

## FACTORS ASSOCIATED WITH ANTENATAL STEROID UPTAKE IN MOTHERS AT RISK OF PRETERM BIRTH AT A TEACHING HOSPITAL IN GHANA

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### Abstract

**Background:** This study was performed to determine the factors associated with antenatal corticosteroid (ACS) use in pregnant women at risk of preterm birth at the Korle-Bu Teaching hospital (KBTH) in Accra.

**Method:** A descriptive cross-sectional study. Subjects and outcome measures - Mothers who should have received antenatal steroids were identified by the admission of their preterm infants to the neonatal unit at KBTH. Maternal ACS status was determined, and the characteristics of women who received ACS were compared with those who did not.

**Results:** There were 284 eligible admissions during the study period of 6 months, of which 43% (121 mothers) were studied due to administrative and logistical constraints. Out of these 121 mothers, 92 (76%) had received antenatal corticosteroids. Mothers with primary and secondary education were less likely to

receive antenatal corticosteroid (OR 0.240, 95% CI 0.058-0.984), (OR 0.211, 95% CI 0.050-0.897) respectively, compared to those with tertiary level education. Mothers who delivered at other hospitals outside KBTH were also less likely to receive ACS (OR 0.195, 95% CI 0.070-0.545). Women who had caesarean delivery were more likely to receive antenatal corticosteroid compared to those with vaginal delivery (OR 4.378 95% CI 1.690-11.346). In this cohort, there was no association between antenatal corticosteroid use and maternal age, maternal medical condition, fetal gender or previous preterm delivery.

**Conclusion:** ACS use in KBTH is low but similar to other low-income countries. Low educational attainment and delivery outside the tertiary facility are factors associated with low use of ACS.

**Key Words:** Antenatal, steroids, preterm, birth

### Introduction

Antenatal corticosteroids (ACS) accelerate maturation of fetal type 2 pneumocytes and, in conjunction with level 2 neonatal intensive care, reduce the severity of respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC), as well as mortality from these conditions<sup>1,2</sup>. Despite the known benefit of ACS, its use in clinical practice is still limited<sup>3</sup>. The uptake of ACS varies between and within countries. Uptake is high in high resource areas and variable in low resource countries, ranging from 16 to 91%<sup>3</sup>. The factors associated with uptake of ACS have been reported to include maternal educational attainment, timing of birth and maternal complications<sup>4</sup>. Short hospitalization before delivery was associated with lowered chance of receiving ACS, while premature rupture of membranes and antepartum maternal transfer were associated with ACS administration<sup>5</sup>. The use of ACS is established as a relatively low-cost and effective method of reducing preterm morbidity and

mortality<sup>6</sup>. It is recommended that a course of ACS should be given to all mothers before delivery between 24 weeks to 34 weeks gestation unless the risk to the mother or fetus outweighs the benefit (chorioamnionitis, acute fetal distress, and acute massive antepartum haemorrhage)<sup>7</sup>. The course is IM Dexamethasone 6mg 12 hourly for 4 doses, or where available, Betamethasone 12mg IM, repeated 24 hours later. This study was performed to determine the factors associated with antenatal corticosteroid (ACS) use in pregnant women at risk of preterm birth at the Korle-Bu Teaching hospital (KBTH) in Accra.

### Methods

This was a descriptive cross-sectional study conducted at the Neonatal Intensive Care Unit (NICU) of the Korle-Bu Teaching Hospital. The audit was performed in 3 phases: from January to March 2015, from December 2015 to January 2016 and in April 2016.

Based on guidelines in the KBTH Department of Obstetrics and Gynaecology manual, a course of ACS should be given to all mothers before delivery between 24 weeks to 34 weeks gestation unless the risk to the mother or fetus outweighs the benefit. During the periods of the study, women who should have received antenatal steroids were identified by the admission of their preterm infants to the neonatal unit at KBTH. Maternal ACS status was determined by reviewing case notes of mothers and babies and completion of a

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questionnaire. The characteristics of women who who did not. Data was extracted with Microsoft Excel spreadsheet and analysed with Social Science Statistics Online Statistical calculators. Ethical review was not considered essential, as this was an audit type study, primarily involving case note reviews with no interventions or deviations from the usual clinical care of participants.

received ACS were compared with those

## Results

During the periods of data collection, there were a total of 284 eligible admissions, of which 43% (121 mothers) were studied due to administrative and logistical constraints. Out of these 121 mothers, 92 (76%) had received antenatal corticosteroids.

