ORIGINAL ARTICLE

Antenatal Steroids Reduced the Risk of Respiratory Distress Syndrome in Malaysian Preterm Infants of Gestation Less than 34 Weeks

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Summary

An observational study was carried out on preterm infants of gestation less than 34 weeks born at the Kuala Lumpur Maternity Hospital between between 1 December 1994 to 31 July 1995 to determine: a) the rate of use of antenatal steroids, and b) whether the use of antenatal steroid had any significant beneficial effect on the early morbidity and mortality in this group of infants, after controlling for the various confounders. Of the 209 infants studied, 110 (52.6%) did not receive any antenatal steroid. Among the remaining 99 (48.4%) infants who received antenatal steroid, 42 (21.5%) had received an incomplete course while 57 (29.2%) had a complete course of antenatal steroid therapy within 7 days prior to delivery. Logistic regression analysis showed that a history of having received a complete course of antenatal steroid within 7 days of delivery was significantly associated with reduced risk of respiratory distress syndrome (RDS) (odds ratio: 0.51, 95% confidence intervals : 0.26, 0.99). Use of antenatal steroid was not significantly associated with increased rates of early mortality (p=0.98), septicemia (p=0.45) or ventilatory support (p=0.15). Our study confirms that antenatal steroid had beneficial effects against RDS in infants born before 34 weeks gestation and should be actively promoted in Malaysia.

Key Words: Malaysian preterm infants, Antenatal steroid, Respiratory distress syndrome

Introduction

The beneficial effects of antenatal steroid for the prevention of respiratory distress syndrome (RDS) in the preterm infants was first reported by Linggins and Howie in 1972[1]. Subsequently, over the last two decades, several well-designed randomised controlled trials have confirmed an association between the use of antenatal steroids and improved outcome in preterm infants[2-10]. The reported benefits of antenatal steroid include reduction of in-hospital mortality by almost 50%[1], a reduction in the incidence of RDS[2-15], a reduction in the incidences of bronchopulmonary dysplasia[5], and a significant improvement in the growth of the infants at 2 years of age[6]. Furthermore, these benefits were not associated with increased rates of infection in the mothers or infants, or an increased incidence of neurodevelopmental handicaps in the infants[1,4-7,16]. Based on the various evidence mentioned above, the use of antenatal steroids in pregnant mothers who are at risk of preterm deliveries at gestations of less than 34 weeks has been actively promoted in many countries in recent years.

In Malaysia, at the time of this study, RDS or its complications was reported to be the most common

cause of death among the preterm infants[17]. The rate of use of antenatal steroid in high risk pregnancies of gestation less than 34 weeks in this country was not known. The main objectives of this study were: a) to determine the rate of use of antenatal steroids in preterm deliveries at gestation of less than 34 weeks born in a large Malaysian maternity hospital; and b) to determine whether the use of antenatal steroids had any significant beneficial effect on the early morbidity and mortality of preterm Malaysian neonates of gestation less than 34 weeks, after controlling for various confounders.

Materials and Methods

An observational study was carried out over an 8-month period, between 1 December 1994 to 31 July 1995 at the Kuala Lumpur Maternity Hospital (KLMH). Consecutive liveborn preterm infants of gestation less than 34 weeks delivered in this hospital during the study period were eligible for the study. Infants with the following criteria were excluded from the study: 1) birthweight less than 500 grams or gestation <25 weeks, or 2) infants with lethal congenital malformations. Upon delivery, the progress of all infants who were included in the study were followed up until discharge or death. The antenatal, intrapartum and neonatal data of each infant were entered into a standard proforma.

For the purpose of our study, infants were considered to have received a complete course of antenatal steroid therapy if their mothers were given a minimum of 2 doses (12 mg per dose) of dexamethasone at 12 hourly intervals, or 3 doses (8 mg/dose) at 8 hourly intervals, within 7 days prior to delivery. Antenatal steroid therapy was considered incomplete if the number of doses given was less than this. Infants were considered to have received no antenatal steroid if there was no history of antenatal steroid therapy or the last dose was given more than seven days prior to delivery. The administration of steroids was decided by the attending obstetric doctors.

