Analysis of cesarean section births according to Robson's Ten Group Classification in a tertiary hospital over a 6-year period (2010–2015)

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SUMMARY

Introduction. In many obstetric situations, cesarean section is a life-saving procedure, and its guaranteed availability is contained in the Millennium Development Goals of the World Health Organization. It is also a surgical procedure that is not free of complications. That is why its overuse can be harmful both to women and to neonates.

Aim. Analysis of cesarean sections performed in 2010–2015 in the Specialist Gynecologic and Obstetric Hospital in Wałbrzych using the Robson classification.

Materials and methods. A retrospective analysis involved all women who gave birth by cesarean section in the Specialist Gynecologic and Obstetric Hospital in Wałbrzych from January 1 2010 to December 31 2015. Each patient was classified into one of 10 groups according to Robson. An overall cesarean section rate and cesarean section rates for individual groups were calculated, and trends in the fluctuation of these rates in individual groups over the investigated 6-year period were presented.

Results. The cesarean section rate in 2010–2015 amounted to 24.76. There were 11,315 childbirths, 2801 of which ended with a cesarean section. Nulliparous women with term cephalic pregnancy in spontaneous labor (Robson's Group 1) and multiparous women with single term cephalic pregnancy with a previous cesarean section (Group 5) accounted for 44.8% of all cases of cesarean sections in 2010, and 52.6% in 2015. This increase resulted from a markedly higher rate of cesarean sections in Group 5 (women after at least one cesarean section).

Conclusions. It seems that all attempts to rationalize the cesarean section rate should focus on proper classification of women with a history of cesarean section (Group 5) to natural childbirths. The number of women with a history of cesarean section that do not consent to natural labor increases markedly. The optimization of medical indications for the primary cesarean delivery, including extra-obstetric ones (Groups 1 and 2), is a more important matter since this will decrease the number of women with a history of cesarean section (Group 5).

Key words: cesarean section; Robson classification; cesarean section classification; natural labor after previous cesarean section

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INTRODUCTION

In many obstetric situations, cesarean section is a life-saving procedure, and its guaranteed availability is contained in the Millennium Development Goals of the World Health Organization as it is a tool that decreases both maternal and neonatal mortality [1]. It is also a surgical procedure that is not free of complications, which means that its overuse can be harmful both to women and to neonates. That is why the international healthcare community has agreed on a so-called optimal cesarean section rate. It directly follows recommendations issued in 1985 by a group of WHO experts. One of these recommendations states that the rate for caesarean sections should not exceed 10–15% in any geographical region [2]. Expert recommendations were based on data available at that time, mainly from Western Europe and Scandinavia where very good outcomes of obstetric care were consistent with a low rate of cesarean sections. Despite these recommendations, cesarean section rates have been rising for the past 3 decades in both developed and developing countries [3–6]. However, there are a few exceptions, e.g. Japan, where a slight decline has been observed in the past few years, or the United States of America where a periodical decline was seen in the early 1990s [7,8]. Moreover, considerable differences in the manner of delivery were analyzed in 2015 based on Eurostat data concerning 25 European countries. For instance, the cesarean section rate in 2010 in Cyprus was 52.2% (of which 38.8% were scheduled procedures), whereas in Norway it amounted to 17.1% (with 6.6% of scheduled procedures) [9].

This upward trend has also been observed in Poland where the cesarean section rate in 2000 was 19.5% and in 2014 – 42.3%. At this point, the considerable role of physicians of other specialties, who issue so-called extra-obstetric indications for a cesarean section, must be underlined [10,11]. For better understanding of these trends, the obstetric population must be divided into certain groups. This understanding used to be difficult due to the lack of an international consensus concerning a universal classification system and cesarean section analysis. In 2011, Torloni et al. analyzed 27 available classifications and concluded that the so-called *Ten-Group Classification System*, proposed in 2001 by Robson, was the most optimal for comparison and analysis of operative delivery [12]. This classification enables analysis of cesarean sections in mutually exclusive groups of women.

The classification is based on 5 characteristics that are routinely collected at nearly all maternity units:
1. Parity (nulliparous or multiparous women with or without previous caesarean section);
2. Onset of labor (spontaneous, induced or pre-labor, elective caesarean section);
3. Gestational age (preterm or term);
4. Fetal presentation (cephalic, breech, transverse or oblique);
5. Number of fetuses (single or multiple).

