

## Prediction of Successful Labor Induction in Multiparas Women

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### ABSTRACT

**Background:** Induction of labor (IOL) is the intervention used to artificially initiate uterine contractions leading to progressive dilatation and effacement of the cervix to accomplish delivery prior to the onset of spontaneous labor.

**Aim:** to assess predictors of successful labor induction in multiparous women. **Method:** This was a prospective cross sectional study. The study population was a consecutive series of participants attending Ain Shams University Maternity Hospital. Pre-induction assessment was done using Bishop scoring system on 57 participants. **Result:** in out of 57 women underwent induction of labor 51 women had successful labor induction (88.3%) and 6 cases had failed (11.7%) labor induction. **Conclusion:** Main predictors of successful labor induction were BMI, gestational weight gain and Bishop score  $\geq 6$ .

**Keywords:** induction of labor (IOL), multiparas women, Bishop score.

### INTRODUCTION

Induction of labor refers to the initiation of uterine contractions before the spontaneous onset of labor by medical and/or surgical means aiming to vaginal delivery<sup>(1)</sup>.

It is considered one of the most commonly performed obstetrical procedures, as its percentage reaching 20% in pregnant women for various reasons by several medical and surgical methods<sup>(2)</sup>.

According to Laughon *et al.*<sup>(3)</sup> IOL was performed in 42.9% of the nulliparous and 31.8% of the multiparas women while elective induction at term occurred in 35.5%. Elective induction at term in multiparas was highly successful (vaginal delivery 97%) compared to nulliparous (76.2%).

IOL usually used when it is more beneficial to mother and to the fetus to terminate the pregnancy, however, the percentage of marginally indicated and elective labor induction is increased<sup>(4)</sup>. IOL most commonly used to decrease fetal or neonatal morbidity and mortality as with post-term pregnancy, oligohydramnios, suspected intrauterine growth restriction (IUGR), as well as it can reduce maternal morbidity as in female with some medical disorders like preeclampsia or to benefit both mother and fetus as in case of prelabor rupture of membranes (PROM) at term<sup>(5)</sup>. Labor induction by using of prostaglandin has several benefits as increasing the rate of successful vaginal delivery, decreases cesarean section rate, lowers the use of regional analgesia and increases maternal satisfaction<sup>(2)</sup>.

Assessment of cervical status is the main predictor for estimating the likelihood of a successful vaginal delivery<sup>(6)</sup>.

However, integrating leading factors for failed labor induction other than cervical status, such as parity, maternal age and weight, and fetal weight

may improve the prediction of vaginal delivery after labor induction<sup>(7)</sup>.

Bishop score is the most popular method and is considered the gold standard traditional method of assessing favorability of the cervix<sup>(8)</sup>.

### Aim of the Work:

To assess predictors of successful labor induction in multiparous women.

### PATIENTS AND METHODS:

**Study place:** The study population was a consecutive series of participants attending Ain shams University Maternity Hospital. **The study was approved by the Ethics Board of Ain Shams University.**

**Sample size:** 57 multiparous women underwent induction of labor.

### Inclusion criteria:

Multiparas women, singleton gestation at 37 completed weeks or greater, cephalic presentation, longitudinal lie, living fetus and intact membrane.

### Exclusion criteria:

Nulliparous, previous cesarean delivery or rupture uterus, antepartum hemorrhage including (abruptio placenta, placenta previa or vasa previa), abnormal fetal lie or presentation, previous uterine surgery as myomectomy, category II, III non-stress test, pelvic structural deformity, intrauterine growth retardation or macrosomia (estimated fetal weight > than 4 kg), patients who received any pre induction ripening, active genital herpes, and invasive cervical carcinoma.

### Methodology

Informed written consent obtained from the participant, history taking and assessment of the indication for induction of labor was done, general examination, non-stress test for 30 minutes, digital examination was done by using Burnett modification of Bishop score<sup>(9)</sup> with a score of zero to maximum

ten (Table 1), induction of labor was carried out with prostaglandin E2 according to the standard protocol of Ain Shams University Maternity Hospital by dinoprostone 3 mg vaginal tablet into posterior vaginal fornix, fetal heart rate was assessed every 30 min in the first stage of labor and every 5 min in the second stage of labor, observation of the progress of labor (partogram) was done. The time elapsed till the active phase of labor was recorded. The time till delivery and the mode of delivery, the total dose of prostaglandin used were recorded. Digital examination was performed with assessment of cervical status and reporting it according to Burrent modification of Bishop scoring system (Table1).

