



MEDICAL UNIVERSITY OF PLOVDIV

FACULTY OF PUBLIC HEALTH

DEPARTMENT OF MIDWIFERY

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**MEDICO-SOCIAL ASPECTS AND EXPECTED
EFFECTS OF ELECTIVE CESAREAN SECTION
UPON REQUEST**

SUMMARY OF THE PhD THESIS

submitted for the educational and scientific degree of doctor (PhD)

Field of Higher Education:

Health Care and Sports

Professional Field:

Public Health

Doctoral Programme:

Health Care Management

Academic Supervisors:

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Plovdiv, 2026

The PhD thesis comprises 164 pages and is illustrated with 44 figures, 12 tables, and 3 appendices. The bibliography includes 242 reference sources.

The PhD thesis was discussed and approved for public defence at an expanded Departmental Council meeting of the Department of Midwifery within the Faculty of Public Health at Medical University – Plovdiv on 24 June 2026.

The public defence will take place on 5 November 2026 at 11:00 in Auditorium II of the Auditorium Complex, Medical University – Plovdiv, 15A Vasil Aprilov Blvd., at an open session of the Scientific Jury comprising:

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* The figure and table numbers in the summary of the PhD thesis (abstract) do not correspond to those in the full PhD thesis.

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ABBREVIATIONS

CS Caesarean Section

VB Vaginal Birth

El CS Elective Caesarean Section

Em CS Emergency Caesarean Section

AH Arterial Hypertension

BMI Body Mass Index

SROM Spontaneous Rupture of Membranes

PROM Premature Rupture of Membranes

CPD Cephalopelvic Disproportion

IMV Invasive Mechanical Ventilation

CPAP Continuous Positive Airway Pressure

ANC Antenatal Care

TOLAC Trial of Labour After Caesarean

VBAC Vaginal birth after caesarean

CRP C-reactive protein

I. INTRODUCTION

Caesarean section (CS) is a mode of delivery that involves the birth of the fetus through a surgical incision in the abdominal wall and uterus of the pregnant woman. It is the most frequently performed surgical procedure worldwide, with projections suggesting that by 2030, one in every three children will be delivered via CS.

CS is a life-saving intervention for both the mother and the newborn. Timely performance of the procedure can substantially reduce maternal and neonatal mortality. Conversely, delayed intervention may contribute to increased mortality and morbidity. On the other hand, an excessively high prevalence of CS without clear indications yields no medical benefits for either the mother or the infant, poses potential risks to their health, and leads to the expenditure of valuable healthcare resources.

In Europe, the rates and trends of CS vary significantly across different regions, with some countries reporting a decline. In contrast, our country demonstrates a high percentage of CS with a continuing upward trend. Official statistics detailing exact figures have only recently become available and cover a limited period, which is particularly noteworthy. Furthermore, CS is frequently associated with significant financial burdens, informal out-of-pocket payments, and the perceived necessity of seeking personal connections.

Elective (planned) repeat CS contributes significantly to the rising overall rate of surgical deliveries. Vaginal birth after caesarean (VBAC) is generally safe; nevertheless, it is rarely undertaken in our country.

The factors driving the substantial proportion of CS deliveries remain largely contentious among researchers. The decision is frequently made unilaterally by the obstetrician-gynecologist, depending entirely on their clinical convictions and experience, patient characteristics, the hospital environment, and the mother's request for a CS in the absence of established medical indications.

Relatively few studies focus on the mechanisms and underlying determinants of maternal request for CS. Factors such as higher education levels, the use of assisted reproductive technology, prior operative deliveries, and a history of spontaneous abortions may be associated with elective CS by maternal request. It is essential to understand individual patient experiences, provide comprehensive information regarding risks and benefits, and ensure that patients receive empathetic communication and shared decision-making.

II. AIM AND OBJECTIVES

1. Aim of the study

Within the scope of this PhD thesis research, the following aim was defined:

To investigate and analyse the rate and medical-social factors associated with cesarean section on request and its expected effects in the Plovdiv region.

2. Objectives of the PhD thesis study

In accordance with the aim of this PhD thesis research, the objectives to be addressed are formulated as follows:

1. To analyse the trends and regional variations in caesarean section rates in Bulgaria over a five-year period (2019–2023).
2. To examine the socio-demographic characteristics of the study cohort. To investigate the factors associated with the preferred mode of delivery (familial, financial, and environmental factors).
3. To conduct a detailed investigation into the indications for caesarean section in a representative sample over a three-year period (2021–2023) in the city of Plovdiv.
4. To analyse and compare the medical history, medical factors, and types of complications occurring in women undergoing elective versus emergency caesarean section.
5. To identify potential factors leading to the refusal of a trial of labour after caesarean section in the surveyed women.
6. To develop and propose an algorithm for risk stratification regarding the performance of unnecessary caesarean sections.

III. MATERIALS AND METHODS

1. Study Design

In terms of its design, this research represents a combined retrospective epidemiological and medico-social study.

Subject of the study – Medical-social factors and expected effects of CS on request.

Object of the study – The study objects vary according to its specific stages. In the first stage, the target population comprises female patients admitted to the Clinic of Obstetrics and Gynaecology at St. George University Hospital, Plovdiv.

In the second stage, the study object consists of two groups: post-CS patients – the "case" group, and post- vaginal birth (VB) patients – the "control" group. Both groups in the second stage of the study comprise female patients recruited from St. George University Hospital, Plovdiv; Selena Specialized Obstetric and Gynaecological University Hospital, Plovdiv; and the Department of Obstetrics and Gynaecology at St. Mina Multiprofile Hospital for Active Treatment – Plovdiv.

2. Stages of the PhD Thesis Study

First Stage of Study

This stage of the study relies entirely on a documentary research method. Official data regarding deliveries nationwide were formally requested and obtained from the National Centre of Public Health and Analyses (NCPHA). The dataset covers a five-year period (2019–2023) and includes information across all 28 administrative regions in the Republic of Bulgaria, categorized by mode of delivery. The obtained data were analysed in detail by the doctoral candidate.

Continuing this stage, women who underwent CS at St. George University Hospital, Plovdiv, along with their newborns, were investigated. A retrospective study of CS cases (elective and emergency) covering a three-year period (January 1, 2021 – December 31, 2023) was conducted using archival documentary analysis. A representative sample of randomly selected cases from this period was reviewed. Identification and selection of CS cases were performed using medical records, including "Pregnancy and Delivery Records," "Newborn Records" (for the corresponding birth), and their respective "Maternal Discharge Summaries" and "Neonatal Discharge Summaries" (or "Interim Neonatal Summaries").

For the three-year period (2021–2023), a total of 609 women undergoing CS and their neonates were included. The studied cases were conventionally divided into two groups:

Group I – Women undergoing elective CS ($n = 342$);

Group II – Women undergoing emergency CS ($n = 267$).

The overall prevalence of CS in the department during the 2019–2023 period was also analysed.

Second Stage of Study

This stage is based on a survey method or, alternatively, semi-structured interviews. It involves the establishment of a "control" group and a "case" group. A retrospective case-control study was conducted among postpartum women between December 2023 and March 2025, divided into two cohorts:

Group I ("Cases") – 210 post-CS patients;

Group II ("Controls") – 210 patients who delivered vaginally.

Technical Units of Observation

The technical units of observation selected for the study were the Maternity Unit of the Clinic of Obstetrics and Gynaecology at St. George University Hospital, Plovdiv; the Delivery Sector of the Department of Obstetrics and Gynaecology at Selenia Specialized Obstetric and Gynaecological University Hospital, Plovdiv; and the Delivery Sector of the Department of Obstetrics and Gynaecology at St. Mina Multiprofile Hospital for Active Treatment – Plovdiv.

Logical Units of Observation

1. In the first stage of the study – women who underwent CS and their newborns at St. George University Hospital, Plovdiv.

2. In the second stage of the study – every postpartum woman (regardless of the mode of delivery) who gave informed consent to participate in the study at St. George University Hospital, Plovdiv; Selenia Specialized Obstetric and Gynaecological University Hospital, Plovdiv; and St. Mina Multiprofile Hospital for Active Treatment – Plovdiv.

Main Observation Variables

I. For all female patients and their newborns in the first stage, the following parameters were monitored:

1. Socio-demographic characteristics.

2. Medical history data.

3. Objective clinical status upon admission.

4. Laboratory data upon admission.

5. Intraoperative and delivery data and types of maternal complications.

6. Neonatal data.

II. For all patients in the second stage of observation, the following were recorded:

1. Socio-demographic data.

2. Information regarding pregnancy and delivery course.

3. Childbirth experiences.

Data Collection Entities

The collection of primary statistical data and the administration of questionnaire surveys were conducted personally by the PhD candidate.

3. Inclusion and Exclusion Criteria

Inclusion Criteria for Stage I of the Study

The requisite data for Stage I of the study were collected using information extracted from the "Pregnancy and Delivery Records," "Newborn Records," "Maternal Discharge Summaries," and "Neonatal Discharge Summaries" at the Clinic of Obstetrics and Gynaecology, St. George University Hospital, Plovdiv. A sample of cases comprising women who underwent CS and their newborns was utilized.

Exclusion Criteria for Stage I of the Study

Cases with missing or incomplete information were excluded from the study.

Inclusion Criteria for Stage II of the Study

1. Obtaining written informed consent from the surveyed participants. The study cohort includes postpartum women at St. George University Hospital, Plovdiv; Selena Specialized Obstetric and Gynaecology University Hospital, Plovdiv; and St. Mina First Grade Multiprofile Hospital for Active Treatment – Plovdiv.
2. More than 24 hours having elapsed since delivery.
3. Women were divided into two groups based on the mode of delivery:
 - **Case group** – post-CS patients, consisting of 210 women;
 - **Control group** – post-VB patients, consisting of 210 women;
4. Fully completed questionnaire.

Exclusion Criteria for Stage II of the Study

1. Patient refusal to participate in the study;
2. Incomplete or missing data in the questionnaires;
3. Less than 24 hours elapsed post-delivery;
4. Multiple pregnancy;
5. Delivery of a newborn in extremely critical condition or stillbirth (to protect the patient's emotional well-being).

4. Methods Used

To achieve the aim of the study, the following research methods were used:

4.1. Sociological Methods

4.1.1. Documentary Methods

A summary report on national deliveries (total and disaggregated by administrative regions) was obtained from the National Centre of Public Health and Analyses (NCPHA). The report covers a five-year period (2019–2023) and includes data on all deliveries categorized by mode of delivery. The obtained results were thoroughly analysed.

The prevalence rate of CS over the 5-year period was analysed based on annual summary reports from the Clinic of Obstetrics and Gynaecology at St. George University Hospital, Plovdiv.

Also, during Stage I of the study, medico-sociological information was extracted from medical records ("Pregnancy and Delivery Record," "Newborn Record," "Maternal Discharge Summary," and "Neonatal Discharge Summary") through representative sampling. Data covering a three-year period (2021–2023) were gathered at the Clinic of Obstetrics and Gynaecology, St. George University Hospital, Plovdiv, directly by the author of the study. A "Statistical Case Processing Form" was developed. In cases of twin deliveries, data were recorded separately for each infant as twin A and twin B (first and second twin) according to the order of birth. Data were collected for a total of 621 performed CS procedures and the infants delivered through them. Twelve cases were subsequently excluded from the results presented below due to missing or incomplete data.

4.1.2. Survey Methods

During the second stage of the study, to better evaluate the medico-social factors associated with caesarean section on maternal request, a questionnaire was developed. The survey instrument consists of a questionnaire containing 30 questions (closed-ended and mixed-type) covering the following key domains:

- Maternal socio-demographic data — place of residence, marital status, age, occupational status, health insurance status, financial status (9 questions);

- Information regarding pregnancy and childbirth — mode of delivery, parity/previous deliveries, ANC attendance, delivery preferences, refusal of vaginal birth (16 questions);

- Information regarding childbirth experience and pain intensity — 5 questions, 3 of which were differentiated according to the mode of delivery (VB or CS).

The questionnaire survey was administered through two methods: self-administered (correspondence) survey and semi-structured interviews. Considering the specific characteristics of a sub-segment of the studied population (illiterate/uneducated patients) and the inherent limitations of self-administered surveys, the interview method was employed whenever necessary. This allowed for the direct involvement of the investigator, thereby ensuring greater validity and completeness of the primary data collected.

4.2. Statistical Methods

Based on the aim and objectives of the research, as well as the volume and data types collected during the study, the following statistical methods were applied:

A. Descriptive Methods and Estimation Techniques:

1. Variational analysis of quantitative variables — standard deviation, minimum, maximum, mode, and median;
2. Frequency analysis of qualitative variables (nominal and ordinal) — absolute frequencies, relative frequencies (percentages), and cumulative relative frequencies (percentages);
3. Graphical visualizations.

B. Hypothesis Testing Methods:

1. Parametric tests:

- 1.1. Independent Samples T-Test — testing for the equality of two population means.

