
INCIDENCE OF CESAREAN SECTION AMONG PARTURIENT WOMEN UNDERGOING INDUCED VERSUS SPONTANEOUS LABOUR PER GESTATIONAL WEEKS

¹Hala Abd El fttah Ali and ²Reda Hemida

¹Lecturer of Women's Health and Obstetrics Nursing, Faculty of Nursing
Kafr El Sheikh University.

²Assistant Professor of Obstetrics and Gynecology Department,
Faculty of Medicine-Mansoura University, Egypt

E-mail of the corresponding author: dr.halafittah@yahoo.com

Abstract:

Objective: To explore incidence of cesarean section among parturient women undergoing induced versus spontaneous labour per gestational weeks. **Methods:** An exploratory descriptive study was carried out at Labour and Delivery Ward at El Mansoura University Hospitals, Egypt. This study comprised a convenience sample of 100 pregnant women out of 130 randomized women who were admitted to Delivery Ward with induced or spontaneous labour with multi parous, low risk women without pregnancy and medical complications or previous cesarean section, with 37-42 gestational weeks, singleton pregnancies and in vertex position. They were randomly assigned into two groups; a total of 60 women had an induction of labour and 40 went into spontaneous labour. Two tools were used: A structured interviewing questionnaire sheet was used to collect the maternal and neonatal characteristics such as; maternal age, parity, newborn weight and labour assessment sheet was used to assess vaginal versus cesarean section incidence according to onset of labour per gestational weeks and induction as well as augmentation methods for cesarean section. **Results:** Among 100 pregnancies that fulfilled the inclusion criteria, induced labour had more risk of cesarean section compared with spontaneous labour onset with statistical significant ($p < 0.001$ in χ^2 test; OR 6.00; 95% confidence interval 2.453 – 14.678). The higher caesarean section rate in the induction group was seen from (38-41) weeks. On the other hand, the higher caesarean section rate was seen in the spontaneous group at 37 weeks and cervical ripening was the highest agent used in induced labour as well as oxytocin for spontaneous onset of labour. **Conclusions and recommendation:** In low-risk multi parous women, induced labour has an increased risk of cesarean section compared with spontaneous onset labour per gestational weeks particularly when cervical ripening was required. Caesarean section incidence was higher in the induction group than spontaneous labour, it was seen from (38-41) gestational weeks. It should be prompt further and larger studies of the effect of induction of labour and its methods on caesarean section rate per gestational weeks.

Key words: Cesarean section, induction, labour, induction methods

Introduction:

Is a procedure stimulating uterine contractions before labour begins, when medically necessary. Physicians typically turn to prostaglandin, oxytocin and amniotomy to induce their patients. Labour is induced in about 20

percent of all births for a variety of reasons, including preeclampsia, diabetes, premature rupture of the membranes, overduration pregnancy and fetal distress. The two most frequent indications for CS among births with induced and

spontaneous onset of labour were failure to progress and non-reassuring fetal status (3).

Moreover, induction of labour is a common and increasing intervention in modern obstetric practice worldwide (4-7). The induction rate is especially high in multi parous women with reported induction rates of up to 38% (3-6). There are reports of associations between induction of labour and cesarean section (CS) in parous women with a particularly high risk of CS in labour requiring cervical ripening for induction (8-10, 12). The incidence of induction, i.e. elective induction of labour when there is no medical reason, appears to be increasing at a greater rate compared with medically indicated inductions and can form up to one third of the total delivery population (6-7, 13).

Besides, elective inductions can lead to unnecessary CS, which in turn increases the risk of maternal and fetal complications, and also increases the cost of healthcare provision and utilization (9, 14-15). Meanwhile, the effect of induction of labour on CS risk in low-risk parous women is controversial; some studies report an increased risk of CS (8,10-11). While others suggest that the risk of CS is unaffected (14, 15-18). In a recent systematic review of induction of labour versus expectant

management, no conclusion could be drawn about the effect of induction on CS risk in parous women with term pregnancies (19).

