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ORIGINAL ARTICLE

Adherence to induction of labor protocols and rate of cesarean sections at a tertiary referral hospital in Saudi Arabia

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ABSTRACT

Background: Induction of labor (IOL) is a frequent obstetric intervention used for a variety of reasons, including post-date gestation. The fundamental goal of IOL is to obtain the best maternal outcomes while lowering gestational morbidity and death. However, IOL is not always effective and may require an emergency cesarean section. Several IOL protocols were developed to increase success rates and decrease the number of cesarean section deliveries; however, adherence to these standards has not been widely reported. The purpose of this study was to evaluate the effectiveness and compliance of various IOL regimens in King Fahad Medical City, Saudi Arabia.

Methods: This was a retrospective chart review of women who presented to the Women's Specialized Hospital in KGMC between January and December 2015 and underwent IOL. Data collected included demographics, medical and obstetric history, IOL indications, and related data.

Results: A total of 346 women were enrolled; the largest proportion was nulliparous (37.3%), and more than one-half were at 36-39 gestational weeks of pregnancy. The major cause of IOL was reduced fetal movement (15.3%). The rate of adherence to protocols was 98%, and the success rate of IOL was 98.6%. Most women delivered normally via the vagina (70.3%).

Conclusion: Adherence to the IOL protocol was high, which led to a high rate of IOL success and a high rate of normal vaginal delivery. The indication for IOL was mainly post-date pregnancy, and prostin was the most used agent for IOL.

Keywords: IOL, adherence, indications, success.

Introduction

Labor is a physiological process by which the fetus and placenta exit the uterus via the vaginal canal [1]. Induction of labor (IOL) is the intentional simulation of uterine contractions to start labor before it spontaneously begins [2], usually at or after 28 weeks of pregnancy [3]. This treatment is used in medical, fetal, and obstetric circumstances where pregnancy prolongation might jeopardize mother or fetal well-being, or when expectant care or vaginal birth without induction is contraindicated [4].

According to the World Health Organization (WHO), IOLs are recommended for improving pregnancy outcomes and the quality of care [5]. Its primary goal is to guarantee the best possible results for the mother [6] and to avoid needless cesarean sections (CS) and serious obstetric complications [5]. Strong evidence suggests that key IOL indications include gestational diabetes mellitus

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(GDM), hypertensive disorders, advanced maternal age, and possible fetal impairment [7]. Other indications are post-term pregnancy, renal illness, placental abruption, and intrauterine fetal death [8]. IOL can be achieved by a variety of methods, including both pharmacological and nonpharmacological therapies [9].

While IOLs have an important role in lowering gestational maternal morbidity and mortality, they are not always effective and may require emergency CS [3]. Several IOL methods have been developed to reduce unsuccessful inductions and CS rates. Notable protocols include those from the "Royal College of Obstetricians and Gynecologists (RCOG)," the "American College of Obstetricians and Gynecologists (ACOG)," and the "Society of Obstetricians and Gynecologists of Canada (SOGC)" [10,11]. One significant distinction between the three regimens is that the ACOG recommends oxytocin for main induction [11]. Despite the presence of these protocols, there are few studies that report on IOL protocol adherence as well as IOL success rates. As a result, the purpose of this study was to assess both IOL protocol adherence and IOL success rates.

Subjects and Methods

Design and subjects

This was a retrospective chart assessment of women who presented to the Women's Specialized Hospital at King Fahad Medical City (KFMC) between January and December 2015 for IOL surgery. The study included women with a gestational age of >24 weeks, cephalic presentation, unfavorable cervix ≤2 cm, and oxytocin initiation during the latent phase of labor. Those who were allowed to enter the active phase of delivery but refused to follow the IOL protocol were disqualified. Adherence to the protocol was determined by checking each female's chart, the IOL chart, and nurse and physician notes.

Data analysis

The collected data were analyzed by SPSS (IBM V.20); mean and SD were applied to represent quantitative data, whereas numbers and proportions were used to represent qualitative data.

Results

A total of 346 women were recruited; the demographics of the subjects are shown in Table 1. The mean ± SD age of women was 30.4 ± 5.2 years. The mean, median, and range of height and weight of the participants were recorded. The mean ± SD of body mass index (BMI) was 35.1 ± 25 kg/m^2. The mean ± SD of induction duration was 557.9 ± 339.8 minutes. The mean ± SD of blood loss volume was 293.1 ± 262.2 ml.

The obstetric characteristics of the women are shown in Table 2. The largest proportion of the subjects was nulliparous, with 129 (37.3%) parity being zero, followed by primiparous 81 (23.4%). More than one-half of the subjects, 193 (55.8%), were at 36-39 weeks of gestation.

