

## **Relationship between amniotomy and rate of cesarean section: a cohort study.**

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### **Abstract**

**Although amniotomy is becoming more popular, however in practice, its recommendation requires special attention, and its indication should be clear. This research aims at studying the impact of amniotomy on rate of cesarean section. This research paper is based on the results of an analytical cohort study which carried out at kosar hospital, Qazvin (Iran) 2008-2009. The population under study consisted of all admitted women (n=305) whose labor was induced by amniotomy. The patients were further divided into two groups including exposure group (n=174) and unexposure group (n=131) based on being in early phase and active phase, respectively. The statistical analysis was performed over the obtained data using t-test, chi-square. Cesarean section was significantly higher, (p=0/001) in the exposure group than in the unexposure group i.e. 19 (10/9%) vs. 2 (1/5%). It is observed that Non-progressive labor during the first stage of labor is considerably higher in the exposure group (p=0/001). Also non-progressive labor during the second stage was (2/9%) in the exposure group and (1/5%) in the unexposure group that revealed no significant difference Oxytocin prescription in the exposure group was (43/7%) while in the unexposure group it was (4/6%) revealing a statistically significant difference (p=0/000). Non-progressive labor during the first stage and oxytocin prescription were all higher in the early phase group than in the active phase group. It seems that early amniotomy may increase the need for cesarean section.**

**Keywords:** Premature rupture of fetal membrane, Cesarean section, Labor, Cohort study.

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### **Introduction**

Caesarean section (C/S) is defined as the delivery of the fetus via laparotomy and hysterotomy [1]. C/S has an important role in reducing maternal and peripartum mortality rate. At first, the primary goal was maternal lifesaving in limited deliveries, but its applications were expanded during recent years and now it covers a wide range of more severe dangers for both mother and fetus [2,3]. Undoubtedly, one of the important justifications for such an increase (due to complications of C/S) is the available anxieties about fetus safety around the time of delivery in women with a history of C/S [1]. A review of cesarean operation in the world shows that C/S rate has increased during the past 20 years and approximately 18.5 million C/Ss are performed yearly worldwide. 73% (13.5 millions) of the total number of C/Ss are performed in the 69 countries with C/S rates >15% where 37.5% (48.4 millions) of the total number of births occur. C/S global rate has been 21.2% in 1984, 25% in 1987, and over 30% in 1995, while the acceptable global rate is 15%. The statistical reports of Iran reveal a high rate of C/S (41.9%) [4]. According to a study conducted in Qazvin in 1996, this figure was 26.8% [5]. Various other studies show that maternal mortality rate related

to C/S has been 4 to 8 in 10000. According to some other studies, mortality risk in C/S is 26 times more than that of the vaginal delivery [3]. The inappropriate use of C/S will increase the cost of health care compared to vaginal delivery [6-13]. Recently, the high rate of C/S in our country has attracted the attention of health experts. The ministry of health, treatment and medical education is concerned about this issue and it is required some studies to be conducted about the factors which have resulted to such an increase in the rate of C/S. One of the influential factors in such of increase is amniotomy [14].

Amniotomy or artificial rupture of membranes is usually implemented to induce and support the delivery process, internal electronic fetal heart monitoring, intrauterine recording of contractions, meconium detection, and uterine dysfunction. On the other hand, its drawbacks are chorioamnionitis, umbilical cord prolapse, a sever urgency to terminate pregnancy, abnormal patterns of fetal heart rate due to cord compression, and fetal distress. The main disadvantage of amniotomy when it is used for induction is that the time required for initiation of contractions is unpredictable and sometimes might be quite long [1]. Releasing amniotic fluid shortens muscular fibers and increases the force and duration

of contractions and thus it is advisable to deter it until the start of the first stage of delivery [3]. Moreover although amniotomy is becoming more popular, but its recommendation needs special attention, and its indication should be clear and there are some controversies about the balance between the advantages and the disadvantages of its usage. In this regard, several studies has demonstrated the effectiveness of amniotomy shortening delivery and reducing variability of 5 minute Apgar score, and that is the reason, which it is used extensively in practice [15]. However on the other hand, amniotomy can increase the rate of intrauterine fetal distress, and the number of cesarean operations [1]. Increase in the number of C/S has caused some alarming advices by clear-sighted authorities. So, it is necessary precisely to study the factors affecting the rate of C/S such as amniotomy.

