The changing indications and rates of cesarean section in one academic center over a 16-year period (1997–2012)

Samuel Lurie a,b,*, Amir Shalev a, Oscar Sadan a, b, Abraham Golan a, b

a Department of Obstetrics and Gynecology, Edith Wolfson Medical Center, Holon, Israel
b Sackler School of Medicine, Tel Aviv University, Israel

A B S T R A C T

Objective: To compare trends and rates of cesarean section delivery by indication in one academic center. A retrospective analysis of the indications of all cesarean sections performed in Edith Wolfson Medical Center, Holon, Israel, a tertiary healthcare university facility, during 1997–2012 was done. Each delivery was assigned to the primary indication noted for that pregnancy, regardless of other indications reported. Whenever more than one indication was present, the principle indication chosen by the attending obstetrician was chosen for the analysis.

Results: The cesarean section rate gradually rose from 15.29% in 1997 to 21.10% in 2012, with an overall cesarean section rate of 20.66%. The cesarean section rate between 1997 and 2000 was 17.52%, between 2001 and 2004 was 18.5%, between 2005 and 2009 was 22.86%, and between 2009 and 2012 was 22.07% (p < 0.001). The five leading primary indications across the years were previous cesarean section (26.0%), non-reassuring fetal heart rate pattern (18.1%), malpresentation (16.9%), labor dystocia (8.8%), and suspected macrosomia (7.2%).

Conclusion: Previous cesarean section persistently increased and was the leading indication throughout the years. Any attempt to reverse this trend must be based on reduction of the primary cesarean section rate.

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Vaginal birth after cesarean delivery (VBAC) emerged from the 1980 National Institute of Health consensus report [8] as a mechanism to safely reduce cesarean section rates. After initial enthusiasm for trial of labor after cesarean birth (TOLAC), concerns about medical liability claims after catastrophic complications (uterine rupture and need for emergency hysterectomy) contributed to a sharp decline in VBAC rates in the beginning of the 2000s [9]. Thus, a “step back” was carried out towards the longstanding dictum suggested by Craigin in 1916 [10]: “once a cesarean always a cesarean”.

The objective of this study was to identify the main indications and to examine the trend of cesarean rate and indications over a 16-year period (1997–2012) in one university affiliated tertiary medical center.

Materials and methods

This retrospective study is based on data concerning method of delivery and indications for cesarean delivery at Edith Wolfson Medical Center, Holon, Israel, a university affiliated tertiary healthcare facility, in the years 1997–2012. The study protocol was approved by the Edith Wolfson Institutional Review Board Committee (protocol number WOMC 0151–12). There were a total of 55,390 deliveries between January 1, 1997 and December 31, 2012. Of those, 11,455 (20.66%) were accomplished by a cesarean section.

The identification of the indications for cesarean delivery was through the Edith Wolfson Medical Center registry in accordance with International Classification of Disease (ICD-9) codes. The selection of the underlying reason or indication for cesarean delivery was based on the primary indication for cesarean delivery as stated by the attending obstetrician. Each delivery was assigned to the primary indication noted for that pregnancy, regardless of other indications reported. All cesarean deliveries were allocated to one of 10 categories: previous cesarean section, labor dystocia, fetal distress [non-reassuring fetal heart rate pattern (NFHRP)], malpresentation, hemorrhage, multiple gestation, macrosomia (and/or cephalopelvic disproportion), failed induction, cesarean on demand (i.e., maternal-choice) and “other.”

In our department, labor is managed by standard departmental protocols, with direct supervision by the senior obstetric faculty. In 2000, refreshment courses of the criteria of indications of cesarean deliveries were undertaken in our department. It was followed by quality control program assessment of indications of cesarean deliveries in 2001 and 2002. In 2001, a policy of labor induction at 41 weeks’ gestation instead of 42 weeks for otherwise uncomplicated singleton pregnancies was introduced.

The category previous cesarean section includes all repeated cesareans, i.e., post one, two, three, and more previous cesareans. The category labor dystocia includes all types of obstructed or nonprogressive labors. In our department, the diagnosis of failure to progress was made in accordance with the guidelines of the American College of Obstetricians and Gynecologists. NRFRHP (i.e., fetal distress) was defined as severe variable decelerations, late decelerations, prolonged decelerations (3–10 minutes), or baseline bradycardia of < 100 beats/min. The category malpresentation includes singleton breech presentation or transverse lie. Since 2001, a policy of planned cesarean section for term breech presentation was introduced in our department in accordance with recommendations of the Term Breech Trial Collaborative Group study [3]. The category hemorrhage includes placental abruption and placenta previa. Until the end of 2005, parturient women with complete placenta previa were delivered by a cesarean section, while those with partial or marginal were allowed to have a trial of vaginal delivery [11]. Since 2006, all women with prelabor diagnosis of either complete, or partial or marginal placenta previa were scheduled for a cesarean section. Until 2011, suspected macrosomia was defined as ultrasonographic or clinical estimation of fetal weight of > 4250 g, and since then as > 4500 g. Women who requested a cesarean section on demand were interviewed by a senior obstetrician and if after they have received and understood all the necessary information and still maintained the request for a cesarean section, their wish was granted. The category “other” includes all other indications for cesarean delivery.

Statistical analysis was performed by Chi-square calculations. Significance was set at $p < 0.05$.

Results

Table 1 summarizes the rate of cesarean sections in the years 1997–2012 in Edith Wolfson Medical Center. The lowest rate (15.29%) was in 1997, while the highest (24.12%) was in 2007. The cesarean section rate between 1997 and 2000 was 17.52% (1858 out of 10,606), between 2001 and 2004 was 18.5% (2252 out of 11,630), between 2005 and 2009 was 22.86% (3431 out of 15,008), and between 2009 and 2012 was 22.07% (4004 out of 18,146) ($p < 0.001$). The cesarean section rate between 1997 and 2004 was 18.03% (4010 out of 22,236) as compared to the 22.43% (7435 out of 33,154) rate between 2005 and 2012 ($p < 0.001$).

