EVALUATION OF THE OUTCOMES OF THE LOW-RISK PREGNANT WOMEN ON THE INDUCTION OF LABOUR AT FULL TERM SEEN AT THE KENYATTA NATIONAL HOSPITAL

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DECLARATION

This dissertation is my original work and has not been presented for a degree in any other University **Dr. Omeonga Djemba**

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CERTIFICATE OF AUTHENTICITY

This is to certify that this dissertation is the original work of Dr. Omeonga Djemba, an M.Med student in the Department of Obstetrics and Gynaecology, College of Health Sciences, University of Nairobi, under the guidance and supervision of Prof. Eunice Cheserem, and Dr. Diana Ondieki. This is to confirm that this dessertation has not been presented in any university for the award of any other degree.

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LIST OF ABBREVIATIONS AND ACRONYMS

CS	Caesarean section
CTG	Cardiotocography
IOL	Induction of Labour
KNH	Kenyatta National Hospital
MAS	Meconium Aspiration Syndrome
RCT	Randomized Controlled Trial
SDG	Sustainable Development Goals

OPERATIONAL DEFINITIONS

Full term: Means a pregnancy of 39 weeks, 0 days and/or 40 weeks, 6 days.

Induction of Labour: The process of artificially stimulating the uterus to start labour.

Low-risk pregnancy: Is defined as pregnancies with no active complications and has no other factors either maternal or fetal that place it at an increased risk of complications.

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ABSTRACT

Introduction: In the recent past there has been increased evidence supporting improved birth outcomes with non-medically indicated induction of labour at 39 weeks gestation. These supportive details were established in two recent randomized control trials. However, concerns have been raised as to whether these studies can apply to the focused group in high-income countries vis-à-vis in low-income countries. Induction of labour is among the most common obstetric interventions. In high-income countries, up to 25% of all deliveries at term involve the induction of labour as compared to low-income countries where the rates are generally lower, though, in some settings, they can be as high as those observed in other high-income countries. The World Health Organization (WHO) recommends Induction of labour for women who are known with certainty at 41 weeks (>40 weeks + 7 days) of gestation. In these earlier Randomized Clinical Trials (RCT) of Induction Versus Expectant Management (ARRIVE), reported that mothers who were induced at 39 weeks were prone to a lower rate of cesarean sections compared to those assigned to expectant management (19%: 22%) and therefore had a lower chance of developing pregnancy-induced high blood pressure (9% versus 14%). The American College of Obstetricians and Gynecologists (ACOG) together with the Society of Maternal and Fetal Medicine (SMFM) found out that babies born at or after 39 weeks have the best chance of health outcomes compared to those born before 39 weeks. Little is known on the recommendation of labour induction at full term in low-income countries.

Broad Objective*:* To evaluate the incidence, indications, and outcomes for induced births among low-risk pregnant women at full term at Kenyatta National Hospital.

Methodology*:* A retrospective descriptive cohort research comprising minimal risk pregnant women at full term who underwent induction of labour, aiming to evaluate the incidence, indications of neonatal and maternal results of induction of labour. A sum of 394 women at full-term gestation and eligible were enrolled in the study; they were women admitted from the clinic and in the maternity unit.

Data analysis: This was analyzed using SPSS version 23. The incidence of childbirth induction at full period, taking all the women who underwent induction of labour in the study period were the denominator, the socio-demographic and clinical characteristics of patients were described and the perinatal outcomes calculated.

Results: The incidence of induction of labour at 39 to 40 weeks + 6 days is 59%. There was less admission to the neonatal unit with less respiratory distress syndrome, meconium aspiration syndrome, asphyxia, umbilical cord related accidents, neonatal resuscitations prevention of macrosomia and foetal distress, all below 10%. There were low hyperstimulation, premature deliveries, and uterine rupture, however, there were high CS rates of more than 96% and failed inductions 67.84% in the maternal arm.

Conclusion: The study concludes that IoL at 39 to 40 weeks + 6 days has a high Cs rate, for instance, there were very few deaths all below 5% in both groups.

CHAPTER ONE-INTRODUCTION

1.1 Background

Induction of labour (IOL) is commonly referred to as iatrogenic restorative of uterus wall shrinking before the onset of voluntary labour, to accomplish vaginal birth (1). This procedure is undertaken when the advantages of expeditious delivery to either fetus or the mother outweigh the risk of carrying on with the pregnancy. Induction of labour, indications, and its incidence may be of clinical or social importance. In some cases, it is the mother's will or for the clinician's convenience due to underlying obstetrical or medical complications during the pregnancy. Clinical indications include post-term pregnancy, hypertension, infections during pregnancy, prelabour (premature) membrane ruptures, diabetes, chorioamnionitis, isoimmunisation, intra-uterine foetal death, intrauterine growth restriction, gross foetal anomalies, and other maternal conditions (2).

Elective induction can be driven by various reasons such as a pregnant mother's wish of terminating pregnancies because of corporeal discomfort. On the other hand, the worry of high progressing labour would preclude timely emerging at the hospital, and ongoing worries for maternal, foetal, or neonatal complications (2). Contraindications to induction include cephalopelvic disproportion, placenta praevia or vasa praevia, abnormal foetal lie, cord presentation/prolapse, previous classical caesarean section scar, prior myomectomy with breach of the uterine endometrium, pelvic structure anomalies, and invasive carcinoma of the cervix and active genital herpes simplex infection. Induction of labour has traditionally been a relatively common procedure, therefore, the rate of IOL may differ depending on the availability of resources and population. Globally, the urgency of labour induction differs greatly between nations and even between dissimilar areas of the same country. In broad, it is much higher in high-income countries (at roughly 20%) compared to the low-income nations (2,3).

The high-income countries' frequency of IOL is on the rise for reasons such as accessibility of better cervical ripening doers, forbearers and clinician's desire to organize a suitable period of delivery, and more modified attitudes toward small designation for induction (4). In a study that had been carried by the Centre for Disease Control (CDC) in 2010 and reported by Michelle et al in 2014 labour induction has more than doubled in the last three decades with as many as twenty-three points eight percent of all gravid women experiencing induction of labour in the US (5). In the United Kingdom (UK) induction increased in 2016-17 from 29.4% to 31.6 percent in 2017-18 as per the Statistics of Hospital Episode (HES) sent to national health service (NHS), digital media on Maternity Statistics reports of 2017-18 (6). We, therefore, suggest that the increased to 20.4

percent of births as of 2008. In 1983 the Nairobi birth survey reported an overall induction rate of 5.7% (7) while at the Kenyatta National Hospital by 1984 the rate was 5.6% which later increased to 14% in 1999 reports from the Aga Khan hospital Nairobi. In a Retrospective descriptive cross-sectional research that was done in KNH in 2002, Njagi J, M, (8) found an induction rate of 12.7%. The indications for induction were mainly premature rupture of membranes, prolonged gestation, foetal demise, and hypertensive conditions.

