


BMJ Open Factors associated with the timely initiation of antenatal care: findings from a cross-sectional study in Northern Bangladesh

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ABSTRACT

Objective This paper explored the factors that influence the timely initiation of antenatal care (ANC) in Bangladesh.

Design This was a cross-sectional survey.

Setting This study conducted in two rural subdistricts and one urban area from three Northern districts of Bangladesh from August to November 2016.

Participants Women who had a live birth in the last 1 year prior to data collection were enrolled for this study. In each study area, around 900 women were interviewed, and finally, we completed 2731 interviews.

Primary outcome measures The primary outcome was timely first ANC from a Medically Trained Provider (MTP).

Results About 43% of pregnancies were detected at their earliest time. The majority of participants (82%) received at least one ANC from an MTP. Only 11% received timely first ANC from an MTP as per the WHO FANC model. The women who detected pregnancy earlier were more likely (adj. OR 1.99, 95% CI 1.31 to 3.01) to receive the timely first ANC. The urban women were more likely (adj. OR 1.78, 95% CI 1.13 to 2.80) to receive the timely first ANC from an MTP than those of the rural women. Besides, their husbands' educational status (adj. OR 1.61, 95% CI 1.0 to 2.60) was significantly associated with the timely first ANC.

Conclusion Apart from sociodemographic factors, early pregnancy detection was strongly associated with the timely first ANC visit. Timely initiation of ANC is an opportunity to adhere to all the WHO recommended timely ANC visits for a pregnant woman. The findings suggest maternal, neonatal, and child health programmes to focus on the early detection of pregnancy to ensure universal ANC coverage and its timeliness.

INTRODUCTION

Across the globe, pregnancy and childbirth are considered important and vulnerable for women and their unborn children.¹ Approximately 830 women die from preventable causes related to pregnancy or childbirth-related complications every day. Countries with low-resource settings account for almost all of these deaths.² By 2015, globally, maternal mortality had decreased by over 40%, yet South Asian and sub-Saharan

Strengths and limitations of this study

- This is the first large-scale study of its type that reports the association between the timing of pregnancy detection and the timely initiation of ANC in both urban and rural settings in Bangladesh.
- A considerable effort was made for ensuring adequate training of data collectors by an expert team, maintained close field supervision, checked on spot interview by team supervisors, and conducted a large number of (≥30%) reinterviews to ensure the quality of data and check the validity of the data collected from the questionnaire survey.
- The data we collected for this study were robust, consistent and reliable.
- The research presented the self-reported data by the women who had a recent delivery of a live baby.
- This study was conducted in urban and rural areas of the Northern part of Bangladesh where maternal and child healthcare utilisations rates are relatively high; hence, findings may not be similar in other parts of Bangladesh where there is a low rate of maternal and child healthcare utilisation.

countries face substantial public health challenges, particularly in maternal and newborn health. The South Asia region alone accounts for approximately one-third of the global maternal and child deaths annually.^{1,3} Globally, the new target set by Sustainable Development Goals (SDG) for maternal mortality ratio (MMR) is to reduce the number to less than 70 per 100 000 live births and reduce neonatal mortality to at least as low as 12 per 1000 live births by 2030.⁴

The MMR of Bangladesh is 196 per 100 000 live births, which remained unchanged since the last decade.^{5,6} It is argued that inadequate and quality compromised antenatal care (ANC) contributes vividly to the preventable maternal deaths.¹ Late detection of pregnancy delays ANC seeking.⁷ If initiation for the first ANC is delayed, women cannot have

all the recommended ANC. A recent study conducted in Northern Bangladesh shows that despite having a high ANC coverage, initiation of timely ANC is mainly delayed. That study found that 1.2% of women could comply with all the four timely visits by the WHO FANC model.⁸

Delay in seeking ANCs may lead to different pregnancy-related complications such as the risk of postpartum haemorrhage, low birth weight, preterm birth, which can eventually cause maternal and perinatal morbidity and mortality.⁹ That is why, for the best possible pregnancy outcomes for mothers and babies, it is imperative to detect pregnancy as early as possible.¹⁰ Timely ANC is also essential to detect and take actions for intrauterine growth retardation, preterm births and other fetal abnormalities that help to ensure healthy pregnancy outcomes.¹¹ ANC from an MTP is vital to monitor pregnancy status, identify the complications associated with the pregnancy, and prevent adverse pregnancy outcomes.¹¹

Maternal, neonatal, and child health (MNCH) received particular attention in SDGs. Though Bangladesh has made impressive progress on MNCH, there are yet so many improvements to make. It is imperative to improve the uptake of the timely ANC coverage as per the WHO recommendation to achieve a milestone in MNCH.

