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Relationship between Antenatal Care and Pregnancy Outcome among Participants of a Rural Upazilla Health Complex in Bangladesh

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Abstract

Background: Antenatal care (ANC) is crucial for monitoring pregnancy and improving maternal and neonatal health outcomes. This study aimed to examine the relationship between ANC and pregnancy outcomes among participants at rural upazilla health complex, like Sariakandi Upazilla of Bangladesh. ***Methods:*** This retrospective study was conducted at the Upazilla Health Complex in Saniakandi, Bangladesh included 45 pregnant women selected through simple random sampling. Data were collected from medical records and structured interviews to gather information on demographics, obstetric history, clinical history, and specifics of ANC. Maternal outcomes of interest included preeclampsia and postpartum hemorrhage, while neonatal outcomes included gestational age at birth, birth weight, Apgar scores, and NICU admissions. Data were analyzed using SPSS version 26, and Pearson correlation coefficients were calculated to explore the relationship between the number of antenatal visits and pregnancy outcomes. ***Results:*** Most participants were aged 21-30 (55.6%) with secondary education (80.0%) and were predominantly housewives (97.8%). Preeclampsia was diagnosed in 6.7% of participants, and postpartum hemorrhage occurred in 2.2%. All cases of preeclampsia and postpartum hemorrhage occurred in women with fewer than 4 antenatal visits, indicating a strong negative correlation (Pearson correlation coefficient of 0.82). Neonatal outcomes showed that 2.2% of newborns were preterm, and 17.8% had low birth weight. Higher frequency of ANC visits correlated positively with better Apgar scores at 1 minute (Pearson correlation coefficient of 0.71) and 5 minutes (Pearson correlation coefficient of 0.61). ***Conclusion:*** The study highlights the critical role of frequent and timely ANC in improving maternal and neonatal outcomes. Enhanced ANC accessibility and early initiation are essential for reducing the risks of adverse outcomes, particularly in resource-limited settings.

Keywords: Antenatal Care, Pregnancy Outcomes, Preeclampsia, Postpartum Hemorrhage, Neonatal Health, Apgar Score.

INTRODUCTION

Every day, approximately 830 women around the world die from avoidable pregnancy and childbirth-related causes; 99% of these deaths occur in developing countries [1]. It has been established that this high rate of maternal deaths in developing countries is linked to inadequate and poor-quality maternal health care [2,3]. Antenatal care (ANC) plays a critical role in the adoption of evidence-based treatments that are essential for the health of women and their babies [4]. ANC is a preventive obstetric health program designed to optimize outcomes for both mother and fetus through consistent pregnancy monitoring [5]. ANC is essential for both maternal and infant health. Three main reasons underscore its importance: promotion of health during pregnancy through counseling and educational activities; screening, identification, and referral of women with risk factors; and health monitoring throughout pregnancy [6]. Furthermore, ANC promotes positive pregnancy outcomes by reducing the risk of low birth weight and preterm newborns, and by improving maternal health through lowering the likelihood of anemia, pregnancy-induced hypertension, and premature labor. ANC also encourages the utilization of skilled birth attendants during delivery and the postpartum period. ANC visits serve as an excellent opportunity to educate women on the warning signs and symptoms of pregnancy,

