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ORIGINAL RESEARCH

CORRELATION BETWEEN ANTENATAL CORTICOSTEROID USAGE AND PERINATAL DEATH IN PRETERM DELIVERIES AT A TERTIARY CARE CENTRE

Suresh Waydande[1], Sachin Vahadane[2], Sushruta Kumar[3], Mahesh Shinde[4], Sunil Natha Mhaske[5], Abhijeet Shinde[6]

[1]Professor & Head, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.

[2]Associate Professor, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.

[3]Assistant Professor, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.

[4]Junior Resident, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.

[5]Professor & Dean, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.

[6]Assistant Professor, Department of Paediatrics, DVVPF's Medical College, Ahmednagar.

Corresponding Author:

Dr. Sushruta Kumar, Assistant Professor, Department of Paediatrics, Dr. Vithalrao Vikhe Patil Foundation's Medical College and Hospital, Ahmednagar, Maharashtra, Pin code: 414111, India.

E-mail ID: sushruta.kumar@gmail.com

ABSTRACT

Aim: The main objectives of this study were to determine whether prenatal exposure to corticosteroids (ACS) was associated with lower rates of perinatal mortality (the primary outcome) and other harmful perinatal outcomes. The primary outcome of this study was perinatal mortality. Secondary outcomes included stillbirth, early neonatal mortality, an APGAR score of less than seven at five minutes, neonatal sepsis, and respiratory distress syndrome.

Materials and Methods: Each premature baby delivered between 24 and 34 weeks of gestation during the research period was included in the study population. There were 280 premature babies delivered in all. The participant's medical records provided us with sociodemographic and health information.

Results: 35.7% of the pregnant women between weeks 24 and 34 received at least one dosage of ACS. Compared to infants that hadn't been exposed to ACS, those who had experienced a lower rate of perinatal mortality (13.77%). (28.38 percent). An analysis of multiple variables found that newborns exposed to ACS had a lower risk of dying throughout the perinatal period (aRR 0.31). (95 % CI: 0.27–0.34) Of the sample, just one-third received ACS. The following factors were linked to the use of ACS: mother education, antenatal care attendance more than three times, gestational age measuring method, maternal infection, exposure to antibiotics while pregnant, delivery method, and level of healthcare facility.

Conclusion: Preterm newborns that received ACS had a considerably lower risk of perinatal mortality. Yet approximately a third of the women who qualified for ACS received it, showing low utilisation of ACS. In the current study, ACS utilisation was found to be poor for a variety of reasons.

INTRODUCTION

Perinatal mortality is the term used to describe stillbirths and neonatal fatalities that occur within the first week of life. Preterm birth is one of the key factors that contribute to perinatal mortality. Stillbirth and early neonatal mortality rates are still unremarkably high everywhere. [1, 2]. Short- and long-term respiratory, viral, metabolic, and neurological problems are more likely to develop in infants who are born before they are fully mature. [3, 4, 5]. Pneumonia (16%), complications during childbirth (12%), diarrhoea (8%), neonatal sepsis (7%) and malaria were the top killers of children under the age of five. Diarrhoea (8 percent), neonatal sepsis (7 percent), and malaria were the other leading causes of mortality (5 percent), whereas preterm birth problems accounted for 18 percent of all paediatric deaths between 2000 and 2016. Given that prematurity, intrapartum-related deaths, and neonatal infections accounted for more than 80% of newborn fatalities in 2007, concentrating on initiatives to reduce premature delivery may have a significant impact on perinatal mortality. Antenatal corticosteroids (ACS) are administered to the pregnant women at high risk of preterm delivery, and this is one of the best hospital-based therapy to reduce neonatal death among preterm newborns. When the following conditions are satisfied, including that gestational age assessment can be done accurately, preterm birth is believed to be imminent, there is no clinical indication that the mother is infected, there is insufficient childbirth care available, and the preterm newborn can receive the necessary care [6,7,8], WHO recommendations for ACS use and treatments to improve preterm birth outcomes.

The absence or immaturity of pulmonary surfactant production is linked to the pathogenesis of respiratory distress syndrome (RDS)[9]. The WHO recommended using ACS for the prevention of RDS, and it is well recognised as an effective method for lowering preterm-related perinatal mortality[10]. Lung development is helped by ACS's release of surfactant into alveoli[11,12]. In this situation, two corticosteroids are used: dexomethasone and betamethasone. Two doses of 12 mg of betamethasone every 24 hours or four doses of 6 mg of dexamethasone every 12 hours are recommended for treatment of pregnant women between 24 and 34 weeks gestation who are at risk for premature delivery within seven days. Only 10 to 68 percent of eligible women receive ACS, and not all hospitals consistently employ ACS when it is necessary[13, 14]This study investigated the variables related to ACS administration to women at risk of preterm deliveries in a tertiary care medical facility to ascertain whether ACS exposure was related to lower rates of perinatal mortality (the study's primary outcome) and other perinatal outcomes (stillbirth, early neonatal mortality, APGAR score of 7 at 5min, neonatal sepsis, and RDS in preterm infants).