The gestational age of the neonates was determined by the period of amenorrhoea of their mothers when the latter were certain of their last menstrual period. In infants whose mothers were uncertain of their last menstrual period, their gestational age was determined by the use of the Ballard's Score[18] postnatally. Infants were defined as small-for-gestation age (SGA) at birth when their birthweight was below the tenth percentile for their gestation age based on the local intrauterine growth chart[19]. A diagnosis of RDS was made based on the presence of clinical evidence of respiratory distress within four hours of birth and radiological findings of ground glass appearance in the chest radiograph taken within the first 24 hours of life. A diagnosis of patent ductus arteriousus (PDA) was made based on the presence of clinical findings alone or confirmation with echocardiograph. A diagnosis of bronchopulmonary dysplasia (BPD) was made based on the presence of a history of ventilatory support during the early neonatal period followed by a need for oxygen therapy of more than 28 days of life and associated with classical radiological changes[20]. A diagnosis of septicemia was made in the presence of clinical signs of septicemia and positive blood cultures.

Statistical analysis

Univariate analysis was carried out to compare the various potential risk factors between groups. The Chi square test (or Fisher's exact test for expected cells of less than 5) was used for analysis of categorical variables. The Student's t test (unpaired, 2-tailed) was used for analysis of continuous variables. The potential risk factors associated with each of the following outcome variables were analysed: death before discharge, RDS, need for ventilatory support and septicemia. Logistic regression analysis was carried out to identify the significant risk factors associated with each of these outcome variables after controlling for the various confounders. P values of ≤ 0.05 were considered statistically significant.

Results

During the study period, there were 18,969 deliveries in this hospital. Of these, 18,730 (98.8%) were live births and 239 (1.2%) were stillbirths. Two hundred and fifty (1.3%) of the 18,730 livebirths were preterm infants with gestation of less than 34 weeks. During the study period, there was no preterm liveborn infant of gestation less than 34 weeks with birthweight of less than 500 grams or with lethal congenital anomalies. Of the 250 preterm infants of gestation less

Table I
Relationship between early mortality and maternal, intrapartum and neonatal factors in preterm neonates of gestation less than 34 weeks

Potential risk factors	Alive n=169	Died n=40	Difference in means (95% C.I.)
Birthweight in gram, mean (sd)	1444 (311)	1091 (272)	426 (327, 524)*
Gestation in weeks, mean (sd)	30.5 (2.3)	27.2 (5.1)	3.3 (1.6, 4.9)*
			Unadjusted odds ratios (95% C.I.)
Small-for-gestational age, (%)	72 (42.6)	18 (45.0)	1.1 (0.5, 2.3)
Males, (%)	86 (50.9)	28 (70.0)	2.3 (1.0, 2.3)**
Twins, (%)	19 (11.2)	7 (17.5)	1.7 (0.6. 4.7)
Maternal parity, (%)			
primagavida	49 (29.0)	9 (22.5)	Reference
multigravida	120 (71.0)	31 (77.5)	1.4 (0.6, 3.5)
Use of tocolytic during intrapartum period (%)	34 (20.1)	7 (17.5)	0.8 (0.3, 2.2)
Pregnancy-induced hypertension, (%)	28 (16.6)	5 (12.5)	0.7 (0.2, 2.2)
Antepartum haemorrhage, (%)	22 (13.0)	9 (25.5)	1.9 (0.7, 5.0)
Cord prolapse, (%)	2 (1.2)	0 (0.0)	0.0 (0.0, 0.1)
Placenta previa, (%)	13 (7.7)	3 (7.5)	0.9 (0.2, 3.4)
Premature rupture of membrane, (%)	54 (32.0)	11 (27.5)	0.8 (0.4, 1.8)
Previous history of premature delivery, (%)	26 (15.4)	5 (12.5)	0.8 (0.2, 2.4)
Had antenatal steroid, (%)	82 (48.5)	17 (42.5)	0.8 (0.4, 1.7)
Had complete course of antenatal steroid, (%)	50 (29.6)	9 (22.5)	0.7 (0.3, 1.7)
Race (%)			
Malay	103 (60.9)	22 (55.0)	2.0 (0.4, 9.7)
Chinese	35 (20.7)	6 (15.0)	2.5 (0.4, 15.9)
Indians	24 (14.2)	9 (22.5)	1.1 (0.2, 6.7)
Others	7 (4.1)	3 (7.5)	Reference
Modes of delivery, (%)			
spontaneous vertex delivery	95 (56.2)	21 (52.5)	0.9 (0.4, 2.1)
lower segment Caesarean section	63 (37.3)	13 (32.5)	Reference
breech	11 (6.5)	6 (15.0)	0.4 (0.1, 1.4)
Respiratory distress syndrome, (%)	88 (52.1)	37 (92.5)	11.4 (3.2, 48.1)*
Patent ductus arteriosus, (%)	25 (14.8)	7 (17.5)	1.2 (0.4, 3.3)
Pneumothorax, (%)	6 (3.6)	12 (30.0)	11.4 (3.6, 37.8)*
Bronchopulmonary dysplasia, (%)	2 (1.2)	1 (2.5)	2.1 (0.04, 41.9)
Septicemia, (%)	24 (14.2)	8 (20.0)	1.5 (0.6, 3.9)
Received ventilatory support, (%)	47 (27.8)	31 (77.5)	8.9 (3.7, 22.0)*
Received continuous positive airway pressure, (%)	69 (40.8)	23 (57.5)	2.0 (0.9, 4.2)
Given surfactant therapy, (%)	18 (10.7)	11 (27.5)	3.2 (1.3, 8.0)**

