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Effective antenatal care often improves the decision-making process among childbearing females for pursuing institutional childbirth in two South Asian Low- and middle-income countries: An appraisal of the 2019 MICS dataset

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ABSTRACT

Antenatal care (ANC) is crucial for protecting the health and reducing the mortality of pregnant women and their unborn children. This study explores whether the number of ANC visits influences the place of delivery in Bangladesh and Nepal. The study analyzed the 2019 Multiple Indicator Cluster Survey datasets. The weighted sample size was 1,696 and 1,810 from Bangladesh and Nepal, respectively. The binary logistic regression model was run between the predictor and outcome variables while controlling the covariates to calculate both countries' crude and adjusted odds ratios. The Hosmer–Lemeshow goodness-of-fit test evaluated each model. This study shows that the number of ANC visits is positively associated with institutional delivery in both countries. The practice of institutional delivery is predominant in Nepal (80.77%) compared to Bangladesh (56.7%), just as the number of ≥4 ANC visits is higher in Nepal (80.9%) compared to Bangladesh (43.6%). The coverage of ≥8 ANC visits was found to be low in both Bangladesh (6.5%) and Nepal (5.1%). The study has found that the women who had completed four ANC visits had about three times higher odds of having facility delivery than those who had completed below four ANC visits. In both countries, the frequency of institutional childbirth was low.

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INTRODUCTION

Antenatal care (ANC) is of utmost importance for the safe delivery of newborns and mothers' well-being (Bee *et al.*, 2018; Mangwi Ayiasi *et al.*, 2014; Phommachanh *et al.*, 2019). ANC is defined as the care provided by skilled healthcare professionals to pregnant women and adolescent girls to ensure the best health conditions for both mother and baby during pregnancy (WHO, 2016). ANC reduces maternal and perinatal morbidity and mortality directly by detecting and treating pregnancy-related complications (Haftu *et al.*, 2018; Tafere *et al.*, 2018) and indirectly by identifying women and girls at increased risk of developing complications during labor and delivery (Konje *et al.*, 2018; Lincetto *et al.*, 2006; Tikmani *et al.*, 2019). Pregnant mothers receive counseling through the ANC regarding childbirth, safety, and complications, which help expectant mothers decide whether to utilize skilled healthcare professional assistance throughout the delivery process (Ayele *et al.*, 2019; McNellan *et al.*, 2019). Furthermore, child delivery is a crucial determinant in maternal mortality (Ahinkorah *et al.*, 2021; Cameron *et al.*, 2019; Rosário *et al.*, 2019). The place of delivery (healthcare institution or home) and the type of care a woman gets during childbirth determine pregnancy outcomes (Abebe *et al.*, 2012). A study conducted in Sub-Saharan Africa demonstrated that the overall prevalence for healthcare facility delivery was 66%. The determinants of the place of delivery were country, age, place of residence, level of education, wealth status, marital status, partner's educational level, number of ANC visits, utilization of a skilled ANC provider during delivery, distance to a health facility, listening to the radio, and watching television (Adde *et al.*, 2020).

In a study conducted in Ethiopia (Abebe *et al.*, 2012) regarding home deliveries, women who utilized home delivery services lacked knowledge about obstetrics care, delayed starting ANC follow-up, were illiterate, and stayed in rural areas. The process of labor, when conducted at home especially induced by unskilled healthcare professionals, increases the possibility of complications that include maternal morbidity and mortality, such as postpartum hemorrhage, birth trauma, infection, and fistula (Roy and Shengelia, 2016). Hence, it is of topmost priority that women have timely access to skilled care during pregnancy, during childbirth, and postpartum (Institute of Medicine, 2003; Sebghati and Chandraharan, 2017). In addition, another study (Central Statistical Agency, 2011) revealed that essential causes of delay to access healthcare facilities are transportation problems (71%), followed by lack of money (68%) and distance to a healthcare facility (66%).

