FETAL-MATERNAL OUTCOMES OF INDUCTION OF LABOUR AMONG WOMEN DELIVERED AT REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM TANZANIA

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ABSTRACT.

Purpose: Africa has a very low rate of induction of labour with high maternal and perinatal morbidity and mortality. However fetal-maternal outcomes following induction of labour are not well documented in Tanzania. This study aimed to assess fetal-maternal outcomes following induction of labour among women delivered at Dar es Salaam regional referral hospitals in Tanzania.

Design/methodology/Approach: A total of 301 expectant mothers were recruited in a prospective observational study conducted at all regional referral hospitals in Dar es Salaam, Tanzania. Data on fetal-maternal outcomes were collected using a pre-designed clinical sheet. Demographic data, obstetric history, methods as well as outcomes of labour induction were recorded. The continuous variables were summarized using the median and corresponding interquartile range. Categorical variables were summarized using frequency and proportions and the significance of differences were assessed using Chi-square at $P<0.05$.

Results: The leading methods for induction of labour were Oxytocin (48.5%) and a combination of Folley's catheter with Oxytocin (28.4%). Induction of labour significantly improved fetal outcomes at birth $P<0.05$. Induction of labour associated with improved Apgar scores in newborn babies. Failure of induction of labour was the largest contributor to the increased Caesarean Section rate observed in this study.

Research limitation/Implication: This study has therefore explored the fetal-maternal outcomes following induction of labour in Tanzanian regional referral hospitals.

Practical implication: Induction of labour improves and minimizes neonatal complications in referral regional hospitals in Dar es Salaam.

Originality/Value: These findings fill a gap of information which was missing on the fetal-maternal outcomes following induction of labour among expectant mothers in Dar es Salaam regional referral hospitals.

INTRODUCTION

Induction of labour is the process of stimulating the uterus artificially to start contractions before its spontaneous onset aiming at achieving vaginal delivery in circumstances where continuation of pregnancy is of more risk to the mother, fetus or both(Leduc, Biringer, Lee, Dy, Corbett, Duperron,... & Senikas, 2013). Currently, the procedure has been found to improve fetal-maternal outcomes when timely and properly applied to pregnancies with high risk(Middleton, Shepherd & Crowther, 2018). Induction of labour and Millennium Development Goals (MDG) 4&5 have been shown to have a direct relationship if the procedure is performed for clear indication has been found to reduce maternal morbidity and mortality(Bukola, Idi, M'Mimunya, Jean-Jose, Kidza, Isilda, ... & Metin, 2012). We are currently on SDGs but MDGs are not yet met.

The global prevalence of induction of labour is about 9.6 % (Bukola *et al.*, 2012). The estimate is relatively higher in developed countries than in developing countries(Bukola *et al.*, 2012; Hogan, Foreman, Naghavi, Ahn, Wang, Makela, ... & Murray 2010). In industrialized countries, with low maternal and perinatal mortality, the prevalence of induction of labour is about 20% and above, but the rate is different between countries and there is also a different rate of induction of labour among regions of the same country. This study was therefore designed to fill a gap of knowledge on fetal-maternal outcomes following induction of labour among women delivered in Dar es Salaam, Tanzania.

Africa has a very low rate of induction of labour but high maternal and perinatal morbidity and mortality. The unmet need for induction of labour is about 60-80.2% with an induction rate as low as 1.4-6.8% while 99% of all maternal death is reported in developing countries (Bukola *et al.*, 2012; Hogan *et al.*, 2010). Besides, in some African countries, like Tanzania, there is no evidence of findings on fetal-maternal outcomes of the induction process during labour. Therefore, we designed a prospective observational hospital-based study to investigate the maternal-fetal outcomes of induction of labour among women who delivered at regional referral hospitals in Dar es Salaam city, Tanzania which is a developing country.

LITERATURE REVIEW

The global prevalence of prolonged pregnancy is about 5-10%. Polish gynaecological report a prevalence of 2% (Bomba-Opoń, Drews, Huras, Laudański, Paszkowski, & Wielgoś, 2017). This has been also found to be the commonest indication for the induction of labour globally. There are also studies in Africa which agree with this observation including studies on induction conducted in Kenya. An observational prospective cohort study which included 188 post-term mothers reported that post-term delivery accounted for 50% of the indications of labour induction (Mozurkewich, Chilimigras, Berman, Perni, Romero, King, & Keeton, 2011). In the same hospital the rate of induction was found to increase two times between the year 1984 and

2002 from 5.6% to 12.7% (Admani, 2014)   The commonest method used was combined methods.

