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Comparison of maternal and fetal outcomes between groups of patients undergoing induction of labor and those having spontaneous labor

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Abstract
Background and Aim: Pregnancy lasting beyond 40 weeks is a known complication of normal delivery. Various studies have found incidence between 2-14%. Post-dated pregnancy carries specific hazards to both mother and fetus. While mothers are faced with problems like increased incidences of induced labour, instrumental delivery and LSCS with associated morbidities, fetuses are faced with morbidities ranging from IUGR to macrosomia. Present study was with an objective of comparison of maternal and fetal outcomes in patients who went into labor spontaneously with the patients in whom induction of labor was undertaken at a tertiary care government facility in India.
Material and Methods: Present study was performed at the department of obstetrics and gynaecology of a tertiary care teaching hospital in India. The participants selected by predefined criteria were divided into 2 groups on the basis of progression of labor. They were spontaneous labor (group A) and induction of labor (group B). All the participants were assessed for various relevant maternal and neonatal outcomes and valid comparisons drawn.
Results: In the present study, a total of 1000 participants were finally enrolled as per mentioned selection criteria and considered for analysis; out of which 494 patients were in group A (patients who went into spontaneous labor) whereas 506 patients were in group B (patients where induction of labor was done). The commonest complication noted was postpartum hemorrhage (PPH). The mean duration of labor in group A was 4.62 ±2.12 hours and in group B was 10.01±5.36 hours, significantly higher than in group A. Most common indication for caesarean section was fetal distress (91.1% in group A and 75% group B, $p < 0.05$). Incidences of NICU admissions and neonatal deaths were significantly higher in induction of labor group.
Conclusion: Induction of labor is associated with comparatively more maternal risk of higher induction delivery interval, more cases of caesarean section due to failure of induction as compared with spontaneous labor apart from being associated with neonatal issues like more NICU admissions and fetal deaths in comparison with spontaneous labor.

Keywords: Caesarean section, Induction labor, pregnancy, spontaneous labor

Introduction
Postdate, post term, post maturity, and prolonged pregnancy is accepted terms by WHO and the International Federation of Gynecology and Obstetrics to describe pregnancy beyond dates. Postdate pregnancy is defined as a pregnancy that had passed 40 completed weeks WHO and FIGO defined post term pregnancy as a pregnancy with a gestational length of 294 days or more [1, 2]. Prolongation of pregnancy complicates up to 10% of all pregnancies and carries increased risk to mother and fetus [3, 4]. Estimation of gestational age is the foundation for diagnosis and subsequent management of postdated pregnancy. Primary method is by dating by LMP, with naegles rule according to which incidence of labor at or after 42 weeks is 14% [5].
Labor is a natural physiological process characterized by progressive increase in frequency, intensity and duration of uterine contractions resulting in effacement and dilatation of the cervix with descent of the fetus through the birth canal [6]. Labor could either be spontaneous or induced. Spontaneous labor is the physiological process by which the uterus expels the products of conception after period of 28 weeks gestation spontaneously termed as normal labor. Spontaneous labor is triggered by release of oxytocin and prostaglandin naturally and progressing to labor [7].
The American College of Obstetricians and Gynecologists, in practice bulletin of Induction of labour states “Generally induction of labour has merit as a therapeutic option when the benefits

of expeditious delivery outweigh the risks of continuing the pregnancy [8]. The benefit of labour induction must be weighed against the potential maternal or fetal risks associated with the procedure" [9].

The world has seen steady and significant rise in proportion of cases of induction of labor vis-à-vis spontaneous labor [10, 11]. Infect, the overall rate of induction of labor is rising faster than the rate of pregnancy complications that would lead to a medically indicated induction [5, 6]. Reasons for this disproportionate increase are complex and multifactorial. Better planning of birth by the obstetricians, patient and her family is the most common reason. Other reasons include greater availability of cervical ripeners, more open attitude towards marginal or elective inductions and undue litigious constraints and considerations at the end of medical practitioners [11, 12]. However, the incidences of maternal and neonatal effects of induction of labor in comparison to spontaneous labor were not studied well enough till now and remain largely presumptuous. Hence, the present study was with an objective of comparison of maternal and fetal outcomes in patients who went into labor spontaneously with the patients in whom induction of labor was undertaken at a tertiary care government facility in India.

Material and Methods

Present study was performed at the department of obstetrics and gynaecology of a tertiary care teaching hospital in India. The study was conducted over 15 months after due approval from the institutional ethics committee.

Inclusion criteria

- Sure, of dates.
- Who crossed the expected date of delivery by USG or LMP.
- Singleton pregnancy.
- Cephalic presentation.
- One first or second trimester USG.
- Unscarred uterus.