MATERIALS AND METHODS

During the study period, this investigation was conducted in a tertiary care centre with the participants' written informed permission and with ethics committee approval. 280 patients were assessed in total. Preterm babies that were both stillbirths and live births were included

in the study population. Congenitally malformed preterm newborns were not included. Women self-reported their most recent regular period, fundal height, and/or the outcomes of an ultrasound to ascertain their gestational age. For the purposes of this study, a stillbirth was defined as the death or loss of a foetus before or during delivery after 20 weeks of pregnancy. At both one minute and five minutes after birth, the newborn's Apgar score was 0. Depending on whether their mothers had ACS or not, babies—including stillborn and live deliveries—were divided into two groups. Within 7 days of receiving the first dose of ACS, every woman who participated in this study gave birth. Medical records were consulted before patients were released from the hospital to learn about perinatal outcomes, ACS consumption, and associated variables. From the moment they were admitted to the hospital until they were discharged, information about pregnant women and their babies was kept on file. The major outcome was perinatal mortality, which is the term for stillbirth or early infant death before day seven. Sepsis in newborns, stillbirths, infant mortality before one year, the APGAR score at five minutes, and RDS were all considered secondary outcomes. Baseline demographics and associated variables, such as multiple pregnancies, birth weight (grammes), gestational age, neonate sex, mode of delivery, level of health facility, parity, prenatal care attendance days, maternal infection, and foetal heart rate, were examined. Penicillin or ampicillin was administered to the mother. The baby was given the medicines gentamicin (4 mg/kg every 24 hours) and ampicillin (50 mg/kg every 12 hours).

Statistical Analysis:

Version 13 of STATA was used to analyse the data. The baseline mother characteristics of parity, marital status, education, days spent in prenatal care, delivery type, method used to calculate gestational age, maternal infection, mother's use of antibiotics, and quality of health facility were examined using chi-square testing. In this research, it was examined how ACS-received women differed from non-ACS-received women. The typical mother's age, typical gestational age, and typical birth weight were contrasted to see if there were any differences. The associations between ACS exposure and perinatal outcomes as well as ACS administration-related factors were examined using modified Poisson regressions. The impact of ACS administration on perinatal outcomes was examined using multivariate regression models, which also corrected for covariates having significant relationships (gestational age, birth weight, level of health facility, multiple pregnancy and delivery mode). Statistics defined significance as a P-value of 0.05 or less. Data are presented as frequencies (percentages), means (standard deviations), and relative risks with the relevant 95 percent confidence intervals.

RESULT

Women who took at least one dosage of ACS delivered delivery in less than seven days—37% of them. There was no discernible difference between women who got ACS and those who did not in terms of marital status, parity, or mean maternal age. There were differences between the two groups with regard to the following factors: maternal education, antenatal care, attendance days, gestational age, method used to determine gestational age, multiple pregnancies, mode of delivery (vaginal or caesarean), maternal antibiotics, maternal infection, and the calibre of the hospital where they gave birth. The majority of patients who had ACS

had singleton pregnancies, were no longer getting antibiotics for their mothers, had less maternal illness before giving birth, had a typical vaginal delivery, and had completed their secondary school.

Ultrasonography was also used to determine the majority of their mean gestational age, and it was higher. The association between ACS exposure and perinatal outcomes: Perinatal death occurred 25.16 percent of the time overall. Infants exposed to ACS showed lower rates of perinatal mortality (13.16 vs. 28.31), stillbirth (2.01 vs. 16.24), APGAR scores of less than 7 at 5 minutes (6.98 vs. 24.91), neonatal sepsis (10.01 vs. 15.19), and RDS than infants who weren't exposed to ACS during pregnancy (13.16 vs. 28.31). 17.82 percent as opposed to 20.46 percent. However, there was no difference in the early neonatal death rate between neonates who had been exposed (10.96%) and those who had not (11.46%). Newborns exposed to ACS had significantly lower rates of perinatal mortality, stillbirth, an APGAR score of less than 7 at 5 minutes, neonatal sepsis, and RDS when compared to infants who were not exposed. APGAR scores of less than seven, and RDS, with an adjusted relative risk (aRR) of 0.31 (95 percent confidence interval [CI] 0.27–0.34), 0.06 (95 percent CI] 0.04–0.13, and 0.18, respectively, after accounting for multiple variables (95 percent CI 0.11 - 0.27). (95 % CI: 0.43 to 0.78)