childbirth, and the postpartum period [7]. However, in the absence of antenatal care and support, pregnancy can lead to high blood pressure, gestational diabetes, iron deficiency anemia, severe nausea and vomiting, and complications such as abortion, preterm birth, and low birth weight [8]. Any pregnancy outcome that is not a typical live birth falls under the category of adverse pregnancy outcomes, which includes low birth weight, stillbirth, and preterm birth. These adverse outcomes are major contributors to long-term physical and psychological issues, as well as neonatal morbidity and mortality, posing serious public health challenges in both developed and developing countries [9,10]. The World Health Organisation (WHO) recommends that pregnant women undergo at least four antenatal care visits under normal conditions. However, in low-income nations, pervasive gender imbalances restrict women's access to and utilization of antenatal care (ANC) [11,12]. Despite a reduction in the maternal mortality ratio (MMR) from 322 deaths per 100,000 live births in 1998–2001 to 194 deaths per 100,000 live births in 2007–2010, only one-third (31%) of pregnant women received at least four ANC services from professionals or non-professional health care providers [13]. Additionally, over one-third (36%) of pregnant women still do not receive any professional ANC services. In Bangladesh, only four out of ten deliveries (42%) are attended by experts [14]. Thus, the ultimate goal of ANC is to ensure the health of both women and babies at the end of pregnancy [4]. Numerous studies have evaluated the impact of ANC on reducing maternal and newborn mortality as well as the adoption of safe delivery practices [3]. These studies have shown that ANC visits are associated with skilled delivery care [15]. This impact is reflected in the perinatal mortality rates of both developed and developing countries [16]. One study even discovered a proportionate correlation between the frequency of ANC visits and adverse pregnancy outcomes [17]. Overall, the identification and treatment of serious obstetric complications, which often arise during and after delivery, may not be significantly improved until antenatal care becomes a common practice in health institutions.

METHODS

This retrospective study was conducted at the Upazilla Health Complex in Saniakandi, Bangladesh, aimed at examining the relationship between antenatal care and pregnancy outcomes. A total of 45 pregnant women were included in the study, selected through a simple random sampling method. Data were collected by reviewing medical records and conducting structured interviews to gather comprehensive information on demographic details, obstetric history, clinical history, and specifics of antenatal care. Maternal outcomes of interest were preeclampsia and postpartum hemorrhage, while neonatal outcomes included gestational age at birth (preterm or term), birth weight (low or normal), Apgar scores at 1 and 5 minutes, and NICU admissions. Data were analyzed using SPSS version 26, and Pearson correlation coefficients were calculated to explore the relationship between the number of antenatal visits and pregnancy outcomes, revealing significant correlations that emphasize the critical role of adequate antenatal care in improving maternal and neonatal health outcomes.

RESULTS

The study population's basic characteristics were categorized by age, education, occupation, obstetric history, and clinical history. Most participants were aged 21-30 (55.6%), followed by ≤20 (37.8%), and 31-40 (6.7%). Secondary education was predominant (80.0%), with primary (15.6%) and higher education (4.4%) less common. Nearly all participants were housewives (97.8%), with only one labor worker (2.2%). In terms of obstetric history, 42.2% were primigravida and 57.8% were multigravida. Parity distribution showed 17.8% nulliparous, 75.6% with 1-2 children, and 6.7% with 3-4 children. Comorbidities included hypertension (11.1%). The gestational age at the first visit was nearly evenly split between 1-12 weeks (51.1%) and 13-26 weeks (48.9%). Antenatal visits varied: <4 visits (51.1%), 4-6 visits (37.8%), 7-9 visits (8.9%), and ≥10 visits (2.2%).

Table 1: Distribution of Study Population Based on Basic Characteristics (n=45)

Basic Characteristics	Number	Percentage
Age		
≤20	17	37.8%
21-30	25	55.6%
31-40	3	6.7%
Education		
Primary Education	7	15.6%
Secondary Education	36	80.0%
Higher Education	2	4.4%
Occupation		
Housewife	44	97.8
Labor Worker	1	2.2%
Gravida		
Primigravida	19	42.2%

Multigravida	26	57.8%
Parity		
Nulliparous	8	17.8%
1-2	34	75.6%
3-4	3	6.7%
Clinical History		
Hypertension	5	11.1%
Gestational Age at 1st Visit (1-12weeks)	23	51.1%
Gestational Age at 1st Visit (13-26weeks)	22	48.9%
Number of Antenatal Visit		
<4	23	51.1%
4-6	17	37.8%
7-9	4	8.9%
≥10	1	2.2%

Table 2 presents 3 women (6.7%) were diagnosed with preeclampsia and only 1 woman (2.2%) experienced postpartum hemorrhage. The occurrence of postpartum hemorrhage at 2.2% highlights its rarity but underscores the importance of close monitoring and management of maternal health during and after childbirth.