This classification is simple, exclusive, reproducible and prospective. This means that every woman admitted for delivery can be immediately classified into one of the 10 groups based on these 5 basic characteristics [13] (Tab. 1).

This classification also allows comparisons and analyses of caesarean section rates both within and across groups. More importantly, it enables comparisons and analyses in a single facility or at regional, national and international levels as well as over a period a time. It also makes it possible to analyze the genuine clinical practice and philosophy of obstetric care [7,14–18]. Similarly to the Society of Obstetricians and Gynaecologists of Canada in 2012, the WHO in 2015 confirmed that this manner of categorization, i.e. the Robson classification, can be used for these purposes [19,20]. The classification system used to date in Poland has been based on indications for and urgency of the procedure.

AIM

Feeling encouraged by the WHO, we have undertaken an attempt to analyze the cesarean section rate in the Specialist Gynecologic and Obstetric Hospital in Wałbrzych according to the Robson classification. In the light of a very high cesarean section rate in Poland, all analyses of this phenomenon are both advisable and necessary.

Tab. 1. Robson classification	Group	Description
	1	Nulliparous women with single cephalic pregnancy, $\geq$37 weeks gestation in spontaneous labor
	2	Nulliparous women with single cephalic pregnancy, $\geq$37 weeks gestation in induced labor or pre-labor cesarean section
	3	Multiparous women without a previous uterine scar, with single cephalic pregnancy, $\geq$37 weeks gestation in spontaneous labor
	4	Multiparous women without a previous uterine scar, with single cephalic pregnancy, $\geq$37 weeks gestation in induced labor or pre-labor cesarean section
	5	All multiparous women with at least one previous uterine scar, with single cephalic pregnancy, $\geq$37 weeks gestation
	6	All nulliparous women with a single breech pregnancy
	7	All multiparous women with a single breech pregnancy (including women with previous uterine scars)
	8	All women with multiple pregnancies (including women with previous uterine scars)
	9	All women with a single pregnancy with a transverse or oblique lie (including women with previous uterine scars)
	10	All women with a single cephalic pregnancy <37 weeks gestation (including women with previous scars)

MATERIAL AND METHODS

The Specialist Gynecologic and Obstetric Hospital in Wałbrzych collects patient records in the hospital computer system. Data from all childbirth (both live and still over week 22 gestation) from January 1 2010 to December 31 2015 were used to classify patients into one of 10 Robson groups.

The overall rate of cesarean sections, the relative size of each group and the contribution of each of the groups to the overall CS rate were calculated for each year separately, and then summed up. Data from all 6 investigated years (2010–2015) in the Robson classification are presented in Table 2.

The number of cesarean sections and deliveries in individual groups are compared in columns A and B, respectively. The CS rate was calculated by dividing the number of cesarean sections by the number of deliveries in each group and expressed in percentage – column C.

Tab. 2. Rate of cesarean sections according to Robson classification in the Specialist Hospital in Wałbrzych (2010–2015)

Robson group	A	B	C	D	E
	Number of cesarean sections	Number of all deliveries	CS rate in each group (A/B) *100	Relative group size (B/sum of all deliveries) *100	Group contribution to CS rate (A/sum of all deliveries) *100
	n	n	%	%	%
1. Nulliparous women with single cephalic pregnancy, $\geq$37 weeks gestation in spontaneous labor	739	4197	17,6	37,2	6,5
2. Nulliparous women with single cephalic pregnancy, $\geq$37 weeks gestation in induced labor or pre-labor cesarean section	261	742	36	6,4	2,3
3. Multiparous women without a previous uterine scar, with single cephalic pregnancy, $\geq$37 weeks gestation in spontaneous labor	83	3325	2,5	29,2	0,7
4. Multiparous women without a previous uterine scar, with single cephalic pregnancy, $\geq$37 weeks gestation in induced labor or pre-labor cesarean section	130	474	27,4	4,2	1,2
5. Multiparous women with at least one previous uterine scar, with single cephalic pregnancy, $\geq$37 weeks gestation	614	934	65,7	8,2	5,4
6. All nulliparous women with single breech pregnancy	276	282	97,9	2,5	2,4
7. All multiparous women with a single breech pregnancy (including women with previous uterine scars)	120	133	90,2	1,2	1,1
8. All women with multiple pregnancies (including women with previous uterine scars)	237	270	87,8	2,3	2,1
9. All women with a single pregnancy with a transverse or oblique lie (including women with previous uterine scars)	59	59	100	0,5	0,5
10. All women with a single cephalic pregnancy <37 weeks gestation (including women with previous scars)	282	899	31,4	7,9	2,5
Total	**2801**	**11315**		**100,0**	**24,77**

The relative size of each of the 10 groups was calculated by dividing the number of deliveries in a given group by the total number of deliveries and expressed in percentage (column D). The contribution of each of the groups to the overall CS rate is shown in column E. This was calculated by dividing the number of cesarean sections in each group by the sum of deliveries in the study population. The contribution of each group to the overall CS rate does not depend only on the CS rate in a given group, but also on the number of women in that group.

