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Original Research

Prevalence and Indications of Cesarean Section at Tobruk Medical Center: A Cross-Sectional Study at Tobruk, Libya

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ABSTRACT:

Knowing the reason for the increase in cesarean births, their complications, and possible outcome. This study aims are to assess the rate and causes of cesarean section births at Tobruk Medical Center in Libya, in light of the increasing rates globally and locally, the results aim to provide data that will contribute to improving medical practices and developing effective strategies to promote maternal and newborn health. Retrospective cross-sectional study was

conducted on 701 women who underwent caesarean sections at Tobruk Medical Center, Libya, between October 2024 and June 2025, after obtaining ethical approval. Data were collected from obstetric records and included maternal demographics, delivery type, indications for caesarean section, and outcomes. All women with complete records were included, excluding vaginal deliveries and abortions below the threshold for survival. The study included 701 women with a mean age of 32 years. Emergency cesarean sections accounted for 64.5% of cases, and 91% of newborns were alive. The most common indication for cesarean delivery was a previous cesarean section (36.7%) ،followed by fetal distress (12.8%) and maternal morbidity (12.7%). At Tobruk Medical Center, 22.6% of births were cesarean, mostly emergency cases. Previous cesarean, fetal distress, and maternal complications were the main causes. Improved obstetric practices and monitoring may reduce unnecessary emergencies.

KEYWORDS: Cesarean Section, Emergency Cesarean, Maternal Outcomes, Fetal Distress, Obstetric Factors, Maternal Complications, Previous Cesarean Delivery, Intrapartum Monitoring.

INTRODUCTION

A C-section is an important surgical procedure in obstetrics which help in reduce maternal and neonatal morbidity and mortality when vaginal delivery is unsafe or contraindicated [1,2]. Nevertheless, over the years, the global increase in the rates of cesarean deliveries has raised concerns regarding the overuse of the surgical procedure and the potential complications that may arise from it [3].

The World Health Organization (WHO) has declared that cesarean sections should ideally account for 10-15% of all births. Caesarean rates above this level do not provide additional protection against deaths of mothers or newborns [4]. On the contrary, the rates of cesarean sections performed in various countries continue to rise, with various regions and healthcare systems displaying differing rates. Research from parts of sub-Saharan Africa and the Middle East has noted increased rates due to easier surgical access, new maternal preferences, and changes in legal medicine [2,3].

In Libya, social, institutional, and clinical factors have contributed to the increasing rate of cesarean sections. Prior studies from Libyan hospitals said c-sections were frequently performed for cephalopelvic disproportion, previous c-section, and fetal distress [5,6].

However, existing studies, such as those conducted in Al-Khums or Al-Wahda Hospital in Derna, have limited scope and do not represent the eastern part of country. Prevalent in literature there also rests the absence of comprehensive research in Tobruk Medical Center about c-section prevalence and reasons.

This study will solve the gap in literature by determining the c-section rate and main reasons for c-sections to be performed in Tobruk Medical Center in Tobruk, Libya. Identifying local patterns and causes of C-sections may help improve obstetrics practices and inform public health strategies aimed at enhancing maternal outcomes in the region.

MATERIALS AND METHODS

Retrospective cross-sectional study included a total of 701 women who underwent cesarean

delivery at Tobruk Medical Center in Libya, from October of 2024 to June of 2025 after obtaining Ethical approval from the University of Tobruk Research and Ethics Committee and the Tobruk medical Center Administration. Information was retrieved from delivery records and tabulated in a structured excel file, including: Maternal age ،Parity / previous CS or NVD ،Gestational age (weeks) ،Type of delivery (vaginal, elective CS, emergency CS) ،Indication(s) for CS ،Neonatal outcome: alive / stillbirth / neonatal death ،Singleton / twin pregnancy.

All the women who underwent cesarean delivery at Tobruk medical center at the time of study were included and only the cases with complete medical records containing the required data variables were eligible for inclusion.

While the exclusion criteria are the vaginal deliveries, Abortions below viability threshold, vaginal deliveries, Abortions below viability threshold.
Records with missing essential information (e.g., delivery type not recorded).

Ethical Considerations

IRB approval from University of Tobruk and Tobruk Medical Center administration.

Data Anonymization

Stored securely in password-protected files.

Retrospective Study

Patient consent not required, institutional approvals Mandatory.