Induction of labor was carried out by dinoprostone if Bishop <6 and by oxytocin if Bishop ≥6.

**Table (1):** The Burnett modification of Bishop score <sup>(9)</sup>

| Score               | 0         | 1      | 2                    |
|---------------------|-----------|--------|----------------------|
| Cervical dilatation | < 1 cm    | 1-2 cm | > 2 cm               |
| Cervical length     | < 2 cm    | 1-2 cm | > 1 cm               |
| Cervical position   | Posterior | Mid    | Anterior             |
| Consistency         | Firm      | Soft   | Soft and stretchable |
| Head station        | ≥ -2      | -1     | ≥ 0                  |

**Table 3:** Significant difference between the studied groups

|                               | Failed induction |           | Successful induction |           | Significance |
|-------------------------------|------------------|-----------|----------------------|-----------|--------------|
|                               | Mean             | SD        | Mean                 | SD        |              |
| Age                           | 31.6667          | 3.50238   | 29.4510              | 4.89209   | 0.288        |
| Gestational age               | 280.83           | 6.46271   | 281.43               | 8.79831   | 0.873        |
| BMI                           | 32.6667          | 4.70815   | 28.3647              | 1.67103   | <0.001*      |
| Gestational weight gain       | 13.8333          | 4.30891   | 10.6863              | 2.81062   | 0.018*       |
| Interpregnancy interval (IPI) | 4.6667           | 2.94392   | 3.7843               | 2.29620   | 0.391        |
| Estimated fetal weight        | 3408.3           | 297.95414 | 3305.7               | 187.86270 | 0.241        |

In this study there was a significant difference between participants who had successful labor induction and those with failed induction as regards BMI and gestational weight gain with P value (<0.001 and 0.018) respectively (Table 3).

**Table 4:** Descriptive data of the studied population

| Variable                      | Min     | Max     | mean    | SD        |
|-------------------------------|---------|---------|---------|-----------|
| Age                           | 22      | 42      | 29.6    | 4.7       |
| Gestational age               | 261     | 299     | 281.36  | 8.53      |
| BMI                           | 25      | 38      | 28.8    | 2.49929   |
| Gestational weight gain       | 7.00    | 20.00   | 11.0175 | 3.10812   |
| Interpregnancy interval (IPI) | 1.00    | 11.00   | 3.8772  | 2.35713   |
| Estimated fetal weight        | 3000.00 | 3844.00 | 3316.5  | 201.11307 |
| Bishop score                  | 2.00    | 10.00   | 6.1053  | 1.35863   |

### Statistical analysis

Data were analyzed using Stata® version 14.2 (StataCorp LLC, College Station, TX, USA).

Normality of numerical data distribution was examined using the Shapiro-Wilk test.

Normally distributed numerical variables were presented as mean and standard deviation (SD) and intergroup differences were compared using the independent-samples t test.

Non-Normally distributed numerical data were presented as median and interquartile and intergroup differences were compared using the Wilcoxon rank sum test.

Categorical data were presented as number and percentage and differences were compared using Fisher’s exact test (for nominal data) or the chi-squared test for trend (for ordinal data).

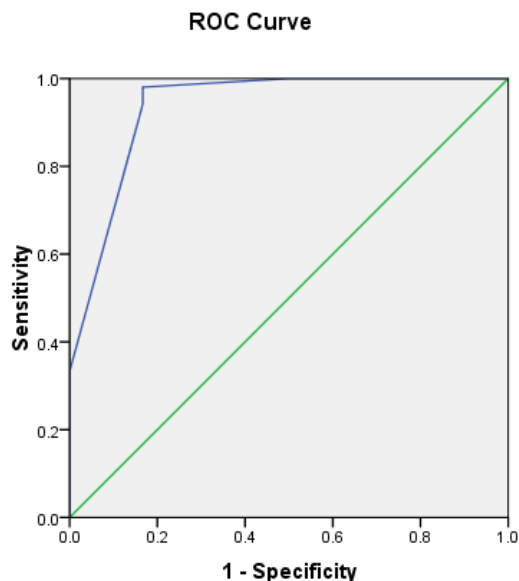
### Results:

51 participants had successful induction of labor while only 6 had failed induction (10.5%) (Table 2).

**Table 2:** Induction outcome

|            | Number | %    |
|------------|--------|------|
| Failed     | 6      | 10.5 |
| Successful | 51     | 89.5 |

In this study, body mass index (BMI) and gestational weight gain (GWG) have a significant value in successful labor induction (Table 3).



Diagonal segments are produced by ties.

