PREDICTORS OF SUCCESSFUL INDUCTION OF LABOUR IN POST-TERM PREGNANCIES AT KENYATTA NATIONAL HOSPITAL

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DECLARATION

I declare that this is my original work and has not been presented elsewhere. References of work done by others have clearly been indicated.

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CERTIFICATE OF AUTHENTICITY

This is to certify that this dissertation is the original work of Dr.Rashida Admani, MMed student, registration number H58/63366/10, in the department of Obstetrics and Gynaecology, College of Health Sciences, University of Nairobi, under the guidance and supervision of Dr Wanyoike Gichuhi and Dr Francis Odawa. It has not been presented in any other university for award of degree.

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DEDICATION

This dissertation is dedicated to my loving husband, Adam Admani who has been by my side all the way.Thank-you and love you very much.

TABLE OF CONTENTS

ABBREVIATIONS

ACOG American College of Obstetrics and Gynaecology

ANC Antenatal clinic

ARM Artificial rupture of membranes

CPD Cephalo-pelvic disproportion

C/S Caesarean section

FIGO International Federation of Obstetrics and Gynaecology

KNH Kenyatta National Hospital

LNMP Last Normal Menstrual Period

NHS National Health Survey

NRFS Non-reassuring fetal status

PGs Prostaglandins

PGE1 Misoprostol

PGE2 Dinoprostone

PI Principal Investigator

RCOG Royal College of Obstetricians and Gynaecologists

WHO World Health Organization

OPERATIONAL TERMS

Expected date of delivery- 280 days or 40 completed weeks from the last menstrual period.

Post-maturity: Post-maturity or Post-maturity Syndrome (PMS) can only be diagnosed after delivery and is defined as a post-dates pregnancy accompanied with any combination of the following newborn assessments:

a. no lanugo (fine body hair)
b. long nails
c. abundant hair on head
d. calcified fetal skull
e. hanging or wrinkled skin, with the appearance of weight loss
f. dehydrated
g. alert face
h. peeling skin
i. little to no vernix
j. oligohydramnios
k. meconium or bile staining of skin
l. long, thin growth retarded body with long thin limbs

Successful induction- Vaginal delivery following induction of labour

Success rate- number of vaginal deliveries achieved per 100 women induced due to post-dates

Failed Induction of labour- Failure to deliver vaginally after initiation of induction (delivery via caesarean section)

ABSTRACT

Background: A post-term or prolonged pregnancy according to World Health Organization (WHO) is one that has exceeded 294 days from the last normal menstrual period. A prolonged pregnancy can lead to post-maturity of the fetus posing a great threat to its further survival in-utero and multiple complications including neonatal mortality post delivery. World-wide 5-10% of all pregnancies are prolonged with 20% of post-term fetuses having dysmaturity syndrome. The incidence of induction is on the rise, half of which are due to post-dates. At Kenyatta National Hospital the rate of induction of labour due to prolonged pregnancies stands at 50 % of all inductions. The failure of induction world-wide has been increasing and it is therefore important to determine some of the predictors of successful induction. Several studies have been done world-wide to predict factors influencing failed induction but there has been none specifically for predictors of successful induction in post-dates.

Objectives: To determine the predictors of successful induction of labour in post-term pregnancies at Kenyatta National Hospital.

Study design: Descriptive cross-sectional study among post-term pregnant women delivering at Kenyatta National Hospital (KNH).

Study setting: The labour ward and post-natal wards at Kenyatta National Hospital

Study participants: 188 post-term pregnant women, with a live fetus undergoing induction of labour with no alternate indication for induction.

Methodology: This was a descriptive cross-sectional study on post-term pregnant women admitted for labour induction at Kenyatta National Hospital between January and April 2013. 188 patients with gestational age of ≥ 41 weeks undergoing induction of labour during the study

period were consecutively recruited into the study until the sample size was reached. A questionnaire was used to obtain data about the socio-demographics, gestational age and parity. The pre-induction Bishop Score, the birth weight of the infant, methods of induction and the outcome of the induction process was availed from the patients file.

Results: A total of 188 women were induced due to post-term pregnancies. Most of the participants (76%) were aged between 20 and 29 years. Majority of the women were primi-gravidae (58%), and the mean gestational age was 41.14 weeks (range 41-42 weeks). The success rate of induction among study participants was 68 %. Prostaglandins in combination with artificial rupture of membranes and Oxytocin infusion was the most common method used for inducing labour. Multiparity and a favourable Bishop score were significant predictors of successful induction in post-term pregnancies. Bishop scores ≥6 were associated with higher success rates for labour induction (85.2%) versus 60.4% in those with lower Bishop scores. Infants less than 4000grams had higher rates of vaginal deliveries (72.8%) compared to those with more than 4kgs (6.7%). Age of the patient and the modality of induction were not determining factors in induction of post-term pregnant women in this study.

Conclusions and recommendations: In conclusion Bishop score of ≥ 6, multi-parous patients and mothers with infants having a birth weight of < 4000grams had a higher rate of successful induction. A pre-induction estimated fetal weight should be a routine practice to select the right patients for the induction process. Mothers with estimated fetuses over 4000grams should be offered an elective caesarean as an option.

CHAPTER ONE

1.1 INTRODUCTION AND LITERATURE REVIEW

Post-term or prolonged pregnancy is when the pregnancy has exceeded the expected date of delivery by 2 weeks or more [1]. World-wide about 5-10% of pregnancies are prolonged [2]. Such pregnancies are at an increased risk of utero-placental insufficiency and macrosomia of the fetus which may lead to other fetal and maternal complications [3] and thus the need to deliver them.

At KNH induction of post-term pregnancies is done at 41 weeks as per the national guidelines, the WHO, American College of Obstetrics and Gynaecology (ACOG) and the Royal College of Obstetricians and Gynaecologists(RCOG) guidelines [1, 4, 5, 6]. The policy of inducing labour at 41 weeks (288 days of gestation) in uncomplicated pregnancies is justified because when the gestational age is more than 41 weeks, the incidence of meconium staining of amniotic fluid and evidence of utero-placental insufficiency increases significantly [7,8]. In addition, labour induction at 41 weeks' gestation for otherwise uncomplicated singleton pregnancies reduces caesarean delivery rates without compromising perinatal outcomes [7,9] A number of key morbidities are greater in infants born to pregnancies that progress to and beyond 41 weeks gestation including meconium aspiration, neonatal academia, low Apgar scores, macrosomia, and, in turn, birth injury[10,11]. Such complications associated with fetal macrosomia include prolonged labor, cephalo-pelvic disproportion, and shoulder dystocia with resultant risks of orthopaedic or neurologic injury [10].