1.1.1 Outcomes of Induction of labour

Induction of labour is not without risks. The main objective of inducing labour is the achievement of a vaginal delivery. Pregnant women who after are induced but fail to deliver through virgina are offered caesarian mode of birth. The only set back of caesarian births are the associations of risks such as morbidity and mortality, which can extend to future pregnancies. Caesarian mode of delivery is most associated with a host of risks morbidity and mortality (9). In most cases, there is a paucity of data to support a policy of routine elective induction of labor at full-term. Whereas, great concerns that have been observed to be associated with elective induction of labor at term are the potential for increased rates of cesarean delivery, iatrogenic prematurity, and cost. Other considered concerns revolve around maternal-fetal medical benefits, such as a reduction in stillbirth, which have not been proofed. However, there are potential advantages to scheduled induction of labor, such as avoiding the risk of delivery en route to the hospital if labor first approaching. Another necessity is the distance of the patient's residence and other work and non-work-related responsibilities. A study carried by Cammu et al., 2002 in a matched cohort study of nulliparous women (10) demonstrated that elective induction appears to double the risk of operative delivery and was supported by other similar studies (11–13), besides other studies reporting that women with favorable cervices were not at increased risk of caesarian birth (14,15). Dublin et al found that the overall caesarian delivery rate was similar for induced and spontaneous labors in low-risk multiparous women (16). Even if IoL is offered for medical indications, multiparas with induced labour have a relatively low rate of cesarean delivery (16). In his study at KNH, Njagi (8) found the Caesarian section rate among induced patients was 21.6%. The general maternal outcome was good although one case of maternal mortality due to anesthetic complications was reported.

CHAPTER TWO-LITERATURE REVIEW

2.1 Timing of Induction of Labour at Full Term

A pregnancy is deemed full term at week 39 to week 40+6days with a due date of 40 weeks, though in some instances pregnancies may be induced at 39 or 40 weeks. The World Health Organization (WHO) together with well-known worldwide guidelines recommend labour induction at week 41 (4-6). Most of these guidelines are commonly based on the findings of Cochrane structured reviews on labour induction at or beyond the term period. The findings tend to favor the induction of labour (IOL) at term with minimal unfavorable perinatal results and little Caesarean sections. The recommendations to some extent also differ with induction timing, at a range between 39 to 40 weeks, though pregnancy management may surpass a gestational period of week 42 in some instances (19,20) (Figure 1.0).

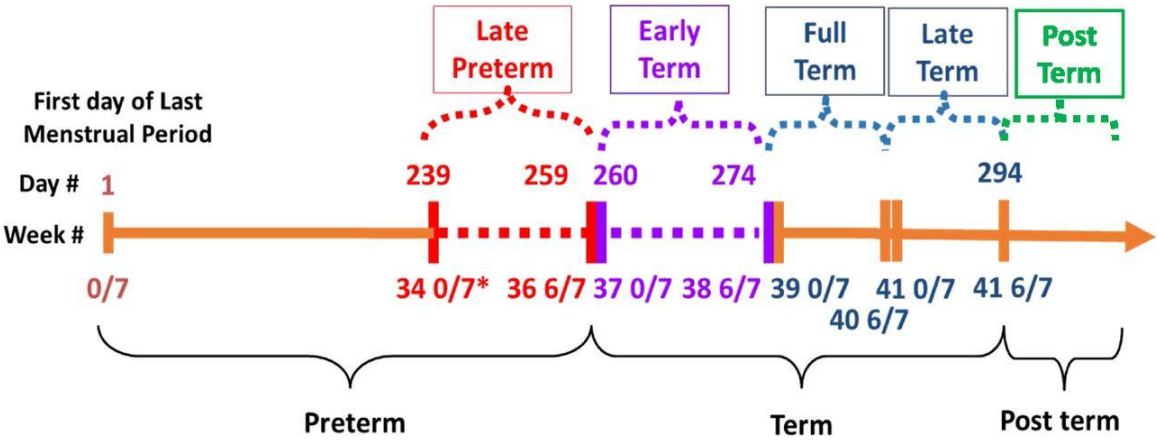

Figure 1 Gestational periods from late preterm to post-term scale depicting favorable perinatal outcomes during full-term (an adapted version of Engle and Kominiarek 2008).

The consensus by the obstetricians on the control of late and post-period deliveries, has guided in the planning of delivery timing for pregnancies between week 39 and 40 + 6 days period. On some level, elective induction of labour at 39 and (40 + 6) weeks gestational age avoids potential risks of ongoing pregnancies that may include membrane rupture, reduced foetal movement, preeclampsia, and stillbirth. In a study carried out by Hilder, Costeloe, and Thilaganathan in 1998 focused on prolonged pregnancy by evaluating gestation-specific risks of foetal and infant mortality they quantified the total pregnancy loss rate at 39, 40, and 41 weeks to be as follows 1.4%, 2.4% and 2.8%, respectively (21). Therefore, by understanding the of previous studies is an indication that elective induction of labour at full-term bear minimal risks both at maternal and neonate angle. Additionally, elective induction has been found to decrease the risk of macrosomia without permanent brachial plexus injury, and preeclampsia and foetal macrosomia (22–25). Poor outcomes of after induction of labour can increase high rates of uterine hyperstimulation and

category II and III foetal heart rate tracings in women. Also nulliparous patients with an unfavorable cervix undergoing induction of labour may carry a higher rate of caesarean delivery (26–28).

Systematic Cochrane reviews on the induction of "labour for advancing birth results for mothers at or beyond the term" concluded that induction of labour improved perinatal outcomes (29,30). The IOL at or beyond week 39 to 40 +0 days has been linked with a minimized danger on perinatal deaths and neonatal morbidity due to meconium aspiration syndrome (MAS) and a minimal rate of caesarean sections (CS). The gestation age from the onset of induction as observed in trials were observed to be varying, especially with IOL beyond 41 weeks +0 days. These kinds of diversities rendered a clear interpretation of the results.

