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Abstract

Background: Understanding the impact of delivery mode on neonatal morbidity becomes essential in the context of rising Caesarian delivery rates.

Aims: We aimed to compare the selected outcomes in neonates born by low-risk planned Caesarian delivery versus planned normal vaginal delivery (NVD).

Methods: This prospective cohort study examined early, and late neonatal complications among 1071 neonates born through low-risk planned Caesarian delivery and 1367 neonates born through planned NVD, in Fars, Islamic Republic of Iran, during 2012–2014.

Results: Gestational age of neonates born through Caesarian delivery was significantly lower than their counterparts in NVD group. Accordingly, babies' birth weights were 3166 (±442.4) grams in Caesarian delivery group and 3213 (±454.8) grams in NVD group. Normal skin colour at birth was more prevalent in the Caesarian delivery group compared to the NVD group (85% vs. 81.3%, P = 0.04). No significant differences were detected between the two groups regarding birth trauma, birth height and head circumference, and developing infection, icterus and convulsion during neonatal period. Also, height and weight at two years of age did not

significantly differ in both groups.

Conclusion: The results of this study show that neonates born by Caesarian delivery and NVD had the same early and late outcomes.

Keywords: vaginal delivery, caesarean delivery, outcome, cohort study, Iran

Citation: Maharlouei N; Mansouri P; Zahmatkeshan M; Lankarani K. B. Low-risk planned caesarean versus planned vaginal delivery at term: early and late infantile outcomes. East Mediterr Health J. 2018;25(7):503-513. https://doi.org/10.26719/emhj.18.066

Received: 16/03/17; accepted: 16/11/17

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Introduction

The rate of caesarean delivery has increased worldwide over the past decades (1–3). There has been a rise in Caesarian deliveryrate in the United States of America from 1996 to 2004 when 1.2 million women (29.1% of all births) had Caesarian delivery (4). In many high-income countries it has exceeded 30% over the past decades. In Germany from 1990 to 2010 it doubled from 15.7 to 31.9% of all births (5). Moreover; worldwide estimates of Caesarian delivery at maternal request are 6–8% in Northern Europe, 11.2% in the United States, 17.3% in Australia and 70% in Brazil (6). A significant rise in Caesarian delivery rate from 14.3% in 1979 to 85.3% in 2009 in the Islamic Republic of Iran has also been reported, although this was a hospital-based report (7).

Caesarian delivery has been considered as a global burden for many years (8) and has been the most common surgical procedure performed on American women (9). A higher risk of infant

morbidity including breastfeeding complications (10), infections and respiratory distresses and even maternal bleeding has been reported to be associated with Caesarian delivery (11). Moreover, compared to planned vaginal delivery, planned CD was related to higher rate of severe maternal morbidity (12).

However, according to studies, Caesarian delivery is selected to avoid certain medical conditions such as fetal distress, fear from urinary sequellas, and anal incontinence (13,14). A main concern is whether the rise in the Caesarian delivery rate is the reason for the fall in perinatal mortality during the past decades (3). Although Caesarian delivery is more expensive than normal vaginal delivery (NVD) (15), it is more common in the private sector (16). Also, the rate of Caesarian delivery went beyond the rate recommended by the World Health Organization (WHO); i.e., 15% of all deliveries, over the past decades.

The decision to choose Caesarian delivery or NVD based only on the emotional status of a pregnant woman is due to evidence indicating a lack of difference in complication rates between Caesarian delivery and NVD patients (17). Within these controversies, understanding the impact of delivery mode on neonatal morbidity and mortality becomes essential in the context of rising Caesarian deliveryrates. Therefore, the present study aims to compare the neonates born by low-risk planned Caesarian delivery and those born by planned NVD regarding selected neonatal outcomes.

