

Success Rate of Labor Induction: Vaginal Delivery Versus Caesarean Section, 2024

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Abstract

Background: Induction of labor (IOL) is a common obstetric intervention, yet data on its outcomes in Rwanda remain limited. This study evaluated the success rate of IOL, identified indications for cesarean delivery, and examined neonatal outcomes at Kacyiru Hospital.

Methods: A retrospective review was conducted among 378 women who underwent IOL at Kacyiru Hospital between January and March 2024. Data were extracted from medical records and analyzed using SPSS version 27

Results: Most inductions (98.7%) were performed using misoprostol (Cytotec). The main indications were late-term pregnancy, term pregnancy, and prolonged latent phase. The overall success rate was 75.1%, resulting in spontaneous vaginal delivery, while 24.9% required cesarean section, primarily upon maternal request. Most newborns had favorable Apgar scores (≥ 7) at 1 and 5 minutes (92.1% and 92.3%, respectively). About 8% required NICU admission, mainly for suspected infection, transient tachypnea, or low birth weight.

Conclusion: Labor induction with misoprostol at Kacyiru Hospital shows a high rate of successful vaginal delivery and favorable neonatal outcomes. Nonetheless, continuous monitoring and evidence-based protocols are needed to optimize safety and reduce unnecessary cesarean deliveries.

Keywords: Labor Induction, Misoprostol, Vaginal Delivery, Cesarean Section, Apgar Score, Rwanda.

Introduction

Induction of labor (IOL) is a medical procedure used to stimulate cervical ripening and initiate uterine contractions to facilitate childbirth [1]. The decision to induce labor is guided by whether the benefits of delivery outweigh the risks of continuing the pregnancy [2, 3]. The American College of Nurse-Midwives

recommends awaiting spontaneous labor onset in the absence of complications [4].

Indications for IOL are broadly classified as maternal, fetal, or obstetric. Maternal indications include medical conditions that may worsen during pregnancy, whereas fetal and obstetric indi-

cations include fetal distress, intrauterine growth restriction, premature rupture of membranes, post-term pregnancy, and placental abnormalities [5]. Successful induction is defined as a vaginal delivery following stimulation of labor and depends on cervical favorability, which is commonly assessed using the bishop score [6]. According to Rwandan obstetric care guidelines, a Bishop score >6 indicates a favorable cervix [7].

Labor can be induced pharmacologically, mechanically, or through a combination of both methods [8]. Misoprostol, a prostaglandin E1 analogue, is one of the most commonly used agents for cervical ripening and can be administered orally or vaginally. The World Health Organization recommends oral misoprostol 25 µg every two hours as the preferred regimen [9]. Oxytocin is also used to augment or induce labor, but its administration requires close monitoring due to risks of uterine hyperstimulation and fetal distress. Mechanical methods, such as intracervical balloon catheters and osmotic dilators, promote endogenous prostaglandin release and can be combined with pharmacological agents for improved efficacy [10-12]. Combined methods have been shown to shorten the induction-to-delivery interval compared to single techniques.

Despite its benefits, IOL carries potential risks, including failed induction, uterine hyperstimulation, infection, and postpartum hemorrhage due to uterine atony [13]. When induction fails after 24 hours, cesarean section (CS) is often indicated. Neonatal well-being is commonly assessed using the Apgar score, which evaluates heart rate, respiration, muscle tone, reflexes, and color [14-16]. Scores are categorized as low, intermediate or normal. Although its predictive value for long-term outcomes is debated, the five-minute Apgar score remains a strong indicator of neonatal morbidity and mortality [17]. Studies suggest that neonates born via CS often have lower Apgar scores than those delivered vaginally [18].

While IOL accounts for about 25% of term deliveries in developed countries, the rate remains considerably lower in developing regions. The WHO Global Survey reported a 4.4% induction rate across seven African countries, highlighting the need for region-specific data [19]. Limited research from Rwanda necessitates evaluating IOL outcomes to guide evidence-based obstetric practice.

Methods

A retrospective, facility-based descriptive cross-sectional study was conducted at Kacyiru District Hospital, located in Kigali City, Rwanda.