Approximately 20% of post-term fetuses have fetal dysmaturity (post-maturity) syndrome, which describes infants with characteristics of chronic intrauterine growth restriction from utero-placental insufficiency [12,13]. These pregnancies are at increased risk of umbilical cord

compression from oligohydramnios, non-reassuring fetal status (antepartum or intrapartum), intrauterine passage of meconium, and short-term neonatal complications such as hypoglycaemia, seizures, and respiratory insufficiency. [12,13]

Post-term pregnancy is also an independent risk factor for neonatal encephalopathy and for death in the first year of life [14]. Perinatal mortality (defined as stillbirths plus early neonatal deaths) at 42 weeks of gestation is twice that at 40 weeks (4-7 vs. 2-3 per 1,000 deliveries, respectively) and increases 4-fold at 43 weeks and 5- to 7-fold at 44 weeks [14,15]

Induction of labour is the iatrogenic stimulation of uterine contractions before the onset of spontaneous labour, to accomplish vaginal delivery. It is performed when the benefits of expeditious delivery to either mother or fetus outweigh the risk of continuing the pregnancy. The frequency of induction has been increasing, and while it is a beneficial process it is not without risks.

Indications for induction of labour may be clinical or social (mother's or clinician's convenience). Clinical indications include post-term pregnancy, hypertensive disorders of pregnancy, prelabour (premature) rupture of membranes, chorioamnionitis, diabetes, isoimmunisation, intra-uterine fetal death, intra-uterine growth restriction, gross fetal anomalies among other maternal conditions.

Contraindications to induction include cephalo-pelvic disproportion, placenta praevia, abnormal fetal lie, cord presentation/prolapse in a live fetus, previous classical caesarean section scar, prior myomectomy with breach of uterine endometrium, pelvic structure anomalies, invasive carcinoma of the cervix, and active genital herpes simplex infection.

Induction of labour is a relatively common procedure. The rate of induction of labour may differ depending on the availability of resources and population. Worldwide, the prevalence of labour induction varies greatly between countries and even between different regions of the same country. In general, however, it is higher in developed countries (at around 20%) than in developing countries [16].

In the Western world, frequency of labour induction has been increasing, with reasons including the availability of better cervical ripening agents, patient and clinicians desire to arrange a convenient time of delivery, and more relaxed attitudes toward marginal indications for induction [16]. Patient or provider concerns about the risk of fetal demise with expectant management of post-term pregnancies have also contributed to the increased rate of induction[16,17]. In the United Kingdom according to the National Health Survey (NHS), one in every five live births is induced half of which are due to post-term pregnancies [18,19]. In a national survey in Kathmandu the incidence of induction of labour was 19.7%, 51.8% of which were for post-dates[20]. In another study in Sweden, the rate of induction in nulliparous women was as high as 40% with post-dates being the major indication. [21]

Back in our setting, Mati et al in 1983 Nairobi Birth Survey reported an overall induction rate of 5.7% [22]. Khisa in 1999 found an induction rate of 14% at Aga Khan Hospital Nairobi [23] Onyambu in 2001, in the same hospital found a rate of 8.04% [24], while Kaguta in 1984 found a rate of 5.6% at Kenyatta National Hospital [25]. In a prospective descriptive cross sectional study done at KNH in 2002, Njagi J, M, found an induction rate of 12.7% [26]. The indications for the above inductions were mainly postdates (approximately 50%), PROM and hypertensive disease. The most recent study by Esiromo in 2011 found the commonest indication for induction at KNH to be postdates (50.8%) [27]

From observational studies it has been found that nulliparous women have a higher failure rate than multiparas and also induction has been known to fail when the bishop score is five or less.[28]. However no such study has been carried out specifically for post-term pregnancies and the rate of successful induction of prolonged pregnancies with such factors world-wide is not known.

The factors of interest include: age of the patient; parity; pre-induction Bishop score, method of induction and the birth weight of the infant.

The pre-induction cervical status is known to be the most effective of all parameters in accounting for successful induction [30,31]. Bishop established the relationship between cervical ripeness and entering spontaneous labour about fifty years ago [31].The modified Bishop score is now being used to assess the cervix. This system tabulates a score based upon the station of the presenting part and four characteristics of the cervix: dilatation, cervical length (instead of effacement in the original scoring system by Bishop), consistency, and position (Appendix 2). A score that exceeds 8 describes the patient most likely to achieve a successful vaginal birth without cervical ripenind [32]. Bishop scores of less than 6 usually require that a cervical ripening method be used before other methods [32].

The relationship between a low Bishop score and failed induction, prolonged labour, and a high caesarean birth rate was first described prior to widespread use of cervical ripening agents [33]. However, this relationship has persisted even after the introduction of these ripening agents [34]. Cervical ripening is a complex process that results in physical softening and distensibility of the cervix, leading to cervical effacement and dilatation. Remodelling of the cervix involves enzymatic dissolution of collagen fibrils, increase in water content, and chemical changes. These

changes are induced by hormones (estrogen, progesterone, relaxin), as well as cytokines, prostaglandins, and nitric oxide synthesis enzymes.

1.2 RATIONALE

The Kenyatta National Hospital is the main referral hospital in Kenya, receiving many high risk referrals as well as many booked patients in the clinics and wards. The rate of induction has been shown to be increasing from 5.6% in 1984[25] to 12.7% in 2002 [26], 50% of which is due to post-dates. This could be explained by more vigilant decisions to induce, rather than expectant management of patients especially with prolonged pregnancies as per the WHO and KNH guidelines. The rate of caesarean section from failed induction has been found to be as high as 30% in patients undergoing induction for various reasons [27] and yet no studies have shown what factors could be influencing that in post-term pregnancies

Although the idea behind an elective induction of labour is culmination to a vaginal delivery it is not always so as some induction processes are unsuccessful and result in an emergency caesarean section. It is therefore important to be very judicious in choosing the correct patients and also to prepare ourselves and the participants on the possible outcome of the induction process.