The recent WHO's 2016 ANC model promotes a minimum of eight contacts, and the first contact starts within the first 12 weeks of gestation.¹² On the other hand, the previous WHO recommendation was for at least four timely ANC visit by 'the WHO FANC model' in which the timely ANC visits refer to the first ANC visit between 8 and 12 weeks of pregnancy.¹² Bangladesh still follow the previous WHO FANC guideline with a bit of variation that emphasises four timely ANC visits where the schedule for the first ANC visit is within 16 weeks.^{13 14} However, there is a dearth of information exploring the factors that influence the early initiation for ANC. This paper aimed to investigate the factors that influence the early initiation of ANC and if early pregnancy identification impacts the timely first ANC visit.

MATERIALS AND METHODS

Study design and settings

It was a cross-sectional study conducted in both rural and urban areas from three Northern districts of Bangladesh. Rural areas were Chirirbandar and Saidpur, two respective subdistricts from Dinajpur and Nilphamari districts, whereas the urban area was Rajshahi City Corporation. According to the Population and Housing Census (2011), the Chirirbandar subdistrict consisted of 12 unions and 142 villages.¹⁵ The Saidpur subdistrict consisted of 1 municipality, 5 unions and 39 villages.¹⁶ On the other hand, Rajshahi City Corporation consisted of 4 thanas, 30 wards.¹⁷ According to the Bangladesh District Level Socio-demographic and Health Care Utilization Indicators (2011), at least one ANC coverage in Dinajpur, Nilphamari and Rajshahi was 75%, 96% and 80%, respectively.¹⁸ According to the HRH sheet-2014, there was

medium vacancy (21% to 30%) in health personnel in Dinajpur, Nilphamari and Rajshahi districts.¹⁹ We selected our study sites that showed high ANC coverage and fewer human resource gaps.

Sampling and study participants

Two stages cluster sampling was applied to recruit the study participants. We considered catchment areas of government and non-government Community-Based Health Worker as applicable both in rural and urban sites maintaining similar population coverage considered as clusters. At first, 1 subdistrict from two rural districts each and 10 wards (lowest administrative unit of city area) from the city corporation area were chosen randomly. Then, we randomly selected 6 clusters out of 12 in Chirirbandar, 6 clusters out of 12 clusters in Saidpur and 6 clusters from 10 clusters in the Rajshahi city area. For the survey, the following equation was used to determine the required sample size. The sample size was estimated accounting for clustering effect using the following formula proposed by Hayes and Bennett²⁰:

$$n = \frac{(z_{\alpha/2} + z_{\beta})^2 [p_0(1-p_0) + p_1(1-p_1)]}{(p_0 - p_1)^2}$$

$$C = 1 + \frac{(z_{\alpha/2} + z_{\beta})^2 \left[\frac{p_0(1-p_0)}{n} + \frac{p_1(1-p_1)}{n} + k^2 (p_0^2 + p_1^2) \right]}{(p_0 - p_1)^2}$$

where

C=Number of clusters required per arm

$Z_{\alpha/2}$ =1.96

Z_{β} =0.84

P_0 =Proportion in comparison

P_1 =Proportion in intervention

n=Average number of analysable individuals in each cluster

K=Coefficient of variation of true proportion between clusters within each arm.

Considering the proportion of taking any ANC by first trimester $P_0=0.41$ and $P_1=0.57$ and $K=0.15$, we needed the highest number of 150 mothers in each cluster. Considering the proportion of taking at least one ANC from medically trained provider (MTP) $P_0=0.49$ and $P_1=0.66$ and $K=0.15$, we needed highest number of 6 cluster at least to assess the change in the indicators that was least known at baseline. Finally, to get the maximum sample size, we took six clusters from each of the three areas. Considering number of clusters, desire sample size for each cluster and 5% non-response rate we needed 900 mothers from each study site. Therefore, the total required sample size was (150×18=2700) for the highest category.

