

Original Article

Rate, Indications and Fetal Outcome of Cesarean Section Deliveries at a University Hospital in Cairo

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Abstract

Background & Objective(s): Cesarean section (CS) rates increased in different parts of the world. Egypt demographic and Health Survey report (2014) shows that Egypt is the third country worldwide. Caesarean sections are associated with short- and long-term complications. The aim of this study was to measure rate and trend of CS at Ain Shams Maternity Hospital (2011-2015), to identify characteristics of females who delivered by CS during the last two years of the study duration (2014-2015) and to find out risk factors of unfavorable/poor fetal outcome.

Methods: A descriptive observational study by record review was performed by randomly selecting 1305 files from hospital archives of 2014 and 2015.

Results: Rate of CS increased over 5 years (2011- 2015) from 27.6% to 36.9. CS rate was 36.6% in 2014 and 36.9% in 2015. The majority of cesarean deliveries (80%) were due to maternal causes (out of which 63% were due to previous CS). Half of the fetal causes was due to fetal distress. Multivariate logistic regression revealed that preterm birth (<37 weeks) and maternal health problems necessitating CS, significantly determined fetal outcome.

Conclusion: The rate of CS in this study was higher than that recommended by international guidelines. Preterm birth and maternal indications for CS significantly determined fetal outcome. Evidence-based protocols for deliveries should be adopted or updated if present and to have clear criteria as well as a written policy for when a CS should be performed.

Keywords: Rate; Cesarean sections (CS); maternal indications; fetal outcome; preterm birth

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INTRODUCTION

Cesarean section (CS) delivery is considered a life-saving operation for both the mother and her fetus ⁽¹⁾. Recently, CS rates have increased worldwide and most of these deliveries had no medical indication. World health organization considered the ideal rate for cesarean section to be 10-15%. When CS rates rise towards 10 %, the number of maternal and newborn deaths decreases, but when the rate goes above 10%, there is no evidence that mortality rates improve ⁽²⁾. A study done in the United States using National Vital Statistics Reports showed a CS rate of 32.7% ⁽³⁾. In 2008, the Egyptian Demographic Health Survey (EDHS) showed that the rate of CS was 25%⁽⁴⁾, while the 2014 Health Issue Survey (HIS) showed that more than 50% of deliveries were by CS ⁽⁵⁾. The population Council reported that rates of CS have been continuously rising since the year 2000 and have more than doubled between 2008 and 2014, reaching

a rate of 67% of hospital-based births in 2014 ⁽⁶⁾. Recently; changes in financial, social, cultural factors and decrease in vaginal births after cesarean (VBAC) influenced the rising of non-medical indications for cesarean section, including Cesarean delivery on maternal request (CDMR) ⁽⁷⁾. According to the guidelines of the Association of Scientific Medical Societies in Germany⁽⁸⁾, absolute indications for CS may be either maternal or fetal. Maternal indications are like absolute disproportion, chorioamnionitis, maternal pelvic deformity, eclampsia and HELLP (hemolysis, elevated liver enzyme levels, and low platelet levels) syndrome, Uterine rupture as well as placenta previa. Fetal indications include fetal asphyxia or acidosis, umbilical cord prolapse, and abnormal lie or presentation. Relative indications include pathological cardiotocography (CTG), failure to progress in labor (prolonged labor, secondary arrest) as well as previous CS. The rates of maternal morbidity and mortality are higher after CS compared to vaginal birth. CS is associated with an increased risk of

abnormal placentation, uterine rupture, ectopic pregnancy, stillbirth, and preterm birth. There is increasing evidence that babies born by CS have multiple hormonal, physical, bacterial, and medical exposures. These exposures may change neonatal physiology. Short-term complications of CS include an increased likelihood of allergy, altered immune system development, and reduced intestinal gut microbiome diversity.

An association between CS use and a higher incidence of late childhood obesity and asthma are frequently reported.⁽⁹⁾ Fetus may be subjected to premature birth. Fetuses delivered by CS are 50% more likely to have lower APGAR scores than those born vaginally⁽¹⁰⁾. Although CS rates have been increasing worldwide, especially in the Arab region including Egypt, increasing the risk of morbidities and mortalities for both the mother and fetus, few studies were found focusing on CS in tertiary referral hospitals. None was found describing the trend of CS in Ain Shams Maternity Hospital.

The aim of this study was to measure rate and trend of CS at Ain Shams Maternity Hospital over the period 2011-2015. We extended our analysis to identify characteristics of females delivering by CS during the study duration and to find out risk factors of unfavorable/poor fetal outcome.