2.2 Clinical Considerations labour induction for Pregnant Women at Full Term

A Cochrane review concluded that IOL at full-term or beyond 41 weeks improved neonatal and maternal outcomes (11,22,24). This, therefore, raised fundamental questions as to, whether the interventions decreased the incidence of late-term and post-term deliveries, taking into considerations of the use of date of LMP alone in allocating gestational age and the estimated date birth. This has been observed to have inappropriate timing that may lead to incorrect classification of a pregnancy as late term or post term (25,26). In addition to this, it's observed that imprecise maternal recollect and variation in the timing of ovulation may contribute to the misinterpretation of LMP-based pregnancy dating (27,28). Numerous investigations have demonstrated that the use of ultrasonography to confirm menstrual dating, the incidence of full-term and post-term pregnancies is reduced as required for obstetric involvement (30–33). According to the World Health Organization (WHO), IOL at term or beyond is recommended (39).

2.3 Recommendations on Term Pregnancy induction of labour

The ACOG has noted that the peril of adverse result is greater for neonates delivered in the early-term period contrasting that of neonates delivered at 39 weeks of delivery (40,41). Several studies have shown rapid rates of adverse long-term neonatal outcomes such as risk for morbidities involving nearly every organ system as well as higher risk of mortality when compared to term neonates (42).

Therefore, ACOG recommends that more studies are needed to better understand if these differences are based on gestational age at delivery or medical declaration for early delivery. Thus the two committees came up with a consensus on recommendations on the redefinition of term pregnancy indications noted below (43):

1. In cases of non-medically indicated deliveries, cervical ripening should occur after 39+0/7 weeks of gestation.
2. The implementation of a regulation of decreasing the rate of non-medically indicated births before 39+0/7 weeks of gestation is decreasing with the number of deliveries and improving the overall outcomes of neonates.
3. The recommendation by the ACOG states that it's better to avoid non-medically indicated births before 39+0/7 weeks of gestation, and should not evolve in, a rise in expectant management of patients with medical indications for delivery before 39+0/7 weeks gestation.
4. Signs for delivery before 39+0/7 weeks of gestation should be documented and discussed with the patient.
5. Since non-respiratory morbidities are also risen in early-term deliveries, documentation of foetal pulmonary maturity does not justify an early non-medically delivery indication.
6. Amniocentesis for the resolving of foetal lung ripening should not be used to control the delivery timing, even in sub optimally dated pregnancies.

2.5 Maternal and Neonatal Outcomes of Induction of Labour

A successful IOL means obtaining a vaginal birth which is not complicated within 24 hours from the onset of induction or otherwise reaching the active phase of labour (44). Therefore, the success of IOL should be represented by the achievement of vaginal birth, even if it is operative, without a defined time limit. Births that occur after 49 hours of induction are somehow deemed as unsuccessful IOL, this might be as a result of patient and medication-related factors that may affect the progression of labour (45). Expectations of full-term inductions maternal deliveries are reduced morbidities such as low CS, higher SVD's, low premature births, low umbilical cord related accidents, low incidents of uterine ruptures, and reduced mortalities. Neonatal expected outcomes from induced labour are good APGAR score, no admission to newborn unit, no neonatal resuscitations, unexpected meconium aspiration syndrome, no asphyxia, no premature births, and no mortalities.

2.5 Statement of the problem

Optimal management of pregnancies at 39 to 40 weeks + 6 days gestational age is not well understood due to the incoherency of information. In Kenyatta National Hospital (KNH) the rate of induction is increasing from 5.6% in 1984 to 12.7% in 2002 of these 50 % amounts for post-dates while the other 50% is shared among near term, early and term mothers (54, 55). This probably

could be explained by more observant decisions for induction, rather than expectant management of pregnancies as per the WHO and KNH guidelines. There is a paucity of data to support a policy of routine elective induction of labor at full-term. Great concerns on risks associated with elective induction of labor at term have been raised on increased rates of cesarean delivery, iatrogenic, and prematurity. Therefore, understanding the pattern of indication and outcomes of labour induction at full term is informative in decision making in labour management.

