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ASSESSMENT OF THE VARIABILITY OF CERVICAL DILATATION RATE IN THE FIRST STAGE OF LABOR AT AL- ELWIYA MATERNITY TEACHING HOSPITAL

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ABSTRACT
Managing labor has long been based on the Friedmans labor curve which gives the cervical dilatation as predictable and sigmoidal. But modern studies indicate a less active development of labor and a greater changeability. The purpose of this study was to assess the rates of cervical dilatation in Arabian women, study the relationship between the mode of delivery and cervical dilatation, and determine thresholds that predict dystocia and cesarean delivery.
A follow-up study was carried out in Al-Elwiya Maternity Teaching Hospital, Baghdad, on 1,000 term women who delivered their infants in spontaneous labor and singleton births. Women who have had a previous cesarean section or malpresentation or have medical complication were excluded. Serial vaginal examinations were used to measure cervical dilatation both in the latent and active stages. The predictors of cesarean delivery were determined with the help of multivariate logistic regression and Receiver Operating Characteristic (ROC) analysis which consider the parity, BMI, and gestational age.
The rate of cesarean section was 15.5% as a result of dystocia. The median rates of cervical dilatation were 0.4 cm/h in the latent and 0.6 cm/h in the active phases, which is slower than Friedman standard yet is in line with current research. Admission dilatation of <4 cm, rate of dilatation of less than 0.5 cm/hour, nulliparity and a BMI of 30 or more were significant predictors of cesarean delivery. Using ROC analysis, it was found that optimal predictive thresholds were at 0.4-0.5 cm / hour.
These results indicate that the development of labor among the Iraqi women is less developed as compared to the traditional standards and strict use of the old-fashioned standards can be a cause of unnecessary cesarean sections.

Keywords: cervical dilatation, progress of labor, dystocia, cesarean section, ROC analysis, Iraq, maternal obesity.

1 Introduction

The birth of a child is a life-altering event, yet a significant maternal and neonatal risk, in the countries that have low and middle-income levels, where mortality and morbidity rates have not been reduced yet (World Health, 1994). The contemporary obstetric practice has significantly advanced the outcomes, but the increased utilization of such technologies as oxytocin augmentation, electronic fetal monitoring, epidural analgesia, and cesarean section has complicated the definition of normal and abnormal labor greatly (ACOG, 2003). Conventionally, the advancement of labor has been measured based on the labor curve as developed by Friedman, where the dilatation of the cervix is characterized as sigmoid where the acceleration of the process is to be expected during the active phase (Friedman, 1954). But there is even more up to date evidence that labor can be more gradual and uneven than Friedman once suggested, casting doubt on the possibility of over-diagnosis of dystocia and unnecessary operative birth (Zhang et al., 2002).
This point is especially applicable to Iraq where the rates of cesarean sections have been clearly on the upswing, both in the public and in the private sector and where maternal obesity, high fertility, and early hospital admission in the latent phase can have a significant impact on labor dynamics (Betrán et al., 2007). The initial phase of labor is particularly critical since mistakes in interpretation cervical progress during this phase can lead to unnecessary interventions that can change the natural progression of labor (Neal et al., 2010). Modern evidence indicates that active labor does not actually start until 6 cm of dilatation (Laughon et al., 2011), and slower rates of dilatition between 4 and 6 cm may still be associated with safe vaginal delivery(Incerti et al., 2011).

It is against this backdrop that the current study was conducted in order to evaluate the variability of cervical dilatation rate in Iraqi women who delivered spontaneously, to study the correlation of admission dilatation with mode of delivery and finally to establish clinically useful threshold values that could be used to predict dystocia and cesarean delivery amongst this group of population.

2 Methodoogy

2.1 Design and Setting of the Study

The aim of the study was to develop a prospective cohort study spanning one year (1 July 2015 to 1 July 2016) at the Al-Elwiya Maternity Teaching Hospital, Obstetrics and Gynecology department, Baghdad. The research design was accepted by the Obstetrics and Gynecology Committee of Arab Board of Medical Specialization in Iraq and hospital administration.