In Nepal, many mothers do not have the means for adequate antenatal visits; thus, home deliveries take place despite the risks involved (Mahato *et al.*, 2017; Mahato *et al.*, 2020; Pradhan *et al.*, 2013). The most common reason (Dhakal *et al.*, 2018) for home delivery was an easy and convenient environment (66.7%), and that for institutional delivery was safety (77.8%). It was reported that Bangladeshi mothers from rural areas were 46.9% less likely to have institutional deliveries than urban dwellers (Yaya *et al.*, 2017). Also, older expectant mothers aged between 30 and 49 years had a 23.6% higher prevalence of institutional delivery service utilization than their younger counterparts (Yaya *et al.*, 2017). Those with higher educational attainment were

about twice as likely to deliver at a standard healthcare facility. In addition, wealth status was also a significant predictor of institutional delivery service use (Yaya *et al.*, 2017). Reducing maternal mortality is the ultimate goal for good ANC (Bintabara and Basinda, 2021; Kyei-Nimakoh *et al.*, 2016; McDonagh, 1996; Rwabilimbo *et al.*, 2020), even in low-income countries such as Bangladesh and Nepal (Kumar *et al.*, 2016). Berhan and Berhan (2014) studies linking the number of antenatal visits to the place of delivery were lacking. This study was conducted to determine whether the number of ANC visits influences delivery in these two countries.

MATERIALS AND METHODS

Data source and study settings

The study analyzed Bangladesh and Nepal's 2019 Multiple Indicator Cluster Survey (MICS) dataset (MICS website: https://mics.unicef.org/surveys).

Study design

The MICS 2019 survey identified rural and urban areas in each district or province as the primary sampling strata, and the sample of households was selected in two stages. Within each stratum at the first sampling stage, a specified number of census enumeration areas (EAs) were selected systematically with probability proportional to the size. After listing households within the selected EAs, many families were systematically drawn into each primary sampling unit. Then, women aged 15–49 from each family chosen were interviewed.

Sampling selection and sample size

The sample for the Bangladesh and Nepal 2019 MICS was designed to provide approximations of several indicators from the situation of children and women from the national level comprising both urban and rural areas of these countries (GovBangladesh, 2019; GovNepal, 2019). The weighted sample size was 1,696 and 1,810 from Bangladesh and Nepal, respectively (Table 1).

Outcome variable

The outcome of this study was recorded from the variable place of delivery. The variable was coded as "home" and "institution." "Home" was coded if the delivery took place in the respondent's home or any other relative's house, and "institution" was coded if the delivery took place anywhere besides home.

Predictor variables

The predictor variable (categorized into ≥4 visits and <4 visits and ≥8 visits and <8 visits) of this study was the number

Table 1. Weighted sample size obtained after filtration in each country.

Country	Year	Filtered sample size (weighted)
Bangladesh	2019	1,696
Nepal	2019	1,810
Both countries	2019	3,506

of prenatal care visits. The number of prenatal care visits was categorized into ≥4 and <4 visits, as well as ≥8 and <8 visits as per the guidance of the WHO (2016).

Covariates

Age group (15–24, 25–34, and 35–49), media exposure (yes, no), residence (urban, rural), number of living children (1 or less, 2–3, and 4 or more), wealth index (poorest, more inadequate, middle, higher, and highest), and education level (no education, primary, secondary, and higher) were the variables selected as potential confounders from previous pieces of literature (Abebe *et al.*, 2012; Adde *et al.*, 2020; Awasthi *et al.*, 2018; Belda and Gebremariam, 2016; Berhan and Berhan, 2014; Bishanga *et al.*, 2018; Gebregziabhe *et al.*, 2019; Gudu and Addo, 2017; Kebede *et al.*, 2016; Kitui *et al.*, 2013; Pandey *et al.*, 2013).

Statistical analysis

Intially, the raw datasets were filtered through the data containing missing values; no response and data comprising human errors were challenging to resolve or interpret, predict, and covariates. Prevalence of institutional delivery in both the countries and the frequency of ≥4 ANC visits and ≥8 ANC visits were calculated. Binary logistic regression was run between the predictor and outcome variables (home, institution) to calculate the crude odds ratios for both countries. Furthermore, the binary logistic regression model was once more run between the predictor and outcome variables after controlling the covariates (age, education, wealth, media exposure, etc.) to calculate the adjusted odds ratios for both countries. Then the data of both the countries were pooled, and crude and adjusted odds ratios were calculated in the same manner from the pooled data. The Hosmer–Lemeshow goodness-of-fit test was performed to evaluate each model. All the analysis was done after incorporating the survey weight as well as the complex survey design. The whole study was done using software R version 4.0.2 and Microsoft Excel.

