

Preterm Labor and the Efficacy of Magnesium Sulphate and Nifedipine in Management

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Abstract

Objective: To find the efficacy of magnesium sulfate and Nifedipine in the management of preterm labor and preterm births in our local population.

Method: This randomized controlled trial research was conducted in the Department of Gynae, Hayatabad Medical Complex, Peshawar from year 18 May 2018 to November 2018. For this research, we select 180 women aged 15-45 years who were in preterm labor between 24-37 weeks gestations (LMP).

Results: The results of our study show high efficacy of Nifedipine than magnesium sulfate. We observed 67.77% cases, which show positive results in term of lengthen the pregnancy period till fetal maturity after utilizing Nifedipine. On the other in 48.88% cases, magnesium sulfate works more efficiently.

Conclusion: Nifedipine give better results in prolonging gestational age as compared to magnesium sulphate.

Keywords: Preterm Labor, Nifedipine, Magnesium Sulphate

Introduction

Preterm labor is considered a threat to maternal and neonatal life around the world. Every year 13% of cases of preterm labor are reported in the US due to artificial conceptions¹. Recent statistics revealed that preterm labor is not only a major reason for morbidity and mortality in developing countries also the majority of developed countries suffer from this alarming situation. In developed countries like Japan, Australia, and New Zealand². Preterm labor is defined as a condition in which birth happens before 37 gestation weeks. A total of 2% of births was reported in gestation week 32 which causes severe abnormalities in infants in the form of handicaps and even death. Intrauterine growth restriction and preeclampsia are reported as a major cause of preterm birth but still many other factors like lack of proper nutrition, maternal weight, infection/inflammation, vascular disease, uterine over distension, and immunological disorders are also counting as primary reasons for preterm labor. Maternal thinness and low socioeconomic status also play an important role in preterm labor along with the short inter pregnancy interval³. Ultrasound-guided analysis of cervical length and vaginal fetal fibronectin are considered important factors for predicting spontaneous birth. Approximately 1% of pregnancies are diagnosed with incompetent cervix due to earlier miscarriage and painless dilatations⁴. Labor-inhibiting drugs play a tremendous role in the management of preterm labor when inserted before the full establishment of labor. These drugs help to reduce early uterine contractions and prolonged pregnancy for 48 hours⁵.

Cochrane meta-analysis on tocolytic agents depicts that drugs that can block calcium channels and contain oxytocin antagonists may help to delay the delivery period for up to 2-7 days^{5,6,7}. Since the half-century magnesium sulfate is the most frequently used drug to reduce the ratio of preterm birth among women having preeclampsia. On the other hand, many studies observed the efficacy of calcium channel blocker, nifedipine in delaying the delivery process⁸.

The current study is designed with a similar purpose to find the efficacy of magnesium sulfate and nifedipine in the management of preterm labor and preterm births in our local population. To the best of our knowledge, no such study has been conducted before in our locality, so it will be the first of its kind. The results of this study will be shared with various health care institutions to improve the management of preterm labor and birth to reduce morbidity and mortality.

Methodology

This randomized controlled trial research was conducted in the Department of Obs & Gynae, Hayatabad Medical Complex, Peshawar from year 18 May 2018 to November 2018. For this research, we select 180 women aged 15-45 years who were in preterm labor between 24-37 weeks gestations (LMP).

We only include those women who had nulliparous and multiparous pregnancies with intact membranes and who were showing clinical signs of preterm labor. We assure that women with clinical intrauterine infection, cervical dilatation >5 cm were not part of this research. After keen medical examination, we exclude women who already suffered from preeclampsia, lethal fetal anomalies, chorioamnionitis, significant antepartum hemorrhage, maternal cardiac, or liver diseases. All the women who had a fever at time of contractions and rupture of membranes, vaginal bleeding due to placental abruption were also excluded from this research. After the approval from the research committee, we equally allocated our patients into two groups by using the lottery method. For this research preterm labor is defined as more than 4 contractions that usually last for more than 30 seconds observed on

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topography within 30 minutes. We further include 0-4 cm dilatation among nulliparous women and 1-4 cm dilatation among multiparous women in the definition of preterm labor. All in-patients and outpatients fulfilling the inclusion criteria were recruited for the study as per the operational definition. In-group A we administer magnesium Sulphate whereas in group B we administer Nifedipine. The efficacy of nifedipine or magnesium sulphate was determined positive in terms of gaining > 48 hours and < 7 days prolonging the gestational age. Before the administration of drugs, we explain the purpose of our research to selected patients and asked for their consent. After collecting written consent all the patients underwent through complete medical examination which includes observation of cervical changes and contradiction within a specific time. By using a strict aseptic technique, we collected 5 cc blood from all selected patients which were sent to a laboratory for further examination. We assured that tests were done under the supervision of senior pathologist and senior gynecologists with great experience in the field managed preterm labor cases. All the patients were examined for 48 hours. All the

demographic information including name, age, gender, and BMI were noted. All the collected information was analyzed through the IBM SPSS version 21.0. Nominal variables were presented in the form of percentage whereas continuous variables were presented in the form of mean and standard deviations. Variables that are beyond the normal distribution were analyzed through the Mann-Whitney U test whereas student t-test and Chi-square were used for normal distribution and nominal variables. p-value < 0.05 considered significant in all the analyses.