Plotting of ROC curve analysis for prediction of successful induction of labor using the Bishop score revealed that it had excellent predictive value with an area under the ROC curve (AUC) of 0.936 (95% CI = 0.812 to 1.061; p-value <0.0001).

## DISCUSSION

Induction of labor (IOL) is carried out in about 20% of term pregnancies. Evidence demonstrated that increased cesarean delivery rate due to the increased proportion of women with complicated pregnancies, fetal distress and subsequent to failure of IOL<sup>(10)</sup>.

Successful IOL can be predicted mainly by assessing cervical status. However, other factors like head position, parity, maternal age and maternal body mass index (BMI); provide useful information in predicting IOL success<sup>(11)</sup>.

The Bishop score remains the gold standard assessment for cervical status, its subjective nature has raised concerns about its routine use<sup>(12)</sup>.

The present study was carried out as a prospective cross sectional study included 57 pregnant females who underwent induction of labor in Ain Shams University Maternity Hospital and it revealed the following results:

The maternal age of the study population ranged between 22 and 42 years with mean of  $29.6 \pm 4.7$  years which was insignificantly different between women with successful induction and those with failed induction (P-value= 0.288). In line with the present study results, a study by  **Eggebo and his colleagues**<sup>(13)</sup> reported that the role of

maternal age in predicting successful IOL was insignificant. On the other hand a study conducted by **Mularz and Gutkin**,<sup>(14)</sup> found that; the relative risk of cesarean delivery increases after labor induction with increasing maternal age.

As regards the gestational age at the time of induction; results of the present study showed that the gestational age ranged between 37.2 and 42.7 weeks with mean of  $40.1 \pm 1.21$  weeks which did not affect the outcome of labor induction as the mean gestational age in the females with successful induction of labor was  $40.2 \pm 1.24$  weeks while was  $40.11 \pm 0.92$  weeks in the failed induction group (P-value=0.873).

In accordance with the present study; **Al-Shaikh and her colleagues**<sup>(15)</sup> found that the mean gestational age, at induction of labor (IOL) was  $39 \pm 2.1$  weeks. On the other hand, **Masan and coworkers**<sup>(16)</sup> in Kenya; reported that the smaller the gestational age the more likely the labor induction will succeed.

Obesity is a growing epidemic worldwide associated with many of gestational medical conditions. Its impact on failed induction was reported by different authors, morbid obesity was associated with higher failure rates<sup>(17)</sup>.

These finding agreed with the present study results where, BMI was found a main factor affecting the success of IOL as the mean BMI in the females with successful induction of labor was  $28.36 \pm 1.671$  and  $32.66 \pm 4.708$  in failed cases with (P-value <0.001).

The current study found that pregnancy weight gain is significantly different between cases with failed cases of  $13.83 \pm 4.30$  kg and  $10.68 \pm 2.81$  kg in successful induction with a P value of 0.018.

Similarly, It was reported that weight gain over 12 kg regardless of pre-pregnancy weight predicted IOL failure in postdate pregnancies<sup>(18)</sup>.

In the present study estimated fetal weight (EFW) was of non-significant value in labor induction as mean $\pm$ SD fetal weight =  $3408.3 \pm 297.9$  g in failed induction and  $3305.7 \pm 187.8$ g in successful induction with a P value of 0.873. **Masan et al.**<sup>(16)</sup> found that fetal weight was increased in women who had failed induction. On the other hand, **Abdulkadir et al.**<sup>(19)</sup> found that EFW was non-significant in labor induction with a P value 0.60.

In this study the inter pregnancy interval was of no value in labor induction with a P value of 0.391

As regards the modified Bishop score; the current study revealed that Bishop score was significantly increased among women who had successful induction at cut off point 6 with sensitivity of 94% and specificity of 83.6%.

**Elkholy and his colleagues** <sup>(20)</sup> concluded that modified Bishop score is a major predictor of the success of induction with optimal cut off points of more than 5 with sensitivity of 80% and specificity of 47%. While, **Pandis and coworkers** <sup>(21)</sup> reported that the best cut-off point for the prediction of successful induction was 3 for the Bishop score.

## CONCLUSION

Induction of labor is an obstetric intervention usually employed to prevent adverse pregnancy outcomes. Given the increasing attention to reducing perinatal morbidity and mortality, rates of induction of labor have continued to rise over the past few decades. The study revealed that the percentage of successful labor induction in multiparas 89.5% BMI and gestational weight gain are important factors in prediction of successful labor induction. Modified Bishop score  $\geq 6$  is associated with successful labor induction.

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