Ethical approval

The current study used publicly available data (secondary) sources that already received ethical approvals for the primary studies in each country and thus did not require further ethical approval. The ethical consent was taken from the respective participants.

RESULTS

Prevalence of institutional delivery and ANC visits in both countries

In the pooled data, the prevalence of institutional delivery is 69.13% (Fig. 1). The occurrence of institutional delivery is more prevalent in Nepal compared to Bangladesh. Similarly, the number of ≥4 ANC visits is higher in Nepal compared to Bangladesh. The overall prevalence of ≥4 ANC visits in the two countries is 62.86% (Fig. 2). Conversely, the bulk of ≥8 ANC visits is higher in Bangladesh than in Nepal (Fig. 3). In the pooled data, the prevalence of ≥8 ANC visits is only 5.76%.

Binary logistic regression model between ANC visits and place of delivery

In both countries, the binary logistic regression model suggests that women attending ≥4 visits are more likely to have institutional delivery (COR: 5.38, 95% CI:4.47–6.48), and similar results persisted (AOR: 4.16, 95% CI: 3.42–5.06) after controlling for the confounders age group, residence, education level, number of living children, wealth index, and media exposure. Similarly, in both the individual countries—Bangladesh (AOR: 2.76, 95% CI: 2.08–3.66) and Nepal (AOR: 3.14, 95% CI: 2.33–4.24)—women visiting ≥4 times are more likely to have institutional delivery compared to women visiting <4 times (Table 2). When categorizing the number of ANC visits according to the new guidelines of the WHO, similar results were obtained in individual countries and combinedly: women
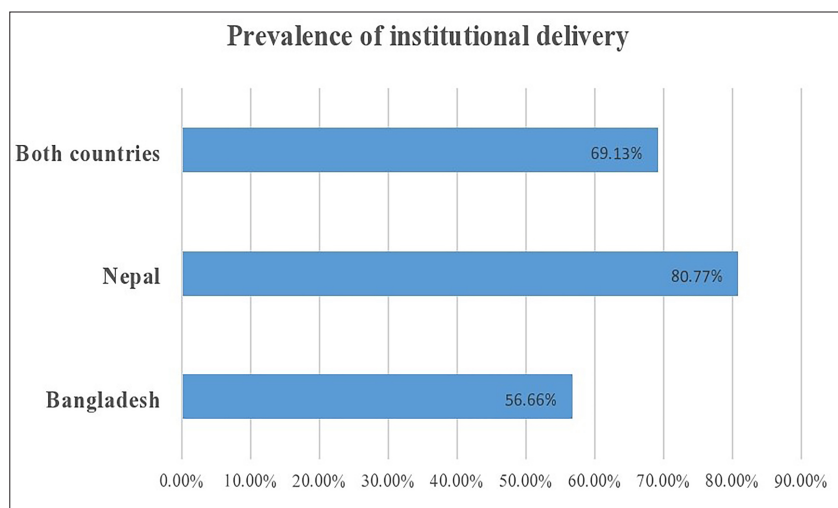