2.2 Study Population

A random sample of 1,000 pregnancies whose labor started randomly at term and whose vertex presentation was that of a singleton was used (CRANE, 2006). All participants provided informed consent that was given in writing. The women were excluded in case they had an overall number of pregnancy, induced labour, preterm labour, abnormal presentation, ruptur of membrane prior to admission, intrauterine fetal death, previous uterine scar, major medical conditions, obstetric complications like ante partum haemorrhage, birth defects in the fetus, and cesarean section due to fetal distress or second stage of dystocia.

2.3 Clinical Assessment and Data Collection

The obstetric and medical history details were taken out and specific to every participant: age, occupation, parity, residence and gestational age. The gestational age was calculated based on the last menstrual period and prenatal ultrasound prior to 22 weeks and classified as early term (37+0 to 38+6 weeks), full term (39+0 to 40+6 weeks), and late term (41+0 to 41+6 weeks). The clinical examination involved pulse, blood pressure, temperature, body mass index (BMI), the estimated fetal weight, fetal head position, membrane status, and liquor characteristics (Konar & Dutta, 2015). Frequent tests were hemoglobin, blood group, Rhesus factor, urine tests, and blood sugar tests.

2.4 Intrapartum Monitoring

A partograph was used to track labor progress, starting at the start of active labor (WHO, 2026). Vaginal checkups were done after every two hour and the results were noted pros pectively (Buchmann & Libhaber, 2007). Amniotomy was done when there was delayed progress and oxytocin augmentation when there was cervical arrest after rupture of the membranes (SELIN et al., 2009). A diagnosis of labor dystocia was made when there was no change in the cervix after four hours despite proper uterine contractions. Outcomes of delivery were either spontaneous vaginal birth or emergent cesarean section because of first-stage dystocia.

2.5 Statistical Analysis

Microsoft Excel 2016 was used to input data into the software and analyzed using IBM SPSS version 21. The KolmogorovSmirnov test was used to test the normality. Since the rate of cervical dilatation was not normally distributed, data were summarized to provide a median and interquartile range and compared using the Mann-Whitney U test or Kruska-Wallis test. Adjusted odds ratios of cesarean delivery were estimated using multivariable logistic regression whereas the continuous outcome like cervical dilatation rate used linear regression. The ROC curve analysis was done with the aim of determining the optimal predictive cut-off points. A statistical significance of $p < 0.05$ was defined.

3 Results

The results of this study were based on the analysis of 1,000 pregnant women in spontaneous labor. Cesarean cases were not included in cases of fetal distress and substituted, to ensure consistency of the samples. About 25 percent of the women were enrolled in the latent phase, with most women being enrolled in the active phase.

3.1 Mode of Delivery and Incidence of Dystocia

Table 1: Mode of Delivery and Failure of Progress

Outcome	N	%
Normal Vaginal Delivery	845	84.5
Cesarean Delivery	155	15.5

Failure of progress occurred in:

- Latent phase: 6.4%

- Active phase: 14.1%

These findings indicate that dystocia is more frequently diagnosed during the active phase (Cheng et al., 2004).

3.2 Socio-demographic Characteristics

Table 2:

Table 2: Participant Characteristics

Variable	Key Finding
Age	Majority 20–34 years (≈58%)
Nulliparity	37.4%
Grand multipara	10.2%
Rural residence	34.5%
Housewives	74.1%

Younger women (<20 years) and nulliparous women showed higher cesarean rates (Lowe, 2007).

3.3 Anthropometric and Obstetric Variables

Table 3: Clinical Characteristics

Variable	Distribution
Obesity (BMI ≥30)	61.8%
Full-term pregnancy	65.2%
High fetal weight (>3.5 kg)	10.5%
Occipito-anterior position	88.6%
Oxytocin use	76.5%
Continuous FHR monitoring	37.2%

Obesity and higher fetal weight were strongly associated with cesarean delivery (Sheiner et al., 2002).

3.4 Predictors of Cesarean Delivery

Table 4:Key Predictors (Relative Risk Summary)

Predictor	Risk Interpretation
Age <20 years	Highest risk (RR ≈ 3.5)
Nulliparity	Increased risk (RR ≈ 2.3)
BMI ≥35	Strongest predictor (RR ≈ 9.9)
Late gestation	Increased risk (RR ≈ 2.4)
High fetal weight	Increased risk (RR ≈ 4.3)
Oxytocin use	Increased risk (RR ≈ 4.0)
Continuous FHR monitoring	Increased risk (RR ≈ 5.4)

Higher cesarean rates were also found to be related to urban residence and artificial rupture of membranes.