The indications of labor induction are displayed in Table 3. The main reason was post-date 97 (28%), decreased fetal movement 53 (15.3%), followed by GDM 51 (14.8%), and spontaneous rupture of membrane 45 (13%). The remaining frequencies of women were indicated for other causes, except for 9 (2.6%) who had no clear indication.

Adherence and outcomes of IOL are illustrated in Table 4; regarding IOL, RCOG, and SOGC protocols were followed in 302 patients (87.3%), and 339 patients satisfied the ACOG criteria, bringing the overall compliance rate to 98%. A high success rate of induction was recorded at 341 (98.6%). Epidural anesthesia was used for 36 (10.4%) of the subjects, and prostin was the mainly used agent for IOL 271 (78.3%). Foley's catheter was required for 15 (4.3%) subjects. Most of the women underwent normal vaginal delivery 242 (70.3%).

Discussion

IOL is commonly utilized as a prenatal intervention in both poor and developed countries [4]. Despite its crucial indications [8], and its role in lowering maternal gestational morbidity and mortality, IOL is not always effective, necessitating emergency CS [3]. Several IOL protocols have been devised to address this issue, although adherence to these standards has not previously been recorded. Our study sought to document IOL protocol adherence and its associated success rate.

Our current investigation discovered a high percentage of adherence to IOL protocols, which is confirmed by the high rate of IOL use and normal vaginal deliveries observed. There are very few studies that precisely examine adherence to IOL regimens. One study compared the outcomes of groups who followed a hospital IOL regimen and those who did not. It demonstrated a decreased rate of failed IOLs in the adherent group, despite the fact that it did not examine overall adherence but rather outcomes of two distinct types [12]. Another study with 195 participants evaluated compliance with a specific IOL procedure incorporating oral misoprostol delivery and found a compliance rate of 73.85% [13].

Failed IOL is commonly described as the inability to induce vaginal labor with IOL interventions [14] or the need to conduct CS during the latent phase of labor induction [15]. Another definition of a failed IOL despite severe contractions resulting in CS [16,17]. In our study, IOLs failed in only a small number of women (1.4%), and nearly one-quarter of the individuals (24.3%) received CS. These data point to positive IOL outcomes and underline the need of adhering to IOL procedures.

Our findings were contrasted to those reported in a prior Saudi study, which found that normal delivery was accomplished by more than half of the individuals who had IOL (62%), whereas 31.1% received CS [2]. Similarly, our findings were more favorable than those of a prospective analysis of 234 individuals, which found

Table 1. *Demographics of the women.*

	Mean	SD	Median	Minimum	Maximum
Age (yrs)	30.4	5.2	30	18	44
Height (cm)	156.5	10.4	157	73.0	182.0
Weight (kg)	81.6	18.5	79	34.0	164.0
BMI (kg/m^2)	35.1	25.0	31.7	14.3	290.9
Duration of induction (min)	577.9	339.8	532.5	50	1,430
Duration of second stage (min)	25.9	36.7	12	1	306
Duration third stage (min)	6.3	6.0	5	1	40
Blood loss	293.1	262.2	200	50	2,000

Table 2. *Obstetric characteristics.*

Variables	*N*(%)
Parity	
0	129 (37.3%)
1	81(23.4%)
2	52(15%)
3	43(12.4%)
4	13(3.8%)
5	12(3.5%)
≥6	16(4.6%)
Gestational age (weeks)	
≤24	2 (0.6%)
26-29	2(0.6%)
30-35	16 (4.6%)
36-39	193 (55.8%)
40-43	130 (37.6%)

Table 3. *Indications of labor induction.*

Reasons	*N* (%)
No clear indication	9 (2.6%)
Cardiomyopathy	1 (0.3%)
Cholestasis of pregnancy	7 (2.0%)
Chronic hypertension	2 (0.6%)
Decreased fetal movement	53 (15.3%)
DM	12 (3.5%)
Fetal anomaly	12 (3.5%)
fetal distress	2 (0.6%)
GDM	51 (14.8%)
H/O IUFD	8 (2.3%)
H/O IUGR	1 (0.3%)
HYDROPS	1 (0.3%)
ITP	1 (0.3%)
IUFD	8 (2.3%)
IUGR	13 (3.8%)
PET	5 (1.2%)
PIH	7 (2.0%)
Placental calcification	1 (0.3%)
Polyhydramnios	1 (0.3%)
Post-dated	97 (28.0%)
PPROM	2 (0.6%)
Sickle cell anemia	1 (0.3%)
SLE	1 (0.3%)
Social reason	1 (0.3%)
SROM	45 (13.0%)
Twins	4 (1.2%)

DM = diabetes mellitus; H/O IUFD = history of intrauterine fetal demise; H/O IUGR = history of intrauterine growth restriction; PET = pre-eclamptic toxemia; PIH = pregnancy-induced hypertension; PPROM = preterm premature rupture of the membranes; SLE = systemic lupus erythematosus; SROM = spontaneous rupture of membrane.

only 57.7% effective IOL and 42% CS rates [4]. This lends credence to the idea that strict adherence to IOL standards can minimize CS rates while increasing IOL success rates.