RESULTS

Cesarean section rates in the Robson groups were determined on the basis of 11,315 deliveries, 2801 of which were operative childbirths. In all analyzed years, Groups 1 and 5 (nulliparous women with cephalic term pregnancy in spontaneous labor and multiparous women with at least one uterine scar, with term cephalic pregnancy) had the greatest contribution to the overall CS rate.

Group 1, i.e. nulliparous women with cephalic term pregnancy in spontaneous labor, was characterized by the greatest contribution. In each of the investigated years, this group was also the most numerous and constituted from 33.5% to 40.3% of the total population of patients in the studied years (Fig. 1). That is why, despite relatively low CS rates in this group (between 14.1% in 2011 and 21% in 2015 – Tab. 3), it had the greatest contribution to the overall level of cesarean sections. The results are presented in graphs in Fig. 1, 2 and 3.

Despite the fact that women in Group 5 (multiparous women with at least one previous CS, with term cephalic pregnancy) constituted only 8.2% of all patients (Tab. 2), the average CS rate in this group reached 21.9% (Fig. 2).

Group 2 (nulliparous women with single cephalic term pregnancy in induced labor or pre-labor CS) had the third largest contribution to the overall CS rate (excluding years 2010, 2014 and 2015 when Group 10 occupied this position). This group accounted for 6.4% of patients with in-group CS rates ranging from 33.3% to 38.6% (Tab. 3).

The second largest group was Group 3 (multiparous women with single term cephalic pregnancy in spontaneous labor). The CS rate was low in this group (between 1.8% and 3% – Tab. 3). That is why its contribution to the overall cesarean section rate was 0.7% (Tab. 2) in the study period, which places it on the seventh position among all Robson groups in the consecutive six years (Tab. 3). The relative cesarean section rate in Group 5, i.e. among women with a history of cesarean section, has been observed to increase continuously. The relative increase over the 6-year period was 46%, reaching 77.4% in 2015. A significant increase in the relative cesarean section rate was also noted in Groups 1 and 2 (Tab. 3).

DISCUSSION

The Robson classification has been recently used for a large international comparison study on the CS rate. In the study conducted in the South America (120 hospitals from 8 countries), North America, Europe, Australia and New

Fig. 1. Percentage share of individual Robson groups in the hospital population
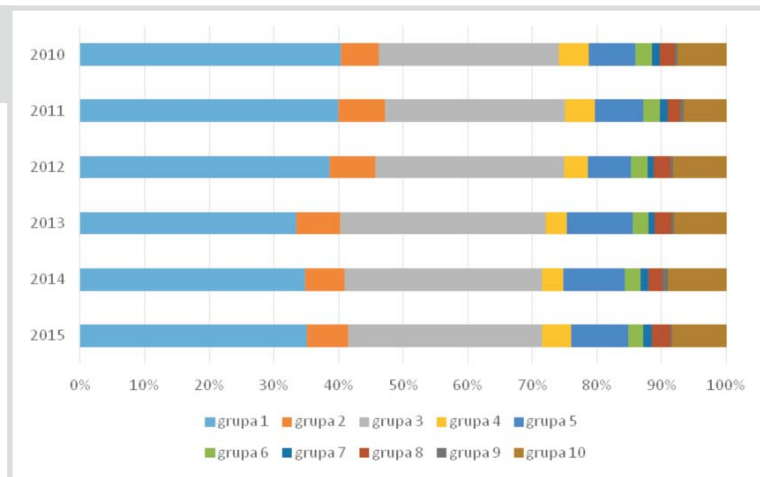
Zealand (9 hospitals per country), this classification system was easily implemented in various hospitals with varied manners of data collection, thus confirming its simplicity and usefulness in analysis [17,18]. Moreover, a systematic review from 2014 demonstrated that there had been 230 analyses of cesarean section births using the Robson classification, encompassing over 33 million women from 31 countries [14].