Methods

Study design and population

This prospective cohort study is a part of the cohort study which has been started since 2012 in Fars, the fifth most populated province in the Islamic Republic of Iran (18). Aiming to compare neonatal outcome of low-risk planned Caesarian delivery and planned NVD, we included mothers whose infant was alive and delivery date was after 37+0 weeks, and who had no history of maternal or fetal complications. We also excluded those whose date of delivery was influenced by maternal or fetal complications, including premature labour pain, ruptured membrane, fetal intra-uterine growth retardation or meconium staining. The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1397.464) (19).

Data collection

In this article we used data collected during fetal period, 2, 6 and 24 months after birth. Data were collected during pregnancy included demographic, medical history and obstetric and gynaecological history of mothers. The checklist used 2 months after delivery consisted of two main parts: the first part asked questions regarding mode of delivery and whether it was

planned and if the mode of delivery was NVD. The next question was concerning type of NVD; routine NVD, physiologic NVD, NVD in water, or painless NVD in which intrathecal analgesic is used routinely. Those mothers who experienced Caesarian delivery were asked about the reason of Caesarian delivery.

In the next part of the study, we asked mothers to answer questions regarding neonatal outcomes based on the infants' health card, vaccination card as well as the diary we had given the mothers in the first phase of the study (during pregnancy). In this part, we asked about infant's weight, height and head circumference at birth as well as presence of congenital anomalies (if any). Since APGAR is not recorded in either the health card or the vaccination card, we had to ask mothers about the neonate's skin colour, crying, and limbs' movement after birth and the place the neonate was kept immediately after birth; i.e. next to mother or in a neonatal intensive care unit (NICU)/neonatal ward. We also asked about birth trauma including bone fracture(s) and/or dislocation(s) and sculpt hematoma, if the child had developed icterus, infection, and convulsion in the neonatal period. The history was considered positive if the diagnosis was confirm by a paediatrician, or the infant was admitted to hospital due the mentioned problems. We also asked if breastfeeding was started within two hours after delivery, and the duration of exclusive breastfeeding.

After the infants passed their 6 and 24 months, the mothers were contacted and asked about any ailments/disease(s) their children had developed that necessitated a visit to a doctor. Also details of infants' feeding including duration of exclusive breastfeeding and weaning were requested, as well as information about any disease(s) confirmed by a physician, any hospital admissions, reason(s), and frequency and duration of each hospitalization (if any).

Statistical analysis

Statistical analyses were performed using SPSS statistical software, ver. 18.0 (SPSS Inc., Chicago, IL: USA). All the participants were categorized into two groups; those who had planned NVD and those who had planned CD. All the comparisons were made between these two groups. Independent t-test was used to compare the quantitative variables, while chi-square test or Fisher's exact test was employed to compare the qualitative ones. All differences with P-values less than 0.05 were considered as statistically significant. The data were reported as mean ± standard deviation (SD) and frequency (percentage) as indicated.

Results

Two months after delivery, we interviewed 4577 out of the 6922 mothers (66.1%) who had participated in the first phase of the cohort study, which have been started in 2012 (17). We found that 72 respondents (1.8%) had experienced either still birth (32; 0.7%) or neonatal

mortality (40; 0.8%). Among the rest of the respondents (4505 mothers) whose pregnancies resulted in live births, 1250 mothers (27.7%) had emergency delivery — either NVD or Caesarian delivery. Hence, of the 3255 mothers who had experienced planned deliveries, 1457 had planned NVDs (44.8%) and 1798 had planned Caesarian deliveries (55.2%). Considering that we aimed to compare neonatal outcome of low-risk pregnancies, we excluded all planned deliveries in which mother and/or the fetus was considered high risk by the maternity care provider. Therefore, data of 1367 low-risk planned NVD and 1071 low-risk planned Caesarian delivery were analyzed. Different indications of Caesarian delivery have been illustrated in Figure 1 .

