

# Who Indicates Caesarean Section in Romania? A Cross-Sectional Survey in Tertiary Level Maternity on Childbirth Patients and Doctors' Profiles

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## Research article

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# Abstract

*Background.* C-section rate in Romania is the second-highest in the European Union (44.1% in 2017) and the number of C-sections performed in the country increased by 32.1% between 2009 and 2017. We offer for the first time insights into the practice and perceptions of patients and doctors in Romania towards delivery mode and on health system particularities that lead to increased numbers of C-sections. The objectives are 1) to compare the preferred modes of birth among women 2) to draw a profile of patients in whose case the actual birth method is different from the preferred method, and 3) to outline a profile of doctors and patients based on the modes of delivery.

*Methods.* We conduct a statistical analysis based on an observational, analytical, and cross-sectional survey on 117 singleton pregnant women more than 36 weeks in spontaneous labor in tertiary level maternity in Romania. Various statistical tests have been used to indicate statistical significance.

*Results.* Our results show an increase of almost 58% in actual childbirth mode against preferred childbirth by C-sections, rather difficult to justify based only on medical emergencies. There are 22 patients with non-concordant C-section indications between preferred and actual mode of birth, 7 of them (31.8%) preferred natural birth and 15 (68.2%) preferred C-section. Scarred uterus is the most frequent medical indication for C-section (30.7%). Overall, birth and birth pain assessment correlates to preferred and actual delivery modes, but respondents distinguish clearly between birth pain alone and their overall birth experience. The profiles of patients with concordant and non-concordant delivery modes are different, and indicate a statistically significant difference between the preference for delivery and actual birth method. Patients who preferred vaginal birth, but gave birth by C-section, are mature and more educated women, in the middle to the high-income category, mostly attended by consultant doctors and specialists. Doctors' profiles show that specialists and consultants attend the largest share of non-concordant births, while residents and young senior doctors attend mostly vaginal births.

*Conclusions.* We emphasize health system particularities in Romania as triggers of high C-section rates that favor women's preferences against C-section medical indication.

## 1. Background

Evidence from database registries shows a considerable increase in birth rates by cesarean section (C-section) use, especially in urban areas of the developing world[1,2]. In 2014, Romania reported a C-section rate of 47.2%, an almost 10 times increase compared to 1990 (4.9%) [3,4]. The rate declined slightly in 2017 to 44.1%, but is the second-highest in the EU. after Cyprus (54.8%). The number of C-sections in Romania between 2009 and 2017 increased by 32.1%, and when reported to 100,000 inhabitants, the increase is 44.11% [5].

Although WHO does not any longer recommend an ideal rate for C-sections, the range of 10-15% at the population level is used pragmatically for international monitoring aiming at ensuring maternal and perinatal health benefits and reduce potential harms[2,6]. Currently, C-sections are not performed exclusively in emergencies to save the mothers' or newborn's lives. Many other factors than medical necessity influenced the choice of cesarean birth: from emotional factors to financial, moral, and ethical ones [3]. Psychological factors include comfort level satisfaction, inappropriate labor assistance, medical complications, or operative vaginal deliveries. Contrary to scientific evidence, many women and doctors who prefer C-sections perceive it to be safer for the baby and for themselves because of the risk of malpractice claim [7-10]. These considerations raise concerns about optional C-sections, without obstetrical indication, performed at the mother's request or sometimes at the doctor's recommendation without strong medical evidence. The recent literature identifies several factors (such as maternal, medical, or social factors) that could optimize the use of C-section [11,12]. There is no evidence that C-sections had improved maternal and fetal mortality and morbidity. Aside from higher costs, C-sections could lead to severe maternal medical complications, especially in the event of subsequent surgical intervention (postpartum hemorrhage, morbidly adherent placenta, ectopic pregnancy on the cesarean scar, symptomatic isthmocele[13-17]. The C-section could lead to a neonatal increase in mortality[18], short-term severe neonatal complications (i.e., respiratory distress syndrome)[19], and long-term

childhood outcomes, i.e., asthma [20,21]. Moreover, the increasing trend in performing elective C-sections could put a strain on hospitals' material and human resources.

Betrán et al. identify two categories of interventions to reduce unnecessary C-sections: clinical (obstetrical) interventions and non-clinical interventions that could overlap each other [6]. Non-clinical interventions target the psychosocial level of women and childbirth education, but also guidelines for health-care professionals and second-opinion on C-sections. At the health-care organizations level, they refer to implementing strategies aiming at midwives-provided care, health-care resources redistribution, and long-term strategic planning[22].

The decision on delivery method should be based on objective information regarding medical indications while also weighing the benefits and risks of the C-section surgery for both mother and fetus.

The objectives of this study are 1) to compare the preferred modes of birth among women who deliver in a tertiary maternity hospital; 2) to draw a profile of patients in whose case the actual birth method is different from the preferred method, and 3) to outline a profile of doctors and patients based on the modes of delivery.

## 2. Methods

We conducted an observational, analytical, and cross-sectional non-anonymous survey based on a questionnaire distributed in a tertiary level maternity hospital in Bucharest, Romania, in February 2014, in the framework of a research grant (Grant no. 20062, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania, 2014-2016) [Additional file: Distributed questionnaire]. The questionnaire was distributed to all full-term pregnant women presenting in spontaneous labor when admitted to the labor ward. Inclusion criteria were more than 36-weeks gestational age, singleton pregnancy, expecting a child without assessed congenital anomalies, and understanding written Romanian. Until 2018, at birth, the attending physician (available 24/7) was called, disregarding of the work schedule. Starting with 2019, and especially after the public debate initiate by the Health and Family Commission of the Romanian Parliament from 27 November 2019 adopted by many public hospitals, the delivery in the hospital takes place with the attending physician during working hours (8 am - 3 pm), and with doctors from the night shift team outside those hours.

Participation was voluntary, participants having the freedom to refuse to answer a question; the study was approved by the Hospital's Commission of Ethics. All mothers discussed with their doctors the birth plan in the third semester/ before birth.

The questionnaire has two main parts and 29 questions. Before birth, patients admitted to the Delivery Room answered the first part of the survey (16 questions). The same patients were interviewed and completed the second part of the questionnaire before discharge one or two days after delivery (13 questions).