In the first half of the 20th century, a woman with a history of cesarean section had a good chance for the next vaginal delivery [21]. Currently, after cesarean section in the low segment, the chance for a subsequent vaginal birth is much lower. This is because an increasing number of women with a history of low segment cesarean section do not consent to natural labor.

Fig. 2 Relative contributions of individual Robson groups to the CS rate
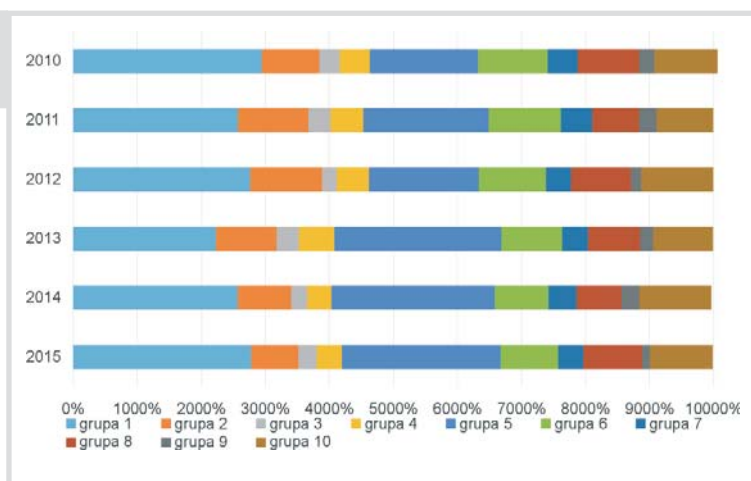
Fig. 3. Number of cesarean sections and natural deliveries in all Robson groups in 2010–2015
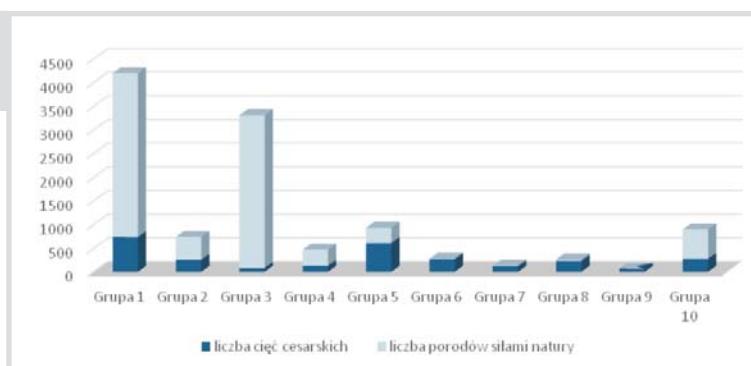
Tab. 3. Relative rate of cesarean sections in individual Robson groups in the Specialist Hospital in Wałbrzych (2010–2015)

Robson group	CS rate in 2010–2015 in groups	2010 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	Absolute change (%)	Relative change (%)
1.	17,6	16,3	14,1	16,7	17,1	20,8	21	4,7	33,3
2.	35,2	34,4	33,3	36,6	36,4	38,6	37,2	2,8	8,1
3.	2,5	2,6	2,7	1,8	3	2,3	2,7	0,1	3,9
4.	27,4	23,4	24,7	31,4	30,9	33,9	23,5	0,1	0,4
5.	65,6	53	57,6	59,5	66,3	75,3	77,4	24,4	46
6.	97,9	100	93,9	95,8	100	97,7	100	0	0
7.	90,2	88	86,9	94,4	100	92	83,3	-3,6	-4,1
8.	87,8	93,7	83,3	85,4	84,1	92,5	87	-6,7	-7,2
9.	100	100	100	100	100	100	100	0	0
10.	31,4	30,1	29,3	31,4	29,6	34,9	32,1	2,1	7

The results obtained in the present study that show an increasing contribution of Group 5 to the overall cesarean section rate are in line with global data obtained in analyses of M. Robson et al. [15,16,22] and other authors [23,24].