The study participants were recruited through Expanded Programme on Immunization method. At first, the starting point was selected to start data collection in the selected clusters. We consulted with the community people to determine the midpoint of each cluster. While ensuring randomisation to begin interviewing eligible participants, we used the bottle spinning method. A bottle

was spun at the midpoint of each cluster to pick a random direction to start searching study participants.^{21 22} Afterwards, every household on next door basis was visited as per bottle indicated direction and interviewers identified eligible participants for interviewing. Data collection continued until the cluster's sample size was met. If any eligible woman was absent during a household visit, data collectors tried at least two more times to interview her. We interviewed around 900 women from each study area and thus ended up completing 2731 interviews from the 3 study areas. We interviewed the woman who had a live birth outcome in the last year before the interview.

Data collection

The survey was conducted from August to November 2016. An expert research team from icddr,b (International Centre for Diarrhoeal Disease Research, Bangladesh. In recent years, we have been known simply as icddr,b) were involved in preparing the survey tool to meet the study's objectives. All the data collectors were compliant with the data collection tool after receiving training on the tool by instructors. Prior to conducting the actual survey, pretesting was done to see if the tool is fine for starting the data collection in the field. The survey was administered through face-to-face interviews with eligible women as per inclusion criteria.

Data management and quality assurance

A project research physician (PRP) and a research investigator (RI) coordinated the data collection team, and data quality was ensured by an efficient team led by experienced team leaders. The team leaders were responsible for regularly ensuring quality data and completeness of the interview during the data collection period. The team leaders were solely responsible for checking every interview on the spot after the data collection, which was supervised through day-to-day monitoring. Again, the team leaders and supervisors checked the accuracy and validity of data by reinterviewing as per the monitoring plan. Expert programmers of the Maternal and Child Health Division designed a database template for the highest quality assurance and systematic data entry. The programming team used Dot net (Version-10) software for data template design as appropriate. The data template was designed so that none of the variable could go missing while entering data. To avoid entry mistakes, skipping options were also maintained strictly and logically. An expert data management team entered all the data through an online database. The data management team simultaneously entered both precoded and post-coded data. For post coding of data, the research team was closely involved with the data management team.

Measures

The primary outcome variable for this study was the timely first ANC by an MTP. The study used an operational definition to determine the early pregnancy detection, where we considered detecting one's pregnancy

within eight gestational weeks. To satisfy our research objectives, we collected the information related to the numbers of received ANCs, timing of receiving the first ANC and the providers of ANCs. To estimate the ANC uptake, we considered women who had received at least one ANC from any provider. If any woman found to have received multiple ANCs at the same week from different providers, we took account of the highest qualified provider for that week. While ranking the providers, we followed Bangladesh Demographic and Health Survey's criteria to identify MTP; per se, we determined qualified doctor, nurse/midwife/paramedic, family welfare visitor and community skilled birth attendant as MTP.²³ For our study purpose, we considered the timely first ANC for the women who made the first ANC within the first trimester in between 8 and 12 weeks of pregnancy as per the WHO FANC model.¹²

Considering several covariates from several relevant articles, including the Anderson and Newman framework, we adopted covariates such as age, completed years of schooling, residence, occupation and economic status to determine the factors associated with the primary outcomes of this study.^{1 24-26} We considered completed years while calculating the age and education of the respondents. The age into 3 groups such as ≤ 19 ; 20-29; and ≥ 30 years were categorised. Similarly, completed years of schooling was categorised into 4 groups as 0-4; 5-7; 8-9; and ≥ 10 years. We also collected information on women's and their partners' current occupation. If respondents and their partners found to be engaged with multiple occupations, we considered their primary occupation. The woman's age, completed years of schooling and occupation were transformed into categorical variables. We used the word parity for the number of deliveries that our participants experienced in their lifetime.

The standard steps of principal component analysis for measuring the socioeconomic status of the households was followed.^{27 28} Women were asked about their household assets, including sources of drinking water, cooking and handwashing; toilet facilities; ownership of TV, refrigerator, radio, mobile phone, table chair, and so on, floor construction materials, wall and roof; cooking fuel; the number of the living room; domestic animals and ownership of land. If they owned any of these assets, the positive responses were summed to derive the assets variable categorised from 1 to 5 quintiles such as lowest, second, middle, fourth and highest.