Statistical A

Data management, analysis, and graphs were performed using RStudio software version 4.3.2. Numerical data were summarized using medians and interquartile ranges, as appropriate. Categorical data were summarized as numbers and percentages. Estimates of the frequency were done using the numbers and percentages. Numerical data were explored for normality using Kolmogrov-Smirnov test and Shapiro-Wilk test. Chi square or Fisher's tests were used to compare between the independent groups with respect to categorical data, as appropriate. Comparisons between two groups for normally distributed numeric variables were done using the student's t-test while for non-normally distributed numeric variables, comparisons were done by Mann-Whitney test. Multivariate logistic regression was performed to calculate odds ratio and determine the most significant risk factors or predictors of the outcome.Associations were also measured in subgroups stratified by gender. Statistical significance was established as a $p < 0.05$.

RESULTS AND DISCUSSION

An analysis of delivery data over ten months show a total of 3432 births, The majority were Normal Vaginal Deliveries (NVDs) (77.36%), Conversely CS made up the remaining (22.64%).

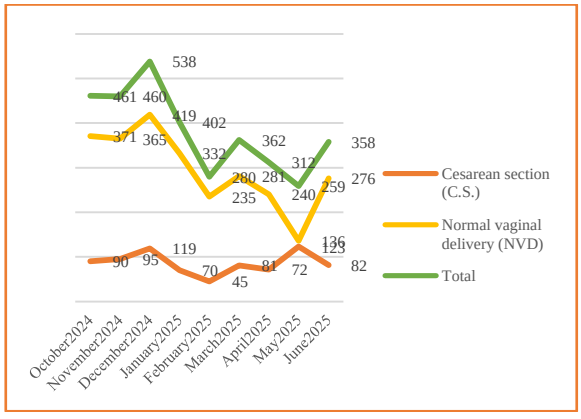
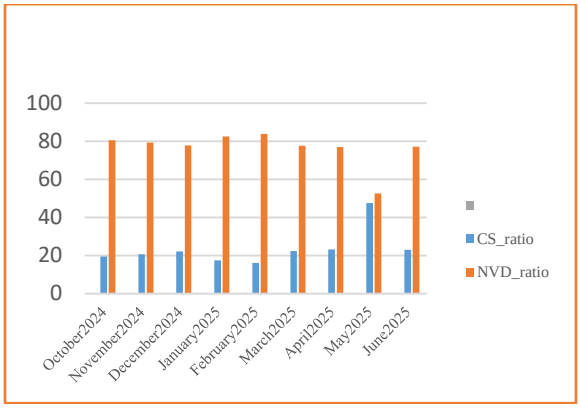


Figure 1.



Figures: (1and 2): Prevalence of VND and CS according to the Months.

The monthly rate of CS was mostly constant, typically hovering around one in five births. However, one month show a notable reading. May 2025 show a dramatic significant shift, during that month, nearly half of deliveries (47.49%) were by CS, approximately a rate more than double that of most other months. [Table 1, Figures 1, 2].

Table 1: Prevalence of NFD and CS

		CS (n)	CS ratio (%)	NVD (n)	NVD ratio (%)	Total (n)
Month:	October2024	90	19.52	371	80.48	461
	November2024	95	20.65	365	79.35	460
	December2024	119	22.12	419	77.89	538
	January2025	70	17.41	332	82.59	402
	February2025	45	16.07	235	83.93	280
	March2025	81	22.38	281	77.62	362
	April2025	72	23.08	240	76.92	312
	May2025	123	47.49	136	52.51	259
	June2025	82	22.91	276	77.09	358
Total:		777 (22.64%)		(77.36%)2655		3432 (100%)

The demographic and clinical characteristics of the participants are summarized in [Table 2]. The cohort had a median age of 32 years (IQR: 27-36) and a median gravidity of 4 (IQR: 3-6).

The majority of the CS procedures were performed urgently (64.5%, n=452), while 35.5% (n=249) were elective. Most deliveries resulted in single, live births (93.2% and 91.0%, respectively). The most common indication for CS was a history of previous cesarean sections (36.7%), followed by fetal distress (12.8%) and maternal conditions (12.7%).

In comparison between the planned elective C-sections and the urgent ones, some clear patterns emerged. Women in the elective cesarean group tended to be older, had higher gravidity and parity than those in the urgent group ($P < 0.001$ for all). The rate of previous abortions also differed significantly between the two groups ($P < 0.001$).