Note: 95% C.I.= 95% confidence intervals;
*Asterisks denote statistical significance: *p <0.0001, **p = 0.029, ***p= 0.006*

than 34 weeks, 41 (16.4%) were subsequently excluded from this study because of missing maternal records (n=8) or missing neonatal records (n=33). There was no significant difference in the mean birthweight (1370 g versus 1310 g; p=0.43), mean gestational age (30.3 weeks versus 29.9 weeks; p=0.42), gender distribution (p=0.85) and modes of delivery (p=0.55) between infants with complete records (n=209) and those with incomplete records (n=41). However, when compared with infants with incomplete records, a significantly higher proportion of the infants with complete records were infants of Indian origin (15.8% versus 4.9%; p=0.002) and small-for-gestational age (43.1% versus 19.5%; p=0.008). The results of this study were based on the analysis of data of the 209 preterm infants with complete records.

The mean gestational age of these 209 preterm infants was 29.9 weeks (95% confidence intervals: 29.4, 30.3). Their mean birthweight was 1363 grams (95% C.I. 1316, 1411). One hundred and ten (52.6%) of these 209 infants did not receive any antenatal steroid. Among the remaining 99 (47.4%) infants who received antenatal steroids, 42 (20.1%) had received an incomplete course while 57 (27.3%) had received a complete course of antenatal steroid therapy within 7 days prior to delivery.

One hundred and sixty nine (80.9%) of the 209 infants survived before discharge. RDS developed in 125 (59.8%) of the infants. One hundred and fifty three (73.2%) of these infants received oxygen therapy and their mean duration of oxygen therapy was 6.1 days (sd=8.4). Ninety two (44%) of these infants were given continuous positive airway pressure (CPAP) therapy. Ventilatory support was required by 78 (37.3%) of the infants. The mean duration of ventilation in this latter group of infants (n=78) was 4.6 days (sd= 5.5) Septicemia developed in 32 (15.3%) infants. PDA was detected in 32 (15.3%) of the infants. The mean duration of hospital stay of the surviving infants (33.6 days, sd=21.5) was significantly longer than those who died before discharge (11.8 days, sd=17.3), the difference between mean duration of hospital stay being 21.7 days (95% C.I. for difference between mean duration being: 15.4, 28.2).

Table I shows the results of univariate analysis of the various potential risk factors associated with early mortality before discharge in these infants. Logistic regression analysis of these various potential risk factors showed that, after controlling for the various confounders, the significant risk factors associated with increased early mortality were: male sex (odds ratio: 4.2, 95% confidence intervals: 1.3, 13.9), a history of receiving ventilatory support (odds ratio: 6.1, 95% confidence intervals: 2.0, 19.1), and pneumothorax (odds ratio: 26.8, 95% confidence intervals: 4.8, 150.7). On the other hand, the following factors were significantly associated with reduced risk of early mortality: increasing birthweight (odds ratio of mortality with every one gram increase in birthweight being: 0.993, 95% confidence intervals: 0.991, 0.996), increase in gestational age (odds ratio of mortality with every one week increase in gestational age being: 0.81, 95% confidence intervals: 0.66, 0.99), twins (odds ratio: 0.2, 95% confidence intervals: 0.0, 1.0), and patent ductus arteriousus (odds ratio: 0.2, 95% confidence intervals: 0.1, 0.8). Use of antenatal steroid, irrespective of whether a complete course was given, was not a significant factor associated with early mortality (p=0.98)