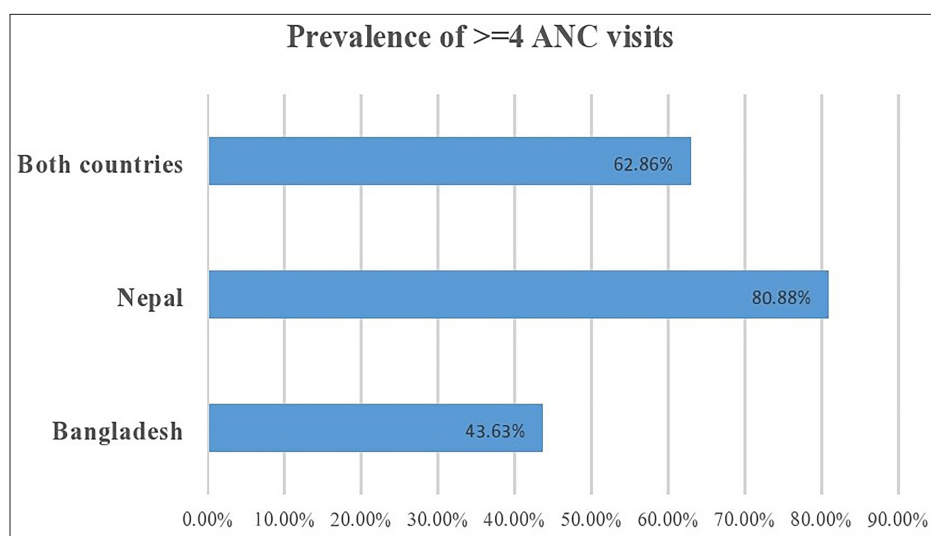Figure 1. Prevalence of institutional delivery.
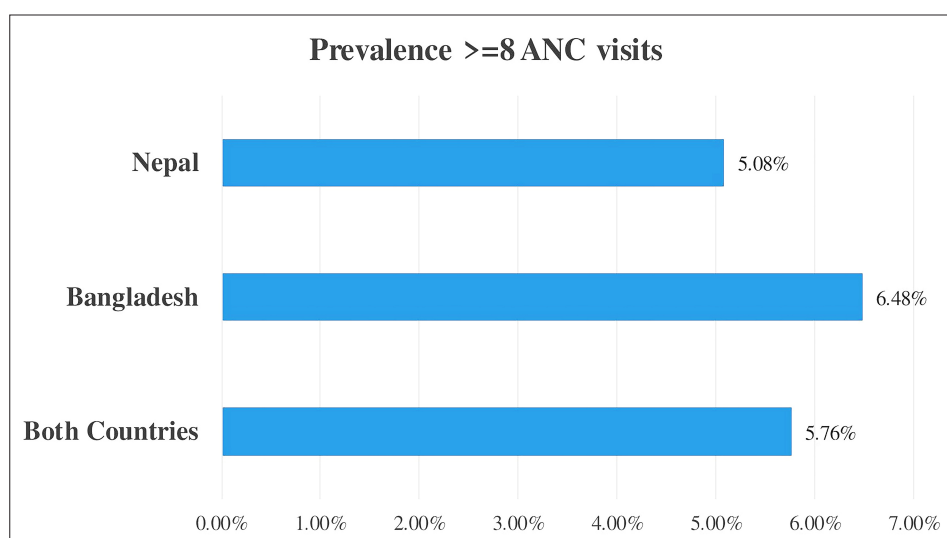
Figure 2. Prevalence of four or more ANC visits.

Figure 3. Prevalence of eight or more ANC visits.

visiting ANC ≥8 times are more likely to have institutional delivery than the women visiting <8 times (Table 3).

DISCUSSION

      This study reports the prevalence of institutional delivery and ANC visits among women of childbearing age in Nepal and Bangladesh based on the data from the MICS. The study highlighted that the quality of ANC services influences women's healthcare-seeking behavior, including delivery. Notably, the institutionalization of the eight or more ANC contact model remained low in both countries.

Prevalence of institutional delivery

      The 2011 Bangladesh Demographic and Health Survey (BDHS) data showed that less than one-third of women reported institutional delivery (Yaya *et al*., 2017). Over the past few years, the country has achieved remarkable progress in utilizing maternal healthcare services. The 2017–2018 Bangladesh DHS (BDHS 2017–2018) findings showed that about half (49.4%) of all live births in the 3 years before the survey were delivered at a health facility (NIPORT and ICF, 2020). Our study revealed a higher prevalence (56.7%) of institutional delivery based on the Bangladesh MICS 2019.