Generally, communication should be clear between personnel concerned with labour induction; nurse, obstetrician and pediatric services to ensure available support and care. Mothers and their birth partners should be given factual and unbiased information about induction of labour. Both medical and nursing staff should discuss issues relating to induction by written opportunity. As with spontaneous labour, all maternal and fetal observations are recorded as contemporaneously as possible on the partogram. A record of discussion and information given during labour is also documented in the mother's notes with each entry signed and time of entry noted. Observations of maternal pulse rate, blood pressure and temperature are made recorded on the partogram. Uterine contractions, fetal well-being, assessment of pain and progress should be observed and recorded by the nurses (20, 21).

Significance of the study:

Induction of labour is a common obstetric practice that accounts for nearly 9.5 to 33.7 percent of all pregnancies annually. In 2004 and 2005, one in every five deliveries in the United Kingdom is induced.

It is extensively indicated in cases in which continuation of pregnancy is hazardous to the mother and/or her fetus (1). For pregnancies that were induced at full-term, there was a 12% higher risk of cesarean delivery, compared with pregnancies that were with spontaneous onset (1). In Assiut University Hospital, Egypt, which is a referral facility with 15000 deliveries per year, the frequency of labour induction in 2008 is 9.3% of all deliveries (2).

Cesarean section rates have been increasing worldwide, but little research exists on trends of cesarean section delivery for any country in the Arab world. In Egypt, a significant rise in cesarean deliveries occurred for all births, from a low of 4.6 percent in 1992 to 10.3 percent in 2000. However, hospital-based cesarean deliveries are much higher in 1987–1988 (13.9%), increasing to 22.0 percent in 1999–2000. Although the cesarean section rate is slightly higher in private hospitals, the rate also increase consistently with induced labour in public hospitals(2).

Material and methods:

Objective: To explore incidence of cesarean section among parturient women undergoing induced versus spontaneous labour per gestational weeks.

Research questions:

- 1-Are parturient women with induced labour more likely to undergo cesarean section than with spontaneous labour per gestational weeks?
- 2-What are the most frequent methods were used for caesarean section at induced versus spontaneous labour?

Research design: An exploratory descriptive study.

Setting: Labour and Delivery Ward at El Mansoura University Hospitals, Egypt.

Sampling: Participants in this research were assigned with a convenience sample between the periods from the first of March 2015 to the end of June 2015. They were admitted to Delivery Ward with induced or spontaneous labour with:

- Maternal age <35 years or 35 and older
- Multi parous
- Low risk women
- Without pregnancy and medical complications or previous cesarean section with 37-42 gestational weeks
- Singleton pregnancies
- In vertex position

- BMI (kg/m²) 18.5 – 24.9 were included in the study.

Pregnancies excluded that met one or more of the following criteria:

- First, prior CS, scheduled CS in the present pregnancy, fetuses in breech position and stillbirth.
- Second, pregnancies excluded with pre-labour rupture of membranes.
- Third, pregnancies excluded with complications including pregnancies with hypertension, pre-eclampsia, type 1 and gestational diabetes mellitus, suspected fetal intrauterine growth retardation, intra hepatic cholestasis, immunization and oligohydramnios.

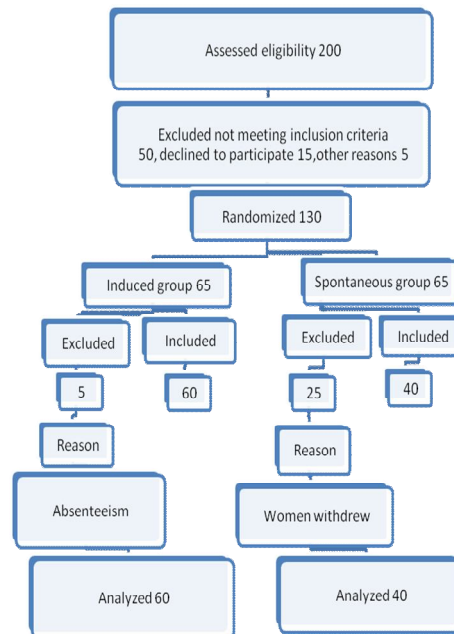
A sample size of 100 subjects, were enrolled in this study.