## Materials and Methods

This prospective analytical cohort study was carried out in Kosar hospital of Qazvin (Iran) in time period of 2008-2009 with statistical parameters of ( $z_{1-\alpha/2}=1.96$ ), ( $z_{1-\beta}=0.84$ ), ( $p_1=0.015$ ), ( $p_2=0.03$ ). Total considered sample size was 281 patients and with respect to the potential loss during study, 305 patients were examined. The population under study (305 persons) included all women underwent amniotomy in the delivery ward of Qazvin Kosar hospital. Inclusion criteria were: The women who had a single pregnancy (37 to 42 weeks) with vertex presentation. Exclusion criteria were: Women in need of urgent C/S due to maternal or fetal conditions, or those with previous history of C/S, women afflicted with diabetes or hypertension, post-term (over 42 weeks) or preterm (under 37 weeks), pregnant women with intrauterine growth retardation, fetal distress (abnormal pattern of fetal heart rate) before amniotomy, primary or secondary infertility, primiparous with age of over 35, and those with fetal weight of more than 4 Kg, were excluded from this study. Women underwent amniotomy by gynecology and obstetrics residents divided into 2 groups-cervical dilatation <3 cm and >3 cm by an expert midwife who was not a member of the research group. She examined the patients after amniotomy and registered the results. Early amniotomy was defined as artificial tearing of fetal membranes in less than 3 cm dilatation or inactive phase of delivery. The exposure group (174 persons) included those women who underwent early amniotomy. The unexposed group (131 persons) consisted of the women who had amniotomy in active phase of labor (more than 3 cm).

An expert midwife collected sociological and obstetric data with by using a questionnaire form. The included sociological and obstetric data were: maternal age, parity, gravidity, gestational age determined by sonography, and the time from the first day of last menstrual period (LMP), lack of progress in the first or second stage of the labor (dilatation of less than one centimeter at a time in the active phase and the descent of the fetus within an hour after the first stage of cervical dilatation 7 cm cervical dilatation and effacement and complete, but no exit embryos after 50 minutes nulliparous and 20 min multiparity),

cephalopelvic disproportion, umbilical cord prolapse, uterine rupture, membrane infection (chorioamnionitis), oxytocin administration, type of delivery, abnormal patterns of fetal heart rate, fetal weight estimation before labor and after birth, and Apgar score in 1st and 5th minute. Chorioamnionitis was diagnosed by symptoms such as fever, leukocytosis and tachycardia in mother or newborn. Abnormal patterns of fetal heart rate included: late deceleration, variable deceleration, intractable fetal tachycardia, and decrease in the basic rate of fetal heart beat. To the all of patients explained that they were participate in a research project and they all accepted to collaborate. Furthermore, all Ethical issues (such as conflict of interest, misconduct, co-authorship, double submission, etc.) have been considered carefully. Ethical permission (No. 28/13589) for the study was obtained from Qazvin University of Medical Sciences. All statistical analyses performed by using SPSS version 18 for windows. Data were analyzed through statistical tests (t-test, chi square, manvitni) and  $P<0.05$  was considered significant.

## Results

From the total 305 women, the exposure group (174 persons-57%) were the women who had early amniotomy and the unexposed group (131 persons- 43%) was consisting of women who had amniotomy in active phase of labor. The average age in the exposure group was 25 and in the unexposed group 24.2 years. There was not a significant statistical difference between these groups based on t-test. The average gestational age in the exposure group was 39.8 (SD=0.4) weeks while it was 39.1 (SD=0.3) weeks for the unexposed group, and this difference was statistically significant ( $p<0.000$ ). The average number of pregnancies in the 1<sup>st</sup> group was 2.05 and in the 2<sup>nd</sup> group it was 1.95. The difference was not significant based on t-test.

**Table 1.** Comparison of the average of midwifery indices in the two groups (exposure group and unexposure group).

Variables	exposure group Mean $\pm$ SD	unexposure group Mean $\pm$ SD	p-value
Age of mother	25 $\pm$ 5.7	24.2 $\pm$ 5.5	0.27
Gestational age	39.8 $\pm$ 0.4	39.1 $\pm$ 0.3	0
Gravidity	2.05 $\pm$ 1.1	1.9 $\pm$ 1.09	0.48
Parity	0.89 $\pm$ 1.06	0.87 $\pm$ 1.06	0.842

The average number of deliveries in the 1st group was 0.89 and in the 2<sup>nd</sup> group was 1.95, and the difference was not statistically significant (Table 1). Furthermore, C/S was significantly higher, ( $p=0/001$ ) in the exposure group compared to the unexposure group i.e. 19 (10.9%) vs. 2 (1.5%). Non-progressive labor during the first stage of labor observed to be considerably higher in the exposure group ( $p=0.001$ ). Also non-progressive labor during the second stage was (2.9%) in the exposure group and (1.5%) in the unexposure group that revealed no significant difference. Oxytocin administration in the exposure group was (43.7%) while in the unexposure group

it was (4.6%) showing a statistically significant difference (p=0/000) based on chi-square test (Table 2).

**Table 2.** Risk Ratio of Cesarean deliveries, no progress in the first stage and oxytocin prescription in the 2 groups of the exposure group and unexposure group).