Exclusion criteria

1. Premature rupture of membranes
2. Associated medical problems like diabetes mellitus, cardiac diseases, renal diseases, pre-eclampsia.
3. Cord presentation.
4. Contraindication to induction of labour such as intrauterine growth restriction, fetal distress, cephalopelvic disproportion, placenta previa, chronic placental insufficiency, abnormal fetal presentations
5. Previous cesarean section

Detailed history was recorded including all complications in past and present pregnancy, if any. Clinical examinations were done including general examination and per abdomen examination to check whether it was relaxed or contraction are present. Per speculum and per vaginal examination were undertaken to assess the Bishops score for induction. Routine investigation like haemoglobin, HIV testing, blood grouping were done for all the patients. Special investigations like liver function test, renal function test, bleeding time clotting time, prothrombin time, INR (International normalized ratio) were done wherever indicated clinically.

Patients in group A were monitored for spontaneous progression of labor. Patients in group B with unfavourable cervix received 0.5 mg of prostaglandin gel (PGE2) in the cervical canal. If the cervix was still unfavourable after 6 hours, another dose of 0.5 mg PGE2 gel was repeated up to a maximum of 1.5 mg PGE2 gel or 3 doses to achieve optimal cervical ripening. Once the cervix became favourable, oxytocin infusion was started 6 hrs after the last dose.

Intrapartum fetal monitoring was done by intermittent auscultation of fetal heart sound and continuous electronic monitoring was done as per requirement. Maternal outcomes in the form of mode of delivery and indications for caesarean section were compared in the two groups. The duration of labor in the two groups were compared by assessing the labor delivery interval (in group A) with induction delivery interval (in group B). Various maternal complications in labor in both groups were compared. Fetal outcomes were compared by assessing the birth weight, neonatal intensive care unit admissions and neonatal deaths in both groups.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

In the present study, a total of 1000 participants were finally enrolled as per mentioned selection criteria and considered for analysis; out of which 494 patients were in group A (patients who went into spontaneous labor) whereas 506 patients were in group B (patients where induction of labor was done). Significant majority of the participants were in the 21-25 years age group. The mean age was 22.74±3.02 years in group A and 22.90±2.45 years in group B and the difference was statistically insignificant. Majority of the patients in both the groups were primigravida, with no statistically significant difference between groups. As for the indications for termination of pregnancy, major ones were those with postdate pregnancy (40.05% in group A, 41.23% in group B), premature rupture of membranes (24.92% in group A, 18.85 % in group B), pregnancy induced hypertension (15.93% in group A, 13.52% in group B); the groups being statistically comparable with similar indications. The labor delivery intervals/induction delivery intervals were compared between the 2 groups. The mean duration of labor in group A was 4.62 ±2.12 hours and in group B was 10.01±5.36 hours, significantly higher than in group A. Majority of patients in spontaneous labor (68%) delivered in less than 6 hours while majority of patients after induction (37%) delivered between 6 to 11 hours. The proportion of patients requiring caesarean section was very high in induction group (39.52%) in comparison to the spontaneous labor group (18.21%), the difference being statistically significant. Most common indication for caesarean section was fetal distress (91.1% in group A and 75% group B, $p < 0.05$). (Table 2). Majority of babies (53.50% in spontaneous labor group and 52.90% in induction labor group) weighed between 2.6-3 kgs at birth. Mean weight was 2.75±0.5 kgs in spontaneous labor group and 2.84±0.72 kgs in induction of labor group, the difference being statistically insignificant ($p > 0.05$). In the present study, 200 out of 1000 total participants (20%) got admitted in neonatal intensive care unit (NICU) during the study. A total of 90 (9%) babies got admitted in NICU who were born to mothers who went into spontaneous labor and 110 (11%) babies admitted whose mother were induced. Majority of babies admitted in NICU were due to meconium aspiration syndrome and birth asphyxia. Incidence of NICU admissions was significantly higher in induction of labor group. Birth asphyxia was the commonest cause of neonatal death. Neonatal deaths were significantly higher in induction labor group.