Few studies have been done world-wide to determine the factors contributing to failed induction where induction process was carried out for all indications [35,36]. However no study has been carried out to determine such predictors for those undergoing induction due to prolonged pregnancies at KNH

This study was conducted to determine the multiple factors that could affect the outcome of induction in the patients with post-term pregnancies and also to find out the rate of successful

induction in patients undergoing induction due to post-term pregnancies at Kenyatta National Hospital.

1.3 RESEARCH QUESTION

What are the predictors of successful induction of labour in post-term pregnant mothers delivering at KNH?

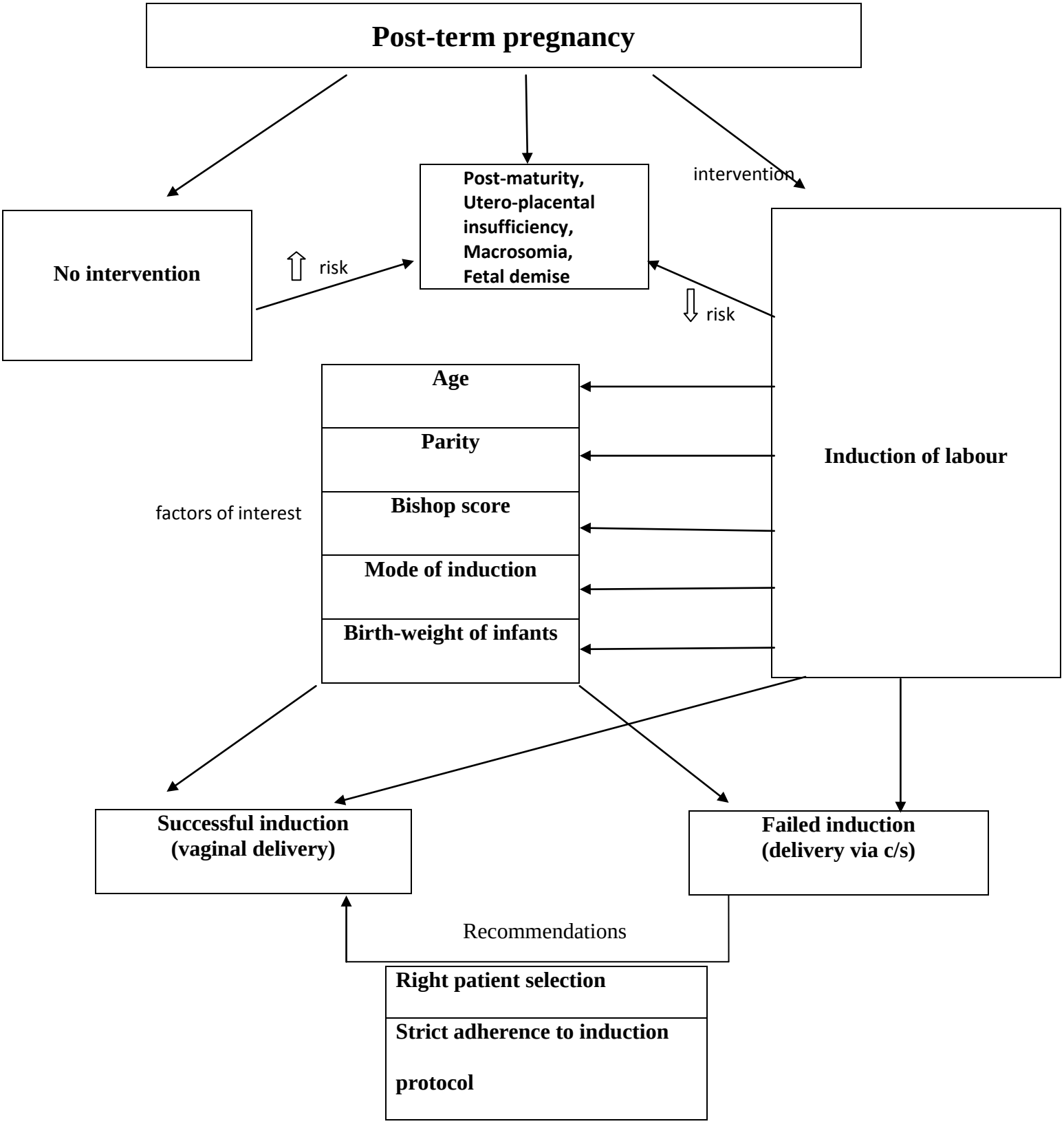
1.4 CONCEPTUAL FRAMEWORK

In post-term pregnancies with live fetus, the aim of induction of labour is to accomplish a successful vaginal delivery with good neonatal outcome. Induction of labour may be successful or may result in caesarean section

This was a cross-sectional study with descriptive research design that sought to determine the predictors of successful induction of labour in post-term pregnancies and also the rate of successful induction in this population. The women included in this study were those who had a singleton, live intrauterine fetus in cephalic presentation at 41 weeks gestational age and above.

Study participants were recruited from postnatal/labour wards immediately after delivery. Once consent was obtained, the participants were interviewed and information obtained was entered into a structured questionnaire. Labour and delivery records were then reviewed and entered into the questionnaire. The outcome variable measured was the mode of delivery of the patient.

1.4.1 SCHEMATIC CONCEPTUAL FRAMEWORK



1.5 OBJECTIVES

A. Broad objective:

To determine the predictors of successful induction of labour in post-term pregnancies at Kenyatta National Hospital.

B. Specific objectives:

- To describe the demographic and obstetric characteristics of the study population
- To describe the mode of induction and delivery outcomes (babies weight, mode of delivery) of the study population
- To assess the predictors of successful induction of labour (age of patient, parity, bishop score, birth weight of infant, method of induction)
- To determine rate of successful induction (patients delivered vaginally)

CHAPTER TWO

2.0 METHODOLOGY

2.1 STUDY DESIGN

This was a cross sectional descriptive study done at KNH. The design was suitable for the study because it sought to observe and describe the labour outcomes following induction of labour of postdates without intervening in any way. It is a review of procedures followed in the unit, in

order to give a feedback on what is currently practiced. The participants were recruited from labour and postnatal wards immediately after delivery and once consent was obtained, the participants were interviewed and labour and delivery records were studied. The information was entered into a structured questionnaire.

