



How much do we pay for Caesarean section - a pilot study in Serbia

Marina Odalović¹, Dragana Lakić¹, Ivana Tadić¹, Ljiljana Tasić¹,
Guenka Petrova²

¹Department of Social Pharmacy and Pharmaceutical Legislation,
University of Belgrade - Faculty of Pharmacy, Belgrade, Serbia

²Department of Social Pharmacy, Medical University of Sofia - Faculty
of Pharmacy, Sofia, Bulgaria

rezime **Background:** Different types of labour need different resources. Subsequently, different costs should be expected. **Aim:** The aim of the study was to determine costs of planned Caesarean section (C-section) in relation to costs of spontaneous (SVD) and induced vaginal (IVD) delivery. **Methods:** Retrospective study was conducted for the period January 1st - December 31st, 2010. Database of Health Insurance Fund of Republic of Serbia was used as a data source. Direct medical costs of labor were estimated for mother/newborn pair. **Results:** The sample was consisted of 99 women where 46.5% had SVD, 28.3% IVD and 25.2% C-section. The average costs of labor, regardless of method, were 417.02±284.14 EUR. Costs of C-section were higher compare to SVD (640.18±240.04 vs. 243.27±131.70 EUR, p<0.05) and IVD (640.18±240.04 vs. 497.10 ± 327.91 EUR, p<0.05). **Conclusion:** Considering high costs of C-section, it is necessary to review such clinical practice for the purpose of optimizing the use of resources.

Key words: costs and cost analysis, obstetric delivery, cesarean section

INTRODUCTION

Estimation of costs related to health resources (e.g. drugs, medical devices) and services in the process of labour is the cost of illness (COI) study. COI studies estimates different types of costs which one disease or health condition cares for the society. Accordingly, results of these studies could help in determination of research and funding priorities by highlighting points where inefficiencies may exist and savings may be done¹.

Labour (partus) evolves three stages, where the second one is delivery of a child. Natural route of delivery is vaginal route helped by birth contractions². However, planned Caesarean section (C-section) without labour became frequent recent years in Serbia where reached 19.3 and

21.6 % in 2008 and 2009, according to Institute of public health of Serbia. Concurrently, the World Health Organization (WHO) recommended the rate of C-section 10-15% for the national level⁴. There was one previous clinical study which reported higher costs of C-section compare to vaginal delivery in Serbia⁴. However, results were based on data set from the only one clinical centre.

Different types of labour and methods of delivery have advantages and disadvantages, whether in terms of maternal or child outcomes⁵. Accordingly, different resources are needed and different costs should be expected. In accordance with the high rate of C-section in Serbia, this study was done with the aim to determine the costs of planned C-section without labor in relation to costs of spontaneous and induced labour with vaginal delivery for the national level.

PATIENTS AND METHODS

We conducted retrospective, population-base study for the period January 1st - December 31st, 2010. Database of Health Insurance Fund of Republic of Serbia (HIFRS) was used as a data source. All costs were estimated from the perspective of HIFRS.

Database contained data on amount and costs of all drugs, medical devices (MD) and health care services used by women and newborns during labour and postpartum/postnatal hospital stay. Database, also, contained data about age of pregnant women, type of labour and method of delivery, duration of postpartum and postnatal hospital stay (in days) at general, semi-intensive or intensive care units. Besides, different types of complications at delivery were, also, collected. Ruptures of perineum, vagina, or cervix, forceps, and C-section in the vaginal labour were considered as complications of spontaneous and induced vaginal labour. Complications due to anaesthesia were considered as complications of C-section delivery without

TABLE 1

HOSPITALIZATION OF MOTHERS AND NEWBORNS

Days	Planned C-section, (%), n=25	Induced vaginal delivery, (%), n=28	Spontaneous vaginal delivery, (%), n=46
Mothers			
≤4	32.0	51.8	68.2
>4	68.0	48.2	31.8
Average	8.52±/4.74	5.22±/2.90	4.59±/2.89
Newborns			
≤4	24.0	57.2	78.7
>4	76.0	42.8	21.3
Average	5.76±/2.20	5.14±/3.39	4.00±/2.07

labour. Wound infections and consequent complications after any method of delivery were not observed.

The study random sample was made out of 67142 women who delivered baby in any maternity hospitals in Serbia in 2010. Selection of the sample was done uniformly from all maternity hospitals. The inclusion criterion for the pilot study sample was delivery in term of one, live born child; women with preterm delivery, who delivered two or more children and who had stillbirth were excluded. The exclusion criterion was presence of any complication other that denoted in previous section (e.g. profuse bleeding requiring transfusion).