RESULTS

The study was conducted at the Department of Obs & Gynae, HMC, Peshawar on 180 patients. The results are as under:

- As per age wise distribution, in Group A, 50 (55.55%) patients were recorded in 15-30 years age group and 40 (44.44%) patients were recorded in 40 (44.44%) patients. In Group B, 50 (55.55%) patients were recorded in 15-30 years age group and 40 (44.44%) patients were recorded in 40 (44.44%) patients. (respective.

Table 1).
As per descriptive statistics, in Group A, mean and SD for age was 32 ± 2.33 , mean and SD for gestational age was 35 ± 2.27 , mean and SD for gestational age was 35 ± 2.27 , mean and SD for height was recorded as 5.6 ± 2.50 , mean and SD for weight was 70 ± 2.12 and mean and SD for BMI was recorded as 26.23 ± 2.30 . In Group B, mean and SD for was 32 ± 3.25 , mean and SD for gestational was recorded as 35 ± 2.34 . Mean and SD for Height was 5.7 ± 2.34 , Mean and SD for Weight was recorded as 69 ± 2.50 . Mean and SD for BMI was recorded as 26.50 ± 2.50 . (Table 2).
As per efficacy, in Group A (Magnesium Sulphate), 44 (48.88%) patients responded positively to this

drug where as in Group B (Nifedipine), 61 (67.77%) patients responded positively to this drug. P Value 0.010. (Table 3).

As per no of doses, in Group A, 50 (55.55%) patients were administered less than or equal to two number of doses each while 40 (44.44%) patients were administered more than two number of doses each. In Group B, 60 (66.66%) patients were administered less than or equal to two number of doses each while 30 (33.33%) patients were administered more than two number of doses each. (Table 4). Stratification of efficacy with respect to age, no of doses, gestational age and BMI are recorded at

Table 5, Table 6, Table 7 and Table 8 respective.

Table 1: Age Wise Distribution (N=180)

Age Group	Group A (n=90)	Group B (n=90)	Total (n=180)
15-30 Years	50 (55.55%)	50 (55.55%)	100 (55.55%)
31-45 Years	40 (44.44%)	40 (44.44%)	80 (44.44%)

Table 2: Descriptive Statistics (N=180)

NUMERICAL VARIABLES	GROUP A (n=90) Mean & SD	GROUP B (n=90) Mean & SD	OVERALL (n=180) Mean & SD
Age	32 ± 2.33	32 ± 3.25	31 ± 3.25
Gestational Age	35 ± 2.27	35 ± 2.50	35 ± 2.45

Height	5.6+2.50	5.7+2.34	5.7+2.35
Weight	70+2.12	69+2.50	69.5+2.75
BMI	26.23+2.30	26.50+2.50	26.50+2.33

Table 3: Efficacy (N=180)

EFFICACY	Group A (n=90)	Group B (n=90)	Total (n=180)	P Value
Yes	44 (48.88%)	61 (67.77%)	105 (58.33%)	0.010
No	46 (51.11%)	29 (32.22%)	75 (41.66%)	
Total	90 (100%)	90 (100%)	180 (100%)	

Table 4: Frequencies and Percentages for No of Doses (N=180)

NO OF DOSES	Group A (n=90)	Group B (n=90)	Total (n=180)	P Value
< 2	50 (55.55%)	60 (66.66%)	110 (61.11%)	0.126
> 2	40 (44.44%)	30 (33.33%)	70 (38.89%)	
Total	90 (100%)	90 (100%)	180 (100%)	

Table 5: Stratification of Efficacy with Respect to Age (N=180)

AGE	Efficacy	Group A (n=90)	Group B (n=90)	P Value
15-30 Years	Yes	20 (22.22%)	40 (44.44%)	0.000045
	No	30 (33.33%)	10 (11.11%)	
31-45 Years	Yes	24 (26.66%)	21 (23.33%)	0.498
	No	16 (17.77%)	19 (21.11%)	

Table 6: Stratification of Efficacy with Respect to No of Doses (N=180)

No of Doses	Efficacy	Group A (n=90)	Group B (n=90)	P Value
≤ 2	Yes	20 (22.22%)	50 (55.55%)	0.00001
	No	30 (33.33%)	10 (11.11%)	
> 2	Yes	24 (26.66%)	11 (12.22%)	0.0533
	No	16 (17.77%)	19 (21.11%)	