Comparison of maternal and neonatal characteristics between the two groups – low-risk planned NVD versus low-risk planned Caesarian delivery – is presented in Table 1 , which indicates that the mean age of mothers in NVD group was slightly lower than that of the Caesarian delivery group (26.5 vs. 28.4 years; P

Comparison of the immediate neonatal outcomes between planned NVD and low-risk planned Caesarian delivery groups is presented in Table 2 . Accordingly, gestational age (39.2 vs. 38.4 weeks; P Table 3. Neonatal complications did not statistically differ in those born through Caesarian delivery and those in NVD group; i.e., icterus (P = 0.52), infection (P = 0.3) and convulsion (P = 0.8).

Certain aspects of health status during the first two years of life were also compared between the two groups and the results are presented in Table 4 . Accordingly, no significant difference was found between the two groups regarding height (P = 0.1) and weight (P = 0.3) at two years of age. Nevertheless, compared to the children born through Caesarian delivery, those born through NVD had more frequently developed ailment/disease(s) for which they had to be visited by a doctor during the first two years of life (34.5% vs. 31%; P = 0.07). However, those born through Caesarian delivery had been more frequently hospitalized (17.1% vs. 14.8%; P = 0.1). Yet, the two groups were similar regarding presence of congenital anomalies/diseases (P = 0.4) and developing nephrological (P = 0.7), dermatological (P = 0.9), neurological (P = 0.5), musculoskeletal (P = 0.9), and respiratory problems including asthma (P = 0.6).

According to what had been recorded by mothers in their diaries, breastfeeding had never been started for three infants (0.2%) in Caesarian delivery group and one infant (0.1%) in NVD group. The reason was multiple congenital anomalies in oropharynx of the infants. Breastfeeding was more likely to be started within two hours after delivery in the neonates born through NVD compared to neonates in Caesarian delivery group (96.3% vs. 93.5%). For the remainder of the neonates, breastfeeding was started within three days; 3.6% in NVD group comparing to 6.3% in Caesarian delivery group. Duration of breastfeeding was also longer in the NVD group

compared to the Caesarian deliverygroup (19.9 vs. 18.8 months, P

Table 5

Discussion

Appropriateness of Caesarian delivery and NVD for pregnant women has been widely debated. In this cohort study, we compared maternal and neonatal characteristics as well as immediate, early, and late neonatal complications among the women who delivered their babies by NVD and Caesarian delivery. The mean age of the mothers was lower in the NVD group than in the Caesarian delivery group. In addition, the mothers in the CD group were more likely to be more educated and be employed. Besides, a significantly higher proportion of Caesarian deliveries were performed at private settings. Similar results were also obtained in other studies (15,16).

The results of our study demonstrated a higher birth weight in the infants delivered by NVD. However, birth weight was reported to be higher in the Caesarian delivery neonates than in the NVD ones (20). The longer gestational age in the NVD group in our study could be a reason for fetal weight gain. Also, the infants born through Caesarian delivery were more likely to have normal pink skin at birth. However, no significant differences were detected between the two groups regarding birth height, place of care after birth (next to mother or in neonatal ward), type of crying, movement, respiration, skull hematoma, and birth trauma. Some studies have reported that mode of delivery could not be related to birth trauma (21), but it has also been reported that Caesarian delivery is protective against birth trauma (22). Other studies have reported an association between Caesarian delivery and newborn's serious respiratory morbidity (23,24), respiratory distress (25), and transient tachypnea (26). In addition, delivery by Caesarian deliveryhas been identified as a risk factor for child asthma (27), respiratory morbidity, and longer NICU stay. Conversely, delivery by Caesarian delivery was reported not to be associated with the subsequent development of asthma, allergic rhinitis, or atopic dermatitis in Korean children (28).

Evaluation of early neonatal outcomes in the groups under study did not show any differences between the two groups regarding development of icterus, infection and other early neonatal complications. This was in agreement with the results of another study indicating no significant difference between NVD and Caesarian delivery neonates concerning neonatal complications (29). In a Chinese study, short-term maternal outcomes were similar in NVD and Caesarian delivery mothers, and Caesarian delivery women had even better neonatal benefits (30). In contrast, a Swedish study reported that Caesarian delivery either without medical indication 0r in emergency situations were associated with higher risks for maternal and neonatal morbidity (11).