Table II shows the results of univariate analysis of various potential risk factors associated with the development of RDS in the infants after birth. Based on univariate analysis, a history of having received a complete course of antenatal steroid was not a significant factor associated with decreased risk of RDS. However, logistic regression analysis of the various factors listed in Table II showed that the significant factors associated with decreased risk of development of RDS in these infants were: a) increasing gestational age (the odds ratio of developing RDS with every week increase in gestational age being: 0.68; 95% confidence intervals: 0.58, 0.79), and b) a history of having received a complete course of antenatal steroid within 7 days before delivery (odds ratio of RDS: 0.51, 95% confidence intervals: 0.26, 0.99). A history of receiving some antenatal steroids (irrespective of whether a full course was given) was not a significant factor associated with reduced risk of RDS (p=0.87).

Table III shows the results of the univariate analysis of various potential risk factors associated with the need for ventilatory support in the infants after

Table II
Relationship between respiratory distress syndrome (RDS) and various potential risk factors in preterm infants of gestation less than 34 weeks

Potential risk factors	RDS n=125	No. RDS n=84	Difference in means (95% C.I.)
Birthweight in gram, mean (sd)	1280 (358)	1487 (290)	207 (119, 296)*
Gestation in weeks, mean (sd)	29.1 (3.6)	31.1 (2.2)	2.1 (1.3, 2.9)*
			Unadjusted odds ratios (95% C.I.)
Small-for-gestational age, (%)	50 (40.0)	40 (47.6)	0.7 (0.4, 1.3)
Males, (%)	73 (58.4)	41 (48.8)	1.5 (0.8, 2.7)
Twins, (%)	20 (16.0)	6 (7.1)	2.5 (0.9, 7.9)
Maternal parity (%)			
primagavida	33 (26.4)	25 (29.8)	Reference
multigravida	92 (73.6)	59 (70.2)	1.2 (0.6, 2.3)
Use of tocolytic, (%)	21 (16.8)	20 (23.8)	0.7 (0.3, 1.4)
Pregnancy-induced hypertension, (%)	15 (12.0)	18 (21.4)	0.5 (0.2, 1.1)
Antepartum haemorrhage, (%)	22 (17.6)	9 (10.7)	1.8 (0.7, 4.5)
Cord prolapse, (%)	1 (0.8)	1 (1.2)	0.7 (0.0, 53.2)
Placenta previa, (%)	9 (7.2)	7 (8.3)	0.9 (0.3, 2.7)
Premature rupture of membrane, (%)	33 (26.4)	32 (38.1)	0.6 (0.3, 1.1)
Previous history of premature delivery, (%)	22 (17.6)	9 (10.7)	1.8 (0.7, 4.5)
Had antenatal steroid, (%)	56 (44.8)	43 (51.2)	0.8 (0.4, 1.4)
Had complete course of antenatal steroid, (%)	30 (24.0)	29 (34.5)	0.6 (0.3, 1.2)
Race (%)			
Malay	75 (60.0)	50 (59.5)	Reference
Chinese	28 (22.4)	13 (15.5)	0.7 (0.3, 1.6)
Indians	16 (12.8)	17 (20.2)	1.6 (0.7, 3.7)
Others	6 (4.8)	4 (4.8)	1.0 (0.2, 4.5)
Modes of delivery, (%)			
spontaneous vertex delivery	67 (53.6)	49 (58.3)	1.0 (0.5, 1.8)
lower segment Caesarean section	43 (34.4)	33 (39.3)	Reference
breech	15 (12.0)	2 (2.4)	0.2 (0.0, 0.8)**

Note: 95% C.I.=95% confidence intervals;
*Asterisks denote statistical significance: *p<0.0001, **p=0.04*

birth. Logistic regression analysis showed that the only significant risk factor associated with the need for ventilatory support was RDS (adjusted odds ratio: 29.0, 95% confidence intervals being: 10.0, 84.0). Antenatal steroids was not a significant risk factor associated with need for ventilatory support (p=0.15).

