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Correlation between Administering Misoprostol Vaginal and Intravenous Oxytocin with Successful Delivery

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Abstract:
Labor induction is the stimulation of labor before there are signs of spontaneous labor. Induction of labor is performed if the risks of waiting for spontaneous delivery are judged to outweigh the risks of shortening the duration of pregnancy. Several labor induction methods are recommended, namely pharmacological and mechanical or non-pharmacological. Pharmacological induction is induction by administering prostaglandin E¹ analogs, namely misoprostol, and oxytocin, which will affect uterine contraction. This study aims to determine the relationship between vaginal administration of misoprostol and intravenous oxytocin with successful delivery. This research uses observational analytics with a cross-sectional approach. Sampling used the accidental sampling method with a sample of 32 respondents, which was carried out in August 2022. The instrument used for data collection was an observation sheet. The results showed that of the 32 respondents for successful delivery, almost all experienced successful delivery, with 24 respondents (75%). Multivariate data processing using the Spearman Rank test calculated using SPSS obtained a p-value < α = 0.001 (value α = 0.05). It can be concluded that H1 is accepted, which means there is a relationship between the vaginal administration of misoprostol and intravenous oxytocin with successful delivery in pregnant women.

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INTRODUCTION

Labor induction is the stimulation of labor before there are signs of spontaneous labor. Induction is an attempt to increase uterine contractions' strength, frequency, and duration because they are considered too weak and ineffective in causing labor progress (Cunningham et al., 2018). According to data from World Health Organization (WHO), In 2021, there will be 500,000 pregnant women, of which 200,000 (40%) pregnant women will be induced during labor around the world, while another 300,000 (60%) will deliver by cesarean section. Labor induction occurs between 10% and 20% of all deliveries with various indications, both for the mother's and fetus's safety (WHO, 2021). In induced labor, complications are uterine hyperstimulation, failed induction, cord prolapse, and uterine rupture. Uterine hyperstimulation can be characterized by tachysystole or hypertonicity which can result in changes in the frequency of the fetal heart rate. Failed induction is defined as a failure to occur in one cycle of therapy. The solution in cases of failed induction is to continue the induction or perform a Sectio Caesarea (SC) delivery. Umbilical cord prolapse can be prevented by examining the presenting part of the fetus during internal examination and avoiding amniotomy when the baby's head is still high. The incidence of uterine rupture during labor induction needs attention, especially in mothers with a history of previous SC (Varney, 2018). In

addition, this will also affect the client's vital signs related to the decreased work function of the body (Fauzi et a, 2022).

Some recommended labor induction methods are pharmacological and mechanical or non-pharmacological. Pharmacological induction is by administering prostaglandin E^1 and Oxytocin analogs, which will have a uterine contraction effect. The trade names for prostaglandin E^1 are Misoprostol and Oxytocin (Varney, 2018). Induction of labor is usually carried out if the risk of waiting for spontaneous labor is judged to be greater than the risk of shortening the duration of pregnancy because if it is maintained, it can increase mortality and morbidity for the baby and the mother, such as in post-term pregnancies, oligohydramnios, premature rupture of membranes, intrauterine fetal death, Intra Uterine Growth Restriction, heart disease, preeclampsia, and others. During the induction process, fetal heart rate and uterine contraction activity must be closely monitored to detect fetal distress, hypercholesterolemia syndrome, uterine hyperstimulation, and hyperparathyroidism. This is done one way or another to avoid uterine hyperstimulation (Mozurkewich E, 2009).

Based on a preliminary study conducted at the Delivery Room at Bhayangkara Lumajang Hospital in February 2022, out of 20 mothers who gave birth, 10 laborers were induced for indications of postdate pregnancy, premature rupture of membranes, preeclampsia, and prolonged labor—induction using vaginal misoprostol and intravenous oxytocin. Five of the ten deliveries were successful (50%), and 5 (50%) failed in labor induction, so a cesarean section was performed. This study aims to determine the relationship between vaginal administration of misoprostol and intravenous oxytocin with successful delivery.

METHOD

The research design uses observational analytics with a cross-sectional approach. Sampling used the accidental sampling method with a total sample of 32 respondents, carried out in August 2022. The instrument used for data collection was an observational sheet. The analysis used in this study is multivariate. Bivariate analysis was used to determine the relationship between the independent and dependent variables using the Spearman rank tests with $\alpha = 0.05$.