Factors associated with administration of ACS

An adjusted multivariate analysis indicated relationships between the use of ACS and mother education, days spent attending prenatal care, delivery style, exposure to maternal antibiotics, maternal infection, level of health institution, and method used to calculate gestational age. More than half of the women came at the hospital very late, just before labour began, according to an analysis of the factors that contributed to their non-receipt of ACS. Just 5% of the participants reported not using ACS because it was out of stock. Prescribers did not provide a justification for not recommending ACS for 13% of the patients.

Table 1: Maternal demographic, medical and health facility characteristics by ACS treatment

	ACS (n=100)	**No ACS (n=180)**	**P value**
	M (SD)/N (%)	M (SD)/N (%)	
Maternal Demographics			
Mean maternal age (years)	25.4 ± 4.9	25.5 ± 3.3	**0.422**
Parity			
Nulliparous	35 (35%)	54 (30%)	**0.050**
Parous	65(65%)	126 (70%)	
Marital status			
Married	88(88%)	155 (86.1)	**0.604**

Single	12(12%)	25 (13.80)	
Education			
College and above	15 (15%)	14 (7.7%)	<0.001
Secondary education	50 (50%)	56 (31.1%)	
Primary education	30 (30%)	95 (52.7%)	
No formal education	5 (5%)	15 (8.3%)	
Medical Variables			
Antenatal care visits			
> 4	46(46%)	63 (35%)	0.001
1-3	54(54%)	117 (65%)	
Mean gestational age (weeks)	29.9 ±1.2	30.1 ± 2.2	**<0.001**
Method used to assess gestational age			
Maternal self-report of the last normal menstrual period	30 (30%)	121(67.2%)	**<0.001**
Ultrasound	62 (62%)	38 (21.1%)	
Fundal height	8 (8%)	21 (11.6%)	
Mode of delivery			
Assisted vaginal	5(5%)	6 (3.3%)	**<0.001**
C- section	41 (41%)	33 (18.3%)	
Normal vaginal	54 (54%)	141 (78.3%)	
Multiple pregnancy			
No	92 (92%)	157 (87.2%)	**0.013**
Yes	8 (8%)	23 (12.7%)	
Maternal infection			
No	91 (91%)	155 (86.1%)	**0.004**
Yes	9 (9%)	25 (13.8%)	
Maternal antibiotics			
No	58 (58%)	135 (75%)	**<0.001**

Yes	42 (42%)	45(25%)	

Table 2: Perinatal outcomes based on ACS exposure

	ACS (n=100)	**Not ACS (n=180)**	**P value**
Outcomes	n (%)	n (%)	
Perinatal mortality	53 (13.77)	210 (28.38)	<0.001
Stillbirth	8 (2.08)	135 (18.24)	<0.001
Early neonatal mortality	45 (11.94)	75 (12.40)	0.830
APGAR score<7 at 5 min	27 (7.01)	191(25.81)	<0.001
Neonatal sepsis	38 (10.08)	98 (16.20)	0.007
RDS	69 (17.92%)	159 (21.49)	0.004

Table 3: Univariate and multivariate analysis of the association between ACS exposure and perinatal outcomes

Outcomes	**Crude relative risk (95%CI)**	**Adjusted relative risk(95%CI)**
Perinatal mortality	0.38 (0.14-0.51)	0.31 (0.27-0.34)
Stillbirth	0.10 (0.05-0.32)	0.06 (0.04-0.13)
Early neonatal mortality	0.84(0.78-1.23)	0.49 (0.31-0.76)
APGAR scores<7 at 5 min	0.21 (0.20-0.38)	0.18(0.11-0.27)
Neonatal sepsis	0.61 (0.39-0.78)	0.52 (0.39-0.70)
RDS	0.70 (0.54-0.89	0.47 (0.43-0.78)

Table 4: Univariate and multivariate analysis of the factors associated with administration of ACS.