Table 2: Distribution of Study Population Based on Maternal Outcome (n=45)

Maternal Outcome	Number	Percentage
Preeclampsia	3	6.7%
Postpartum Hemorrhage	1	2.2%

Table 3 presents the neonatal outcomes of the study. Regarding gestational age, only 1 newborn (2.2%) was delivered preterm, while the vast majority, 44 newborns (97.8%), was born at term, indicating that most pregnancies reached full term and suggesting effective prenatal care or maternal health within the study population. In terms of birth weight, 8 newborns (17.8%) had a low birth weight (<2.5 kg), whereas 37 newborns (82.2%) had a normal birth weight (2.5-4 kg), with the majority falling within the normal range, which is generally associated with better neonatal health outcomes. Apgar scores at 1 minute showed that 4 newborns (8.9%) had a score of 6, 14 newborns (31.1%) had a score of 7, and 27 newborns (60.0%) had a score of 8, indicating that most newborns were in good health shortly after birth, with fewer immediate post-birth complications. At 5 minutes, 1 newborn (4.4%) had a score of 6, 6 newborns (13.3%) had a score of 7, 7 newborns (15.6%) had a score of 8, and 10 newborns (66.7%) had a score of 10, showing an improvement in health status as most newborns achieved the highest possible Apgar score, reflecting effective postnatal care and neonatal health stabilization.

Table 3: Distribution of Study Population Based on Neonatal Outcome (n=45)

Neonatal Outcome	Number	Percentage
Gestational age		
Preterm (<37 weeks)	1	2.2%
Term (37-40 weeks)	44	97.8%
Birthweight		
Low (<2.5kg)	8	17.8%
Normal (2.5-4kg)	37	82.2%
Apgar Score @1 minute		
6	4	8.9%
7	14	31.1%
8	27	60.0%
Apgar Score @5 minute		
6	1	4.4%
7	6	13.3%
8	7	15.6%
10	10	66.7%

Table 4 examines the relationship between the frequency of antenatal check-ups and the occurrence of maternal outcomes, specifically preeclampsia and postpartum hemorrhage, among the 45 participants. The

data show that all cases of preeclampsia (3 instances) occurred in women who had fewer than 4 antenatal visits, representing 100% of the preeclampsia cases in the study. Similarly, the only instance of postpartum hemorrhage was also in a woman with fewer than 4 antenatal visits, accounting for 100% of the postpartum hemorrhage cases. No cases of either preeclampsia or postpartum hemorrhage were reported among women who had 4-6, 7-9, or 10 or more antenatal visits. The Pearson correlation coefficient of 0.82 indicates a strong negative correlation between the number of antenatal visits and the incidence of these adverse maternal outcomes.

Table 4: Distribution of Study Population Based on Antenatal Check-Up and Pregnancy Outcome (n=45)

Ante-natal Check-up	Preeclampsia		Postpartum Hemorrhage	
	Number	Percentage	Number	Percentage
<4	3	100%	1	100%
4-6	0	0.0%	0	0.0%
7-9	0	0.0%	0	0.0%
≤10	0	0.0%	0	0.0%

Table 5 explores the relationship between the number of antenatal check-ups and various pregnancy outcomes, including preterm birth, term birth, low birth weight, normal birth weight, and NICU admissions, among the 45 participants. The data indicate that all preterm births (1 case, 100%) and NICU admissions (1 case, 100%) occurred in women who had fewer than 4 antenatal visits. Additionally, 5 newborns (62.5%) with low birth weight were from mothers with fewer than 4 visits, while no term births or normal birth weights were recorded in this group. For those with 4-6 antenatal visits, there were no preterm births or NICU admissions, but there were 10 term births (22.7%) and 3 low birth weight cases (37.5%), with 12 newborns (32.4%) having a normal birth weight. Among women with 7-9 antenatal visits, there were also no preterm births or NICU admissions, with 12 term births (27.2%) and 11 normal birth weight cases (29.7%), and no instances of low birth weight. Finally, for those with 10 or more antenatal visits, no preterm births, low birth weights, or NICU admissions were reported, with 22 term births (50.0%) and 14 normal birth weights (37.8%). The Pearson correlation coefficient of 0.60 indicates a moderate positive correlation between the number of antenatal visits and favorable pregnancy outcomes.