2.2 STUDY SETTING

The study took place at Kenyatta National Hospital, situated in Nairobi, 4kms from the city centre. It serves as the national referral and hospital receiving high-risk patients, self-referrals and un-booked patients from Nairobi and its environs as well as from other hospitals. It also serves as a teaching hospital for the under-graduate and post-graduate students from the University of Nairobi, Faculty of Medicine and for the students from the Kenya Medical Training College, Nairobi. The maternity unit caters for about 10000 deliveries annually, offering comprehensive obstetric care. The Obstetrics unit consists of an antenatal clinic, three antenatal/postnatal wards, a labour ward and a maternity operating theatre.

At the Kenyatta National Hospital, patients are induced only for obstetric and medical indications. Post-term pregnancies are induced at 41 weeks and above. Breech presentations, previous uterine scars and patients with multiple gestation are not induced.

The patient is counselled about the procedure and indication, and a verbal consent is obtained. The patient is admitted to antenatal or labour ward. Physical examination is done and Bishop Score of the cervix is noted. If the score is poor (≤5) cervical ripening is done with prostaglandin pessary; a score of 6 and above is managed by ARM and Oxytocin.

If PGE2 (dinoprostone) is used, 3mg tablet is administered every 6-8 hours inserted in the posterior fornix, to a maximum of 3 doses.

When misoprostol is used, it is administered as 25mcg inserted in the posterior fornix every 4-6 hours to a maximum of 6 doses according to hospital protocol. Once the mother experiences contractions or a vaginal examination confirms favourable Bishop Score, she is transferred to labour ward, ARM is done and Oxytocin infusion started. If the Bishop score remains poor 4 hours after the 6^{th} dose, critical reappraisal is done. The patient may be allowed to rest for 24hrs then induction started again, or caesarean section delivery depending on the fetal status. A fetal surveillance is carried out using a non-stress test or an ultrasonography to determine the biophysical profile and resistive index before re-induction.

Oxytocin infusion rates for induction of labour are administered as per WHO protocol starting with 5IU in 500mls of normal saline at 10 drops/minute, increased at 10 drops ½ hourly to a maximum of 60 drops/min or 3 strong contractions in 10 minutes.

Fetal wellbeing is established by continuous electronic monitoring or intermittent monitoring. In case of uterine hyper stimulation, Oxytocin infusion is stopped and tocolysis given if indicated. Fetal heart rate abnormality is managed by immediate delivery via caesarean. After successful delivery of the baby and stabilization of mother, immediate post-partum care is given at Labour Ward and then transferred to the postnatal wards for postnatal care after review by the doctor.

2.3 STUDY POPULATION

The target population for this study was mothers with gestation age of ≥41 weeks admitted for induction at KNH

2.4 ELIGIBILITY CRITERIA

a. Inclusion criteria

- Patients admitted for induction with a gestational age of ≥ 41 weeks
- Patients who consented to participate.
- Singleton pregnancy with a live intrauterine fetus in cephalic presentation

b. Exclusion criteria

- All those who had other obstetric and medical indications for induction (other than post-dates)
- Patients with absolute or relative contra-indications to induction (e.g. Previous uterine scar, breech presentation etc)
- Contra-indication to vaginal delivery (e.g. Placenta praevia)
- Multiple gestation

2.5 SAMPLE SIZE

The sample size for cross-sectional survey will be used as shown below,

$$n = \frac{Z\alpha^2 P(1-P) \times DEFF}{d^2}$$

Where:

n = required sample size

Z = Z statistic for a 95% level of confidence (1.96)

P = Proportion of successful deliveries after induction (70%)

d = Margin of error of ±0.05.

DEFF = design Effect set at 0.5.

Substituting for the variables:

$$n = \frac{1.96^2 \times 0.7(1-0.7) \times 0.5}{0.0025}$$

$$n = 187.2$$

n = 188 participants

A sample size of 188 mothers was sufficient to determine the predictors of successful induction in post-term pregnancies at KNH with 95% confidence and error margin of ± 5%. From previous literature [27], the proportion of successful deliveries after induction (70%) was used to calculate the sample size using the formula above [27]. Although the success rate indicated above is a cumulative percentage of all indications of induction, taking into account that post-dates is the most common indication of induction (50.8%) [27], the formula approximated the minimum sample size for the participants to be enrolled.

2.6 STUDY INSTRUMENTS AND PROCEDURE

Data was collected using a structured questionnaire (Appendix 1) designed to contain questions on socio-demographic parameters, obstetric history and characteristics, induction method used and the outcome measures. Three registered nurse-midwives were recruited as research assistants. The principal investigator trained them on recruitment, obtaining consent and data collection before the study commenced.

Some of the quality assurance measures undertaken prior to commencement of data collection were:

- Using standardized methods of determining the Bishop scores
- Using a standard protocol of induction of labour for all mothers
- Pre-testing the questionnaire and standardization in filling the questionnaire with research assistants on 10 cases prior to undertaking the study

All patients in labour and post-natal wards who met the eligibility criteria were recruited to participate in the study and explained about the purpose of the study. Those who consented were consecutively enrolled to reach the targeted sample size. The participants' were interviewed and their socio-demographic and obstetric data was entered into the questionnaires. The other information like the mode of delivery, method of induction used and the infants' birth-weight was obtained from labour and delivery records and subsequently filled into the questionnaires.

2.7 STUDY VARIABLES

a. Independent variables:

1. Socio-demographic:
    - Age of mother

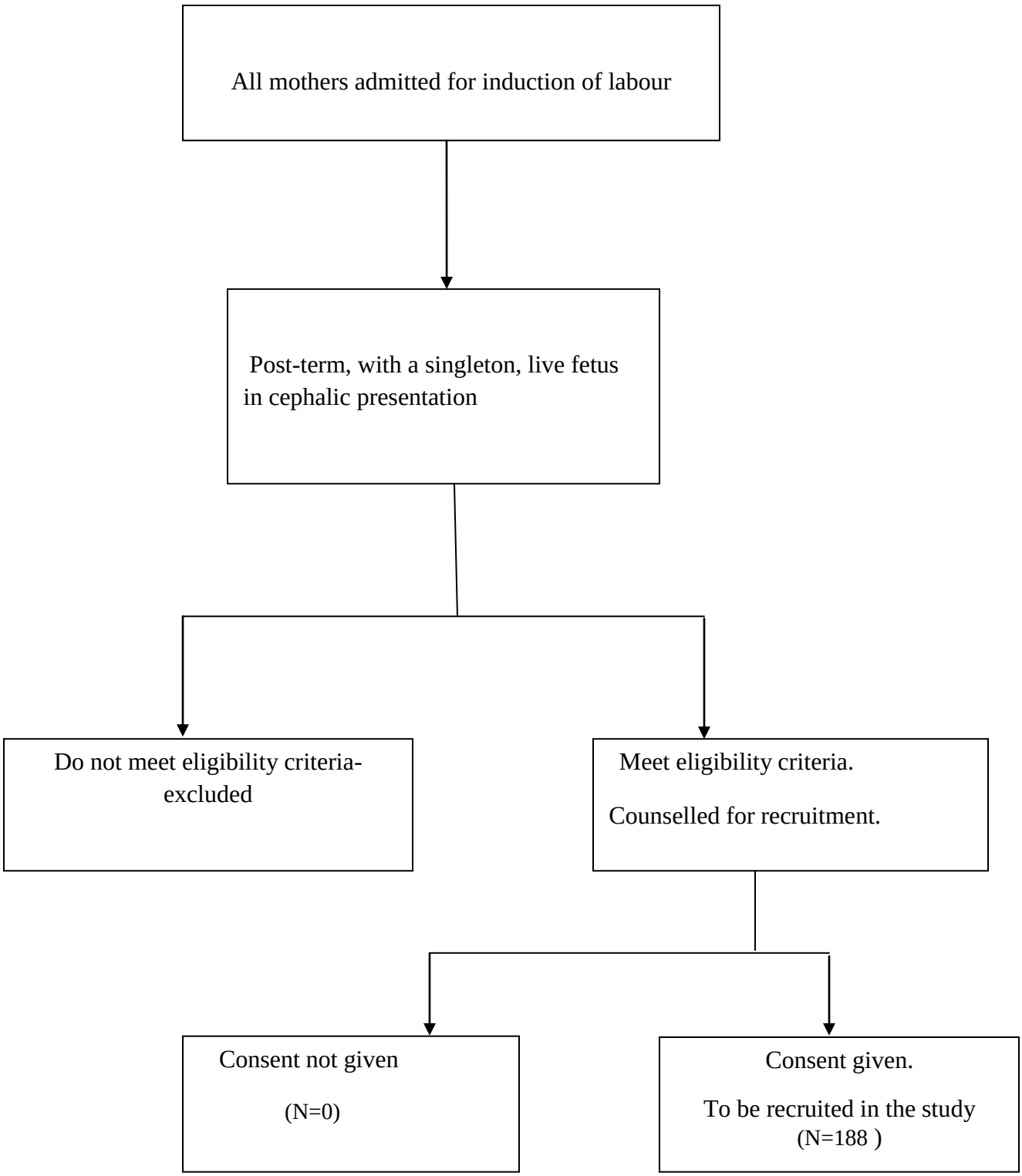
2. Obstetric characteristics:
    - Parity
    - Bishop score
    - Mode of induction

3. Birth weight of infant

b. Outcome variable

- Mode of delivery.

2.8 STUDY FLOW CHART



CHAPTER THREE

3.1 DATA MANAGEMENT AND ANALYSIS

a. DATA MANAGEMENT

Data was collected using a structured questionnaire (Appendix 1). The questionnaires were coded to make the data entry easy. All raw data was reviewed by the principal investigator and cross-checked to ensure completeness; any clarifications to be made were sought out immediately. The filled questionnaires were kept in a safe and confidential place that was accessible only to the principal investigator, ready for the data entry.

After cross checking the questionnaires for any missing entries a database was designed in MS Access which allowed the researcher to set controls and validation of the variables. On completion of the data entry exercise the data was exported in a Statistical Package (SPSS – Version 17.0) for analysis.

b. DATA ANALYSIS

Analysis of data involved descriptive statistics i.e. frequency distribution, means, standard deviations, proportions and cross tabulations. Data was presented in tables and graphs. Cross tabulation was done for the different socio-demographic and obstetric parameters and the successful induction process.

3.2 ETHICAL CONSIDERATIONS

- Written approval to conduct the study was obtained from the Kenyatta National Hospital Ethics and Research Committee (KNH-ERC) before collection of data.(pg 43)
- Informed consent was obtained from the participating mothers. Information about the study was given to the mothers in a language that was most comfortable for them to comprehend. Participation in this study was voluntary. No form of inducement or coercion was given to participants to force them to participate.
- Every precaution was taken to respect the privacy and confidentiality of the mothers who participated in this study. There were no names on the questionnaires and participants were only identified by a unique identification number.
- Standard of care was the same for all mothers; even those who did not participate in the study.

3.3 STUDY LIMITATIONS

1. Administration of drugs may not have been consistent (as per the KNH protocol) thus leading to prolonged induction process and higher rates of failed induction.

2. Pre-induction Bishop score was carried out by different medical doctors and therefore a variation in assessment could have occurred (despite prior discussion on the process)

3. Some mothers could have been induced for obstetrical conditions (not purely an elective induction for post-dates) but not comprehensively documented in the files.

4. Due to the working definition of failed induction (delivery via c/s), patients who had to be delivered by c/s due to other reasons (NRFS, CPD) after induction were generalized as failed induction.

CHAPTER FOUR

STUDY RESULTS

This chapter presents findings of the analysis of predictors of successful induction among post-term patients admitted for induction at KNH. Between the months of January and April 2013, 188 pregnant women at a gestational age of 41 weeks and above undergoing induction of labour were recruited.

Table 1: Demographic and Obstetric characteristics of women with post-term pregnancies undergoing induction of labour at KNH (n= 188)

Age (in years)	**Frequency (percentage)**
<20	2 (1)
20-24	57 (30)
25-29	87 (46)
30-34	31 (17)
35-40	11 (6)
Gestation	**Frequency (percentage)**
41 Weeks	161 (85.6)
42 Weeks	27 (14.4)
Parity	**Frequency (percentage)**
Zero	109 (58)
1 - 2	64 (34)
3 - 4	14 (8)
Bishop Score	**Frequency (percentage)**
0 - 5	134 (71.3)
6 and above	54 (28.7)

A total of 188 post-term maternal admissions were included in the analysis and the average age was 26.8 years (SD ± 4.6 years). The age range was 18 to 40 years.

Table 1 show that most of the post term pregnant women undergoing induction at KNH were aged between 20 and 29 years (76%).