Direct medical costs were calculated for each mother/newborn pair and included costs of drugs, MDs (consumables) and health services used by each pair. Costs of drugs included costs of all topical, oral and parenteral preparations. Costs of consumables included costs of instruments, catheters, needles, syringes, sponges, etc. Health services included all obstetric, anaesthesiologist and nursing services. Indirect medical costs were not included.

Mean costs and standard deviations (SD) according to different types of labor and modes of delivery were estimated using previously calculated costs of each mother/newborn pair. These included estimation of mean costs for planned C-section without labour, spontaneous and induced labour with vaginal delivery. Costs were first calculated in the currency of Republic of Serbia, Serbian Dinars (RSD). Relevant costs were then converted to European Monetary Unit (EUR) according to official exchange rate for 2010⁶.

The mean, SD, minimum and maximum were used for the description and presentation of the costs. Categorical data were compared using X^2 test. Continuous variables between groups were compared with the use of analysis of variance with the post hoc Tukey's analysis. A p-value < 0.05 was considered to be significant, and p-value < 0.001 was considered to be high significant. Data analysis was performed using Statistical Package for Social Science (SPSS) software (SPSS 18.0 for Windows, SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 99 women were selected for the pilot study. The average age of women was 30.55±5.42 years. Less women had planned C-section compare to vaginal delivery 25.2% vs. 74.8 % (p<0.05), respectively. The spontaneous onset of labour was more frequent than induced labour, 46.5 vs. 28.3 % of cases (p<0.05), respectively. Women with C-section were older than women with spontaneous and induced vaginal delivery, 31.48±5.2 vs. 30.54±5.73 and 29.71±5.11, but without significant statistical difference (p>0.05).

The average maternal hospital stay was 5.73±3.84 days. Women who had C-section were significantly longer hospitalized compare to women who had spontaneous vaginal (8.52±4.74 vs. 4.59±2.89 days, p<0.05) and induced vaginal delivery (8.52±4.74 days vs. 5.04±3.01 days, p<0.05) (Table 1).

The average neonatal hospital stay was 4.80±2.64 days. Newborns after C-section were significantly longer hospitalized compare to newborns after spontaneous vaginal delivery, 5.76±2.20 vs. 4.0±2.07, p<0.05 (Table 1).

Hospitalization longer than four day after C-section was more frequent compare to spontaneous vaginal and induced vaginal delivery, for mothers (68.0% vs. 31.8% and 48.2%, respectively, p<0.05), as well as for children, 76.0% vs. 21.3% and 42.8%, respectively, p<0.05) (Table 1).

The prevalence of complications after C-section was 12% of women. The prevalence of complications was almost the same in the cases of spontaneous vaginal and induced vaginal delivery, 31% and 32% of women, respectively. There was no statistically significant association between the age of pregnant women and complication of labour, regardless of type of labour and method of delivery (p>0.05).

Women who had C-section and induced vaginal delivery were more frequently hospitalized at the intensive and/or semi-intensive care units compare to women who had spontaneous vaginal delivery, 88.0 and 67.9 % vs.

TABLE 2

COSTS OF DIFFERENT TYPES OF LABORU (EUR)

	Planned C-section	Induced vaginal delivery	Spontaneous delivery	Average
Mean costs	640.18	497.10	243.27	417.02
Standard deviation	240.04	327.91	131.70	284.14
Minimum	33.60	185.98	98.60	33.60
Maximum	1186.59	1394.24	757.72	1394.24

21.7% ($p < 0.001$). Similarly, newborns after C-section and induced vaginal delivery were more hospitalized at the intensive and/or semi-intensive care units compare to newborns after spontaneous vaginal delivery, 80.0 and 67.9% vs. 46.7% ($p < 0.001$). There was no significant statistical difference between maternal and child hospitalization at the intensive and/or semi-intensive care units after induced vaginal delivery and C-section ($p > 0.05$). There was no statistically significant association between age of pregnant women and hospitalization at the intensive and/or semi-intensive care units ($p > 0.05$).

The average costs of labour, regardless of type of delivery, were 417.02 ± 284.14 EUR (Table 2). The costs of C-section were higher compare to induced vaginal delivery, 640.18 ± 240.04 vs. 497.10 ± 327.91 , $p < 0.05$, as well as compare to spontaneous vaginal delivery, 640.18 ± 240.04 vs. 243.27 ± 131.70 EUR, ($p < 0.05$) (Table 2).

Health services had the largest share in total costs of labour (82.31%), regardless of the type of delivery. Drugs and MDs had much lower share in total costs of labour 10.63% and 8.95%, respectively.

