Predictors of successful induction of labour in post-term pregnancies at the Kenyatta National Hospital, Nairobi

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Abstract

Background: A prolonged pregnancy poses a threat to the fetal survival *in-utero* and may compromise perinatal outcomes. Worldwide 5-10% of all pregnancies are prolonged, and post-datism remains the commonest indication for induction of labour.

Objective: To determine predictors of successful induction of labour in post-term pregnancies at Kenyatta National Hospital (KNH).

Methods: A prospective observational study among post-term pregnant women delivering at KNH.

Results: The success rate of induction among study participants was 68%. Prostaglandins in combination with artificial rupture of membranes and oxytocin infusion were the commonest used methods for inducing labour. Multiparity was major predictor for successful induction of labour; 55% in primigravidae; between 84% (OR 4.4[95% CI 2.0-9.6]) and 87% (OR 5.3[95% CI 1.1-24.7]) in multiparous. Another significant predictor of successful induction of labour was the pre-induction Bishop's score; 85.2% (OR 3.8[95% CI 1.6-8.6]) of patients with Bishop score above 6 compared to 60.4% of patients with lower scores. 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.

Conclusion: A favourable Bishop's score, multi-parity and birthweight were better predictors of successful induction of labour in post term pregnancies at the KNH.

Keywords: Post-term pregnancy, Prolonged pregnancy, Induction of labour, Successful induction of labour

Introduction

A pregnancy is considered prolonged pregnancy if it exceeds the expected date of delivery by 2 weeks or more (1). Approximately 5-10% of all pregnancies are prolonged (2). Such pregnancies have been shown to be associated with poor perinatal outcomes, hence the need to induce labour after 41 weeks (3). The causes of morbidity among infants born postdates include meconium aspiration syndrome (due to increased incidence of meconium in amniotic fluid), neonatal academia and low Apgar scores which may be due to utero-placental insufficiency and large birth weights with subsequent risk of birth injuries (4-7) . Approximately 20% of post-term fetuses may also have what was known as *'fetal dysmaturity'* syndrome, which described infants with characteristics of chronic intrauterine growth restriction from utero-placental insufficiency. These subset of 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 (8,9). Induction of labour at 41 weeks' gestation for otherwise uncomplicated singleton pregnancies reduces caesarean delivery rates without compromising perinatal outcomes and avoids these complications associated with post-term pregnancies (9,10).

At the Kenyatta National Hospital (KNH), Nairobi, induction of post-term pregnancies is done at 41 weeks as per the national guidelines which is same as the practice elsewhere (1,11-13). Several factors have been known to influence the success of induction of labour such as; age of the patient, parity, pre-induction 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 (14,15).

The rate of induction of labour at KNH has increased from 5.6% in 1984 to 12.7% in 2002, 50% of which is due to post-dates pregnancies (14-16) and the rate of caesarean section from failed induction is 30%. However, there are no studies to establish factors that could be contributing to the failed induction, especially in post-term pregnancies, which contribute a large proportion of inductions.

The aim of the study was to determine factors that could affect the outcome of induction in the patients with post-term pregnancies at KNH.

Materials and methods

This was a prospective observational study done at KNH. The target population was mothers with gestation age of ≥41 weeks admitted for induction of labour. The participants were recruited from labour ward and once consent was obtained, they were interviewed and labour and delivery records were studied. The women were counselled about the procedure and indication, and a verbal consent obtained. This information was entered into a structured questionnaire. Only women with viable singleton pregnancy in cephalic presentation

with a gestational age of ≥ 41 weeks were eligible for recruitment.

On admission to antenatal or labour ward the standard protocols for the management of labour at KNH were used. Physical examination was done and the Bishop's score of the cervix was determined. If the score was poor (≤5) cervical ripening was done with prostaglandin pessary; a score of 6 and above was managed by Artificial Rapture of Membrane (ARM) and oxytocin.

If PGE2 (dinoprostone) was used, 3mg tablet was administered every 6-8 hours inserted in the posterior fornix, to a maximum of 3 doses. When misoprostol was used, it was 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 experienced contractions or a vaginal examination confirmed favourable Bishop score, she was transferred to labour ward, ARM was done and oxytocin infusion started if needed. If the Bishop score remained poor 4 hours after the 6th dose, critical reappraisal was done. The patient could be allowed to rest for 24hrs then induction started again, or caesarean section delivery depending on the fetal status. A fetal surveillance was carried out using a non-stress test or an ultrasonography to determine the biophysical profile and resistive index of the umbilical artery before re-induction.

Oxytocin infusion rates for induction of labour were administered as per WHO protocol starting with 2.5mIU per minutes increasing to a maximum of 64mIU per minute to achieve 3 strong contractions in 10 minutes lasting at least 30 seconds. After successful delivery of the baby and stabilization of mother, immediate post-partum care was given at labour ward and then transferred to the postnatal wards for postnatal care after review by the doctor.