2. Nonparametric tests:

2.1. Kolmogorov-Smirnov and Shapiro-Wilk tests — assessing the normality of distribution for quantitative variables;

2.2. Mann-Whitney U test — comparing distributions/median ranks between two independent groups for a quantitative variable when normality is violated;

2.3. Kruskal-Wallis H test — comparing distributions among three or more independent groups for a quantitative variable when normality is violated;

2.4. Chi-square (χ^2) test or Fisher's exact test — analyzing associations between two categorical variables;

2.5. Median test — comparing medians between two independent groups for a quantitative variable.

3. Regression Analysis:

3.1. Logistic regression analysis — evaluating the relationship between a dichotomous dependent variable and multiple independent variables (categorical or continuous);

3.2. Binary logistic regression analysis — quantifying the effect of predictors on a dichotomous outcome and estimating outcome probabilities.

The threshold for statistical significance was set at $\alpha = 0.05$. The corresponding null hypothesis was rejected when the P-value was less than α . Statistical analysis of the research data for this PhD thesis was conducted using IBM SPSS Statistics, Version 23.0.

The study protocol was reviewed and approved by the **Research Ethics Committee at the Medical University of Plovdiv** (Approval Protocol No. 1 / February 5, 2025).

IV. RESULTS AND DISCUSSION

1. First Stage of the Study

1.1. Analysis of Trends and Regional Variations in Caesarean Section Rates in Bulgaria for the Period 2019–2023

The aim of the present analysis is to investigate the trends in the proportion of CS relative to the total number of deliveries for the period 2019–2023 across the 28 administrative regions of Bulgaria, tracking the dynamics and highlighting regional variations.

Territorial Analysis of Birth Rates and CS in Bulgaria

Figure 1 presents data on the total number of deliveries and the total number of CS procedures in the country for the period 2019–2023.

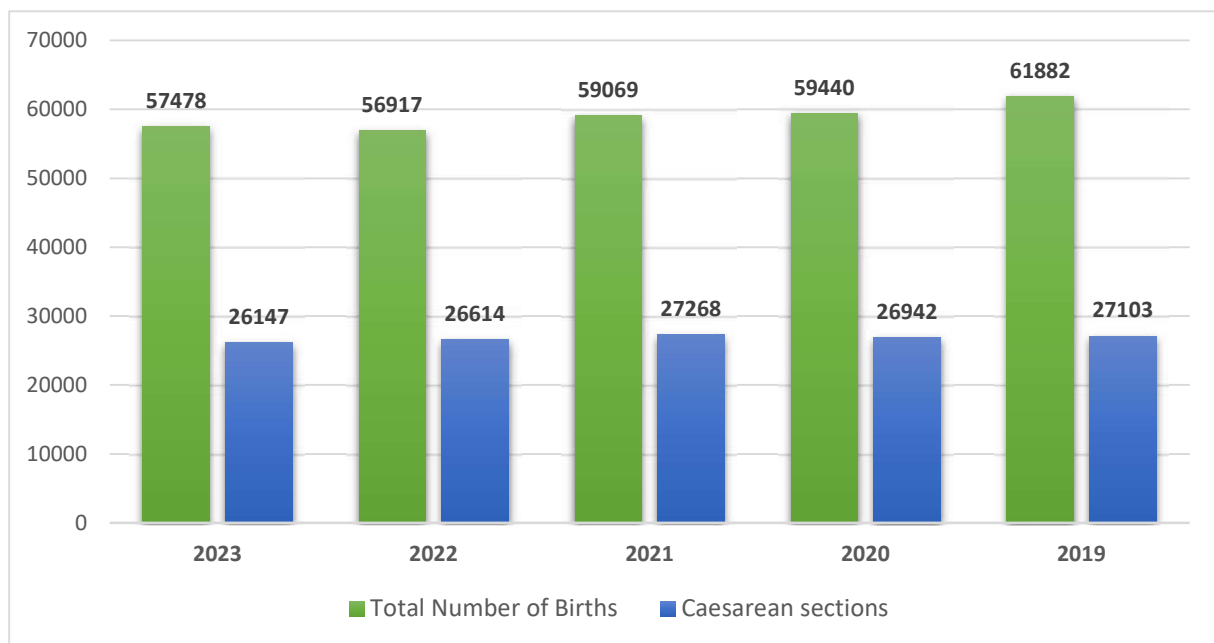


Figure 1. *Distribution of the Total Number of Deliveries and Total Number of CS in the Country for the Period 2019–2023*

Analysis of the overall birth figures reveals that the total number of deliveries was highest at the beginning of the observation period (2019), reaching 61,882 nationwide. Over the subsequent years through the end of the period, a gradual decline was observed, with deliveries reaching 57,478 in 2023. This represents an approximate decrease of 7.00% in the total number of deliveries, while concurrently demonstrating an upward trend in the relative proportion of CS compared to total national births.

Analysis of CS volume indicates that the absolute number of procedures remained relatively stable throughout the study period, showing a distinct increase from 27,103 (43.80%) in 2019 to 27,268 (46.76%) in 2021. In the final year of the period (2023), a slight reduction to 45.49% was observed. Overall, the data depict a sustained trend of high CS rates in Bulgaria against the backdrop of a declining total birth rate.

Conclusion: During the 2019–2023 period, the total number of deliveries in Bulgaria decreased by approximately 7.00%, accompanied by a persistently high proportion of CS procedures. Despite the minor reduction observed at the end of the period, the overall trajectory demonstrates a rising relative proportion of CS in the setting of declining birth rates.

Regions with the Highest and Lowest CS Proportions in the Country

The results indicate that throughout the studied 5-year period, the highest proportions of CS were consistently observed in major regional administrative centres, which also feature a high concentration of specialized medical institutions. In the Plovdiv region, this proportion fluctuated around 62–68%; in Sofia (capital), approximately 60–66%; in Pleven, approximately 55–68%; in Varna, approximately 58–62%; in Silistra, approximately 57–65%; in Ruse, approximately 53–57%; and in Stara Zagora, approximately 50–53%.

The lowest CS proportions were recorded in smaller administrative regions: in Lovech, rates fluctuated around 12–18%; in Vratsa, approximately 12–15%; in Vidin, variation spanned a broader range of 2–17%; and in Yambol, rates remained around 3–7%.

Figure 2 presents the percentage proportions of abdominal deliveries for 2023, during which the total number of deliveries nationwide was 57,478. CS accounted for 45.49% of all births. The general trend for 2023 demonstrates that CS rates remained elevated, with several regions maintaining levels comparable to the preceding year. The highest proportions were observed in Pleven (68.21%), Plovdiv (66.42%), Sofia (capital) (66.21%), Varna (59.88%), Ruse (57.32%), and Silistra (57.32%), whereas the lowest values continued to be recorded in Vratsa (12.24%), Lovech (12.16%), Yambol (3.30%), and Vidin (3.08%).

A summary of the primary trends and regional disparities for the 2019–2023 period indicates that throughout the entire observation window, the proportion of CS in Bulgaria remained high and relatively stable, characterized by a slight increase early in the period and a minimal decline in 2023. Major administrative regions—such as Plovdiv, Sofia (capital), Pleven, Varna, Ruse, and Silistra—consistently reported the highest percentages of surgical deliveries, whereas smaller regions, including Vidin, Yambol, Lovech, and Vratsa, continued to exhibit lower rates. Across the period, both regional disparities and specific temporal shifts were observed—most notably a

significant increase in Pleven, contrasted with declines recorded in Vidin and Yambol during certain years. Overall, a sustained trend of high CS rates persists against the backdrop of a gradually decreasing total birth volume nationwide.

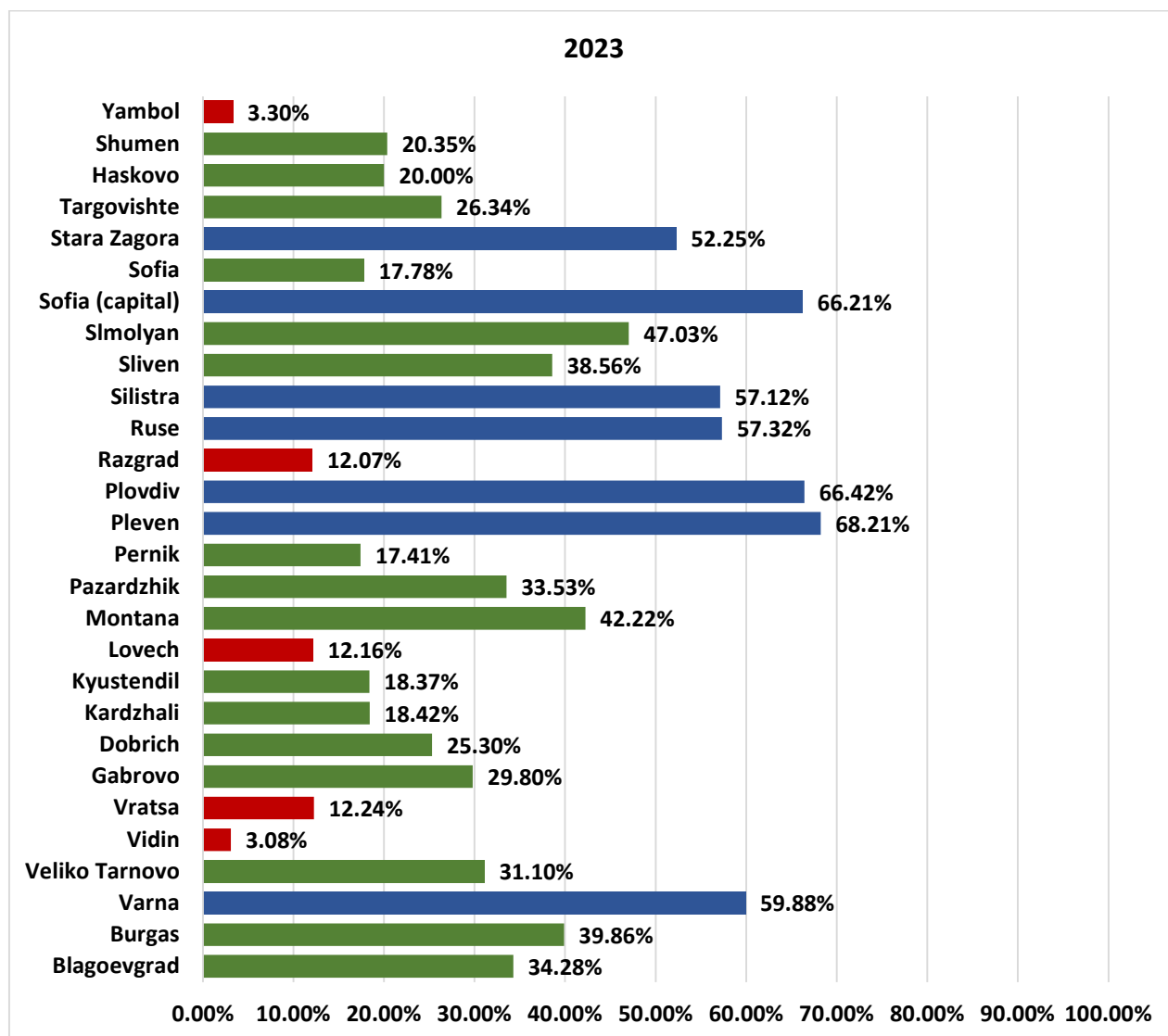


Figure 2. Percentage distribution of CS by region for 2023

Analysis of CS for the Sofia (Capital) Region

Figure 3 illustrates data regarding the total number of deliveries and the proportion of CS for Sofia (capital) over the 2019–2023 period.

Analysis of the results indicates that in Sofia (capital), the number of deliveries remained relatively stable over the studied period, with a slight decline observed in the last two years. At the same time, the proportion of CS gradually increased relative to total deliveries—rising from 60.31% in 2019 to 66.21% in 2023—demonstrating a sustained trend toward the more frequent use of surgical delivery.

Conclusion: The summary of findings for Sofia (capital) shows that the proportion of CS increased by approximately 5.9 percentage points, representing a moderate yet steady upward trajectory throughout the period.