Table IV shows the results of the univariate analysis of various potential risk factors associated with the development of septicemia during the neonatal period. Logistic regression analysis showed that the only significant risk factor associated with septicemia was the presence of patent ductus arterious during the neonatal period (adjusted odds ratio: 4.7, 95%

Table III
Relationship between need for ventilatory support and various maternal, intrapartum and neonatal factors in preterm neonates of gestation less than 34 weeks

Potential risk factors	Ventilated n=78	Not ventilated n=131	Difference in means (95% C.I.)
Birthweight in gram, mean (sd)	1247 (354)	1433 (324)	186 (89, 283)*
Gestation in weeks, mean (sd)	28.7 (4.2)	30.5 (2.4)	1.8 (0.8, 2.8)**
			Unadjusted odds ratios (95% C.I.)
Small-for-gestational age, (%)	31 (39.7)	59 (45.0)	0.8 (0.4, 1.5)
Males, (%)	45 (57.7)	69 (52.7)	1.2 (0.7, 2.2)
Twins, (%)	15 (19.2)	11 (8.4)	2.6 (1.1, 6.3)***
Maternal parity, (%)			
primagavida	22 (28.2)	36 (27.5)	Reference
multigravida	56 (71.8)	95 (72.5)	1.0 (0.5, 2.0)
Use of tocolytic, (%)	11 (14.1)	30 (22.9)	0.6 (0.2, 1.3)
Pregnancy-induced hypertension, (%)	10 (12.8)	23 (17.6)	0.7 (0.3, 1.6)
Antepartum haemorrhage, (%)	13 (16.7)	18 (13.7)	1.3 (0.5, 2.9)
Cord prolapse, (%)	0 (0)	2 (1.5)	0.0 (0.0, 9.0)
Placenta previa, (%)	5 (6.4)	11 (8.4)	0.8 (0.2, 2.5)
Premature rupture of membrane, (%)	19 (24.4)	46 (35.1)	0.6 (0.3, 1.2)
Previous history of premature delivery, (%)	14 (17.9)	17 (13.0)	1.5 (0.6, 3.4)
Had antenatal steroid, (%)	31 (39.7)	68 (51.9)	0.6 (0.3, 1.1)
Had complete course of antenatal steroid, (%)	19 (24.4)	40 (30.5)	0.7 (0.4, 1.5)
Race (%)			
Malay	45 (57.7)	80 (61.1)	Reference
Chinese	14 (17.9)	27 (20.6)	1.1 (0.5, 2.4)
Indians	14 (17.9)	19 (14.5)	0.8 (0.3, 1.8)
Others	5 (6.4)	5 (3.8)	0.6 (0.1, 2.6)
Modes of delivery, (%)			
spontaneous vertex delivery	39 (50.0)	77 (58.8)	1.2 (0.6, 2.2)
lower segment Caesarean section	28 (35.9)	48 (36.6)	Reference
breech	11 (14.1)	6 (4.6)	0.3 (0.1, 1.1)
Respiratory distress syndrome, (%)	74 (94.9)	51 (38.9)	29.0 (9.8, 114.1)*
Patent ductus arteriosus, (%)	21 (26.9)	11 (8.4)	4.0 (1.7, 9.6)*

Note: 95% C.I.= 95% confidence intervals;
*Asterisks denote statistical significance: *p <0.001, **p = 0.001, ***p= 0.02*

confidence intervals: 2.0, 11.1). Use of antenatal steroids was not a significant risk factor associated with the development of neonatal septicemia (p=0.45).

Discussion

At the time of this study, the Maternity Hospital

Table IV
Relationship between early septicemia and maternal, intrapartum and neonatal factors in preterm neonates of gestation less than 34 weeks