METHODS

Study setting and design: A descriptive observational study by record review was conducted on cesarean section registry in Ain Shams Maternity Hospital between 2011 to 2015 to identify trend of CS in the study hospital. Ain Shams Maternity Hospital is a tertiary care University hospital located in El-Abbassia Cairo, Egypt. The total number of deliveries (2011-2015) is distributed per year in Table 1.

Table 1: Total deliveries in Ain Sham Maternity Hospital (2011-2015)

Year	2011	2012	2013	2014	2015
Total deliveries	20,468	19,585	17,961	17,633	17,894

The sample Size was calculated using PASS 11 (Power and Sample Size calculator). Based on 95% confidence interval, alpha error 0.05 and CS rate of 50%⁽⁵⁾, a sample size of 1305 files achieves study objectives. Sample was divided into 645 and 660 files from 2014 and 2015 files respectively. A total of 1305 files were selected by systematic random sampling. A file was chosen every 10th file from hospital records completed between 2014 and 2015.

Inclusion and Exclusion criteria: Files in which cesarean sections were carried out after approval of attending obstetric consultant were included in the present sample. Patients with ruptured uterus (an emergency condition that needs laparotomy) and files with incomplete obstetric history were excluded.

Data collection: data collection took almost two months duration. It was done on three days every week with an average of 50 files per day.

Study Tool: The "Checklist For Cesarean Sections" developed by Pallasmaa⁽¹¹⁾ was modified and adapted before use. The checklist included items covering: i) demographic data (maternal age, working status), ii) obstetric history (parity, number of previous cesarean deliveries, gestational age in weeks), iii) medical history of the mother [diabetes mellitus (DM) hypertension (HTN)], diseases affected the mother during pregnancy (gestational HTN, gestational DM)], iv) antenatal care (regular, irregular)⁽¹²⁾, v) reasons for CS (either maternal or fetal), vi) outcomes [viability (alive, stillbirth or neonatal death), birth weight as well as Neonatal Intensive Care Unit (NICU) admission].

Anthropometric measurements: Maternal weight and height were measured according to the standard procedures and body mass index (BMI) was calculated according to the following formula: BMI = weight in kilograms/height in squared meters⁽¹⁴⁾.

Definition of variables

Parity and gestational age were defined according to the American College of obstetrics and gynecology (ACOG)⁽¹³⁾.

- Regarding parity, a primigravida is a woman who gave birth once, a multiparous gave birth more than once, a grand multipara is a woman who has delivered five or more times.
- Gestational age categories are detailed in Table 2.

Table 2: Gestational age categories

Categories	Gestational age	
	Weeks	Days
Preterm	<37	
Early term	37 to 38	6
Full term	41 to 41	6
Post term	≥42	

- **Outcome of delivery:** favorable and unfavorable outcomes were determined according to fetal outcomes (alive and well or dead)⁽¹⁵⁾.

Statistical analysis

Data was analyzed using Statistical Package for Social Science (SPSS) version 20.0. Quantitative data was expressed as mean ± standard deviation (SD). Qualitative data was expressed as frequency and percentage. Chi-square (χ^2) test of significance was used in order to compare proportions between two qualitative variables. Multivariate logistic regression was done to explore different risk factors of unfavorable fetal outcome in case of cesarean deliveries.

Ethical consideration

The study was approved by the institution review board and the ethics committee of the Faculty of Medicine, Ain Shams University. Administrative permission to conduct

the study was obtained from Ain Shams Maternity Hospital manager. The study conformed to the international research ethics guidelines and that of the declaration of Helsinki (2013). Anonymous data collection was done and confidentiality of recorded data was guaranteed.

RESULTS

Total number of deliveries over 5 years period was 93,541. CS deliveries were 30,566. Rate of CS deliveries = $30,566/93,541 \times 100 = 32.7\%$. Elective cesarean section represented 56.6% while 43.4% underwent emergency CS.

Figure (1) shows that rate of CS increased from 27.6% in 2011 (95% CI 27-28.3) to 36.9% in 2015 (95% CI 36.2-37.6).