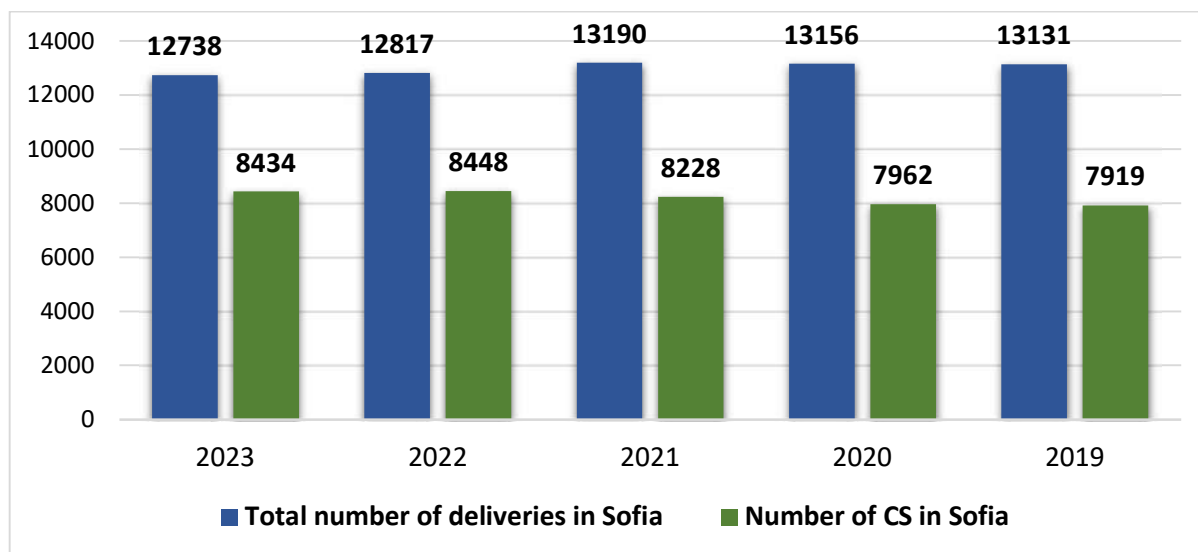


Figure 3. *Distribution of the Total Number of Deliveries and Total Number of CS in Sofia (Capital) for the Period 2019–2023*

Analysis of CS for the Plovdiv Region

Figure 4 illustrates data on the total number of deliveries and the proportion of CS for the city of Plovdiv over the 2019–2023 period.

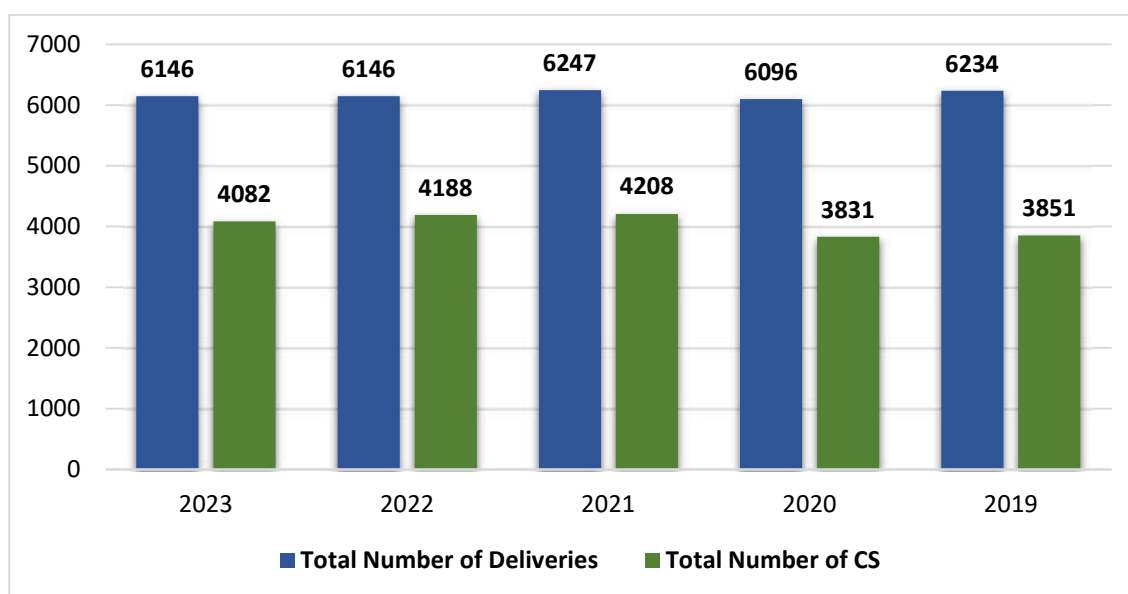


Figure 4. *Distribution of the Total Number of Deliveries and Total Number of CS in the City of Plovdiv for the Period 2019–2023*

Analysis of the results indicates that in the Plovdiv region, the proportion of CS gradually increased relative to total deliveries—from 61.77% in 2019 to 68.14% in 2022, followed by a slight decline to 66.42% in 2023. A substantially and consistently high level of surgical deliveries is evident throughout the period.

Conclusion: The summary of findings for the Plovdiv region shows that the proportion of CS increased by approximately 6.4 percentage points, representing a significant and sustained rise, notwithstanding the minor decrease observed in the final year of the period

Comparative Analysis of CS Between Sofia (Capital) and Plovdiv Regions

The results of the analysis revealed that Sofia (capital) and Plovdiv are the regions with the highest proportion of CS in the country. **Figure 5** presents the percentage ratio of CS between them across the entire observation period.

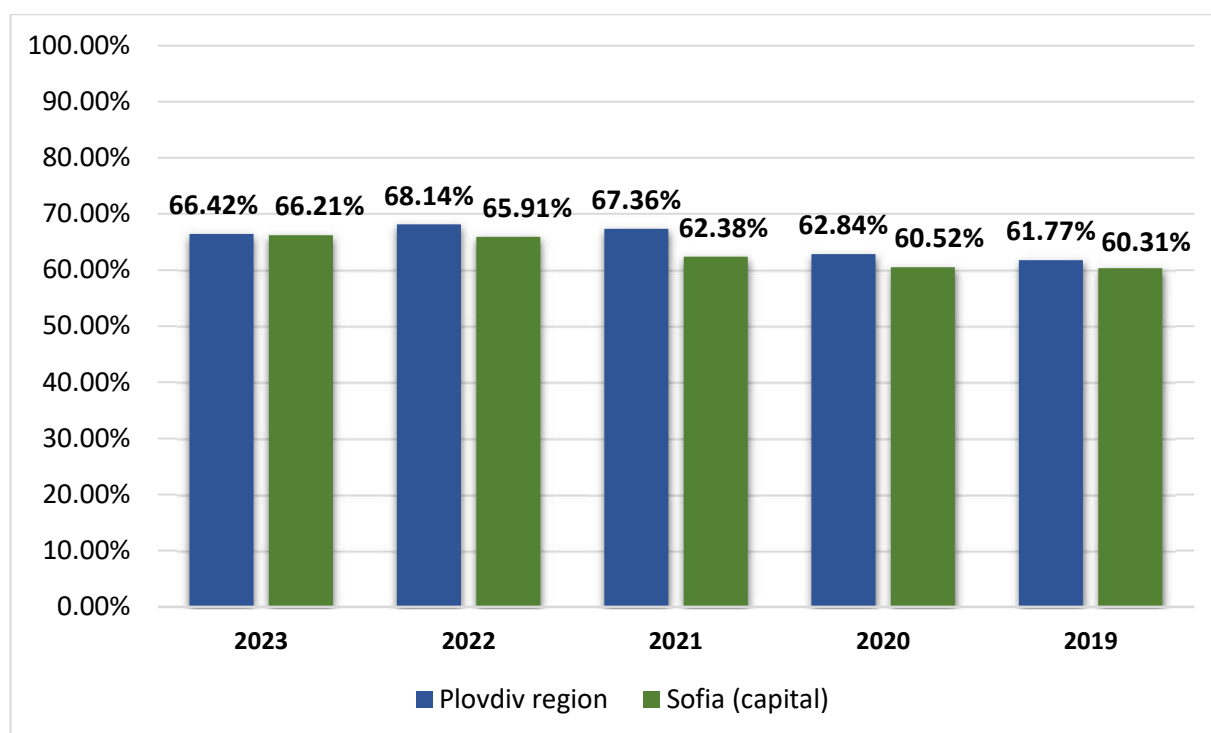


Figure 5. *Percentage distribution of CS proportions in Plovdiv and Sofia (Capital) for the period 2019–2023*

The figure illustrates moderate dynamics, showing a gradual increase in CS proportions in Plovdiv and Sofia (capital) over the studied period. Comparative analysis demonstrates that Plovdiv reports slightly higher values compared to the capital across almost all years, with the difference ranging between 2.00 and 5.00 percentage points. At the beginning of the period (2019), the

proportions were roughly similar (61.77% and 60.31%), in 2021 and 2022 CS rates in Plovdiv slightly exceeded those in Sofia (67.36%/62.38% vs. 68.14%/65.91%), and by the end of the period (2023) the values converged (66.42% and 66.21%). The summary of findings indicates that Sofia and Plovdiv are firmly established as leading centres with the highest frequency of surgical delivery, attributed to the higher concentration of university hospitals and broader medical infrastructure.

Conclusion: Analysis of CS trends in Bulgaria during the 2019–2023 period demonstrates that the proportion of surgical deliveries remains high and relatively stable, characterized by a slight increase early in the period and a minimal drop in 2023. Major administrative regions and medical hubs—Plovdiv, Sofia (capital), Pleven, Varna, Ruse, and Silistra—consistently report the highest CS proportions, whereas smaller regions such as Vidin, Yambol, Lovech, and Vratsa maintain significantly lower rates. Specific regional dynamics were noted: Pleven demonstrated a steady increase, while Vidin and Yambol recorded declines in certain years. Sofia and Plovdiv stand out as the leading centres in surgical delivery frequency due to their dense hospital network and developed medical infrastructure. Overall, the findings for the period emphasize a sustained trend of elevated CS proportions against the backdrop of a gradually declining total birth volume.

1.2. Analysis of Summarised Annual Results

Data for "St George" University Hospital, Plovdiv demonstrate that over the five-year study period, the proportion of CS accounts for approximately half of all deliveries, standing at 50.23% in 2019 and 54.34% in 2023.

1.2.1. Socio-Demographic Characteristics

In **Stage I** of the combined epidemiological, medical-social retrospective study covering a three-year period (2021–2023), a total of 609 women who underwent CS and their newborns were included. The mean age of the studied cohort was $29,25 \pm 6,50$ years, ranging from a minimum of 14 to a maximum of 48 years.

To facilitate a clearer interpretation of the medico-social aspects influencing the choice of delivery via CS, the participants were conditionally divided into two groups:

Group I – Women undergoing elective CS: $n = 342$ (56.20%);

Group II – Women undergoing emergency CS: $n = 267$ (43.80%).

Analysis of the age distribution revealed statistically significant differences between the studied groups ($p = 0.005$). The mean age in the elective CS group was higher (29.92 ± 6.36 years) compared to the emergency CS group (28.40 ± 6.60 years). The distribution across age groups showed no statistically significant differences based on the type of CS ($p > 0.05$). The largest proportion belonged to the 30–34 age group—170 (27.9%), followed by the 25–29 age group—157 (25.8%).

When analysing the variables education, place of residence, marital status, and employment status, notable statistically significant differences between the studied groups were observed for education ($p = 0.04$; $r = 0.13$) and marital status ($p = 0.01$; $r = 0.11$) (**Table 1**).

Table 1. Distribution of the Studied Groups by Education, Place of Residence, Marital Status, and Employment Status

		El CS		Em CS		p	r
		n	%	n	%		
Education	Illiterate	14	4,10%	9	3,40%	0,04	0,13
	Primary	15	4,40%	26	9,70%		
	Lower secondary	37	10,80%	39	14,60%		
	Upper secondary	131	38,30%	90	33,70%		
	Higher	145	42,40%	103	38,60%		
Place of Residence	City	245	71,60%	197	73,80%	NS	
	Town	97	28,40%	70	26,20%		
Marital Status	Married	139	40,60%	80	30,00%	0,01	0,11
	Unmarried	199	58,20%	185	69,30%		
	Divorced	4	1,20%	2	0,70%		
Employment Status	Employed	272	79,50%	202	75,70%	NS	
	Unemployed	67	19,60%	61	22,80%		
	University student	2	0,60%	0	0,00%		
	School student	0	0,00%	3	1,10%		
	Disability pensioner	1	0,30%	1	0,40%		

1.2.2. Medical History Data

Lunar Month of Pregnancy

Analysis of the results regarding the lunar month of pregnancy indicates that 90.15% ($n = 549$) reached the 10th lunar month, followed by patients in the 9th lunar month, accounting for 40

cases (6.57%). Additionally, 2.13% ($n = 13$) were in the 8th lunar month at the time of admission, and 1.15% ($n = 7$) were in the 7th lunar month.

Concomitant (Additional) Pregnancy Conditions

In 523 (85.90%) of the studied women, additional conditions associated with the current pregnancy were identified. However, these conditions were found to have no statistically significant impact on the decision to perform emergency surgical delivery ($p > 0.05$).

Multiple conditions could be present in a single case. The condition observed with the highest frequency was a history of prior CS (39.41%). This was followed by the presence of moderate preeclampsia and SROM or PROM. Other recorded conditions were observed relatively less frequently.

The vast majority of cases in this sample involved singleton pregnancies, accounting for 591 women (97.04%). A significantly smaller proportion were twin pregnancies (18 cases, 2.96%). Triplet or higher-order multiple pregnancies were not observed in this sample.

Spontaneous conception occurred in the majority of cases (93.30%). The total number of pregnancies achieved via IVF was 35, representing 6.70% of all cases.

A history of previous CS significantly increased the likelihood of undergoing a subsequent elective CS ($p = 0.000001$; $r = 0.23$). Data confirming prior CS were recorded in 240 women (39.4%), with 169 (70.4%) of these belonging to the elective CS group during the current pregnancy.