      The prevalence of institutional delivery in Nepal in this study was 80.77%. A similar prevalence rate of 83.7% was found in a cross-sectional survey among 245 mothers having children aged up to 2 years in the Kaski district of Nepal (Acharya and Pandey, 2015). The Nepal DHS in 2016 found a lower prevalence (57.5%) of institutional delivery than in our study based on the data on all live births in the country in the 5 years preceding the survey (Ministry of Health, 2017). Inconsistencies between the DHS and MICS results may have been attributed to differences in

Table 2. Crude odds ratio and adjusted odds ratio after controlling covariates between ANC visits and place of delivery.

Country	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Both countries	5.38[a] (4.47–6.48)	4.16 (3.42–5.06)
Bangladesh	4.19[a] (3.26–5.40)	2.76 (2.08–3.66)
Nepal	4.31[a] (3.25–5.72)	3.14 (2.33–4.24)

Table 3. Crude odds ratio and adjusted odds ratio after controlling for the confounders between ANC visits and place of delivery according to the new guidelines of WHO.

Country	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Both Countries	5.20[a] (3.12–8.65)	3.54 (2.0-76.05)
Bangladesh	5.73[a] (3.18–10.31)	3.63 (1.91–6.87)
Nepal	7.48[a] (2.82–19.86)	3.99 (1.46–10.85)

the reference periods used to measure coverage and the population covered (Amouzou *et al.*, 2017).

Generally, the proportion of facility delivery is positively associated with the level of education and socioeconomic status (Yaya *et al.*, 2017; Uddin *et al.*, 2019). However, socioeconomic disparities in maternity care facilities affect people differently between the countries (Do *et al.*, 2015). Based on the results of a comparative analysis of the data from surveillance sites in South Asia, it was found that the use of private sector maternity care facilities in Bangladesh was greater for better educated and wealthier women in Bangladesh. In Nepal, on the contrary, it was more common for less educated and poorer women to deliver at private sector facilities (Das *et al.*, 2016).

Prevalence of ANC follow-ups

The proportion of women with four or more ANC visits in Bangladesh in this study (43.6%) was in line with the latest DHS in this country (47.9%) (NIPORT and ICF, 2020). Our research found a higher prevalence of women with four or more ANC visits in Nepal (80.9%) than the latest nationwide DHS (69.4%) (Acharya and Pandey, 2015). The latest WHO guidelines recommend ANC models with a minimum of eight visits (WHO, 2016). Evidence supports an association of the previously recommended four-visit focused ANC model, developed in the 1990s, with higher perinatal mortality than models that included at least eight visits (Dowswell *et al.*, 2015). The updated recommendations were also influenced by evidence indicating improved pregnancy experience and safety during pregnancy through more contact between pregnant women and healthcare practitioners (Downe *et al.*, 2016).

The new ANC model with eight or more visits has yet to be fully implemented in Bangladesh and Nepal. In our study, the coverage of eight or more ANC visits was low in Bangladesh (6.5%) and Nepal (5.1%), attributed to individual-, cultural-, and healthcare-related factors. A recent study from Nigeria reported that 17.4% of women had eight or more ANC visits based on the data from the latest national DHS (Ekholuenetale *et al.* 2020). The results of a study using the 2019 population-based data in Ghana found a much higher prevalence of eight and more ANC visits (41.9%) (Ekholuenetale *et al.*, 2021). Improved infrastructures and overcoming hurdles such as lack of knowledge, long distances to health facilities, and extended hospital waiting time would bring ANC closer to women, specifically in the rural areas. These are required to improve the institutionalization of the eight or more ANC contact models in Bangladesh and Nepal (Acharya and Pandey, 2015; Sarker *et al.*, 2020).

Factors associated with institutional delivery

This study aimed to understand better the underlying factors of institutional delivery to sustain the progress in its utilization in both countries. The factors contributing to the use of health services for delivery by women include their literacy and a higher level of education, higher socioeconomic status, working status, and urban residency (Agha and Williams; 2016; Fekadu *et al.*, 2019; Mukherjee and Roy; 2020). One of the most effective approaches to increase the use of facility delivery services is ANC. ANC visits provide an opportunity for health promotion, ensuring that women better understand home delivery risks and are better adjusted to the healthcare facility environment (Fekadu *et al.*, 2018). The frequency of ANC visits expresses the perceived need that plays a crucial role in utilizing facility delivery service (Nigusie *et al.*, 2020).