Table 2 summarizes the distribution of indications for cesarean sections in the years 1997–2012 in Edith Wolfson Medical Center. In total, the five leading primary indications were previous cesarean section (26.0%), NFHRP (18.1%), malpresentation (16.9%), labor dystocia (8.8%), and suspected macrosomia (7.2%). The leading primary indication for cesarean delivery differed across the years: it was previous cesarean in 1997–2000 and 2006–2012 (68.7%); malpresentation in 2001–2004 (25.0%); and NFHRP pattern in 2005 (6.3%). Malpresentation contribution to cesarean section rate was 14.3% (76/530) and 24.5% (114/464) in 2000 and 2001, respectively ($p < 0.05$). Malpresentation contribution to cesarean section rate was 14.1% (262/1858) between 1997 and 2000, and 17.5% (1674/9587) between 2001 and 2012 ($p < 0.05$).

Discussion

During the 16-year study period (1997–2012) the overall cesarean section rate at Edith Wolfson Medical Center was 20.66%. The cesarean section rate in Israel in the 1960s was 1.8% [12]. Since then, the national cesarean section rate steadily increased and was

<table>
<thead>
<tr>
<th>Year</th>
<th>Deliveries (n)</th>
<th>Cesareans (n)</th>
<th>Cesareans (%)</th>
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<tr>
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<td>2688</td>
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<tr>
<td>1998</td>
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<tr>
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<td>2000</td>
<td>2620</td>
<td>530</td>
<td>20.23</td>
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<tr>
<td>2001</td>
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<tr>
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<td>2012</td>
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<td>1045</td>
<td>21.10</td>
</tr>
<tr>
<td>Total</td>
<td>55390</td>
<td>11,445</td>
<td>20.66</td>
</tr>
</tbody>
</table>

*p < 0.05 when compared to the rate in 2000.
**p < 0.05 when compared to the rate in 2004.
***p < 0.05 when compared to the rate in 2006.
Data are presented as number (%) in parentheses. We believe that this decline in cesarean section rate is a result of educational interventions. The national rate was 19.1% (1997) and 17.67% (2012). It was the leading primary indication of cesarean section. Suspected fetal distress usually results in expedited delivery which is often a cesarean section. Unfortunately, fetal distress is often overdiagnosed using the tool of NRFHRP [2]. Moreover, the subsequent increase in cesarean section rate did not necessarily lead to improved perinatal morbidity or mortality [2]. It was previously shown that combined use of electronic fetal monitoring and fetal scalp blood pH estimation may reduce the diagnosis of fetal distress and resulting cesarean deliveries [22]. In 2011, Reif et al [23] showed that if one or more results of fetal scalp pH were within the normal range, a cesarean delivery could be avoided in 6.4% of cases in spite of the NRFHRP. We agree with this approach and believe that a more strict policy of interpreting fetal heart rate tracing and the liberal use of scalp pH may reduce the contribution of suspected fetal distress to cesarean section rate. By contrast, the use of fetal pulse oximetry [24] or fetal ECG ST segment analysis [25] were not shown to be beneficial in reducing cesarean section rate for non-reassuring fetal status.

Malpresentation was the third leading primary indication for cesarean section (16.9%) during the 16-year study period (1997 to 2012). This finding is in agreement with previous studies that have revealed that fetal distress is another major contributor to cesarean section rate in industrialized as well as developing countries [19,20,21]. In that publication, they showed that if one or more results of fetal scalp pH were within the normal range, a cesarean delivery could be avoided in 6.4% of cases in spite of the NRFHRP. We agree with this approach and believe that a more strict policy of interpreting fetal heart rate tracing and the liberal use of scalp pH may reduce the contribution of suspected fetal distress to cesarean section rate. By contrast, the use of fetal pulse oximetry [24] or fetal ECG ST segment analysis [25] were not shown to be beneficial in reducing cesarean section rate for non-reassuring fetal status.
The relative contribution of labor dystocia as a primary indication of cesarean sections during the 16-year study period (1997–2012) was relatively low and constant over the years. One of the explanations for that could be our policy of labor induction at 41 weeks’ gestation for otherwise uncomplicated singleton pregnancies. This approach is supported by a meta-analysis that concluded that a policy of labor induction at 41 weeks’ gestation for otherwise uncomplicated singleton pregnancies reduces cesarean delivery rates without compromising perinatal outcomes [28]. It demonstrated that, compared with women allocated to expectant management, those who underwent labor induction at 41 weeks’ gestation had a lower cesarean delivery rate (odd ratio 0.88; 95% confidence interval 0.78, 0.99). The raise in cut-off of suspected macrosomia from 4250 g to 4500 g did not result in significant increase in contribution of this indication to cesarean section rate. The study has few limitations, since it is a retrospective study in which the data were extracted from a registry. In that way, founders cannot be excluded as possible explanations for the findings. The strength of the study is in its large cohort over a relatively long period (16 years) in a single medical center, a feature that maintained homogeneity regarding the attending obstetricians’ attitudes towards cesarean section. In summary, cesarean section rates steadily increased during the 16-year study period (1997–2012) and the distributions of contribution of each indication have changed across the years, although the principle contributor remained previous cesarean section. We therefore feel that if one wishes to lower the total cesarean section rate, the appropriate way would be to reduce the primary section rate by increasing the rate of external cephalic version for breech presentation (and safe breech vaginal delivery technique), tightening the criteria for NRFHRP (and liberal use of scalp pH) and labor induction at complete 41 weeks’ gestation.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

References