Calculation of sample size based on the following formula:

$n = f(\alpha/2, \beta) \times [p_1 \times (100 - p_1) + p_2 \times (100 - p_2)] / (p_2 - p_1)^2$. Where p_1 and p_2 are the percent 'success' in the control and experimental group respectively, and $f(\alpha, \beta) = [\Phi^{-1}(\alpha) + \Phi^{-1}(\beta)] \cdot \Phi^{-1}$ is the cumulative distribution function of a standardized normal deviate. Hence, 63 participants were required per each group in the current study. By assuming that some participants may drop out from the study.

Group assignments:

In arrangement of study groups, a convenience sample was assigned. A study sample of 100 multi parous women out of 130 randomized women that were randomly divided equal into two groups; 65 women per each group. Randomization was carried out using a numbered women's name list. A total of 65 had an induction of labour takes odd numbers and 65 went into spontaneous onset of labour takes even numbers. Each group was further divided and randomly allocated into two groups; a total of 60 had an induction of labour and 40 went into spontaneous onset of labour. A flow chart of the women's assignment was presented in Frame 1.



Frame 1. Flow chart of the women's assignment

Data collection tools:

Data collection obtained by using the following tools:

Tool I A structured interviewing questionnaire sheet: It consists of four items that was originally designed to collect the maternal and neonatal characteristics such as; maternal age, parity, gestational length, newborn weight. It was reviewed by supervisors in the field of maternity nursing and it was implemented by researcher.

Tool III Labour assessment sheet: It was originally designed to assess vaginal versus cesarean section rate according to onset of labour per gestational weeks and induction as well as augmentation methods for cesarean section. It was reviewed by supervisors in the field of maternity nursing and it was implemented by researcher.

Validity of the tools:

The three tools used in this study were reviewed by a panel of 3 expertises in the maternity nursing specialty before introducing them to the participants to ensure its validity and their comments were considered.

Ethical consideration:

Permission to carry out the study was obtained from the Supervisor of Maternity and Gynecology of Nursing Department, the Director of El Mansoura University Hospital and the Head of Obstetrics and Gynecology Department. The researcher introduced herself to all health care providers & parturient women and the aim of the study was explained prior their participation to obtain their acceptance

& cooperation as well as their written consent.

Pilot study:

Pilot study was conducted on 10% of total sample. It aimed to assess the required time for each group to perform the task and to assess clarity, feasibility and applicability of the tools. The results of the pilot indicated that the task needs 10 to 20 minutes to be completed and statements of the tools were clear and applicable. The pilot sample was excluded from the study.

Research procedure:

-Study population outcomes were compared with consisting of women by maternal age, parity and gestational weeks.

-The researcher introduced herself to eligible women and briefly explained the nature of the study, and then written consent was obtained from them, the researcher was visiting the Delivery Ward two days /week (Friday and Saturday) for 12hr daily to obtain the study sample. The interview took from 10 to 20 minutes with each woman in intervention groups after admission to Delivery Ward.

-A study sample of 100 multi parous women out of 130 randomized women that were randomly divided into two groups. A total of 60 women had an induction of labour and 40 went into spontaneous onset of labour.

-Specific issues addressed and documented included: A structured interviewing questionnaire sheet was used to collect the maternal and newborn history such as; maternal age, parity, gestational length /weeks and newborn weight.

-Further information retrieved on the two most frequent indications for CS among births with induced and spontaneous onset of labour (failure to progress and non-reassuring fetal status). Variables were parity, maternal age, gestational length/weeks, birth weight. All variables were identified. Parity was defined as the number of previous births and categorized into 1 – 2 and >2. Maternal age was categorized as less than 35 years or 35 and older. Gestational length at birth was 37 - 42 weeks. Gestational length was assessed by ultrasound scans, principally around the 17th week of gestation.

BMI (kg/m²) 18.5 – 24.9. Birth weight of the newborn was categorized into less than 3370 grams, 3370 to 3990 grams and more than 3990 grams.