The first part of the questionnaire had the following structure: 6 demographic questions, 6 questions about patients' behavior during pregnancy monitoring (laboratory tests, ultrasound screening, and attendance to parenting classes), 4 questions about patients' preferred delivery method (for the index pregnancy), C-section indications, and the choice of epidural anesthesia.

The second part of the questionnaire has 13 birth experience questions regarding the actual delivery mode, newborn's weight and Apgar score, the use of epidural anesthesia, childbirth or postpartum complications, and patients' assessments of their birth experience and pain during labor, and medical personnel performance. The "preferred" method of delivery in the questionnaire refers to what the patient wants before entering labor and reaching the labor ward. The "actual" delivery method refers to how delivery happened and must reflect the medically recommended method.

A 1 to 10 scale was used to assess birth experience and pain during labor (1 – worst; 10 - best), as well as doctors' (obstetrician and anesthetist) and midwives' performance (1-worst; 10 – best). We have transformed patients' assessments into Very good to Not satisfactory categories, as follows: 9 and 10 for Very good, 7 and 8 for Good, 5 and 6 for Satisfactory, and 1 to 4 for Not Satisfactory.

The original questionnaire was developed in Romanian and is the first time this type of investigation is being conducted in a Romanian health-care facility. We also used medical data from the hospital's birth registries on the level of doctors that attended the patients, time spent by patients in the labor room, time of birth, and obstetrical indications of C-section. Patients' responses and the information from birth registries were stocked in a Tibco Statistica 13.3 database.

In the hospital, doctors conducted labor assisted by midwives in supporting families during labor and the postpartum period. The obstetrician monitors the fetal status and labor progression, cares for and assists women in labor, and performs C-section. Obstetricians write partographs and other medical observations. Midwives take patient samples, pulses, temperatures and blood pressures, monitor and administer medication, injections, and intravenous infusions during labor, and monitor the fetus by cardiotocography. The first quick examination of the newborn is performed in the delivery room by the neonatologist who notes the Apgar score at 1 and 5 minutes.

We conduct the statistical analysis using the Tibco Statistica 13.3 software. Firstly, we perform descriptive statistics of the responses; for qualitative variables, we present frequencies in absolute and relative form, and for quantitative variables (scores of patients' assessments), data is shown in terms of mean and standard deviation. We compared preferred and actual modes of delivery using the Chi-square and V-square tests. At the same time, we tested the t-test for independent samples differences in mean scores for statistical significance. Then, we use Mc-Nemar Non-parametric significance tests for two dependent samples (known as the symmetry McNemar chi-square test for The analysis of the matched samples presenting the choice of pregnant women before delivery and the actual method of birth (the after effect). A p-value of less than 0.05 ( $p \leq 0.05$ ) is statistically significant.

### 3. Results

During February 2014, there were 168 deliveries at the maternity, out of which 61 spontaneous vaginal deliveries - including 10 cases of operative vaginal deliveries (forceps in 8 cases and vacuum in 2 cases) - and 107 C-section deliveries. 69.6% of the women (117) consented to participate and responded to the questionnaire. The demographic characteristics of the 117 women are presented in Table 1. The majority of respondents were between 26 and 35 years of age (63.3%), work in the private sector, either as employees or business owners (69.3%), and are graduates of higher education (67.5%). 63.9% of them are in the middle-income category (64.1%) at the time of the survey, are married (81.2%), and live in urban areas (79.5%).

**Table 1. Demographic characteristics of survey respondents**

Characteristics of respondents	Number of answers and percentage (n=117)
<b>Age</b>	
16-25 years	25 (21.4%)
26-30 years	47 (40.2%)
31-35 years	27 (23.1%)
36-40 years	15 (12.8%)
>40 years	2 (1.7%)
No answer	1 (0.8%)
<b>Workplace</b>	
Government employee	21 (17.9%)
Business owner	3 (2.6%)
Private employee	78 (66.7%)
Unemployed	13 (11.1%)
No answer	2 (1.7%)
<b>Graduated educational level</b>	
Tertiary education	79 (67.5%)
Secondary education	27 (23.1%)
Primary education	7 (6.0%)
Professional school	3 (2.6%)
No answer	2 (0.8%)
<b>Income (per month)<sup>1</sup></b>	
Below 1.000 lei (Low income)	23 (19.7%)
1,000 – 5,000 lei (Middle income)	76 (64.1%)
5,000 – 10,000 lei (Upper middle income)	6 (5.1%)
>10.000 lei (High income)	2 (1.7%)
No answer	12 (9.4%)
<b>Marital status</b>	
Married	95 (81.2%)
Single	7 (6.0%)
In a partnership	13 (11.1%)
No answer	2 (1.7%)
<b>Residence</b>	
Urban	93 (79.5%)
Rural	24 (20.5%)

<sup>1</sup> Income classes are calculated on the gross and net earnings per person in Romania in 2014 (<https://insse.ro/cms/en/content/earnings-1938-annual-series-0>)

### 3.1. Preferred versus actual mode of delivery

22.2% (n=26) of respondents had pursued parenting classes, and 95.7% (n=112) mentioned having undergone laboratory tests. 98.30% (n=115) declared to have attended more than four medical consultations, and 92.3% (n=108) mentioned a full ultrasound screening. The overwhelming majority of women reported that prenatal care screening recommendations came from their obstetrician (78.6%), 3.4% mention their family doctor, and 17.1% indicate that both doctors recommended them.

In the third trimester of pregnancy, for all women, a birth plan and indicated mode of delivery were established with the doctor. In the birth plan, the methods of analgesia are explained, and who can participate in the childbirth. Patients may state their options during the vaginal birth, or state cesarean delivery, including C-section on request. The C-section on request is not reimbursed by the National Health Insurance House in Romania, and it cannot be specified in the partograph.

On the day of labor ward admission, 70.1% (n=82) preferred vaginal birth, 28.2% (n=33) preferred C-section and two women (1.7%) did not respond to this question. Younger and more educated women, mostly living in urban areas and in the low to middle-income categories, show a higher preference for a vaginal birth (Table 2).