Kacyiru District Hospital is a public facility situated in Gasabo District, offering a wide range of maternal and child health services, including antenatal care, emergency obstetric services, and both vaginal and cesarean deliveries. The maternity unit is staffed by obstetricians, general practitioners, midwives, and nurses, and conducts several thousand deliveries annually.

The study included all pregnant women who underwent labor induction between January and March 2024 at Kacyiru Hospital. Inclusion criteria were women with singleton pregnancies at ≥37 weeks of gestation who were admitted for induction according to hospital protocols. Records with incomplete data or missing

outcome details were excluded.

A census sampling approach was applied, yielding a total of 378 participants. Data were collected retrospectively from patient medical records using a pretested structured checklist. The checklist captured sociodemographic details, obstetric history, method and indication for induction, mode of delivery, and neonatal outcomes including Apgar scores at one and five minutes.

Data entry and cleaning were performed using Microsoft Excel, and statistical analysis was conducted using IBM SPSS Statistics version 27. Descriptive statistics such as frequencies and percentages were used for categorical variables, and means with standard deviations were reported for continuous variables. The Chi-square test was applied to assess associations between categorical variables, and binary logistic regression was used to determine factors associated with successful labor induction. A p-value of <0.05 was considered statistically significant.

Ethical approval for this study was obtained from the Kacyiru District Hospital Research Committee, and data confidentiality was maintained throughout the study process.

Results

A total of 378 women who underwent labor induction were included in the study. The mean age of participants was 29.0 ± 5.3 years (range 17–48 years). Most participants (64.6%) had unspecified educational levels, while 31.4% had no formal education and 4.0% were students. Over half (53.3%) were unemployed, and among the employed, 12.2% were in business, 10.3% were traders, 6.4% were farmers, and 5.6% were self-employed. The majority (71.7%) were married, whereas 28.3% were single (Table 1).

More than half of the deliveries occurred between 39 and 40 weeks of gestation (54.5%), followed by 41–42 weeks (19.1%). Preterm (<37 weeks) and post-term (>42 weeks) deliveries represented 5.0% and 1.3%, respectively. In terms of parity, primigravida accounted for 50.0%, multigravida for 38.8%, and grand multipara for 11.2% (Table 2).

Regarding induction characteristics, elective inductions (52.1%) were slightly more frequent than emergency inductions (47.9%). Cytotec (misoprostol) was the predominant induction method (98.7%), while Foley catheter and Cytotec with oxytocin were used in 0.8% and 0.5% of cases, respectively. The number of induction doses ranged from 1 to 12, with most women receiving two (18.7%) or three doses (17.9%). The mean duration from induction to delivery was 19.2 ± 11.2 hours (range 1–59 hours) (Table 3).

The most common indications for induction were late-term pregnancy (18.6%), full-term pregnancy (18.1%), and prolonged latent phase (16.8%). Other reasons included PROM at term (11.7%), oligohydramnios (9.8%), maternal request (7.7%), decreased fetal movement (3.5%), pre-eclampsia (1.9%), and PPROM (1.6%) (Table 4).

Overall, 75.1% of inductions resulted in spontaneous vaginal delivery (SVD), while 24.9% required cesarean section (C-section). The main indications for C-section were maternal request

(33.0%), failed induction (30.9%), fetal tachycardia (12.8%), face presentation (4.3%), placental abruption (3.2%), fetal bradycardia (2.1%), and uterine rupture (1.1%) (Table 5).

Most newborns had favorable Apgar scores, with 92.1% scoring 9 at 1 minute and 92.3% scoring 10 at 5 minutes (Table 6). Twenty-five newborns (6.6%) required admission to the neonatology or NICU units—92.0% to neonatology and 8.0% to NICU. The leading causes of admission were risk of neonatal infec-

tion (61.5%), transient tachypnea (11.5%), and low birth weight (7.7%). Among admitted neonates, 90.5% were discharged, and 9.5% died (Table 7).

Comparison by mode of delivery showed higher Apgar scores among newborns delivered vaginally. At 1 minute, 93.6% of SVDs had an Apgar score of 9 compared to 87.2% among C-sections. At 5 minutes, 94.0% of SVDs had a score of 10 versus 87.2% for C-sections (Table 8).

