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The Characteristics of Vaginal Labor with Ripening and Induction with Intravaginal Misoprostol in Prof. Dr. I.G.N.G. Ngoerah Hospital Denpasar during the Period of June 2016 to May 2019

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Abstract

BACKGROUND: Labor induction is the process of initiating labor by pharmacologic agents or other measures. The advantages and disadvantages of labor induction are still a controversy that is much debated.

AIM: The aim of the study was to determine the characteristics of vaginal delivery with intravaginal misoprostol induction.

METHODS: This is a retrospective descriptive study at Sanglah General Hospital, Denpasar, during the period of June 1st, 2016-May 31st, 2019. Data for the eligible cases were obtained from the medical records.

RESULTS: A total number of 114 deliveries with intravaginal misoprostol induction were obtained during the study period. Seventy-one cases (61.4%) met the inclusion criteria and 43 cases (38.6%) were excluded from the study. Of the 71 cases, 52 cases (73.23%) succeeded in vaginal delivery and 19 cases (26.76%) failed to be induced and underwent a cesarean section. Most cases of vaginal delivery with intravaginal misoprostol induction occurred in nulliparous women, term pregnancy, without a history of rupture of the membranes, and with a pelvic score (PS) of 4.

CONCLUSION: Majority of misoprostol induction succeeded in vaginal delivery and it was more prevalent among nullipara, term pregnancy, without a history of rupture of the membranes, and with a PS of 4.

Introduction

Labor induction is the process of initiating labor before there are signs of labor with the use of pharmacologic agents or other measures with the ultimate goal of delivering the baby and the placenta. Induction of labor usually occurs in cases of infants with severe congenital defects, stunted fetal growth, intrauterine infections, late pregnancy, and for maternal indications such as preeclampsia with severe features, heart disease, diabetes, or other chronic diseases that warrant pregnancy termination. Every physician has to consider the advantages and disadvantages of labor induction for the mother and the baby.

In recent years, the incidence of labor induction has been increasing. Data from the World Health Organization Global Survey On Maternal and Perinatal Health in 2004–2008 show that 9.6% of all deliveries result from labor induction. In the United States, the incidence of induction of labor increased significantly from 9.0% in 1989 to 18.4% in 1997, then increased to 23% in 2009. In Indonesia, from 500,000 women at risk, 200,000 of them underwent induction of labor and 300,000 performed cesarean section [1].

Regarding the advantages and disadvantages of labor induction is still a controversy that is much debated. Besides the advantages of accelerating the cervical ripening process, shortening the time of delivery, and reducing the number of infections during labor, labor induction also has a detrimental effect, namely, a hypertonic uterus that causes fetal distress and can end in failure and must end in cesarean section [2]. Therefore, labor induction must follow the indications for the mother and the fetus, not merely to speed up the labor process.

Various types of induction methods are present according to their efficacy and safety, i.e., oxytocin, dinoprostone (prostaglandin E2), and misoprostol (prostaglandin E1). The use of dinoprostol and oxytocin is considered less effective due to their high cost and instability to temperature, making storage difficult.

Misoprostol is a synthetic prostaglandin E1 which is a drug that is considered safe by the American Drug Administration (FDA) as a drug to prevent gastric ulcers due to non-steroidal anti-inflammatory drugs. The use of misoprostol in childbirth is still controversial in the United States regarding the effects of uterine hyperstimulation. However, the current use of misoprostol is preferred because it is cheap, stable at room temperature, easy storage, and easy use for cervical ripening and labor induction. In cases where the cervix is immature, the use of more misoprostol provides several advantages so that it can reduce the incidence of cesarean section [3].

The widespread use of misoprostol for labor induction but the lack of study data regarding the factors associated with the success of vaginal delivery and the side effects of using misoprostol induction in Bali, especially at Sanglah General Hospital, Denpasar, is why the authors are interested in conducting a descriptive study to determine the characteristics of vaginal delivery with intravaginal misoprostol induction at Sanglah General Hospital Denpasar in the period June 1st 2016 to May 31st 2019.

Materials and Methods

This study is a retrospective descriptive study at Division of Maternal Fetal Medicine, Department of Obstetrics and Gynecology, Faculty of Medicine Udayana University/Sanglah General Hospital during the period of June 2016–May 2019. All eligible cases of vaginal delivery with intravaginal misoprostol induction during the study period are recruited into the study population. Data were obtained from the medical records. The study inclusion criteria were cases with complete medical records. The exclusion criteria were (1) missing or incompletely filled medical records of patients with a history of vaginal delivery with intravaginal misoprostol induction and (2) induction in intrauterine fetal death. Data were analyzed using SPSS software ver. 25.

