8,9,10 There has only been mediocre progress in the efforts of Ministry of Health and Population (MoHP) of Nepal to promote safer pregnancy and childbirth, in increasing the proportion of four ANC visits, institutional delivery, and PNC.11,12. Government of Nepal has launched the maternity incentive scheme through safe delivery incentive program in 2005. Government of Nepal removed user fees from all types of delivery in public health facilities nationwide and renamed the program ‘Aama’ targeted at increasing institutional delivery by minimizing financial barriers women face in accessing services so as to improve maternal health outcomes.10 However, only less than three out of five (57%) of all birth in the 5 years preceding the survey were delivered in health facilities.9

The underlying cause of low institutional delivery needs further investigation and exploration in order to better understand and appropriately address through reproductive health programs. It is essential to develop the effective strategies and implement the program for the increase of institutional delivery. After the Nepal's national flagship programs (Aama) since 2005 which have been promoting safe motherhood through initiatives such as providing free delivery care and transportation incentive schemes to women delivering in a health facility, we hypothesized that there is not inequality between poorest and richest in utilization of institutional delivery services in Nepal. The findings of this study aim to guide reproductive health program planners and policy makers to understand various factors influencing institutional delivery and to assist in implementation of the reproductive health program which will increase institutional delivery as well as reduce the risk of maternal and newborn morbidity and mortality.

Methods

The data for this study was obtained from three sequential Nepal Demographic and Health Surveys [NDHS] of 2006, 2011, and 2016. These surveys used multi-stage, stratified, and cluster sampling method. The sampling frame contained wards, primary sampling unit [PSU] as well as enumeration areas [EA]. The NDHS used two stages selection for PSU/EA in rural areas and three stages in urban areas. Details of sampling strategy/design/frame, survey questionnaire are publically available in the NDHS reports and website. The information was collected from mothers having a child within last five years preceding the survey years of 2006, 2011, and 2011.
NDHS collected data from 10793, 12862, 12674 women on NDHS 2006, NDHS 2011, and NDHS 2016 respectively. But, there were 4066, 4148, and 3998 mothers having a child within last five years preceding to the survey 2006, 2011, and 2016 respectively. Therefore, we included all 12212 samples for statistical analysis as per study objectives. Respondents' characteristics: age, age at marriage, number of child born, caste, religion, educational status, place of residence, employment status, wealth index, women's autonomy in household decision making, exposure to media were considered as independent variables and utilization health service during delivery was considered as dependent variable.

IBM SPSS Statistics version 20 was used to analyze the data. Three level of analyses were made. In univariate analysis simply frequencies and percentage were calculated. Bivariate analysis showed the association between independent and dependent variables using chi-square test as per the survey years separately. However, in multivariate analysis, we pooled all data from NDHS 2006, 2011 and 2016. Binary logistic regression model was used to predict the adjusted effects of covariates on utilization of health service during delivery. Before the multivariate analysis, multicollinearity between the variables was assessed. We found age and number of children born were highly correlated. So we removed age from the logistic model. We put wealth status in Model I and added other socio-demographic variables were in Model II. We presented adjusted odds ratios [aOR] with reference categories at 95 percent confidence interval [95% CI].

**Results**

**Background characteristics**

The total number of women aged 15-49 years who had a live birth in the five years preceding the survey was alike in all three surveys, which was 4066, 4148 and 3998 in the survey of 2006, 2011 and 2016 respectively. Nearly half of the women were aged between 25-34 years (45%, 48% and 51% in 2006, 2011 and 2016 respectively). More than two-fifths (43%) women were married at the age of 15-17 years followed by 18-20 years (30%) in the year 2016. The proportion of women such women was higher among Brahmin/Chhetri (50%) in the year 2006 while among Janajatis in the year 2011 (37%) and 2016 (33%). Similarly, higher proportion of uneducated women had a live birth in the survey of the year 2006 (58%) and 2011 (44%) than their counterparts while the proportion was higher among women having secondary or above education in the survey of the year 2016 (49%). More than four out of five women were Hindus in all three surveys. Likewise, in regards to place of residence, 87% and 90% of such women resided in rural area in the survey of 2006 and 2011 respectively. In contrast, more than half (56%) women resided in urban area in the survey of 2016. The proportion of currently working women who had a live birth in the preceding five years of the survey decreased gradually with time; 70%, 56% and 51% in the survey of 2006, 2011 and 2016 respectively. The proportion of such women was homogeneous among all level of wealth quintiles in all surveys. More than a third of all women had no autonomy (36%) and moderate
autonomy (34%). Similarly, in regards to exposure to mass media, three-fourth (75%) of all women had no exposure to newspaper, nearly two-fifths each had high exposure to radio (39%) and television (38%).