Table 2: The Descriptive Data of CS Women, Data are expressed as n (%), and median (IQR)

		Overall (n= 701)
Age		32 (27- 36)
Gravidity		4 (3- 6)
Parity		2 (1- 4)
Abortion		1 (0- 1)
Elective CS (%)	Elective	249 (35.5)

	urgent	452 (64.5)
Outcome (%)	Both sex	9 (1.3)
	Boy	336 (47.9)
	Girl	319 (45.5)
	Not applicable	37 (5.3)
Single or twins (%)	single	653 (93.2)
	twins	48 (6.8)
Alive or dead (%)	alive	638 (91.0)
	Dead	63 (9.0)
Duty group (%)	A	198 (28.2)
	B	207 (29.5)
	C	193 (27.5)
	D	103 (14.7)
Indication	Amniotic Fluid Issues	67 (9.6)
	cord presentation	1 (0.1)
	Fetal Distress	90 (12.8)
	Infertility	24 (3.4)
	Labor Progress Issues	38 (5.4)
	Malpresentation	54 (7.7)
	Maternal Conditions	89 (12.7)
	Multiple Pregnancy	13 (1.9)
	Other Indications	68 (9.7)
	Previous Cesarean Sections	257 (36.7)

Table 2: The Descriptive Data of CS Women. Data are expressed as n (%), and median (IQR)

Twin pregnancies were more common in the urgent group (8.8%) compared with the elective group (3.2%) (P = 0.008). Moreover, neonatal survival was higher among elective cases (96.8%) than among urgent ones (87.8%) (P < 0.001). A clear difference was also noted in the indications for cesarean section between the two groups (P < 0.001). The leading indication for elective CS was a previous cesarean section (71.5%), whereas fetal distress (19.7%), malpresentation (10.4%), and maternal complications (16.6%) were more common among urgent cases. These findings suggest that the reasons prompting cesarean delivery differ substantially between planned and emergency operations. [Table 3, Figures 3,4,5,6 and 7].

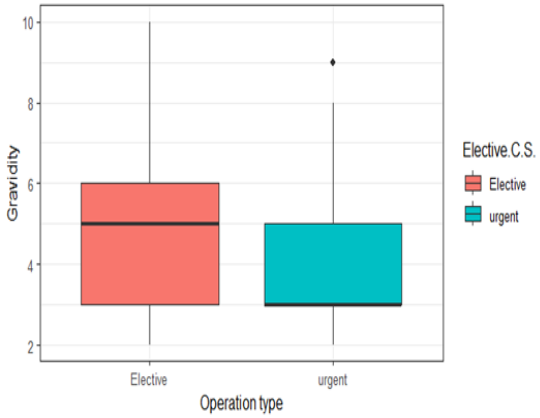


Figure 3: The Boxplot for the Association between the Two Groups Regarding Gravidity.

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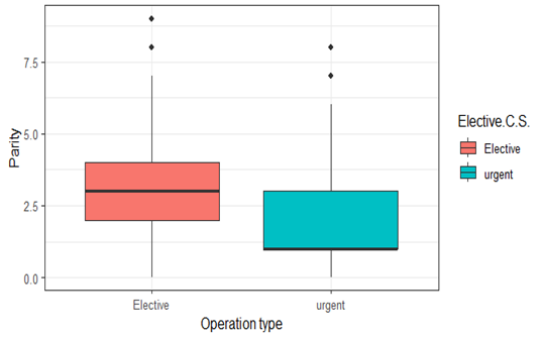

Figure 4: The boxplot for the Association between the Two Groups Regarding Parity

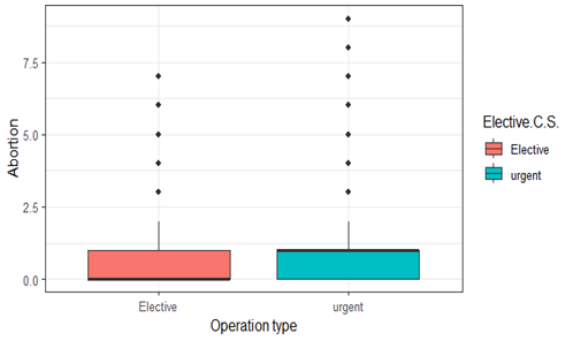

Figure 5: The Boxplot for the Association between the Two Groups Regarding Abortion