A previous study has shown that higher parity is connected with a higher likelihood of vaginal delivery, but longer maternal age (over 35 years) and nulliparity are linked to an increased risk of CS [18]. Additionally, higher maternal BMI and nulliparity have been linked to an increased risk of CS during IOL [19]. In our study, more than half of the participants were nulliparous or primiparous, with a mean age of 30.4 years and a mean BMI of 35.1 kg/m^2. However, we did not investigate the particular characteristics linked with CS versus vaginal birth outcomes.

IOLs are used for a variety of reasons, including GDM, hypertensive disorders, maternal age, potential fetal compromise, post-term pregnancy, renal diseases, placental abruption, and intrauterine fetal death. In our analysis, the most common indication for IOL was post-dated pregnancy (28%), followed by diminished fetal movement (15.3%) and GDM (14.8%). Similar to our findings, the principal indications for IOL, as reported in a prior Saudi study, included post-date (26.2%), but in contrast to our data, the second indication was GDM (19.4%), followed by decreased fetal movement, which constituted 9.2% of causes [2]. Another Saudi study from Jeddah included 127 pregnant patients and found that preeclampsia was the leading cause of IOL (34.65%), followed by post-date pregnancy (18.9%) [5]. This was in contrast to our findings, as preeclampsia accounted

Table 4. *IOL adherence and outcomes.*

Variables	*N*(%)
Followed protocol and compliance	
RCOG and SOGC	302 (87.3%)
ACOG	339 (98%)
IOL outcomes	
Failure	5 (1.4%)
Success	341 (98.6%)
Epidural anesthesia	36 (10.4%)
Agent for induction	
Prostin	271 (78.3%)
Oxytocin	54 (15.6%)
Foley's catheter	15 (4.3%)
Delivery	
Normal vaginal	242 (70.3%)
CS	84 (24.3%)

for only 1.2% of all indicators. Another study found that the most common indication for IOL was premature membrane rupture (49.5%) [4]. However, in the current study, this factor accounted for only 0.6% of all causes of IOL.

IOL can be achieved by a variety of methods, including both pharmacological and nonpharmacological therapies [9]. Pharmacological treatments that stimulate the uterus for IOL include oxytocin and prostaglandins; prostaglandin preparations are typically used when the cervix is not suitable [9,20,21]. Prostaglandins are essential for IOL, cervical ripening, and uterine contractions. Oxytocin is a hormone that stimulates uterine contractions during childbirth [11]. Prostaglandin E2 is more efficacious than oxytocin for IOL in non-dilated cervixes [22,23]. In the absence of prostaglandins, the WHO advised using oxytocin alone [24].

In the current study, prostin was the most commonly used IOL agent, with oxytocin administered to just 15.6% of women. Similar to our findings, prostin was the most commonly utilized agent in a prior Saudi study of 531 mothers, which discovered that prostin was used by more than half of the subjects (63.5%) [2].

Conclusion

This study found a high degree of adherence to IOL protocols, which was associated with a high rate of normal vaginal births. The indications for IOL were various, with post-date pregnancy being the most common one. Additionally, prostin was the most often utilized drug for IOL, which contributed to the reported high success rate.

Limitations, strengths, and recommendations

The limitations of this study include the retrospective design, and we did not assess the factors linked with vaginal delivery and CS. However, the main strength point of this research is that it is the first work conducted to report the adherence level to the IOL protocol and the outcomes of this adherence. Therefore, further studies are highly recommended to understand the adherence level to IOL protocols in national and international settings.

List of Abbreviations

ACOG	American College of Obstetricians and Gynecologists
BMI	Body mass index
CS	Cesarean section
GDM	Gestational diabetes mellitus
IOL	Induction of labor
KFMC	King Fahad Medical City
RCOG	Royal College of Obstetricians and Gynecologists
SOGC	Society of Obstetricians and Gynecologists of Canada
WHO	World Health Organization

Conflict of interest

No conflict of interest according to the authors.

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Consent to participate

Not applicable; this was a retrospective study based on the data of patients. However, the security of data and anonymity were guaranteed.

Ethical approval

Ethical approval was received from KFMC before the beginning of the study.

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