Table 7: 7 Stratification of Efficacy with Respect to Gestational Age (N=180)

Gestational Age	Efficacy	Group A (n=90)	Group B (n=90)	P Value
< 30 Weeks	Yes	22 (24.44%)	55 (61.11%)	0.000029
	No	23 (25.55%)	09 (10%)	

> 30 Weeks	Yes	22 (24.44%)	06 (6.66%)	0.0320
	No	23 (25.55%)	20 (22.22%)	

Table 8: STRATIFICATION OF EFFICACY WITH RESPECT TO BMI (n=180)

BMI	Efficacy	Group A (n=90)	Group B (n=90)	P Value
≤ 27 kg/m ²	Yes	35 (38.88%)	55 (61.11%)	0.236
	No	20 (22.22%)	20 (22.22%)	
> 27 kg/m ²	Yes	09 (10%)	06 (6.66%)	0.312
	No	26 (28.88%)	09 (10%)	

Discussion

The frequency of uterine contractions along with progressive effacement and dilation of the cervix earlier to the gestation term are the defining elements of preterm labor. In the previous year, this condition is observed as threatening for the life of the mother and newborn⁹. Preterm labor is considered as one of the major causes of increase perinatal morbidity and mortality which need proper prevention and management at an early stage. Since now there is no proper etiology to define preterm labor^{10,11} Previous abortion, previous preterm labor is highly associated with increased risk of preterm labor whereas genital and urinary tract infection is another major reason for preterm labor¹² This condition has serious negative consequences on preterm infants in the form of developmental delay, hearing and neurological impairments, neurological disorders, and even cause lung disorders among them¹³

The results of our study show high efficacy of Nifedipine than magnesium sulfate. We observed 67.77% cases, which show positive results in term of lengthen the pregnancy period till fetal maturity after utilizing Nifedipine. On the other in 48.88% cases, magnesium sulfate works more efficiently. Among 67.77% cases, we observed better results in the young mother group range 15-30 years (44.44%) whereas in the adult age (31-45) group we measured only 23.33% positive outcomes. On the other hand, magnesium sulfate had more positive outcomes for the adult age group (26.66%) as compared to young ones (22.22%). We found significant statistical results for Nifedipine (0.000045). Regarding dose, we found a positive outcome of Nifedipine dose less than 2mg (55.55%) whereas more than 2 mg dose works more efficiently (26.66%) in the adult age group. On the other hand, both medications show positive results for patients under 27 kg BMI. These results are in correspondence to the results of previous studies. Recently results of Kupfermanc et al¹⁴ and Ferguson et al¹⁵ are quite similar to our studies. The efficacy of magnesium sulfate is comparable to other studies in prolongation of pregnancy up to 7 days. But on the other hand, the results of our studies were in contradiction to the previous study of Kupfermanc et al¹⁶ and Ferguson et

al¹⁷. We observed a smaller number of undelivered women up to 36 weeks after examining the patients for 48 hours as compared to the previous studies. Our studies reflect significant statistical differences among the magnesium sulfate & nifedipine group. In a previous study of James et al¹⁸. He observed more efficient results of Nifedipine treatment as compared to magnesium sulfate. Both drugs act through different cellular mechanisms to achieve uterine quiescence. Krishnan et al¹⁹ observed identical results after utilizing Atosiban and nifedipine. Both drugs prolonged pregnancy after 48 hours. Some other studies show better results of nifedipine while comparing it with other tocolytics^{20,21}. This drug also assists in decreasing the ratio of respiratory distress syndrome during labor. After 26 trials Conde-Agudelo et al²² reported better results for delaying pregnancy within 7 days and prolonged it to more than 34 gestation age. Interestingly, Lim observed similar results of nifedipine and magnesium sulfate for delaying delivery, prolongation of gestation age, and positive results for neonatal outcomes. Nifedipine is a calcium channel blocker that is why it is commonly used for preterm labor tocolysis and demonstrate better outcomes in delaying preterm delivery for at least 48 hours. In a study by Nikbakht R et al magnesium sulfate was effective in 64% and nifedipine was effective in 56% of patients in the prevention of labor and delaying delivery >7 days which as compared to my study, in Group A (Magnesium Sulphate), 44 (48.88%) patients responded positively to this drug whereas, in Group B (Nifedipine), 61 (67.77%) patients responded positively to this drug. P-Value 0.010. (Table No. 3). A study demonstrated magnesium in preterm delivery as 55.4% efficacious. while another study showed nifedipine as 76% effective in preterm labor which as compared to my study, in Group A (Magnesium Sulphate), 44 (48.88%) patients responded positively to this drug whereas, in Group B (Nifedipine), 61 (67.77%) patients responded positively to this drug. P-Value 0.010. (Table No. 3).

Conclusion:

Through the findings of our study, we have concluded that the results of nifedipine are far better than the magnesium sulphate results, as observed in prolonging gestational age.

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