Table 4.1: Demographic Characteristics of Study Participants

		Count	%
Age in years (mean \pm SD), range		29.04 \pm 5.27	(17 - 48)
Education Level	Unspecified	243	64.6%
	None	118	31.4%
Occupation	Student	15	4.0%
	None	201	53.3%
	Business	46	12.2%
	Trader	39	10.3%
	Farmer	24	6.4%
	Self-employed	21	5.6%
	Tailor	14	3.7%
	Teacher	8	2.1%
	Housekeeper	5	1.3%
	Accountant	3	0.8%
	Decorator	3	0.8%
	Agent	2	0.5%
	Civil servant	2	0.5%
Marital Status	Chef	2	0.5%
	Cleaner	2	0.5%
	Police	2	0.5%
	Auditor	1	0.3%
	Barber	1	0.3%
	Technician	1	0.3%
	Married	271	71.7%
	Single	107	28.3%

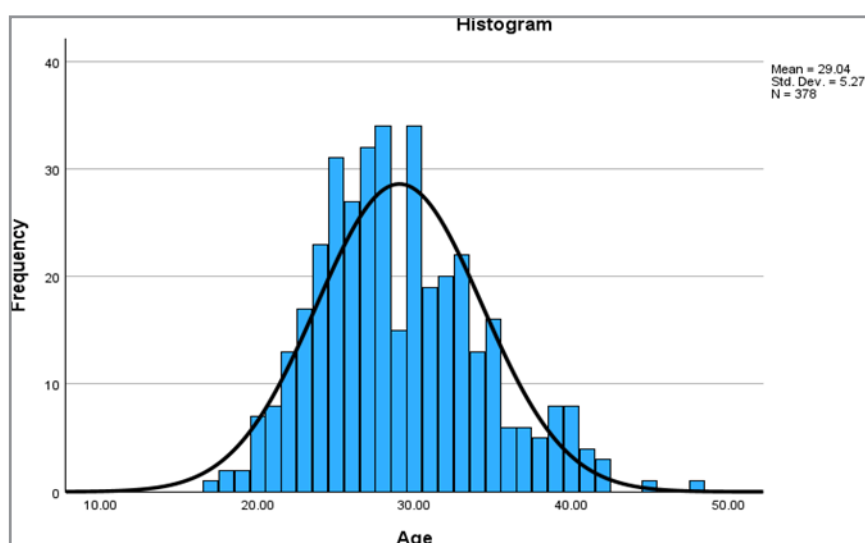


Figure 4.1: Age Distribution among Participants

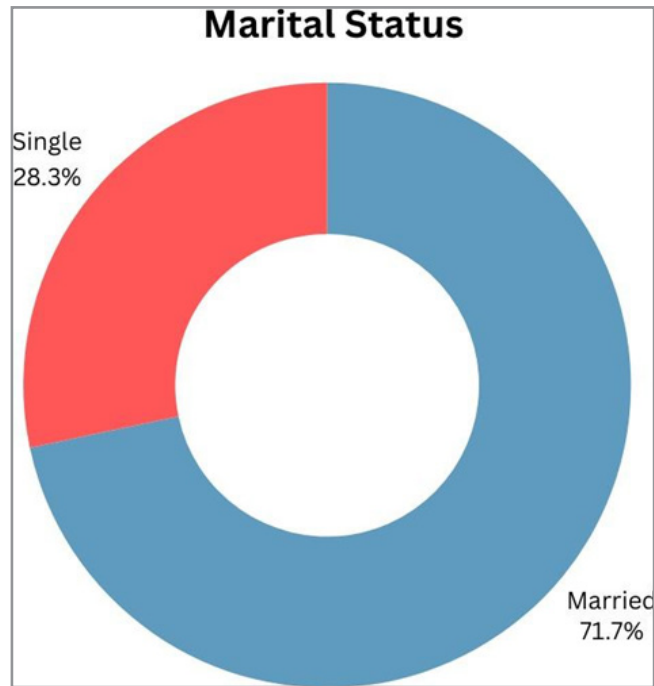


Figure 4.2: Distribution of Marital Status among Study Participants

Table 4.2: Distribution of Gestational Age and Parity

	Count	Percentage
Gestational Age Group		
<37 weeks	19	5.0%
37 - 38 weeks	55	14.7%
39 - 40 weeks	205	54.5%
41 - 42 weeks	72	19.1%
>42 weeks	5	1.3%
Parity		
Primigravida	188	50.0%
Multigravida	146	38.8%
Grand multipara	42	11.2%