Table 5: Distribution of Study Population Based on Antenatal Check-Up and Pregnancy Outcome (n=45)

Maternal Outcome Ante-natal Check-up	Preterm		Term		Low Birth weight		Normal Birth weight		NICU Admission	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
<4	1	100%	0	0.0%	5	62.5%	0	0.0%	1	100%
4-6	0	0.0%	10	22.7%	3	37.5%	12	32.4%	0	0.0%
7-9	0	0.0%	12	27.2%	0	0.0%	11	29.7%	0	0.0%
≤10	0	0.0%	22	50.0%	0	0.0%	14	37.8%	0	0.0%

Pearson correlation=0.60

The tables illustrate the distribution of a study population consisting of 45 subjects based on their antenatal check-up frequency and the corresponding Apgar scores at 1-minute post-birth, categorized by maternal outcomes. Among mothers who had less than 4 antenatal visits, 3.75% of their babies had an Apgar score of 6, 4.28% had a score of 7, and 9.33% had a score of 8. The Pearson correlation coefficient of 0.71 indicates a strong positive correlation between the frequency of antenatal visits and Apgar scores at 1 minute, suggesting that more frequent antenatal check-ups tend to correlate with higher Apgar scores shortly after birth.

Table 6: Distribution of Study Population Based on Antenatal Check-Up and Apgar Score @1 minutes (n=45)

Maternal Outcome Ante-natal Check-up	Apgar Score					
	6		7		8	
	Number	Percentage	Number	Percentage	Number	Percentage
<4	3	75%	4	28.5%	9	33.3%
4-6	1	25%	7	50%	11	40.7%
7-9	0	0.0%	3	21.4%	7	25.9%
≤10	0	0.0%	0	0.0%	0	0.0%

Table 7 categorizes antenatal check-up frequencies into four groups: less than 4 visits, 4-6 visits, 7-9 visits, and 10 or more visits. Each category intersects with columns detailing specific Apgar scores: 6, 7, 8, and 10. In the category of mothers who attended less than 4 antenatal visits, 1.1% of babies had an Apgar score of 6 at 5 minutes after birth, while 4.75% received an Apgar score of 7. No instances of Apgar scores of 8 or 10 were recorded in this group. For mothers with 4-6 antenatal visits, no babies had an Apgar score of 6 or 8, while 2.25% received an Apgar score of 7. There were no cases of Apgar scores of 10 in this category. In the 7-9 antenatal visits category, there were no recorded cases of Apgar scores of 6 or 7. However, 7.25% of babies had an Apgar score of 8, and 5.5% had a score of 10. In the category with 10 or more antenatal visits, there were no recorded cases of Apgar scores of 6, 7, or 8. However, 5.5% of babies received an Apgar score of 10. Pearson correlation 0.61 it indicates a moderate positive correlation between antenatal check-up frequency and Apgar scores at 5 minutes' post-birth within the study population of 45 subjects.

Table 7: Distribution of Study Population Based on Antenatal Check-Up and Apgar Score @5minutes (n=45)

Maternal Outcome Ante-natal Check-up	Apgar Score							
	6		7		8		10	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
<4	1	100%	4	75%	0	0.0%	0	0.0%
4-6	0	0.0%	2	25%	0	0.0%	0	0.0%
7-9	0	0.0%	0	0.0%	7	25.9%	5	50%
≤10	0	0.0%	0	0.0%	0	0.0%	5	50%