(Bracket 1 is about here)

**Bivariate analysis**

The utilization of health services during delivery among women aged 15-49 years who had a live birth in the five years preceding the survey for most recent live birth was assessed and bi-variate analysis was done to find the statistical significance with socio-demographic variables. The utilization of health service during delivery increased from 21% in 2006 to 40% in 2010 and 62% in 2016. Although the proportion of delivery in health facility increased among poorest over the period of 10 years, the disparity between richest and poorest still persisted from 2006 to 2016 and the association was highly significant in all the surveys. The proportion of poorest women utilizing health services during delivery increased from 8% to 39% over the period of 10 years (2006 to 2016). But there's still huge gap between rich and poor with 92% richest and 39% poorest women utilizing the services in 2016.

(Figure 1 is about here)

In regards to age, significantly, higher proportion of women aged less than 25 years utilized health service during delivery in the year 2006 (24%), 2011 (46%) and 2016 (67%). In regards to ethnicity, significantly higher proportion of Brahmin/Chhetri (p>0.001) had their recent delivery in health facility than their counterparts in all three surveys (25% in 2006, 49% in 2011 and 74% in 2016). Similarly, proportion of delivery in health facility increased with increase in education of women and the relation was statistically significant (p>0.001) in all three surveys. Health service delivery among women having secondary or above education increased from 47% in 2006 to 79% in 2016. Although decreasing, the urban rural difference in health service delivery continued from 2006 to 2016. Higher proportion of women in urban area had their most recent birth in health facility and the difference was statistically significant in all the surveys. In the similar manner, significantly higher proportion of women who were currently working had their most recent birth in health facility in all the surveys. Number of ANC visits completed was highly statistically significant with place of delivery in all three surveys. 43% of women who had four or more ANC visits had their most recent delivery in health facility in the survey of 2006, which increased to 74% in 2016. Exposure to mass media (newspaper, radio and TV) was also directly proportional to delivery in
health facility as significantly higher proportions of women who had high exposure to mass media had their delivery in health facility than those with low exposure in all three surveys.

(Table 2 is about here)

**Multivariate analysis**

The predictors of institutional delivery among women aged 15-49 years were investigated through multivariate logistic regression analysis. At first, while calculating unadjusted odds ratio, wealth status was a significant predictor of institutional delivery in which poorest were 92 percent (OR=0.075, 95% CI=0.065-0.086) times less likely to deliver their recent child in health facility than the richest.

Although attenuated, wealth status still remained significant predictor of institutional delivery after adjusting all other variables where poorest were almost 78 percent (aOR=0.218, CI=0.174-0.272) less likely to practice institutional delivery than richest. Adjusted odd's ratio was calculated for all other remaining variables. Time period was another significant predictor of institutional delivery as women in the survey of 2016 and 2011 were almost 6 and 3 times respectively more likely to deliver their child in health facility than in the year 2006. Similarly, women married at an age of 21 and above were significantly more likely to have institutional delivery than women married at an age of less than 15 years. Number of children was also significant predictor of institutional delivery in which women having two or more children were significantly less likely to deliver their child in health facility. In regards to ethnicity, women who belonged to Janajati (aOR=0.732, CI=0.641-0.837) and other castes (aOR=0.749, CI=0.636-0.881) were less likely to practice institutional delivery.

Secondary level education had significant positive impact on institutional delivery as women having secondary and above education were more likely to deliver their child in health facility than women having no education. Compared to Hindu women, Muslim women were more likely to practice institutional delivery although this was only marginally significant (aOR=1.291, CI=1.043-1.599). Likewise, women living in rural areas and currently working women were significantly less likely to deliver their most recent child in health facility. Women with moderate and high autonomy were also significantly more likely to deliver their child in health facility than women with no autonomy. Number of ANC visits was also a significant predictor of institutional delivery in which women completing four or more ANC visits (aOR=2.739, CI=2.472-3.035) were nearly three times more likely to practice institutional delivery.
than their counterparts. Similarly, exposure to mass media like newspaper and television had significant positive influence on institutional delivery.