Parity Sequence

Analysis regarding pregnancy order demonstrates that first pregnancies were the most prevalent, accounting for 38.8% ($n = 236$) of all cases. Second pregnancies were also common, representing 35.0% ($n = 213$) of the total sample. Combined, primigravidae and secundigravidae comprised nearly three-quarters (73.7%) of all cases.

Number of Prior CS Procedures

The total number of women with a history of prior CS was 240 (39.41%). The dominant trend within this subgroup comprised women who had undergone one prior CS (220 cases, 91.7%), while 7.9% had two prior CS procedures, and only 1 patient in the sample had undergone three previous CS operations.

Medical History of Abortions

The majority of women had no history of induced or spontaneous abortions (421 cases, 69.1%). The second significant subgroup comprised women with a history of one abortion, totaling

138 patients. Overall, 188 women (30.87%) had a prior pregnancy ending in abortion. This included abortions categorized by type and frequency: medically indicated, spontaneous, and elective. No statistically significant association was found between the mode of current CS and reproductive history of prior abortion ($p > 0.05$). However, it can be hypothesized that a prior pregnancy ending in abortion may influence gestational age at delivery ($p = 0.0004$; $r = 0.24$).

Comorbidities

Data indicate that in 361 women (59.3%), no comorbidities were recorded. In the remaining 248 women (40.7%), between 1 and 4 different conditions or diseases were documented. The most common comorbidities identified among the studied cohort of postpartum women were autoimmune thyroiditis (Hashimoto's thyroiditis), thrombophilia, AH, myopia, insulin resistance, and COVID-19 during pregnancy and delivery. These accounted for more than half of all diagnoses recorded in the study (62.1% of all diagnoses).

Total Number of Prior Surgeries

Data show that the largest subgroup consisted of women with no history of prior surgical procedures (261 cases, 42.9%). A comparable proportion comprised women with a history of one prior surgery (260 cases, 42.7%). Women who had undergone two surgical procedures represented 11.0% ($n = 67$). The lowest proportions were observed among women with three prior surgeries (2.1%, $n = 13$) and more than three prior surgeries (8 cases, 1.3%).

Types of Prior Obstetric and Gynaecological Operations

The results indicate that the most common operation among the women was CS (88.8%, or 262 procedures in the sample). Ovarian interventions were the second most frequent (31 cases, or 10.5% of all operations). Uterine body interventions ranked third, performed in 7.8% of cases ($n = 23$). Other interventions were observed infrequently. Nearly half of the women (304, or 49.9%) had no history of obstetric or gynecological surgeries.

Data analysis revealed a statistically significant association between parity sequence and the mode of CS performed ($p = 0.00003$; $r = 0.22$). Emergency CS was observed in a higher percentage among primigravidae—134 (50.20%)—whereas elective CS predominated in secondary and subsequent pregnancies. A similar pattern emerged when evaluating the number of prior deliveries ($p = 0.0002$; $r = 0.19$). No statistically significant difference was found between the study groups regarding the mode of delivery in previous pregnancies—i.e., whether prior deliveries were vaginal or by CS ($p > 0.05$).

A statistically significant difference between the studied groups was also recorded for the lunar month of delivery ($p = 0.0006$; $r = 0.22$). Forty-five (16.85%) of the emergency CS procedures were performed prior to reaching the 10th lunar month, whereas only 15 (4.38%) of the elective CS procedures occurred at an earlier gestational month.

Data show that concomitant diseases were documented in 248 (40.7%) of the women. Maternal comorbidities significantly influenced the selection of elective CS ($p = 0.005$; $r = 0.11$).

Furthermore, the total number of prior surgeries significantly influenced the choice of elective CS ($p = 0.00001$; $r = 0.27$). A history of at least one prior surgical intervention was present in 236 (38.75%) of the women undergoing elective delivery. Gynecological surgeries specifically also influenced the selection of elective CS ($p = 0.04$; $r = 0.10$). A history of gynecological surgery was recorded in 65 (10.67%) of the study population, with 44 (67.7%) of them undergoing elective delivery in the current pregnancy.

Preeclampsia or Arterial Hypertension as a Complication of the Current Pregnancy

Analysis regarding the presence of preeclampsia/AH during pregnancy demonstrated that this condition was present in 106 women, or 17.41% of all patients in the sample. This includes cases of moderate and severe preeclampsia, super-imposed preeclampsia on chronic hypertension, pregnancy-induced hypertension, and pre-existing chronic hypertension. The high incidence of hypertensive complications can be attributed to the nature of the study setting—St. George University Hospital is the largest healthcare institution in Southern Bulgaria, serving as a referral center for a significant proportion of complicated and high-risk cases from the Plovdiv region and surrounding provinces.

The presence of hypertensive disorders during pregnancy was associated with a higher frequency of emergency CS ($p = 0.02$; $r = 0.10$). Of all 106 patients with preeclampsia/AH, 57 (53.8%) underwent emergency CS.

Analysis of neonatal prematurity data demonstrated that the rate of premature births in the cohort of women with preeclampsia/AH was 24.27%, compared to only 8.60% in the cohort of mothers without hypertensive disorders (OR = 3.41, 95% CI: 1.96–5.90). This specific analysis evaluated singleton pregnancies exclusively. When including all neonates (from both singleton and twin pregnancies), the proportion across the two cohorts was 25.69% versus 11.00%, respectively (OR = 2.80, 95% CI: 1.68–4.66).

In the cohort of obese women, the incidence of hypertensive disorders was 28.91%, whereas in non-obese women, it was substantially lower at 8.66% (OR = 1.93, 95% CI: 1.63–2.28; $p < 0.001$). This evaluation was performed exclusively on singleton pregnancies.

1.2.3. Objective Clinical Status Upon Admission

Spontaneous Rupture of Membranes (SRM / PROM)

Analysis indicates that the majority of women ($n = 542$, or 89.0%) were admitted with intact membranes. The remaining 67 patients presented with spontaneous rupture of membranes (SRM) or premature rupture of membranes (PROM).

Cervical Dilation

In approximately two-thirds of the documented cases (65.0%, or $n = 396$), no cervical dilation was recorded at the time of admission.

Presence of Labour Activity

The largest proportion comprised pregnant women admitted without labour activity (425 cases, or 69.8%), while 161 patients were admitted with irregular labour contractions. Upon analysing the obstetric status, it is notable that the presence of labour activity, changes in cervical status, and SRM are directly associated with emergency CS performance (**Table 2**).

A comparative analysis between the two groups studied revealed a statistically significant difference in these parameters, which can be identified as potential drivers in the decision-making process for emergency surgical delivery. In the present study, SRM emerged as a risk factor for emergency CS delivery ($p = 0.0001$; $r = 0.35$), with the likelihood being more than 2.5 times higher (OR = 2.60, 95% CI: 2.32–2.93).

Table 2. Distribution of the Studied Groups by Labor Activity, SRM, and Cervical Status

		El CS		Em CS		p	r
		n	%	n	%		
Labour Activity	None	302	88,30%	123	46,10%	0,00005	0,42
	Irregular	39	11,40%	122	45,70%		
	Regular	1	0,30%	22	8,20%		
SRM	Yes	2	0,60%	65	24,30%	0,0001	0,35
	No	340	99,40%	202	75,70%		

Cervical Status	With dilation	62	18,10%	151	56,60%	0,00001	0,38
	Without dilation	280	81,90%	116	43,40%		

1.2.4. Delivery Data

Indications for Surgical Delivery

A central focus of this study is the medical indications leading to CS. Analysis of the extracted data regarding clinical indications indicates that for the majority of patients, two separate indications were documented, though up to five indications were recorded (in 15 cases). Only 80 patients had a single documented indication.

For analytical purposes, certain related indications were grouped together. The indication listed with the highest overall frequency was "prior CS," recorded in 38.42% of cases. Although it is the most frequent, it was rarely cited as a solitary indication, being typically combined with low pelvic score values, reported labour activity, or scar pain/tenderness at the uterine operative site. Due to the presence of multiple documented indications per patient, the cumulative total percentage exceeds 100%. Leading indications reported are presented in **Table 3**.

Table 3. Frequency and Percentage of Leading Indications for CS

	Indication	n	%
1.	History of Prior CS	234	38,42%
2.	Low pelvic score (unfavourable cervical status)	150	24,63%
3.	Registered labour activity	79	12,97%
4.	Term pregnancy	78	12,81%
5.	Preeclampsia (moderate)	64	10,51%
6.	SROM (PROM)	63	10,34%
7.	Breech presentation	51	8,37%
8.	Scar tenderness / Pain at the uterine scar site	39	6,40%
9.	Foetal asphyxia	39	6,40%
10.	Firm refusal of trial of VB	37	6,08%
11.	IVF pregnancy / History of sterility treatment	37	6,08%
12.	Failed induction of labour / Lack of response to Oxytocin	36	5,92%
13.	Foetal macrosomia / CPD	32	5,25%
14.	Post-term pregnancy	30	4,90%
15.	Absence of conditions for rapid vaginal delivery	27	4,43%
16.	Oligohydramnios	25	4,11%
17.	Failure of progress	22	3,61%
18.	Primigravity	22	3,61%
19.	Preterm pregnancy	20	3,28%
20.	Ophthalmologist's recommendation for CS	19	3,12%

21.	Twin pregnancy	18	2,96%
22.	Contracted pelvis	17	2,79%

Among the listed indications, it is particularly noteworthy that a total of 40 women explicitly declared a firm refusal of a trial of vaginal labour and insisted on a CS. These patients account for 6.57% of the total study sample. Within this cohort, women with secondary and higher education predominated—90.5%—whereas those with primary education or lower comprised only 9.5%. In other words, as educational attainment increases, there is a corresponding rise in the proportion of women who decline vaginal delivery and express a preference for CS (OR = 2.903, 95% CI: 1.018–8.280).

An analysis of the specific indications for CS revealed statistically significant differences between the studied groups ($p = 0.00007$; $r = 0.52$). The primary indications for elective CS were a history of prior CS—171 (50.00%)—followed by an unfavorable cervical status—135 (39.47%). Conversely, for emergency CS, the leading indications were documented labor activity—76 (28.46%)—followed by a history of prior CS—63 (23.60%)—and SROM—60 (22.47%).

1.2.5. Neonatal Data

To ensure precise data evaluation, the cohorts of neonates from singleton and multiple pregnancies were analysed separately within the sample.

The gender distribution indicates that male neonates accounted for 52.95% ($n = 332$), compared to 47.05% ($n = 295$) female neonates.

The 1-minute Apgar score data reveal that for singleton pregnancies, the mean value was 8.63 ± 0.69 (range: 1–9), with 69.37% of infants achieving a score of 9 points. At 5 minutes, the mean score was 9.86 ± 0.49 (range: 7–10), with 88.16% receiving the maximum score of 10 points. Within the singleton pregnancy cohort, 15 infants (2.54%) required early endotracheal intubation in the delivery room and were consequently excluded from the 5-minute Apgar score analysis.

For twin pregnancies, the mean Apgar scores at 1 and 5 minutes were 7.86 ± 0.72 (range: 5–9) and 9.64 ± 0.64 (range: 8–10), respectively. No neonates in this cohort required early intubation in the delivery room.

The primary baseline data for the neonates are presented in **Table 4**.

Table 4. Baseline Data for the Neonates

Variable	n	%	Mean±SD/(min-max)	n	%	Mean±SD/(min-max)
	Singleton pregnancies			Twin pregnancies		
Term infant (according to weight)	524	88,66%	3232,21±412,05 (2500-4550)	18	50,00%	2735,00±181,34 (2510-3120)
Grade 1 prematurity	45	7,61%	2308,00±138,28 (2266-2349)	12	33,33%	2296,67±166,10 (2010-2490)
Grade 2 prematurity	15	2,54%	1696,67±128,21 (1500-1930)	6	16,67%	1855,00±106,91 (1720-1980)
Grade 3 prematurity	4	0,68%	1285,00±241,18 (1000-1490)	No cases recorded in the sample		
Grade 4 prematurity	3	0,51%	843,33±145,71 (690-980)	No cases recorded in the sample		
Condition on discharge	Singleton pregnancies			Twin pregnancies		
Healthy	541	91,54%	-	24	66,67%	-
Improved	35	5,92%	-	10	27,78%	-
Deteriorated / Transferred	14	2,37%	-	2	5,56%	-
Complications occurred	115	19,56%	-	21	58,34%	-
Duration of hospital stay (days)	-	-	6,30±8,65 (1-105)	-	-	9,64±7,30 (4-32)

The most frequent complications in the cohort of neonates from singleton pregnancies were pulmonary (50.72%), neurological (22.46%), dermatological (20.29%), infectious (18.84%), and ocular (16.67%). The remaining recorded complications accounted for significantly smaller proportions. In twin pregnancies, pulmonary complications were again predominant (13.77%), followed by dermatological manifestations (5.07%) and anaemia/polycythaemia (2.19%). The cumulative total of complications in both groups exceeds 100%, as more than one complication was documented in a large proportion of neonates.