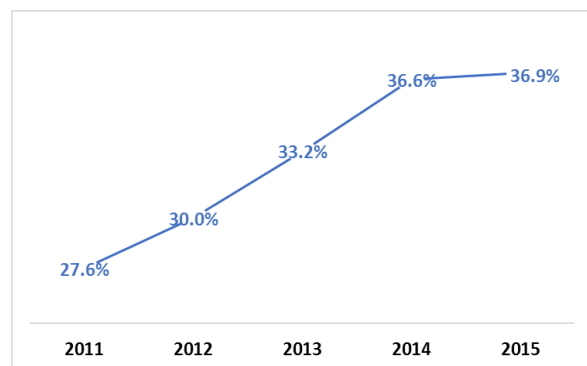


Figure 1: Rate of cesarean section delivery in Ain Shams Maternity Hospital over time (2011-2015)

The present study included 1305 files of females who delivered by CS. More than half of females (58.1%) were 21-30 years old, 32.9% were 31-40 years old, their mean age \pm SD 28.9 \pm 5.8 years. About half of females (48.8%) were severely or morbidly obese, while only 5% were of normal weight with mean BMI \pm SD was 35.9 \pm 7.8. About half of females subjected to CS (48.1%) were multiparous. Para one females represented 25.3%. Twenty-two percent were primigravida. Only 4.2% were grand-multipara (≥ 5 deliveries). Regarding gestational age; 36.4% of females had early term pregnancy while full term represented 63.6% (mean \pm SD 37 \pm 2.8 weeks).

Exploring medical history of studied participants showed that 22.3% suffered from medical diseases of them 25.4% had pre-gestational Diabetes Mellitus, 24.7% were hypertensive, 19.3% had heart diseases, 11.3% had bronchial asthma and finally 19.3% complained of other diseases such as Systemic Lupus Erythematosus, Hypo- or Hyperthyroidism, HCV infection, iron deficiency anemia etc.

Obstetric history shows that 34% of study participants had obstetric disorders of them gestational HTN (61.9%), Gestational DM (6.8%), oligohydramnios (5.4%), placenta-previa (5.1%), and IUGR (4.5%), in addition to 16.3% who complained of other diseases such as

Polyhydramnios, chorioamnionitis, antiphospholipid syndrome, etc.

Fetal indications (20% of all indications) for CS were: 53% fetal distress, 25% mal-presentation (8%), multiple pregnancy (6%), precious baby (2.7%), fetal macrosomia (2.3%), postdate and others (3%). On the other hand, maternal indications (80% of all indications) for CS were: previous CS (63%), pre-eclampsia (9.8%), arrest of labor (9.4%), failed induction (9.3%), other maternal causes such as distress, failed vaginal birth after cesarean (2.9%) (Figure 2).

Among 1358 live births (156 twins and 24 triplets were included) majority of the newborns 89.8% were alive and well. About two thirds of them 66.6% had normal weight and 96.6% of them had normal 5 min APGAR score (Table 3).

Table 3: Birth characteristics of live births delivered at Ain Shams Maternity Hospital (2014 – 2015)

Birth characteristics	Live births (n=1358)	
	No.	%
Birth Outcome		
Alive and well	1219	89.8
Transferred to NICU	139	10.2
Birth weight		
Normal weight (≥ 2500 -4000gm)	905	66.6
Low birth weight (<2500gm)	391	28.8
Macrosomia (>4000gm)	62	4.6
APGAR score at 5 minutes		
Normal score (≥ 7)	1312	96.6
Low score (<7)	46	3.4

*Multiple pregnancies are included

Table (4) showed that there was a statistically significant difference regarding cause of CS. Unfavorable fetal outcome was more liable to occur due to maternal causes ($p = 0.008$). Regarding parity 2% of the unfavorable outcomes group were born to primigravida women versus 12.5% of the Grand-multipara group. Unfavorable outcomes were more frequently recorded among preterm babies (7.1 %); while it represented 1.2% for those who had a gestational age 37 - 40 weeks. Differences between the two groups regarding parity and gestational age were statistically significant ($p < 0.001$). No statistically significant difference was observed regarding maternal age, BMI, maternal diseases, type of CS nor for regularity of antenatal care

Preterm neonates are 6.32 times likely to develop unfavorable outcome 95% C.I. (3.11-12.8) $p < 0.0001$. Maternal indications for CS increases risk of having unfavorable outcome by 5.8 times 95% C.I. (1.359-24.949) $p = 0.018$. Maternal age and parity did not significantly affect fetal outcome (Table 5).