Data were collected using a structured questionnaire designed to contain questions on socio-demographic parameters, obstetric history and characteristics, induction method used and the outcome measures. 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 were exported in a Statistical Package (SPSS – Version 17.0) for analysis. Descriptive statistics were used to categorize maternal characteristics and a multivariate logistic regression was performed to determine association between dependent variables.

Results

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). A majority (85.6%) of patients were at 41 weeks gestation while the rest were 42 weeks. The demographic and obstetric characteristics of the women are shown in Table 1.

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

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

The commonest method used for induction was prostaglandins in combination with Artificial Rapture of Membranes (ARM) and oxytocin (59.4%) followed by ARM and oxytocin (18.7%). Misoprostol (PGE1) was used more inductions than Dinoprostone (PGE2).

Table 2: Mode of induction and delivery outcomes in post-term pregnancies undergoing induction of labour at KNH

Method used for induction	Frequency (%)
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 (%)
Vaginal	127 (68)
C/S	61 (32)
Vacuum	0
Indication for C/S	Frequency (%)
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 (%)
< 4000	173 (92)
4000 and above	15 (8)

The success rate for induction of post-term pregnancies was 68%. All the failed inductions of labour were delivered by caesarean section. None of the mothers had an assisted operative vaginal delivery. The main indication of the caesarean section was failure to achieve cervical ripening or failure to progress one the labour got established.

There was a direct correlation between the rate of success of induction with maternal age even though it was statistically significant (Table 3). Multiparity was a major predictor for success full induction of labour; 55% in primigravidae,, between 84% (OR 4.4[95% CI 2.0-9.6]) and 87% (OR 5.3 [95% CI 1.1-24.7]) in multiparous.

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)	
20-24	37 (65)	20 (35)	1.0	
25-29	57 (66)	30 (34)	1.0 (0.5-2.1)	0.43
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	
1- 2	54 (84)	10 (16)	4.4 (2.0-9.6)	<0.001
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
10	46 (85.2)	8 (14.8)	3.8 (1.6-8.6)	

Another significant predictor of successful induction of labour was the pre-induction Bishop's score; 85.2 % (OR 3.8[95%CI 1.6-8.6]) of patients with Bishop score above 6 compared to 60.4% of patients with lower scores (Table 4). The methods of labour induction used at KNH did not show significant associations with successful induction of labour, p = 0.35. As shown in Table 4, 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 4).

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)	

After adjusting for 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 (Table5).

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 (grams)						
< 4000	1.00					
4000 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

Discussion

A favourable pre induction Bishop's score, multiparity and birthweight less than 4000gm were factors that significantly influenced the success of induction of labour in women with singleton live fetuses at a gestation of 41 weeks and above at the KNH. The method of induction and maternal age did not seem to affect the success of labour induction in this cohort of women. Other observational studies in Canada and California reported that the same factors were associated with higher success of labour induction (17, 18).

The success rate of induction of labour in this study was found to be 68%. This was similar to the study by Esiromo (16) in the same hospital, which found that successful vaginal delivery was achieved in 74% of induced patients. This success rate is comparable to that of 70.4% and 72% described in other settings (19, 20).

A majority of the women undergoing induction were primigravidae (58%). 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. In a previous study done at Kenyatta National Hospital in 2011, the mean age of patients was 27.6 years, but differs from a similar study done at the Aga Khan Hospital where the mean age was higher (31.2 years). The latter serves a slightly different population (21,22).

Mean gestation of patients undergoing induction was 41.14 weeks with majority at 41 weeks (85.6%) which is in line with the World Health Organisation recommendation on induction of labour for post-term pregnancies (1). There were fewer women who progressed to 42 weeks of gestation which may be due to the hospital's induction protocol.

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 (misoprostol) being more commonly used than PGE 2 (Dinoprostone). This may be related to the high cost and unavailability of dinoprostone compared to misoprostol.

In this study the mode of induction was not a significant factor in the outcome of the process unlike the study by Balci and colleagues (18) 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. However, Guerra *et al* (23) 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 (24).

This study evaluated the commonest indication for labour induction at KNH and therefore provides valuable information that can be used in counselling women prior to labour indications. The study however relied on gestational age determined by date of the last menstrual period, which is unreliable compared to date determined by the crown rump length (25). Indeed there is evidence that wrong determination of gestational age could be associated with high rates of induction

of labour due to postdatism (26). This may explain the reason why this remain the comments reason for labour induction at KNH. However, our findings did not find a more advanced gestational age of 42 weeks to affect the success, which may bring to question the fear of failure with earlier insulation. The study did not also evaluate for neonatal outcomes.

Conclusions

The success rate of induction of labour in this study was modest. A favourable pre-induction cervical score and birth weight of less than 4000gms were strongly associated with successful induction of labour. Multiparous post-term pregnant women also have higher rates of successful induction of labour. These findings should, however, be interpreted with caution considering the study limitations. The use of different induction regimens also makes the results difficult to interpret and there may be need to perform further studies well powered to determine whether this indeed had an influence on the outcome. It however provides useful information that can form the basis of a comparative study of induction outcomes for different indications

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