**Table 2. Respondents' characteristics depending on the mode of delivery choice**

Preferred mode of delivery	Number of respondents	Age (years)			Residence		Income level			Education		
		< 35	>35	NA <sup>1</sup>	Urban	Rural	<5.000 lei	>5.000 lei	NA <sup>1</sup>	Tertiary	Primary/ Secondary	NA <sup>1</sup>
Vaginal birth	82 (70.1%)	70	11	1	64	18	69	5	8	53	28	1
C-section	33 (28.2%)	27	6	0	27	6	27	3	3	24	9	0
NA	2 (1.7%)	2	0	0	2	0	2	0	0	2	0	0
Total	117 (100%)	99	17	1	93	24	98	8	11	79	37	1

<sup>1</sup> NA – no answer

86 women respond to both the question of parenting classes during pregnancy and on the preferred mode of delivery. 75.6% of respondents (62 women) that prefer vaginal birth declare of not having attended parenting classes during pregnancy compared to 72.7% of respondents that prefer C-section (24 women).

Out of the 117 respondents, 55.6% (n=65) had vaginal births and 44.4% (n=52) had C-sections (Table 3). For 19 cases, the preferred way of delivery was different from the actual mode of delivery. None of the women who choose C-section had undergone vaginal birth.

**Table 3. Preferred versus actual mode of delivery**

Preferred mode of delivery	Actual mode of delivery	
	Vaginal birth	Caesarean section
Vaginal birth (82=100%)	65 (79.3%)	17 (20.7%)
Caesarean section (33=100%)	0	33 (100%)
NA <sup>1</sup> (2=100%)	0	2 (100%)
Total = 117	65 (55.6%)	52 (44.4%)

<sup>1</sup> NA – no answer

The non-parametric significance tests show that the initial preferences of women for vaginal birth versus C-section are significantly different, and the highest preference refers to vaginal birth – Chi-square test value=60.61,  $p<0.05$ ). The V-square test, which corrects for sample size and uncertainty, confirms the results of the Chi-square test (value=59.64,  $p<0.05$ ) The McNemar Chi-square test shows a significant difference (value=9.81,  $p<0.05$ ) between the preference for a delivery method and the actual birth method.

Concerning the patients' understood indication for C-section, the profile of the 41 respondents is the following : young (83.7% are aged below 35 years), living in urban areas (83.7%), have lower to middle income (83.7%) and more educated (76.7% are graduates of tertiary education). Out of them, 16 (39%) prefer natural birth, and 25 (60.9%) prefer C-section. Of the 16 women that prefer natural birth and state an indication for C-section, 3 (18.7%) give birth by vaginal way, and 13 (81.3%) give birth by C-section. All 25 (100%) women that prefer C-section and declare an indication for C-section give birth this way.

6.8% (n=8) prefer C-section on request. They are young (aged below 35 years), more educated (graduates of higher education), and 6 out of 8 have middle to high income and live in urban areas. 5 out of 8 are married, 2 are in a partnership and all were giving birth to their first child. 7 out of these 8 women state they do not have an indication for C-section, and 1 declares an indication. For all 8 women, C-section indications are not concordant when we compare patients' indication and doctors' indication in medical records.

Scarred uterus is the most frequent medical indication for C-section: it is mentioned in 15 womens' medical records (30.76%) out of 52 women that gave birth by C-section. One 35 years old secundipara at fully dilatation with scared uterus preferred vaginal birth – and after 1 hour in the labor ward delivered by cesarean section for cephalopelvic disproportion , a baby weighted 3800 g. The remaining 14 women preferred C-section and gave birth by C-section.

On the 4 cases of fetal breech presentation during labor, C-section was performed. One term breech primipara preferred vaginal birth but the doctor recommended C-section (baby birth weight = 3000 grams) and a trial vaginal delivery was not allowed. Taking out the indications for scarred uterus and breech presentation, there are 22 non-concordant patients with non-concordant C-section indications between preferred and actual mode of birth, 7 of them (31.8%) preferred natural birth and 15 (68. 2%) preferred C-section.

Many types of medication are available to ease pain during labor or delivery: epidural analgesia, intramuscular opioids, nitrous oxide, local anesthesia, or pudendal block. Except for the epidural anesthesia which is fitted by the anesthetist, all the others are used routinely in the maternity at the request of the patient and the indication of the obstetrician. For C-section, the anesthetist uses spinal anesthesia or combined spinal-epidural anesthesia.

Almost half of women that prefer vaginal birth (49=59.8%) and 48.5% of women preferring C-section choose epidural anesthesia. The preferred versus actual mode of delivery is correlated with the patients' option for epidural anesthesia. 59.5% (n=49) of women that preferred vaginal birth also preferred epidural anesthesia; 38 of them (77.6%) had vaginal birth, while 11 (22.4%) had C-section.

18 out of 33 women (54.5%) that prefer C-section are primipara. All multiparous women (n=7) prefer vaginal birth. Primiparous and secundiparous women preferred and had vaginal birth (58). 32 C-sections were performed on primiparas (14 for women that preferred vaginal birth initially and 18 for women with C-section preference), and 18 on secundiparas.

The professional doctor's degree is an essential factor from the perspective of the preferred versus the actual type of birth. There were 58 (49.6%) patients attended by consultants, 29 (24.8%) attended by specialists, 18 (15.4%) by young senior doctors, and the remaining 12 (10.3%) by residents. Differences between preferred versus actual birth modes of delivery occurred for consultants (8 cases), specialists (7 cases), and young senior doctors (2 cases).

Time spent in the labor room, collected from patients' medical records, was between 30 minutes (13 women = 11.2%) to more than 24 hours (1 woman = 0.9%). We used a cut-off of 5 hours to divide the patients; 46.1% of our respondents spent more than 5 hours in the labor room, while 53% of them spent less than 5 hours.

52 women (44.4%) gave birth during working hours (DW) (8 a.m. – 3 p.m.), 39 (33.3%) occurred during the evening shift (AOD - 3 to 10 p.m.) and 26 (22.2%) during the night shift (AON - 10 p.m. to 8 a.m.) There are more C-sections than vaginal births performed DW (30 against 22), but more vaginal births than C-sections were performed after working hours, either AOD (25 against 8) or AON (18 against 5). The concordant births (the same mode of delivery preferred by the patient and performed) took place mostly AOD, for vaginal births (25), but DW for C-sections (23) – Figure 1.