2.6 Conceptual Framework

2.6.1 Diagrammatic

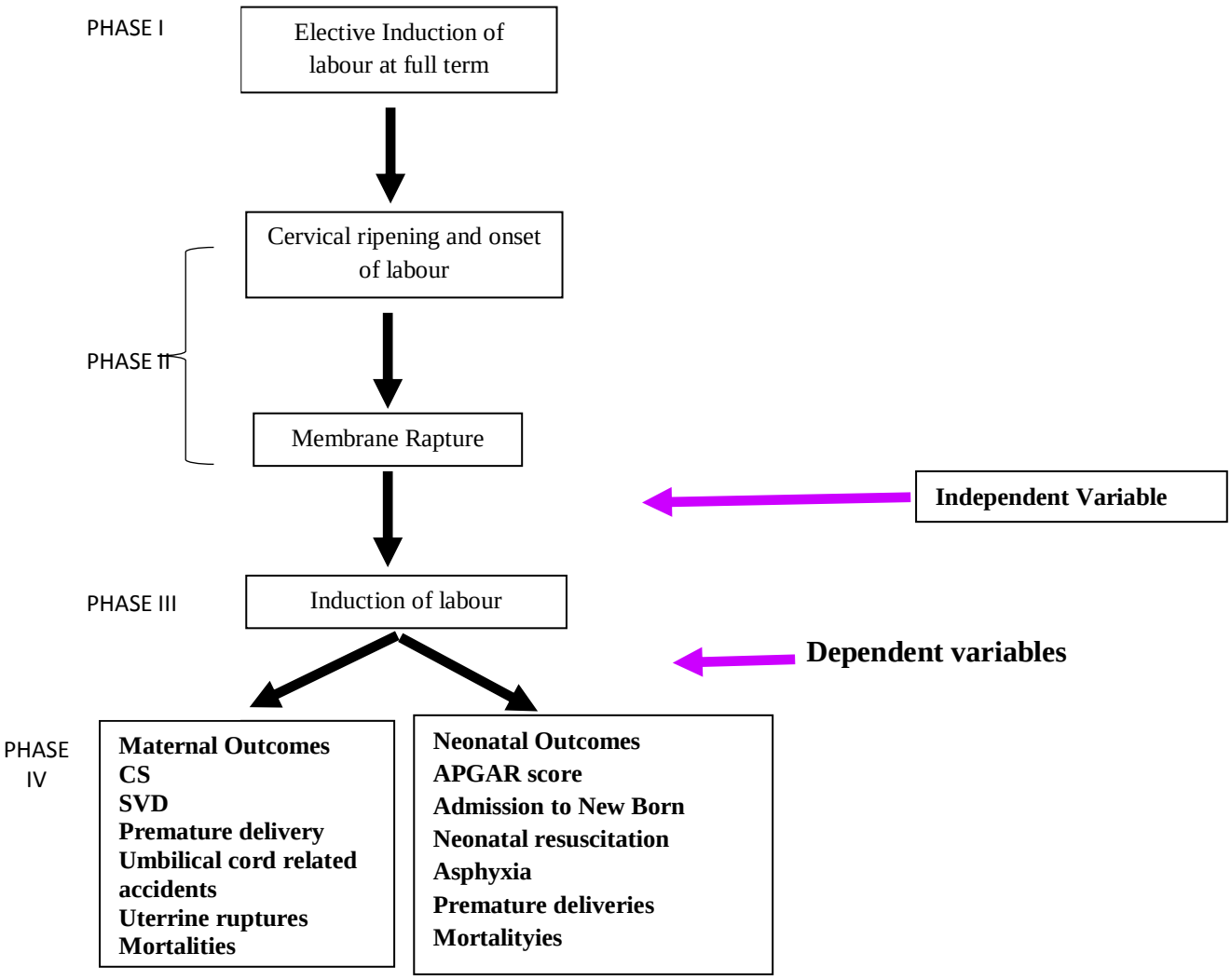

Figure 2 Conceptual Framework for Induction of Labour of low-risk pregnant women at full term at the Kenyatta National Hospital

In the figure above Phase, **I** study subjects are enrolled, **II** participants screening and evaluated, **III** refers to indications or reasons of IOL, **IV** the study outcomes as the variable.

The study variable types comprised of independent (this will be IoL), confounders (characteristics of communal-demographic e.g. age, occupation, marital status, Obstetric characteristics e.g. parity, gestational age, Indication for induction), and dependent which relied on the success of induced labour such as maternal outcomes (Mode of delivery: caesarean section, vaginal delivery, Induction to delivery interval, Intra-partum complications of uterine tachysystole, hypertonus, vomiting, fever, shivering, diarrhea, ruptured uterus, hysterectomy, or any other postpartum complications- uterine atony, genital tract tears, need for blood transfusion, Death, foetal outcomes (Non-reassuring Foetal Status, Meconium-stained liquor, Birth-weight, Apgar score at 5 minutes, Admission to NBU, Neonatal death)

2.8 Research Question

What are the outcomes of induction of labour at full-term among low-risk pregnant women at full term at Kenyatta National Hospital?

2.9 Study Objectives

2.9.1 Broad Objective

To evaluate the outcomes of the low-risk pregnant women on the induction of labour at full term seen at the Kenyatta National Hospital

2.9.2 Specific objectives

i. To determine the incidence of labour induction at the Kenyatta National hospital
ii. To evaluate the induction of labour indications such as ripening of the cervix and membrane ruptures.
iii. To evaluate the maternal and neonatal outcomes of induced pregnancies at full term.

CHAPTER THREE-METHODOLOGY

3.1 Study Design

This was a retrospective cohort study, in which source documents of low-risk pregnant women who had induction of labour at the gestation age of between week 39 and 40 +6 days. Women who underwent induction of labour at this gestation age source documents from labour wards (the period between 2015 and 2020) were reviewed.

3.2 Study Area

The study site was at Kenyatta National Hospital (KNH). The hospital is a Teaching and Referral Hospital. It is located in Nairobi, 4 kilometers from the Central District Business. It is also the major tutoring hospital for the College of Health Sciences, University of Nairobi. The hospital cares for patients from Nairobi and its vicinity as well as referrals from other medical facilities in the state and the greater Eastern Africa region. The KNH has three antenatal/postnatal wards, one ward for labour (GFA, GFB, and 1A) as well as one New Born Unit.

3.2.1 Procedures followed labour related wards at KNH

Patients with a pregnancy above 20 weeks' gestation and those who are in immediate puerperium are admitted to the antenatal/postnatal wards. Patients in labour or with conditions requiring close monitoring are admitted to the labour ward. On average 80 to 100 women are reviewed in the labour wards daily. At the KNH, patients are induced only for medical indications; inductions at the mother's request are not done or done but with no proper record. Post-term pregnancy is induced beyond 41 weeks; PROM beyond 34 weeks is induced with oxytocin. Other indications such as diabetes, hypertensive disease, and rhesus negative mothers are induced at 38 weeks if they have been otherwise stable. Patients with breech presentation and previous uterine scars are not induced.

3.3 Study Population

Source documents (files) of low-risk pregnant women at full term who were admitted between 2015 and 2020 at KNH in different gestation periods from 39 weeks to 40 +6 gestational age.

3.4 Sample Size Determination and Formula

The sample size was determined by Fisher's exact test, based on assumptions from a similar study conducted by ACOG in 2013 (56), where the incidence of induction of labour at 39 weeks was 37%:

Given that the Incidence of induction of labour at term is estimated at 37%

Assuming a margin of error of 5%, the samples size estimated as follows:

$$n = \frac{\mathrm{Z}^2 \mathrm{x}\ \mathrm{p}(1-\mathrm{p})}{\mathrm{d}^2}$$

Precision (d) = 5.0%

Prevalence (p) = 37 % (47)

Z = 1.96

Estimated sample size:

$$n = \frac{1.96^2 \mathrm{x} 0.37(1-0.37)}{0.05^2} = 358$$

N = 358

After adjustment for 10% non-response rate: n= 394

3.5 Study Procedure

Pregnant women at 39 weeks to 40 weeks+6 days who had been admitted in labour wards from home or the antenatal clinic source document were subjected to scrutiny and data mining in a structured questionnaire.