RESULT

Table 1. Characteristics of Respondents Based on Age, Education, Occupation, Parity, Gestational Age, Opening Phase and Referral Indications (n=32)

Variable	Frequency (f)	Percentage (%)
Age		
<20 Years	6	18.8
20-35 Years	22	68.8
>35 Years	4	12.5
Education		
Elementary School	6	18.8
Junior High School	7	21.9
Senior High School	16	50
College	3	9.4
Occupation		
Housewife	27	84.4
Self-employed	3	9.4
civil servant	2	6.3

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Variable	Frequency (f)	Percentage (%)
Parity		
Primipara	14	43.8
Multipara	18	56.3
Gestational Age		
Term	26	81.2
Post Date	6	18.8
Opening Fiss		
To leave	14	43.8
Active	18	56.3
Referral indication		
Premature Rupture Membrane	12	37.5
Post Date	6	18.8
Pre-Eclampsia	8	25.0
Prolonged first phase	6	18.8

Table 2. Characteristics of Respondents Based on Vaginal Misoprostol Administration

Administration of Misoprostol	Frequency (f)	Percentage (%)
Yes	13	81.25
No	3	18.75
Total	16	100

Table 2 shows that most respondents were given vaginal misoprostol as many as 13 respondents (81.25%).

Table 3. Characteristics of Respondents Based on Intravenous Oxytocin Administration

Administration of Intravenous Oxytocin	Frequency (f)	Percentage (%)
Yes	11	68.75
No	5	31.25
Total	16	100

Based on Table 3, most of the respondents were given intravenous oxytocin as many as 11 respondents (68.75%).

Table 4. Characteristics of Respondents Based on Delivery Success

Childbirth Success	Frequency (f)	Percentage (%)
Succeed	24	75
Not successful	8	25
Total	32	100

Table 5. Cross-tabulation of the Relationship between Administering Vaginal Misoprostol and Intravenous Oxytocin and Delivery Success

Misoprostol vaginal, Intravenous Oxytocin	Childbirth Success				Total	p-value	r
	Successful		Not successful				
	f	%	f	%			
Vaginal Misoprostol	12	37.5	1	3.1	13	0.001	0.542
Intravenous Oxytocin	10	31.2	1	3.1	11		
No Induction	2	6.3	6	18.8	8		
Total	24	75	8	25	32		

Table 5 shows that 12 respondents (37.5%) were given vaginal misoprostol and experienced successful delivery, one respondent (3.3%) gave vaginal misoprostol and failed delivery, one respondent (3.3%) gave intravenous oxytocin and experienced successful delivery, as many as ten respondents (31.2%), given intravenous oxytocin and did not succeed in delivery by one respondent (3.1), did not do induction and experienced successful delivery as many as two respondents (6.3%) and did not do induction and did not experience delivery success as many as six respondents (18.8%).

DISCUSSION

Administration of Misoprostol Vaginally to Women Giving Birth

The measurements of vaginal misoprostol administration showed that out of 32 respondents, almost half were given vaginal misoprostol with 13 respondents (40.6%). Misoprostol is a synthetic prostaglandin E1 that can trigger cervical ripening. As an induction drug is used "off-label" to ripen the cervix. In the uterus, misoprostol causes myometrial contractions and cervical ripening. Like prostaglandins, misoprostol works by increasing intracellular free Ca2+. This process results in the interaction of phosphorylated myosin and actin. At the same time, there are coordinated contractions of the uterus. Cervical dilation occurs because of increased hyaluronic acid and fluid and decreased demand sulfate and chondroitin sulfate, which are the basic ingredients for collagen formation. In the vagina, prostaglandins can be absorbed easily and quickly, so they can be given in tablet form (Oxorn, 2018).

According to the researchers' assumptions, almost half of the respondents received a doctor's advice to be given vaginal misoprostol. The provision of this intervention was based on the indications and clinical conditions of the respondents, considering that accelerating delivery was better than waiting for delivery which could increase maternal and infant mortality. Clinical conditions that support the administration of vaginal misoprostol are that respondents experience pre-eclampsia and post-date, and the condition of the cervix is immature, so the cervical ripening process is needed beforehand. Therefore, researchers assume the importance of further study of the indications for giving misoprostol vaginally to increase delivery success.

Administration of Intravenous Oxytocin to Mothers in Birth

The measurement results of intravenous oxytocin administration showed that out of 32 respondents, almost half were given intravenous oxytocin, with 11 respondents (34.3%). Oxytocin is used to speed up labor or delivery (postpartum). Oxytocin is a hormone produced by the hypothalamus and released by the pituitary gland. This hormone plays an important role in the delivery process, such as strengthening uterine or uterine contractions and controlling bleeding after delivery (Varney, 2018).

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Oxytocin regimens are divided into two types: low-dose and high-dose. The parameters used to classify are the number of initial doses, the speed of additional doses, and the increase interval. Low-dose oxytocin regimens are started at 1–4 mU/min, with increasing rates ranging from 1 to 2 mU/min and maximum rates between 1 and 32 mU/min. At the same time, high doses were started at initial doses ranging from 4 to 10 mU/min (mU/min), with increasing doses ranging from 4 to 7 mU/min and maximum rates ranging from 4 to 90 mU/min (Tesemma et al., 2020).