Data for the entire sample demonstrates a statistically significant difference in the incidence of neonatal complications between singleton and twin pregnancies ($p < 0.001$), as well as in gestational age ($p < 0.001$). For singleton pregnancies, the mean gestational age was 37.93 ± 1.90 gestational weeks, compared to 36.39 ± 1.20 gestational weeks for twin pregnancies. These parameters are consistent with published literature data. Within the sample, 1 neonatal death was reported, accounting for 0.17% of infants from singleton pregnancies.

Data also reveal a statistically significant difference in the duration of hospital stay between the two groups of neonates—singleton vs. twin pregnancies ($p < 0.001$).

Administration of exogenous surfactants was required in 28 of all neonates, 3 of whom were twins. Accordingly, the proportion of neonates receiving surfactants in the two cohorts was 4.23% and 8.33%, respectively. Antenatal corticosteroid prophylaxis for neonatal respiratory distress syndrome (RDS) was administered in 37 cases—29 from singleton pregnancies and 8 from twin pregnancies, representing 4.23% and 8.33% of their respective cohorts. These disparities between singleton and twin pregnancies are likely attributable to the small sample size; therefore, drawing generalized conclusions would be inappropriate.

Comparative analysis of neonatal outcomes between the elective CS and emergency CS groups revealed statistically significant differences across the evaluated parameters (**Table 5**).

Table 5. *Comparative Analysis of Neonates According to Mode of Delivery (Elective vs. Emergency CS)*

	El CS X±SD	Em CS X±SD	p	r
Gestational age	37,88 ± 1,07	37,79 ± 2,60	0,00001	0,44
Birth weight (in g)	3099,89 ± 484,93	3008,13 ± 665,63	NS	
Birth length (in cm)	48,79 ± 2,07	48,42 ± 3,39	0,0004	0,27
Apgar 1 min.	8,60 ± 0,77	8,28 ± 1,39	0,01	0,18
Apgar 5 min.	9,88 ± 0,45	9,81 ± 0,52	0,03	0,12

Although the mean values of the evaluated parameters were close across both study groups, it was established that lower gestational age predominated in the emergency CS group—57 (20.88%) of the emergency deliveries were performed before 37 completed gestational weeks, whereas in the elective group, neonates delivered prior to 37 gestational weeks numbered 29 (8.19%).

It can be hypothesized that prematurity is directly associated with emergency surgical delivery via CS ($p = 0.000003$; $r = 0.19$) (**Table 6**). The likelihood of emergency delivery in the setting of a preterm foetus is more than 1.5 times higher than in term deliveries (OR = 1.68, 95% CI: 1.40–2.02).

Table 6. *Comparative Analysis of Interventions Administered to Neonates According to Mode of Delivery (Elective vs. Emergency CS)*

		EI CS		Em CS		p	r
		n	%	n	%		
Prematurity	Yes	28	7,90%	57	20,90%	0,000003	0,19
	No	326	92,10%	216	79,10%		
CPR	Yes	134	37,90%	134	49,10%	0,005	0,11
	No	220	62,10%	139	50,90%		
Early intubation	Yes	3	0,80%	12	4,40%	0,004	0,11
	No	351	99,20%	261	95,60%		
Exogenous surfactant admission	Yes	4	1,10%	24	8,80%	0,000004	0,18
	No	350	98,90%	249	91,20%		
Antibiotics admission	Yes	51	14,40%	73	26,70%	0,0001	0,15
	No	303	85,60%	200	73,30%		
Complications occurred	Yes	62	17,50%	74	27,10%	0,004	0,12
	No	292	82,50%	199	72,90%		
IMV	Yes	13	3,70%	27	9,90%	0,002	0,13
	No	341	96,30%	246	90,10%		

It is clearly evident that neonates delivered via emergency CS required resuscitation and other interventions more frequently, and a higher complication rate was observed within this subgroup.

A statistically significant difference was also noted in the length of hospital stay for neonates between the two studied groups ($p = 0.000005$; $r = 0.35$). The mean length of hospital stay for neonates following elective CS was 5.31 ± 5.89 days (range: 2–85), whereas after emergency CS it was 8.03 ± 11.00 days (range: 1–105). A corresponding difference was also observed in the neonatal health status at discharge ($p = 0.006$; $r = 0.16$).

Conclusions from Stage I

1. During the 2019–2023 period in Bulgaria, a persistently high proportion of CS procedures was observed against the backdrop of a declining national birth rate.
2. The highest CS rates were registered in major regional administrative centres, including Plovdiv, Sofia, Varna, and Pleven, highlighting distinct regional disparities.

3. Elective CS procedures predominated over emergency surgeries, with women undergoing elective surgical delivery being statistically significantly older.
4. Socio-demographic factors, particularly educational level and marital status, influenced the choice of elective CS.
5. Primigravity was associated with a higher risk of emergency CS, whereas elective surgical delivery was performed more frequently in second and subsequent pregnancies.
6. A history of prior CS represents a major predictor for subsequent elective caesarean delivery.
7. Labor activity, SROM, and the presence of cervical dilation were the primary clinical factors associated with emergency surgical delivery.
8. Maternal comorbidities and hypertensive disorders during pregnancy influenced the choice of delivery mode.
9. The overall CS rate is determined by a complex interplay of medical, obstetric, and medico-social factors.

These findings justify the necessity of developing targeted strategies to limit non-medically indicated CS procedures and promote informed decision-making during childbirth.

2. Second Stage of the Study

During the second stage, a retrospective case-control study was conducted among postpartum women between October 2023 and March 2025, divided into two groups:

Group I ("Cases") – 210 female patients who delivered via CS;

Group II ("Controls") – 210 female patients who delivered vaginally.

2.1. Socio-Demographic Characteristics

Age

Results for the **CS case group** indicate that the largest proportion comprised women in the 25–29 age bracket (36.70%), followed by the 30–34 age group (25.20%). Analysis demonstrates that the vast majority of women (81.4%) were aged between 25 and 39 years, with a overall mean age for the cohort of 30.56 ± 5.81 years (95% CI: 29.77–31.35; min 17, max 48; $Me = 30.00$).

Results for the **control group (VB)** show that the largest proportion similarly belonged to the 25–29 age bracket (36.70%). The mean age for the control cohort was 29.62 ± 5.39 years (95% CI: 28.89–30.35; min 15, max 44; $Me = 29.00$).

A comparative analysis of the results between both groups reveals that in both CS and VB cohorts, women aged 25 to 39 years accounted for the largest share. The mean age of women who delivered via CS was approximately one year higher than that of women delivering vaginally, though this difference was not statistically significant ($p = 0.087$).

Marital Status

Results for the **case group** indicate that the highest percentage was recorded among married postpartum women (54.29%). Co-habiting unmarried women ranked second (31.43%).

Results for the **control group** show that the largest proportion comprised married women (48.10%), followed again by co-habiting unmarried women (38.10%). No divorced women were recorded in the vaginal delivery cohort.

Education

Results for the **case group** demonstrate that the largest proportion of the sample (64.77%) had completed higher education.

Results for the **control group** show that the largest proportion (62.39%) likewise possessed higher education. All obtained results are graphically depicted in **Figure 6**.

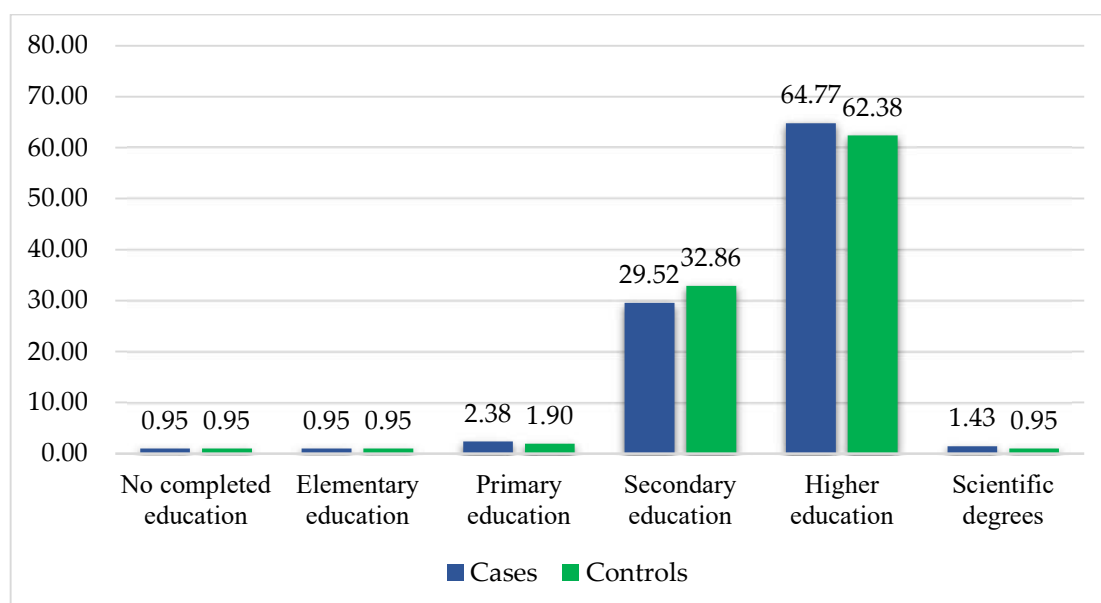


Figure 6. Education level

Financial and Material Status

The results for the **case group** show that the highest proportion are the patients (60.95%) who assessed their financial status as “rather good”. One third of the respondents (30.95%) assessed their status as “very good”.

The distribution for the **control group** shows that the highest proportion are the patients (60.95%) who assessed their status as “rather good”. Again, about one third (30.00%) assessed their status as “very good”.

Analysis of the results shows that in both groups the largest proportion of women define their financial and material status as “rather good” or “very good”, which suggests that the economic factor does not have a significant impact on the mode of birth.

When analysing the socio-demographic characteristics of the sample, no statistically significant differences were reported in the studied groups ($p > 0.05$).

2.2. Information Regarding Pregnancy and Childbirth

Previous Birth

The distribution of results for the **case group (CS)** shows that the highest proportion is occupied by women who have not had previous births (60.00%). Approximately one third of all (31.43%) have previously suffered from CC, and only 8.10% of all have previously had a VB.

The results for the **controls** show that the highest proportion is again occupied by women who have not had a previous birth (55.24%). 42.86% of the respondents had a previous VB.

When examining the reproductive history of the sample, it turned out that in 242 (57.62%) the current birth was the first, and 178 (42.38%) had a previous birth. When considering the type of previous birth, a higher percentage of previous vaginal births is reported – 108 (60.67%), and previous CAs were performed in 70 (39.33%).

Logically, a significant relationship is reported here between the type of previous birth and the method of delivery in the current one ($p = 0.000003$; $r = 0.61$). The analysis of the results shows a strong relationship between the type of previous and the type of current birth (Cramer's $V = 0.76$), which indicates that the two variables are dependent.

Presence of preferences regarding the method of delivery during pregnancy

The results for the case group show that almost all parturient women in this sample had preferences – 89.05%.

The results for the control group again show that almost all parturient women had preferences regarding the mode of delivery during pregnancy – 96.67% of them.

All responses received are presented graphically in **Figure 7**.

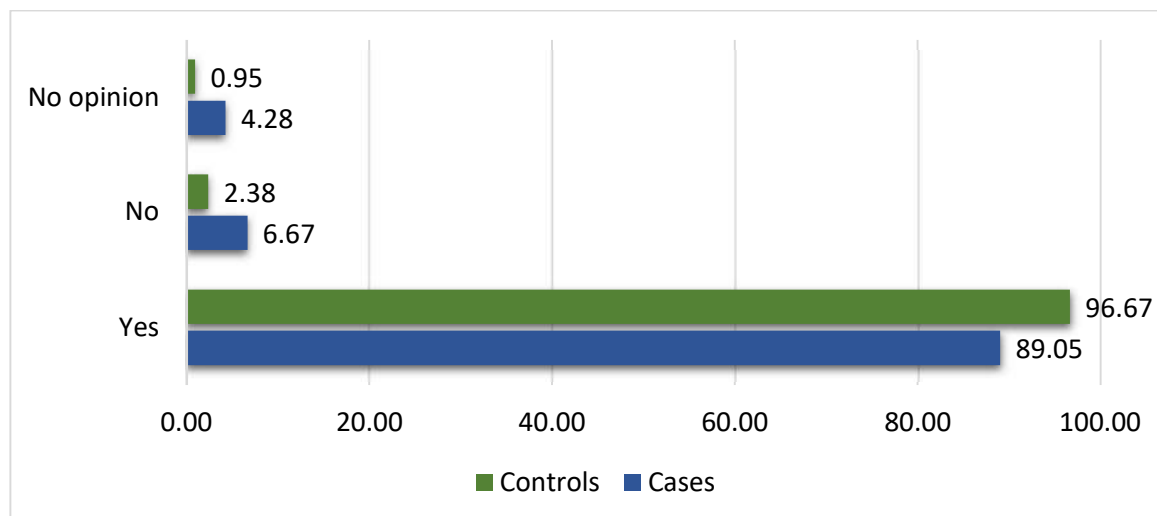


Figure 7. Percentage distribution of results for the presence of preferences regarding the mode of delivery during pregnancy

Preferred Mode of Delivery During Pregnancy

The results for the **case group** show that almost half of the studied women (48.10%) preferred CS as a mode of delivery. 40.48% of them had preferences for VB, and 11.42% of all did not provide a definitive answer.

