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The Effectiveness of Dexamethasone as an Intrauterine Agent for Fetal Lung Maturation in Preterm Labor at Dr. M. Djamil General Hospital, Padang

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ABSTRACT: **Background:** Preterm birth, defined as delivery before 37 completed weeks of gestation, remains a major contributor to neonatal morbidity and mortality. One of the most serious complications in preterm neonates is respiratory distress syndrome (RDS), which is largely attributable to pulmonary immaturity. Antenatal corticosteroid therapy has been widely adopted to enhance fetal lung development and reduce the incidence of RDS.

Objective: This study aimed to assess the effectiveness of intrauterine dexamethasone administration as an agent for fetal lung maturation in cases of preterm labor at the Obstetrics and Pediatrics Departments of Dr. M. Djamil General Hospital, Padang.

Methods: A descriptive observational study was conducted using medical record data from January to June 2024. A total of 48 women with preterm delivery who received antenatal dexamethasone were included. Maternal characteristics, gestational age, duration and dosage of dexamethasone therapy, and neonatal respiratory outcomes were analyzed using descriptive statistics.

Results: Most patients were aged 20–35 years (69%). The majority of preterm deliveries occurred at a gestational age of 28–34 weeks (92%). Dexamethasone was most frequently administered for 48 hours (54%), and doses greater than 6 mg were used in 83% of cases. The administration of dexamethasone was associated with improvements in neonatal oxygen saturation and respiratory rate in all cases, with favorable heart rate and Apgar score outcomes observed in 96% of neonates. All neonates requiring respiratory support were successfully managed using positive end-expiratory pressure (PEEP).

Conclusion: Antenatal dexamethasone administration was effective in promoting fetal lung maturation and improving early neonatal respiratory outcomes in preterm births. These findings support the continued use of dexamethasone as a standard intervention for women at risk of preterm delivery.

KEYWORDS: dexamethasone; preterm birth; antenatal corticosteroids; fetal lung maturation

I. INTRODUCTION

Preterm birth is defined as delivery occurring before 37 completed weeks of gestation. This condition often arises without a clearly identifiable etiology; however, several contributing factors have been reported, including elective delivery, multiple gestations, and maternal or fetal complications. The risk of preterm birth is multifactorial and varies among individuals, encompassing socioeconomic status, maternal age, uterine abnormalities, history of abortion, smoking behavior, racial factors, and previous obstetric history (1)

Antenatal corticosteroid administration is a critical intervention for enhancing fetal lung maturation in pregnancies at high risk of preterm delivery. Corticosteroids have been shown to significantly reduce the incidence of respiratory distress syndrome (RDS) in preterm neonates by accelerating pulmonary maturation. The mechanism of action involves stimulation of surfactant phospholipid production in type II pneumocytes, which plays a vital role in improving fetal lung function (2)

From a histological perspective, fetal lung development is characterized by the differentiation of alveoli composed of two primary cell types: type I pneumocytes, responsible for alveolar gas exchange, and type II pneumocytes, which are essential for surfactant synthesis and secretion. Antenatal corticosteroid therapy accelerates the maturation of both cell types, as evidenced by epithelial cell flattening, thinning of alveolar septa, and enhanced cytodifferentiation. Furthermore, corticosteroids specifically stimulate surfactant synthesis and release

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through the formation of intracellular corticosteroid–receptor complexes within fetal type II pneumocytes (3). The primary objective of antenatal corticosteroid administration is to promote fetal lung maturity, thereby enabling spontaneous respiration following delivery. Dexamethasone is one of the most commonly used corticosteroids for fetal lung maturation. It enhances surfactant production, leading to improved Apgar scores and a reduced risk of respiratory distress syndrome in preterm neonates(4).

II. METHOD

3.1 Study Design and Setting

This retrospective observational study was conducted at Dr. M. Djamil General Hospital, Padang, Indonesia, a tertiary referral center. Data were collected from medical records of patients who delivered between March and May 2024.

3.2 Study Population and Sample

The study population comprised all women who delivered at the hospital during the study period. The sample included women with preterm delivery who received antenatal dexamethasone for fetal lung maturation in the Obstetrics and Neonatology Inpatient Units.

3.3 Eligibility Criteria

Inclusion Criteria

Women with preterm delivery (≤37 completed weeks of gestation) who received antenatal dexamethasone therapy for fetal lung maturation.

Exclusion Criteria

Incomplete or missing medical record data and cases involving maternal or neonatal death during hospitalization.

3.4 Sampling Method

A consecutive sampling technique was applied, whereby all eligible cases meeting the inclusion criteria during the study period were included in the analysis.

3.5 Data Collection and Variables

Data were extracted using a standardized data collection form. Maternal variables included age, gestational age at delivery, and dexamethasone administration details. Neonatal outcomes related to lung maturation, such as respiratory rate, oxygen saturation, heart rate, Apgar score, and need for respiratory support, were obtained from neonatal records.

3.6 Data Analysis

Secondary data were extracted from hospital medical records of women with preterm delivery and their neonates who received antenatal dexamethasone therapy at Dr. M. Djamil General Hospital between March and May 2024.