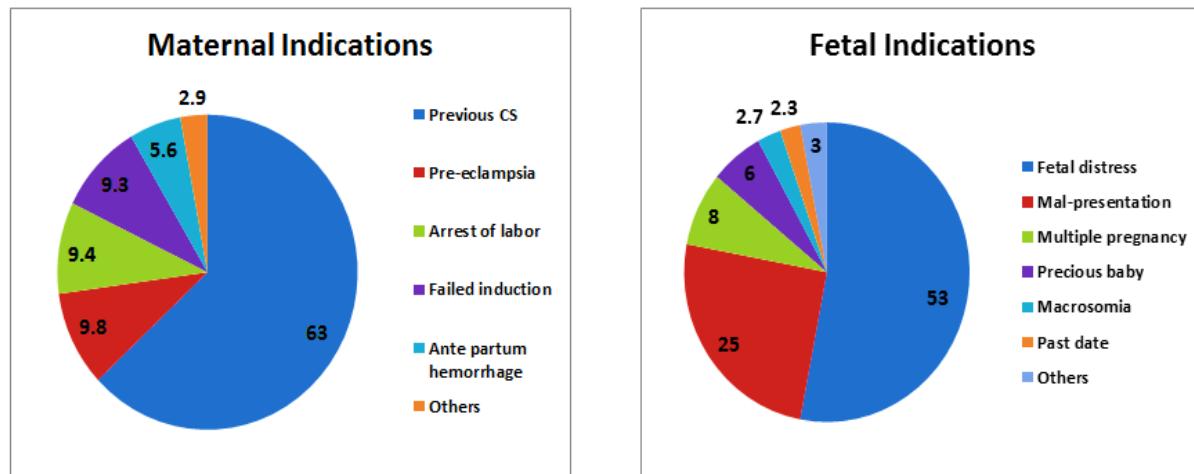


Figure 2: Indications for Cesarean Section in the last two years of the study period, Ain Shams Maternity Hospital (2014-2015)

Table 4: Relationship between maternal factors for Cesarean Section and fetal outcome

		Favorable outcome (n=1264)	Unfavorable outcome (n=41)	Row total	<i>p</i> value	cOR	95% CI	
		No. (%)	No. (%)	No.				
Age	<= 20 years	73 (89)	9 (11)	82	4.179	0.243	1.02	0.85- 2.8
	21 - 30	672 (88.5)	87 (11.5)	759			Ref	
	31 - 40	364 (84.8)	65 (15.2)	429			1.08	0.55-2.12
	≥ 41	26 (82.9)	6 (17.1)	32			4.13*	1.34-12.6
BMI (n=738)	Normal	36 (97.3)	1 (2.7)	37	0.028#	0.587	Ref	
	Overweight/obese	685 (97.7)	16 (2.3)	701			0.84	0.11 -6.5
Maternal diseases	Free	983 (96.9)	31 (3.1)	1041	0.107	0.744	Ref	
	One or more diseases	281 (96.6)	10 (3.4)	291			1.13	0.55- 2.33
Type of CS	Elective	719 (97.3)	20 (2.7)	739	1.061	0.303	Ref	
	Emergency	545 (96.3)	21 (3.7)	566			1.38*	0.74 -2.58
Cause of CS	Maternal	916 (95.9)	39 (4.1)	955	6.96	0.008	Ref	
	Fetal	260 (99.2)	2 (0.8)	262			0.18	0.043 - 0.75
Parity	Primigravida	602 (98)	12 (2)	614	24.09	<0.001*	Ref	
	Multipara	606 (96.6)	21 (3.4)	627			4.98*	1.16 - 21.35
	Grand-multipara	56 (87.5)	8 (12.5)	64			4.17*	1.77- 9.85
Gestational age	< 37 weeks	390 (92.9)	30 (7.1)	420	32.53	<0.001*	6.11*	3.03 - 12.31
	37 +	874 (98.8)	11 (1.2)	885			Ref	
Antenatal care	Regular	1167 (97.1)	35 (2.9)	1202	2.65	0.104	Ref	
	Irregular	97 (94.2)	6 (5.8)	103			2.06	0.85 – 5.02

*Significant at $p < 0.05$

ref: reference category

Table 5: Binary logistic regression model for prediction of neonatal unfavorable outcome

Variables	β	p value	Odds ratio	95% C.I. for odds ratio	
				Lower	Upper
Gestational age (ref: ≥ 37 wks)	1.844	<0.0001*	6.320	3.114	12.828
Maternal Cause of CS	1.762	0.018*	5.824	1.359	24.949
Maternal Age	0.033	0.261	1.033	0.976	1.094
Parity (ref: primigravida)	0.336	0.382	1.399	0.659	2.971
Constant	-7.075	<0.0001	.001		

*Significant at $p < 0.05$

ref: reference category

DISCUSSION

The study shows that the overall rate of caesarean deliveries over 5 years period (2011-2015) was 32.7%. This rate is lower than the overall rate of CS in a study done at Mansoura University Hospital (2006-2010) by Helal *et al.* which reported 47.25%⁽¹⁶⁾. This rate of CS was extremely higher than the ideal rate of CS determined by the WHO in a statement issued on CS in April 2015 which considered the ideal rate of CS to be 10-15%. Ain Shams Maternity Hospital is a specialized consultative tertiary care hospital. It receives referral from primary and secondary medical care facilities. Tertiary care hospitals have specialized personnel and facilities for sophisticated investigations and treatment.