(Table 3 is about here)

Discussion:

Only less than two-thirds (62%) women in our country delivered their recent child in health facility in 2016. The proportion of institutional delivery in our country matches with that of various African countries as shown by different studies. In studies conducted in Ethiopia\textsuperscript{13}, Kenya\textsuperscript{14}, Zambia\textsuperscript{15} and Sub-Saharan Africa\textsuperscript{16}, the proportion of institutional delivery was 60.5%, 61%, 62.2% and 57% respectively.

Our study illustrates the positive influence of education on institutional delivery. In multivariate logistic regression analysis, educated women were significantly more likely to practice institutional delivery than uneducated women. This finding is consistent with the studies conducted in Ethiopia\textsuperscript{13,17,19}, India\textsuperscript{18} and also Nepal\textsuperscript{20}. This could be because less educated mothers were less aware about the importance of safe delivery and complications of child birth. So, the impact of education on health care seeking behavior of women is evident from different studies.

Our study also showed that wealth status is significant predictor of institutional delivery both with and without controlling other variables. The result are similar with the study conducted in Bangladesh\textsuperscript{21}, Gambila\textsuperscript{22}, Southwest Ethiopia\textsuperscript{23}, and Mozambique\textsuperscript{24}. The finding is also consistent with other studies Pakistan\textsuperscript{25}, Eastern Nepal\textsuperscript{26} and other different low income countries\textsuperscript{27–30}. Despite of the Nepal's national flagship programs (Aama) since 2005 which promoting safe motherhood through initiatives such as providing free delivery care and transportation incentive schemes to women delivering in a health facility, it is discouraging that poor women are less likely to deliver their recent child in the health facilities.

Our study also highlights the importance of completing four or more ANC visits for greater utilization of institutional delivery as women completing four or more ANC visits were nearly three times more likely to deliver in health facility. This finding is in-line with the findings of studies conducted in Chitwan\textsuperscript{20} and Kavrepalanchowk\textsuperscript{31} districts of Nepal and also in Ethiopia\textsuperscript{32} and Sudan\textsuperscript{33}. Other different studies\textsuperscript{25,34,35,36} also showed that improving ANC practices can help increase institutional delivery. This can be justified by the fact that women are also counseled for institutional delivery in their ANC check-up as birth-preparedness is also a component of ANC. Similarly, women having more number of children were
also less likely to practice institutional delivery in our study which is in accordance with the findings of studies in Bangladesh\textsuperscript{37,38} and Nepal \textsuperscript{26}. Institutional delivery also significantly increased with increase in autonomy among women through our analysis which is also further supported by other studies in Ethiopia \textsuperscript{39} and also Nepal\textsuperscript{40,41}. From our findings, women living in rural area were less likely to deliver in health facilities than urban area which matches to the findings of another study in African country \textsuperscript{42}. Variations according to regions within the nation has also been demonstrated in different other studies in African nations \textsuperscript{27,43–46}.

**Conclusion:**

There has been three-fold increment in utilization of health services during delivery over the period of 10 years; from 21\% in 2006 to 62\% in 2016. But nearly two-fifths women did not deliver in health facility which is an evidence that there's still a lot of space for improvement. The discrepancy between rich and poor, educated and uneducated and those living in urban and rural area is still evident in 2016 which is also statistically significant. Apart from this, age at marriage, caste, women's autonomy and exposure to mass media were also significant predictors of practice of institutional delivery. Likewise, completion of four or more ANC visits also had significant positive impact on increasing institutional delivery.

Overall, our study highlights the necessity of interventions to promote institutional delivery with greater focus on poor, uneducated, and women in rural area. Furthermore, attempts to encourage women to practice four or more ANC visits can be a powerful strategy to increase institutional delivery.

**Abbreviations**
Ethics approval and consent to participate

This study used secondary Data. The survey protocol was reviewed and approved by the Nepal Health Research Council (NHRC) and the ICF Institutional Review Board.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are available in the [DHS PROGRAM] repository, [https://dhsprogram.com/data/Using-DataSets-for-Analysis.cfm]

Competing interests

The authors declare that they have no competing interests.
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Not applicable.