-The final study sample included 100 term 37-42 weeks births in low-risk multi parous women and with total information on all cases. Criteria for failed induction should also be carefully considered and defined. The American College of Obstetrics and Gynecology, for example, suggested that at least 12-18 hours of latent labour was allowed before failed induction was diagnosed and that this will reduce the risk of CS in induced labour(4).

-Inductions of labour were recorded as use of cervical ripening agent (intracervical catheter or prostaglandin E₂) when cervix is closed followed by amniotomy and oxytocin or combined. While augmentation methods were recorded as use of amniotomy followed by oxytocin or combined when cervix is 4 cm dilated. Cervical ripening is generally applied

if the Bishop score is less than six and amniotomy is performed with a Bishop score of six or more. Augmentation used only for spontaneous labour.

-Oxytocin 10 IU in 1 L normal saline was performed when membranes were ruptured. The oxytocin infusion rate commenced at 2 mU/min and was doubled every 30 minutes until effective regular uterine contractions were achieved (3 uterine contraction/10 minutes lasting 40-50 seconds), the maximum rate of oxytocin being 32 mU/min. While spontaneous labour was augmented by use of oxytocin and amniotomy.

-Observations of maternal pulse rate, blood pressure and temperature were recorded on the partogram. Uterine contractions, fetal well-being, assessment of pain and progress were observed and recorded by the researcher and nurses. Finally, labour assessment sheet was used to assess labour progress by Bishop score which used to follow up the labour progress and any raised problems.

Main outcomes were:

-Caesarean section incidence related to induced versus spontaneous labour per gestational weeks.

-The most frequent methods were used for caesarean section at induced versus spontaneous labour.

Strengths and difficulties of the study: The distinction between induction and augmentation of labour and control for additional potential confounding factors such as maternal body mass index which may be associated with an increased risk of CS in induced labour were sometimes difficult. There were missing values on

birth weight in the database. Births with missing values on birth weight were excluded from the study population. Strengths of current study included the size of the sample. All births took place at the same clinical unit ensuring uniformity of labour management.

Statistical analysis:

Risk of CS delivery was estimated for births exposed for induction of labour using spontaneous onset of labour as reference. Odds ratios are presented with 95% confidence intervals using a generalized estimating equations logistic regression model. An exchangeable correlation structure was used to control for the dependence between births by the same woman. The Statistical Package for Social Sciences (SPSS) for windows version 20.0 was used.

Results:

Concerning maternal and neonatal characteristics of table 1 showed that when induced women compared with spontaneous onset of labour, women who undergo an induced labour had a lower rate with statistical significant related to parity $> \chi^2$, ($p= 0.096$). On the other hand, induced labour had higher gestational length, had more age, 35 years and older and had a higher rate related to newborn weight (3370–3990 and > 3990 g) with high statistical significant ($p<0.001$) for newborn weight).

Table 2 specified vaginal versus cesarean incidence according to onset

of labour per gestational weeks. One hundred women who fulfilled the criteria, a total of 60 had an induction of labour and 40 went into spontaneous labour. In the induced group, 40 (66.7%) resulted in caesarean section, as compared to 10 (25%) in the spontaneous labour $p < 0.001$ in χ^2 test; OR 6.00; 95% confidence interval 2.453 – 14.678. The higher caesarean section rate in the induction group was seen from (38-41) gestational weeks. On the other hand, the higher caesarean section rate was seen in the spontaneous group at 37 weeks with OR 0.333, 95% confidence interval 0.017–6.655. There was statistical significant differences between two groups at (39-41) weeks.

Figure 1 showed vaginal versus cesarean incidence according to onset of labour. In the induced group, (66.7%) resulted in caesarean section, as compared to (25%) in the spontaneous labour group.

Table 3 illustrated risks of CS by methods of induction or augmentation related to onset of labour, women induced by amniotomy were (12.5 versus 20%), intravenous oxytocin infusion was used in (37.5 versus 80%) and a cervical ripening was used in (50 versus 0 %) respectively for induced and spontaneous labour. A cervical ripening was the highest agent used in induced labour $p=0.004$ as well as oxytocin for spontaneous labour $p=0.016$, OR 6.667 and 95% confidence interval 1.247 – 35.647.