3.7 Statistical Analysis

Data were analyzed descriptively using Microsoft Excel. Results are presented as frequencies and percentages to describe maternal characteristics, treatment patterns, and neonatal outcomes.

3.8 Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. Patient confidentiality was ensured through data anonymization. Ethical approval was obtained from the Institutional Review Board of Dr. M. Djamil General Hospital, Padang.

1. RESULTS AND DISCUSSION

Corticosteroids are frequently administered to pregnant women who are at risk of preterm birth. These drugs are used to prevent respiratory distress syndrome (RDS), thereby reducing mortality and morbidity associated with preterm delivery(5). The World Health Organization (WHO) recommends dexamethasone and betamethasone to promote fetal lung maturation and prevent neonatal RDS(6). WHO prefers dexamethasone due to its cost-effectiveness, wide availability, and benefits in various medical applications. In this study, a total of 48 patients who experienced preterm delivery during the period of March–May 2024 were included. The distribution of patients by age group is presented in Table 1. Based on the collected data, the highest number of preterm deliveries occurred in the 20–35 year age group, with 33 patients (69%).

Tabel 1. Number of Patients with Preterm Delivery by Age Group at RSUP Dr. M. Djamil Padang, March–May 2024

Age group	Number of Patients	Percentage (%)
<20 years	1	2%
20-35 years	33	69%
>35 years	14	29%

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The 20–35 year age group represents the reproductive age range, during which pregnancy occurs and the risk of premature rupture of membranes (PROM), one of the causes of preterm delivery, is present (7). The exact cause of PROM in women aged 20–35 years remains unclear and cannot be definitively determined. Possible predisposing factors include infection, cervical incompetence, acquired trauma, socioeconomic conditions, smoking habits, and nutritional deficiencies. Other age groups also carry a risk of preterm birth due to multiple factors. Women aged <20 years are at increased risk of preterm delivery due to the immaturity of reproductive organs and psychological readiness, while women aged >35 years are at higher risk because of increased complications related to reduced optimal strength of the perineal and abdominal muscles (8). The duration of dexamethasone administration in patients with preterm delivery at RSUP Dr. M. Djamil Padang is shown in Table 2. The most common gestational age at preterm delivery in this study was 28–34 weeks, involving 44 patients (92%)

Table 2. Number of Patients with Preterm Delivery by Gestational Age at RSUP Dr. M. Djamil Padang, March–May 2024

Gestational age	Number of patients	Percentage
>28 weeks	4	8%
28-34 weeks	44	92%

This finding is consistent with the theory stating that preterm PROM occurs at gestational ages >28 weeks and <37 weeks (9). Administration of corticosteroids between 23 and 34 weeks of gestation is an effective method for reducing perinatal morbidity and mortality caused by RDS. The Society for Maternal-Fetal Medicine (SMFM) and the American College of Obstetricians and Gynecologists (ACOG) recommend antenatal corticosteroid (ACS) administration for women with singleton pregnancies at 34+0 to 36+6 weeks of gestation who are at high risk of preterm birth within 7 days. In this study, the largest number of patients delivered after 48 hours of dexamethasone administration, totaling 26 patients (Table 3). According to guidelines from ACOG and WHO, corticosteroids to accelerate fetal lung maturation are recommended for pregnancies between 24 and 34 weeks of gestation. Administration is recommended for pregnancies at high risk of preterm birth, including those with premature rupture of membranes. Corticosteroids are recommended to be administered as a single course (4 × 6 mg intramuscularly over 48 hours for dexamethasone) (10). Corticosteroid administration shows optimal effects when the infant is delivered within 24 hours to 7 days after therapy. If maternal or fetal conditions pose significant risks at the time of delivery, such as in cases of severe preeclampsia, delaying delivery for up to 48 hours may be considered to allow corticosteroid administration for fetal lung maturation.

Table 3. Number of Patients with Preterm Delivery by Duration of Dexamethasone Therapy at RSUP Dr. M. Djamil Padang, March–May 2024

Duration	Number of patients	Percentage
24 hours	5	11%
48 hours	26	54%
72 hours	17	35%

The most commonly used dexamethasone dose in this study was >6 mg, administered to 40 patients (83%) (Table 4). A reduction in morbidity and mortality has been shown with intravenous dexamethasone administered at a dose of 6 mg every 12 hours for four doses. The dexamethasone used is generally dexamethasone sodium phosphate.

Table 4. Number of Patients with Preterm Delivery by Dexamethasone Dose at RSUP Dr. M. Djamil Padang, March–May 2024

Dose	Number of patients	Percentage
< 4 mg	0	0%
4-6 mg	8	17%
>6 mg	40	83%

III. CONCLUSION

Administration of dexamethasone is associated with a reduced risk of fetal and neonatal mortality, respiratory distress syndrome (RDS), and intraventricular hemorrhage (IVH), without evidence of an increased risk of infection in either the fetus/neonate or the mother. Antenatal corticosteroid therapy accelerates fetal lung maturation and contributes to a reduction in neonatal morbidity and mortality. These benefits outweigh the potential adverse effects associated with corticosteroid exposure.

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