Original Article

Correlation Of Maternal Characteristics (Age, Parity, BMI) With Success Of Labor Induction Oxytocin Drip

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ABSTRACT

Background: *: Labor induction with oxytocin drip is an alternative action that can be used to overcome complications in the labor process. The study aims to determine the correlation between maternal characteristics (age, parity, BMI) and the success of labor induction oxytocin drips in Aminah Hospital Blitar City.*

Methods: *The research design was cohort retrospective—Independent data on maternal age, parity, and BMI. Dependent data is the success of oxytocin drip labor induction. Data was obtained through medical record status with 50 respondent samples. It was taken using proportional random sampling, Inclusion criteria for oxytocin drip labor induction starting in the latent phase, and collected using the data collection instrument sheet on July 12 - 30, 2023. The data analysis used the Chi-Square test.*

Results: *Results of the study showed that there was a relationship between maternal age and labor induction success with oxytocin drip, with an Asymp Sig (0,000) < α (0,05). There was no relationship between parity and labor induction success with oxytocin drip, with an Asymp Sig (0,157) > α (0,05). There was a relationship between BMI and labor induction success with oxytocin drip, with an Asymp Sig (0,000) < α (0,05).*

Conclusion: *Maternal age and BMI affect the success of labor induction, so women should give birth in a safe age range, which is 20-35 years, and a BMI of 18,5-24,9 kg/m2 will reduce the risk of failure in the labor process, especially labor with oxytocin drip induction.*

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Introduction

The Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) are key indicators reflecting societal welfare in a country. Maternal and child health is a top priority in Indonesia's health development agenda. Evaluating the health status and performance of maternal and child health initiatives is essential for understanding the nation's health welfare. The MMR and IMR measure the success of these efforts. The Maternal Mortality Rate (MMR) represents the number of maternal deaths occurring during pregnancy, childbirth, or the postpartum period, excluding deaths caused by unrelated factors such as accidents, per 100,000 live births. The Infant Mortality Rate (IMR) indicates the

number of deaths among infants under one year of age per 1,000 live births (Kaslam, 2017) Based on the evaluation of the Millennium Development Goals (MDGs) in 2015, the Maternal Mortality Rate (MMR) in Indonesia remains high at 305 per 100,000 live births. This figure is still significantly above the National Medium-Term Development Plan (RPJMN) target of 183 per 100,000 live births by 2024 and far from the Sustainable Development Goals (SDGs) target of 70 per 100,000 live births by 2030.

Meanwhile, According to the 2017 Indonesian Demographic and Health Survey (IDHS), Indonesia's Infant Mortality Rate (IMR) remains high at 24 per 1,000 live births. This rate is above the National Medium-Term Development Plan (RPJMN) target, which aims to reduce the IMR to 16 per 1,000 live births by 2024, and the Sustainable Development Goals (SDGs) target of 12 per 1,000 live births by 2030. There was a significant increase in East Java from 2016 until the 2020 and 2010 pandemic; in 2020, it rose 98.4 per cent, and in 2021, it increased again (Kemenkes RI, 2020)

The number of labor inductions continues to increase. According to Human, the American College of Obstetricians and Gynecologists (ACOG) recorded an average of 12% of spontaneous births, 23.4% of inductions with medical indications, and 23.8% without medical indications. In Australia, around 27% of pregnant women experience induction of labor. Meanwhile, in the United Kingdom (UK), the incidence of labor induction reaches 19.5%. Meanwhile, WHO found that in Indonesia, of the 500,000 mothers who gave birth at risk, 200,000 of them underwent labor induction, and 300,000 underwent cesarean section (Salmarini, Lathifah and Puruhita, 2016)

At Aminah General Hospital, Blitar City, in January-March 2023, 205 mothers experienced the birth process. 146 (71.21%) mothers gave birth by cesarean section, while 59 (28.78%) experienced expected delivery. The number of births with oxytocin drip induction was 64; 25 (39.06%) were successful in giving birth normally vaginally, while the remaining 39 (60.93%) experienced failed labor induction and underwent cesarean section.

