COMPARATIVE ANALYSIS OF FETOMATERNAL OUTCOME IN INDUCED VS SPONTANEOUS LABOR IN NULLIPAROUS WOMEN AT TERM

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ABSTRACT

Objective: To assess the fetomaternal outcome of spontaneous labor compared to induced labor in primiparous women at a tertiary care unit.

Study Design: A prospective comparative analysis.

Place and Duration of Study: Tertiary Care Hospital, Malir-Karachi Pakistan, from Sep 2018 to Feb 2019.

Methodology: A prospective comparative analysis of 255 subjects divided into two groups: induced labor (study) group and spontaneous labour (control) group. All low-risk nulliparous after 37 weeks with single cephalic presentation were included. Seventy six participants received induction of labour and 129 were enrolled in spontaneous labour. Fifty patients had elective caesarean section for medical/obstetric reasons. Data was collected for age, labour outcomes (vaginal delivery or caesarean section), neonatal outcomes and maternal complications.

Results: A total of 1165 deliveries occurred during the study period in hospital. Out of 255 subjects, in induced (study) group vaginal delivery rate was 46.1% whereas 83% delivered vaginally in spontaneous (control) group. Emergency caesarean section rate was 54% for study group compared with 17.1% in control group. Five percent of the patients had caesarean section due to obstetric reasons.

Conclusion: To conclude induction of labour is associated with an increased risk of caesarean delivery compared with spontaneous labour.

Keywords: Caesarean section, Induced labour, Neonatal outcome, Spontaneous labour.

INTRODUCTION

Current obstetrics aims to improve maternal and fetal health. Although most women during their reproductive life are healthy and have an uncomplicated delivery with spontaneous onset of labor[1]. For some however, continuation of pregnancy threatens maternal and fetal health and obstetric interventions become necessary to improve fetomaternal outcome.

Induction of labour is becoming the commonest interventional procedure. Labour induction is the iatrogenic initiation of uterine contractionsprior to onset of labour to achieve vaginal delivery[2,3]. It needs to be supervised carefully as it is not without risks.

Induction rates vary between and within countries and regions. It is higher in developed countries than indeveloping due to increasing rate of elective induction[4,8]. A rate of 12.1% for induction of labor has been reported for Asia, 22.5% in USA[5], 5-13% in the Sub-Saharan, Africa[6], 18-23% in Nigeria (Benin)[6] and 3% in Sokoto[7].

The indications for induction need to be established beforehand and have been classified as obstetric, medical, elective or social. Obstetric indications include prolonged pregnancy, hypertensive disease in pregnancy, intrauterine growth restriction (IUGR), Rhesus isoimmunization and intrauterine fetal death (IUD). Medical indications include chronic hypertension, diabetes mellitus, haemoglobinopathies, chronic renal diseases and liver diseases co-existing with pregnancy[8]. Elective induction is also referred to as social induction performed at patient's or doctor's convenience without any medical or obstetric indication[1,9].

The success of induced labor is directly related to the favorability of the cervix, as accessed using the Bi-shop's scoring system. It is associated with a greater likelihood of intrapartum interventions and adverse maternal outcome. The intervention and caesarian section risk following induction in nulliparous increases with obesity and advanced maternal age, fetal macrosomia and chorioamnionitis[4]. Other factors affecting outcome include women attitude, belief, and perception of labor pain as they may request for caesarean section (C-section) out of fear and pain of vaginal delivery [10].

Since an overall rising C-section rate is a global concern, our objective was to ascertain whether induction of labour poses an increased risk of intervention leading to C-section as compared to spontaneous lab-

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ouring women. Our additional aim was to find effects of induction of labour on maternal complications and neonatal outcomes.

METHODOLOGY

It was a prospective comparative study conducted at a tertiary care hospital, Malir, Karachi, from September 2018 to February 2019. All nulliparous women at term were included. Total participants were 255, 76 in induced (study group) and 129 enrolled in spontaneous labor (control group). Fifty participants had elective C-section due to medical and obstetric indi-cations. Clearance was obtained from hospital ethics committee and informed consent was taken.

Inclusion criteria were singleton live fetus, vertex presentation, gestational age at term (≥37 weeks) no presenting medical/obstetric indications for caesarian delivery, clinically suspected decrease amniotic fluid with AFI >6 and reduced fetal movements with reactive NST. Exclusion criteria included non-cephalic and malpresentations, gestational age <37 weeks, severe pre-eclampsia, uncontrolled GDM, contracted pelvis, severe oligohydramnios and IUGR, multiple pregnancies, macrosomia, non-reassuring fetal status and Intrauterine fetal demise.

