

Characteristics of Vaginal Delivery with Ripening and Intravaginal Misoprostol Induction in Sanglah General Hospital

Wayan Artana Putra¹, Sudung Reinhard M Siahaan²

Department of Obstetrics and Gynecologic, Medical Faculty of Udayana University-Sanglah Hospital Denpasar, Bali, Indonesia

Abstract: *Ripening is a cervical softening process where this process plays an essential role in cervical dilation. Meanwhile, labor induction is a process to start labor before there are signs of delivery with the help of medical pharmacology or medical action with the ultimate goal of giving birth to the baby and the placenta. Ripening and induction are urgently needed in various obstetric cases such as term pregnancy, hypertension in pregnancy, and premature rupture of membranes. Various types of induction methods can be selected according to their efficiency and safety, namely oxytocin, dinoprostone (prostaglandin E2), and misoprostol (prostaglandin E1). However, the current use of misoprostol is preferred because it is cheap, stable at room temperature, accessible storage, and easy to use for cervical ripening and labor induction. This study aimed to find out the characteristics of vaginal delivery with intravaginal misoprostol induction at Sanglah General Hospital Denpasar. This was a retrospective descriptive study involving women who delivered vaginally with intravaginal misoprostol induction in the delivery room of Sanglah General Hospital Denpasar from June 1st, 2017 to May 31st, 2019 including with the sampling total. Maternal age, gestational age, parity, rupture of membranes history, pelvic score, and birth weight data were collected from medical records. The data were analyzed by using the SPSS. This study included 37 cases of vaginal misoprostol induction in Sanglah General Hospital Denpasar (60.66%) out of a total of 61 cases of labor induction. The success rate of labor induction with misoprostol was 72.97%.*

Keywords: Ripening, Misoprostol, Induction

1. Introduction

Ripening is a cervical softening process where this process plays an essential role in cervical dilation. Meanwhile, labor induction is a process to start labor before there are signs of delivery with medical pharmacology or medical action with the ultimate goal of giving birth to the baby and the placenta. Considering the induction of labor or start labor before its onset, concerning more benefits for mother and baby than disadvantages [1].

In recent years, the process of labor induction is increasingly being carried out throughout the world, data from the WHO global survey on maternal and perinatal health in 2004 - 2008 shows that 9.6% of all deliveries result from the labor induction process. In Indonesia, WHO has received from 500,000 women with risky deliveries, 200,000 of them were induced labor, and 300,000 were undergoing to cesarean section [2].

Ripening and induction are need in various pregnancy cases, such as gestational pregnancy, gestational hypertension, and premature rupture of membranes. Regarding the advantages and disadvantages, labor induction is still a controversy. Besides the benefits of accelerate the cervical ripening process, shortening the delivery time, 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. So that for induction of labor, it must be following the indications for the mother and the fetus, not merely accelerate the labor process [3].

Various induction methods can be selected according to their efficiency and safety, namely oxytocin, dinoprostone

(prostaglandin E2), and misoprostol (prostaglandin E1). Dinoprostone and oxytocin is a less effective approach due to its high cost and stability 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. Misoprostol is currently preferred because it is cheap, stable at room temperature, accessible storage, and easy to use for cervical ripening and labor induction [4].

Due to the increasing use of labor induction with misoprostol but the lack of research data regarding the factors associated with the success of vaginal delivery using intravaginal misoprostol induction in Bali, especially at Sanglah General Hospital Denpasar, the authors are interested in conducting a descriptive study to determine the characteristics of vaginal delivery with intravaginal misoprostol induction in Sanglah Hospital Denpasar in the 2017-2019 period.

2. Literature Survey

Definition and Physiology of Labor

Childbirth is a process in which the uterus contracts can cause dilation of the cervix, resulting in the expulsion of the fetus from the uterus. Several theories state the labor process, one of which is a decrease in progesterone levels, where the function of progesterone is to cause relaxation of the uterine muscles or maintain uterine calm until the end of pregnancy. During pregnancy, there is a balance between decreasing progesterone levels so that it arises [1].