3.5.1 Study Flow Chart

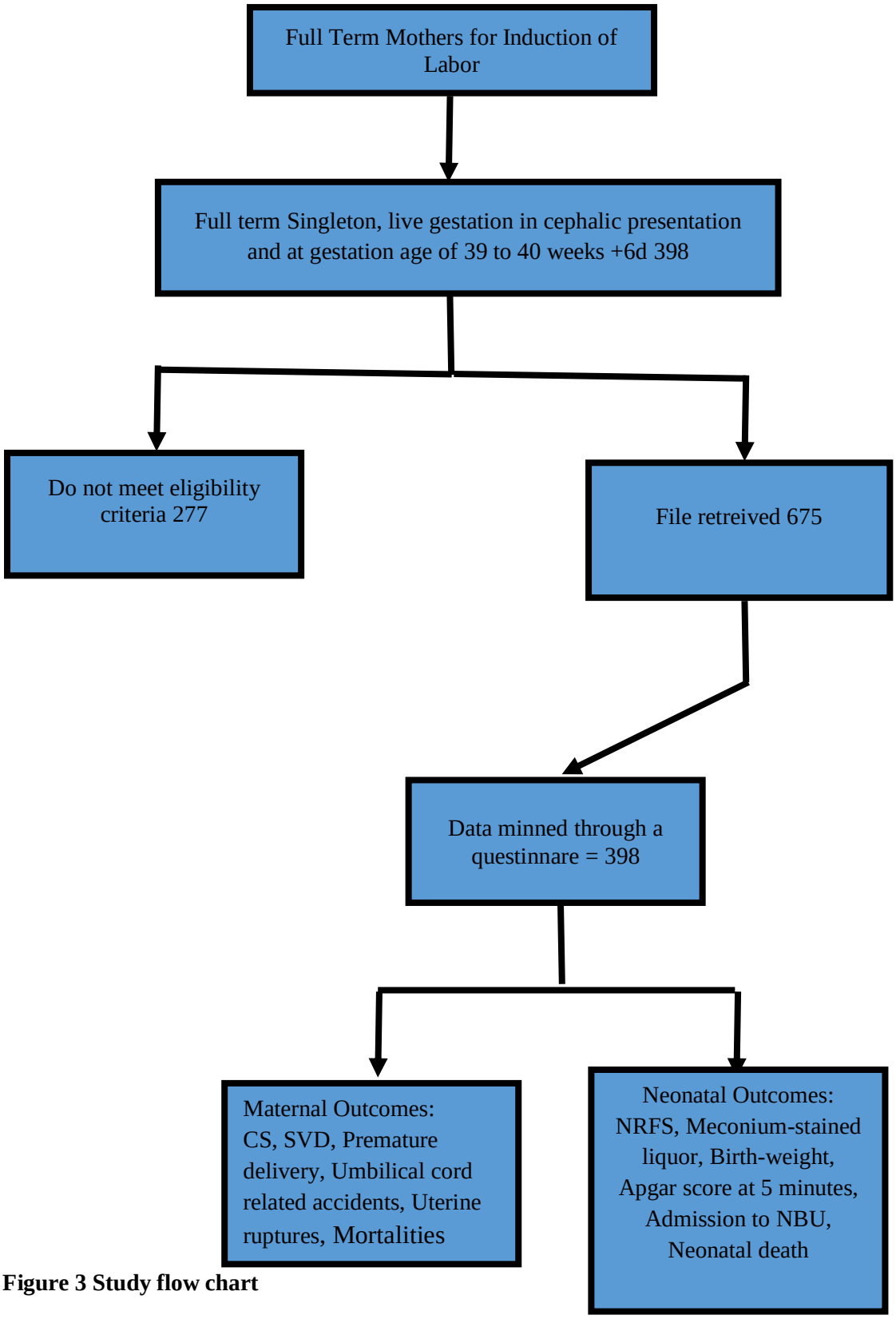

Figure 3 Study flow chart

3.6 Recruitment

3.6.1: Inclusion criteria

i. Singleton, live gestation in cephalic presentation
ii. Gestation age 39 weeks to 40 weeks +6 days gestation

3.6.2 Exclusion criteria

The participants excluded were those who:

i. Induced from a prior location
ii. Allergies to prostaglandins

3.7 Study Instruments and Data Collection Procedures

Data was collected using a structured questionnaire (Appendix 1) designed to contain questions on socio-demographic characteristics, obstetric history, indications for induction, induction method used, and the outcome measures. The questionnaire was pretested in the labour ward and postnatal wards of KNH by the principal investigator a few weeks before the study to establish the reliability of the study questions and to ensure that any errors or ambiguities are corrected before data collection began. Three registered nurse-midwives were recruited as research assistants. The principal investigator trained them on recruitment data collection points. The source documentation was interrogated for socio-demographic and obstetric data and other information such as the method used, duration of induction to delivery, mode of delivery, neonatal outcome into the questionnaires

3.8 Study Materials

The material used for this study include: Stationery, which was used to facilitate recording procedure by the research team, the study questionnaire which was made in both English and Swahili, Patients' files and maternity/NBU registers, hard drives, and password protected computers for data storage

3.9 Quality Assurance Procedures

Data obtained from the records were checked by the data manager to ensure it is correctly filled and will countercheck files. All the study instruments including the questionnaire were pretested before the actual data collection. Data was stored in password-protected computers, hard drives, and flash drives that are accessible to only the principal investigator, supervisors, and statistician to ensure confidentiality is maintained.

3.10 Data Management and Analysis

A structured questionnaire was used to collect data (Appendix 1). The questionnaires were encrypted to make entry of data easy. The principal investigator reviewed the raw data and cross-checked it to make sure it's complete; clarifications made were sorted out without hesitation. The completed questionnaires were kept in a good and confidential place that was accessible only by the investigator, ready for the data entry. After cross-checking the questionnaires for any missing entries a database was designed in MS Access or Microsoft forms that allowed the data statistician to validate variables as well as setting controls. The data was exported to a package of statistics after data entry is completed (SPSS - Version 23.0) for analysis. The collected data was uploaded to SPSS version 23 software for cleaning, coding, and analysis. A univariable exploratory analysis was conducted for the sociodemographic characteristics of the study participants was analyzed and presented as proportions in frequency tables.

3.11 Ethical Considerations

Approval was obtained from the Ethics and Research Committee of the Kenyatta National Hospital and the Department of Obstetrics/Gynaecology before carrying out the study. To ensure confidentiality, the questionnaires were not bearing any patient's name or other personal and identifying information but numbered serially.

3.12 Data Management

The incidence of induction of labour between 39 weeks and 40 weeks +6 days was calculated as follows:

$$\frac{\text{No. of women who were induced between 39 wks. and 40+6 days during the study period}}{\text{Total number of women admitted at full-term without contraindications for IOL during the study period}} \times 100$$

Univariate analysis for the indications for induction of labour was done and presented as a table of frequencies:

Indications for induction of labour between 39 weeks and 40 weeks + 6 days at the Kenyatta National Hospital. This was done using simple fitting logistic regression models to assess the relationship between the predictor variables (socio-demographic and clinical) and the maternal and neonatal outcomes. Fishers and chi-square tests of significance were applied as appropriate taking

a p-value of 0.05 and 95% level of confidence as statistically significant. Multiple logistic regression model was fitted to the data to adjust for the other parameters. The non-significant predictors were dropped one by one from the model to come up with a parsimonious last model. The backward removal method was utilized to select the variables to be retained in the last model. In the backward removal process, all the candidate predictors of whether there was a successful induction of labour or not was fitted in the logistic regression model. The insignificant predictors during analysis were then dropped out of the model starting with the most insignificant until a model that only contains significant predictors.

