Association between antenatal care utilization with severe maternal and perinatal morbidity

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ABSTRACT

Aim: To analyze association between adequate antenatal care utilization with severe maternal morbidity and severe perinatal morbidity.

Methods: The prospective observational study was conducted in a Government medical college and hospital, Aurangabad from 1st October 2017 to 30th September 2019 after Institution Ethics Committee approval. Pregnancy after 28 weeks without pre-existing medical disorder and fetal anomaly were studied. The data were analyzed to find out the association between adequate antenatal care utilization and severe maternal and severe perinatal morbidity by using chi-squared test.

Results: Among 500 participants, 243 (48.6%) had adequate visits. Women with inadequate antenatal care utilization were at higher risk of preterm delivery, severe maternal and perinatal morbidity.

Conclusions: Inadequate antenatal care is can predict increased severity of maternal and perinatal morbidity.

Keywords: Antenatal care utilization, focused antenatal care, severe maternal morbidity, severe perinatal morbidity

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INTRODUCTION

Antenatal care (ANC) is a preventive obstetric health program that aims at optimizing maternal-foetal outcome through regular monitoring of pregnancy for the successful pregnancy outcome and healthy babies. Good quality ANC improves maternal health; decreases the chances of suffering from anaemia, pregnancy induced hypertension, preterm labour and promote positive pregnancy outcomes, including a reduced risk of low birth weight and preterm babies. The antenatal period clearly presents opportunities for reaching pregnant woman with number of interventions that may be vital to their health and well-being. In 2002, World Health Organization (WHO) has recommended a package of at least four visits in antenatal period with evidence-based interventions through goal-oriented clinic visits as known as focused antenatal care (FANC). Since 2002, many low- and middle-income countries have adopted FANC into national policies, guidelines and institutional protocols. However, global estimates indicate that only about half of all pregnant women receive this recommended amount of care. Our women are just beginning to appreciate the value of antenatal care, so it is only prudent to evaluate the current trend and its effectiveness before implementing a new recommendation WHO in 2016. Thus, this study was conducted to analyse the effect of antenatal care on maternal and perinatal outcome where there is 19000 delivery annually.

METHODS

A prospective observational study was conducted in Government Medical College and Hospital, Aurangabad from 1st October 2017 to 30th September 2019, after Institution Ethics Committee approval. Sample size of 500 was taken by the prevalence data. All pregnant women with singleton pregnancy who registered for antenatal care at any facility and delivered after 28 weeks in this hospital were
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Inclusion criteria included. Women without antenatal visit at study site, known pre-existing medical disorder and fetal congenital anomaly were excluded.

Severe maternal morbidity (SMM) was defined by at least one of the following complications: haemorrhagic shock, severe postpartum haemorrhage (second-line uterotonic treatment associated with transfusion of at least two units of packed red blood cells, and/or uterine artery ligation, and/or uterine compressive sutures and/or hysterectomy), eclampsia, abruptio placenta, severe preeclampsia, severe sepsis (sepsis with organ failure), convulsions, diabetic ketoacidosis, deep venous thrombosis or pulmonary embolism, grade 3 or 4 perineal trauma, uterine rupture, intensive care unit (ICU) admission.

Severe perinatal morbidity (SPM) included at least one of the following complications: very preterm birth (before 32 weeks), birth weight below the third percentile, foetal death, early neonatal death (<7 days and before discharge), neonatal trauma (except collarbone fracture), brachial plexus strain, meconium aspiration syndrome, neonatal convulsions, 5-minute Apgar score <7.

Antenatal care was considered as adequate when care was given by skilled health care provider (ANC care provided by nurse/physician), timely (initial ANC visit during first trimester of pregnancy), sufficient (at least 4 ANC visits during the pregnancy such as between 8-12 weeks, 24-26 weeks, 32 week and 36-38 weeks) and appropriate in content (an indicator summarizing the procedure and process of care provided during ANC care). For the indicator of appropriate content, we selected following items; weight, height, blood pressure, urine analysis, blood analysis for haemoglobin, blood grouping and Rh typing, VDRL, HIV, GCT, Obstetrics Ultrasound (at least once between 16-18 weeks), tetanus vaccination, prescription of iron & folic acid (at least for 90 days), vitamins, calcium supplementation and deworming. If the antenatal care service did not fully comply with this criterion, then the antenatal care was considered under inadequate care.

MS Excel and SPSS version 25 was used. Chi-square test was applied to find association between ANC visits and perinatal and maternal outcome. The significance level of this test was checked at 0.05.