Statistical analysis

The statistical analysis using STATA software (V.13.1) was performed. We performed the χ^2 test for categorical data and independent sample t-test for continuous data to identify differences between the groups. The linearity assumption between the predictor and the outcome variable was also checked. We found there was a non-linear relationship between the predictors and the outcome variable. Then, we transformed the covariate (age and education) into categories. We also checked the covariates for

multicollinearity by variance inflation factor (VIF) where all the covariate showed VIF <10. Bivariate logistic regression was done to examine the association between the covariate (age, completed years of schooling, place of residence, occupation and wealth quintile, etc.) and the outcome variable (timely first ANC by skilled provider) using the crude OR at a 95% CI. CI and p value were adjusted based on cluster effect. We estimated both unadjusted and adjusted OR using simple and mixed effect logistic regression models considering different covariates to see the effect of covariates on the timely first ANC visits by MTPs. Factors that were significant with a p value of less than 0.05 were considered to further run the multiple logistic regression model. We used the principal component analysis method for wealth quintile analysis.

RESULTS

Sociodemographic characteristics of the women

Table 1 shows the sociodemographic characteristics of the study participants. Among the survey participants, almost two-thirds of the women (62%) belonged to 20–29 years. About half of the women (51%) had passed the junior secondary level (class 8 and above). Most of the participants (95%) were homemakers. The median number of deliveries that the women had experienced (parity) was 2. Nearly one-fourth of the women's husbands were service holder (22%). Almost 77% of women reported that they watch television.

Early pregnancy detection and ANC coverage

Table 2 shows that 43% of women reported that their pregnancy was detected early within 8 weeks of gestation. Almost all women (98%) had received at least one ANC in their last pregnancy by any provider, and 82% had received at least one ANC from an MTP. The majority of the women (78%) had four or more ANCs. Only 11% of the women received their first ANC from an MTP timely as per the WHO FANC model.

Association between the timely first antenatal contact and sociodemographic characteristics

Table 3 presents that, the women who took the timely first ANC by MTPs, around half of the women (49%) and their partners (51%) had completed class 10 and above. A more significant proportion of urban women (58%) reported they had received the timely first ANC by MTPs. A significantly higher percentage of women (69%) who had received their first ANC timely had detected their pregnancy earlier.

The timely first antenatal contact by an MTP and its covariates

Table 4 presents that almost all the indicators were crudely associated with the higher prevalence of receiving the timely first ANC from an MTP. After adjusting the covariates, the model suggests that the women who detected pregnancy earlier (adj. OR 1.99, 95% CI 1.31 to 3.01) were

Table 1 Background characteristics

Traits	Total n=2731 (%)
Age	
≤19 years	609 (22.3)
20–29 years	1693 (62.0)
≥30 years	429 (15.7)
Completed years of schooling	
0–4 years	541 (19.8)
5–7 years	796 (29.2)
8–9 years	606 (22.2)
≥10 years	788 (28.9)
Husband's completed years of schooling	
0–4 years	843 (30.9)
5–7 years	590 (21.6)
8–9 years	517 (18.9)
≥10 years	781 (28.6)
Place of residence	
Urban	915 (33.5)
Rural	1816 (66.5)
Primary occupation of the women	
Homemaker	2583 (94.6)
Employed*	148 (5.4)
Husband's primary occupation	
Service	607 (22.2)
Business	657 (24.1)
Agriculture	368 (13.5)
Skilled labour†	1055 (38.6)
Unemployed	44 (1.6)
Parity	
1	1164 (42.6)
≥2	1567 (57.4)
Median	2
Living children	
1	1252 (45.8)
2	972 (35.6)
3+	507 (18.6)
Wealth quintile	
Lowest	547 (20.0)
Second	546 (20.0)
Middle	546 (20.0)
Fourth	546 (20.0)
Highest	546 (20.0)
Mass media exposure (reading newspaper or magazine)	
Yes	312 (11.4)
No	2419 (88.6)
Mass media exposure (watching TV)	
Yes	2101 (76.9)
No	630 (23.1)

*Refers to service, business, handicraft, agriculture, farm, fishing and day labour, and so on.

†Refers handicraft, rickshaw or van driver, transport worker and day labour, and so on.