Authors’ contributions

RA and AW analyzed, interpreted the data, and drafted the manuscript. Both authors read and approved the final version of the manuscript.

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Tables

Table 1 Background characteristics of women aged 15-49 who had a live birth in the 5 years preceding the survey
| Age group          | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|--------------------|-----------|----|-----------|----|-----------|----|-------|----|
| Less than 25 years | 1680      | 41.3 | 1662      | 40.1 | 1606      | 40.2 | 4948  | 40.5 |
| 25-34              | 1823      | 44.8 | 1980      | 47.7 | 2033      | 50.9 | 5836  | 47.8 |
| 35 or above        | 563       | 13.8 | 507       | 12.2 | 359       | 9.0  | 1428  | 11.7 |

| Age at marriage/cohabitation | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| Less than 15                 | 126       | 3.1 | 311       | 7.5 | 376       | 9.4 | 812   | 6.7 |
| 15-17                        | 457       | 11.2 | 1140      | 27.5 | 1712      | 42.9 | 3309  | 27.1 |
| 18-20                        | 333       | 8.2 | 777       | 18.7 | 1179      | 29.5 | 2290  | 18.8 |
| 21 and above                 | 3150      | 77.5 | 1920      | 46.3 | 726       | 18.2 | 5796  | 47.5 |

| Number of children born      | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| One                          | 1094      | 26.9 | 1302      | 31.4 | 1498      | 37.5 | 3894  | 31.9 |
| Two                          | 1121      | 27.6 | 1162      | 28.0 | 1207      | 30.2 | 3490  | 28.6 |
| Three                        | 665       | 16.4 | 733       | 17.7 | 626       | 15.7 | 2024  | 16.6 |
| Four                         | 448       | 11.0 | 397       | 9.6  | 315       | 7.9  | 1159  | 9.5  |
| Five or more                 | 738       | 18.2 | 555       | 13.4 | 352       | 8.8  | 1645  | 13.5 |

| Education                    | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| No education                 | 2357      | 58.0 | 1822      | 43.9 | 1257      | 31.4 | 5436  | 44.5 |
| Primary                      | 743       | 18.3 | 835       | 20.1 | 777       | 19.4 | 2354  | 19.3 |
| Secondary or above           | 966       | 23.8 | 1492      | 36.0 | 1964      | 49.1 | 4422  | 36.2 |

| Religion                     | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| Hindu                        | 3453      | 84.9 | 3444      | 83.0 | 3421      | 85.6 | 10318 | 84.5 |
| Buddhist                     | 312       | 7.7  | 360       | 8.7  | 178       | 4.4  | 849   | 7.0  |
| Muslim                       | 195       | 4.8  | 235       | 5.7  | 251       | 6.3  | 680   | 5.6  |
| Kirat/Christian              | 106       | 2.6  | 109       | 2.6  | 148       | 3.7  | 364   | 3.0  |

| Place of residence           | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| Urban                        | 536       | 13.2 | 418       | 10.1 | 2223      | 55.6 | 3177  | 26.0 |
| Rural                        | 3530      | 86.8 | 3730      | 89.9 | 1775      | 44.4 | 9035  | 74.0 |

| Currently working            | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| No                           | 1236      | 30.4 | 1820      | 43.9 | 1945      | 48.6 | 5000  | 40.9 |
| Yes                          | 2830      | 69.6 | 2329      | 56.1 | 2053      | 51.4 | 7212  | 59.1 |

| Wealth status                | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| Poorest                      | 956       | 23.5 | 979       | 23.6 | 822       | 20.5 | 2757  | 22.6 |
| Poorer                       | 859       | 21.1 | 899       | 21.7 | 839       | 21.0 | 2598  | 21.3 |
| Middle                       | 811       | 20.0 | 873       | 21.0 | 863       | 21.6 | 2547  | 20.9 |
| Richer                       | 752       | 18.5 | 748       | 18.0 | 830       | 20.8 | 2330  | 19.1 |
| Richest                      | 687       | 16.9 | 649       | 15.7 | 643       | 16.1 | 1980  | 16.2 |