DISCUSSION

The present study aimed to examine the relationship between antenatal care (ANC) and pregnancy outcomes among participants at the Upazilla Health Complex. The findings provide critical insights into how the frequency and timing of ANC visits influence maternal and neonatal health outcomes. The demographic characteristics of the study population revealed that the majority of participants were aged 21-30 (55.6%), with a significant portion (37.8%) aged ≤20. This age distribution aligns with findings from Chingle *et al.,* who observed similar demographics in a rural Nigerian hospital, suggesting a common trend of younger women being more likely to access ANC services in developing regions [18]. The predominance of secondary education (80.0%) among participants highlights the crucial role of education in healthcare utilization, as supported by Adedokun & Yaya's study, which found that higher educational levels significantly improve ANC uptake in sub-Saharan Africa [19]. Nearly all participants being housewives (97.8%) indicates socio-economic constraints, which limit women's access to and utilization of healthcare services, consistent with Tikmani *et al.,*'s observations [20]. The obstetric history of participants showed that 42.2% were primigravida and 57.8% multigravida, with parity distribution reflecting a high percentage of women having 1-2 children (75.6%). This pattern is comparable to the findings by Belay *et al.,* who noted that multigravida women are more likely to utilize ANC services due to their previous pregnancy experiences [21]. The presence of hypertension in 11.1% of the participants mirrors the clinical findings in studies by Fenta *et al.,* emphasizing the need for regular monitoring and management of hypertensive disorders during pregnancy [22]. The gestational age at the first ANC visit was nearly evenly split between 1-12 weeks (51.1%) and 13-26 weeks (48.9%), underscoring the critical period for ANC initiation. Early ANC initiation, as highlighted by Eli *et al.,* is vital for timely identification and management of potential complications [23]. The frequency of antenatal visits showed that a significant proportion (51.1%) had fewer than 4 visits, a concerning trend also observed by Rahman *et al.,* who reported similar ANC visit patterns across multiple countries [24]. Our study found a strong negative correlation between the number of antenatal visits and adverse maternal outcomes such as preeclampsia and postpartum hemorrhage. All cases of preeclampsia (6.7%) and postpartum hemorrhage (2.2%) occurred in women with fewer than 4 antenatal visits. This finding aligns with Tandu-Umba *et al.,* who demonstrated that frequent ANC visits are crucial for early detection and management of high-risk pregnancies [25]. The importance of frequent ANC visits is further supported by Tyas, Lestari, & Akbar, who found that regular ANC visits significantly reduce the risk of severe maternal complications, including preeclampsia and postpartum hemorrhage [26]. Neonatal outcomes revealed that 2.2% of newborns were delivered preterm, and 17.8% had low birth weight, while 97.8% were born at term, and 82.2% had normal birth weight. These findings are consistent with the study by Pario *et al.,* which highlighted the impact of inadequate ANC on preterm births and low birth weight [27]. The positive correlation between ANC visit frequency and neonatal outcomes is evident, as all preterm births and NICU admissions occurred in women with fewer than 4 antenatal visits. This relationship is also noted in McDiehl *et al.,*'s study, where increased ANC visit frequency was associated with reduced preterm births and better neonatal outcomes [28]. Apgar scores at 1 and 5 minutes in our study showed that higher frequency of ANC visits positively correlated with better scores. At 1 minute, 60.0% of newborns scored 8, and at 5 minutes, 66.7% scored 10. This positive correlation is supported

by Onwuhafua *et al.*, who found that more frequent ANC visits lead to significantly higher Apgar scores, indicating better immediate neonatal health [29]. Razaz *et al.*, also emphasized that higher Apgar scores are associated with lower neonatal morbidity and mortality, reinforcing the importance of frequent ANC visits [30]. In summary, this study underscores the critical role of frequent and early ANC visits in improving maternal and neonatal outcomes. Comparative analysis with studies from various regions confirms the universal importance of ANC, highlighting the need for improved accessibility and education to ensure positive pregnancy outcomes, particularly in resource-limited settings. The findings advocate for policy interventions to increase ANC coverage and promote early initiation of ANC visits to mitigate the risks of adverse maternal and neonatal outcomes.

CONCLUSION

This study underscores the critical importance of frequent and timely antenatal care (ANC) in improving maternal and neonatal outcomes. The findings reveal that inadequate ANC is strongly associated with adverse maternal outcomes, such as preeclampsia and postpartum hemorrhage, as well as negative neonatal outcomes, including preterm birth and low Apgar scores. Our results highlight the necessity for enhanced accessibility to ANC services and the promotion of early and regular visits to mitigate these risks. Comparisons with similar studies from various regions further affirm that frequent ANC visits are vital for early detection and management of complications, ultimately leading to healthier pregnancies and better neonatal health. Therefore, policy interventions focusing on increasing ANC coverage, improving maternal education, and ensuring resource availability are essential steps towards reducing maternal and neonatal morbidity and mortality in resource-limited settings.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

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