Note: DW – during working hours; AON – after working hours but daytime (3-10 pm); AON – after working hours during night time (10 pm – 8 am)

**Figure 1. Preferred versus actual mode of delivery and birth times**

*3.2. Modes of delivery and patients' birth perception*

To a large extent, respondents have a good and very good assessment on giving birth in the hospital assessed on a scale 0-10 – 64.1% (n=75) offer a grade of 9 or 10 out of 10 (Very good), and 17.9 % (n=21) grade giving birth by a 7 or 8 (Good). Only 3 patients (2.6%) offer a non-satisfactory grade (below 5 out of 10). Similarly, 41 patients (35.0%) rate the pain felt during birth as having very low intensity (Very good), and 26 (22.2%) rate the pain as having low intensity (Good). Still, 18 patients (15.4%) appreciate the pain as having very high intensity (Not satisfactory), and 14 consider it intense (12.0%) and grade it as Satisfactory.

The two assessments are highly correlated – see Table 4, as most patients that rate the birth with Very good and Good, also evaluate the pain on high satisfaction note (63=53.8%). Mean scores for birth assessment are different ( $p \leq 0.05$ ) for Very good and Satisfactory, as well as between Good and Satisfactory birth pain assessments.

**Table 4. Means of birth assessment depending on birth pain assessment categories**

Birth pain assessment	Very good	Good	Satisfactory	Not satisfactory
Mean of birth assessment scores	9.725	8.846	7.416	8.555
Standard deviation of birth assessment scores	1.320	0.967	2.595	2.678

Note: Very good: 9 and 10; Good – 7 and 8; Satisfactory: 5 and 6; Not satisfactory: 1 to 4. Higher standard deviation indicates a wider range of scores' spread.

Both birth and birth pain assessments are linked to the preferred and actual modes of delivery. 81.7% of women that preferred vaginal birth and 81.8% of women that preferred C-section rated birth with Very good and good. Proportions are very similar when we consider the actual mode of delivery: 83.1% of women that had vaginal birth and 80.8% of women that had C-section rate their births under the Very good and Good categories.

Concerning birth pain, only 63.4% of women that preferred vaginal birth, and 42.4% of women that preferred C-section rated birth with Very good and Good. 27.3% of women that preferred C-section before labor are not satisfied with their birth pain. 64.6% of women that had vaginal birth and 48.1% of women that had C-section rate their birth pain under the Very good and Good. 23.1% of patients that delivered by C-section rate their birth pain as Not satisfactory. Patients distinguish clearly between birth pain alone and their overall birth experience; they rate pain on the lower part of the scale, although birth experience is evaluated on a higher note, regardless of their preferred versus actual mode of delivery. Patients' mean scores for their birth pain depending on their preferred mode of delivery are 7.535 (SD=2.756) for vaginal birth and 6.111 (SD=3.745), which means that patients that would have chosen vaginal birth assess better their birth ( $p \leq 0.05$ ). The mean scores based on the actual mode of delivery are 7.625 (SD=2.666) for vaginal birth and 6.511 (SD=3.501) for C-section birth ( $p \leq 0.05$ ).

The concordance between modes of delivery (preferred versus actual) plays a role in patients' assessment of their birth and birth pain. The percentage of patients that gave birth by their desired mode and rate their birth experience well and very well is 82.8%, against only 75% for patients that gave birth by C-section but would have preferred vaginal birth. 57.6% of patients whose modes of delivery are concordant rate birth pain as Good and Very good, compared to 56.3% of patients that gave birth by C-section but stated a preference for vaginal birth. Women with concordant modes of delivery have a slightly lower average score than women that gave birth by the other mode - 8.855 (SD=1.693) to 9.000 (SD=2.449), not statistically different -, but birth pain scores are identical for both categories: for vaginal birth 7.143 (SD=3.101) and C-section 7.143 (SD=3.254).

The epidural anesthesia during labor changes patients' perception of birth significantly, but not of birth pain. The average score of birth of patients with epidural anesthesia was 9.22 (SD=1.15) and the average score of patients without anesthesia was 8.35 (SD=2.30) - both in the good category ( $p \leq 0.05$ ). Albeit, the average score for birth pain of patients without epidural anesthesia is higher than the score patients without anesthesia (7.57 (SD=2.94) against 6.79 (SD=3.08)).

83% (n=39) women that spent less than 5 hours in the labor room rate their birth as Very good compared to 61.4% (n=35) women that spent more than 5 hours in the room. Less time spent in the labor room leads to a better assessment of birth experience - 9.15 (SD=1.73) against 8.63 (SD=1.80) -, but a longer time spent in the labor room means a better score for birth pain - 7.73 (SD=2.74) against 6.57 (SD=3.29).

The relationship between birth assessment and birth time during the day is shown in Figure 2. Women that gave birth DW rate higher their birth (74.4% rate birth as Very good), followed by women that gave birth AOD (69.4%), and patients that gave birth AON (68.2%). The highest percentage of women that are not satisfied with their births is also found for births DW (10.6%). Birth pain ranking is maintained for very satisfied patients: births AOD (47.1%), births DW (38.4%), and births AON (32%). If we include Good assessments of birth and birth pain, women that gave birth AON were the most satisfied by their birth experience followed by patients that gave birth AOD, and patients that were giving birth DW. Birth pain is best perceived by women giving birth AOD, followed by women giving birth AON and women giving birth DW. The largest proportion of unsatisfied women by their birth pain is found for patients that gave birth DW. The average scores of patients' assessment of their birth and birth pain depending on the time of birth indicate that women rate the highest births AON (9.04) compared to births during daytime (8.83 is the score for DW and AOD). Birth pain is best rated for AOD (7.73), followed by AON (7.33) and DW (6.59).

Note: DW – during working hours; AON – after working hours but daytime (3-10 pm); AON – after working hours during night time (10 pm – 8 am)

### Figure 2. Birth time and birth assessment

Doctors' professional categories, birth experience, and birth pain scores are compared in Figure 3. Young senior doctors and residents receive the best scores for birth – 9.00 (SD=1.46) and 9.08 (SD=1.08) - and birth pain – 8.06 (SD=1.98) and 7.82 (SD=2.32). Specialist doctors have the lowest mean score for birth – 8.80 (SD=1.86), but only a slightly higher mean score for birth pain compared to consultants – 7.04 (SD=3.17) against 6.72 (SD=3.48).

### Figure 3. Mean scores of birth and birth pain and doctors' professional categories

### *3.3. Relationship between patients and medical personnel in the delivery room*

Patients rate the obstetricians highly – mean score 9.93 (SD=0.35). Anesthetists are appreciated with a mean score of 9.69 (SD=0.80) – to note that 32 patients did not grade the anesthetist. In the case of midwives, 88.9% are very good rated, 6% are rated good, and one patient rates the midwife as satisfactory – mean score 9.73 (SD=0.76). The scores are significantly different ( $p \leq 0.05$ ) between obstetricians and anesthetists, as well as between obstetricians and midwives.