Potential risk factors	Developed septicaemia n=32	No septicaemia n=177	Difference in means (95% C.I.)
Birthweight in gram, mean (sd)	1267 (370)	1380 (341)	144 (-28, 255)
Gestation in weeks, mean (sd)	28.6 (6.1)	30.1 (2.4)	1.5 (-0.8, 3.7)
			Unadjusted odds ratios (95% C.I.)
Small-for-gestational age, (%)	12 (37.5)	78 (44.1)	0.8 (0.3, 1.8)
Males, (%)	16 (50.0)	98 (55.4)	0.8 (0.4, 1.8)
Twins, (%)	4 (12.5)	22 (12.4)	1.0 (0.2, 3.3)
Maternal parity, (%)			
primagavida	6 (18.8)	52 (29.4)	Reference
multigravida	26 (81.3)	125 (70.6)	0.6 (0.2, 1.5)
Use of tocolytic during intrapartum period (%)	8 (25.0)	33 (18.6)	1.5 (0.6, 3.8)
Pregnancy-induced hypertension, (%)	6 (18.8)	27 (15.3)	1.3 (0.4, 3.6)
Antepartum haemorrhage, (%)	7 (21.9)	24 (13.6)	1.8 (0.6, 5.0)
Cord prolapse, (%)	0 (0)	2 (1.1)	0.0 (0.0, 29.8)
Placenta previa, (%)	2 (6.3)	14 (7.9)	0.8 (0.1, 3.7)
Premature rupture of membrane, (%)	8 (25.0)	57 (32.2)	0.7 (0.3, 1.8)
Previous history of premature delivery, (%)	7 (21.9)	24 (13.6)	1.8 (0.6, 5.0)
Had antenatal steroid, (%)	17 (53.1)	82 (46.3)	1.3 (0.6, 3.0)
Had complete course of antenatal steroid, (%)	10 (31.3)	49 (27.7)	1.2 (0.5, 2.9)
Race (%)			
Malay	22 (68.8)	103 (58.2)	Reference
Chinese	5 (15.6)	36 (20.3)	1.5 (0.5, 5.6)
Indians	3 (9.4)	30 (16.9)	2.1 (0.6, 11.9)
Others	2 (6.3)	8 (4.5)	0.9 (0.2, 8.8)
Modes of delivery, (%)			
spontaneous vertex delivery	21 (65.6)	95 (53.7)	0.6 (0.2, 1.5)
lower segment Caesarean section	9 (28.1)	67 (37.9)	Reference
breech	2 (6.3)	15 (8.5)	1.0 (0.2, 10.5)
Respiratory distress syndrome, (%)	22 (68.8)	108 (58.2)	1.4 (0.6, 3.4)
Patent ductus arteriosus, (%)	12 (37.5)	20 (11.3)	4.7 (1.9, 12.0)*
Pneumothorax, (%)	3 (9.4)	15 (8.5)	1.1 (0.2, 4.3)
Bronchopulmonary dysplasia, (%)	1 (3.1)	2 (1.1)	2.8 (0.1, 55.4)
Received ventilatory support, (%)	15 (46.9)	63 (35.6)	1.6 (0.7, 3.6)
Received continuous positive airway pressure, (%)	19 (59.4)	73 (41.2)	2.1 (0.9, 4.8)
Given surfactant therapy, (%)	3 (9.4)	26 (14.7)	0.6 (0.1, 2.2)

Note: 95% C.I.= 95% confidence intervals;
**denotes statistical significance, where p=0.001*

Kuala Lumpur was the largest maternity hospital in Malaysia and was the major referral center for obstetric care in the country. However, the results of our study showed that the rate of use of antenatal steroids, at 47.4%, for premature delivery of gestation of less than 34 weeks was relatively low. Furthermore, only 57.8% (57/99) of the infants given antenatal steroids during our study received a full course of antenatal steroids within 7 days prior to delivery. In other centers in the developed countries during the same period of time, the rate of usage of antenatal steroids has been reported to be as high as 98% in booked cases and 73% for both booked and unbooked cases[21]. Despite this, our study confirmed that a complete course of antenatal steroids given to pregnant mothers within 7 days of delivery resulted in a significantly lower risk of developing RDS in the preterm infants. However, unlike the results of large series studies with samples sizes varied between 1691 infants to 9949 infants[13-15], our study did not show a significant reduction in early mortality with the use of antenatal steroids. One possible explanation for this lack of significance was the relatively small sample size of our study (n=209).

Unlike the results of the study by Doyle *et al*[5], our study did not show that the use of antenatal steroid was significantly associated with reduced need for ventilatory support in our infants. One possible explanation could be due to the relatively small sample size of the ventilated infants (n=78) in our study. However, our study did show that RDS was a significant risk factor in pretem infants. Our study also confirms that the use of antenatal steroids was not associated with significantly increased risk of neonatal septicemia.

Based on the results of our study, we recommend that the use of antenatal steroids in all pregnancies at risk of premature delivery before 34 weeks gestation should be actively promoted among obstetricians in Malaysia. Our results also emphasised the importance of administering a full course of antenatal steroids within 7 days of delivery to women at high risk of premature delivery at gestation between 28 and less than 34 weeks in accordance to the National Institutes of Health (NIH) consensus statement[22].

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