Birthing is a natural process that is a woman's nature and takes place physiologically. Still, in some cases, this physiological thing can turn into a pathological one with complications or difficulties that can result in death for the mother and baby. Standard delivery is currently still the mother's first choice of method, but not all pregnant women can give birth typically. Certain conditions require delivery to be carried out in another way, especially if these conditions pose a risk of endangering the health of the mother, baby, or both. In emergencies, other methods of delivery will be considered, including artificial birth such as Sectio Caesarea, Vacuum Extraction, or recommended delivery by stimulating labor or induction of labor (Chen, w., Zhou, Y., Pu., X. (2014).

Induction of labor is an attempt to give birth to a fetus before term, in a situation where there are no signs of labor or not yet in labor, with the possibility that the fetus can live outside the womb (above 28 weeks of age) (Manuaba, 2012) Induction of labor is labor initiated using mechanical or pharmacological methods. Pharmacological induction is done by administering intravenous prostaglandins and oxytocin, while mechanical induction is carried out by installing a Foley catheter, laminaria, and amniotomy (Cunningham FG, Lenovo KJ, Bloom SI, Haulth JC, Rouse DJ, 2013) Induction stimulates contractions before spontaneous labor begins, with or without membrane rupture. Augmentation refers to

the stimulation of spontaneous contractions that are considered inadequate due to failure of cervical dilatation and fetal descent. If his failure occurs, it causes slow labor and causes metabolic disorders leading to acidosis and dehydration, which require treatment according to the cause (Cunningham, 2016) The type of induction used takes into account the indications and condition of the mother, but the kind of drug commonly used to induce labor in the hospital is oxytocin. Oxytocin is used as an induction drug, which is believed to speed up the labor process because oxytocin can stimulate the release of prostaglandins, thereby stimulating the uterine contractions needed in the labor process.

Induction of labor is a method that is often used in normal labor if there are indications that spontaneous labor is not going smoothly. Several indications should be considered when inducing labor with an oxytocin drip. These include post-term pregnancy, premature rupture of membranes, gestational hypertension, preeclampsia, placental insufficiency, and maternal comorbidities such as diabetes and kidney disease. In fetal conditions, the most common indication is intrauterine fetal demise (IUFD). Labor induction is performed to reduce maternal mortality and morbidity and to improve outcomes for both the mother and the fetus (Nurhidayati, E., Nuryati. S., Nugroho, 2013) Labor induction also has contraindications that must be considered before deciding to induce labor. Some of the contraindications for labor induction include uterine conditions such as a history of uterine injury, placenta previa, macrosomia, fetal anomalies, pelvic anatomy, and several medical illnesses that accompany the mother's condition. Apart from the indications and contraindications for labor induction, several complications can be found from labor induction, including uterine atony, hyperstimulation, fetal distress, umbilical cord prolapse, uterine rupture, placental abruption, hyperbilirubinemia, hyponatremia, intrauterine infection, postpartum haemorrhage. maternal fatigue, and emotional crisis, which can increase cesarean delivery in elective induction (Cunningham FG, Lenovo KJ, Bloom SI, Haulth JC, Rouse DJ, 2013)

The success of labor induction depends on the condition of the cervix at the start. An immature cervix can result in an extended induction, induction failure, increased risk of surgery, more extended treatment, and increased costs. Based on research in the Maternity Room at RSUD dr. Soewondo, Kendal Regency, on January 1 – March 31, 2013, 284 mothers gave birth typically; 66 mothers gave birth with induction and 218 mothers gave birth without induction (Ginting, 2015)

Induction of labor requires a careful process to be successful. Health service providers are required to have counselling data or data about the obstetric history of pregnant women as a requirement for induction. Obstetric data and counselling history will help inform patients about evidence-based labor induction. Induction of labor is an action that carries risks. Therefore, health service providers must have a quality assurance program and induction policy, including safety tools such as checklists or medical records, to ensure that induction is performed with the best quality (Hiluf, S., and Assefa, 2015)

Research conducted by Triatmi et al. at Aura Syifa Hospital in 2016 demonstrated significant relationships between several factors and the success of labor induction using an oxytocin drip. The analysis revealed a significant relationship between maternal age and the success of induction ($p = 0.022$, $p < 0.05$), between parity and the success of induction ($p = 0.007$, $p < 0.05$),

and between body mass index (BMI) and the success of oxytocin drip induction (p = 0.003, p < 0.05) (Triatmi, 2022)