The patient that offered lower ratings for the obstetrician delivered by vaginal birth, as desired, and rated the birth with an 8 and birth pain with a 7. The birth occurred DW and the woman spent 3 hours in the labor room. She is a young secundipara, working in the private sector and the high-income category. She rated the consultant 7/10 and the midwife 6/10. The patient graded the anesthetist doctor with 5/10, and the obstetrician with 10/10, preferred a C-section, and this was the actual mode of delivery. She rated birth pain as Not satisfactory and birth as Satisfactory. The woman is in the middle-income category and working in the public sector.

### *3.4. Patients' profiles regarding preferred versus the actual way of birth*

Patients with concordant vaginal births are younger, in the middle to low-income category, less educated, but have undergone mainly through laboratory tests and ultrasound screening during their pregnancies (Table 5). They were attended mostly by consultants and preferred epidural anesthesia. They assessed birth experience as Good to Very good and birth pain as good.

Patients with C-section as preferred and actual mode of delivery (concordant) are in an elder group, with middle income mostly, educated. They had laboratory tests, and all of them underwent a full ultrasound screening. They are attended mostly by consultants, but also specialists, and are the group with the lowest preference for epidural anesthesia. They highly assess their birth but rate the birth pain as satisfactory only.

The patients with non-concordant modes of delivery (they preferred vaginal birth, but gave birth by C-section) are mature women (mostly aged between 26 and 35 years old), in the middle to high-income category, more educated than the ones in the previous two groups (88.2% of them are graduates of tertiary education). Although almost all had laboratory tests during their pregnancies, 17.6% did not have a full ultrasound screening. Most preferred epidural anesthesia, and assessed their birth as Good to Very good and their birth pain as Good.

### *3.5. Doctors' professional degree and birth characteristics*

Resident and young senior doctors tend to be somewhat similar in profile – Table 6. They both attended younger patients, in the middle to the low-income category, which has undergone full sets of laboratory tests during pregnancy. Their birth is mostly vaginal and concordant, and they received Good to Very good assessment for deliveries and birth pain. They differ only concerning the percentage of patients with full ultrasound screening (83.3% for young senior doctors against 100% for residents) and time of births they attend (DW for residents, but DW and AON for young senior doctors).

Specialists and consultant doctors also share characteristics. The women they attend are more mature, in the middle to high-income category, mostly with higher education and with full prenatal test screenings. These doctors attend the largest share of non-concordant births. Their patients assess in a somewhat similar manner birth experiences and birth pain (Good to Very good for both types of doctors in case of birth; birth pain is considered Good to Very good for specialists, but only Good for primary doctors).

### **Table 5. Patients' profiles depending on preferred versus actual mode of delivery**

Note: DW – during working hours; AON – after working hours but daytime (3-10 pm); AON – after working hours during night time (10 pm – 8 am); Very good – 9 to 10; Good – 7 to 8; Satisfactory: 5 to 6; Not satisfactory: 1 to 4.

Characteristics	Concordant birth Vaginal birth	Concordant birth Caesarean section	Non-concordant birth Preferred: Vaginal birth Actual: Caesarean section
Age	<b>Younger</b> 67.6% below 30 years 40% in 26-30 age group	<b>Elder</b> 66.7% in 26-35 age group 6.4% in 31-35 age group 18.2% above 36 years	<b>Mature</b> 76.5% in 26-35 age group 52.6% in 26-30 age group
Income	<b>Middle to low income</b> 81.5% <5000 lei 56.9% 1000-5000 lei 24.6% <1000 lei	<b>Middle income</b> 81.8% <5000 lei 63.6% 1000-5000 lei	<b>Middle to high income</b> 88.2% 1000-5000 18.2% <1000 lei
Education	<b>Less educated</b> 58.5% higher education 30.7% high school 9% primary/gymnasium /professional school	<b>Educated</b> 72.7% higher education 9.1% primary/gymnasium/ professional school	<b>More educated</b> 88.2% higher education 5.9% primary/gymnasium
Laboratory tests during pregnancy	<b>Yes</b> 96.9%	<b>Yes</b> 93.9%	<b>Yes</b> 94.1%
Ultrasound screening	<b>Most</b> 90.8% full	<b>Full</b> 100%	<b>Least</b> 82.4% full
Type of obstetrician	<b>Consultant doctor</b> 46% Consultant (highest percentage) 18.4% Specialist 18.4% Young senior 16.9% Resident	<b>Consultant doctor and specialist</b> 60.6% Young senior 27.3% Specialist	<b>Consultant doctor and specialist</b> 47.1% Consultant 41.2% Specialist (highest percentage) 11.8% Young senior
Attendance to parenting classes	<b>Low</b> 21.5% attended	<b>Low</b> 24.4% attended (highest attendance rate)	<b>Low</b> 23.5% attended
Epidural anesthesia	<b>Preferred</b> 58.4%	<b>Less preferred</b> 48.5%	<b>Mostly preferred</b> 64.7%
Birth assessment	<b>Good –Very good</b> 56.9% Very good 26.1% Good 7.7% Not satisfactory (highest percentage)	<b>Very good</b> 75.8% Very good	<b>Good – Very good</b> 64.7% Very good
Birth pain assessment	<b>Good</b> 34.8% Very good 26.1% Good	<b>Satisfactory</b> 30.3% Very good 12.1% Good 27.3% Not satisfactory	<b>Good</b> 35.3% Very good 23.5% Good