RESULTS

Out of 500 pregnant women, maximum women (55.2%) who attend antenatal clinic belonged to age group of 20-25 years and 77.8% belonged to upper lower class of socio-economic strata. Mean age was 23 years. Around 64.6% were multiparas and 53.4% were from urban background. History of IPV was revealed by 32.6% pregnant women.[Table-1]

Table-1: Distribution according to Baseline Characteristics (n=500)

| Characteristics                  | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Age in Years                     |           |            |
| ≤20                              | 99        | 19.8       |
| >20-25                           | 276       | 55.2       |
| >25-30                           | 97        | 19.4       |
| >30                              | 28        | 5.6        |
| Gravidity                        |           |            |
| Primigravida                     | 177       | 35.4       |
| Multigravida                     | 323       | 64.6       |
| Socio-economic status*           |           |            |
| Lower class                      | 50        | 10         |
| Upper lower class                | 389       | 77.8       |
| Lower middle class               | 35        | 7          |
| Upper middle class               | 19        | 3.8        |
| Upper class                      | 7         | 1.4        |
| Residence                        |           |            |
| Rural                            | 233       | 46.6       |
| Urban                            | 267       | 53.4       |
| H/o Intimate Partner Violence (IPV) |         |            |
| Revealed                         | 163       | 32.6       |
| Not revealed                     | 337       | 67.4       |

*Socioeconomic status is according to Modified Kuppuswamy Scale.

The minimum number of scheduled antenatal visits was 4; and 52% of the woman had recommended number of visits (for their duration of pregnancy). Nevertheless 48% women had irregular visits and 40% women began antenatal care after 12 weeks of gestational age. Moreover 15% of the woman missed injection tetanus toxoid and 35.6% of the woman missed the ultrasound between 16-18 weeks. Only 68.4% women had their complete blood and urine profile including CBC, blood group, HIV, HbsAg, VDRL, GCT, thyroid profile, urine routine and
microscopy and 48.6% received hematinic for at least 3 months. Thus, 48.6% pregnant women had adequate antenatal care utilization. [Table-2]

Table-2: Distribution according to utilization of antenatal care services (n=500)

| Parameter                  | Frequency | Percent |
|----------------------------|-----------|---------|
| Initiation of care         |           |         |
| ≤12 weeks                  | 300       | 60      |
| >12 weeks                  | 200       | 40      |
| Antenatal Visits           |           |         |
| As recommended             | 260       | 52      |
| Irregular                  | 240       | 48      |
| Investigation              |           |         |
| Blood & Urine Done         | 342       | 68.4    |
| Blood & Urine Not Done     | 158       | 31.6    |
| Obstetric USG Done         | 322       | 64.4    |
| Obstetric USG Not Done     | 178       | 35.6    |
| Treatment                  |           |         |
| Tetanus toxoid Received    | 425       | 85      |
| Tetanus toxoid Not received| 75        | 15      |
| Hematinic                  |           |         |
| Received                   | 243       | 48.6    |
| Not received               | 257       | 51.4    |
| Deworming                  |           |         |
| Received                   | 270       | 54      |
| Not received               | 230       | 46      |
| Antenatal care             |           |         |
| Adequate                   | 243       | 48.6    |
| Not Adequate               | 257       | 51.4    |

Among 257 women having inadequate antenatal care utilization, 41 women had preterm delivery of which 12 participants had very preterm delivery, while among 243 women who had adequate antenatal care utilization, 233 delivered at term which was statistically significant which signifies that inadequate antenatal care was associated with preterm delivery. But there was no statistically significant association between antenatal care utilization and mode of delivery. Severe maternal morbidity (SMM) occurred among 83 women. The main maternal complication was severe pre-eclampsia in 54 women, severe PPH, hemorrhagic shock, ICU admission, eclampsia in 14 women each, placental abruption in 10 women, puerperal sepsis and perineal tear in 2 women each. Among 14 women with severe PPH, 4 women with severe PPH required surgical interventions in the form of bilateral uterine artery ligation and uterine compression sutures while other responded to medical management. Among 14 ICU admissions, 3 women had placental abruption with multiorgan dysfunction, 2 women had eclampsia with pulmonary edema and 1 woman had PRES syndrome, while 8 women were in hemorrhagic shock requiring ICU. Inadequate antenatal care was associated with severe maternal morbidity except puerperal sepsis and grade 3 and 4 perineal tear. Thus, women with inadequate antenatal care utilization were at higher risk of severe maternal morbidity than with adequate antenatal care. No maternal death was observed in women enrolled in the study. [Table-3]

Table-3: Distribution according to antenatal care utilization and maternal outcome (n=500)