Table 2 Information related to pregnancy detection and antenatal care coverage

Indicators	Total n=2731(%)
Pregnancy detection by gestational age	
Within 8 weeks	1184 (43.4)
9–12 weeks	530 (19.4)
≥13 weeks	1008 (36.9)
Don't know	9 (0.3)
Women received at least one ANC by any provider	
Received	2676 (98.0)
Didn't receive	55 (2.0)
Number of ANC check-ups received in last pregnancy	
One time	14 (0.5)
Two times	217 (7.9)
Three times	303 (11.1)
Four or more times	2142 (78.4)
Didn't receive any ANC	55 (2.0)
At least one ANC by an MTP	
2232 (81.7)	
Women timely received their first ANC by MTPs as per the WHO FANC model	
Yes	299 (11.2)
No	2377 (88.8)

ANC, antenatal care; MTP, medically trained provider.

more likely to receive the timely first ANC than those who were detected later. The urban women (adj. OR 1.78, 95% CI 1.13 to 2.80) were more likely to receive the timely first ANC from an MTP than the rural women. The educational status of the husbands (adj. OR 1.61, 95% CI 1.0 to 2.60) was also associated with the early initiation of ANC by an MTP.

DISCUSSION

Despite a better ANC coverage, a few more than half of the women detected their pregnancies within the first trimester. This study indicated that a few factors were significantly associated with the timely first ANC visit. The significantly associated factors with the timely first ANC visit include early pregnancy detection, place of residence and husband's educational status.

The utilisation of ANC, according to WHO recommendation, is not commonly practised. Multiple studies found that education is one of the most critical social determinants of health and healthcare.^{29–32} Women with no or less academic exposure have less knowledge about pregnancy, more specifically about ANC, thus restricting their access to the health service.^{29–32} Studies done in the slum area of Bangladesh (Dhaka) and India (Mumbai) discerned mother's educational level is the primary factor influencing ANC utilisation.^{33 34} Different studies conducted in Bangladesh, India, Indonesia, Vietnam, Jordan, Uganda

and other developing countries conveyed that women's education consistently showed a positive association with the uptake of ANC.^{35–48} A study conducted in Bangladesh suggested that when women passed secondary education are 4.5 times more likely to receive ANC than women with no education.⁴⁰ This finding is also similar to two other studies conducted in Bangladesh, suggesting that, mother's education level positively influences ANC uptake.^{49 50} On the contrary, this study found significant association with the husband's education in the adjusted analysis. Studies conducted in Bangladesh, India, Philippines and sub-Saharan African countries found that attainment of higher education of partners influenced early timely ANC uptake.^{1 48 49 51} Similarly, another study argued that better-educated husbands readily understand the necessity of ANC and support their wives to initiate ANC utilisation.³⁷ This study found a significant association between husband's education and early initiation of ANC.

As discussed in this study, rural residence negatively impacted ANC initiation timing. Studies conducted in Bangladesh, India, Nepal, Afghanistan, Pakistan and Ethiopia shared similar findings.^{24 52–60} While exploring further, many studies conducted in different settings claimed the interplay between few rural geo-social characteristics such as infrequent service or distance of health facilities, poor education and employment status and access to mass media factors.^{1 37 38 61} A study conducted in Africa concluded their findings while suggesting long distance is associated with lower odds of ANC utilisation.¹ Another study also documented the negative effect of long-distance on the utilisation of ANC.⁶²

The studies conducted in Bangladesh, Cambodia, Uganda and sub-Saharan Africa show that women with higher parity pay less attention to the ANC.^{1 42 45 63} Studies have argued that one of the possible reasons for that is women may consider themselves 'experienced' and thus overlooked the recommendations of the timely ANC utilisation.^{1 64}

This study did not find significant association between the higher parity and timely ANC uptake in the adjusted analysis. One possible explanation is that early detection, probably associated with these social determinants and situated at a proximal level in relation to the outcome.

The early initiation of ANC promotes health and provides a critical opportunity to have curative care for both mother and children to prevent ill occurrence.⁶⁵ However, one study brought attention that the previous negative experience of ANC may negatively influence women on availing ANC services.³⁷ The same study also referred to the low-income family resource as one of the obstacles.³⁷ Several studies conducted in developing countries and other African countries concluded that poverty is a deterrent to ANC utilisation.^{1 37 39 49 50 63}

The uptake of ANC is increasing in Bangladesh, but there is a visible gap in the utilisation of ANC between urban and rural community, similarly among different socioeconomic classes; per se most affluent and poor