3.13 Study Results Dissemination Plan

The study findings were disseminated to the faculty, students of the University of Nairobi, and KNH through seminars. Additionally, the findings are to be published in peer-reviewed journals and also presented in local and international conferences.

3.14 Study Limitations

The limitations observed during the study were missing or incomplete data from the patient records, numbers were adjusted by women who delivered at 41 weeks.

Most records that had missing details were cleaned and dropped out of the study.

CHAPTER FOUR-RESULTS

4.1 Study Results

The study results from a population of 398 women at a gestational age at 39 weeks to 40 weeks +6 days gestation who underwent induction of labour were retrospectively reviewed and documented.

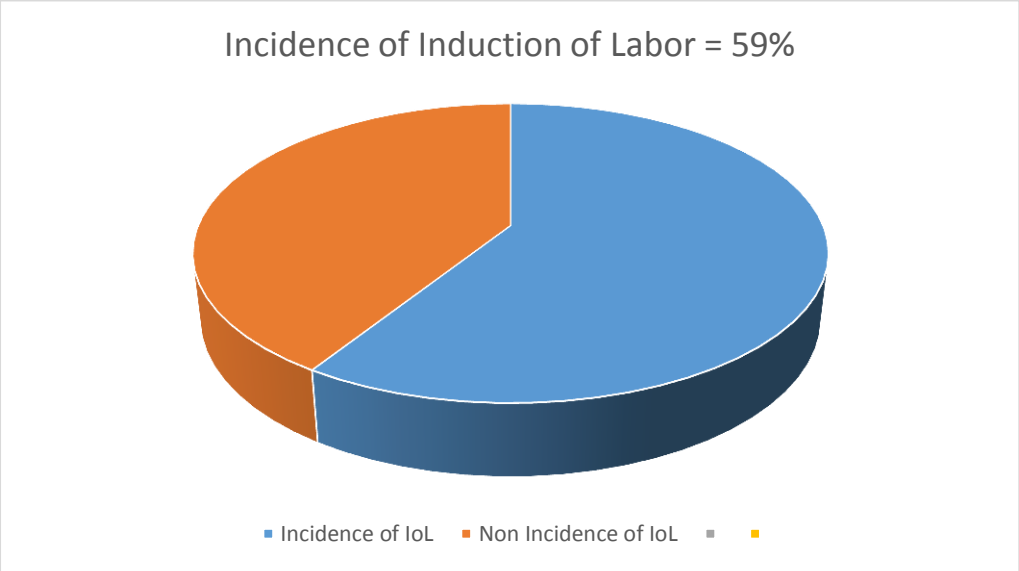

Figure 4 Incidence Of Induction Of Labour Among Full Term Low-Risk Pregnancies

As shown in figure 4 above, the incidence of full-term (low-risk) pregnancies induced women among the total population of full-term pregnant women inclusive of those without IOL contradictions at the KNH was 59%.

4.2 Socio-demographic and obstetric characteristics of women who underwent IOL at 39 to 40 weeks +6 days gestation at the KNH

Table 1 Sociodemographic and obstetric characteristics of women who underwent IoL at 39 to 40 weeks +6 days gestation at the KNH N=398

Particulars	**Frequencies**	**Percentage** %
Age		
Less than 20	20	5
20-34	320	80
35 above	58	15
Marital status		
Married	346	87
Single	51	13
Occupation		
Self Employed	116	29
Salaried	93	23
Unemployed/Housewife	141	35
Other	48	13
Gestation age at an induction in weeks		
38	10	2
39-40	370	95
41	18	3
Status of the membrane at the time of Induction		
Intact membrane	353	89
Unknown	45	11

In table 1 above, Demographic characteristics showed that age ranges between 20-34 years of age were the highest category with 320 (80%). Marital status indicated that the married were the highest study participants at 346 (87%). In terms of occupation, the highest recorded number was unemployed housewives at 141 (35.43%).

Obstetric characteristics, the highest category in terms of gestational age in weeks were those between 39-40 + 6 days recording 378 (95%) number of participants. About 217 (55%) participants experienced a prolonged latent phase of labour. About 88.69% (353 participants) had an intact membrane at the time of induction while 11.31% (45) participants having a ruptured membrane.