Uterine Cervical Anatomy and Physiology

The cervix consists of loose and dense connective tissue. The main component of this connective tissue is collagen, with several elastic tissues. Apart from connective tissue, there is not much muscle tissue. During pregnancy, the function of the cervix is to keep the fetus in the uterus. The cervix must withstand pressure from the uterus, fetal growth, and pressure from the amniotic fluid to perform this function. After a term, the cervix will slowly soften, shorten and dilate, eventually entering labor. After delivery, the cervix will return to its previous shape and consistency. The process of cervical ripening reduces the number of collagen fibers minimizes the strength of collagen and reduces the power of the extracellular matrix. The changes made by cervical ripening enhance the proteoglycan dermatan sulfate, in which the collagen fibers separate. All changes lead to thinning and softening of the cervix [5, 6, 7].

Misoprostol for Induction of Labor

Misoprostol is a synthetic analog of prostaglandin E1 used off-label for various indications in obstetrics and gynecology, such as medication abortion, removal of conception in miscarriage, management of fetal death in utero, and cervical ripening in labor induction. Misoprostol has a beneficial effect on the cervix, with a bishop score of less than five. A meta-analysis of the Cochrane database concludes that intravaginal misoprostol is more effective in inducing labor than the conventional method using oxytocin. Several routes of administration of misoprostol, intravaginal administration is the most effective route and the least effective route by mouth. As a cervical induction and ripening drug, misoprostol doses are used starting from a low dose of 25 µg every four to six hours, whereas higher doses are administered hyperstimulated. Regular observation of uterine contractions, health deficiencies, and cervix for bishop scores should be made [8, 9].

Advantages and disadvantages of using Misoprostol

Based on several clinical comparisons of misoprostol to oxytocin as the most widely used induction protocol, it has been suggested that the use of misoprostol has shown better results. In women in the misoprostol group, the average induction time was 253 minutes, whereas, in oxytocin, it took 352 minutes. According to the interval from induction to the end of labor, the misoprostol group showed significantly better results. In the misoprostol group, 81% of women delivered within 24 hours, while in the oxytocin group, only 62%. Vaginal deliveries occurred in 81% of the misoprostol group and 64% in the oxytocin group. The use of misoprostol for cervical ripening and induction led to a 47% reduction in the risk of cesarean section. Intravaginal administration of misoprostol appears to reduce the time required for delivery (15.91 hours compared with 37.68 hours). When compared with oral administration, the incidence of hyperstimulation (22.8% versus 5.0%) [10, 11].

3. Methods

Retrospective descriptive study was conducted at delivery room and Installation of medical records Sanglah General Hospital Denpasar. Sampling was conducted with inclusion The average age of the subjects who participated in this study was 26.03 + 5.75 years. In the group of successfully

criteria that are patients with a history of vaginal delivery with intravaginal misoprostol induction in the delivery room of Sanglah General Hospital in Denpasar for the period of June 1st, 2017 to May 31st, 2019. The exclusion criteria of this study were missing or incompletely filled medical records of patients with a history of vaginal delivery with intravaginal misoprostol induction. Medical record data of patients with a history of vaginal delivery with intravaginal misoprostol induction in labor with intra-uterine fetal death.

4. Result and Discussion

Table 1 show characteristics of labor induction with intravaginal misoprostol. Thirty seven patients that met the inclusion criteria, 27 patients were successfully induced and delivered vaginally, and ten patients failed to be rendered and performed a cesarean section. Another study conducted by Navamar in 2016 in Iran, it was found that in 200 women who underwent labor induction with intravaginal misoprostol (n= 100) compared to sublingual misoprostol (n = 100), it was found that labor induction with intravaginal misoprostol was higher in the number of vaginal deliveries, namely 86% (n = 86), and births with lower cesarean section, that is 14% (n = 14) [12].