Table 3 Associated covariates with the timely first ANC by MTPs

Traits	Timely first ANC by MTPs			P value
	Yes (299)	No (2377)	Total (2676)	
Age				
≤19 years	58 (19.4)	543 (22.8)	601 (22.5)	0.376
20–29 years	196 (65.6)	1473(62)	1669 (62.4)	
30+ years	45 (15.1)	361 (15.2)	406 (15.2)	
Women's years in schooling				
0–4 years	30 (10.0)	489 (20.6)	519 (19.4)	<0.001
5–7 years	62 (20.7)	714 (30.0)	776 (29.0)	
8–9 years	60 (20.1)	539 (22.7)	599 (22.4)	
≥10 years	147 (49.2)	635 (26.7)	782 (29.2)	
Husband's years of schooling				
0–4 years	48 (16.1)	763 (32.1)	811 (30.3)	<0.001
5–7 years	41 (13.7)	539 (22.7)	580 (21.7)	
8–9 years	57 (19.1)	456 (19.2)	513 (19.2)	
≥10 years	153 (51.2)	619 (26.0)	772 (28.9)	
Place of residence				
Rural	125 (41.8)	1645 (69.2)	1770 (66.1)	<0.001
Urban	174 (58.2)	732 (30.8)	906 (33.9)	
Primary occupation of the women				
Homemaker	268 (89.6)	2263 (95.2)	2531 (94.6)	<0.001
Employed*	31 (10.4)	114 (4.8)	145 (5.4)	
Husband's primary occupation				
Service	104 (34.8)	498 (21.0)	602 (22.5)	<0.001
Business	87 (29.1)	557 (23.4)	644 (24.1)	
Agriculture	28 (9.4)	329 (13.8)	357 (13.3)	
Skilled labour†	71 (23.7)	959 (40.3)	1030 (38.5)	
Unemployed	9 (3.0)	34 (1.4)	43 (1.6)	
Parity				
1	159 (53.2)	993 (41.8)	1152 (43.0)	<0.001
≥2	140 (46.8)	1384 (58.2)	1524 (57.0)	
Living children				
1	168 (56.2)	1071 (45.1)	1239 (46.3)	<0.001
2	103 (34.4)	857 (36.1)	960 (35.9)	
3+	28 (9.4)	449 (18.9)	477 (17.8)	
Intention of pregnancy				
Intended	85 (28.4)	920 (38.7)	1005 (37.6)	0.001
Unintended	214 (71.6)	1457 (61.3)	1671 (62.4)	
Previous perinatal outcomes				
Live birth	296 (99.0)	2332 (98.4)	2628 (98.4)	0.401
Stillbirth/MR/abortion	3 (1.0)	39 (1.6)	42 (1.6)	
Wealth quintile				
Lowest	30 (10.0)	506 (21.3)	536 (20.0)	<0.001
Second	26 (8.7)	509 (21.4)	535 (20.0)	
Middle	43 (14.4)	492 (20.7)	535 (20.0)	
Fourth	74 (24.7)	461 (19.4)	535 (20.0)	
Highest	126 (42.1)	409 (17.2)	535 (20.0)	

Continued

Table 3 Continued

Traits	Timely first ANC by MTPs			P value
	Yes (299)	No (2377)	Total (2676)	
Mass media exposure (reading newspaper or magazine)				
Yes	69 (23.1)	242 (10.2)	311 (11.6)	<0.001
No	230 (76.9)	2135 (89.8)	2365 (88.4)	
Mass media exposure (watching TV)				
Yes	261 (87.3)	1811 (76.2)	2072 (77.4)	<0.001
No	38 (12.7)	566 (23.8)	604 (22.6)	
Pregnancy detection by gestational age				
Early detection (within 8 weeks)	205 (68.6)	966 (40.6)	1171 (43.8)	<0.001
Late detection	94 (31.4)	1411 (59.4)	1505 (56.2)	

*Refers service, business, handicraft, agriculture, farm, fishing, and day labour, and so on.

†Refers to handicraft, rickshaw or van driver, transport worker and day labour, and so on.

ANC, antenatal care; MTP, medically trained provider.

community and women and their partner with at least secondary education. According to the recent national survey, urban women are more likely to receive ANC from an MTP than rural women (90% vs 79%).⁶⁶ Another study conducted in a rural area of Bangladesh also found only one-fourth of women receive the first ANC in time. The uptake rate is only 10% for the women from hard-to-reach areas who receive ANC at least three times from an MTP during their pregnancy.⁶⁷ The national survey shows that 64% of women from the lowest wealth quintile receive at least one ANC from a trained provider, whereas it is 97% for the highest quintile. It also shows, almost 96% of women with secondary education receive at least one ANC from an MTP where the rate of ANC uptake is 60% for the women with no education.⁶⁶ On the contrary, this study did not find significant association between the wealth index and timely initiation of ANC in the adjusted analysis.