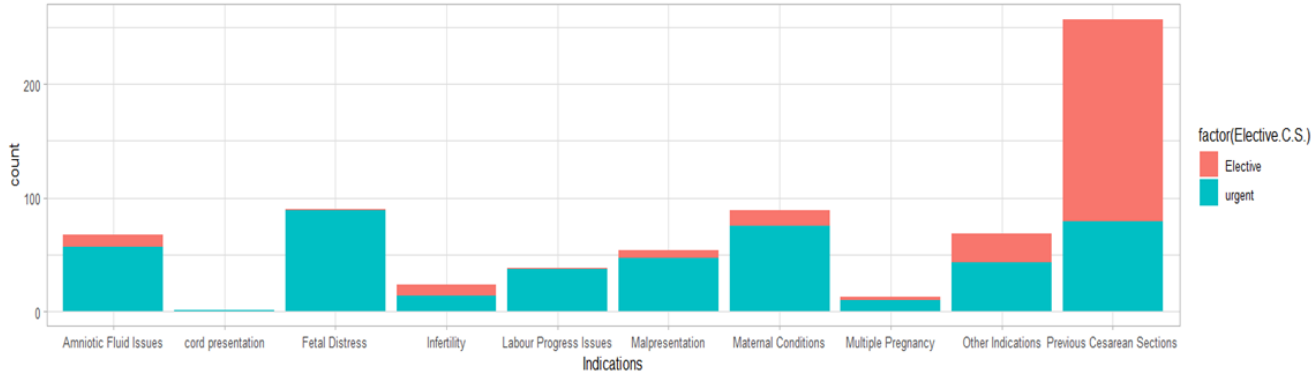

Figure 6: The Bar Chart for the Distribution of Indications among Women Undergo Elective and Urgent Cesarian Section

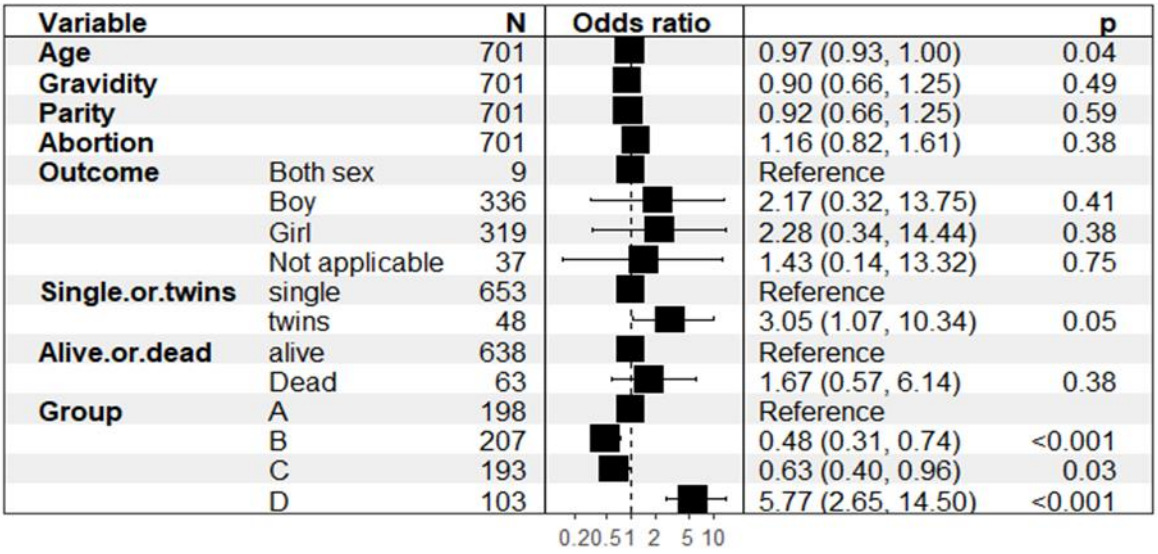

Figure 7: The forest plot for the relation between the two studied group.

To dig deeper, we used a statistical model to see which factors were independently linked to having an urgent C-section. This analysis confirmed that a mother's age played a role,

with younger mothers having a slightly higher chance of an emergency section (OR = 0.97, 95% CI: 0.93–1.00, P = 0.040). We also found that a woman's specific group classification was a very strong predictor. For instance, being in Duty Group D made a woman much more likely to have an urgent C-section (OR = 5.77, 95% CI: 2.65–14.5, P < 0.001), while being in Groups B or C seemed to be protective (OR = 0.48, 95% CI: 0.31–0.74, P < 0.001, OR = 0.63, 95% CI: 0.40–0.96, P = 0.034, respectively). Finally, while not quite hitting the strictest level of significance, twin pregnancies showed a strong trend toward being associated with urgent C-sections, making them about three times more likely. Other factors, like the number of past pregnancies or abortions, didn't show a significant independent link in this model. [Table 4].