According to the researchers' assumption, almost half of the respondents received a doctor's advice and were given intravenous oxytocin. The provision of this intervention was based on the indications and clinical conditions of the respondents, considering that accelerating delivery was better than waiting for delivery. Clinical conditions that support intravenous oxytocin administration are cervical conditions that are mature. This is supported by the results of the measurement study in Table 5.9, which shows that most oxytocin was administered intravenously with 11 respondents (68.75%). This is by Manuaba's theory (2018); the immature and unsupportive condition of the cervix will affect delivery success.

Delivery Success for Mothers Giving Birth

The measurement of successful delivery showed that almost all 32 respondents experienced successful delivery, with a total of 24 respondents (75%). The success of normal delivery is influenced by factors of power (mother's strength), passage (birth canal), passenger (fetus and placenta), psychology, and helpers. The success of labor induction is influenced by several factors: parity, bishop score, mother's age, and gestational age. This study aims to describe the mother's characteristics, the type of induction, and the success of induction (Manuaba, 2018).

According to the researchers' assumptions, apart from being influenced by power, passage, and passenger, the success of delivery in this study was also due to the administration of labor induction consisting of vaginal misoprostol and intravenous oxytocin. The two interventions both have an impact on success at different levels. In the administration of vaginal misoprostol, the delivery success rate is 24 times, and in the administration of intravenous oxytocin, 40 times. The level of cervical maturity influences the difference in the success rate. Researchers assume the assessment of the bishop score is critical before determining the type of labor induction to increase the success of labor.

Correlation between Administering Misoprostol vaginally and Delivery Success in Maternity

The results of measurements of vaginal misoprostol administration showed that out of 32 respondents, almost half were given vaginal misoprostol with 13 respondents (40.6%). The results of bivariate analysis using testWho Square showed a p-value of 0.018 was obtained because the p-value < α (0.05), then H0 was rejected, and Ha was accepted, which means a relationship exists between vaginal administration of misoprostol and successful delivery. Markodd ratio is 24,000, meaning that giving misoprostol vaginally has a risk of 24 times increasing successful delivery.

Labor induction is when uterine contractions are started with the help of medical pharmacology or medical action before signs of normal labor. Two factors are needed for labor: cervical maturity and effective uterine contractions. These factors must be met for labor induction to succeed (Manuaba, 2018).

The cervix is composed of loose and dense connective tissue. The main component of this connective tissue is collagen, with several elastic tissues. Collagen consists of regular dense fibers arranged in parallel bundles linked to each other by cross-links. The basic substance of this connective tissue is a complex proteoglycan consisting of a glycosaminoglycan chain as a core protein and tightly linked to the hyaluronic acid chain. With increasing gestational age, vascularity

increases and causes leukocytes and macrophages to migrate out of the blood vessels into the cervical stroma. The enzymatic breakdown of these collagen fibers by collagenase and matrix metalloproteinase by fibroblasts and leukocytes causes softening of the cervix (Cunningham, 2018).

According to the researchers' assumptions, almost all respondents given vaginal misoprostol experienced successful delivery. This was due to administering 25 µg misoprostol which was given vaginally. Administration of 25 µg misoprostol vaginally will mediate the migration of neutrophils and macrophages into the cervical stroma, making it easier for the cervix to dilate and thin out until complete opening and adequate contractions and vaginal delivery are achieved.

The Relationship of Intravenous Oxytocin Administration to Delivery Success in Maternity

The measurement results of intravenous oxytocin administration showed that out of 32 respondents, almost half were given intravenous oxytocin, with 11 respondents (34.3%). The bivariate analysis results using uji Chi-Square with a p-value of 0.005 was obtained because the p-value < α (0.05), then H0 was rejected, and Ha was accepted, which means a relationship exists between intravenous oxytocin administration and successful delivery. The odd ratio is 40,000, meaning that giving intravenous oxytocin has a risk of 40 times increasing the success of delivery.

The goal of induction or augmentation is to produce enough uterine activity to produce cervical change and descent of the fetus—several oxytocin regimens for labor stimulation. Kusmintarti's research (2012), showed that the most common method of induction was giving oxytocin infusions (84.2%) compared to the induction method with prostaglandins and other techniques because administration of oxytocin was thought to be sufficient for fast uterine contractions.