Though the coverage of ANC increased at a high rate in Bangladesh for the last decade, a recent study finding from Northern Bangladesh shows a very few women received their ANCs timely as per WHO recommendations. Findings also show that in terms of timely ANC contacts by the recent 2016 WHO ANC model rate is very poor; no woman could follow all the eight timely contacts.⁸ Another study found a significant relationship between LMP recall and early detection of pregnancy. The study also suggested introducing a simple tool to help women recall LPM accurately in resource-poor settings where ultrasound facility is limited. This simple tool can expedite the early detection of pregnancy, which can eventually ensure timely ANC coverage.⁶⁸ In addition to introducing a simple tool for recalling the LMP, other strategies such as on-site testing can facilitate the pregnancy detection that may allow immediate ANC consultation.

A study from Nigeria revealed the positive impact of watching television on pregnancy care. The same study

also suggested that frequent exposure to the radio may enable women to get better exposure to healthcare information and thus encourage them to avail appropriate ANC services.⁶⁹ However, this study did not find any significant association between the exposure to mass media and timely first ANC uptake in the adjusted analysis.

The study showed a significant association between early initiation of ANC and early detection of pregnancy. A similar study conducted in developed country like the USA and the analysis sample was representative of resident women of childbearing age in 29 US states who had live births within 2–6 months before they were interviewed.⁷⁰ The study found that the most of the women had identified their pregnancy by 12 weeks, and almost 80% of them initiated ANC within first trimester. The study pointed out that the early pregnancy identification was associated with significantly increased odds of initiating ANC early. The study recommended that the promotion of early pregnancy recognition could be a means of improving birth outcomes.

Another study conducted in Brazil evaluated the access to and utilisation of prenatal services in the Unified Health System in the city of Rio de Janeiro in 2007–2008.⁷¹ The study performed a descriptive analysis of the reasons mentioned by women for the late start of prenatal care and hierarchical logistic regression for the identification of the factors associated with prenatal care. The absence of a diagnosis of pregnancy and poor access to services were the reasons most often cited for the late start of prenatal care. However, women who had a higher level of education, were primiparous and lived with a partner were found to have earlier access to ANC.

We did the analysis of the self-reported data because we did not have a surveillance system, so, there had been a chance of over-reporting or under reporting. Since our study was conducted in the Northern part of Bangladesh, where ANC coverage is higher, the literacy rate is moderate, and human resource gaps are low; hence, the

Table 4 Unadjusted and adjusted OR for the timely first ANC contact by MTP according to WHO FANC model

Covariates	Timely first ANC by MTPs	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Women's completed years of schooling		
0–4 years	1	1
5–7 years	1.42 (0.88 to 2.28)	1.03 (0.62 to 1.73)
8–9 years	1.81 (1.18 to 2.80)**	0.96 (0.58 to 1.58)
≥10 years	3.77 (2.40 to 5.92)***	1.18 (0.59 to 2.33)
Husband's completed years of schooling		
0–4 years	1	1
5–7 years	1.21 (0.84 to 1.73)	1.08 (0.77 to 1.51)
8–9 years	1.99 (1.31 to 3.02)**	1.19 (0.73 to 1.93)
≥10 years	3.93 (2.68 to 5.75)***	1.61 (1 to 2.6)*
Place of residence		
Rural	1	1
Urban	3.13 (2.04 to 4.79)***	1.78 (1.13 to 2.8)**
Primary occupation of the women		
Homemaker	1	1
Employed†	2.30 (1.48 to 3.57)***	1.34 (0.86 to 2.1)
Husband's primary occupation		
Service	0.79 (0.47 to 1.34)	0.81 (0.47 to 1.41)
Business	0.59 (0.31 to 1.11)	0.83 (0.48 to 1.46)
Agriculture	0.32 (0.15 to 0.67)**	0.95 (0.39 to 2.31)
Skilled labour‡	0.28 (0.16 to 0.50)***	0.61 (0.3 to 1.25)
Unemployed	1	1
Parity		
1	1.58 (1.25 to 2.01)***	1.14 (0.58 to 2.23)
≥2	1	1
Living children		
1	1	1
2	0.77 (0.59 to 1.00)*	0.94 (0.48 to 1.86)
3+	0.40 (0.26 to 0.61)***	0.79 (0.43 to 1.43)
Intention of pregnancy		
Intended	1.59 (1.23 to 2.06)**	1.15 (0.84 to 1.58)
Unintended	1	1
Wealth quintile		
Lowest	1	1
Second	0.91 (0.54 to 1.53)	0.73 (0.43 to 1.24)
Middle	1.42 (0.87 to 2.34)	0.89 (0.5 to 1.58)
Fourth	2.76 (1.55 to 4.92)***	1.14 (0.57 to 2.3)
Highest	5.25 (2.97 to 9.28)***	1.33 (0.66 to 2.69)
Mass media exposure (reading newspaper or magazine)		
Yes	2.65 (1.77 to 3.97)***	1.23 (0.81 to 1.87)
No	1	1
Mass media exposure (watching TV)		
Yes	2.15 (1.49 to 3.08)***	1.14 (0.68 to 1.92)
No	1	1
Pregnancy detection by gestational age		