The share of health services, drugs and MDs in total costs of labour was analyzed according to the method of delivery. Costs of health services had the smallest share in C-section compare to spontaneous vaginal and induced vaginal delivery, 77.54% (496.4 EUR) vs. 86.25% (209.8 EUR) and 84.78% (421.4 EUR), respectively, (Figure 1). In contrast, costs of drugs had the largest share in C-section compare to spontaneous vaginal and induced vaginal delivery, 14.4% (92.2 EUR) vs. 7.45% (18.1 EUR) and 5.28% (37.0 EUR), (Figure 1). Finally, costs of MDs had the largest share in induced vaginal delivery compare to spontaneous vaginal delivery and C-section, 9.94% (49.4 EUR) vs. 6.30% (15.3 EUR) and 8.06% (51.6 EUR) (Figure 1).

DISCUSSION

The rates of different types of labour and methods of delivery were reported in national statistical reports of many countries. Accordingly, increased rate of C-section was observed in 80's and 90's years of XX century worldwide, particularly in developed countries. Similar trend has been continued in the beginning of XXI century. The rate of C-section increased from 8.6% in 1976 to 24.9% in 2009, in Scotland⁷. Similar trend was observed in England, from 9% in 1980 to 24.8% in 2010⁸. The rate of C-

section was 23% in 1991 and even 32% in 2007, in United States, while, in Northern Australia was 32.4% in 2009^{9,10}. On the contrary, many low income countries had the rate of C-section below WHO recommendation of minimum 10%, from 0.4% in Chad (2004) to 9.9% in Viet Nam (2002)¹¹. The results of the WHO report carried out among 137 countries pointed out that only 14 countries fulfilled the required criterion of 10-15 % rate of C-section¹¹.

There are clinical conditions when the C-section is the safest mode of delivery, for both, mother and child. The usefulness of C-section in the situation of breech presentation of the fetus was confirmed in several clinical trials¹²⁻¹⁴. However, high increase in the rate of C-section during last three decades and high exceed of WHO recommendation are reasons for concern³. Beside older maternal age, parity and obesity in pregnancy, it was observed that one of potential reasons of increased rate of C-section may be low operational risk of C-section in spite of lack of clinical indication¹⁵⁻¹⁷. Maternal request for C-section was also considered to be potential reasons for increasing rate of this mode of delivery^{15,18-20}. Moreover, it was observed that the rate of C-section is much higher at private obstetrics clinics in developed countries, which additionally contributed to the high rate of C-section²¹.

In spite of lower incidence of complications during delivery, significantly longer women's and newborn's postpartum/postnatal hospital stay in Serbia was observed after C-section vs. spontaneous and induced vaginal delivery. Moreover, women and babies were more frequently hospitalized at the intensive care units after C-section then after spontaneous and induced vaginal labour. National Institute for Health and Clinical Excellence of England and Wales reported that planned C-section, in correlation to spontaneous onset and induced vaginal delivery, carries out different consequences for maternal health, particularly long-term reproductive health. Planned C-section, although technically simple operation, has numerous and serious potential complications in comparison to vaginal delivery which include abdominal pain, the need for surgery in the future, a longer period of hospital stay after childbirth, major haemorrhage⁵. Moreover, planned C-section carries a higher risk of stillbirth, placenta praevia and infertility in subsequent pregnancies in comparison with vaginal delivery⁵. Accordingly, all potential risks of C-section should be carefully discussed for each pregnant