The results for the **control group** show that almost all of the studied patients had preferences for VB (96.67%), i.e. women who gave birth naturally almost completely realized their preference. The share of those who preferred CS (0.95%) is insignificant, and the lack of a definitive answer is reported in 2.38% of all women in labour.

Anxiety/Fear of VB

The distribution of results for the **case group** reveals a pronounced predominance of fear regarding vaginal birth. Approximately two-thirds (63.33%) of the women who underwent CS in this sample indicated that they experienced anxiety or fear related to vaginal delivery.

The analysis for the **control group** likewise demonstrates a predominance of affirmative responses. Almost two-thirds (65.24%) of the postpartum women in the sample indicated that they experienced anxiety or fear regarding VB.

In summary, the findings show that anxiety or fear of vaginal birth was present among postpartum women in both studied groups. An absence of fears was observed in approximately one-

third of the women across both groups. All obtained responses are presented graphically as percentage proportions in **Figure 8**.

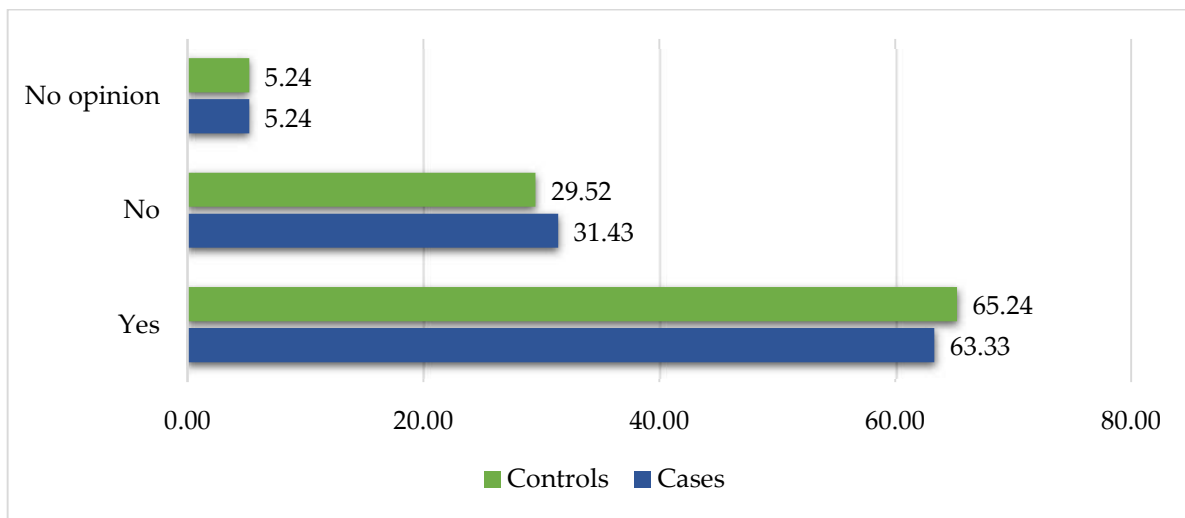


Figure 8. *Percentage distribution of survey responses regarding anxiety/fear of VB*

Anxiety/Fear of CS

Results for the **case group** once again demonstrate a highly pronounced predominance of fear regarding CS — reported by over two-thirds (69.52%) of the women.

For the **control group**, a highly pronounced majority of affirmative responses was likewise recorded, with 77.62% of postpartum women in this sample indicating that they experienced anxiety or fear of CS.

Comparison of the findings indicates that while fear of CS was substantial across both groups of postpartum women, it was more strongly expressed among women who delivered vaginally. All obtained responses are presented graphically as percentage proportions in **Figure 9**.

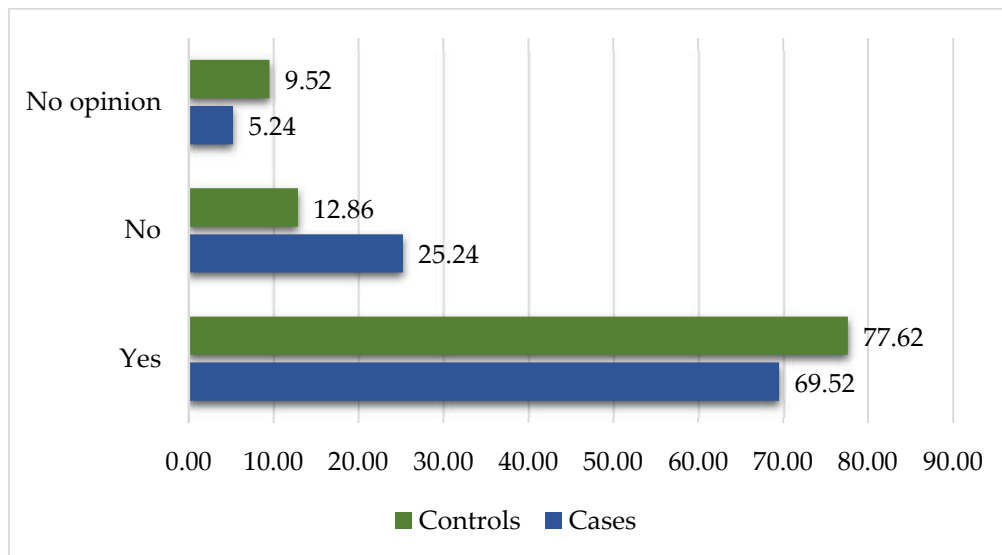


Figure 9. Percentage distribution of survey results regarding anxiety/fear of CS

Data analysis showed no statistically significant differences regarding the presence of fear or anxiety toward vaginal birth between the two studied groups ($p > 0.05$)—137 (65.24%) of the control group and 133 (63.33%) of the case group reported fear and anxiety regarding vaginal delivery. However, a statistically significant difference was identified regarding concerns and fears related to delivery via CS ($p = 0.002$; $r = 0.17$). Here, 163 (77.6%) of the control group reported such concerns, whereas in the case group, anxiety regarding surgical delivery was reported by fewer patients—146 (69.5%).

Communication of Delivery Mode Preferences with an Obstetrician or Midwife

Results for the **case group (CS)** show that the vast majority of women (82.80%) communicated their preferred delivery mode. A smaller proportion (17.20%) provided a negative response.

The distribution of results for the **control group (VB)** demonstrates that nearly all women in the sample (91.40%) shared their preferred mode of delivery with an obstetrician or midwife. A smaller subset (8.60%) provided a negative response.

Discussion of Advantages and Disadvantages of Delivery Modes with an Obstetrician or Midwife

Results for the **case group** indicate that the majority of women (79.05%) discussed the advantages and disadvantages of different delivery modes with an obstetrician or midwife. The remaining 20.95% did not discuss this issue with a medical professional.

The distribution of results for the **control group** shows that the majority (71.90%) discussed the pros and cons of different modes of birth with an obstetrician or midwife, whereas just over a quarter (28.10%) had not engaged in such discussions with a healthcare specialist.

Advice Received from Immediate Social Circle Regarding Modes of Delivery

Responses from the **case group** demonstrate a nearly even split between women who received advice from their immediate social circle ("yes" – 38.10% and "rather yes" – 14.76%) and those who did not receive advice from family or close acquaintances ("no" – 25.24% and "rather no" – 21.90%).

The distribution of responses for the **control group** likewise shows an almost even split between those who received advice from close social contacts and those who did not. All recorded responses are presented graphically as percentage proportions in **Figure 10**.

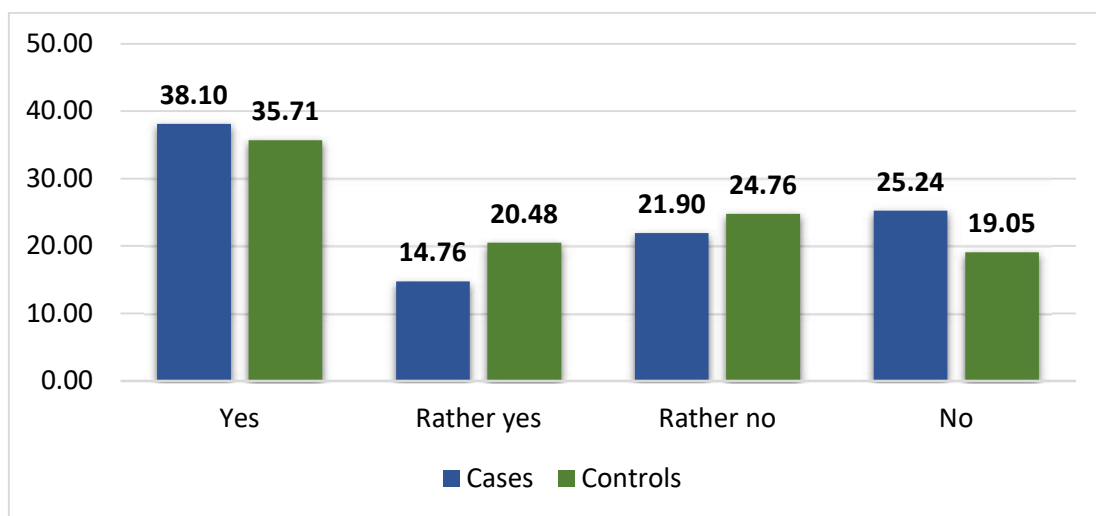


Figure 10. Percentage distribution of results regarding advice received from the immediate social circle on different modes of delivery

Influence of the Immediate Social Circle on the Choice of Delivery Mode

The distribution of results for the **case group** shows that the immediate social circle has a weak influence. Almost all women ("No" – 71.43% and "Rather no" – 20.95%) reported that their relatives and close acquaintances had no or negligible influence on their decision regarding the mode of delivery. Although more than half of the women received advice from close social contacts (52.86% in the previous question), this advice did not significantly alter their final decision.

The distribution of results for the **control group** likewise indicates that the immediate social circle exerts little influence. Almost all respondents ("No" – 58.10% and "Rather no" – 24.29%) stated that their close contacts did not influence or had an insignificant impact on their birth plan decision.

Comparative analysis of the obtained data shows that across both postpartum groups; the immediate social circle possesses limited influence over the mother's choice regarding mode of delivery.

ery. Even though over half of the women in both cohorts received advice from close relations, it had no major bearing on their ultimate determination. The percentage proportions of responses are presented in **Figure 11**.

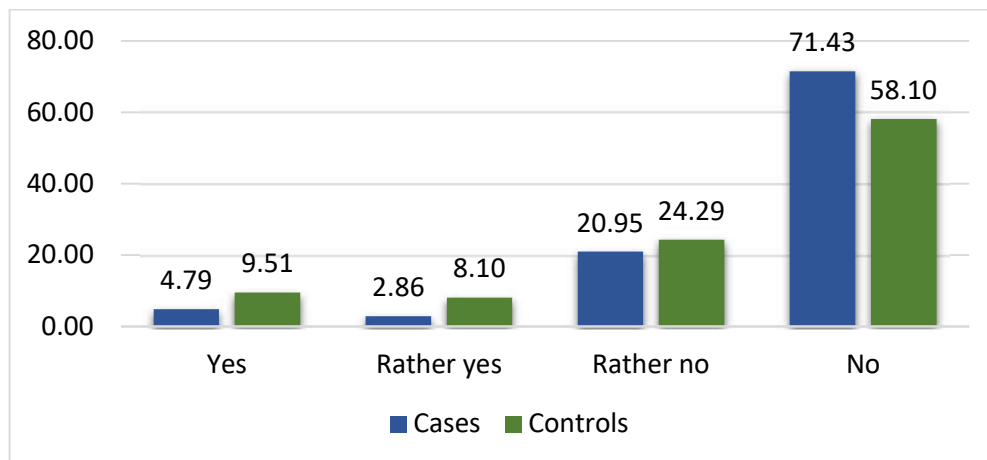


Figure 11. Percentage distribution of results regarding the influence of the immediate social circle on the choice of delivery mode

Significant Advantages of CS over VB for Mother and Neonate

Results in the **case group** reveal a divergence of opinions. Respondents indicating that CS has significant advantages and those denying any advantages accounted for roughly equal shares. Once again, approximately one-third of cases (32.38%) were unable to assess or answer the question.

Results in the **control group** show that the vast majority of respondents see no significant advantages in CS. The percentage of controls considering CS a superior delivery method compared to vaginal birth was minimal.

Significant Advantages of VB over CS for Mother and Neonate

Results for the case group demonstrate a inclination toward the advantages of vaginal birth. Half of the women ("Definitely yes" – 23.33% and "Rather yes" – 28.57%) believed that vaginal delivery offers significant advantages for mother and baby compared to CS. Nevertheless, a substantial proportion of respondents (34.29%) were undecided as to whether such advantages exist.

The distribution of results for the control group demonstrates strong conviction regarding the advantages of vaginal birth over CS. Almost all respondents ("Definitely yes" – 60.48% and "Rather yes" – 29.05%) considered natural childbirth to have major benefits. Hesitation on this issue was expressed by only 7.14%.