To obtain sociodemographic information, a structured pro forma was used with age, education, gestation age and parity. In our setup all patients who needed induction were admitted in hospital due to social and litigation issues. Gestational age was confirmed by early scan before 20 weeks of pregnancy. Cervical assessment was performed during antenatal visits. Admission CTG was carried out for all cases. Women who came in spontaneous labor and fulfilled the inclusion criteria were selected for spontaneous group category. Induction of labor was initiated with PGE2, 2 doses, atleast 6 hours apart and was synchronized with amniotomy and oxytocin infusion if cervix was favorable. Oxytocin was administered via intravenous infusion 10 unit in 1000ml of ringer lactate for primiparous and titrated according to uterine contractions and cervical dilatations. Labor progress was monitored by WHO partograph.

Successful induction is defined as successful vaginal delivery. Failed induction was labelled if the latent phase was >18 hours in nulliparous or failure to deliver vaginally[4,15].

RESULTS

A total of 1165 deliveries occurred during the study period. In our study total 255 primiparous patients were enrolled out of which 76 participants had induction of labor and 129 went into spontaneous labor. A total of 50 primiparous participants (5%) had elective C-section due to medical indications over the study period. The data was coded in SPSS and analyzed in JMP statistical software. (JMP is a SAS product headquartered in Cary NC, USA and is a leader in statistical software).

First, we examine the age of women in spontaneous verses induced category of delivery. The results indicate that women in the spontaneous group had a mean age of 21.5 years and in the induced group had a mean age of 23 years. There was no statistically significant difference in age of the two groups at alpha of 0.05 and hence was non-comparable.

When comparing mode of delivery amongst two groups, the study group (induced labour) had a total vaginal delivery rate of 46.1% out of which 39.5% had SVD and 6.6% had instrumental vaginal delivery. Whereas in control (spontaneous labour) group, a total of 83% delivered vaginally with 81.4% and 1.6% undergoing SVD and instrumental vaginal delivery, respectively. Figure-1 reflects the significantly higher rate of vaginal delivery in control group versus study group.

Emergency C-section rate in spontaneous group was 13.2% whereas 3.9% had C-section who declined for further trial of labor (fig-1). In contrast, within induced group, 31.6% ended up in emergency C-section due to failed induction and 22.4% had opted for C-section who were not ready for further trial of labor (fig-1 & 2).

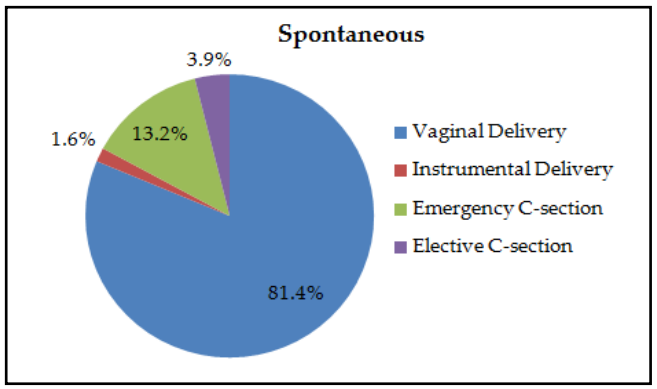

Figure-1: Analysis of delivery outcome in spontaneous (control) group (n=129).

Induced labor was associated with a significantly higher C-section rates, 54% compared with 17.1% in spontaneous group. We test the hypothesis that induced labor is positively related to high C-section out-

come. To test this hypothesis, we perform contingency analysis. Since both the variables being analyzed at categorical variables, this is the best suited method to test the statistical significance of the differences. The mosaic plot of the results is shown in the fig-3. The results support our hypothesis that induction yields higher C-section rates at a significance level of *p*-value <0.001.

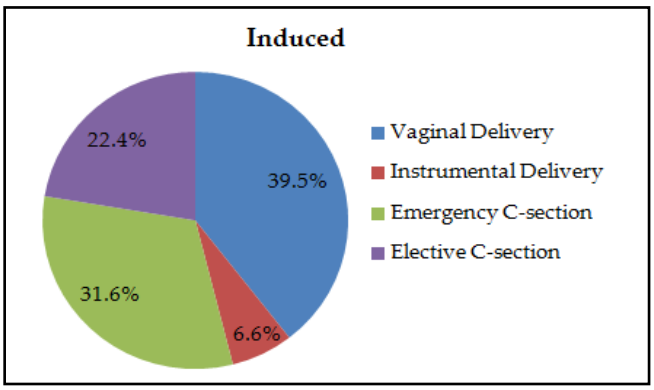

Figure-2: Analysis of delivery outcome in induced (study) group (n=76).