Majority of patients were at 41 weeks gestation-the recommended gestation for induction for prolonged pregnancies (WHO).

Majority of patients undergoing induction of labour at KNH due to post-term pregnancies were primigravidae (58%).

Most (71.3%) of the participants undergoing induction had a Bishop score of 5 and below.

Table 2: Mode of induction and delivery outcomes in post-term pregnancies undergoing induction of labour at KNH (n=188)

Method Used For Induction	**Frequency (percentage)**
Prostaglandin only	22 (11.8)
PG + ARM + Oxytocin	111 (59.4)
ARM + Oxytocin	36 (18.7)
PG+ ARM	17 (9.1)
Other (mechanical-stripping of membranes)	2 (1)
Prostaglandin Type	
PGE1	132 (88)
PGE2	18 (12)
Mode Of Delivery	**Frequency (percentage)**
Vaginal	127 (68)
C/S	61 (32)
Vacuum	0
Indication For C/S	**Frequency (percentage)**
Failed induction(Failure of cervical ripening or progress)	32 (52.5)
NRFS	14 (23)
CPD	11 (18)
Others	4 (6.5)
Birth Weight (in grams)	**Frequency (percentage)**
< 4000	173 (92)
4000 and above	15 (8)

Table 2 shows that the commonest method used for induction was Prostaglandin in combination with artificial rupture of membranes(ARM) and Oxytocin (59.4%) followed by ARM and Oxytocin (18.7%). PGE1 was found to be more commonly used than PGE2 in our set-up.

The table shows that the success rate for induction of post-term pregnancies was 68%. The c/s rate was found to be 32%.None of the mothers on induction was delivered by vacuum delivery.

The birth weight of babies delivered post-term ranged from 2190 to 4530 grams with an average birth weight of 3359.2 grams (SD ± 408). Most babies (92%) weighed less than 4000 grams. The main indication of for the c/s was failure in cervical ripening or failure to progress (52.5%)

PREDICTORS OF SUCCESSFUL INDUCTION OF LABOUR

Table 3 : Association between sociodemographic and obstetric characteristics and Success of Induction (n=188)

	Mode of delivery			
Age in years	**Vaginal (%)**	**C/S (%)**	**OR (95% CI)**	**P value**
<20	1 (50)	1 (50)	0.5 (0.03-9.1)	0.43
20-24	37 (65)	20 (35)	1.0	
25-29	57 (66)	30 (34)	1.0 (0.5-2.1)	
30-34	22 (71)	9 (29)	1.3 (0.5-3.4)	
35-40	10 (91)	1 (9)	5.4 (0.6-45.3)	
Parity	**Vaginal (%)**	**C/S (%)**	**OR (95% CI)**	**p value**
Zero	60 (55)	49 (45)	1.0	<0.001
1- 2	54 (84)	10 (16)	4.4 (2.0-9.6)	
3 - 4	9 (87)	2 (13)	5.3 (1.1-24.7)	
Pre-induction Bishop Score	**Vaginal (%)**	**C/S (%)**	**OR (95% CI)**	**P value**
0 - 5	81 (60.4)	53 (39.6)	1.0	0.001
6 - 10	46 (85.2)	8 (14.8)	3.8 (1.6-8.6)	

Table 3 shows that most mothers across all age groups were successfully induced and the rate of success appeared to increase with age from 65% in mothers aged 20-24 years to 91% in the oldest age group (35-40 years). However, there was no statistically significant association between successful induction of labour and maternal age.

Maternal parity showed a statistically significant association with successful induction of labour ($p < 0.001$). As presented in the table, the rate of successful induction increased with increasing parity from 55% in primi-gravidae, to between 84% and 87% in multi-parous patients.

As shown in table 3 there is a significant association between the pre-induction Bishop score and success of induction; High pre-induction Bishop scores were associated with higher success rates for labour induction with 85.2% of patients with Bishop score above 6 being successfully induced compared to 60.4% of patients with lower scores.

Table 4 : Association between the induction modality and delivery outcome and Success of Induction (n =188)

	Mode of delivery			
Method	**Vaginal (%)**	**C/S (%)**	**OR (95% CI)**	**p value**
Prostaglandin only	11 (50)	11 (50)	1.0	0.35
PG + ARM + Oxytocin	77 (69.4)	34 (30.6)	2.3 (0.9-5.7)	
ARM + Oxytocin	26 (72)	10 (28)	2.5 (0.8-7.6)	
PG+ARM	13 (76.5)	4 (23.5)	3.3 (0.8-13.2)	
Other (mechanical)	1 (50)	1 (50)	1.0 (0.1-18.1)	
Birth Weight (in grams)	**Vaginal (%)**	**C/S (%)**	**OR (95% CI)**	**P value**
< 4000	126 (72.2)	47 (27.8)	1.0	<0.001
4000 and above	1 (6.7)	14 (93.3)	0.03(0.003-0.2)	

Table 4 indicates that the main methods of labour induction employed did not show significant associations with successful induction of labour, p = 0.35. Rates of successful induction for the different methods ranged from 50% for prostaglandin only to 76.5% for prostaglandin and ARM

As shown in the table, birth weight was significantly associated with rate of successful induction of labour ($p < 0.001$). Successful labour induction was achieved in 72.2% of deliveries with babies weighing less than 4000 grams compared to 6.7% in heavier babies (> 4000 grams)

Table 5: Multivariable regression of parity, Bishop Score and birth weight on successful induction of labour in post date pregnant mothers undergoing induction of labour (n =188)

	Odds Ratio	SE	z statistic	P value	95% Confidence interval	
Birth weight						
< 4000 grams	1.00					
4000 grams and above	0.02	0.03	-3.38	0.001	0.003	0.21
Parity						
Zero	1.00					
1-2	4.02	1.77	3.17	0.002	1.70	9.53
3 and above	2.76	2.25	1.25	0.212	0.56	13.63
Bishops score						
<= 5	1.00					
6 and above	3.50	1.73	2.53	0.011	1.33	9.23

Table 5 shows the results of the multivariable logistic regression analysis. After adjusting for the confounding effect of parity, both pre-induction Bishop score and birth weight were independent predictors of successful induction for post-term pregnancies. The odds of a successful induction was 3.5-fold higher (95% CI 1.33-9.23) in mothers with a Bishop score of 6-10 compared to participants with a score of 5 or less (p = 0.011). The odds of a successful induction were also significantly lower in newborns weighing above 4000 grams (OR = 0.02, 95% CI 0.003-0.21) compared to those weighing less than 4000 grams.