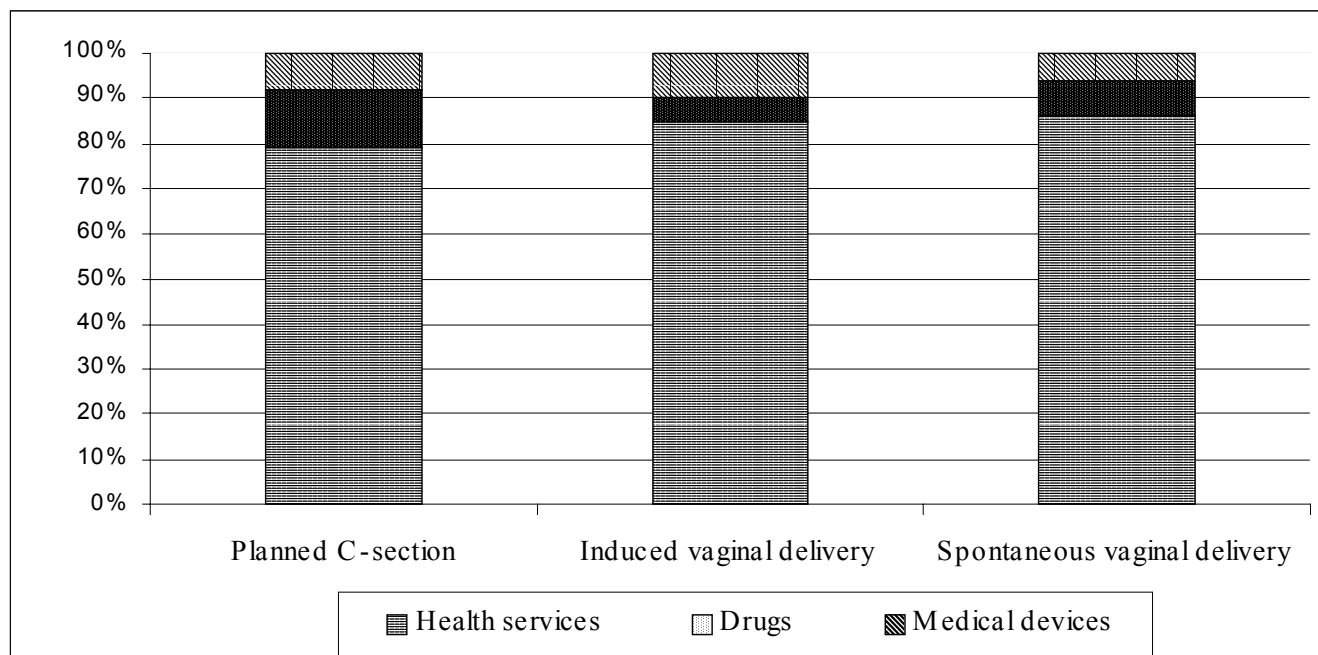


FIGURE 1
STRUCTURE OF COSTS REGARDING DIFFERENT TYPES OF LABOUR

woman before the decision on the type of labour and the method of delivery would be made.

Mean costs of delivery were the highest for C-section according to our results. Longer hospital stay of mothers and babies after C-section was one of the main reasons for significantly higher costs of C-section. Even four days longer maternal hospital stay and two days longer newborn's hospital stay was observed after C-section compare to spontaneous vaginal delivery. Moreover, hospitalization at the semi-intensive and intensive care unites which was more frequent after C-section contributed to higher costs of C-section. Maternal and newborn postpartum/postnatal hospital stay may be considered representative of maternal and newborn morbidity, and, accordingly, mean costs of different types of delivery may indicate different costs associated with short-term maternal and newborn adverse effects.

Results of many earlier studies pointed out higher costs of C-section compare to other methods of delivery world wide^{16,22}. However, long-term effects caused by different morbidities associated with different types of labour and methods of delivery and subsequent additional costs were not analyzed in any study, which would be very useful to do in the future. Moreover, pharmacoeconomic cost-effectiveness analysis of C-section, where the costs of short- and long-term effects would be included, would be very useful in decision making processes related to funding of certain types of labour. In order to lower costs of C-section in Serbia, it would be useful to make the rate of C-section lower, as well as maternal postpartum hospital stay shorter. A small study sample could be considered as the limitation of the study. Nevertheless, this study is the first attempt of estimation of labour costs in Serbia at the national level which should be considered as an advantage.

CONCLUSION

Significantly higher costs of planned C-section in comparison to spontaneous and induced vaginal delivery were shown in Serbia. Longer hospital stay of mothers and babies and more frequent hospitalization at semi-intensive and intensive care unites after C-section were the leading causes of estimated higher costs. Considering high costs of C-section, it is necessary to review such clinical practice for the purpose of optimizing the use of resources. The costs of spontaneous vaginal delivery were shown as the lowest, with adequate clinical outcomes for mothers and newborns, e.g. day of hospital stay.

SUMMARY

KOLIKO PLAĆAMO ZA CARSKI REZ - PILOT STUDIJA U SRBIJI

Uvod: Različiti tipovi porodjaja zahtevaju različite resurse. Shodno tome, mogu se očekivati i različiti troškovi.

Cilj: Studija je sprovedena sa ciljem da se utvrdi visina troškova carskog reza (CR) u odnosu na spontani (SVP) i indukovani (IVP) vaginalni porodjaj.

Metode: Retrospektivna studija je sprovedena za period 1. Januar - 31. Decembar, 2010. Baza podataka Republičkog fonda za zdravstveno osiguranje Republike Srbije korišćena je kao izvor podataka. Određivani su direktni medicinski troškovi za par majka/novrodjenče.