3.5 Cervical Dilatation Rate and Labor Progression

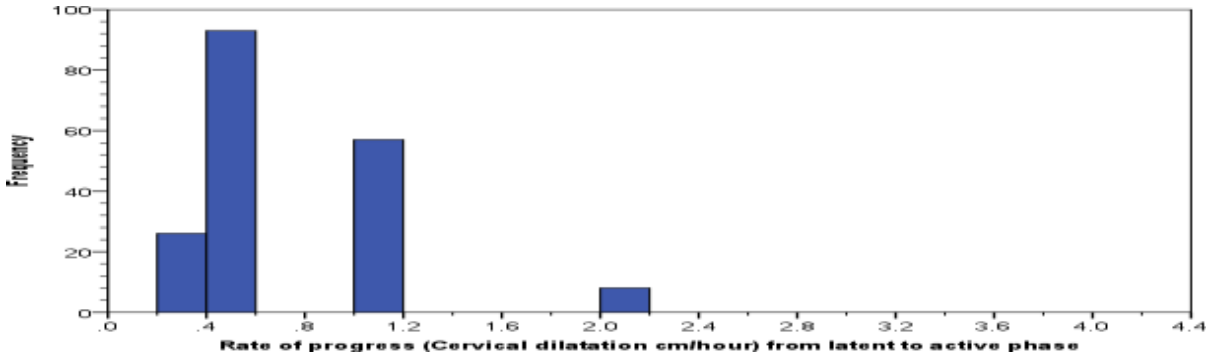

Figure 1 : Histogram of cervical dilatation rate showing distribution in latent and active phases.

The median cervical dilatation rate was:

- 0.5 cm/hour in latent phase
- 0.9 cm/hour in active phase

The rate increased significantly from latent to active phase (median difference = 0.4 cm/hour, $p < 0.001$).

3.6 Median Cervical Dilatation Rate (cm/hour)

Table 5: Median Cervical Dilatation Rate (cm/hour)

Phase	Median	IQR
Latent	0.5	0.5–1
Active	0.9	0.75–1.2

The latent phase exhibited a strong positive correlation between parity and labor progress, and a weak negative correlation between fetal weights (Neal et al., 2010).

3.7 Factors Affecting Labor Progression

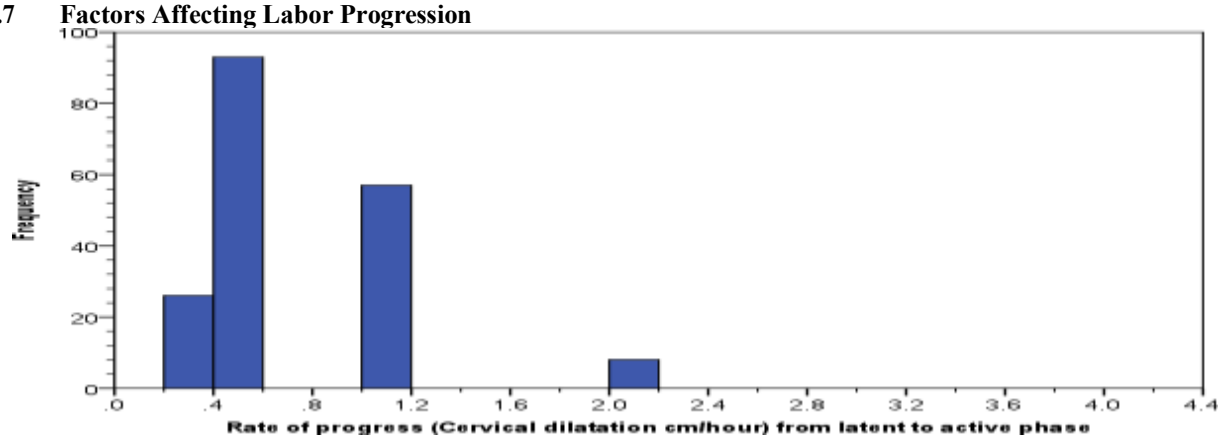

Figure 2: Dot plots showing cervical dilatation rate stratified by parity, BMI, and fetal head position.