Table4: Multivariate logistic regression for the association between the two studied groups, OR = Odds Ratio, CI = Confidence Interval.

Characteristic	**OR**[1]	**95% CI**[1]	**p-value**
Age	0.97	0.93, 1.00	**0.040**
Gravidity	0.90	0.66, 1.25	**0.5**
Parity	0.92	0.66, 1.25	**0.6**
Abortion	1.16	0.82, 1.61	**0.4**
Outcome			
Both sex	—	—	
Boy	2.17	0.32, 13.8	**0.4**
Girl	2.28	0.34, 14.4	**0.4**
Not applicable	1.43	0.14, 13.3	**0.8**
Single or twins			
single	—	—	
twins	3.05	1.07, 10.3	**0.051**
Alive or dead			
alive	—	—	
Dead	1.67	0.57, 6.14	**0.4**
Duty group			
A	—	—	
B	0.48	0.31, 0.74	**<0.001**
C	0.63	0.40, 0.96	**0.034**
D	5.77	2.65, 14.5	**<0.001**

The institutional caesarean section rate of 22.64% at Tobruk Medical Center (TMC), based on an analysis of 3,432 births, represents a critical and contemporary indicator of

obstetric practice in eastern Libya. This rate warrants careful comparative analysis at the regional and global levels. Although this rate clearly exceeds the WHO's optimal range (10-15%) [4], it provides a differential context when directly compared to high global and regional rates. The TMC rate is lower than the United States rate (32.3%) [7] and significantly lower than the regional peak recorded in some centers, such as Syria (47.4%) [8]. This confirms that, despite exceeding the global health target, TMC maintains a lower rate compared to some models that experience severe excess. The crux of the discussion is intensified when analyzing the reasons, where a history of previous cesarean delivery tops the list at 36.7%, making it the single largest contributor to the overall increase in the rate. Furthermore, the center's findings reveal that the majority of cesarean sections (approximately 64.5%) were mandatory (emergency), while elective operations accounted for the remaining 35.5%. This distribution indicates that two-thirds of surgical interventions are performed to save the life of the mother or fetus, rather than being driven by social factors or maternal preference. This contrasts with the pattern of increase in some countries where the rate of elective cesareans is high and not medically justified. In India, for example, the rate of cesarean delivery on maternal request (CDMR) can range from 17.2% to 48% of all cesarean sections in some regions [9], confirming the dominance of social and financial motivations in surgical decisions in these settings. In the context of institutional practice, the role of duty groups emerges as one of the organizational factors influencing surgical decisions. The analysis showed that duty group D was most associated with compulsory/emergency caesarean sections (with a very high-risk ratio of 5.77), indicating that this group handles the most complex or urgent cases that cannot be postponed. Duty groups B and C, on the other hand, exhibit different patterns with lower risk ratios, suggesting a greater association with scheduled elective operations or a lower risk of emergency procedures, this distribution is consistent with research, which has found that emergency caesarean sections and their complications vary slightly depending on the time of day and day of the week, which is closely related to the timing and, consequently, the distribution of work teams [10,11], Regarding demographic factors, although advanced maternal age is globally an important factor in increasing the likelihood of caesarean sections, an analysis of the results at Tobruk Medical Center did not show a strong statistical significance for an independent association of age with risk, suggesting that purely clinical motives or institutional policies dominate the decision to perform the operation in this specific Libyan context. In contrast, studies in Saudi Arabia, which record overall cesarean section rates as high as 48.6% [12], show that the increased rates are increasingly associated with higher body mass index (BMI), and patient age [13]. Other factors also emerge as strong variables in other countries. A recent study in Nepal (2025) revealed that economic status (an AOR of 6.729; $p<0.001$ for the richest quintile) and higher educational attainment (AOR: 3.207; $p<0.01$) were the most significant independent factors driving the increase in cesarean deliveries [14], supporting the theory that demographic and social variables play a much greater role elsewhere than in the Libyan context. Therefore, there is an urgent need to adopt the Robson Classification [15] at Tobruk Medical Center to enable a detailed analysis of the contribution of each group of women to the overall rate and to accurately identify medically unjustified procedures.