The study results also revealed no significant difference between the two groups with respect to height and weight at the end of the second year of life. In contrast, Caesarian delivery has been reported as a risk factor for child obesity (27). Moreover, a systematic review reported a strong association between Caesarian delivery and increased offspring Body Mass Index (BMI), overweight, and obesity in adulthood (31). Compared to vaginally born infants, Caesarian delivery infants have different timing, composition, and acquirement of intestinal flora, which may contribute to intestinal microbial composition in the first year of life, causing obesity and other health outcomes (27).

There was no significant difference between the NVD and Caesarian delivery group regarding the rate and length of hospital admission. This was in contrast to the results of other studies, showing higher newborn hospitalization for vaginally born neonates (20). Nevertheless, similar to the present research, that study demonstrated no significant difference between Caesarian delivery and NVD born infants with regard to duration of hospital stay. In has been shown that in preterm births,Caesarian delivery significantly increases the risk of longer neonatal length of hospital stay compared to NVD (32). Our study results also indicated no significant differences between the two groups regarding dermatological, nephrological, spinal cord, and musculoskeletal problems.

In this study, a slightly higher but significant proportion of the Caesarian delivery neonates did not start breastfeeding at all. Duration of breastfeeding was higher in the NVD group than in the Caesarian delivery group. Compared to the Caesarian delivery infants, a significantly higher proportion of the NVD infants had six-month exclusive breastfeeding. These findings were consistent with those of other studies (29,32,33).

The main strength of this study is that all data have been collected prospectively in a cohort study by trained research assistants and we did not use retrospectively collected hospital data. The limitation of the study is that we had to rely on mothers' claims, although they were trained to write all important events regarding their baby as well as themselves in the notebook given to them during their.

Conclusion

The results of this study show that neonates born by Caesarian deliveryand normal vaginal delivery had the same early and late outcomes. Also Caesarian delivery neonates were more likely to have normal pink skin at birth. However, breastfeeding habits were better among NVD neonates. Considering the controversies reported in studies on Caesarian delivery and NVD outcomes, more research is needed to evaluate the short-term and long-term effects of Caesarian delivery.

Acknowledgements

We would like to express our special gratitude to the Vice-chancellor for Research of Shiraz University of Medical Sciences for their financial support. It should be noted that this article is extracted from Parisa Mansouri's thesis (No: 87/1006).

Funding: Shiraz University of Medical Sciences, Shiraz, Islamic Republic of Iran.

Competing interests: None declared.

WHO EMRO | Low-risk planned caesarean versus planned vaginal delivery at term: early and late infantile

الولادة المهبلية الطبيعية . لذلك، كان الوزن عند الولادة 3166 (±442.4) جرامًا في فئة
الأطفال الذين وُلِدوا من خلال الولادة القيصرية، و 3213 (±454.8) جرامًا في فئة
الأطفال الذين وُلِدوا من خلال الولادة المهبلية الطبيعية . وكان لون البشرة الطبيعي
عند الولادة أكثر انتشارًا بين فئة الأطفال الذين وُلِدوا من خلال الولادة القيصرية
مقارنة بفئة الأطفال الذين وُلِدوا من خلال الولادة المهبلية الطبيعية (85% مقابل
يتعلق فيما الفئتين بين جوهرية اختلافات أي لاحظُي ولم 81.3%، P (الاحتمالية) = 0.04).
برضح الولادة، والطول عند الولادة، ومحيط الرأس، والإصابة بالعدوى، واليرقان
والاختلاجات في فترة الولادة الحديثة . ولم يختلف الطول والوزن عند عمر السنتين
اختلافًا كبيرًا بين الفئتين .

: توضح نتائج هذه الدراسة أن الأطفال حديثي الولادة الذين وُلِدوا من خلالالاستنتاجات
الولادة القيصرية منخفضة المخاطر والولادة المهبلية الطبيعية لديهم نفس حصائل
الولادة المبكرة والمتأخرة .

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