Variables Group	Number of C/S		Progress in the first stage		Oxytocin prescription	
	Done	Not done	No	Yes	Have been prescribed	Not prescribed
Amniotomy in inactive phase ( exposure group) (N=174)	19	155	13	161	76	98
Amniotomy in active phase ( unexposure group) (N=131)	2	129	0	131	6	125
	21	284	13	292	82	223
Total (N=305)	Risk Ratio=1.658 Confidence Limits:1.392, 1.974		Risk Ratio= 1.814 Confidence Limits: 1.635, 2.011		Risk Ratio=2.109 Confidence Limits: 1.797, 2.475	
Level of significance	P=0.001		P=0.001		P=0.000	

There were no reports of umbilical cord prolapse, abnormal pattern of fetal heart rate, labor with forceps or vacuum, Cephalopelvic disproportion (CPD), uterine rupture, and chorioamnionitis in both groups. “Lack of progress” in 2nd stage of labor in the case group was 2.9% and in the control group it was 1.5%, and the difference was not statistically significant. In 5 cases, 4 cases in the exposure group and 1 case in the unexposure group, Apgar score in 1st minute was less than 7 and hence the difference was not statistically significant. In addition, In 6 cases, the Apgar score in 5th minute was equal to 9. From these 6 cases, 5 cases were in the exposure group and 1 case in unexposure group and the difference was not statistically significant (p=0.245) based on chi-square test.

**Discussion**

This study revealed that amniotomy in inactive phase of labor (dilatation <3 cm) increases C/S rate. Mercer et al. divided 209 women undergoing induction with oxytocin into two groups. One group underwent early amniotomy in dilatation of 1 to 2 cm and the other group underwent late amniotomy in dilatation of 5 cm. In those underwent early amniotomy, the duration of labor was significantly lower, while chorioamnionitis and patterns of cord prolapse increased. It can be concluded that the increase in cord compression with abnormal patterns of fetal heart rate results to an increase in the tendency toward Cesarean operation, but no figure in this regard has been reported [1]. Kariet et al. studied 459 women with average dilatation of 5.5 cm and reported 81 minute of decrease in labor duration, but no impact over the number of C/S was observed [1].

Fracier et al. studied 925 women with dilatation of more than 5 cm and reported 125 minutes of decrease in labor duration, but no effect on number of C/S was observed. In this study, early amniotomy has not been done as well [15,16]. A study in England was carried out on 1463 women with average dilatation of 5.1 cm and reported 60 minutes decrease in labor

duration, but no specific impact over the number of C/S observed. In this study, the two groups have not been segregated [17]. Segal et al. studied 3 groups of women including 1) those underwent amniotomy, 2) those underwent induction, and 3) those underwent spontaneous premature rupture of membranes with Bishop number (cervix num.) of less than 5 and concluded that in early amniotomy group the C/S rate has increased significantly [18]. The same researchers carried out another study in 2000 on 338 women with Bishop number of less than 5 that had undergone early amniotomy and observed a significant increase in C/S rate in comparison with spontaneous premature rupture of membranes group [19,20].

The similarity between the above-mentioned studies with the present study is in the used variables. While on the other hand, one of the differences is that Bishop Score which is not applicable in Iran and instead in Iran we use active and inactive phase. The other distinction was that both groups underwent amniotomy and divided into active and inactive phase groups. In light of the benefits of amniotomy and the inevitability of its application, the aim of this study was to reach to a conclusion for the right time for amniotomy in order to have the least effect on the rate of C/S. Artificial rupture of fetal membranes is a method of labor induction carried out without using drug and causes release of prostaglandins. The same mechanism exists when amnion ruptures spontaneously [20,21]. In Kosar therapeutic centre, selective amniotomy is implemented more than other ways of inducing labor. This study revealed that amniotomy is carried out more in inactive phase comparing to active phase and in the most cases it was prior to the prescription of oxytocin. Gestational age was significantly older in the exposure group, but generally both groups were in term range (37 to 42 weeks).

It seems that in the exposure group, oxytocin has been prescribed due to the lack of initiation of labor after amniotomy. The main reason for C/S in the exposure group was the lack of progress in the 1<sup>st</sup> stage of labor and the

difference between the two groups was significant, while for those showing lack of progress in the 2<sup>nd</sup> stage, there was not a significant difference. It seems that the increase in the gestational age is a factor for conducting early amniotomy, and its rate is higher. However the lack of progress in the 1<sup>st</sup> stage of labor, oxytocin prescription, and cesarean is the consequence of early amniotomy. Anyhow the usage of amniotomy in inactive phase must be revised in medical centres. Considering the fact that this method is commonly used to diagnose meconium, it is recommended that other methods such as amnioscopy, nonstress test (NST), oxytocin challenge test (OCT) and biophysical profile to be used to diagnose fetal distress in inactive phase (less than 3 cm).

## Conclusion

Early amniotomy has to be carried out with more delicacy and deterred for the time other methods are contraindicated. In addition, it can be concluded that early amniotomy is associated with an increase in the cesarean rate and its main reason is the lack of progress in the 1<sup>st</sup> stage of labor. Also early amniotomy results to the higher rate of prescription of oxytocin. There were no restrictions in this study and all stages of the study were welcomed by the under studied patients. The results of this research can be used to estimate the latent proper time. As the suggestion for the future work, it is recommended that further studies to be conducted on the effects of amniotomy over the other maternal and fetal complications.

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