Characteristic	Resident	Specialist	Consultant doctor	Young senior doctor
Patient age	Young 83.3% <30 years	Mature 65.5% 26-35 years	Elder 53.4% 26-40; 17.2% 36-40	Young 77.8% <30 years
Patient income	Middle to low 91.7% <5000 lei	Middle 79.3% <5000 lei 58.6% 1000-5000 lei	Middle to high 65.5% 1000-5000 lei 12.1% >5000 lei	Middle to low 94.4% < 5000 lei
Patient education	Tertiary 75% higher education	Secondary and tertiary 58.6% higher education 20.7% high school 20.8% primary/gymnasium /professional school	Tertiary 75.8% higher education	Secondary and tertiary 50% higher education
Laboratory tests	Full 100%	Almost full 96.50%	Almost full 93.10%	Full 100%
Ultrasound screening	Full 100%	Almost full 86.2% full	Almost full 96.6% full	Almost full 83.3%
Preferred versus actual mode of delivery	Vaginal birth and concordant 91.7% vaginal birth (concordant); 8.3% C-section (concordant)	Mostly vaginal birth; concordant and non-concordant 63.2% vaginal birth (concordant); 31.0% C-section (concordant); 24.1% non-concordant	Vaginal birth and C-section; mostly concordant 51.7% vaginal birth (concordant); 34.5% C-section (concordant); 13.8% non-concordant	Mostly vaginal birth; mostly concordant 66.7% vaginal birth (concordant); 16.7% C-section (concordant); 11.1% non-concordant
Indication for C-section	Very low 16.7%	High 51.7%	Low 34.5%	Low 33.3%
Epidural anaesthesia	Recommended 41.7%	Mostly recommended 51.7%	Highly recommended 58.6% Yes	Highly recommended 66.7% Yes
Time spent in labour room	Mostly >5 hours 58.33%	Almost equally 55.1% >5 hours 44.9% <5 hours	Almost equally 51.72% >5 hours 48.28% <5 hours	Equally 50% both >5 hours and <5 hours
Time of birth	Mostly DW 58.3% DW 25% AOD 16.7% AON	DW & AOD 37.9% DW 34.5% AOD 27.6% AON	DW & AOD 36.2% AOD 46.6% DW 17.2% AON	DW & AON 27.8% AOD 38.9% DW 33.3% AON
Parental classes	No 33.3% Yes	No 17.2% Yes	No 24.1% Yes	No 16.7% Yes (lowest percentage)
Birth assessment	Very good 100% VG&G 0% S&NS	Good to Very good 79.3% VG&G 65.6% VG 3.4% NS	Good to Very good 77.6% VG&G 60.3% VG 3.4% NS	Very good 72.2% VG 88.9% VG&G 0% NS 5.6% S
Birth pain assessment	Good to Very good 66.7% VG&G 41.7% VG 16.7% NS	Good to Very good 65.5% VG&G 31.0% VG 17.2% NS	Good 48.3% VG&G 32.8% VG 19% NS	Good to Very good 66.7% VG&G; 44.4% VG; 0% NS

## 4. Discussion

In our study, according to the initial birth plan, 28.2% of women expressed their preference for C-section, and 70.1% preferred a vaginal birth. After birth, data collected on the same patients shows that the percentage of C-sections increased to 44.4% showing a difference between actual versus preferred mode of delivery with an increase of 16.2 percentage points or 57.4%, in relative terms in favor of C-section. This may be considered difficult to justify based on medical emergencies during the birth process. The preference for C-section in our sample seems higher than that shown in other studies. A systematic review and meta-analysis of 38 studies on C-section rates in the middle- and high-income countries around the world found that only 16% of women in a great variety of countries and situations expressed a preference for C-section. A higher preference for C-section was reported in women with a previous C-section (29.4%), and those living in a middle-income country (22.1%) [23].

Patients' profiles depending on their preferred and actual modes of delivery, on the one hand, and on the obstetrician that attended their birth are highly relevant for a proper understanding of the relationship with health-care personnel, but also between pain and choice of delivery method. Patients that have preferred and delivered by the vaginal way are younger, in the middle to the low-income category, less educated, but have undergone prenatal screening. They were attended mostly by experienced consultants and preferred epidural anesthesia. Except for patients with scarred uterus indication, patients that have preferred and delivered by C-section (19 women) are younger (68.4% are aged below 30 years, and 31.6% below 25 years),

with middle income mostly (52.6%), more educated (57.9% are graduates of tertiary education), live in urban areas (84.2%), are married or in a partnership (84.2%), and had a full prenatal screening. They are attended by consultant and specialist doctors and are the lowest preference for the epidural. They highly assess their birth but rate the birth pain as satisfactory only. The profile of patients that have chosen vaginal birth and gave birth by C-section shows they are in the 26-35 years group, in the middle to the high-income category, more educated (88.2% graduates of tertiary education). Most of them preferred epidural anesthesia and noted Good to Very good birth and Good their birth pain.

Doctors' profiles show that specialists and consultants attend the largest share of non-concordant births, while residents and young senior doctors attend mostly vaginal births. There are no significant differences in the time spent in the labor room between doctors' categories, except residents that have the highest share of births beyond 5 hours (58.3%). But patients do not seem to differentiate their assessment of birth and birth pain depending on the type of doctor that attended their delivery.

A study from Sweden shows that patient's satisfaction is not influenced by the delivery method. The patients would have preferred to be involved in the decision of delivery method – given the fact that in Sweden, the doctor decides the delivery method and informs the patient[24]. In our study, patients' mean scores for their birth experience depending on their preferred mode of delivery is 8.743 (SD=1.843) for vaginal birth and 9.206 (SD=1.634), which means that patients that would have chosen C-section assess better their birth. At the same time, the mean scores based on the actual mode of delivery are 8.683 (SD=1.712) for vaginal birth and 9.133 (SD=1.841) for C-section birth.

We found a negative correlation between the time spent in the labor room and birth pain assessment. More women that spent less than 5 hours in the labor room (n=39, 83%) rate their birth as Very good compared to women that spent more than 5 hours in the labor room (n=35, 61.4%). Rating birth's pain, 35.5% of women that spent less time in the labor room have Very good ratings and 22.2% have Good ratings, while 47.2% of women that spent more than 5 hours in the labor room rate their birth pain as very good and 30.2% as Good.

To the best of our knowledge, this is the first survey about the preferred versus actual mode of birth in a Romanian public hospital. Many media outlets try to explain the large number of births by C-section as a sign of system corruption[25]. Also, in Romanian society, there seems to be a confusion between the provider's professional obligation to establish the indication of the birth path and the patient's consent, the patient's wish being substituted for the medical indication many times, as our study proves.

There seems to be a degree of awareness and mature consciousness and preparedness towards the excess of C-section in Romania, as proven by some recent political actions. In 2019, the Commissions for Public Health and Human Rights, Equal Opportunities, Cults, and Minorities of the Romanian Parliament organized a debate on public strategies and policies for supporting natural birth and management of Cesareans in Romania [26]. The debate ended with a statement that encourages giving birth by vaginal delivery, which adds to the consolidation of indications for C-section at the level of the Romanian Gynecological Society. Certainly, other countries' example – see, in this respect, the case of Italian women parliamentarians involved in addressing the overuse of C-section in the country[27] – proves that interventions focused only on the medical side were not successful, requiring multidisciplinary actions and the creation of a model of dialogue, reflection, and action, which brings together healthcare professionals, advocacy groups, media, politicians and the entire society to understand what determines women's birth preferences and needs.