Many factors influence the success of labor induction, both external factors from health care providers and internal factors from pregnant women. This research focused on internal factors to determine the relationship between maternal characteristics (age, parity, and BMI) and the success of oxytocin drip labor induction at Aminah General Hospital, Blitar City

Methods

The author uses a correlation analytical research design that tests relationships, estimates, and tests based on existing theories in this research. This correlational research uses a cohort design using a retrospective approach, where research is carried out for cohort groups that have experienced effects. Subjects are observed for a certain period regarding risk factors, and the effects are assessed. In a retrospective cohort study, the risk factors and effects have happened in the past. This research was conducted at Aminah Hospital, Blitar City. This type of secondary data is taken from the medical records of women giving birth who received an oxytocin drip induction.

The population in this study included all mothers giving birth and receiving birth assistance at Aminah RSU, Blitar City, from January to March 2023. The sampling technique was proportional random sampling, namely combining those who were successful with the oxytocin drip with those who did not progress in labor after being given the oxytocin drip for 4 hours. The sample size was 55 women giving birth by induction of labor with oxytocin drip. Inclusion criteria for samples of women giving birth who were given oxytocin drip induction since the latent phase. Exclusion criteria for mothers whose babies experience fetal distress that a sample that met the researchers' criteria could be found, namely 50 people (25 people who experienced successful oxytocin drip labor induction and 25 people who experienced failed oxytocin drip labor induction).

In this study, the independent variables were maternal age, maternal parity, and maternal BMI. In contrast, the dependent variable in this study was the success of labor induction with oxytocin drip.

Bivariate analysis examines the relationship between two independent variables and a dependent variable. In this study, the researchers will test three hypotheses: (1) whether there is a relationship between maternal age and the success of labor induction with an oxytocin drip, (2) whether there is a relationship between maternal parity and the success of labor induction with an oxytocin drip, and (3) whether there is a relationship between maternal body mass index (BMI) and the success of labor induction with an oxytocin drip. To test these three hypotheses, the researcher used the chi-square statistical test (X2) with a 2x2 table, with a confidence level of 95%, $\alpha = 0.05$. In processing the data, researchers used the SPSS application.

If X2 count > X2 table, Ho is rejected, and Ha is accepted, which means there is a relationship, and if X2 count < X2 table, then Ho is accepted and Ha is rejected, which means there is no relationship.

Meanwhile, the way to conclude hypothesis testing with SPSS is as follows:

If the Asymp Sig value < 0.05, the alternative hypothesis (H_1) is accepted, indicating a significant relationship between the tested variables. If the Asymp Sig value > 0.05, the alternative hypothesis (H_1) is rejected, indicating no significant relationship between the tested variables

Results

The data presentation displayed includes general data and unique data. General data includes indications for induction, and unique data includes maternal age, maternal parity, and maternal BM.

Table. 1 Characteristics of respondents based on indications for oxytocin drip labor induction

Induction Indication	Amount	Percentage (%)
Oligohydramnios	19	38,0
KPD	22	44,0
Post Date	5	10,0
HT Gestational	3	6,0
IUFD	1	2,0
Total	50	100

Source: Medical records of Aminah Hospital, Blitar City

Based on Table. 1 Nearly half of the respondents who received labor induction with oxytocin drip with the indication of PROM were 22 respondents (44.0%), and the indication of Oligohydramnios was 19 respondents (38.0%).

Table. 2 Characteristics of respondents based on the causes of failure of oxytocin drip labor induction

Causes of Failure	Frequency	Percentage (%)
Uterine Atony	12	48,0
Stuck Opening	8	32,0
Fetal Distress	3	12,0
Maternal Emotional Crisis	2	8,0
Total	25	100

Source: Medical records of Aminah Hospital, Blitar City

Based on Table. 2, It is known that almost half of the respondents experienced failed oxytocin drip labor induction caused by uterine atony, namely 12 respondents (48%) and obstructed opening by eight respondents (32%).