Prostaglandins with artificial membrane and oxytocin infusion were the main method reported. The success rate was 68%, with the main predictors of successful induction being multiparity 84%, and primigravidae 55%. Predictors for success in this study included pre-induction Bishop's score > 6 which accounted for an 85.2% success rate, and 60.4% of failed induction had a score < 6 (Admani, 2014). Cases of premature rupture of membrane at or after 37 weeks gestation induction of labour reduce the risks of maternal and neonatal complications. This can be achieved by prostaglandin or oxytocin. It reduces complications like sepsis in the mother without increasing risks for operative delivery (Kidanto, Kaguta & van Roosmalen, 2007). In cases of infection like chorioamnionitis, induction labour is the best choice regardless of gestation (Kidanto, et al., 2007).

RESEARCH METHODOLOGY

The study was conducted at Dar es Salaam Regional Referral Hospitals namely Amana, Mwananyamala and Temeke Regional Referral Hospitals. These facilities act as referral centres for Dar es Salaam city public health institutions. They have specialist obstetricians and equipment necessary for induction of labour with also functional theatre in case an emergency which requires operation arises. The study design was a prospective observational study.

Inclusion Criteria
All expectant mothers who were planned for labour induction in those health facilities.

Sampling technique and sample size of Recruited Research Participants:
A total of 301 expectant mothers were recruited in a prospective observational study conducted at all regional referral hospitals in Dar es Salaam, Tanzania. Written informed consent was sought from each participant before inclusion into the study. All expectant mothers who underwent induction of labour were prospectively followed up from antenatal wards up to 24 hours post-delivery.

All women who were planned for induction of labour at the study sites were initially invited to participate in the study after written informed consent. Each woman was included in the study if she was at least 18 years of age at the time of the study. All women who planned for induction of labour but were contraindicated were excluded from participating in this study.

 Thus, we virtually included all eligible expectant mothers in this study. Specifically, we recruited followed up and analysed 301 women from their labour process to after 24 hrs post-natal era. Approval to conduct the study was obtained from The institutional review Board (IRB) of Hubert Kairuki Memorial University and permission to conduct the study in those health

facilities were sought from Ilala, Kinondoni and Temeke municipalities. Each study participant wrote and signed informed consent before inclusion into the study.

Data Collection Procedures

Demographic data, obstetric history, indications and methods used for labour induction were collected directly from research participants and were confirmed using either their antenatal cards or hospital case notes. The independent variables were maternal age, parity, gestational age (in weeks), Bishop's score, labour induction indications and methods. Dependent variables included delivery outcomes (both maternal and fetal). Mode of delivery, maternal conditions post-delivery, fetal weight as well as fetal APGAR scores at 1st and 5th minutes respectively were obtained from the hospital delivery register. Moreover, follow-up of induction of labour was done within 24 hours post-delivery.

Data Analysis

Data were collected using a pre-designed clinical sheet. Demographic data, indication methods, and fetal-maternal outcomes were filled up in the designated clinical sheet after recruitment into the study following a written and signed informed consent. Data were double entered into Epi-Info version 7.2.2 statistical software template and stored. Explorative data analysis was the first step of data analysis performed. Pearson Chi-square test was used to assess the association between variables. Continuous variables were summarized using the median (with corresponding interquartile range). Categorical variables were summarized using frequencies and proportions. An alpha level of 5% was a limit of type 1 error in this study.

RESULTS AND DISCUSSION

Various induction methods were used in this study. These included Oxytocin, Folleys catheter, Amniotomy, Misoprostol as well as combinations of some of the methods together, Table 1

Table 1: Frequency distribution of methods used for induction of labour among expectant women followed-up at Dar es Salaam Regional Referral Hospitals from December 2017 to June 2018.

Methods/Methods used	Frequency	Percentage
Oxytocin	146	48.5
Folley's catheter/Oxytocin	86	28.4
Misoprostol	30	9.7
Amniotomy/Oxytocin	12	4.0
Folley's catheter/Oxytocin/Amniotomy	7	2.3
Others*	20	6.8
Total	301	100

Key *denotes other methods like membrane sweep, membrane sweep with amniotomy, membrane sweep/folleyscatheter, membrane sweep/misoprostol/oxytocin, misoprostol/amniotomy/oxytocin, misoprostol/folley's catheter, membrane sweep/oxytocin, misoprostol/oxytocin.