4.3 Distribution of pharmacological agents used for induction of labour

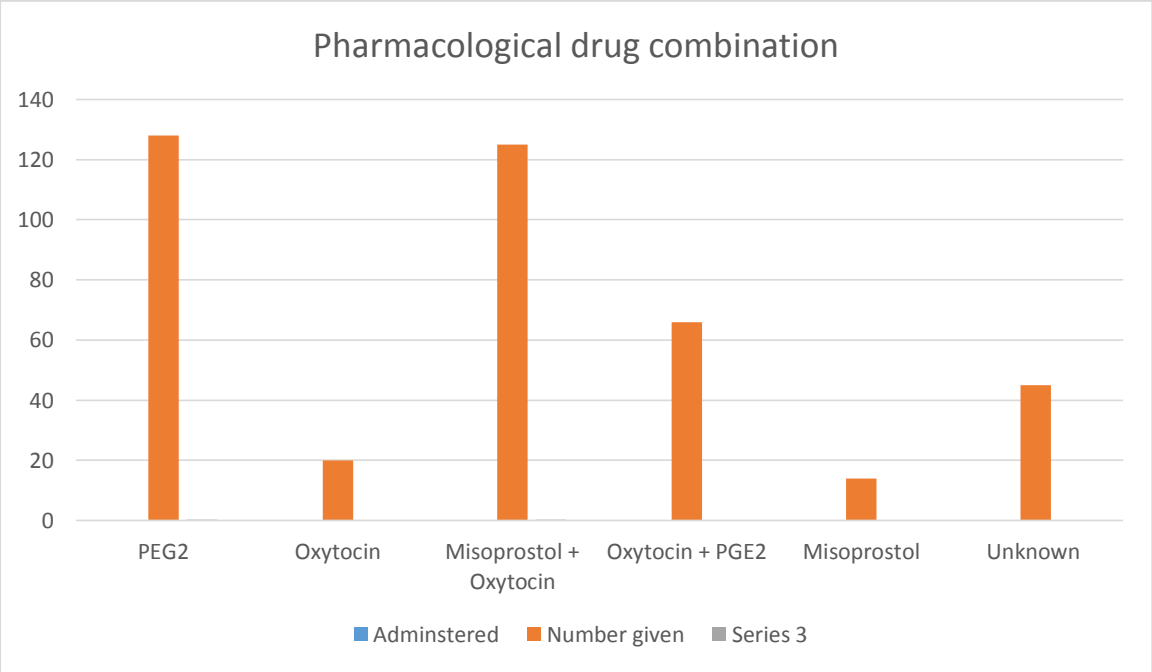

Figure 5 Pharmacological drug combination

Figure 5 above the pharmacological drug combinations indicate that PGE2 alone was the drug of choice having been given to about 128 (32%) of the participants. Oxytocin alone was administered to 20 (5.03%), misoprostol in 14 (3.52%), and unknown were 45 (11.31%) participants.

4.4 Indications for induction of labour at 39 weeks to 40 weeks +6 days gestation at KNH

Table 2 Induction of labour at 39 weeks to 40 weeks +6 days gestation due to maternal perception (N=398)

Social reasons	**Frequencies**	**Percentage (%)**
Old age		
Yes	0	0
No	398	100
Self-Comfortability		
Yes	398	100
No	0	0
Prolonged first phase of Labour		
Yes	144	36
No	217	55
Unknown	37	9
Failed Inductions		
Yes	270	68
No	128	32
Prevention of Macrosomia		
No	386	97
Yes	4	1
Unknown	8	2

In **table 2** above, 398 (99%) participants had maternal reasons for IoL. Socially self comfortability was the biggest indicator or reason for IoL at 398 (100%), 37% prolonged latent phase of labour, 97% had no prevention of macrosomia, and failed inductions were 270 (68%). Prolonged first phase of labour (26%) and prevention of macrosomia (1%) .

4.5 Maternal Outcomes

Tabel 3 Maternal outcomes for induction of labour at 39 weeks to 40 weeks +6 days gestation in the (N=398)

Mode of Delivery		%
CS	383	97
SVD	15	3
General anesthesia for CS	25	6
Spinal anesthesia for CS	373	94
Hyper-stimulation	4	1
Premature delivery	25	6
Umbilical cord related accidents	0	0
Uterine rupture	11	3
Maternal Outcome		
Alive	398	100
Dead	0	0

In table 3 ceaseraen section was the most performed practice medically with 383 (97%) performed cases with 15 (3.77%) having a spontaneous vaginal delivery. The most common type of anesthesia performed was the spinal route with 373 (94%) cases, besides the general cases. uterine ruptures were observed in 11 (3%) cases. Out of all the women who underwent IoL 100% (398) participant's outcomes were alive.

4.6 Neonatal Outcomes

Table 4 Neonatal outcomes of women who underwent induction of labour at 39 weeks to 40 weeks +6 days gestation at the KNH (N=398)

Apgar Score at 5 mins	**Frequency**	**Percentage**
9--10	347	88
6--8	37	9
0—5	14	3
Admission to New Born Unit		
No	371	93
Yes	27	7
Neonatal Resuscitation		
No	382	96
Yes	12	3
Unknown	4	1
Meconium Aspiration Syndrome		
No	385	97
Yes	9	3
Unknown	4	1
Respiratory Distress Syndrome		
No	387	97
Yes	7	2
Unknown	4	1
Asphyxia		
No	394	99
Yes	0	0
Unknown	4	1
Premature delivery		
Yes	24	6
No	374	94
Alive or Dead		
Alive	385	97
Dead	13	3

In table 4 above, neonatal outcome characteristics indicate that: the Apgar score ranges recorded were as follows 9-10 in 347 (88%) was the highest in the study. Admission to the newborn unit

was fewer in 27 (7%) neonates among the total deliveries. Neonatal resuscitation as well was very low in 12 (3%) neonates. Respiratory distress syndrome was experienced in only 7 (2%) of neonates. Only 1 (0.25%) experienced asphyxia. Premature delivery in 24 (6.03%) cases, Overall, neonatal survival indicate that 385 (96.73%) were alive with 13 (3.27%) mortalities.

CHAPTER FIVE- DISCUSSION

5.1 Discussion

The study evaluated 398 women (39 weeks to 40 weeks +6 days gestation) who had induction of labour at the Kenyatta National Hospital Maternity unit over a period between (January 2015 to August 2020. The incidence of induction of labour among categories of women at 39 weeks to 40 weeks +6 days gestation period was found to be 59%. The demographic characteristics of this group of women found the median age as 27, the least was 16, while the maximum age was 43 years old compared to the age of patients observed in earlier studies in KNH (12,50) and in at public hospitals in Mekelle (51). The age range in this study was 16-43 years and from audit reports, it was comparable to the age range of women admitted to the maternity ward in KNH during the study period. Other socio-demographic characteristics such as marital status and occupation were comparable to a previous study (12, 50) in Kenyatta National hospital which reviewed a total of 398 women who underwent induction of labour and found that the majority 87% of women were married, and singles were 13%. Occupation indicated that: self-employed 29%, which is in agreement with an earlier study by Esiromo on outcomes of pharmacological induction of labour at or near term at the Kenyatta national hospital (48).

Gestation age at an induction in weeks indicated that full-term was 60%, late/post-term were 20.35% and the preterms were 20.10% compared with a study by Lueth et al Prevalence, outcomes and associated factors of labor induction among women delivered at public hospitals of Mekelle town (49). The prolonged first phase of labour showed that 55% were not induced at latent phase labour, 36.18 were induced due to prolonged first phase and 9% not indicated. Although some studies suggest that the prolonged first phase is related to the increased rate of cesarean section (C/S), which is in agreement with our cases. Keulen et al. (19) described results of a study wherein IOL at 41 weeks gestation age was compared to expectant management until 42 weeks gestation age, though in our study were didn't have a comparison arm, the rate of C/S's in 383 96% participants, higher than expected, with good neonatal outcomes in IOL. This kind of higher number of caesarian sections was doubtly expected on IoL even though previous studies have suggested such kind of trends. In a review by Mary Ann-Davy and James king on caesarean section following induction of labour in uncomplicated first births- a population-based cross-sectional analysis of 42,950 births, found that induction of labour in medically uncomplicated nulliparous women at term carries a more than doubling of the risk of emergency CS, compared with spontaneous labour, with no impact on perinatal mortality (9). In this study 270 (68%) represented

failed inductions which indicate that a failed induction of labour should rarely be an indication for a caesarean delivery, as has been underscored in the recent study by Spong et al., on prevention of the first cesarean delivery document (50).