Table. 3 The relationship between maternal age and the success of oxytocin drip labor induction

Maternal age	Successful Induction Of Labor					
	Succeed	%	Failed	%	total	%
< 20 Years	2	4	1	2	3	6
25-35 Years	20	40	23	46	43	86
> 35 Years	3	6	1	2	4	8
Total	25	50	25	50	50	100

Source: Medical records of Aminah Hospital, Blitar City

Based on Table. 3 It is known that from 43 respondents with an age range of 20-35 years, almost half of the respondents, namely 20 respondents (40.0%), experienced successful oxytocin drip labor induction, from 3 respondents with an age range of <20 years, 2 respondents (4%) experienced successful oxytocin drip labor induction. Of the 4 respondents with an age range of > 35, 3 (6%) experienced successful oxytocin drip labor induction.

The statistical analysis using the Chi-square test with a 95% confidence level ($\alpha = 0.05$) in SPSS yielded an Asymp Sig value of 0.000. Since the Asymp Sig value is less than α ($0.000 < 0.05$), the alternative hypothesis (H_1) is accepted. This indicates a significant relationship

between maternal age and the success of labor induction with an oxytocin drip at Aminah General Hospital, Blitar City, during January–March 2023.

Table. 4 The relationship between maternal parity and the success of oxytocin drip labor induction at Aminah General Hospital, Blitar City, January-March 2023

Parity Mother	Successful Induction Of Labor					
	Succeed	%	Failed	%	total	%
Primipara	15	30	15	30	30	60
Multipara	10	20	10	20	20	40
Total	25	50	25	50	50	100

Source: Medical records of Aminah Hospital, Blitar City

Based on table. Fourth, it is known that of the 30 respondents with primiparous parity, half, namely 15 (30%), experienced successful oxytocin drip labor induction. Of the 20 respondents with multiparous parity, a small number of respondents, namely 10 respondents (20%), experienced successful oxytocin drip labor induction.

The statistical analysis using the Chi-square test with a 95% confidence level (α = 0.05) in SPSS resulted in an Asymp Sig value of 0.157. Since the Asymp Sig value is more significant than α (0.157 > 0.05), the alternative hypothesis (H_1) is rejected. This indicates no significant relationship exists between maternal parity and the success of labor induction with an oxytocin drip at Aminah General Hospital, Blitar City, from January–March 2023.

Table. 5 Relationship between maternal BMI and success of oxytocin drip labor induction

BMI Mother	successful induction of labor					
	Succeed	%	Failed	%	total	%
< 18,5 kg/m^2	1	2	1	2	2	4
18,5-24,9 kg/m^2	13	26	8	16	21	42
25 kg/m^2	11	22	16	32	27	54
Total	25	50	25	50	50	100

Source: Medical records of Aminah Hospital, Blitar City

Table 5 shows That of the 2 respondents with a BMI < 18.5 kg/m2, a small proportion of respondents, namely 1 respondent (2%), experienced successful oxytocin drip labor induction and of the 27 respondents with a 25 kg/m2 BMI, 11 (22%) experienced successful oxytocin drip labor induction.

The statistical analysis results using the Chi-square test with a 95% confidence level (α = 0.05) in SPSS showed an Asymp Sig value of 0.000. Since the Asymp Sig value is less than α (0.000 < 0.05), the alternative hypothesis (H_1) is accepted. This indicates a significant relationship between maternal BMI and the success of labor induction with an oxytocin drip at Aminah General Hospital, Blitar City, during January–March 2023.

Discussion

Induction of labor can be successful or unsuccessful. It is said to be successful if the mother in labor experiences adequate uterine contractions accompanied by an increase in the opening of the cervix so that spontaneous labor occurs. It is said that the oxytocin drip labor induction has failed or

been stopped if a complication arises in the process for both the mother and fetus.

Based on the results of data analysis from 50 respondents who received oxytocin drip labor induction, it is known that half of the respondents, namely 25 respondents (50.0%), experienced successful oxytocin drip labor induction, and half of the respondents, 25 respondents (50.0%) experienced failure. Oxytocin drip labor induction.

The success of vaginal labor induction is influenced by several factors, including the position of the lowest part, placement (presentation), condition of the cervix, parity, age of the patient or age of the youngest child, gestational age, and Body Mass Index (BMI). Meanwhile, failure to induce labor can occur or result from complications found during labor induction, such as uterine atony, obstructed opening, hyperstimulation, fetal distress, bleeding, uterine rupture, maternal fatigue, and emotional crisis in the mother. The emotional turmoil in the mother in question is the condition of the mother's intolerance to the pain felt during labor induction so that the mother feels anxious and acute when the induction process takes place and chooses to stop the oxytocin drip labor induction process.