In this study expectant mothers had various modes of delivery as shown in Figure 2
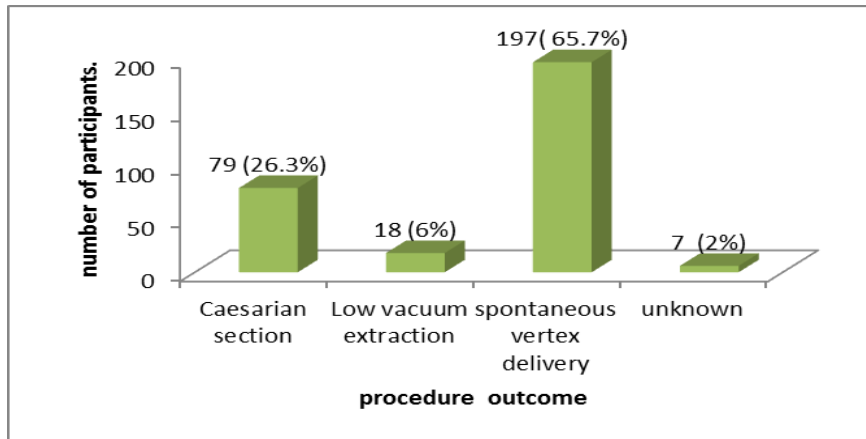
Figure 1: Frequency distribution of mode of delivery from expectant mothers who underwent induction of labour at Dar es Salaam Regional Referral Hospitals from December 2017 to June 2018.

We conducted the study at Amana, Mwananyamala and Temeke Regional Referral Hospitals in Dar es Salaam, Tanzania from December 2017 to June 2018. We followed up with 301 expectant mothers who underwent induction of labour out of 4146 registered deliveries during the study period. Follow-up was from the ante-natal ward within 24 hours post-delivery. Maternal outcomes following induction of labour at Dar es Salaam Regional Referral Hospitals are summarized in Table 2.

Table 2: Maternal outcomes following induction of labour among expectant mothers delivered at Dar es Salaam Regional Referral Hospitals from December 2017 to June 2018.

Hospital name	Maternal Dead	Outcomes Alive	Others**	Total
Amana	1+r*	130	5	136
Mwananyamala	1	77	1	79
Temeke	2	83	1	86
Total	4	290	7	301

NOTE: +R* Ruptured uterus**Included those whose outcomes were unknown – e.g. those referred to Muhimbili National Hospital (MNH),

Out of 294 mothers whose delivery status was known at the study sites, 256 (87%) mothers delivered newborns whose Apgar scores were ≥ 7. On another note, efforts were made to consider if there were any hospital effects concerning maternal outcomes. The resultant Pearson $\chi 2$ value statistic (with Yates' correction) was 2.9732; df=4. (p=.562). Likewise, it was of interest to investigators to assess fetal outcomes of observed expectant mothers induced during labour at Dar es Salaam Regional Referral Hospitals during the study period, Table no.3 below provides summary statistics of the findings on fetal outcomes versus maternal indications for induction of labour.

Table no.3: Summary statistics of fetal outcomes versus maternal indications for induction of labour at Dar es Salaam Regional Referral Hospitals from December 2017 to June 2018.

Indications	Babies without complications (%)	Babies with complications (%)	Total
Post-term	87 (34.8)	4 (16.7)	91
PROM	55 (22)	4 (16.7)	59
Mild/Moderate HDP	43 (7.2)	1 (4.2)	44
Pre-eclampsia/eclampsia	58 (23.2)	9 (37.5)	67
Others*	7 (2.8)	6 (25)	13
Total	250	24	274**

NOTE: *Less frequent induction of labour indications that include chronic hypertensives, placental calcifications, IUGR, oligohydramnios, fetal malformations (i.e. anencephaly), recurrent fetal loss, placental abruption.**Includes those mothers (7) who were referred to Muhimbili National Hospital as well as those who had macerated stillbirth.