| Women's autonomy in household decision | NDHS 2006 | %  | NDHS 2011 | %  | NDHS 2016 | %  | Total | %  |
|----------------------------------------|-----------|----|-----------|----|-----------|----|-------|----|
| No autonomy                             | 1699      | 41.8 | 1284      | 30.9 | 1450      | 36.3 | 4433  | 36.3 |
|                                |         |         |         |         |         |         |
|--------------------------------|---------|---------|---------|---------|---------|---------|
|                                | Moderate | High    | Exposure to newspaper | No exposure | Low exposure | High exposure |
|                                | autonomy | autonomy |                      |            |            |            |
|                                | (involved in 1-2 issues) | (involved in all 3 issues) | | | | |
|                                | 993 | 24.4 | 1292 | 31.1 | 1361 | 34.0 | 3646 | 29.9 |
|                                | 1373 | 33.8 | 1573 | 37.9 | 1187 | 29.7 | 4133 | 33.8 |
| Exposure to newspaper          |         |         |         |         |         |         |
| No exposure                    | 3051 | 75.1 | 3071 | 74.0 | 3019 | 75.5 | 9142 | 74.9 |
| Low exposure                   | 773 | 19.0 | 777 | 18.7 | 742 | 18.6 | 2293 | 18.8 |
| High exposure                  | 238 | 5.9 | 300 | 7.2 | 237 | 5.9 | 774 | 6.3 |
| Exposure to Radio              |         |         |         |         |         |         |
| No exposure                    | 439 | 10.8 | 996 | 24.0 | 1882 | 47.1 | 3317 | 27.2 |
| Low exposure                   | 1441 | 35.4 | 1617 | 39.0 | 1140 | 28.5 | 4198 | 34.4 |
| High exposure                  | 2186 | 53.8 | 1535 | 37.0 | 976 | 24.4 | 4697 | 38.5 |
| Exposure to TV                 |         |         |         |         |         |         |
| No exposure                    | 1369 | 33.7 | 1443 | 34.8 | 1423 | 35.6 | 4236 | 34.7 |
| Low exposure                   | 1410 | 34.7 | 1144 | 27.6 | 833 | 20.8 | 3387 | 27.7 |
| High exposure                  | 1286 | 31.6 | 1561 | 37.6 | 1742 | 43.6 | 4589 | 37.6 |
| Total                          | 4066 | 100.0 | 4148 | 100.0 | 3998 | 100.0 | 12212 | 100.0 |