Results:

Table 1. Distribution of onset of labour regarding to maternal and neonatal characteristics.

Onset of labour							
Parameters	Total	Spontaneous (N=40)		Induced (N=60)		Qui square test	
		N	%	N	%	X ²	P value
Maternal age							
<35 years	80	35	87.5%	45	75%	2.344	0.126
35 or >35 years	20	5	12.5%	15	25%		
Gestational weeks							
(mean ±SD)		39±1.5		39±4.65		0.2601	0.795
Parity							
Parity: 1- 2	60	20	50%	40	66.7%	2.778	0.096*
Parity >2	40	20	50%	20	33.3%		
Newborn weight							
< 3370 g	55	35	87.5%	20	33.3%	28.617	<0.001**
3370– 3990 g	21	3	7.5%	18	30%		
> 3990 g	24	2	5%	22	36.7%		

*p < 0.05 **p < 0.001

Table 2 : Distribution of vaginal versus cesarean section incidence according to onset of labour per gestational weeks.

Gestational weeks	Spontaneous labour (N=40)				Induced labour (N=60)				P value	OR	95% CI
	Vaginal		Cesarean section		Vaginal		Cesarean section				
	N	%	N	%	N	%	N	%			
37	1	2.5	2	5	3	5	2	3.3	0.465	0.333	0.017 – 6.655
38	3	7.5	1	2.5	6	10	10	16.7	0.178	5.00	0.419 – 59.660
39	4	10	2	5	1	1.7	10	16.7	0.013*	20.00	1.391 – 287.614
40	0	12.5	1	2.5	5	8.3	10	16.7	0.038*	10.00	0.907 – 110.287
41	6	22.5	2	5	3	5	5	8.3	0.048*	7.5	0.921 – 61.05
42	8	20	2	5	2	3.3	3	5	0.121	6.00	0.563 – 63.987
Total	30	75	10	25	20	33.3	40	66.7	<0.001**	6.00	2.453 – 14.678

*p < 0.05 **p < 0.001

Figure 1: Distribution of vaginal versus cesarean section incidence according to onset of labour.

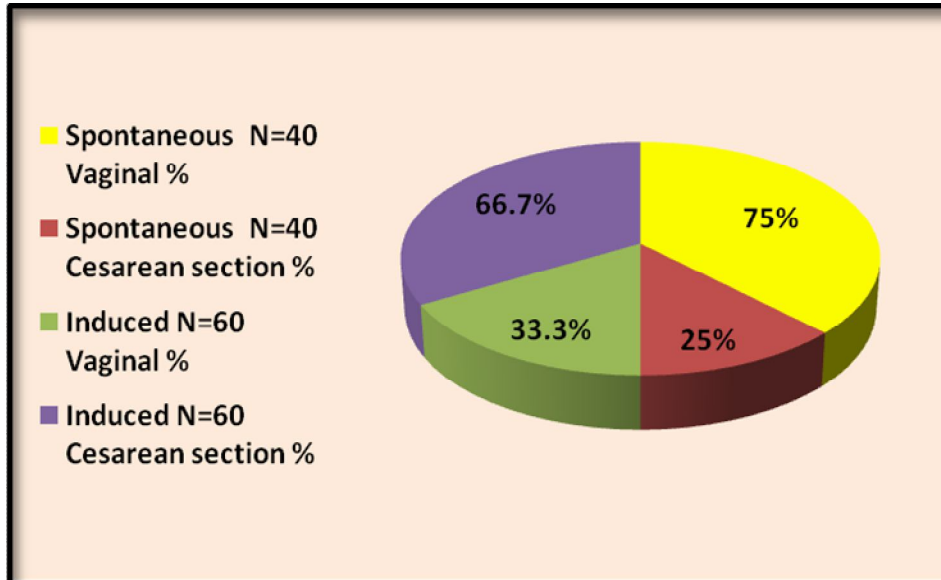


Table 3. Distribution of induction as well as augmentation methods for cesarean section according to onset of labour.