Rezultati: Uzorak se sastojao od 99 žena od kojih je 46,5% imalo SVP, 28,3% IVP i 25,2% carski rez. Prosečni troškovi porodjaja, bez obzira na tip, iznosili su 417,02±284,14EUR. Troškovi carskog reza bili su viši u odnosu na SVP (640,18±240,04 prema 243,27±131,70

EUR, $p < 0,05$) i IVP ($640,18 \pm 240,04$ prema $497,10 \pm 327,91$ EUR, $p < 0,05$).

Zaključak: Uzimajući u obzir visoke troškove carskog reza, neophodno je izvršiti reviziju aktuelne kliničke prakse radi optimizacije upotrebe resursa.

Ključne reči: troškovi i analiza troškova, porodjaj, carski rez

REFERENCES

- World Health Organization. The costs of maternal-newborn illness and mortality. 2006. cited 2013 Mar 12. Available from: http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/9241594497/en/index.html
- Plecas D, Stanimirovic D, Stankovic A, Vasiljevic M. Ginekologija i akušerstvo. Gynecology and obstetrics. 3rd ed. Belgrade: University of Belgrade - Faculty of Medicine; 2011. In Serbian
- World Health Organization. Appropriate technology for birth. *Lancet* 1985; 2: 436-7.
- Folic M, Jankovic S, Folic M, Varjadic M. Costs of caesarean section and vaginal delivery in an upper-middle-income country: a case series. *Ser J Exp Clin Res* 2009; 10(2):61-4.
- National Collaborating Centre for Women's and Children's Health. Caesarean section. Clinical Guideline. 2004. cited 2013 Mar 18. Available from: <http://www.nerve.nice.org.uk/nicemedia/pdf/CG013fullguideline.pdf>
- National Bank of Serbia. Exchange Rates. cited 2013 Mar 12. Available from: <http://www.nbs.rs/internet/english/80/index.html>
- ISD Women & Children's Health Information Program. Births in Scottish Hospitals. cited 2013 Mar 21. Available from: <http://www.isdscotlandarchive.scot.nhs.uk/isd/1018.html>
- NHS Maternity Statistics 2009-10. cited 2013 Mar 20. Available from: <http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=1475>
- Menacker F, Hamilton BE. Recent trends in cesarean delivery in the United States. cited 2012 Dec 17 Available from: <http://www.cdc.gov/nchs/data/databriefs/db35.pdf>.
- Chan A, Scheil W, Scott J, Nguyen A. Pregnancy outcomes in South Australia in 2009. Adelaide: Pregnancy Outcome Unit, SA Health, Government of South Australia, 2011.
- Gibson L, Belizan JM, Lauer JA, Betran AP, Meraldi M, Althabe F. The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage - World Health Report. Geneva (Switzerland). World Health Organization; 2010. Background paper No.: 30.
- Hogel K, Kilburn L, Hewson S, Gafni A, Wall R, Hannah ME. Impact of the international term breech trial on clinical practice and concerns: a survey of centre collaborators. *J Obstet Gynaecol Can* 2003; 25(1):14-6.
- Daskalakis G, Anastasakis E, Papantoniou N, Mesogitis S, Thomakos N, Antsaklis A. Caesarean vs. vaginal birth for term breech presentation in 2 different study periods. *Int J Gynaecol Obstet* 2007; 96(3):162-6.
- Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomized multicentre trial. *The Lancet* 2000; 356(9239):1375-83.
- Usha Kiran TS, Jayawickrama NS. Who is responsible for the rising caesarean section rate? *J Obstet Gynaecol* 2002; 22(4):363-5.
- Allen VM, O'Connell CM, Farrell SA, Baskett TF. Economic implications of method of delivery. *Am J Obstet Gynecol* 2005; 193(1):192-7.
- Wax JR, Cartin A, Pinette MG, Blackstone J. Patient choice caesarean-the maine experience. *Birth* 2005; 32(3):203-6.
- Leitch CR, Walker JJ. The rise in caesarean section rate: the same indications but a lower threshold. *BJOG* 1998; 105(6):621-6.
- Marsden W. Choosing caesarean section. *The Lancet* 2000; 356(9242):1677-80.
- Viswanathan M, Visco AG, Hartmann K, Wechter ME, Gartlehner G, Wu JM, et al. Caesarean delivery on maternal request. Evidence report/Technology Assessment 2006: 1-138.
- Leone T, Padmadas SS, Matthews Z. Community factors affecting rising caesarean section rates in developing countries: an analysis of six countries. *Soc Sci Med* 2008; 67(8):1236-46.
- Henderson J, McCandlish R, Kumiega L, Petrou S. Systematic review of economic aspects of alternative modes of delivery. *BJOG* 2001; 108(2):149-57.