CHAPTER FIVE

5.1 DISCUSSION

The study evaluated 188 women (with singleton live fetuses at a gestation of 41 weeks and above) who had induction of labour at the Kenyatta National Hospital Maternity unit over a period of four months (January 2013 to April 2013).

The mean age of patients undergoing induction of labour in this study was 26.8 years, with the majority (76%) being of age between 20-29 years and the age range between 18 and 40 years. This is comparable to the age of patients undergoing induction (for all indications) in a study done at Kenyatta National Hospital in 2011 where the mean age of patients was 27.6 years [27], but differs from a similar study done in more affluent population at the Aga Khan Hospital where the mean age was higher (31.2 years)[23,24].

Majority of the women undergoing induction were primigravidae (58%).This is comparable to previous studies at KNH [27] and even around the world where induction was carried out for different indications.

Mean gestation of patients undergoing induction was 41.14 weeks with majority at 41 weeks (85.6%) which is the recommended gestation for induction of post-term pregnancies according to WHO[1]. Very few mothers progressed to 42 weeks of gestation since they were being followed up at the ANC clinics and advised on induction of labour at 41 weeks as per the national guidelines and WHO protocol[1,4]. This was similar to other hospital protocols around the world which use WHO or ACOG guidelines

Prostaglandin tablet in combination with artificial rupture of membranes and Oxytocin infusion was the most common method used for inducing labour in this study with PGE 1 being more commonly used than PGE 2. At the Aga Khan hospital, prostaglandin E2 is the most common method used because it is the gold-standard and more accessible to this population of higher socio-economic status.[24]

The success rate of induction of labour in this study was found to be 68%. This was comparable to the study by Esiromo (induction for all indications) which found that successful vaginal delivery was achieved in 74% of induced patients[27]. This success rate is comparable to that of 70.4% and 72% described in other settings in Latin America[29] and USA[37] respectively where induction was also done for all indications. No study has been carried out at KNH for induction in post dates alone.

Mothers across all age groups were successfully induced and the rate of success appeared to increase with age from 65% in mothers aged 20-24 years to 91% in the oldest age group (35-40 years). However, there was no statistically significant association between successful induction of labour and maternal age. From studies it has been noted that older women have higher rates of complications and especially older primigravidae and thus higher rates of caesarean sections. But in this study one of the exclusion criteria was alternate indications to induction and thus such complicated pregnancies (diabetes, hypertension in pregnancy) were excluded.

In observational studies, Crane in Canada[35] and Pevzner in California[37] reported that characteristics associated with successful induction included cervical status (cervical dilatation) and multi-parity. This study too conformed to the above findings, with nulli-parous having higher rates of failed induction (45%). Mothers with poor Bishop score (5 and <) also had higher rates of operative deliveries (39.6%)

In this study the mode of induction was not a significant factor in the outcome of the process unlike the study of Balci [38] which illustrated that vaginal prostaglandin with Oxytocin infusion was more effective for labour induction than Oxytocin alone in patients with a Bishop score less than 6. This could be attributed to by the difference in target population. He induced primigravidae at 38 weeks with poor Bishop score (less than six) whereas our patients had varied parity and Bishop scores. However, Guerra et al [29] in their review described a high rate of successful induction regardless of method used.

The birth weight of the infant was a determining factor where heavier babies (4 kgs and above) had higher incidences of being born via caesarean sections (93.3%). This was in keeping with other studies around the world where macrosomia was found to be a poor predictor of successful induction. [39]

This study included a fairly good sample size of mothers with post-term pregnancies on induction of labour. The findings though consistent with induction of labour in the general population (for all indications), are new for these contingent of patients. Furthermore the study was carried out in a place with laid down protocols for the induction process and gestation at induction therefore standardized and results can be replicated. Some of its limitations however are the difference in assessment of the pre-induction Bishop score done by different medical doctors and even the timings of insertion of prostaglandins in patients with poor cervical scores since patients had to be brought from the ante- natal wards to labour ward for the same. The study could be improved if done prospectively where the Bishop score and induction process would be carried out by the PI and delivery outcomes assessed.

5.2 Conclusions

The success rate of induction of labour in this study was 68%.

A favourable Bishop score and average sized infants (<4000g) were strongly associated with successful induction of labour

Multi-parous post-term pregnant women have higher rates of successful induction of labour.

The age of the mother and the mode of induction were not determining factors of successful induction

5.3 Recommendations

A pre-induction estimated fetal weight should be a routine practice to select the right patients for the induction process. Mothers with fetuses estimated over 4000 grams should be offered an elective caesarean as an option.

Patients with poor bishop score should be given an option of an elective c/s after the initial process of cervical ripening fails.

There is need to review the protocols of administration of prostaglandins in the antenatal and labour wards because the movement of patients to and from the wards in between drug administration may be the cause of incorrect dosaging intervals and thus higher rates of failed inductions in patients with poor Bishop scores.

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APPENDICES

APPENDIX 1 QUESTIONNAIRE

Number……

Date of admission…….time (am/pm)……

.**A. Socio-demographic data:**

1. Age……

B. Obstetric Data

1. LNMP……..EDD…….

   Gestation by dates……

2. Parity……

C. Induction Data

1. Pre-induction Bishop score……
2. Method used for induction:

   (a) Prostaglandin only [ ] : Type PGE1 [ ] PGE2 [ ]

   (b) PG + ARM + Oxytocin [ ]

   (c) ARM + Oxytocin [ ]

   (d) Other (mechanical) [ ]

3. Date and time of initiation of induction

(a) Date……

(b)Time…….

4. Number of vaginal passerines used…….

5. Date and time of delivery.

(a) Date……

(b) Time……..

6. Induction to delivery time…….

D. Induction success

1. Mode of delivery (a) vaginal [ ]

(b) Caesarean section [ ]

(c) Vacuum [ ]

E. Neonatal Outcome

1. Birth weight of the infant in grams……..

APPENDIX 2 BISHOP SCORING (MODIFIED)

	Score			
Factor	**0**	**1**	**2**	**3**
Dilatation (cms)	**0**	**1-2**	**3-4**	**5-6**
Length (cms)	**3**	**2**	**1**	**0**
Station (-3 to 3)	**-3**	**-2**	**-1 or 0**	**+1 or +2/+3**
Consistency	**Firm**	**medium**	**Soft**	
Position	**Posterior**	**middle**	**anterior**	

At KNH however, station of the fetal head is not determined as part of the Bishop score. Descent of the head is instead calculated in fifths above the pelvic brim. The table below shows the comparison between the fetal station and the corresponding descent of head.