The highest success rate for labor induction in the maternal age variable was in the group of respondents aged 20-35 years, namely 20 respondents (40.0%). From the maternal parity variable, the highest number of successes were among respondents with primiparous parity, 15 respondents (30.0%), while in the maternal BMI variable, the highest number of successes in labor induction with oxytocin drip were respondents with a BMI of 18.5-24.9 kg/m2. as many as 13 respondents (26.0%).

Relationship between Maternal Age and Success of Oxytocin Drip Labor Induction

Overall, of the total research sample (50 respondents), namely, all mothers giving birth who received oxytocin drip labor induction, the majority of respondents (86%), 43 respondents, were in the age range of 20-35 years. A total of 20 respondents (40%) in the 20-35 year age range experienced successful oxytocin drip labor induction and of the three respondents with an age range < 20 years, two respondents (4%) experienced successful oxytocin drip labor induction. Of the four respondents with an Age range > 35 years, three (6%) experienced successful oxytocin drip labor induction. Static analytical results using the chi-square test with a degree of confidence of 95%, $\alpha = 0.05$ in calculations using SPSS obtained an Asymp Sig value of 0.000. The Asymp Sig value < α so that H1 is accepted means there is a relationship between maternal age and the success of labor induction with oxytocin drip at Aminah General Hospital, Blitar City, in January – March 2023. The highest percentage of successful labor induction with oxytocin drip is aged 20-35 years, namely 86%.

This study's results align with Triatmi et al.'s research at Aura Syifa Hospital in 2016. Among the 136 respondents, nearly all were mothers aged 20-35, with 104 respondents (76.5%) experiencing successful oxytocin drip labor induction. Of the 10 respondents who failed the oxytocin drip labor induction, 6 (60%) were aged 20-35. The contingency coefficient correlation test, conducted at a significance level of 0.05, yielded a p-value of 0.022, less than α (0.022 < 0.05). This indicates a significant relationship between maternal age and the success of oxytocin drip labor induction.

The results of this study are also in line with the BKKBN recommendation that pregnancy and childbirth be in the safe

reproductive age group, namely 20-35 years, because the risk of complications during pregnancy is more negligible compared to mothers aged < 20 years and > 35 years. This is closely related to the maturity of reproductive cells and the level of work of the reproductive organs so that at ages < 20 years and > 35 years, it can endanger the mother during pregnancy and childbirth and increase the risk to the condition of the fetus. Maternal age is one of the factors that influence health status during pregnancy and birth, both on the condition of the mother and the fetus (Cunningham FG, Lenovo KJ, Bloom SI, Haulth JC, Rouse DJ, 2013)

Relationship between Maternal Parity and Success of Oxytocin Drip Labor Induction

In this study, the results obtained were that of the 30 respondents with primiparous parity, half of the respondents, namely 15 (30%), experienced successful oxytocin drip labor induction. Of the 20 respondents with multiparous parity, a small number of respondents, namely 10 respondents (20%), experienced successful oxytocin drip labor induction. Static analytical results using the chi-square test with a degree of confidence of 95%, α = 0.05 in calculations using SPSS obtained an Asymp Sig value of 0.157. Asymp Sig value > α so that H1 is rejected, which means there is no relationship between maternal parity and the success of oxytocin drip labor induction at Aminah General Hospital, Blitar City, in January – March 2023.

The results of this study do not align with the research conducted by Triatmi et al. at Aura Syifa Hospital in 2016. Their study found that out of 136 respondents, nearly half were primiparous mothers, and 55 (40.4%) experienced successful oxytocin drip labor induction. Of the 10 respondents, the majority of respondents were nulliparous mothers and failed the oxytocin drip labor induction, namely 7 people (70%). Based on the contingency coefficient correlation test with a significant level of 0.05, it shows that p-value < α (0.007 < 0.05), it can be concluded that there is an essential relationship between parity and the success of oxytocin drip labor induction.