The status of the membrane at the time of induction showed that 87% had intact membranes and 11 was unknown as was expected (51). Pharmacological drug combinations indicate that PGE2 alone was the drug of choice having been given to about 32% of the 398 participants (52), followed closely by a combination of misoprostol and oxytocin in 31%, PGE2 plus oxytocin 17%, participants as expected and was observed in previous studies (53,54). Past studies indicates that there are potential medical advantages to scheduled induction of labour at full term, such as reduction in stillbirth and further fetal growth (55–57), however, the study has recorded less than 5% cases of macrosomia.

On neonatal outcomes such admission to new born unit, neonatal resuscitation, prevention of macrosomia, meconium aspiration syndrome, respiratory distress syndrome, asphyxia, the study recorded very low adverse events all below 10% as expected by the ARRIVE and ACOG studies and recommendations (36, 58). Dispite these great benefits the study reported a higher number of failed inductions which could have been an indication to the higher number of CS's.

CONCLUSION

We were able to retrieve files or source documents for the given study group. The incidence of induction of labour at 39 to 40 weeks + 6 days is 59%. The study concludes that IOL at 39 to 40 weeks + 6 days has high rate of CS 97%, significant neonate death 3.27%,maternal death 0.25%. There were low hyperstimulation, premature deliveries and uterine rupture's, and failed inductions 67.84% in the maternal arm. There were less admission to neonatal unit with less respiratory distress syndrome, meconium aspiration syndrome, asphyxia, umblical cord related accidents, neonatal resuscitations, prevention of macrosomia and foetal distress, all below 1 0%. The results suggest minimising unindicated inductions at term or before 41 weeks' gestation has the potential to reduce the rate of CS.

RECOMMENDATIONS

Therefore, from this study we can not recommend induction of labour at 39 to 40 weeks plus 6 days, due to higher rate of CS's, the significant neonate and marternal deaths,but looking at the high percent of failed induction ,we recommend a preper monitoring concerning induction ,knowing that majority of CS was due to failed induction .

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ANNEXES

Annex 1 Study Variables

Tabel 5 Study variables

Variable type	Variable Definition
Independent	Induction of labour
confounders	Characteristics of communal-demographic e.g. age, occupation, marital status, Obstetric characteristics e.g. parity, gestational age, Indication for induction
Dependent	**Successful Induction of Labour** **Maternal outcomes:** Mode of delivery: caesarean section, vaginal delivery, Induction to delivery interval, Intra-partum complications of uterine tachysystole, hypertonus, vomiting, fever, shivering, diarrhea, ruptured uterus, hysterectomy, or any other postpartum complications- uterine atony, genital tract tears, need for blood transfusion, Death.
	Foetal outcomes: Non-Reassuring Foetal Status, Meconium-stained liquor, Birth-weight, Apgar score at 5 minutes, Admission to NBU, Neonatal death

Annex 2 Study Time Frames

Tabel 6 Time frame

	2020			2020		
	Jan-Apr	**May**	**Jun-Jul**	**Aug-Sep**	**Oct**	**Nov**
Proposal Development						
Proposal Presentation						
Ethics Committee Review						
Data Collection						
Data Analysis						
Results Presentation and final write-up						

Annex 3 Study Budget and Justification

Tabel 7 Budget line, Item and amount.

Budget Line	**Item**	**Amount (Ksh)**
Proposal development	Printing questionnaires	10000
	Proposal copies	6000
	KNH/UON ERC	2000
	Research Assistant 3 @1000 per day for 3 months	270000
	Stationary	3000
	Transport and meetings	1000
Data analysis	Statistician	30000
Thesis write up	Printing draft thesis	7500
	Printing the main thesis	7500
	Contingency	3000
	Total	**340,000**

Annex 3: Data Abstruction Tool

INCIDENCE, INDICATIONS, AND OUTCOMES OF INDUCTION OF LABOUR IN LOW-RISK PREGNANT WOMEN AT FULL TERM AT KENYATTA NATIONAL HOSPITAL

Date ____/_____/____ study No**.**…….

A. SOCIODEMOGRAPHIC DATA OF THE WOMAN

1. Mothers Age_____years

2. Marital status. single b. married/ cohabiting c. separated d. divorced. Widowed

3. Educational level 1. None 2. Primary 3. Secondary 4. Tertiary

4. Occupation 1. Unemployed /house wife 2. Self-employed 3. Salaried employment 4. Other (specify)_____

B. Obstetric Characteristics

Gestation age in weeks + days ……..

1. A number of pregnancies, including the current pregnancy.

2. When was the last menstrual period (LMP)? a.___/___/___ b. Not known

3. When was the expected due date (EDD)? a.___ /____/____ b. Not known

Ultrasound due date 1st or early second trimester

1. Bishop's Score at the time of induction of labour
2. Cervical dilation after 12 hours of induction of labour
3. State of the membranes at the time of induction of labour

   Intact

   Draining Liquor
4. Mode of induction of labour

   Vaginal pessaries

   Both

INDICATIONS;

1. **Obstetrics indications /health care recommendations**;
   - The prolonged latent phase of labour? a.yes…….,b. …….no.
   - Prevention of macrosomia? A.yes……..,b…….no

- Prevention of hypertensive disorder of late or post-term pregnancy: a, yes…… b, no……..

1. **Maternal Request**
    1. Excessive vaginal Examinations: a, yes……b, no…….
    2. Maternal fatigue/exhaustion and painful "false labour: a, yes, ……b, no…….
    3. Social reasons:……
    4. Self-comfortability: a yes,……b, no……

DELIVERY/ MATERNAL OUTCOMES

1. Date of admission ___ / ____/ ____
2. Time of induction
3. Date of delivery ___/____/____
4. Time of delivery
5. Gestation at delivery in weeks.
6. Mode of Delivery

    SVD

    Ceserian Delivery

6. What was the indication for the C/s_____?

7 Duration of the Cs

8 Type of anaesthesia 1= Spinal 2. GA_____

Was there documented PPH

Yes

No

Neonatal Outcomes

Weight in grams

Apgar Score at 5 min _____

Admission to the New Born Unit

Yes

No

Neonatal status

Alive

Dead