Table 4.3: Characteristics of Labour Induction

		Count	%
Elective or Emergent IOL	Elective	197	53.1%
	Emergent	181	46.9%
Method Used for Labour Induction	Cytotec	372	98.7%
	Foley catheter	3	0.8%
	Cytotec and oxytocin	2	0.5%
Number of Induction Doses	1 dose	57	15.2%
	2 doses	70	18.7%
	3 doses	67	17.9%
	4 doses	46	12.3%
	5 doses	37	9.9%
	6 doses	53	14.1%
	7 doses	11	2.9%
	8 doses	6	1.6%
	9 doses	4	1.1%
	10 doses	13	3.5%

	11 doses	5	1.3%
	12 doses	6	1.6%
Duration from Induction to Delivery	19.2 ±11.2	(1-59)	

Table 4.4: Reasons for Labour Induction and Their Frequencies

		Count	%
Reason for Labour Induction	Late term	70	18.6%
	Full term	68	18.1%
	Prolonged latent phase of Labouré	63	16.8%
	PROM at term	44	11.7%
	Oligohydramnios	37	9.8%
	Maternal request	29	7.7%
	Decreased fetal movement	13	3.5%
	Pre-eclampsia	7	1.9%
	Full to late term pregnancy	7	1.9%
	PPROM	6	1.6%
	Programmed for IOL	5	1.3%
	Preeclampsia with severe features	5	1.3%
	Post term	4	1.1%
	Preeclampsia without severe features	3	0.8%
	PROM with complicated to oligohydramnios	3	0.8%
	Early term with prolonged latent phase	2	0.5%
	Controlled chronic hypertension	2	0.5%
	Fetal tachycardia	1	0.3%
	Gestational hypertension	1	0.3%
	Calcified placenta at term	1	0.3%
	Polymyomatous and PROM	1	0.3%
	IUFD	1	0.3%
	Rupture of membrane	1	0.3%
	PROM with meconium-stained amniotic fluid	1	0.3%
	Polyhydramnios	1	0.3%

Table 4.5: Mode of Delivery and Reasons for Cesarean Section

Mode of delivery	SVD	283	75.1%
	C-section	94	24.9%
Reason of C- section delivery	Failed induction	29	30.9%
	Maternal request	31	33.0%
	Fetal tachycardia	12	12.8%
	Fetal bradycardia	2	2.1%
	Face presentation	4	4.3%
	Placenta abruption	3	3.2%
	Uterine rupture	1	1.1%
	NRFHR	6	6.4%
	Arrested descent	1	1.1%
	Prolonged latent phase	1	1.1%
	Previous C-section scar	1	1.1%
	Arrested labour	1	1.1%
	Failed induction + fetal distress	1	1.1%
	Prolonged labour	1	1.1%

Table 4.6: Distribution of Apgar Scores at 1 Minute and 5 Minutes

		Count	Percentage
Apgar score at 1 min	0	2	0.5%
	2	1	0.3%
	6	3	0.8%
	7	9	2.4%
	8	14	3.7%
	9	348	92.1%
Apgar score at 5 mins	10	1	0.3%
	0	2	0.5%
	2	1	0.3%
	7	2	0.5%
	8	5	1.3%
	9	19	5.0%
	10	349	92.3%

Table 4.7: Distribution of Neonatology and NICU Admissions and Reasons for Admission

		Frequency (n=25)	Percent
NICU / Neonatology admission	Neonatology admission	23	92.0
	NICU admission	2	8.0
Reason of admission	Risk of neonatal infection	16	61.5
	Transient tachypnea	3	11.5
	Transient tachypnea		
+ low birth weight	1	3.8	
	Hypoxic ischemic encephalopathy	1	3.8
	MMR	1	3.8
	Low birth weight	2	7.7
	NNIR	1	3.8
Outcome	Discharged	19	90.5
	Died	2	9.5