From the above Table, the association between maternal indications for induction versus fetal outcomes was found. The resultant Pearson's χ^2 value was 29.35, df=4 (P= .00001). Moreover, there were six (6) Fresh Still Births (FSB), one early neonatal death and eighteen (18) Macerated Still Birth (MSB). Among the FSB two were associated with abruption placenta the other two were cord accident (cord around the neck) and the last two one was prematurity other was associated with chorioamnionitis, in all cases of MSB ultrasound confirms IUFD before induction of labour. One early neonatal death was of a congenital malformed baby with anencephaly.

This study provides another proof of the advantage to newborns towards induction of labour among at-risk mothers. Characteristically, more than nine-tenth (91.2%) of all expectant mothers, who underwent induction of labour, in this study, delivered babies without any complications. The calculated Pearson's χ^2 statistic with corresponding degrees of freedom was considered statistically significant at α-level of 5% set apriori in this study. Several published studies have shown significant benefits of induction of labour to expectant mothers and a survey of maternal and newborn health of 2004/2005, revealed that induction of labour was associated with a reduction of stillbirth and perinatal deaths [OR- 0.34, 95% C.I. (0.27-0.43)]. These findings are similar to what we observed in this study since in both study findings, there was a statistically significant association between induction of labour and improved fetal outcomes. It is therefore recommended that for cases that meet indications for induction of labour, the exercise should be practised even in resource-poor settings. We also observed that 79 (26.3%) expectant mothers who underwent induction of labour ended up with Caesarean section. This finding is higher than the recommended Caesarean section rate of 10%-15% reported in the literature before (Middleton, Shepherd & Crowther, 2018). A study done in Ethiopia revealed

the prevalence of Caesarean section following induction of labour to have been 24% (Lueth, Kebede & Medhanyie, 2020). In our current study, the largest contributor to increased Caesarean Section was the failure of induction noted during the study. Another study on maternal and newborn outcomes with induction reports a reduction of the caesarian section following induction 14.7% vs 23.2%; adjusted odds ratio, 0.61; 95% confidence interval, 0.41–0.89) operative vaginal birth is similar to our study (18.5% vs 10.8%; adjusted odds ratio 1.8; 95% confidence interval 1.28–2.54 (Grobman & Caughey, 2019) in the study done on Maternal and neonatal outcomes associated with induction of labour after one previous cesarean delivery show increase in the caesarian section similar to our study 26.1% with nine uterine rupture this could be due to nature of study retrospective and sample deals with those with the previous scar who were induced in our study previous scar were excluded in the study (Vecchioli *et al.*, 2020).

Fetal outcomes, measured using Apgar scores revealed another proof towards the beneficial effects of induction of labour to expectant mothers. The fact that about 87% of all induced mothers delivered babies with Apgar score ≥ 7 is evidence in favour of induction of labour even in resource-limited settings. This finding is comparable to Cochrane Pregnancy and Childbirth Group's findings, which that found induction of labour resulted in improved neonatal Apgar scores at 1st and 5th minutes respectively. (Middleton et al., 2018) In the same Cochrane review, no significant differences between the rates of Apgar scores < 7 at 5 minutes (RR: 0.72, 95% C.I.: 0.44-1.18; 10 trials – 5379 women) (Middleton et al., 2018).

Maternal deaths reported in this study findings could not be directly associated with the process of inducing labour. However, efforts need to be in place to ensure no mother dies before and during the process of induction of labour. Clinical audits for ascertaining the causes of maternal deaths were far beyond the scope of this study. Moreover, the observed maternal deaths in the study settings were far above the maternal deaths national average of 556 per 100000 live births reported at the time of writing this article (Middleton et al., 2018) All maternal deaths in our study were caused by Post-partum haemorrhage. The maternal mortality finding reported in this study is therefore a potential avenue for further studies. Frequent clinical audits are thus warranted in this setting to account for immediate-underlying-root causes of maternal deaths. The results of audit studies may be used to improve clinical outcomes in obstetric care provision.

CONCLUSION AND RECOMMENDATIONS.

Induction of labour improves and minimizes neonatal complications in referral regional hospitals in Dar es Salaam.

Given the significant benefits of induction of labour observed in this study, healthcare workers in resource-limited settings should be encouraged to induce labour in expectant mothers with

established clinical indications. Furthermore, the selection criteria for induction of labour, need to be emphasized by all clinicians and decision-makers, to avoid failure of induction of labour, which may necessitate Caesarean Section.

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