| Maternal outcome                  | Inadequate ANC (n=257) | Adequate ANC (n=243) | χ² test | p-value* |
|-----------------------------------|------------------------|----------------------|---------|----------|
|                                   | Frequency (%)          | Frequency (%)        |         |          |
| Gestation at delivery (in weeks)  |                        |                      |         |          |
| 28-32                             | 12                     | 4.66                 | 0       | 0        | 21.5     | <0.0001  |
| 32-37                             | 29                     | 11.28                | 10      | 4.11     | 21.5     | <0.0001  |
| 37-41                             | 216                    | 84.04                | 233     | 95.88    | 21.5     | <0.0001  |
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| Maternal outcome | Inadequate ANC (n=257) | Adequate ANC (n=243) | χ² test | p-value* |
|------------------|------------------------|----------------------|---------|----------|
|                  | Frequency (%)          | Frequency (%)        |         |          |
| Mode of delivery |                        |                      |         |          |
| Vaginal          | 201 78.21              | 193 79.42            | 0.117   | 0.947    |
| LSCS             | 55 21.4                | 49 20.16             | 0.117   | 0.947    |
| Instrumental     | 1 0.38                 | 1 0.41               | 0.117   | 0.947    |
| Severe maternal morbidity* |                |                      |         |          |
| Severe PE        | 41 15.95               | 13 5.34              | 11.6    | 0.003    |
| Severe PPH       | 11 4.3                 | 3 1.2                | 4.28    | 0.038    |
| Hemorrh shock    | 11 4.3                 | 3 1.2                | 4.28    | 0.038    |
| ICU admit        | 11 4.3                 | 3 1.2                | 4.28    | 0.038    |
| Eclampsia        | 11 4.3                 | 3 1.2                | 4.28    | 0.038    |
| Abruptio         | 10 3.89                | 0 0                  | 17.8    | <0.0001  |
| Puerperal sepsis | 2 8                    | 0 0                  | 0.75    | 0.8      |
| 3°& 4° tears     | 2 8                    | 0 0                  | 0.75    | 0.8      |

*p<0.05 indicates statistically significant. *one woman may have more than one severe maternal morbidity indicators.

The severe perinatal morbidity occurred in 37 women. Inadequate antenatal care utilization was significantly associated with severe perinatal morbidity indicators like very preterm birth <32 weeks, birth weight <3rd centile, 5 minutes Apgar score <3, IUFD, early neonatal death. Among nine IUFDs, four were fresh still birth because of placental abruption and five were macerated still birth among which two each were attributed to undiagnosed diabetes mellitus and fetoplacental insufficiency, and one was postdated. Three babies who had meconium aspiration syndrome despite adequate antenatal care utilization had cord around neck, prolonged PROM and oligohydramnios each.

**DISCUSSION**

To estimate the association between antenatal care utilization and severe morbidity, we used chi-square test of significance. This method enabled us to access impact of antenatal care utilization on SMM and SPM. This approach seems appropriate as we hypothesize that ACU may have an impact on each of these morbidities.

In our study, the mean age of participants was found to be 23 years, which was similar to the findings noted by Abbas et al but 64.6% participants were found to be multiparous, 53.4% were from urban area and 46.6% was from rural area which was not consistent in which maximum participants (87.7%) were from
rural area. The possible reason for this discrepancy could be that our institute is located in an urban area with large number of referrals from nearby rural area. Compared with participation in the study conducted by Manisha et al.\(^9\) where 62% lower middle class of socioeconomic strata, it was found that 77.1% participants in this study belong to upper lower class. The same reason cited above can be applied here.

The prevalence of late initiation of care was 6.1% in Belgium\(^{10}\) and 17% in the study conducted in the area of Northern -Paris\(^{11}\), however in our study 40% of the participants had late initiation of care. This discordance in the result might be explained by high prevalence of underprivileged rural population in our study. Around 32.6% women in this study revealed the history of IPV. This might be one of the important but less uttered factors for inadequate ANC utilization. In our study, 52% women had recommended number of antenatal care visits. Moreover 15% of the woman missed injection tetanus toxoid and 35.6% of the woman missed the ultrasound between 16-18 weeks. In our study, only 68.4% women had their complete blood and urine profile. However, 51.4% population had inadequate antenatal care utilization compared to 34.6% population in study conducted by Linard et al.\(^{12}\) This could be due to difference in demographic variation in population.

In our study, there was statistically significant association found between antenatal care utilization and severe maternal and perinatal morbidity indicating that women with inadequate antenatal care utilization are at a higher risk SMM and SPM. Failure to follow-up in third trimester leads to missing out on cases of severe preeclampsia which ultimately results in low birth weight and IUGR babies. Two studies have previously reported an association between a small number of visits and perinatal morbidity. Petrou\(^{13}\) described an association between low birth weight, admission to neonatal ICU and perinatal mortality; and Raatikainen\(^{14}\) described an association between low birth weight, foetal and neonatal death. Bouvier-Colle\(^{15}\) reported a higher risk of maternal ICU admission among women with no antenatal care. Similarly, a study conducted by M Linard et al.\(^{12}\) also shows association between inadequate antenatal care and severe pre-eclampsia, severe PPH, birth weight below third centile, very preterm birth, and foetal death. This association may reflect the importance of regular antenatal care to screen for and treat some pathology like severe pre-eclampsia. Other studies\(^{16,17}\) reported an association between inadequate antenatal care utilization and perinatal morbidity.

**CONCLUSIONS**

There was significant association of inadequate antenatal care with severe maternal morbidity like preterm delivery, very preterm delivery; and severe perinatal morbidity indicators like very preterm birth <32 weeks, birth weight <3rd centile, 5 minutes Apgar score <3, IUFD, early neonatal death.

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