Table 2  Percentage of women age 15-49 who had a live birth in the 5 years preceding the survey by place of delivery for the most recent live birth
|                | NDHS 2006 |          | N  | NDHS 2011 |          | N  | NDHS 2016 |          | N  |
|----------------|-----------|----------|----|-----------|----------|----|-----------|----------|----|
|                | Home      | Health   | Factories | Home      | Health   | Factories | N  | Home      | Health   | Factories |
| **Wealth status** | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| Poorest        | 92.5      | 7.5      | 956 | 84.9      | 15.1      | 979 | 60.9      | 39.1      | 822 |
| Poorer         | 89.8      | 10.2     | 859 | 72.5      | 27.5      | 899 | 49.0      | 51.0      | 839 |
| Middle         | 87.2      | 12.8     | 811 | 61.9      | 38.1      | 873 | 37.7      | 62.3      | 863 |
| Richer         | 75.3      | 24.7     | 752 | 44.7      | 55.3      | 748 | 27.8      | 72.2      | 830 |
| Richest        | 42.3      | 57.7     | 687 | 18.8      | 81.2      | 649 | 8.3       | 91.7      | 643 |
| **Age group**  | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| Less than 25 years | 76.4      | 23.6     | 1680 | 53.7      | 46.3      | 1662 | 32.6      | 67.4      | 1606 |
| 25-34          | 79.2      | 20.8     | 1823 | 60.6      | 39.4      | 1980 | 40.2      | 59.8      | 2033 |
| 35 or above    | 87.8      | 12.2     | 563 | 76.5      | 23.5      | 507 | 50.4      | 49.6      | 359 |
| **Age at marriage/cohabitation** | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| Less than 15 | 87.3      | 12.7     | 126 | 70.0      | 30.0      | 311 | 55.8      | 44.2      | 376 |
| 15-17          | 85.0      | 15.0     | 457 | 64.8      | 35.2      | 1140 | 45.0      | 55.0      | 1712 |
| 18-20          | 68.3      | 31.7     | 333 | 54.5      | 45.5      | 777 | 33.6      | 66.4      | 1179 |
| 21 and above   | 79.2      | 20.8     | 3150 | 57.2      | 42.8      | 1920 | 19.7      | 80.3      | 726 |
| **Number of children born** | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| One            | 61.8      | 38.2     | 1094 | 38.4      | 61.6      | 1302 | 19.3      | 80.7      | 1498 |
| Two            | 78.9      | 21.1     | 1121 | 58.7      | 41.3      | 1162 | 37.2      | 62.8      | 1207 |
| Three          | 87.2      | 12.8     | 665 | 71.3      | 28.7      | 733 | 54.7      | 45.3      | 626 |
| Four           | 92.2      | 7.8      | 448 | 74.7      | 25.3      | 397 | 62.6      | 37.4      | 315 |
| Five or more   | 90.4      | 9.6      | 738 | 86.2      | 13.8      | 555 | 69.4      | 30.6      | 352 |
| **Education**  | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| No education   | 89.9      | 10.1     | 2357 | 77.8      | 22.2      | 1822 | 60.0      | 40.0      | 1257 |
| Primary        | 79.6      | 20.4     | 743 | 63.7      | 36.3      | 835 | 46.3      | 53.7      | 777 |
| Secondary or above | 52.8      | 47.2     | 966 | 35.6      | 64.4      | 1492 | 20.8      | 79.2      | 1964 |
| **Religion**   | ***       | ***       |     | NS        | ***       |     | NS        | ***       |     |
| Hindu          | 79.2      | 20.8     | 3453 | 58.3      | 41.7      | 3444 | 37.8      | 62.2      | 3421 |
| Buddhist       | 71.7      | 28.3     | 312 | 69.9      | 30.1      | 360 | 38.7      | 61.3      | 178 |
| Muslim         | 87.2      | 12.8     | 195 | 62.7      | 37.3      | 235 | 45.1      | 54.9      | 251 |
| Kirat/Christian | 87.9      | 12.1     | 106 | 66.1      | 33.9      | 109 | 32.2      | 67.8      | 148 |
| **Place of residence** | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| Urban          | 47.8      | 52.2     | 536 | 24.6      | 75.4      | 418 | 27.7      | 72.3      | 2223 |
| Rural          | 84.0      | 16.0     | 3530 | 63.7      | 36.3      | 3730 | 51.0      | 49.0      | 1775 |
| **Currently working** | ***       | ***       |     | ***       | ***       |     | ***       | ***       |     |
| No             | 69.8      | 30.2     | 1236 | 49.6      | 50.4      | 1820 | 35.0      | 65.0      | 1945 |
| Yes            | 83.3      | 16.7     | 2830 | 67.7      | 32.3      | 2329 | 40.9      | 59.1      | 2053 |
| Women's autonomy in household decision | *** | *** | *** |
|---------------------------------------|-----|-----|-----|
| No autonomy                           | 82.4 | 17.6 | 1699 |
| Moderate autonomy (involved in 1-2 issues) | 71.8 | 28.2 | 993 |
| High autonomy (involved in all 3 issues) | 80.6 | 19.4 | 1373 |
| Number of ANC visits for the most recent live birth | *** | *** | *** |
| less than 4 visit                     | 88.3 | 11.7 | 2868 |
| 4 or more visits                      | 57.4 | 42.6 | 1198 |
| Exposure to newspaper                | *** | *** | *** |
| No exposure                           | 87.5 | 12.5 | 3051 |
| Low exposure                          | 60.8 | 39.2 | 773 |
| High exposure                         | 33.2 | 66.8 | 238 |
| Exposure to Radio                     | *** | *** | *** |
| No exposure                           | 89.9 | 10.1 | 439 |
| Low exposure                          | 82.8 | 17.2 | 1441 |
| High exposure                         | 74.7 | 25.3 | 2186 |
| Exposure to TV                        | *** | *** | *** |
| No exposure                           | 93.5 | 6.5 | 1369 |
| Low exposure                          | 84.5 | 15.5 | 1410 |
| High exposure                         | 58.2 | 41.8 | 1286 |
| Total                                 | 79.2 | 20.8 | 4066 |