Results

During the period of June 1st, 2016–May 31st, 2019, the total number of deliveries with intravaginal misoprostol induction was 114 cases. Seventy-one cases (61.4%) met the inclusion criteria and 43 cases (38.6%) were excluded. Of the 71 cases that met the inclusion criteria, 52 cases (73.23%) succeeded in vaginal delivery and 19 cases (26.76%) failed to be induced and subsequently underwent a cesarean section. The distribution of the characteristics of labor induction with intravaginal misoprostol at Sanglah General Hospital Denpasar in 2016–2019 is summarized in Table 1.

Table 1: The distribution of the characteristics of labor induction with intravaginal misoprostol at Sanglah General Hospital Denpasar in 2016–2019

Subject characteristics	Induction of labor (%)		Total (%)
	Success	Failed	n=71 (100)
	(n=52; 73.23)	(n=19; 26.76)	
Parity			
Nulipara	32 (61.5)	13 (68.4)	45 (63.4)
Multipara	20 (38.8)	6 (31.6)	26 (36.6)
Gestational age			
Preterm	7 (13.5)	6 (31.5)	13 (18.3)
Term	45 (86.5)	12 (68.5)	57 (81.7)
Post-term	0 (0)	0 (0)	0 (0)
History of rupture of membranes			
Yes	23 (44.2)	5 (26.3)	28 (39.4)
No	29 (55.8)	14 (73.7)	43 (60.6)
Pelvic score			
1	3 (5.8)	5 (26.3)	8 (11.2)
2	14 (27)	4 (21)	18 (25.4)
3	17 (32.6)	5 (26.3)	22 (31)
4	18 (34.6)	5 (26.3)	23 (32.4)

The average time required to achieve cervical maturation, labor, and complete cervical dilatation among the group successfully induced are shown in Table 2 following.

Table 2: Average time required to achieve cervical maturation, labor, and complete cervical dilatation

Characteristics	Successful misoprostol induction			
	Total	PS Ripe	In Labor	Complete CD
		H	H	H
Parity				
Nulipara	40	0	6.50	9.72
Multipara	22	0	6.58	10.14
Preterm	11	0	8.00	10.57
Gestational age				
Aterm	51	0	6.19	9.66
Post-term	0	0	0	0
History of rupture of membranes				
Yes	27	0	6.15	8.71
No	35	0	6.98	10.68
Pelvic score				
1	5	0	9.20	11.86
2	17	0	7.62	10.80
3	20	0	6.01	9.89
4	20	0	5.39	8.50
Fetal weight				
<2500 g	17	0	7.12	9.77
2500–4000 g	45	0	6.39	9.79
>4000 g	0	0	0	0

Discussion

In this study, we observed that the majority of misoprostol induction succeeded in vaginal delivery and it was more prevalent among nullipara, term pregnancy, without a history of rupture of the membranes, and with a pelvic score (PS) of 4.The results of this study are consistent with other studies conducted by Jahromi *et al*., in Iran where 200 women underwent labor induction with intravaginal misoprostol (n = 100) compared with sublingual misoprostol (n = 100). The number of vaginal deliveries was higher in group with intravaginal misoprostol (86%) [4]. The intravaginal route of administration of misoprostol is associated with slower absorption, lower peak plasma levels, and slower clearance, similar to the action of extended-release

preparations. Intravaginal administration of misoprostol is associated with greater overall exposure to the drug and a greater effect on the cervix and uterus [5].

Nulliparous women were the most prevalent subject to underwent labor induction. A total of 45 cases (63.4%) achieved successful induction (61.5%, 32 cases). This result is not in line with the study conducted by Wing *et al*., which found that nulliparous mothers experienced more failure of induction, namely, 34.5% (n = 152) compared to multiparous mothers, namely, 10.1% (n = 24) of all cases of labor induction with intravaginal misoprostol. A study by Thorsell *et al*. also found that nulliparous was associated with an increased risk of induction failure [6], [7]. At term gestation, labor induction was most often performed, as many as 57 cases (81.7%) in this study. The success rate of labor induction at term gestation was higher than failed cases, i.e., 86.5% (45 cases) versus 68.5% (12 cases). At preterm gestation, there were 7 cases (13.5%) who were successfully induced and 6 cases (31.5%) failed induction.

A similar study conducted at the University of Mississippi Medical Center found that at term pregnancy, 363 cases (40.11%) were successful in the induction of labor, compared to 170 cases (18.78%) who failed induction, which was then performed for cesarean sections. This study also found that preterm gestational age is more at risk for failure of induction than at term gestation. However, in this study, it was stated that the posterior gestational age was not significantly associated with induction failure [8].