**Table 1:** Characteristics of mothers who received ACS compared to those who did not

	Received ACS (n=92)	Did not receive ACS (n=29)	Odds ratio (95% CI)
<b>Maternal age</b>			
≤20yrs	3 (3.3%)	4 (13.8%)	0.241 (0.049-1.180)
21-35yrs	56 (60.9%)	18 (62.1%)	Ref
>35yrs	28 (30.4%)	4 (13.8%)	2.250 (0.695-7.283)
Not documented	5 (5.4%)	3 (10.3%)	-
<b>Level of education</b>			
None	18 (19.6%)	5 (17.2%)	0.337 (0.072-1.580)
Basic	23 (25.0%)	9 (31.0%)	0.240 (0.058-0.984)
Secondary	18 (19.6%)	8 (27.6%)	0.211 (0.050-0.897)
Tertiary	32 (34.8%)	3 (10.3%)	Ref
Not documented	1 (1.1%)	4 (13.8%)	-
<b>Mode of delivery</b>			
Vaginal delivery	37 (40.2%)	21 (72.4%)	Ref
Caesarean section	54 (58.7%)	7 (24.1%)	4.378 (1.690-11.346)
Not documented	1 (1.1%)	1 (3.4%)	-
<b>Maternal medical history</b>			
Hypertension	30 (32.6%)	5 (17.2%)	2.049 (0.665-6.307)
Preterm PROM	11 (12.0%)	7 (24.1%)	0.537 (0.174-1.653)
APH	3 (3.3%)	1 (3.4%)	1.024 (0.098-10.667)
Asthma	1 (1.1%)	1 (3.4%)	0.341 (0.020-5.829)
Sickle cell disease	2 (2.2%)	1 (3.4%)	0.683 (0.057-8.122)
Others	4 (4.3%)	0 (0%)	-
Nil	41 (44.6%)	14 (48.3%)	Ref
<b>Gender of infant</b>			
Male	46 (50.0%)	14 (48.3%)	1.071 (0.465-2.470)
Female	46 (50.0%)	15 (51.7%)	Ref
<b>Place of delivery</b>			
KBTH	82 (89.1%)	16 (55.2%)	Ref
Other hospitals	10 (10.9%)	10 (34.5%)	0.195 (0.070-0.545)
Home	0 (0%)	3 (10.3%)	-
<b>Previous preterm delivery</b>			
Yes	4 (4.3%)	3 (10.3%)	Ref
No	88 (95.7%)	24 (82.8%)	2.750 (0.576-13.133)
Not documented	0 (0%)	2 (6.9%)	-

shows the characteristics of mothers who received ACS compared with those who did not. The majority of the mothers, over 60%, in both groups were aged 21 to 35 years. Regarding educational attainment, the largest proportion (34.8%) in the ACS group had completed tertiary education, whilst the largest proportion in the non-ACS group had only basic education (31.8%). In nearly half of both groups, there was no underlying medical condition that necessitated the preterm delivery. Hypertensive disorders were the commonest condition underlying preterm delivery, contributing 32.6%, in the ACS group, and second commonest,

forming 17.0%, in those without ACS. More than half (58.7%) of the ACS group were delivered by caesarean section, compared to 24% of the non-ACS group. More than two-thirds (72.4%) of mothers who did not receive ACS delivered vaginally. There were 18 cases of preterm premature rupture of membranes (PPROM) of whom 61% received ACS. Results from multinomial logistic regression model showed that mothers with primary and secondary education were less likely to receive antenatal corticosteroid (OR 0.240, 95% CI 0.058-0.984), (OR 0.211, 95% CI 0.050-0.897) respectively. Mothers who delivered at other hospitals

outside KBTH were also less likely to receive ACS (OR 0.195 95% CI 0.070-0.545) Women who had caesarean delivery were more likely to receive antenatal corticosteroid compared to those with vaginal delivery (OR 4.378 95% CI 1.690-11.346). There was a trend towards lower ACS use in mothers younger than 20 years but this did not reach statistical significance. Maternal medical condition, fetal gender and previous preterm delivery did not predict antenatal corticosteroid use in this cohort.