Table 1: Characteristic of Samples

Karakteristik Subyek	Keberhasilan Induksi		Total n = 37 (100%)
	Berhasil (n = 27; 72,97%)	Tidak Berhasil (n = 10; 27,03 %)	
Usia (tahun)	25,96 ± 6,25	26,20 ± 4,42	26,03 ± 5,75
Paritas			
Nulipara	18 (69,2%)	8 (30,8%)	26 (70,27%)
Multipara	9 (81,8%)	2 (18,2%)	11 (29,73%)
Usia Kehamilan			
Preterm	6 (60%)	4 (40%)	10 (10,27%)
Aterm	21 (77,8%)	6 (22,2%)	27 (72,97%)
Post-term	0 (0%)	0 (0%)	0 (0%)
Riwayat pecah ketuban			
Ya	9 (69,2%)	4 (30,8%)	13 (35,14%)
Tidak	18 (75%)	6 (25%)	24 (64,86%)
Pelvic Score			
1	2 (50%)	2 (50%)	4 (10,81%)
2	10 (76,92%)	3 (23%)	13 (35,14%)
3	9 (75%)	3 (25%)	12 (32,43%)
4	6 (75%)	2 (25%)	8 (21,62%)
Berat Bayi Lahir			
< 2.500 gram	7 (58,3%)	5 (41,7%)	12 (32,43%)
2.500 – 4.000 gram	20 (80%)	5 (20%)	25 (67,57%)

induced, the average age was 25.96 ± 6.25, and 26.20 ± 4.42 in the group labor induction failed, that ends with cesarean

section. A study conducted by Kim in 2017 found that young age was one of the factors that determined the success of vaginal labor induction. Based on research conducted by Batinelli, maternal age is not a factor that determines the success of labor induction [13, 14].

In this study, the level of misoprostol induction in nulliparous patients was 18 subjects (69.2%), while in multiparous patients, it was nine subjects (81.8%). These results are consistent with research conducted by Wing in 2013, which received a more significant increase that is 89.9% for nulliparous and 66.5% for multiparous from women misoprostol induced [15].

The pregnancy criteria for gestation at gestational age are divided into preterm (28 - 36 weeks), term pregnancy (37 - 42 weeks), and post-term pregnancy (> 42 weeks). In pregnancy, the most frequent induction of labor was 27 cases (72.97%). The rate of increase in induction of labor and pregnancy was higher than the cases that failed, that are 77.8% (21 cases) and 60% (6 cases), respectively. There were six cases (22.2%) that were successfully induced in preterm pregnancies, and four cases (40%) failed the induction. In this study, there were no post-term cases that underwent labor induction. A similar study by the University of Mississippi Medical Center found that in term pregnancies were successfully induced, that are 363 cases (40.11%) than 170 cases (18.78%) that failed to induce labor. This study also found that preterm pregnancies were more at risk for failure to induce a pregnancy at term. However, in this study, it was stated that post-term pregnancy was not significantly associated with induction failure [16].

Based on the history of rupture of membranes, there were a total of 13 cases (35.14%) has a history of labor induction with intravaginal misoprostol induction, which nine cases (69.2%) were successfully induced and four cases (30.8%) failed to induce labor. Twenty four cases of induction without a history of rupture of membranes, 18 cases (75%) were successfully induced, while 6 cases (25%) failed to induce labor.

This study was consistent with the study by Lin which stated that giving misoprostol for labor induction compared to placebo significantly increased the success of vaginal delivery for less than 12 hours in cases with a history of rupture of the membranes [17].

In this study, that labor induction was most often performed at a pelvic score of 2, that is a total of 13 cases (35.14%), the success rate of labor induction was found to be approximately the same for a pelvic score above 1, that are 76.92% (n = 10), 75 % (n = 9), and 75% (n = 6) for patients with a pelvic score of 2,3, and 4. The results in this study are appropriate with research by Crane, which states that the pelvic score is five or more consider significant for cervical ripening. The greater the pelvic score, the greater successful labor induction. A systematic review by Kolkman represents the pelvic score turned out to be a poor predictor for determining the success of labor induction even though these patients had a high pelvic score. However, in his research represent the data included the overall pelvic score

assessment, not one part of the pelvic score assessment points [9, 18].