The best way to reduce the rate of cesarean section births in this group and in the entire population is to prevent primary cesarean deliveries. This dependence, at the level of 97–99%, has been demonstrated in recent studies [18,24,25]. This is confirmed in own observations, according to which nulliparous women with single term pregnancy (Groups 1 and 2) had greater contribution to the overall cesarean section rate than women with a previous cesarean section (Group 5). Decisions about the primary cesarean section should be made by an experienced obstetrician, and optimization of obstetric indications is an even more important issue [10,26]. These conclusions were also drawn from the 35th retrospective analysis of cesarean section births conducted in 2011 in the National Maternity Hospital in Dublin, Ireland by Brennan et al. [25]

Indications for the primary cesarean delivery should be issued by a very experienced obstetrician, and the procedure should be conducted only on the basis of medical indications. This is particularly important in the light of discussions on the safety of natural delivery after cesarean section [25,26]. This is also shown by own data – a 46% increase in the rate of cesarean sections in women with previous CS from 2010 to 2015 (Group 5).

The results of this analysis consistently show that the greatest contribution to the total cesarean section rate over the entire study period (2010–2015) belonged to the same two groups: Group 1 and 5 (nulliparous women with term cephalic pregnancy in spontaneous labor and multiparous women with at least one uterine scar, with term cephalic pregnancy). Moreover, a significant increase in the contribution of Group 5 (multiparous women with a history of cesarean section) to the overall rate of cesarean sections was noted.

Multiparous women without a previous uterine scar, with single cephalic term pregnancy in spontaneous labor (Group 3) were the second most numerous group, but the in-group cesarean section rate was very low – 2.5%, which was similar to the rates observed in other centers. However, data from centers in South America show that the CS rate in this group was 9.9% [16]. Additionally, next to Group 9, this group constitutes a tool for evaluating data collection quality. It is said that a cesarean section rate over 3% in this group results from improper data collection or performing cesarean sections without medical indications [18].

In Group 4 (multiparous women with induced labor or pre-labor CS), the rate of cesarean section births amounted to 27.4%, and was significantly higher compared with the results published earlier (ranging from 12% to 23%) [17,22,23]. A high rate of cesarean sections in this group, and in Group 2, may reflect higher frequency of high-risk pregnancies associated with the tertiary level of our Center.

Breech presentation groups (Group 6 and 7) were characterized by the highest rates of cesarean sections in all 10 Robson groups. This results from management recommendations of most societies, including the Polish Gynecologic Society. Despite this, due to their low sizes, these groups have a low contribution to the overall rate of cesarean sections (the sixth and eighth largest contribution).

The sizes of Group 8 (all women with multiple pregnancies) and Group 10 (all women with a preterm cephalic pregnancy) were higher than the national average, which might also be associated with the tertiary level of our Center.

The analysis of cesarean sections using the Robson classification and the possibilities of subdividing the existing groups as well as the analysis of indications in selected groups are a part of a new philosophy in reviewing the results of each maternity unit in a standardized way. This enables proper interpretation of obstetric care and allows clinicians to self-evaluate and improve on the basis of their own results [16].

CONCLUSIONS

It seems that all attempts to rationalize the cesarean section rate should focus on proper classification of women with a history of cesarean section (Group 5) to natural childbirths. The number of women with a history of cesarean section that do not consent to natural labor is increasing markedly.

The optimization of medical indications for the primary cesarean delivery, including particularly extra-obstetric ones (Group 1 and 2), is a significant matter since this will decrease the number of women with a history of cesarean section (Group 5).