## Discussion

This is the first published report on the factors associated with use of ACS in women at risk of preterm birth before 34 weeks in our facility, and as far we can ascertain, in Ghana. The overall uptake of ACS in this study was relatively low at 76%, similar to reports from other low and middle-income countries<sup>3,8,9,10</sup>. In the WHO Multicountry Survey of Maternal and Newborn Health (WHOMCS), of the women who delivered at 26–34 weeks gestation, 52% received antenatal corticosteroids<sup>3</sup>. It was a prospective, cross-sectional, facility-based survey of deliveries in 2010 and 2011 from 29 countries of all income levels in Africa, Asia, Latin America and the Middle East. They found no difference in ACS use between spontaneous preterm birth and provider-initiated preterm birth. The odds of receiving antenatal corticosteroids were significantly raised in nulliparous women and in caesarean deliveries. Women with pyelonephritis had raised odds of antenatal corticosteroid receipt, as did those pregnant with twins and higher-order multiple pregnancies. The odds of antenatal corticosteroid use were lower in women younger than 20 years and women with only 1–6 years of education. In our study, women who received ACS had higher educational attainment, compared to those not receiving ACS. Similar findings were reported in a multi-country survey in South East Asia<sup>10</sup>. The association between educational attainment and health status is well known, and may be mediated through greater income and social networks, as well as a better understanding of health issues and a healthier lifestyle<sup>11</sup>. We found that women who received ACS were more likely to have delivered at the tertiary facility (KBTH), compared to those not in receipt of ACS. Profit et al reported similar findings in California<sup>12</sup>. Lee et al reported, in a study from California of preterms born between 2005 and 2007, an overall uptake of 77%; risk factors for low uptake were mothers who were Hispanic, younger than 20 years, received no antenatal care, delivered vaginal delivery or whose baby had fetal distress. The factors associated with higher ACS uptake were premature rupture of membranes, multiple gestation and delivery in hospitals participating in quality improvement programs. They recommended that quality improvement initiatives to improve antenatal steroid administration should target specific high-risk groups<sup>13</sup>.

In China, Xi et al reported an overall ACS uptake of 68.1% in a study of 232 women delivering after 27–34 weeks gestation; teenage girls were less likely to receive ACS than women aged 20–35 years<sup>14</sup>. In our setting, the involvement of patients in clinical decision-making regarding the use of ACS in anticipated preterm delivery before 34 weeks is unknown. In a New Zealand study of patient attitudes and beliefs towards use of ACS and clinical practice guidelines, the following features were found to be important enablers for the uptake of ACS: patients who are optimistic about ACS use, strong knowledge about why ACS is being offered, high resilience about pregnancy, and confidence in decision-making after being provided with information about ACS<sup>15</sup>. Conversely, difficulty in understanding information provided by health workers, and time constraints faced by patients and health workers, were identified as important barriers to uptake of ACS<sup>11</sup>. In KBTH, considerable emphasis is placed on ACS administration in the management of anticipated preterm delivery before 34 weeks, but in other health facilities in Accra, the level of emphasis is unknown but is likely to be lower. This may partly be attributed to lack of national guidelines on the use of ACS in anticipated preterm delivery, as well as the absence of specialist obstetricians in many delivery facilities. This latter issue could be addressed by task shifting as recommended by the World Health Organisation<sup>16</sup>. Task shifting addresses deficits in human resources for health by optimization of the roles and tasks of a range of health-care providers in order to deliver interventions through the existing health workforce. Other possible explanations for the facility-based difference in uptake could be local management practices that affect staff motivation and availability of dexamethasone or betamethasone. For instance, Smith et al found that low initial rates of ACS use were related to limited authority for administration by midwives and to the limited availability of dexamethasone on the maternity unit<sup>9</sup>. They reported that it was feasible to rapidly increase coverage of ACS for women at risk of preterm birth using a short technical update followed by a monthly audit and feedback schedule; there were also concomitant improvements in routine recording of gestational age and in completeness of documentation. They speculated that regular audit and feedback of ACS data was a more significant influence than the provision of updated technical information. In our study, women who received ACS were more likely to deliver by caesarean section, similar to a report from South East Asia<sup>10</sup>. They also reported that ACS use was more likely in women who had postpartum haemorrhage and pyrexia, factors not explored in this study.

## Conclusion

ACS use in KBTH is low but similar to other low and middle-income countries. Low educational

attainment and delivery outside the tertiary facility are major factors associated with low use of ACS. Areas for further research include the determination of factors that cause low uptake of ACS especially in non-tertiary institutions and how these factors can best be modified.

### Limitations

This study is limited by its small study population. Women who received ACS but delivered after 34 weeks gestation, or whose babies were stillborn or did not survive long enough to be admitted to NICU, were not included in this study. As a result, the uptake of ACS may be higher than we found.

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