Statistically significant differences between the two studied groups were recorded regarding maternal attitudes toward significant advantages of CS over vaginal birth ($p = 0.00004$; $r = 0.43$).

A similar significant result was observed regarding attitudes toward the major benefits of vaginal delivery over CS ($p = 0.00008$; $r = 0.41$). Notably, however, the proportion of women selecting "undecided / unable to judge" was markedly higher in the case group—32.38% for the first statement and 34.29% for the second, respectively.

Absolute Refusal of VB

Absolute refusal of VB was reported exclusively in the **case group**—56 patients (26.70%). Nevertheless, the majority of women in this group did not completely rule out the option of vaginal delivery (73.30%). Based on these responses, an estimate of the potential proportion of maternal-request CS procedures can be inferred.

Results for the **control group** demonstrate that 100.00% of participants expressed explicit willingness and acceptance regarding natural vaginal childbirth.

A statistically significant difference was identified between the studied groups for the variable of absolute refusal of vaginal birth ($p = 0.00009$; $r = 0.37$).

Fears and Concerns Related to Childbirth

Results for the **case group** indicate that the most frequently reported concerns were fear of pain (59.50%) and fear of the unknown (56.70%). For the **control group**, fear of pain was likewise the leading concern (65.85%), followed by fear of the unknown (54.63%) and fear of unsuccessful vaginal delivery (49.27%). Less frequently cited concerns included fear of severe perineal lacerations and birth trauma (36.10%) and fear of neonatal death (28.78%). The percentage distribution of results and statistical significance are detailed in **Table 7**.

Table 7. *Comparative Analysis of Reported Fears Between the Studied Groups*

	Control group (VB)		Case group (CS)		p	r
	n	%	n	%		
Fear of Pain	135	64,30%	125	59,50%	NS	
Fear of the Unknown	112	53,30%	119	56,70%	NS	
Fear of Dependence	30	14,30%	42	20,00%	NS	
Fear of Adverse Outcome/Death of the New-born	59	28,10%	79	37,60%	0,03	0,10
Fear of Adverse Outcome/Death for Themselves	49	23,30%	58	27,60%	NS	
Fear of Failure	101	48,10%	54	25,70%	0,000002	0,23
Fear of Trauma and Tears	74	35,20%	64	30,50%	NS	
Fear of Urinary/Sexual Dysfunction	16	7,60%	29	13,80%	0,04	0,10
Fear of Anesthesia	1	0,50%	5	2,40%	NS	
Other Fears	5	2,40%	7	3,30%	NS	

When evaluating fears and attitudes associated with childbirth, statistically significant differences between the studied groups were identified regarding the fear of an adverse neonatal outcome (foetal/neonatal mortality) and the fear of urinary or sexual dysfunction; these concerns were more pronounced in the case group (CS). Conversely, fear of failure to progress/unsuccessful labour was observed more frequently among women delivering vaginally (VB).

Factors Influencing Maternal Perceptions Regarding the Advantages and Disadvantages of Different Modes of Delivery

The distribution of results for the **CS cohort** indicates that the total number of cited factors exceeds 100%, as a large proportion of respondents selected multiple factors matching their personal view.

Analysis of the responses demonstrates that the most frequently cited factor influencing maternal perception regarding the advantages and disadvantages of delivery modes was a **consultation/conversation with an obstetrician or midwife** (76.26%). The second most frequent influential factor was a discussion with a spouse or close family members (27.27%).

For the **control group**, the most cited factor influencing maternal perception of birth options was likewise a **consultation/conversation with an obstetrician or midwife** (70.05%), followed by discussions with a spouse or close family members (42.13%).

When examining factors influencing maternal opinion on the pros and cons of different delivery methods, statistically significant differences between the studied groups were observed only regarding the influence of partners/relatives and peer/friendship networks, both showing stronger influence within the control group. Overall, maternal decision-making regarding the mode of delivery was overwhelmingly influenced by medical professionals (obstetrician/midwife) (**Table 8**). Across both cohorts, the least influential factors were non-medical specialists and traditional media (television, magazines, newspapers).

Table 8. Comparative Analysis of Factors Influencing Perception Regarding the Advantages and Disadvantages of Different Modes of Delivery

	Control group (VB)		Case group (CS)		p	r
	n	%	n	%		
Conversation with an Obstetrician /Midwife	138	65,70%	151	71,90%	NS	
Opinion of the Partner (Family members)	83	39,50%	54	25,70%	0,003	0,15
Opinion of the Circle of Friends	59	28,10%	39	18,60%	0,02	0,11
Attendance at a Parenting School/Open Day	26	12,40%	15	7,10%	NS	
Scientific Publications	43	20,50%	32	15,20%	NS	
Information from Mass Media	9	4,30%	5	2,40%	NS	
Online Media	19	9,00%	21	10,00%	NS	
Parenting Forums	20	9,50%	20	9,50%	NS	
Social Networks	15	7,10%	18	8,60%	NS	
Non-medical specialists	9	4,30%	6	2,90%	NS	

2.3. Birth-related Experiences

Recommendations of CS to Close Relatives as a Mode of Delivery

The distribution of results within the **case cohort** indicates that half of the participants ("Yes" – 30.48% and "Rather yes" – 18.10%) would recommend CS as a mode of delivery to their immediate social circle.

The results for the **control group** demonstrate that more than two-thirds of the participants would not recommend CS as a mode of delivery to their close contacts ("No" – 34.76% and "Rather no" – 33.81%). The proportion of those who would recommend CS as a delivery method to their close social circle remains low.

In both groups, there is a statistically notable percentage of women who expressed hesitation in choosing a definitive answer, which may be attributed to a lack of sufficient information or a lack of confidence in making recommendations to their close relatives.

Recommendations of VB to Close Relatives as a Mode of Delivery

The results for the **case group** show that half of the respondents ("Yes" – 39.05% and "Rather yes" – 14.76%) would recommend vaginal delivery as a method to their immediate social circle.

The distribution of results for the **control group** shows that the vast majority of participants ("Yes" – 66.67% and "Rather yes" – 22.65%) would recommend natural childbirth as a mode of

delivery to their close social circle. Here, we observe once again that women who gave birth naturally exhibit high confidence in the advantages of VB (**Figure 12**).

As evident from the graph, women who gave birth via CS experience significantly more hesitation on this issue, which could be attributed to uncertainty, a lack of personal experience, or internal conflict regarding the topic.

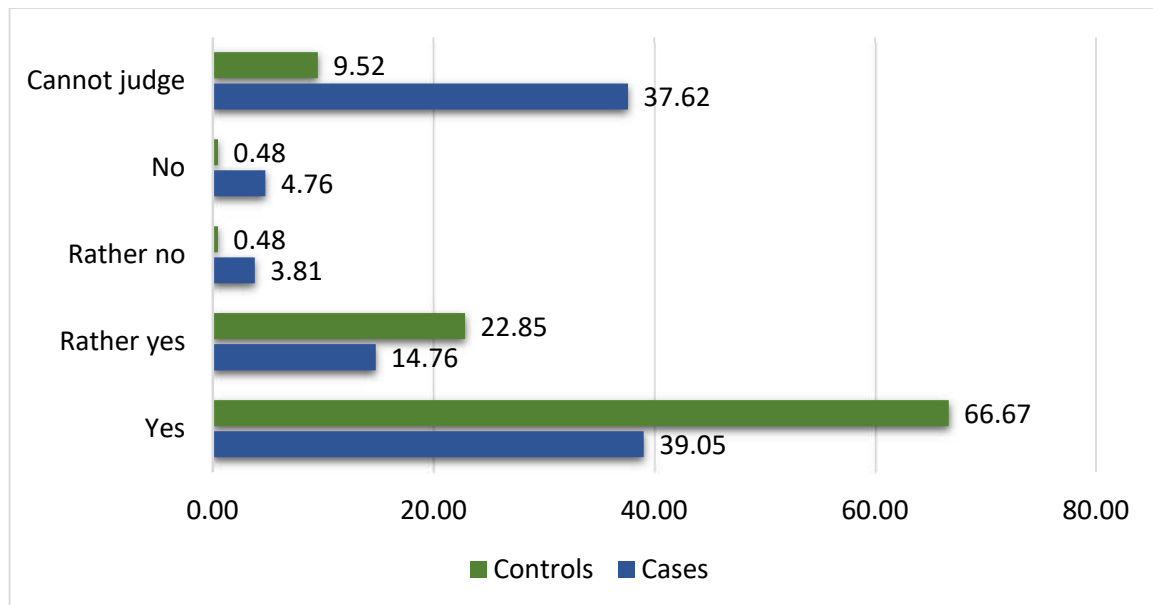


Figure 12. *Percentage Distribution of Results Regarding Recommendations of Natural Childbirth to Close Contacts*

Would They Choose CS/VB Again for Subsequent Deliveries

The analysis of the results for the **case group** indicates a positive attitude towards choosing CS again. Two-thirds of the women who gave birth via this method ("Yes" – 48.57% and "Rather yes" – 15.24%) express willingness or explicitly state a desire to give birth in this manner for a subsequent delivery. Approximately one-quarter of women who underwent operative delivery reject the possibility of experiencing CS again during a future pregnancy. Uncertainty or hesitation was expressed by 12.86% of the women in this group.

The analysis of the results for the **control group** shows a positive attitude towards repeat VB ("Yes" – 76.20% and "Rather yes" – 13.81%). The proportion of women stating that they would not choose this mode of delivery is exceptionally low, indicating positive experiences associated with VB. Uncertainty or hesitation in answering this question was displayed by 7.14% of women in this group. All obtained results are presented as percentage proportions in **Figure 13**.

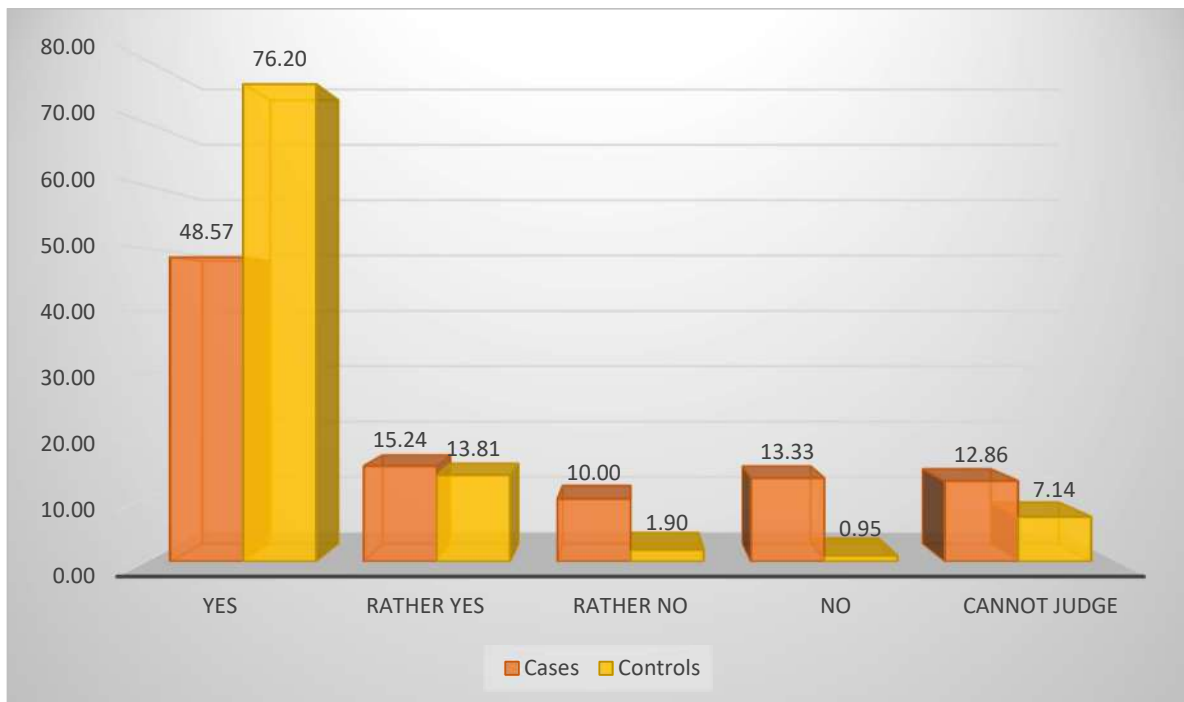


Figure 13. *Percentage Distribution of Results Regarding Repeat Choice of the Same Mode of Delivery*

Results for Pain Intensity Assessment in CS

In the group of women who underwent CS, we examined pain intensity during the first 24 hours post-operatively. This covered the period following the offset of anaesthesia up to the completion of the first post-operative day, using a 0 to 10 scale. The results demonstrated that the mean pain score reported by respondents was 6.09 ± 2.49 (95% CI 5.75–6.43; min 0, max 10; Me 6.00).

In the same cohort, we evaluated pain intensity after the first 24 hours until discharge. The same 10-point evaluation scale was used, alongside pooled values. The results showed that the mean pain score reported by respondents was 5.21 ± 2.253 (95% CI 4.90–5.52; min 0, max 10; Me 5.00).