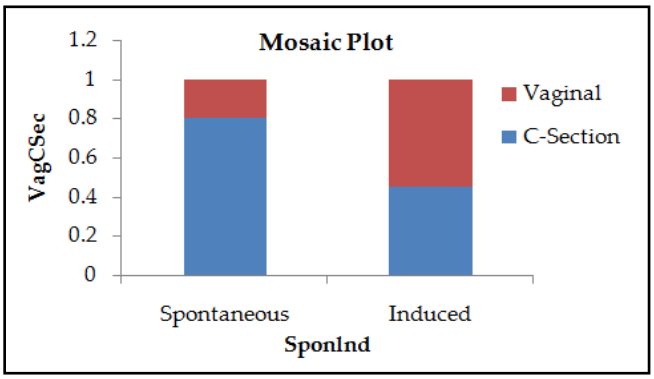

Figure-3: Mosaic plot of Vaginal delivery vs Caesarean section in control and study groups.

Our results analysed vaginal versus C-section births across various age groups. In the age group over 30, majority of the deliveries were C-section (65%), while in the age group of 25-29, the majorities of deliveries were vaginal. This leads us to explore if age of the patient has other significant impact on the outcomes.

Regarding indictations for induction of labour our study showed that oligohydramnios at term followed by poor Bishop at 40 weeks were the most common indications for induction of labor by 32% and 25% respectively. Social reasons, mainly logistics and non-availability of tertiary care in hometown was the third commonest cause for induction.

In this study the frequency of maternal complications as primary PPH and perineal tears were equivocal in both groups.

Considering the neonatal outcomes in vaginal delivery versus C-section for both spontaneous and induced groups, results indicate that the null hypothesis on equal means is rejected and that the means for the Apgar scores for both are significantly different from each other.

We compare the means of the Apgar scores overall for the vaginal and c-section births. The scatter plot of the means is shown in fig-4.

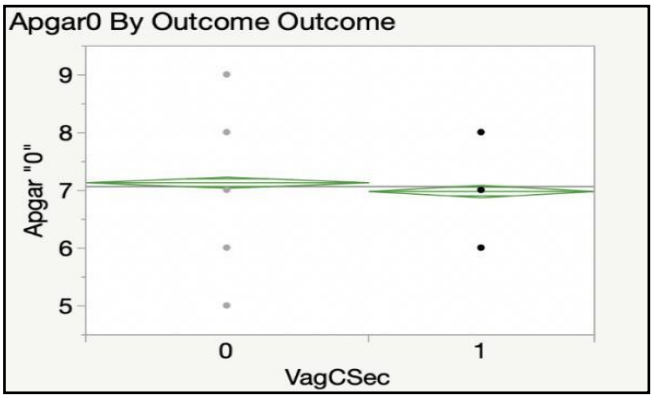

Figure-4: Scatter plot of means of Apgar score for vaginal delivery and C-section.

Oneway Anova

Summary of Fit

Rsquare	0.01682
Adj Rsquare	0.012934
Root Mean Square Error	0.577655
Mean of Response	7.066667
Observations (or Sum Wgts)	255

Pooled t Test

1-0
Assuming equal variances

Difference	-0.15150	t Ratio	-2.08048
Std Err Dif	0.07282	DF	253
Upper CL Dif	-0.00809	Prob > |t|	0.0385*
Lower CL Dif	-0.29491	Prob > t	0.9808
Confidence	0.95	Prob < t	0.0192*

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
VagCSec	1	1.444318	1.44432	4.3284	0.0385*
Error	253	84.422348	0.33369		
C. Total	254	85.866667			

Table: ANOVA analysis for vaginal vs C-section: analysis of Apgar scores.

One-way analysis of variance is performed in the table. Overall ANOVA indicates statistically significant differences in the mean Apgar scores for vaginal versus csection births. The high F-statistics scores and low *p*-values lead to rejecting the null hypothesis that the Apgar scores for both types of outcomes are equal. The means of the ANOVA table indicates that the mean

Apgar scores for vaginal birth (7.13) are statistically higher than the mean Apgar score for C-section (6.98) outcomes.

DISCUSSION

Labour is induced when the risk of continuing the pregnancy outweighs that of delivering a fetus and the goal is to achieve a successful vaginal delivery.

Fetomaternal safety is the ultimate aim in all deliveries and every obstetrician aims to anticipate the risk and provide timely intervention for better neonatal outcome and maternal health.