Induction of labor can be influenced by parity. A mother who is often pregnant or often gives birth has a higher risk compared to a mother who does not give birth usually because the more pregnancies and births the mother experiences, the higher the risk of experiencing pregnancy and childbirth complications (Manuaba, 2012)

According to the researchers' analysis based on the distribution of respondents' characteristics, the success or failure of oxytocin drip labor induction in primiparous and multiparous parties can be influenced by several factors, which can originate from maternal and fetal factors such as indications for labor induction and the characteristics that cause the failure of oxytocin drip labor induction which include uterine atony, obstructed opening, fetal distress, and maternal emotional crisis.

However, the results of this study are consistent with the research conducted by Ryan et al., which found no significant differences in contractile parameters related to maternal parity. Specifically, parameters such as the maximum amplitude of contractions (MAMP), mean contractile force (MCF), time to first contraction, rate of increase in contractions, and contraction frequency showed no significant correlation with parity. Although there was a trend toward a higher MCF with increasing parity, the difference was not statistically significant, as indicated by a p-value of 0.412, indicating no relationship between parity status on myometrial contractility and the oxytocin drip labor induction action (Esmaya R.A, 2021)

Relationship between maternal BMI and the success of Oxytocin Drip labor induction

In this study, the results obtained were that of the 21 respondents with a BMI of 18.5-24.9 kg/m2, more than half of the respondents, namely 13 respondents (26%), experienced successful oxytocin drip labor induction. Of the two respondents with a BMI < 18.5 kg/m2, a small proportion of respondents, namely one respondent (2%), experienced successful oxytocin drip labor induction and of the 27 respondents with a 25 kg/m2 BMI, 11 (22%) experienced successful oxytocin drip labor induction. The static analysis results using the chi-square test with a confidence level of 95%, α = 0.05 in calculations using SPSS obtained an Asymp Sig value of 0.000. The Asymp Sig value < α so that H1 is accepted means there is a relationship between maternal BMI and the success of oxytocin drip labor induction at Aminah General Hospital, Blitar City, in January - March 2023.

The results of this research align with the study conducted by Triatmi et al. at Aura Syifa Hospital in 2016. In that study, among 136 respondents, half of the mothers had a BMI of 18.5-24.9 kg/m^2, and 68 of these respondents (50%) experienced successful oxytocin drip labor induction. Of the 10 respondents, the majority of respondents were mothers with a BMI > 25 kg/m2 and failed the oxytocin drip labor induction, namely 6 people (60%). Based on the contingency coefficient correlation test with a significant level of 0.05, it shows that p-value < α (0.003 < 0.05). It can be concluded that there is a substantial relationship between Body Mass Index (BMI) and the success of oxytocin drip labor induction.

Maternal BMI can also be a significant parameter in determining the success or failure of labor induction. The duration of labor in obese women occurs more slowly; this is because the myometrium of obese women is less responsive to oxytocin, which causes labor to take a long time and not progress and ends with a cesarean section. Myometrial strips obtained from obese women undergoing elective cesarean section contracted with weaker force and lower frequency than those obtained from women of normal weight. This effect is mediated by high levels of cholesterol, adipokines (especially leptin), and inflammatory cytokines in obese women (R.A, 2021).

Conclusion

his study concludes that maternal age and BMI significantly influence the success of labor induction using oxytocin drips, while parity does not show a significant correlation. Women in the safe reproductive age range of 20-35 years and with a BMI within the normal range of 18.5-24.9 kg/m^2 have a higher likelihood of successful labor induction. These findings emphasize the importance of pre-pregnancy counseling and prenatal care focusing on maternal health optimization to improve labor outcomes. urther studies should explore other factors influencing labor induction success, such as maternal comorbidities, fetal conditions, and the duration or dosage of oxytocin administration. Additionally, prospective cohort studies with larger and more diverse populations are recommended to validate these findings and improve generalizability.

Authors Contributions

Siti Asiyah, wuri Widi Astuti, and Linda Silvia contributed to the design, data collection, data analysis, data interpretation and report preparation, and the writing of the manuscript.

Conflicts of Interest

The author states that he has no involvement with any organization with material or non-material interests, and we state that our data was obtained through an applicable research ethics process. The data we received came from valid sources.

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