Table 4.8: Apgar Scores at 1 and 5 Minutes by Mode of Delivery

Mode of Delivery						
		SVD		C-section		P-value
Apgar score at 1 min	0	0	0.0%	2	2.1%	.015
	2	1	0.4%	0	0.0%	
	6	3	1.1%	0	0.0%	
	7	7	2.5%	2	2.1%	
	8	6	2.1%	8	8.5%	
	9	265	93.6%	82	87.2%	
	10	1	0.4%	0	0.0%	.052
Apgar score at 5 mins	0	0	0.0%	2	2.1%	
	2	1	0.4%	0	0.0%	
	7	2	0.7%	0	0.0%	
	8	3	1.1%	2	2.1%	
	9	11	3.9%	8	8.5%	
	10	266	94.0%	82	87.2%	

Discussion

This retrospective study assessed the success rate and maternal–neonatal outcomes of labor induction among 378 women at Kacyiru Hospital, Rwanda. The findings demonstrate a high success rate of induction, with 75.1% of participants achieving spontaneous vaginal delivery. The predominant indication for induction was late-term pregnancy, followed by full-term pregnancy and prolonged latent phase of labor. Cytotec (misoprostol) was the most commonly used induction agent, administered in 98.7% of cases.

These results are consistent with previous studies identifying post-term pregnancy and prolonged latent phase as leading indications for labor induction in similar settings [20-23]. Misoprostol remains one of the most widely used prostaglandin analogues for cervical ripening and induction due to its effectiveness, affordability, and ease of administration [24-26]. Nevertheless, its use requires close monitoring given potential complications such as uterine tachysystole, fetal distress, and, in rare cases, uterine rupture [27, 28]. The favorable induction-to-delivery outcomes observed in this study likely reflect effective dosing protocols and vigilant intrapartum monitoring at Kacyiru Hospital.

The spontaneous vaginal delivery rate of 75.1% aligns with previously reported success rates of 70–80% for medically induced labor [29, 30]. However, the observed cesarean section rate of 24.9% underscores the ongoing challenge of optimizing induction protocols to minimize unnecessary operative interventions. The most frequent indication for cesarean section was maternal request, suggesting growing patient involvement in delivery decision-making. While this reflects positive trends in patient autonomy and shared decision-making it also highlights the importance of patient education regarding the risks and benefits of elective cesarean delivery following induction [31].

Neonatal outcomes in this study were largely favorable, as evidenced by high Apgar scores at both 1 and 5 minutes. These results indicate that induction, when properly managed, does not significantly compromise neonatal wellbeing [32]. However, a small proportion of neonates required admission to the NICU or neonatology unit, primarily due to risks of infection and transient respiratory complications, echoing findings from similar reports [33].

Overall, this study supports the safe and effective use of Cytotec for labor induction in resource-limited settings when accompanied by adequate maternal and fetal monitoring.

Conclusion

Labor induction with Cytotec at Kacyiru Hospital demonstrated a high success rate and favorable maternal and neonatal outcomes. While the results underscore the efficacy of misoprostol for induction, continuous monitoring and standardized induction protocols remain essential to reduce cesarean section rates and improve safety. Future multi-center and prospective studies are recommended to further elucidate the determinants of successful induction and refine national obstetric practice guidelines in Rwanda.

Contributions of Authors

- Ahmed Hend: Conceptualization of the study, data collection, statistical analysis, manuscript drafting, and literature

review.

- Mohamed Dina: Conceptualization of the study, data collection, statistical analysis, manuscript drafting, and literature review.
- Ahmed Ammar: Data interpretation, critical review of the manuscript, and contribution to discussion and revision.
- Toto Razan: Data interpretation, critical review of the manuscript, and contribution to discussion and revision.

All authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Declaration of Interests

The authors declare that they have no conflicts of interest related to this study. All authors have completed the ICMJE uniform disclosure form and report no financial, personal, or professional relationships that could influence the work reported in this manuscript.

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