Rate of induction not only depends on clinical conditions but according to many recent studies it is a multifactorial process with variable unexplained factors. We found that the rate of induction in our study was 29% of the total primiparous deliveries. In comparison, induction rate of 16.7% has been reported in Latin America, 32.1% in India, 41% in Japan and 77.2% in Srilanka[2]. Our results are consistent with 24% rate in a study by Chawla *et al*[2].

Regarding mode of delivery, successful vaginal deliveries were more for spontaneous labour compared to induced labour, 83% vs 46.1% respectively. These results are similar to studies done by Orji *et al*, which showed a greater proportion of 72.1% delivering vaginally in spontaneous labour compared to 64.7% in induced group as well as fewer C-sections in spontaneous group[11].

In Pakistan, the proportion of births delivered by C-section has rapidly increased in the past 5 years, from 14% in 2012-13 to 22% in 2017-18[12]. We found a higher emergency C-section rate of 39.5% in induced group as compared to 13.2% incase of spontaneous group. Likewise Aboisowo *et al* reported 32.3% in induced and 16.4% in C-section rate in spontaneous labouring women[4]. Similar results have been found in[11,13]. A study Sharma *et al*, conducted in SLBSGMC Mandi at Nerchowk from 2016-2017 concluded a 57.1% C-section rate in primigravida supporting the high C-section rates in nulliparous women[14]. Hence we conclude that although the IOL is to achieve vaginal delivery, it exposes women to higher rate of C-section when compared with women in spontaneous labour. Other underlying factors for induction of labour also affect the outcome rather than the process of induction itself i.e. pregnancy associated with comorbids and postdatism[4].

A Cochrane review of 58 trials concluded that although oxytocin reduced unsuccessful delivery rate compared with expectant management within 24 hours (8.3% vs 54%), the C-section rate was increased (10.4% vs 8.9%)[15]. Similar to our study those done by Macer *et al* and Sweeney *et al* also found an increased risk of C-section in induced nulliparous women[16,17].

Women preference for C-section is generally on a rising trend due to multiple factors. The response to labour pain varies with different perception and interpretation among women[18].

These factors may include cultural, environmental, and psychological influences[19]. Such factors played a pivotal role in our study where 22.4% of participants in induced group refused for further trial of labour and opted for cesarean delivery especially due to negative attitude and fear of pain during vaginal birth. This is supported by studies which highlight the association between negative attitude and reduced tendency towards vaginal delivery[20]. According to this study, oligohydramnios was the leading cause of induction of labour with 32%. A systemic review and meta-analysis, conducted by Shrem *et al* evaluated a high rates of labour induction with isolated oligohydramnios[21]. Other causes included postdate pregnancy with poor bishop at 40 weeks of gestation, social reasons (14%) and prelabour rupture of membranes (8.7%). We observed a higher rate of inductions for social reasons: mainly logistics, lack of family support and inadequate health care facility in their hometown compared to prelabour rupture of membranes. This contrasts with other studies held in African and Asian facilities where prelabour rupture of membranes was 27.3% and 19.3% respectively[22].

Apgar scores continue to be widely used as monitor of neonatal health at 1 and 5 minutes. There was no statistical difference between neonatal Apgar scores at 1 and 5 minutes for vaginally delivered cases in both induced and spontaneous groups. These findings are in conjunction with results of Abisowo and Orji *et al*[4,11,23]. According to extensive literature, CS delivery is more associated with increased fetal complications including reduced Apgar score, respiratory distress syndrome, and neonatal transfer rate[24]. However, when comparing overall neonates delivered vaginally vs via caesarean section, our study concluded a significant difference between the two. Eyowas *et al* reported similar results where children born through CS had a significantly lower first minute Apgar score than in those in the vaginal delivery group[25].

LIMITATION OF STUDY

Reason for induction of labour has impact on outcome of induction and therefore could have contribu-

ted to a higher c-section rate. Psychological factors also influence the failure rate of induction that need to be addressed in the antenatal period. The ideal method of fetal monitoring is fetal scalp pH testing which was not available. Instead, non-stress testing was used which is not the accurate predictor of fetal outcome. This could have been one of the factors affecting outcome of induction.

CONCLUSION

High rates of successful vaginal deliveries were seen in spontaneous labouring women as compared to those in induced labour. In spite of being a safe procedure, induction of labour poses increased risk of C-section in nulliparous women. Therefore, the indications for induction must be carefully gauged before initiation. Neonatal outcome was same for all vaginal deliveries among the two groups. However, a significant difference was observed when neonatal outcome was compared between vaginal deliveries and C-section cases.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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