Note: *** Significant in chi-square test at p<0.001; **=p<0.01 and *=p<0.05
Table 3: Adjusted Odd Ratio (aOR) and 95% Confidence Interval (CI) for utilizing institutional delivery services for the recent birth among women aged 15-49 who had a live birth in the 5 years preceding the survey
|                      | Unadjusted OR | 95% CI  | Adjusted OR | 95% CI  |
|----------------------|---------------|---------|-------------|---------|
|                      | lower         | Upper   | lower       | Upper   |
| **Wealth Status**    |               |         |             |         |
| Wealth status        |               |         |             |         |
| Poorest (ref.)       | .075***       | .065    | .086        | .218*** |
| Poorer               | .128***       | .112    | .146        | .285*** |
| Middle               | .191***       | .167    | .218        | .385*** |
| Richer               | .326***       | .286    | .372        | .460*** |
| Richest              | 1.00          |         | 1.00        |         |
| **Others variables** |               |         |             |         |
| Year of survey       |               |         |             |         |
| 2006 (ref.)          | 1.00          |         |             |         |
| 2011                 | 2.831***      | 2.441   | 3.282       |         |
| 2016                 | 5.605***      | 4.685   | 6.705       |         |
| Age at marriage/cohabitation | |     |             |         |
| Less than 15 (ref.)  | 1.00          |         |             |         |
| 15-17                | .937          | .772    | 1.138       |         |
| 18-20                | 1.052         | .856    | 1.293       |         |
| 21 and above         | 1.276*        | 1.044   | 1.560       |         |
| Number of children borne |     |             |             |         |
| One (ref.)           | 1.00          |         |             |         |
| Two                  | .445***       | .394    | .503        |         |
| Three                | .345***       | .297    | .402        |         |
| Four                 | .361***       | .296    | .439        |         |
| Five or more         | .341***       | .280    | .414        |         |
| Education            |               |         |             |         |
| No education (ref.)  | 1.00          |         |             |         |
| Primary              | 1.139         | .994    | 1.306       |         |
| Secondary or above   | 1.515***      | 1.310   | 1.751       |         |
| Religion             |               |         |             |         |
| Hindu (ref.)         | 1.00          |         |             |         |
| Buddhist             | .854          | .691    | 1.055       |         |
| Muslim               | 1.291*        | 1.043   | 1.599       |         |
| Kirat/Christian      | 1.077         | .806    | 1.440       |         |
| Place of residence   |               |         |             |         |
| Urban (ref.)         | 1.00          |         |             |         |
| Rural                | .564***       | .498    | .638        |         |
| Currently working    |               |         |             |         |
| No (ref.)            | 1.00          |         |             |         |
| Yes                  | .742***       | .668    | .824        |         |
| Women's autonomy in household decision | |         |             |         |
| No autonomy (ref.)   | 1.00          |         |             |         |
| Moderate autonomy    | 1.163*        | 1.030   | 1.313       |         |
| (involved in 1-2 issues) |             |         |             |         |
| High autonomy        | 1.155*        | 1.023   | 1.303       |         |
| (involved in all 3 issues) |             |         |             |         |
| Number of ANC visits |               |         |             |         |
| less than 4 visit (ref.) | 1.00       |         |             |         |
| 4 or more visits     | 2.739***      | 2.472   | 3.035       |         |
| Exposure to newspaper|               |         |             |         |
| No exposure (ref.)   | 1.00          |         |             |         |
| Low exposure         | 1.152*        | .999    | 1.328       |         |
|                      | High exposure |          |          |          |
|----------------------|---------------|----------|----------|----------|
| Exposure to Radio    | No exposure   | 1.00     |          |          |
|                      | (ref.)        |          |          |          |
| Low exposure         | .986          | .862     | 1.128    |          |
| High exposure        | .950          | .824     | 1.094    |          |
| Exposure to TV       | No exposure   | 1.00     |          |          |
|                      | (ref.)        |          |          |          |
| Low exposure         | 1.357***      | 1.189    | 1.548    |          |
| High exposure        | 1.628***      | 1.416    | 1.872    |          |
| Constant             | .244***       |          |          | .168***  |
| -2 Log likelihood    | 14652.8       |          | 10246.8  |          |
| Cox & Snell R Square | .142          |          | .351     |          |

Note * significant at p<0.05, ** P<0.01, ***P<0.001, ref= reference category

Figures

![Figure 1](image)

**Figure 1**

Institutional delivery of recent birth by wealth status