Table 2: Average time to Success of Intravaginal Misoprostol Induction

Karakteristik		Induksi Misoprostol Berhasil		
		Jumlah	Inpartu Waktu (Jam)	Ø Lengkap Waktu (Jam)
Paritas	Nullipara	26	6,76	9,44
	Multipara	11	6,00	9,09
Usia Kehamilan	Preterm	10	7,40	10,00
	Aterm	27	6,22	9,07
	Postterm	0	0	0
Riwayat Pecah Ketuban	Ya	13	6,15	9,08
	Tidak	24	6,75	9,46
Pelvic Score	1	4	8,00	10,75
	2	13	6,54	9,38
	3	12	6,58	9,00
	4	8	5,75	9,00
Berat Bayi	<2500gr	12	7,17	9,50
	2500-4000gr	25	6,24	9,24

In the parity characteristic, nulliparous reached the complete dilation phase more slowly, with an average time of 9.44 hours than multiparous, with an average time of 9.09 hours. The average time to get into intrapartum is also slower in nullipara that is 6.76 hours. This study consistent with Wing's research, which represents the average time required for vaginal delivery to intravaginal misoprostol induction in multiparous mothers was shorter than nulliparous mothers, that is 13.4 hours versus 29.2 hours [13].

In terms of gestational age characteristics, the average time required to achieve complete dilation is 6.22 hours for intrapartum and 9.07 hours to reach full dilation. This study follows Ennen's research, which found that during term pregnancy, labor induction was more successful than induction failure [16].

This study also found that a history of rupture of membranes accelerated the average time of induction with intravaginal misoprostol, namely 6.15 hours required to reach labor in cases with a history of rupture of membranes compared to cases without a history of rupture of the membranes, namely 6.75 hours. The time to reach a full dilation in cases with rupture of membranes was faster 9.08 hours than 9.46 hours in cases without previous rupture of membranes. Based on the study by Lit, the administration of misoprostol induction significantly increased the success of vaginal delivery in less than 12 hours in cases with a history of rupture of membranes [17].

In the pelvic score, score 4 had the fastest average time to achieve a complete cervical dilation, which is 9 hours and an average of 5.75 hours to reach intrapartum. This study consistent with Wing's research which found that a higher pelvic score was considered significant in achieving successful labor induction with intravaginal misoprostol and shortening the average time of vaginal delivery, and shortening the time for cervical ripening [15].

At birth weight, 2500 - 4000 g has time to reach labor faster than birth weight <2500 g, i.e., 6.24 hours compared to 7.17

hours. However, the time to get complete dilation was not too different in these two groups, that is 9.5 hours and 9.24 hours for the group with a birth weight of 2500 - 4000 g and the group with a birth weight <2500 g, respectively. This study the same as Crane's research that the baby's body has a significant effect on vaginal delivery within 12 hours [9].

5. Conclusion

In one year, from June 1st, 2017 to May 31st, 2019 there were 37 patients out of a total of 61 labor induction patients. Based on age, vaginal delivery with intravaginal misoprostol induction was successful with an average age of 25.96 ± 6.25 years. Based on parity, most cases occurred in nulliparous mothers with an average intrapartum time of 6.76 hours and an average complete dilation time of 9.44 hours. Based on gestational age, most cases occurred at term gestation with an average intrapartum time of 6.22 hours and an entire dilation time of 9.07 hours. Based on the history of amniotic rupture, it occurred in pregnancies without a history of rupture of the membranes, with an average intrapartum time of 6.75 hours and an average time of complete dilation 9.46 hours. Based on the pelvic score, the highest number occurred in the pelvic score with an average intrapartum time of 6.54 hours and an average complete dilation time of 9.38 hours.

6. Future Scope

This study is a preliminary study that can be used as a reference regarding vaginal delivery with intravaginal misoprostol induction in the obstetrics and gynecology section, so it is necessary to carry out further research to see the overall relationship that has been described by monitoring intravaginal misoprostol induction so that it can be used in labor induction.