Of course, an essential role is played in Romania by local culture and the tribute of communism and lack of education, but also by social and financial context. Before 1990, abortions were prohibited in Romania by the communist regime, jointly with contraceptives and sex education. Despite the decree prohibiting abortion abolition in 1990, the lack of sexual education remains a critical issue in the Romanian society [28] and is reflected, as one example, in the adolescent mothers' phenomenon in the country – the proportion of births to mothers aged below 19 years old was 9.05% in 2010 and 8.1% in 2018[5]. The average total monthly income of Romanian households increased with 80.3% between 2006 and 2014, and it almost further doubled in 2019, signaling higher access of the population to more sophisticated health-care procedures, including C-section. This is coupled with increase of average age of mothers at first birth from 22.3 years in 1990 to 26 years in 2010 and 27.4

years in 2018, and to changes in the health system infrastructure in favor of the private sector, which offers alternatives for the entire range of medical services and units. In 2014, 30.6% of Romanian hospitals were under private ownership, compared to 1990, when all 423 hospitals were public. The increase in hospital beds in the private sector was also impressive – 97.2 times between 1999 and 2014 [29]. As a result, women giving birth are not reluctant in paying for the C-section bill either in a public or private hospital, although the costs are not meager. In public hospitals, a C-section cost approximately 1,200 euros in 2019, but more in private hospitals (even up to 3,000 euros, depending on the package the customer buys[1]), which is a significant payment given an average monthly income per person of around 400 euros. Therefore, it is not surprising to find that the percentage of women giving birth in some Romanian clinics and hospitals reached 80% [29].

**Strengths and limitations.** The strengths of this preliminary study are a homogenous population, given that the same obstetrician who supervised pregnancy delivered the baby as well. This represents an optimal doctor-patient communication situation during pregnancy. The sample size represents a limitation due, in fact, to the available data from a research grant and the general lack of official data on C-sections and birth process in Romania. The 30% non-response rate to the questionnaire is also a limitation, which adds to the lack of information in terms of the difference between the women who responded and the 30% who did not. The C-section rate in February 2014 in the unit was 64%, but only 44% of the 117 women interviewed underwent a C-section; as a result, women who had a C-section are underrepresented in the sample. For these reasons, our findings cannot be generalized to all women giving birth in Romania. Nevertheless, we offer first-time insight into Romanian women's preferences for their mode of delivery and to sketch a profile of both patients and doctors involved in the process. Moreover, since Central and Eastern European countries face a similar conjecture as Romania in terms of C-section rate (particularly Bulgaria, Poland, and Hungary, with C-section rates close to 40% in 2017), we believe that our preliminary study results may represent food for thought for the entire region.

[1] Based on available information from public and private hospitals and maternities websites (accessed on June, 2020).

## Conclusions

Our work aims at raising awareness about the high rate of C-sections in Romania by outlining the profile of patients and doctor's behind the choice of C-section as a mode of delivery. We show the existence of a difference between the preferred versus actual birth method, most likely because patients perceive C-section as a better procedure (or option), with a lower degree of pain and safer for the fetus. Moreover, the Romanian health system particularities regarding birth have consolidated a higher weight of patients' voice in the decision regarding the mode of delivery, beyond medical indications.

This study demonstrates the need for an in-depth analysis of obstetrical medical practice at the hospital and country-level in Romania, as well as for more focused interventions on women's education. Moreover, the health system, including doctors, should be more motivated and supported by public policies to implement an evidence-based instead of demand and supply based medicine. Not the less, questions are remaining that need to be addressed as further research directions. Among them, the critical ones refer to the reliability and accuracy of information sources that pregnant women access before deciding on their mode of delivery, the link between sexual education and the choice of the delivery mode, and the desired communication patterns between doctors and patients during pregnancy. Turning to the health system, one important further research direction should address doctors' motivations towards performing more C-sections that medically needed and the proper public policy measures to encourage natural births in Romania and similar countries.

## Abbreviations

C-section : cesarean section

EU: the European Union

WHO: World Health Organization

DW-working hours, between 8a.m. to 3p.m.

AOD-evening shift , between 3p.m. to 10 p.m.

AON-night shift , between 10 p.m. to 8a.m.

SD-standard deviation

p-value -probability value

## Declarations

**Ethics approval and consent to participate.** Data for this study was collected in 2014, within a research grant that was approved by the Carol Davila University of Medicine and Pharmacy, Bucharest-Romania and maternity management. Participation in the study was voluntary.

**Consent for publication :** Not applicable .

**Availability of data and materials:** Datasets used for analysis in the current study are available from the corresponding author on request.

**Competing interests :** The authors declare no competing interests.

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**Authors' contributions.** Conceptualization, Anca Angela Simionescu, Alexandra Horobet and Lucian Belascu; Data curation, Alexandra Horobet and Erika Marin; Formal analysis, Anca Angela Simionescu, Alexandra Horobet, Erika Marin and Lucian Belascu; Investigation, Anca Angela Simionescu, Alexandra Horobet and Erika Marin; Methodology, Alexandra Horobet and Erika Marin; Project administration, Anca Angela Simionescu; Resources, Anca Angela Simionescu and Lucian Belascu; Software, Alexandra Horobet and Erika Marin; Supervision, Anca Angela Simionescu; Validation, Lucian Belascu; Writing – original draft, Anca Angela Simionescu and Lucian Belascu; Writing – review & editing, Anca Angela Simionescu, Alexandra Horobet, Erika Marin and Lucian Belascu. All authors have read and agreed to the published version of the manuscript.

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**Consent for publication.** Not applicable.