Key findings:

- Nulliparous women were the slowest (c. 0.75 cm/hr) progressors.
- Grand multipara had the quickest (thought to be approximately 1.5 cm/hr)
- Occipito-posterior position had slower improvements.
- Lower median progress was observed with Oxytocin use in active phase.

There were mixed effects of BMI, and weak correlations between phases.

3.8 ROC Analysis and Diagnostic Performance

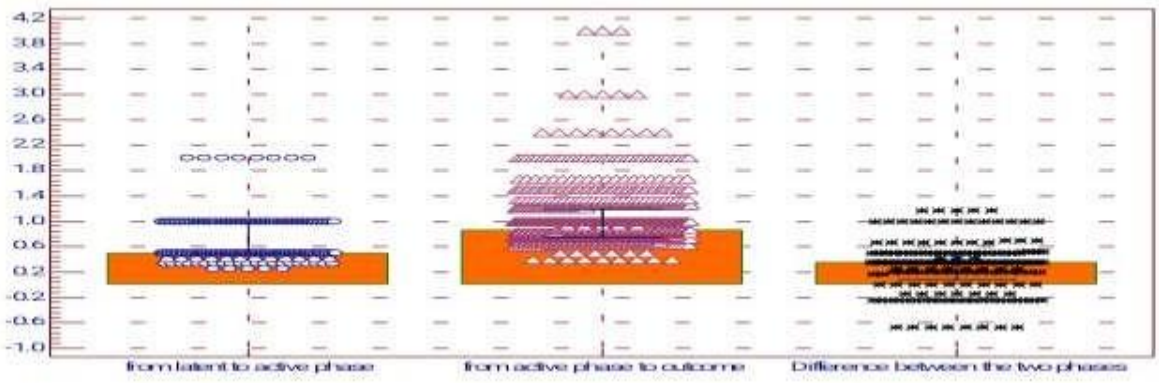

Figure 3: ROC curve for latent phase cervical dilatation rate.

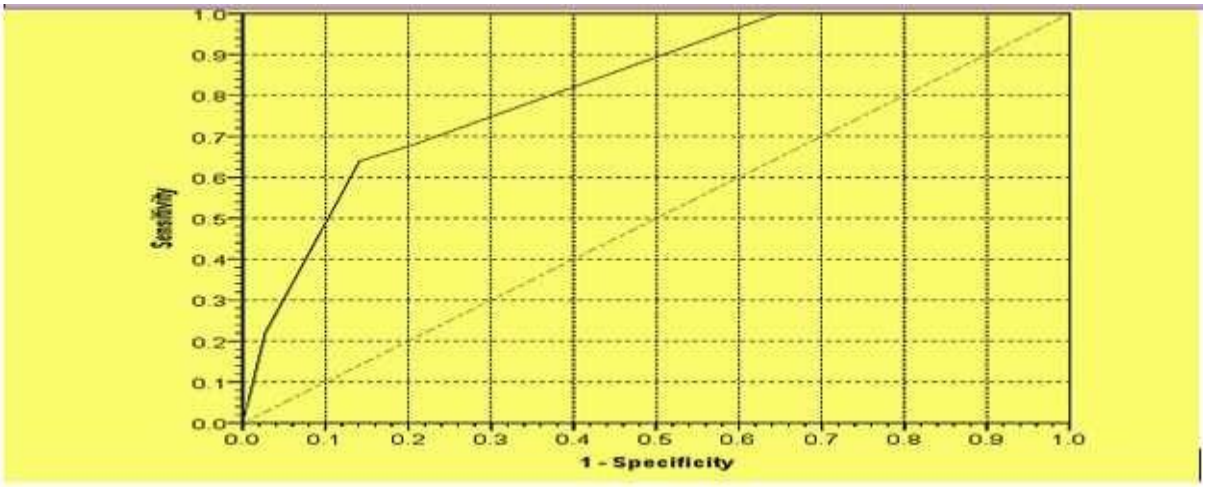

Figure 4: ROC curve for active phase cervical dilatation rate.

3.9 ROC Summary

Table 6 ROC Summary

Parameter	Cut-off	AUC	Sensitivity	Specificity
Latent phase	0.4 cm/hr	0.818	64%	85.9%
Active phase	0.6 cm/hr	0.987	98.6%	97.5%

Active phase dilatation rate was found to be a good predictor of cesarean delivery.