References

- [1] Cunningham F.G., Leveno K.J., Bloom S.L., Dashe J.S., Hoffman B.L., Casey B.M., Spong C.Y. 2018. William Obstetrics. 25th Ed. McGraw-Hill Education. Duff Patrick, *et al.* 2005. Obstetrics & Gynecology International edition. USA. Library of Congress Cataloging in Publication.
- [2] WHO. 2010. Global Survey on Maternal and Perinatal Health. Global Survey Database Crude Tabulations. Geneva: World Health Organization; Available at: http://www.who.int/entity/reproductivehealth/topics/best_practices/globalsurveyoriginal/en/index.html.
- [3] Hofmeyr, GJ. Gulmezoglu, AM. Pileggi, C. 2010. Vaginal Misoprostol for Cervical Ripening and Induction of Labour. The Cochrane Collaboration. DOI : 10.1002/14651858.CD000941.pub2.
- [4] Kundodyiwa, TW. Alfirevic, Zarko. Weeks, Andrew D. 2009. Low-Dose Oral Misoprostol for Induction of Labor. The American College of Obstetricians and Gynecologists. 113(2): Part 1; 374-383.
- [5] Mackenzie I Z. 2006. Induction of Labour at The Start of The New Millennium. Journal of Reproduction. 131: 989-998.

- [6] Myers KM, Helen F, Edoardo M, Joy V, Michael B. 2015. The Mechanical Role of the Cervix in Pregnancy. *Jbiomech.* 48 (9), 1511-1523.
- [7] Afolabi E O, Kuti O, Orji E O, Ogunniyi S O. 2010. Oral Misoprostol versus Intramuscular Oxytocin in the Active Management of the Third Stage of Labour. *Singapore Medical Journal.* 51(3): 207-211.
- [8] Desrini, S., 2015. The benefit and risk of misoprostol use: in obstetrics and gynecology. *Jurnal Kedokteran dan Kesehatan Indonesia*, 7(1), pp.25-29.
- [9] Crane J. 2001. Induction of Labour at Term. *Journal of Obstetric and Gynecologic Canada.* 107: 1-12
- [10] Maria Ma, Guillaume J. 2003. Misoprostol Versus Oxytocin for Labor Induction in Term and Post-Term Pregnancy: Randomized Controlled Trial. *Sao Paulo Medical Journal.* 121(3): 102-106.
- [11] Redling, K., Schaedelin, S., Huhn, E.A. and Hoesli, I., 2019. Efficacy and safety of misoprostol vaginal insert vs. oral misoprostol for induction of labor. *Journal of perinatal medicine*, 47(2), pp.176-182.
- [12] Navamar B, Poorgholam F, Salarian L. 2016. Sublingual versus Vaginal Misoprostol for the Induction of Labor at Term: A Randomized, Triple-Blind, Placebo-Controlled Clinical Trial. *Iran J Medical Science.* 41(2):79-85.
- [13] Kim YM, Park JY, Sung JH, Choi SJ, Oh SY, Roh CR, Kim JH. 2017. Predicting factors for success of vaginal delivery in preterm induction with prostaglandin E2. *ObstetGynecol Sci.* 60 (2), 163-169.
- [14] Batinelli L, Serafini A, Nante N, Petraglia F, Severi FM, Messina G. 2018. Induction of labour: Clinical predictive factors for success and failure. *J Obstet Gynecol.* 38 (3), 352-358.
- [15] Wing D, Brown R, Plante L, Miller H, Rugarn O, Powers B. 2013. Misoprostol Vaginal Insert and Time to Vaginal Delivery A Randomized Controlled Trial. *The American College of Obstetricians and Gynecologists.* 122(2): 201-209.
- [16] Ennen C, Bofill J, Magann E, Bass J, Chauhan S, Morrison J. 2008. Risk Factors for Cesarean Delivery in Preterm, Term and Post-Term Patients Undergoing Induction of Labor with an Unfavorable Cervix. *Gynecologic and Obstetric Investigation.* 67:113-117. DOI: 10.1159/000166307.
- [17] Lin M, Nuthalapaty F, Carver A, Case A, Ramsey P. 2005. Misoprostol for Labor Induction in Women With Term Premature Rupture of Membranes; A Meta-Analysis. *The American College of Obstetricians and Gynecologists.* 106(3) : 593 – 601.
- [18] Kolkman, D., Verhoeven, C., Brinkhrost, S., Post, J., Pajkrt, E. 2013. The Bishop Score as a Predictor of Labor Induction Success: a systematic Review. *American Journal Perinatology.* 30(08): 625-630.