Continued

Table 4 Continued

Covariates	Timely first ANC by MTPs	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Early detection (within 8 weeks)	3.19 (2.20 to 4.61)***	1.99 (1.31 to 3.01)***
Late detection	1	1

Significant level: 0 '****' 0.01 '***' 0.05 '**'.

Model adjusted for all indicators as well as completed years of schooling, occupation, place of residence, husband's years of schooling, husband's occupation, parity, living children, intention of pregnancy, wealth quintile, mass media exposure (reading newspaper, watch TV regularly) and pregnancy detection.

*Refers service, business, handicraft, agriculture, farm, fishing and day labour and so on.

†Refers to handicraft, rickshaw or van driver, transport worker and day labour, and so on.

ANC, antenatal care; MTP, medically trained provider.

findings are subject to compare contextually and may not be alike in other parts of Bangladesh. Another limitation of our study was that we only considered the women with live birth in last 1 year might have excluded some women who could be the potential participants in the study. In addition, other relevant variables associated with early initiation of ANC such as chronic conditions, lack of awareness about the importance of gestational age, and irregular menstrual cycle and social support that could have been included in the analysis.

CONCLUSION AND RECOMMENDATION

The factors that affect ANC utilisation include poor economic condition, less or no exposure to formal education of the women and their partners, rural residence and late detection of pregnancy. After adjusting all the covariates, early pregnancy detection was strongly associated with the early initiation of ANC while urban residential status and the husband's educational status were also statistically significant. Findings suggest the need for early pregnancy detection to expedite early initiation of ANC care in addition to the sociodemographic factors. Therefore, multistakeholder intersectoral collaboration with existing MNCH programmes is needed to promote early pregnancy detection and ANC initiation to ensure universal ANC coverage. The timely first ANC would allow women to attain the opportunity to have all the recommended ANC visits to ensure a healthy pregnancy outcome. Further, there is an acceptable scope to use these findings in similar contexts such as sociodemography, economy and healthcare infrastructure to conduct a nationwide study on similar issues for better planning and interventions.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval We acquired IRB approval from icddr,b before we start collecting data. The name of the IRB is Ethical Review Committee (ERC). The Federal Wide Assurance (FWA) number of ERC is FWA-00001468. The protocol ID number of the IRB is PR-16040. During the data collection period, we received written informed consent from all the participants after ensuring that none was exposed to minimal risk while participating in this study. Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available upon reasonable request. Unpublished data are available in accordance with icddr,b's data sharing policy. Requests should be addressed to Ms. Armana Ahmed, Head, Research Administration, icddr,b; aahmed@icddr.org. More information can be found here-<https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.icddr.org%2Fdmdocuments%2Ficddr%2520Data%2520Access%2520Policy.pdf&data=02%7C01%7CAnne.lattera%40care.org%7C73604d2a11bc4750c21608d75e12da16%7Ce83233b748134ff5893ff60f400bfcba%7C0%7C1%7C637081307376649360&sdata=fLeMI0sL2d%2FnkdoDyKAoa9kmPxhn3hnJutjwEkOscI4%3D&reserved=0>.

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