Study Limitations

This study faced several fundamental methodological limitations, most notably its retrospective cross-sectional study, which relies on previously recorded data for clinical purposes, potentially affecting data quality and

consistency.

Furthermore, the methodology required the inclusion of only cases with complete medical records containing all required variables, while excluding records lacking essential information. This represents a methodological limitation that could lead to selection bias, as excluded cases may differ in characteristics from those included, limiting the accuracy of the results' representation of the overall clinical reality at the center. Furthermore, the study's scope was limited to only one center, Tobruk Medical Center, limiting the generalizability of these results to the entire Tobruk region or to other private healthcare facilities.

CONCLUSION

The study confirmed that the caesarean section rate at Tobruk Medical Center exceeds the optimal rate recommended by the World Health Organization, highlighting a local health challenge that requires intervention. The analysis revealed that the most common reason for cesarean section was a history of previous cesarean deliveries, accounting for approximately one-third of all operations, with fetal distress and maternal complications following in order. The results also showed that the majority of operations were mandatory or emergency, and these were associated with lower neonatal survival rates (87.8% versus 96.8% for elective operations). From an organizational and clinical perspective, shift group D classification was a very strong independent predictor of an increased likelihood of an emergency cesarean section, while younger mothers were associated with a slightly higher chance of an emergency cesarean section. To reduce these patterns, the study recommends adopting standardized protocols such as the Robson criteria, enhancing maternal health awareness about the risks of unjustified cesarean delivery, training medical personnel on the management of complicated vaginal labor, and reviewing compensation policies to encourage vaginal delivery. May help develop effective strategies to improve obstetric practices and enhance maternal and newborn health outcomes in the region.

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We would like to express our appreciation to the staff, doctors, and nurses working at the Obstetrics and Gynecology Department at Tobruk Medical Center for their roles in saving the lives of these patients.

ETHICS

IRB approval from University of Tobruk and Tobruk Medical Center administration, data anonymized and stored securely in password-protected files, patient consent not required, as the study is retrospective, institutional approvals mandatory.

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الملخص

يهدف هذا البحث إلى تقييم معدل وأسباب الولادات القيصرية في مركز طبرق الطبي بليبيا، في ضوء ارتفاع معدلاتها عالميًا ومحليًا، وذلك بهدف معرفة أسباب ازديادها. وتهدف النتائج إلى توفير بيانات تُسهم في تحسين الممارسات الطبية ووضع استراتيجيات فعّالة لتعزيز صحة الأم والوليد. أُجريت دراسة مقطعية استرجاعية على 701 امرأة خضعن لعمليات قيصرية في مركز طبرق الطبي بليبيا، خلال الفترة من أكتوبر 2024 إلى يونيو 2025، بعد الحصول على الموافقة الأخلاقية. جُمعت البيانات من سجلات التوليد، وشملت البيانات الديموغرافية للأمهات، ونوع الولادة، ودواعي إجراء العملية القيصرية، والنتائج. شملت الدراسة جميع النساء اللاتي لديهن سجلات كاملة، باستثناء الولادات الطبيعية والإجهاضات التي تقل فيها احتمالية بقاء الجنين على قيد

الحياة. بلغ متوسط عمر المشاركات 32 عامًا. شكلت العمليات القيصرية الطارئة 64.5% من الحالات، وبلغت نسبة المواليد الأحياء 91%. كانت الولادة القيصرية السابقة السبب الأكثر شيوعًا للولادة القيصرية (36.7%)، تليها ضائقة الجنين (12.8%) ومضاعفات الأم (12.7%). في مركز طبرق الطبي، كانت 22.6% من الولادات قيصرية، ومعظمها حالات طارئة. وكانت الولادة القيصرية السابقة وضائقة الجنين ومضاعفات الأم من الأسباب الرئيسية. قد يساهم تحسين ممارسات التوليد والمتابعة في تقليل حالات الطوارئ غير الضرورية.

الكلمات المفتاحية: الولادة القيصرية، الولادة القيصرية الطارئة، نتائج الأم، ضائقة الجنين، العوامل التوليدية، مضاعفات الأم، الولادة القيصرية السابقة، المتابعة أثناء الولادة.