Station of head	Corresponding descent
-3	5
-2 to -1	4
0	3
+1	2
+2	1
+3	0

APPENDIX 3 PATIENT INFORMATION AND CONSENT FORM

PREDICTORS OF SUCCESSFUL INDUCTION OF LABOUR IN POST-TERM PREGNANCIES AT KENYATTA NATIONAL HOSPITAL.

This document is to be read by or read to each prospective participant in a language she understands.

Principal investigator: Dr.Rashida.Admani

Supervisors:

1. Dr. F.X. Odawa, Lecturer in department of Obstetrics/Gynaecology, University of Nairobi.
2. Dr.Wanyoike Gichuhi, Senior Consultant in department of Obstetrics/Gynaecology, University of Nairobi.

I am a resident doctor specializing in obstetrics and gynaecology at the University of Nairobi. I am conducting a research on women with prolonged pregnancies (≥ 41 weeks) who are having their labour induced. You are being asked to participate in this study which will include a total of 188 women who will deliver in this hospital. The purpose of this consent form is to provide you with basic information about the research and to help you decide whether you wish to be included in the study or not. Please read through the form and feel free to ask any questions/ make clarifications or raise any concerns at any point. When you have read through and feel satisfied that your questions have been answered and you agree to participate in the study, you will be asked to sign (or thumb-print) your consent

Participants Rights

Participation in this research is entirely voluntary, and you have a right to decide whether you would like to participate or not. You have a right to ask any questions at any time. If you decide to enrol, you can drop out of the study at any time, and you will not be denied any care. If you decline to participate in the study, it will not affect your management and you will receive normal care and standard treatment and medication.

Purpose of study

The purpose of this study is to review the factors predicting successful vaginal delivery in mothers undergoing induction of labour due to prolonged pregnancies (≥ 41 weeks) and the rate of caesarean sections in such patients The study is being done in order to assess whether mothers with different factors like age, how many children she has, her baby's birth weight among others have any effect on the outcome of the pregnancy i.e. a vaginal delivery or a caesarean section.

The information obtained from the study will help us improve on the induction process in our maternity unit and psychologically prepare mothers for the possible outcomes.

Procedure

A vaginal examination will then be done to assess the state of your cervix. You shall then undergo induction as per the hospital protocol. This will involve insertion of the prostaglandin tablet vaginally every 4-6 hours until onset of labour. Once labour sets in, you will be monitored by attending midwife and doctor in the labour ward until the time that you deliver. A caesarean

section may be performed if your labour does not progress well, or if there is any indication that your baby is distressed during the labour process. If you decide to participate in the study, you will fill in a simple questionnaire with the help of an assistant. The duration of your labour, mode of delivery and your baby's birth weight will then be recorded. If you choose not to participate in the study, you will not be penalized or disadvantaged in any way. The same management will be given to you as described above; however, the outcome of your labour will not be used for purposes of this study.

Risks and Discomforts

This study is simply observing your labour and its outcome, and will not include any interference or interventions aside from routine management of other women with prolonged pregnancies, whose labour is being induced.

Benefits and compensation

There will be no financial or material benefit to you if you choose to participate in the study. Your participation will be very helpful and information obtained from the study will help us improve on the induction process in the facility.

Confidentiality

Any information that is collected in this study will be kept strictly confidential. Your full name will not appear on any study document and only the principal investigator will have access to

information you provide. No information by which your identity can be revealed will be released or published.

Who to contact

If you wish to ask any questions later, you may contact the responsible doctor caring for you or reach me on number 0721975597 or contact ethical committee secretary on 726300-9 ext. 44102.

Consent

I have read the information sheet (or it has been read to me) concerning this study and I understand what is required of me to participate in the study. My queries have been addressed to my satisfaction. I voluntarily agree to take part in the study.

Patient's signature (or thumb print)……..

Date……

Witness' signature…….

Date……..

HABARI KWA MGONJWA NA CHETI CHA KUKUBALI KUSHIRIKI KATIKA UTAFITI

Mtafiti ni Dr.Rashida Admani, daktari na mwanafunzi wa maswala yanayohusu uzazi, katika Chuo Kikuu cha Nairobi. Huu ni utafiti wa kujua namna ya uzaaji ya wajawazito waliyopitisha masiku za kuzaa na wakipewa dawa za uchungu.

Maelezo ya utafiti

Maana kuu ya hii cheti cha kukubali ni kupasa wewe mshiriki habari kuhusu huu utafiti. Haya maelezo yatakuwezesha kuamua kama utakubali kushiriki au la. Tafadhali yasome maelezo haya kwa utaratibu. Unaweza kuuliza maswali kuhusu maana ya utafiti, yale mambo faida na adhari kwako, haki zako na jambo linguine lolote lingine ungelitaka kujua juu ya huu utafiti. Wakati ambapo tumejibu maswali yako yote, utaamua kushiriki kwenye utafiti au la.

Sababu na manufaa ya huu utafiti

Sababu hasa ya kufanya huu utafiti ni kuchunguza afya ya wamama na kujua namna ya uzaaji ya wajawazito wanapotumia madawa ya kuleta uchungu wa kuzaa, kwa wale ambao wamepitisha masiku za kuzaa na hawajapata uchungu.

Habari tutazopata kwako tutaziweka siri na hakuna mtu mwingine atajulishwa. Jina lako halitatumika wakati utafiti huu utakapochapishwa.

Cheti cha kukubali kushiriki kwenye utafiti

Mimi nimekubali kushiriki katika utafiti wa matumizi ya dawa ya kuleta uchungu wa kuzaa kwa akina mama wajawazito. Nimeelezwa kwamba habari zangu zitawekwa siri, na kwamda matibabu yangu hayataadhiriwa nikikataa kushiriki ama kujiondoa kwenye utafiti. Nimekuwa na nafasi ya kuuliza maswali, na kama nitakuwa na maswali mengine, ninaweza kuuliza watafiti wakati wowote.

Sahihi ya mshiriki…….au

Kidole gumba

(kulia/kushoto)……tarehe……..