REFERENCES

1. United Nations, Millenium development goals and beyond 2015. www.un.org/milleniumgoal.
2. Appropriate technology for birth. *Lancet* 1985;2:436–7.
3. **Declerq E, Young R, Cabral H, Ecker J.** Is a rising cesarean rate inevitable? Trends in industralized countries, 1987 to 2007. *Birth*. 2011;38(2):99-104.
4. **Ye J, Betran AP, Vela MG et al.** Searching for the Optimal Rate of Medically Necessary Cesarean Delivery. *Birth.* 2014;41(3):237-43.
5. **Villar J, Valladoes E, Wojdyla D et al.** Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global Surrey on maternal and perinatal health in Latin America. *Lancet* 2006;367:1819–29.
6. **Althabe FA, Sosa C, Belizan** JM **et al.** Caesarean section rates and maternal and neonatal mortality in low, medium and high-income countries: an ecological study. *Birth* 2006;33:270–6.
7. **Vogel JP, Betrán AP, Vindevoghel N et al.** On behalf of the WHO Multi-Coun−try Survey on Maternal and Newborn Health Research Network. Use of the Robson classification to assess caesarean section trends in 21 countries: a secondary analysis of two WHO multicountry surveys. *Lancet Global Health* 2015;3(5):e260-70.
8. **Declercq E, Menacker F, MacDorman M.** Maternal Risk Profiles and the Primary Cesarean Rate in the United States, 1991–2002, *American Journal of Public Health.* 2006;96,5:867-872.
9. **Macfarlane A, Blondel B, Mohangoo A et al.** Wide differences in mode of delivery within Europe: risk-stratified analyses of aggregated routine data from the Euro-Peristat study. BJOG: an international journal of obstetrics and gynaecology. *Br J Obstet Gynaecol* 2015. DOI: 10.1111/1471-0528.13284.
10. **Suchocki S**. Jak ograniczyć epidemię cięć cesarskich? *GinPolMedProject* 2012;2(24):9-16.
11. **Pomorski M, Wiatrowski A, Fuchs T i wsp.** Analiza porównawcza wskazań do cięć cesarskich w ośrodku III stopnia referencyjności w latach 2002 oraz 2007. *Perinat Neonat Gin* 2008;1,1:19-22.
12. **Torloni MR, Betran AP, Souza JP et al.** Classifications for cesa − rean section: a systematic review. PLoS ONE. 2011; 6(1):e14566.
13. **Robson MS**. Classification of cesarean section. *Fet Matern Med Rev* 2001;12:23–39.
14. **Betran AP, Vindevoghel N, Souza JP et al.** A Systematic Review of the Robson Classification for Caesarean Section: What Works, Doesn't Work and How to Improve It. PLoS One. 2014;9(6):e97769 doi: 10.1371/journal.pone.0097769 [PMC free article] [PubMed].
15. **Kelly S, Sprague A, Fell DB et al.** Examining caesarean section rates in Canada using the Robson classification system. *J Obstet Gynaecol Can* 2013;35(3):206–14.
16. **Robson M, Murphy M, Byrne F.** Quality assurance: The 10-Group Classification System (Robson classification), induction of labor, and cesarean delivery. *International Journal of Gynecology and Obstetrics* 2015;131:23−27.
17. **Betrán AP, Gulmezoglu AM, Robson M et al.** WHO global survey on maternal and perinatal health in Latin America: classifying caesarean sections. *Reprod Health* 2009;6:18.
18. **Brennan DJ, Robson MS, Murphy M, O'Herlihy C**. Comparative analysis of international cesarean delivery rates using 10-group classification identified significant variation in spontaneous labour. *Am J Obstet Gynecol* 2009;201:308.e1–e8.
19. World Health Organization. WHO Statement on Caesarean Section Rates. WHO/RHR/15.02. Geneva: WHO; 2015. http://apps.who.int/iris/bitstream/10665/161442/1/WHO_RHR_15.02_eng.pdf?ua=1.
20. **Farine D, Shepherd D.** Classification of caesarean sections in Canada: the modified Robson criteria. *J Obstet Gynaecol Can* 2012;34(10):976–83.
21. **Paul RH, Miller DA.** Cesarean birth: how to reduce the rate. *Am J Obstet Gynecol* 1995;172:1903–11.
22. **Robson M.** National Maternity Hospital Dublin. Labour and delivery summary for the year 2010. Dublin: National Maternity Hospital; 2011; Availabe from: http://www.nmh.ie/_fileupload/Annual%20Reports/NMH2011%20Final%20New.pdf.
23. Perinatal Services BC. Examining cesarean delivery rates in British Columbia using the Robson Ten Classification. Part 1: Understanding the Ten Groups. Vancouver, BC; December 2011, Available from: http://www.perinatalservicesbc.ca/NR/ rdonlyres/3CE464BF-3538-4A78-BA51-451987FDD2EF/0/ SurveillanceSpecialReportRobsonTenClassificationDec2011. pdf.
24. **Stavrou EP, Ford JB, Shand AW et al.** Epidemiology and trends for Caesarean section births in New South Wales, Australia: a population-based study. *BMC Pregnancy Childbirth* 2011;11:8.
25. **Brennan DJ, Murphy M, Robson MS, O'Herlihy C.** The singleton, cephalic, nulliparous woman after 36 weeks of gestation: contribution to overall cesarean delivery rates. *Obstet Gynecol.* 2011;117(2 Pt 1):273-9 (ISSN: 1873-233X).
26. **Poręba R.** Cięcie cesarskie – korzyści i zagrożenia. *GinPolMedProject* 2007;3;1:22-34.