Factors		**Crude relative risk**	**Adjusted relative risk**
Education	College and above	2.01 (1.21-3.12)	1.5 (1.1-2.40)
	Secondary education	1.7(1.1-2.31)	1.71 (1.21-2.72)
	Primary education	0.72 (0.41- 1.3)	1.41 (1.1-2.51)

	No formal education	1	1
Antenatal care visits	> 4	1.21(1.1-1.31)	1.11(1.01-1.31)
	1-3	1	1
Delivery mode	Assisted delivery	1.52 (1.04 - 2.30)	1.31 (1.06-1.8)
	C-section	2.31 (1.71 - 2.41)	1.7 (1.07-1.22)
	Normal vaginal	1	1
Maternal antibiotics	No	0.51(0.33-0.23)	0.51(0.30-0.34)
	Yes	1	1
Maternal infection	No	1.41 (1.1-2.12)	1.41(1.3-2.1)
	Yes	1	1
Method used to assess gestational age	Maternal self-report of the last normal menstrual period	0.32 (0.26-0.39)	0.55 (0.46-0.66)
	Fundal height	0.41 (0.26-0.50)	0.87(0.55-1.05)
	Ultrasound	1	1
Multiple pregnancy	No	1.18 (1.06-2.1)	1.1 (0.88-1.58)
	Yes	1	1

Table 5: Reasons for not administering ACS.

Reason	**Percentage**
Arrived late	61
Out of stock	5
Intrauterine foetal death	9
Maternal infection	7
No reasons provided	13
Other	5

DISCUSSION

The overall perinatal mortality rate was 25.16 percent for preterm deliveries occurring between 24 and 34 weeks. A lower rate of perinatal death was seen in preterm infants exposed to ACS during pregnancy. This finding is consistent with a Cochrane review of hospital-based randomised controlled trials, which found that neonates exposed to ACS had a decreased rate of perinatal mortality regardless of resource availability (RR 0.85, 95 percent CI 0.77 -0.93; 14 studies, 9833 infants)[15]. A decreased risk of perinatal mortality as well as a lower risk of other severe perinatal outcomes, such as stillbirth, early neonatal mortality, newborn sepsis, RDS, and APGAR scores of less than 7 at 5 minutes, were associated with the administration of ACS in the current study. Contrarily, the WHO ACTION trial, which was just published, found that giving the ACS to women in low resource countries who were at risk for early preterm birth significantly reduced the risk of early neonatal death, but there was no difference in the risk of stillbirth, neonatal sepsis, severe RDS at 24 hours after birth, or APGAR scores of less than 7 at 5 minutes after birth[16]. There could be discrepancies in method, research site, and participant characteristics between the results of the current investigation and the WHO ACTION Trial. For instance, the WHO ACTION experiment was a randomised control trial carried out at 29 secondary and tertiary institutions located throughout Bangladesh, India, Kenya, Nigeria, and Pakistan. Unlike the current study, which was a prospective observational study carried out in a single tertiary medical centre, that experiment included a larger population.

Hospitals that could provide ACS in accordance with WHO criteria were used for the WHO ACTION trial, which used an ultrasound to assess gestational age. Women who had a maternal infection were not included in the WHO ACTION research, but in the current analysis, 9 percent of the women who developed ACS had a maternal infection. Only 35.7% of the women in the current study received ACS when delivering birth between 24 and 34 weeks gestation. Ecuador made a similar observation[17]. Due to their delayed arrival at the hospital, towards the time of labour, more than half of the women did not receive ACS. As a result, more has to be done to inform pregnant women about the dangers of preterm birth and the signs of an early labour. Reminding women to visit medical facilities and get help from a doctor as soon as they notice any labor-related symptoms is important. Lack of regular treatment advice, physician attitudes, abilities, and knowledge, patient access to proper healthcare facilities, and ACS[18]. A range of availability problems have been blamed for the slow adoption of ACS. Only 6% of the sample mentioned it, and the current research did not reveal that the availability of ACS was a major factor in why it was not administered. But the 20% of doctors who did not prescribe ACS did not give a justification. This can be as a result of unknown causes or a lack of research regarding how effectively ACS reduces perinatal mortality.

CONCLUSION

The perinatal death rate for newborns delivered in tertiary care facilities was shown to be lower when ACS was used, according to our study. The administration of ACS reduced RDS, stillbirth, early infant death, and newborn sepsis (scoring 7 at 5 minutes). Only around one-third of the eligible women in the current study received ACS, which indicates that the

therapy is not widely used. Healthcare professionals should be made aware of the benefits of providing ACS and the WHO recommendations for doing so in order to reduce perinatal mortality among preterm neonates. Additionally, medical practitioners need to be trained to identify pregnant women who are at risk for preterm birth. Aside from providing antenatal care, institutions must inform women of the signs of preterm birth and encourage them to seek medical attention if they exhibit them.

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