Table 1: Outcome comparison for mode of delivery and indications of caesarean section

Variables	Spontaneous labor group N (494) Percentage (%)		Induction of labor group N (50 Percentage (%)	
Mode of delivery				
Normal	392	79.35	290	57.3
Caesarean	90	18.21	200	39.52
Instrumental	12	2.4	16	3.1
Indication of caesarean section	**N=90**		**N=200**	
Fetal distress	82	91.1	150	75
Failed induction			36	18
Prolonged PROM with nil draining liquor	5	5.5	12	6
Deep transverse arrest	3	3.3	2	1

Table 2: Comparison of maternal complications

Complications	Spontaneous labor group N (494) Percentage (%)		Induction of labor group N (506) Percentage (%)	
No Complications	477	96.5	489	96.6
PPH	13	2.63	10	19.76
Perineal laceration	2	0.4	2	0.39
Need of blood transfusion	2	0.4	4	0.79
Fever/chills/rash	0	0	1	0.19
Maternal sepsis	0	0	0	0
Hysterectomy	0	0	0	0

Discussion

Management of pregnancy beyond EDD is a subject of concern because of its known association with increased risk to mother and fetus. The risks include increased incidence of oligohydramnios due to declining placental function, umbilical cord compression resulting in transient or permanent decreased oxygenation to the fetus, nonprogressive labour, instrumental delivery and increased risk of caesarean delivery [13]. The perinatal risk seems to be higher for intrauterine growth restricted or small for gestational age infants than it is for average for gestational age infants. However, some fetuses continue to grow and become macrosomic. These babies have a greater risk of shoulder dystocia. Meconium stained amniotic fluid and meconium aspiration syndrome are seen more in labour beyond EDD [14]. The exact management in pregnancy beyond 40 weeks of gestation remains unclear as some people advocate expectant management to wait for spontaneous onset of labour and some advocate induction of labour. The induction of labour is justified when the benefits over weigh the risks of continuing the pregnancy.

The mean age was 22.74±3.02 years in group A and 22.90±2.45 years in induction of labor group, which was statistically comparable and similar to the age groups studied in earlier studies [2, 8]. Majority of the patients in both the groups were primigravida, which was on expected lines and means more primigravida needed induction of labor. Sarvanan *et al*. Cammu *et al*. and Kandemir *et al*. amongst others, also reported the proportion to be in favour of primigravida with no significant difference between the studied groups [15-17].

Postdated pregnancy, premature rupture of membranes, pregnancy induced hypertension were the major indications with no significant difference between the groups. Gardosi *et al.* had reported that, after postdates, the hypertensive diseases of pregnancy were becoming more common indications for induction of labor as well as high risk in spontaneous labor [18]. Rest of the previously similar studies were also in agreement with this observation [19, 20].

Majority of patients in spontaneous labor group delivered in less than 6 hours while those after induction mostly delivered between 6 to 11 hours, the difference between two groups being significant. Pant *et al.* had observed that the Bishops score was related to the mean duration of labor and reported that patients who had induction of labor had significantly higher duration of labor than the patients who went into spontaneous labor [21]. Our results are similar to the study finding by Chabbra *et al*. who also found reduced cesarean section rates in induced labour group as compared to spontaneous labour group [22].

In this study, proportion of patients requiring caesarean section was very high in induction labor group as compared to spontaneous labor group. The greatest maternal risk of induction of labor was the potential risk of morbidity associated with caesarean section and the risk was observed to predictably increase with the decrease in parity and also with the decrease in the favourability of the cervix at induction. The observations of Stock *et al.* Sujata *et al.* and Pant *et al.* were much in line with the relatively higher section rate amongst induction group [19, 21]. Similar findings of 5.4 % rates of LSCS in induced labour were reported in the study published by James *et al*. However, in the study by Virginija *et al*. reported a higher rates of caesarean section of 22% in induced labour at 41 weeks-41 weeks + 6 days of gestation compared to 10% cesarean section rates at 40 weeks-40 weeks 6 days of gestation [23-25]. The most common indication for caesarean section in both the groups in the present study was fetal distress, mostly in agreement with observations of Bueno *et al*, Babu *et al*. and Tripathi *et al*. [20, 26, 27]

No statistically significant difference was observed with respect to birth weight of babies in the two groups, a finding in line with Sujata *et al*. and Tripathy *et al*. amongst others [20, 26]. NICU admissions were significantly higher in induction of labor group as compared to spontaneous labor group, with majority of admissions being due to meconium aspiration syndrome and birth asphyxia. This was relatively much higher than what Macer *et al.* in their study found out (0.8%) [28]. The reason for this disparities could be explained on the basis of the fact that both the above studies were conducted in tertiary care centers where all the deliveries were being attended by a specialist neonatologist, leading to better newborn related outcomes.

Conclusion

Induction of labor is associated with comparatively more maternal risk of higher induction delivery interval, more cases of caesarean section due to failure of induction as compared with spontaneous labor apart from being associated with neonatal issues like more NICU admissions and fetal deaths in

comparison with spontaneous labor. And hence induction should be employed judiciously by assessing the maternal and fetal condition and confirming relevant indication and should only be done if continuation of pregnancy is relatively more hazardous to either mother or baby.

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