Results for Labour Pain Intensity

In the group of women who had a VB, we investigated pain intensity during labour. Respondents again rated their pain on a scale from 0 to 10, where 0 corresponds to an absence of pain and 10 to intolerably severe pain. The results demonstrated that the mean pain score reported by respondents was 8.27 ± 2.018 (95% CI 8.00–8.55; min 0, max 10; Me 9.00).

The results indicate a very high mean pain level for women during labour in the control group. This value suggests that the pain is perceived as unbearable by most women.

In this cohort, we examined the perception of pain intensity following delivery using the same assessment scale. The results showed that the mean pain score reported by respondents was 4.46 ± 2.392 (95% CI 4.14–4.79; min 0, max 10; Me 4.00).

In analysing the results regarding birth-related experiences and which mode of delivery women would recommend to their close contacts, significant differences were logically identified between the studied groups. In response to the question "Would you recommend CS as a mode of delivery to your close contacts?", 48.6% of women in the CS group responded with "Yes" or "Rather yes", whereas this percentage in the control group was merely 2.8% ($p = 0.00003$; $r = 0.47$). Recommendations for VB (answering "Yes" or "Rather yes") were given by 89.6% of women in the control group and 53.8% of those in the case group, respectively ($p = 0.00001$; $r = 0.37$).

Significant differences were also noted regarding attitudes toward choosing the same mode of delivery again in a subsequent pregnancy ($p = 0.0002$; $r = 0.33$). This indicates that the mode of delivery influences women's decision-making regarding the method chosen for future pregnancies.

Statistically significant differences were also observed regarding pain intensity between the studied groups. Among women who gave birth naturally, the mean pain intensity during and in the initial hours following delivery was 8.27 ± 2.02 , whereas for women delivered via CS, it was significantly lower during the first 24 hours at 6.09 ± 2.49 ($p = 0.00003$; $r = 0.44$). Beyond 24 hours, however, greater pain intensity was observed in women delivered via CS (5.21 ± 2.25) compared with women who had a natural birth (4.46 ± 2.39 ; $p = 0.01$; $r = 0.23$).

Conclusions from Stage II

1. Socio-demographic characteristics show no statistically significant influence on the mode of delivery.
2. The type of previous delivery is one of the strongest predictors for the current mode of delivery, with a prior CS significantly increasing the likelihood of a repeat operative delivery.
3. Fear of vaginal delivery is widespread among pregnant women, but it does not independently determine the choice of delivery mode.
4. Fear of CS is significantly more pronounced among women who gave birth vaginally.
5. Definitive refusal of vaginal delivery is observed exclusively among women delivered by CS, suggesting the presence of marked psychological factors and tokophobia.

6. Women who undergo CS more frequently experience fear of adverse neonatal outcomes as well as urinary or sexual dysfunction.
7. Healthcare professionals serve as the primary factor shaping opinions regarding different delivery modes, whereas the influence of immediate social contacts is limited.
8. Personal birth experience exerts a substantial impact on women's future preferences and their willingness to recommend a specific mode of delivery.
9. The decision to undergo CS is shaped by a complex interplay between reproductive history, psychological attitudes, fears, and medical recommendations.
10. The obtained results support the necessity of developing an interventional algorithm for women with tokophobia, aimed at reducing fears, improving awareness, and facilitating informed choice regarding the mode of delivery, which constitutes one of the primary objectives of this PhD thesis research.

V. ALGORITHM FOR REDUCING UNNECESSARY CESAREAN SECTIONS

Stage 1: Early Screening in Antenatal Care — 12–20 Weeks of Gestation

Four groups of factors are evaluated: obstetric history, medical risk, psychological attitudes, and level of information.

Key screening questions:

1. "Do you have a preference regarding the mode of delivery?"
2. "Do you have a fear of vaginal delivery? What is it related to?"
3. "How definitive is your decision regarding the mode of delivery?"
4. "What causes you the greatest anxiety — pain, uncertainty, risk to the baby, birth trauma, dysfunction, or failure?"
5. "Who or what would exert the strongest influence on your decision — the opinion of an obstetrician, midwife, partner, friends, or the internet?"

These questions align with WHO recommendations for non-clinical interventions that take into account women's fears, beliefs, and awareness in order to reduce unnecessary CS.

Stage 2: Risk Stratification for Unnecessary CS — 21–28 Weeks of Gestation

Low Risk of Unnecessary CS

Characteristics:

- No definitive refusal of VB;
- No previous CS;
- Prefers VB or has no firmly fixed preference;
- Fear is moderate and manageable;
- No significant medical indications for elective CS.

Management:

- Standard ANC;
- Brief counselling regarding the benefits/risks of VB and CS;
- Encouraging partner involvement;

- Antenatal education and birth preparation led by a midwife.

Moderate Risk of Unnecessary CS

Characteristics:

- Marked fear of VB, but without a definitive refusal;
- Uncertainty and answers such as "cannot judge";
- Fear of pain, uncertainty, or birth trauma;
- Strongly influenced by non-medical sources;
- Previous negative birth experience, but without absolute medical indication for CS.

Management:

- Individual midwifery consultation;
- Structured information delivery regarding real risks and benefits;
- Attendance at antenatal classes / individual discussions;
- Discussion of analgesia options, partner presence, and birth plan;
- Re-evaluation at 28–32 weeks of gestation.

High Risk of Unnecessary CS

Characteristics:

- Definitive refusal of VB;
- Severe fear of adverse neonatal outcome;
- Fear of urinary or sexual dysfunction;
- Previous CS without absolute contraindication to vaginal birth after CS;
- High anxiety, tokophobia, or a fixed belief that CS is "safer".

Management:

- Multidisciplinary consultation: obstetrician-gynaecologist, midwife, psychologist/psychiatrist;
- Discussion of vaginal birth after Caesarean or trial of labour after Caesarean (VBAC/TOLAC) for women with a prior CS when no contraindications are present;
- Tailored individual birth plan;
- Documentation of informed consent/choice;

- Re-evaluation at 34–36 weeks of gestation.

Practical Algorithm

1. **Screening** — Every pregnant woman completes a brief assessment form regarding preferences, fears, and previous obstetric experience.
2. **Classification** — Women are stratified into risk categories: low, moderate, or high risk of unnecessary CS.
3. **Risk-Tailored Intervention:**
Low risk — Standard preparation.
Moderate risk — Targeted counselling.
High risk — Multidisciplinary interventions.
4. **Re-evaluation** — Women undergo reassessment at 28–32 weeks and 34–36 weeks of gestation to re-evaluate fear, awareness, and preferences.
5. **Final Decision** — Determination of the mode of delivery based on medical indications, obstetric status, informed consent, and psychological risk assessment.
6. **Postpartum Feedback** — Mandatory postpartum counselling to assess satisfaction, pain, birth experience, and willingness to make the same choice in a future pregnancy.

VI. CONCLUSIONS

1. In Bulgaria, a persistently high rate of Caesarean sections is observed against a backdrop of declining birth rates, with Plovdiv being among the regions recording the highest values.
2. In the first stage, elective Caesarean sections predominate over emergency ones, and women undergoing elective CS are statistically significantly older.
3. Previous Caesarean section represents one of the strongest factors for subsequent elective operative delivery.
4. Onset of labour, SROM (spontaneous rupture of membranes), and cervical dilation are the primary factors associated with emergency Caesarean section.
5. In the second stage, socio-demographic characteristics show no statistically significant differences between women delivered by CS and VB, pointing to a greater relative weight of medical and psychological factors.
6. The mode of prior delivery demonstrates a strong association with the mode of current delivery, with Cramer's $V = 0.76$ indicating a marked dependence.
7. Fear of vaginal delivery is widespread across both groups, but in itself does not account for the choice of Caesarean section.
8. Absolute refusal of vaginal delivery is identified exclusively among women delivered by CS, encompassing 26.7% of them, serving as an important indicator of tokophobia or a strong negative attitude toward VB.
9. Women undergoing CS more frequently report fear of adverse neonatal outcomes as well as urinary/sexual dysfunction, whereas fear of failure is more common among women delivered vaginally.
10. Healthcare professionals — doctors and midwives — exert the strongest influence on opinions regarding the mode of delivery, establishing their pivotal role in preventing non-medically indicated CS.
11. Personal birth experience shapes future attitudes — women are more inclined to recommend and select again the mode of delivery they themselves experienced.
12. The obtained results support the necessity of an algorithm for the early identification of women at high risk of unjustified preference for CS and their referral for structured counseling.

VII. CONTRIBUTIONS AND RECOMMENDATIONS

Scientific and Theoretical Contributions

1. A retrospective, combined epidemiological and medico-social study of the factors influencing CS, as well as its expected effects, was conducted in the Plovdiv region.
2. For the first time in Bulgaria, the perspectives of post-partum women regarding the mode of delivery were investigated using a case-control design via an anonymous group survey.

Confirmatory Contributions

1. The multifactorial etiology of rising operative delivery rates was confirmed.
2. A comprehensive analysis of the risk factors for CS was performed in this PhD thesis, examining the expected effects of operative delivery in detail.

Practical and Applied Contributions

1. A questionnaire was developed to investigate the opinions of post-partum women regarding the advantages and disadvantages of different modes of delivery.
2. An algorithm was established for early screening and risk stratification for unnecessary CS.
3. Concrete recommendations were formulated for national institutions aimed at reducing rates of unnecessary CS and enabling the early identification of women at risk. These recommendations have the potential to mitigate adverse consequences for pregnant women, post-partum mothers, families, and society.

Based on the findings of the study, concrete recommendations were formulated for institutions in the Republic of Bulgaria to limit non-medically indicated CS. They are addressed to:

1. Ministry of Health (MH) and Executive Agency "Medical Supervision" (EAMS)

1.1. Implementation of a national strategy and regional monitoring to prevent unnecessary CS. National institutions should formally approve a practical prevention algorithm. Regulatory bodies should exercise enhanced monitoring regarding compliance with these recommendations.

1.2. Implementation of an algorithm for the early identification of women at high risk of unjustified CS. This algorithm provides for the referral of identified patients to specialised counselling. Funding should be secured for activities related to the identification and counselling of pregnant women.

2. Inpatient Healthcare Facilities (Obstetric/Gynaecological Hospitals, Clinics, and Departments)

2.1. Rigorous clinical evaluation of indications for primary CS. Departmental leads should regularly hold meetings and disseminate updated methodological guidelines among obstetric teams for an objective assessment of factors requiring operative delivery. Obstetricians must thoroughly analyse comorbid conditions, as they exert a direct influence on the choice of delivery mode.

2.2. Management of delivery in patients with a prior CS. Healthcare facilities should implement clinical protocols for trial of labour after CS (VBAC/TOLAC) in the absence of medical contraindications.

2.3. Multidisciplinary approach for women refusing VB. For women with a definitive refusal of VB, high anxiety, or tokophobia, facilities should provide multidisciplinary counselling involving an obstetrician-gynaecologist, a midwife, and a psychologist or psychiatrist.

2.4. Provision of postpartum feedback. Healthcare facilities should introduce mandatory postpartum counselling to rigorously assess satisfaction, pain perception, overall birth experience, and willingness to make the same choice in a future pregnancy.

3. Outpatient Healthcare Facilities (ANC Clinics)

3.1. Introduction of early screening (12–20 weeks of gestation) for women at risk of unnecessary CS.

3.2. Risk stratification (21–28 weeks of gestation), classifying patients into low, moderate, or high-risk categories for unnecessary CS.

3.3. Targeted interventions for women at risk. For women with marked fear of VB and pain who are strongly influenced by non-medical sources, ANC clinics should offer individual consultations with an obstetrician and a midwife, as well as attendance at antenatal classes. Structured information regarding real risks and benefits must be provided.

4. Bulgarian Medical Association (BMA) and Bulgarian Association of Health Care Professionals (BAHCP)

4.1. Professional organisations should invest in continuing professional development courses aimed at enhancing communication skills between obstetricians/midwives and patients.

5. Medical Universities

5.1. Provision of postgraduate training for medical professionals to update knowledge regarding issues surrounding CS, tokophobia, and the early identification of risk factors for unnecessary CS.

VIII. PUBLICATIONS RELATED TO THE THESIS

1. **Nikolova Z**, Momchilova T, Amydzhian D, Ruschucova D. Main risks of the Caesarean Section on Maternal Request. Bulgarian Journal of Public Health (Sofia), 2023;15(1):45-51. ISSN 1313-860X
2. **Nikolova Z**, Sandeva M. Indications for and Medical-Social Aspects of Caesarean Section. J of IMAB. 2025 Jan-Mar;31(1):6079-84. ISSN: 1312-773X <https://doi.org/10.5272/jimab.2025311.6079>
3. Georgieva L, **Nikolova Z**, Kuzmanov B, Ruschukova D. Complications of Pregnancy and Delivery in Obese Women – Literature Review. Information for Nursing Staff, 2025, 57(1), 58-63. ISSN 1310-7496 (Print), 3134-2027 (Online)