The mode of action of oxytocin affects uterine smooth muscle contraction through “Ca2+ dependent” and “Ca2+ independent” mechanisms. In the "Ca2+ dependent" mechanism, oxytocin receptors on the smooth muscle membrane will open calcium and sodium ion channels and cause membrane depolarization. In addition, oxytocin receptors on the membrane that do not open any ion channels can cause internal changes in muscle fibers, such as releasing calcium ions from the intracellular sarcoplasmic reticulum; calcium ions then induce contractions (Kristanti, 2014).

According to the researchers' assumptions, almost all respondents who were given intravenous oxytocin induction experienced successful delivery. This is due to the administration of intravenous oxytocin, which is dissolved in the solution Ringer Lactat 500 ml and is influenced by the ripe condition of the cervix. In this study, almost all respondents in the group given intravenous oxytocin were in the active phase of labor, namely opening above 4 cm. The intravenous oxytocin administration to the ripe cervix will trigger smooth muscle contractions in the uterus. Oxytocin is a hormone that can increase the entry of calcium ions into the intracellular. The release of the hormone oxytocin will strengthen the actin and myosin bonds so that uterine contractions strengthen. The hormone oxytocin released from the pituitary gland strengthens and regulates uterine contractions. Maturity of the cervix affects the success of induction with intravenous oxytocin.

Correlation between Administering Vaginal Misoprostol and Intravenous Oxytocin with Delivery Success for Maternity Mothers

The measurement results for vaginal misoprostol and intravenous oxytocin showed that 12 respondents (37.5%) received vaginal misoprostol and experienced successful delivery, one respondent (3.3%) gave vaginal misoprostol and failed delivery, oxytocin was administered intravenously and experienced successful delivery by ten respondents (31.2%), given intravenous

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oxytocin and failed delivery by one respondent (3.1), did not undergo induction and experienced successful delivery by two respondents (6.3%) and did not induced and did not experience successful delivery as many as six respondents (18.8%).

Multivariate statistical test results using test Spearman Rank a p-value of 0.001 was obtained because the p-value < α (0.05) then H0 was rejected, and Ha was accepted, which means that there is a relationship between vaginal administration of misoprostol and intravenous oxytocin with successful delivery. With a correlation value of 0.542. This means that administering vaginal misoprostol and intravenous oxytocin has a strong relationship with successful delivery.

Labor induction is carried out to stimulate uterine contractions before there are signs of labor using oxytocin or misoprostol, one of them. Administration of vaginal misoprostol and oxytocin drip can increase intrauterine tone so uterine contractions arise (Saifuddin, 2010).

Misoprostol works better on an immature cervix, so it can cause cervical changes and cause uterine contractions. At the same time, Oxytocin should be given to a mature cervix. However, this is also related to the parity of the mother, that successful cervical ripening in the administration of oxytocin appears to occur in parities 3 and 4. In contrast, in misoprostol, successful cervical ripening occurs in parity 1 to parity 4 (Lasmini et al., 2019).

Misoprostol is used for cervical ripening and is only used in certain cases, for example, severe preeclampsia or eclampsia and the cervix is immature. At the same time, a cesarean section cannot be done immediately, or the baby is too premature to live, fetal death in the uterus for more than four weeks is not yet in labor, and there are signs -signs of blood clotting disorders.

Oxytocin is used with caution because fetal distress can occur from hyperstimulation. For this reason, always carry out strict observations on mothers who receive oxytocin. Thus, more benefits are obtained by administering a higher dose regimen than at a lower dose. Medical staff who handle things like this must prioritize ethical principles in service (Rifai et al., 2021).

Researchers assume that the relationship between vaginal administration of misoprostol and intravenous oxytocin both have a strong relationship but have different success rates. Based on the study's results, intravenous oxytocin administration has a higher success rate than vaginal administration of misoprostol. The results of the researcher's analysis were because, in the group given intravenous oxytocin, the cervical condition was sufficiently mature. This is supported by the research results in Table 5.6, which shows that all respondents are in the active phase of labor, which is at an opening of 4 -5 cm. The mature cervix contains much nitric oxide. Nitric oxide is a free radical gas with a short half-life that plays a role in thinning and opening the cervix.

CONCLUSION

The results of the research that the researchers conducted regarding the relationship between vaginal administration of misoprostol and intravenous oxytocin in mothers giving birth at Bhayangkara Hospital Lumajang In 2022, almost half were given vaginal misoprostol with a total of 13 respondents and intravenous administration of oxytocin to women giving birth at Bhayangkara Lumajang Hospital in 2022 almost half were given intravenous oxytocin with a total of 11 respondents. The results showed that of the 32 respondents for successful delivery, almost all experienced successful delivery, with a total of 24 respondents. It can be concluded that there is a relationship related to vaginal administration of misoprostol and intravenous oxytocin administration with successful delivery.

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