Cesarean section N, 50							
Induction methods	Spontaneous labour N, 10		Induced labour N, 40		P value	OR	95% CI
	N	%	N	%			
Cervical ripening	0	0	20	50	0.004*	0	Infinity
Amniotomy	2	20	5	12.5	0.541	1.75	0.286 – 10.702
Oxytocin	8	80	15	37.5	0.016*	6.667	1.247 – 35.647

*p < 0.05 **p < 0.001

Discussion:

This study aimed to explore incidence of cesarean section among parturient women undergoing induced versus spontaneous labour per gestational weeks. To fulfill the aim of this study, research questions were answered: These study findings revealed that:

- 1- Parturient women with induced labour was more likely to undergo cesarean section per high gestational weeks than with spontaneous labour.
- 2- A method of cervical ripening for induced labour was more likely to induce cesarean section as well as oxytocin for spontaneous labour accordingly the study questions were answered.

These study findings were consistent with prior research studies, from these single study revealed that the researcher was found that for pregnancies that were induced at full-term. There was a 12% higher risk of cesarean delivery, compared with pregnancies that were with spontaneous onset. This finding was paralleled with past randomized controlled trials, systematic reviews and meta-analysis which were carried out at UK, in which labour induction was compared with expectant management among women with a viable singleton pregnancy. Research had indicated that women who had induced labour were more likely to need cesarean section as well as more likely to use induction methods (8,10-11). The similarities between the present and other studies might be explained by the control for additional potential confounding factors such as maternal

body mass index which may be associated with an increased risk of CS in induced labour.

Conversely with the present study, a new study published in the Canadian Medical Association Journal suggested that evidence to support this was "weak" and women who undergo spontaneous onset of labour close clinical monitoring of the process - might be at increased risk of cesarean. Recent studies showed there were fewer cesarean deliveries with labour induction than without it (22). The last study was in contrast with the current study. The discrepancies between two studies might be explained by the distinction between induction and augmentation of labour and control for additional potential confounding factors such as maternal body mass index which may be associated with an increased risk of CS in induced labour.

In Egypt, Although the cesarean section rate is slightly higher in private hospitals, the rate also increase consistently with induced labour in public hospitals (2).

Two prospective studies conducted at three large Ohio State hospitals. Of the sample, 216 low-risk parous women with spontaneous labour onset at term gestation stated that induction was a way to increase the likelihood of a vaginal birth. Inducing labour lowered the chance of cesarean delivery in both high- and low-risk pregnancies and it also reduced the risk of fetal death and complications in mothers (3). Also these findings in contrast with the present study which had more cesarean section with induced delivery. The investigators

stated that labour induction was criticized for increasing the risk of cesarean section. In addition, there were 37 Randomized Controlled Trials (RCTs) identified through online databases for analysis. There were 27 trials that included uncomplicated pregnancies (37-42 weeks gestation) and 10 covering pregnancies that were not complicated with diabetes, suspected macrosomia, twins or at a high risk score for caesarean section. Only three trials documented statistically significant differences in caesarean section rates between a policy of induction and with spontaneous onset of labour, two reported reductions with one reporting an increase in risk. While the remaining trials reported non-significant differences in caesarean section rates based on further analysis of the combined results the researchers suggested the overall caesarean section risk was lower by approximately 17% with induction of labour (3, 22).

The previous studies did not support the current study. The discrepancies between two studies might be explained by the small sample size of the present study or as a result of implementation of an induction with a low risk women.

While another study was concluded that induction of labour in low risk women who had previously vaginal birth were associated with more rate of secondary caesarean section if performed before 41 weeks (23). These findings in contrast with the findings by the current study which found that a total of 60 women had an induction of labour and 40 went into spontaneous labour. In the induced group, 40 (66.7%) resulted in caesarean section,

as compared to 10 (25%) in the spontaneous labour group. The higher caesarean section rate in the induction group was seen from (38-41) weeks as well as the higher caesarean section rate was seen in the spontaneous group at 37 weeks.