In general, cesarean delivery was affected by a set of maternal, fetal and intrapartum factors. The rate of cervical dilatation proved a powerful predictor, where slower rates highly raised the chances of dystocia. The results indicate that the rate of labor is fluctuating and slow rates, particularly the latent rate, may not exceed the physiological boundaries.

4 Discussion

The increased worldwide rates of cesarean delivery are a significant issue in contemporary obstetrics and Iraq is no exception. The national statistics show that cesarean morbidity in both the public and the private is high which the reason is why there is the necessity to better comprehend the dynamics of labor and minimize unnecessary surgical interventions (Betrán et al., 2007).

The current paper revealed that the process of labor advancement in Iraqi females is extremely heterogeneous, even in those women who were admitted with a similar cervical dilatation. This observation strengthens this idea that labor is not a consistent or predictable process (Vahratian et al., 2006), and criticizes the Friedmanian tradition of relying on this curve. The identified cesarean rate of 15.5 percent as a result of dystocia is consistent with the national trends and highlights the role of first-stage labor malfunction to propel operative childbirth.

There were various maternal factors which have a great impact on the outcome of labor (Ecker et al., 2001). Ends of maternal age especially that of women below 20 years were linked to increasing cesarean section and delayed cervical dilatation. Parity was also a critical factor, as the nulliparous women were progressing with slower labor and below the risk of cesarean section over the multiparous women. Interestingly, grand multiparity was as well linked with some changes in the labor patterns making it sound that there was no linear relationship between parity and labor progression.

Mothers who were obese were found to be one of the most powerful predictors of dystocia and cesarean section. The cervical dilatation of obese women slowed down in the latent stage, which was associated with the international evidence of obesity to increase the labor duration and the rate of interventions (Vahratian et al., 2004). Fetal causes, especially high fetal weight, and advanced gestational age were also identified as risk factors of cesarean delivery, probably as a result of mechanical causes, including cephalopelvic disproportion (Sheiner et al., 2002).

There were great impacts on intrapartum practices. Early admission to hospital in the latent phase was linked to more interventions and cesarean section, which confirms earlier literature that does not encourage such a practice (McNiven et al., 1998). Equally, the use of oxytocin, artificial rupture of membranes and constant monitoring of the fetuses were

all correlated with cesarean section delivery, perhaps as a domino effect of interventions in response to perceived slow labor (Wei et al., 2009).
Notably, the research has established that the rate of cervical dilatation was lower than the classical standards though a substantial number of women successfully made normal childbirth. This corroborates modern findings that active labor starts between 6 and 10 cm and that slow pre-5 cm progression might be physiological. The specified thresholds (0.4 0.5 cm/hr) proved good predictive power but cannot be regarded as diagnostic criteria but should be regarded as clinical hints.
The findings justify the significance of individual labor management and the need not to necessarily adhere to the old labor curves in the practice of obstetrics in Iraq.

5 Conclusion and Future work

The current study provides useful information on the development of labor among women in Iraq, demonstrating that these levels as the cervical dilatation are more gradual and irregular than it is declared by the classical Friedman criteria. The fact that the latex values of 0.4 cm/hour in the latent stage and 0.6 cm/hour in the active stage are lower than the normal physiological values is a pointer that the slower rate of labor may still be regarded as a normal physiological value. These results are in line with the increasing literature that recommends the replacement of fixed labor curves by more personalized evaluation of labor advancement.
The implications of the clinical implications are huge. Strict use of the previous thresholds may imply over-diagnosis of dys-tocia, unnecessary C-section, and additional rise of the incidence of surgical rates and complications. The cervical dilatation thresholds in the present paper (0.4 to 0.5 cm/hour) can be utilized to act as the warning signal but not the last signal to give more attention but not treatment.
The research is also limited by the single-centre study and exclusion of epidural analgesia that may also influence the generalizability. Therefore, the findings can be considered with a great degree of caution and not be converted to national guidelines immediately.
Future studies ought to be conducted on large multicenter studies in Iraq and Middle East in order to confirm such findings and set up region-specific labor standards. The impact of altering admission policy, reducing the unnecessary procedures and simplifying the labor management measures on cesarean rates and maternal outcomes also should be additionally studied.

6 Reference

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