Based on history of rupture of membrane, there were a total of 28 cases (39.4%) with a history of labor induction with intravaginal misoprostol induction, of which 23 cases (44.2%) were successfully induced and 5 cases (26.3%) failed to induce labor. Of the 43 cases of induction without a history of rupture of the membranes, 29 cases (55.8%) were successful in the induction of labor, whereas 14 cases (73.7%) failed to induce labor. This study is in line with a study by Kehl *et al*., who found that administering misoprostol for labor induction when compared to placebo significantly increased the success of vaginal delivery for <12 h in cases with a history of rupture of the membranes [9].

In this study, it was found that labor induction was most often performed at a PS of 4, namely, a total of 23 cases (32.4%). The highest success rate of labor induction was PS 4, namely, 18 cases out of 23 cases (78.26%). The results in this study are in line with research by Arif *et al*., which states that a PS of 5 or more is considered significant for a mature cervix, the greater the PS, the higher the likelihood of successful labor induction [10]. In line with other studies by Ennen *et al*., it was found that the risk of induction failure and cesarean delivery was significantly increased by 73% (n = 25) compared to the number of vaginal deliveries 54% (n = 9) at a PS of ≤1 [8].

A systematic review conducted by Kolkman *et al*. found that the PS turned out to be a poor predictor of successful induction of labor even though these patients had a high PS. However, in his study, it was stated that the data included the overall PS assessment, not one part of the PS assessment points [11].

A study by Vallikkannu *et al*. also found that Bishop score was an independent predictor of labor within 24 h. However, Marsdal *et al*. did not find that bishop score was an independent predictor of induction with vaginal misoprostol. However, their analysis included only women with unfavorable Bishop scores, excluded those with ruptured membranes, and did not evaluate oral misoprostol. The time predictors for vaginal delivery were cervical dilatation and parity. A study by Arif *et al*. also found that cervical thinning was an independent predictor of labor induction. The Bishop score was not an independent predictor for the induction of the time of vaginal delivery, but cervical thinning and dilation were independent predictors and therefore probably the most important aspect of the Bishop score [10], [12], [13].

In this study, all cases of successful misoprostol induction could not detect ripening when evaluated. On average, it immediately reaches the intrapartum stage followed by complete cervical dilatation. In the parity characteristic, nulliparous reached the complete cervical dilatation phase faster, with an average time of 9 h 43 min compared to multiparous, with an average time of 10 h 8 min. The average time to reach interstate was also faster in multiparous, namely, 6 h 30 min. This is different from the study by Wing *et al*., which found the average time required for vaginal delivery to intravaginal misoprostol induction in multiparous mothers was shorter than nulliparous mothers, namely, 13.4 h versus 29.2 h [7].

In terms of gestational age characteristics, the average time required to reach complete cervical dilatation and delivery at term is 6 h 11 min for delivery and 9 h 40 min to achieve complete cervical dilatation. This study is in line with the study of Ennen *et al*., who found that at term pregnancy was more successful than induction failure [8].

This study also found that a history of rupture of membranes accelerated the average time of induction with intravaginal misoprostol, which is 6 h 9 min of the time needed to reach labor in cases with a previous history of rupture compared to cases without a history of rupture, which was 6 h 59 min. The time to reach a complete cervical dilatation in cases with rupture of membranes was faster, namely, 8 h 43 min compared to 10 h 41 min in cases without previous rupture of the membranes [9].

In the PS, it was found that the PS 4 value had the fastest average time to achieve the complete cervical dilatation, which was 8 h 30 min and it took an average time to reach into labor, which is 5 h 23 min. This study is in line with study by Wing *et al*., who found that

a greater PS is considered significant in achieving the success of labor induction with intravaginal misoprostol and shortening the average time in vaginal delivery and shortening the time for cervical ripening [7].

Characteristics of infant body weight in this study were divided into three groups, namely, baby weight <2500 g, baby weight born 2500–4000 g, and baby weight >4000 g, in this study there were no cases with infant weight >4000 g. Babies with birth weight 2500–4000 g have a faster time to reach labor, namely, 6 h 23 min compared to birth weight <2500 g which takes 7 h 7 min to reach labor. This is in line with a study by Lao and Cheng who found that the greater the baby's body weight has a significant effect on vaginal delivery within 12 h [14].

A study by Acharya *et al*. showed that misoprostol appears to have less hyperstimulation than oxytocin. There was no difference in neonatal outcomes other than greater base excess in the oxytocin group in multiparous women. This study does not have sufficient power to evaluate uncommon neonatal or maternal side effects, but it is important to consider this alkaline excess effect in larger trials with sufficient power to evaluate uncommonly, but important, neonatal outcomes [15].

Conclusion

In 1 year from 1 June 2016 to 31 May 2019, there were 71 cases of vaginal misoprostol induction (61.4%) out of a total of 114 cases of labor induction. Most cases of vaginal delivery with intravaginal misoprostol induction occurred in nulliparous women (parity 0), gestational age at term, in pregnancies without a history of rupture of the membranes, and at a PS of 4.

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