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## Figures

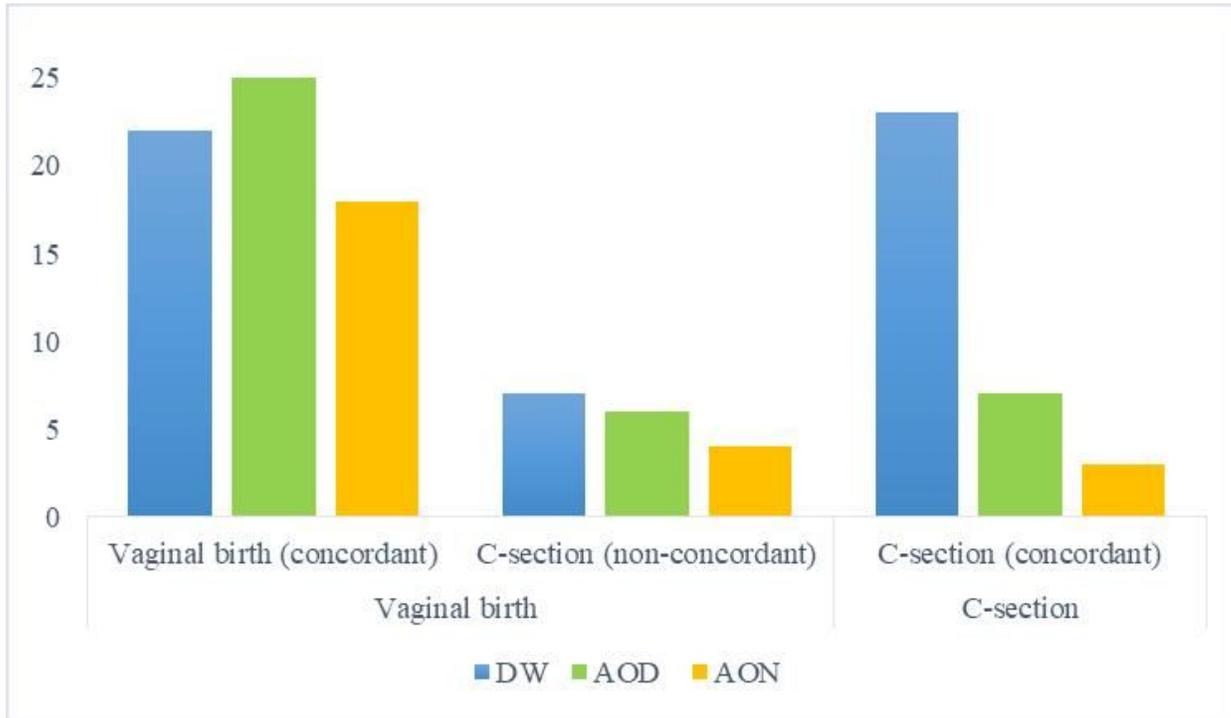


Figure 1

Preferred versus actual mode of delivery and birth times. Legend: DW – during working hours; AON – after working hours but daytime (3-10 pm); AON – after working hours during night time (10 pm – 8 am).

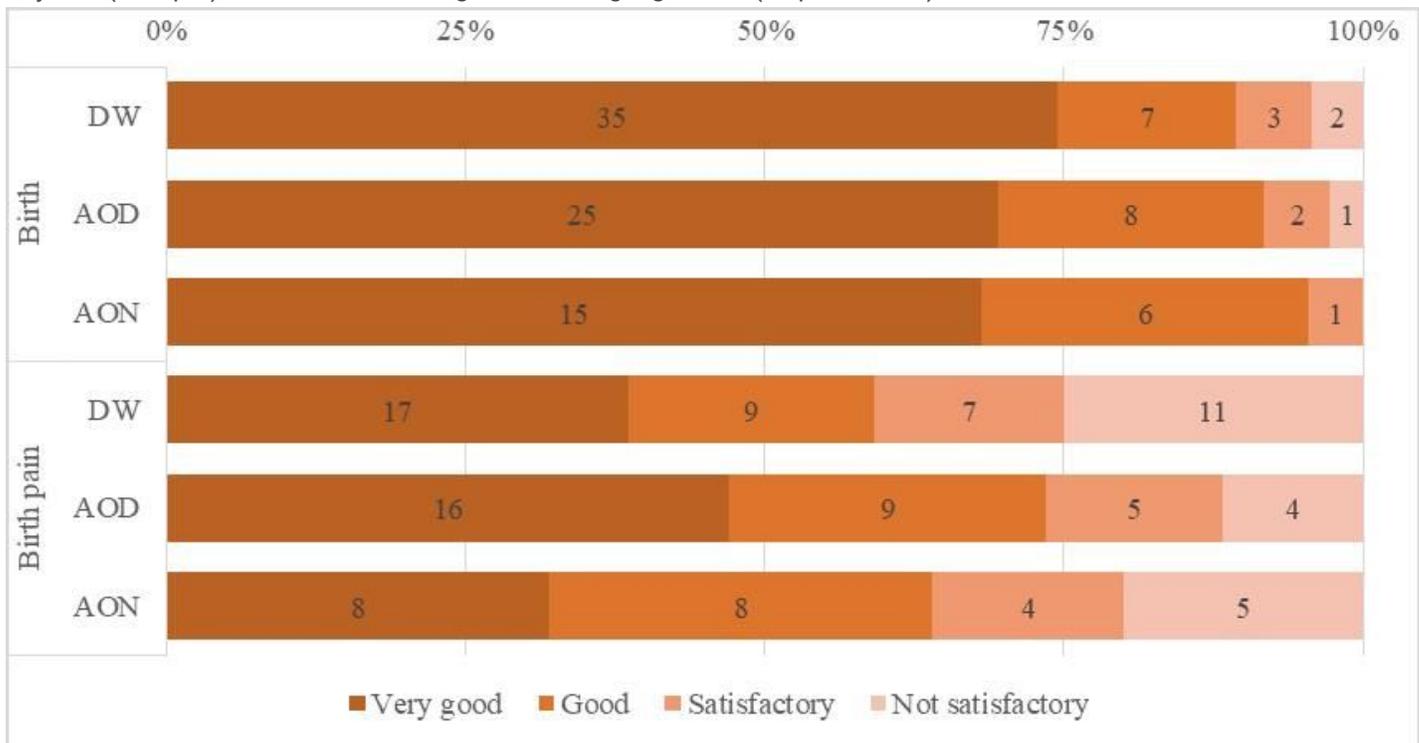


Figure 2

Birth time and birth assessment Legend : DW – during working hours; AON – after working hours but daytime (3-10 pm); AON – after working hours during night time (10 pm – 8 am)



**Figure 3**

Mean scores of birth and birth pain and doctors' professional categories

## Supplementary Files

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