Furthermore, Washington conducted a population-based case-control study which was allocated randomly, the study population consisted of 43,410 mothers who had singleton live births by vaginal delivery was supported by retrospective cohort study carried out at California (N=532,088) and included all women who delivered between 37 and 40 completed weeks of gestation. These studies suggested that induction of labour in low-risk parous women with maternal age more than 35 years is associated with a greater risk of CS compared with spontaneous onset labour and that this risk was more greater when cervical ripening was used. Compared with previous studies (8, 10-11) which were found a slightly higher risk of CS in parous women who underwent inductions. This was probably explained by the higher proportion of inductions requiring cervical ripening.

On the other hand, records of 1135 eligible Canadian women in a systemic review and meta analysis research with low-risk, singleton, vertex pregnancies and at 38-41 weeks' gestation who were eligible for vaginal delivery and were analyzed retrospectively after induction (n = 263) or spontaneous labour (n=872) evaluated that, both the induction rate and the general CS rate in parous women were lower than in previous studies. Some previous

studies did not find an association between induction of labour and risk of CS (14, 16-18). Also these previous studies were in discrepancies with the current study which might be resulted from low risk parturient that included in the present study.

One hundred and sixteen patients (45 parous) were randomized to a randomized clinical trial at USA involving women with 39 weeks' gestation, included only women with favorable cervix status (17). And another study included few multiparas (14); in addition, a retrospective case-control study at Michigan with 461 case-control pairs with vertex presentations judged to be elective by chart analysis performed adjustments for parity and cervical ripening instead of stratification (18). Three hundred four case-control pairs at USA were studied in a retrospective, case-control assessment of the risk of cesarean section in multiparas with no medical or obstetric complications and vertex presentations. Case women were matched with controls in spontaneous labour (16). In addition, Two previous studies of similar populations failed to show an association between CS risk and inductions that require cervical ripening (8, 10) reported that, the overall rate of CS was higher than in our and the previous studies which might be explained by differences in obstetric management practices.

Hoffman and colleagues showed that labours induced by cervical ripening compared with spontaneous onset labours required a greater amount of

time to enter the active phase of labour (cervix dilated to 5-10 cm) and were more likely to undergo a CS (10). The risks of CS in low-risk parous women separated from who underwent induction by cervical ripening and from those that underwent induction by amniotomy. Amniotomy was associated with an almost two-fold increased risk of CS compared with women with spontaneous onset of labour and this risk was increased to over three-fold in labour induced by cervical ripening. In addition, a retrospective study at UK with uncomplicated pregnancies that had an elective CS delivery after 34 completed weeks of gestation. There were 118,456 elective CS deliveries. In this study, the CS rate was highly influenced by initial cervical dilatation in parous women undergoing induction of labour at term (8-10, 12, 23-24).

These previous findings were parallel with the current study which found that compared women with spontaneous onset of labour, women who had an induced labour, a cervical ripening was the highest agent was used as well as oxytocin for spontaneous onset of labour. It is possible that the high proportion of CS in induced labour in the present study may partly be influenced by poor knowledge and patience in providers and women concerning the time needed to enter and coming through the active phase of labour, especially when cervical ripening is needed.

Conclusions:

Based on the results which were revealed by the present study, it could be concluded that induced labour was more likely to undergo cesarean section per high gestational weeks than spontaneous labour. Caesarean section rate was the higher in the induction group than spontaneous labour, it was seen from (38-41) gestational weeks. There were statistical significant differences between two groups at (39-41) weeks.

Induced labour was more likely to undergo cesarean section with a method of cervical ripening as well as oxytocin for spontaneous labour.

Recommendations:

The following recommendations could be inferred from the study findings. Women that are requested induction of labour should be informed of increasing risk of CS. If there is a decision to proceed, the best option to avoid failed induction is probably to await cervical ripeness and to allow and prepare the women for a long latency period. It should prompt further and larger studies of the effect of induction of labour and its methods on caesarean section rate per gestational weeks.

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