Our results show that the number of ANC visits was positively associated with the prevalence of institutional delivery in Bangladesh and Nepal. The women who had completed four ANC visits had about three times higher odds of having facility delivery than those who completed fewer than four ANC visits. Compliance with the new WHO guidelines of completing eight ANC visits resulted in even higher odds of delivering at a health facility. Therefore, establishing contact with the health services during pregnancy motivates and enables women to use them for giving birth. Several studies revealed similar positive effects of ANC on institutional delivery (Devkota *et al.*, 2020; Dixit *et al.*, 2017; Ejigu *et al.*, 2018; Fekadu *et al.*, 2018; Yaya *et al.* 2017).

Strengths and Limitations

Although many studies assessed the role of ANC in the uptake of institutional delivery services, our study addressed the issue of the association of a specific component of ANC—the number of ANC visits—and facility delivery in two South Asian countries, Bangladesh and Nepal. Previous studies in different countries mostly used the data on ANC visits and delivery from the DHS. One of the limitations of this study is cross-sectional survey data, so the reported association between the frequency of ANC visits and the prevalence of institutional delivery may change in studies accounting for the temporal relationship between the variables. Moreover, our research could have been exposed to a recall bias due to the self-reported number of ANC visits. Nevertheless, we used a nationally representative large sample from the MICS that focuses on women who had given birth in the last 2 years preceding the survey. Thus, the possibility of recall bias is minimized within this period.

CONCLUSION

In this study, we have found that the quality of ANC services influences women's healthcare-seeking behavior, including delivery. However, the institutionalization of the eight-or-more ANC contact model remained low in both countries, showing a perceived lack of need for institutional delivery among the women in both countries. The MICS data of both countries supported the association between the frequency of ANC visits and the prevalence of facility delivery services.

RECOMMENDATIONS

There is an urgent need to adopt and implement WHO's new evidence-based global recommendation on ANC visits based on the country's context and populations' needs to decrease maternal and child mortality rates. Concerted efforts from relevant stakeholders should be implemented to improve ANC compliance. The ANC visits should incorporate behavioral interventions to support women's intention to deliver at a health facility.

ARTICLE HIGHLIGHTS

ANC is an essential component of the reproductive health continuum that ensures safe delivery of babies and mothers' wellbeing, including health promotion, screening and diagnosis, and disease prevention. It reduces maternal and perinatal morbidity and mortality.

- In low-income countries such as Bangladesh and Nepal, the quality of ANC provision, in general, remains inadequate.
- According to Bangladesh and Nepal's 2019 MICS dataset, I. the occurrence of institutional delivery and ≥4 ANC visits are higher in Nepal compared to Bangladesh, II. in both countries, women attending ≥4 visits are more likely to have institutional delivery, and III. in both countries, women who had ≥4 ANC visits or ≥8 ANC visits are more likely to have institutional delivery than women who had <4 ANC visits or <8 ANC visits, respectively.
- The MICS data of both countries supported the association between the frequency of ANC visits and the prevalence of facility delivery services.

- There is an urgent need to adopt and implement WHO's new evidence-based global recommendations on ANC visits based on the context of each country and populations' needs to decrease maternal and child mortality rates.

CONFLICT OF INTERESTS

None.

AUTHORS' CONTRIBUTIONS

All authors made significant contributions to the work reported, whether it is in the conception, study design, execution, acquisition of data, analysis, and interpretation or in all these areas; they took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work, including any issues related to accuracy or integrity.

DISCLOSURE

The authors declare that they do not have any financial involvement or affiliations with any organization, association, or entity directly or indirectly with the subject matter or materials presented in this article. This includes honoraria, expert testimony, employment, ownership of stocks or options, patents or grants received or pending, or royalties.

DATA AVAILABILITY

The dataset used in this study is, without restrictions, available at https://mics.unicef.org/surveys. Nevertheless, admittance to the dataset necessitates registration and is granted only for authentic research motives.

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