In the present study the rate of CS increased from 27.6% in 2011 to 36.9% in 2015. This rate agrees with a study conducted in Obstetrics and Gynecology Cairo University Hospital by Ebrashy *et al.*, which showed that during 2008 CS rate was 37.8%⁽¹⁷⁾. This agreement may be due to that the two hospitals are teaching referral hospitals. This agrees with a study done in a referral hospital in East Africa (2005-2010) by Worjolah *et al.*, in which the cesarean section rate ranged from 29.9% in 2005 to 35.5% in 2010⁽¹⁸⁾.

In a study done in 2012 to identify demographic and socioeconomic determinants of caesarean delivery in Egypt, two features are special to the Egyptian case. First, there is an extremely fast rise in caesarean delivery rates. It shows that CS rate has doubled in only 5 years. Second, the rise was unjustified by national guidelines to rationalize caesarean deliveries. Moreover costs and complications of these caesarean deliveries were rarely subject for research. These factors increase the fear that a large proportion of these caesarean deliveries are not needed⁽¹⁹⁾. In a research performed by the Population Council, participating physicians stated that the CS mode of delivery was over-used in Egypt. Reasons stated for increased CS deliveries were financial reward, physicians' desire to have control over their time, medical protocols regarding indications for use of CS are not clear, limited opportunities for junior physicians to practice vaginal deliveries, shortage of pain relief medications in public hospitals, and shortage of anesthesiologists trained to administer epidural anesthesia which could be used to relieve pain in vaginal deliveries⁽⁶⁾.

Elective cesarean section represented 56.6% while 43.4% underwent emergency CS. This result agrees with Driul *et al.*, who conducted a retrospective analysis of one year of caesarean sections at the Gynecology-Obstetrics (Gyn/Obs) Clinic in a University hospital, Italy. They showed that 42.1% of caesarean deliveries were elective⁽²⁰⁾. The principal reason for CS delivery was previous CS. In a study conducted in Pakistan, the percent of elective CS was 22%⁽²¹⁾. Mylonas and Friese stated in their review article published in 2015 that there was increased neonatal risk associated with elective cesarean section compared with vaginal delivery, including increased mortality, increased risk of respiratory disease, or type 1 diabetes. Therefore elective CS should be performed only when significant advantages are expected⁽²²⁾.

The mean maternal age in this study was 28.9 years. This was similar to that reported by Ebrashy *et al.*, study. They found that the average maternal age was 28.3⁽¹⁷⁾. This agrees with Worjolah *et al.*, study which found that mean age was 27.8⁽¹⁸⁾. More than half of mothers who underwent caesarean sections in the current study (58.1%) were in the age group (21-30 years). This age group represents the most reproductively active age group⁽¹⁸⁾. In contrary to a study that was done by Yassin and Saida who argued that older maternal age (40-44 years) is often associated with fetal distress, prolonged labor or failure to progress at delivery, which may be an indication for CS⁽¹⁹⁾. This finding confirms that evidence-based protocols for deliveries are not applied in Egypt. House-officers and interns are not well trained or prefer the CS to preserve their time due to overwhelming number of deliveries.

Around half of study sample were overweight or obese/ morbidly obese females (46.2%, 48.8% respectively) with a mean BMI of 35.9 ± 7.8 . Voigt *et al.*, stated in their systematic review that being overweight or obese may predispose to other risks such as hypertension and other morbidities which are encountered as reasons for the increase in caesarean deliveries. However, Overweight/obesity was not recorded in patient files as a single cause or indication for CS⁽²³⁾. About half of study sample (48%) in the present study were multiparous. This agrees with a study done by Jawa *et al.*, who found that 57% of caesarean sections were multiparous females. Primigravida females represented 39.7% in the present study which predicts that this group of females may have future

repeated CS⁽¹⁷⁾. About two-thirds of females (63.6%) in this study had term pregnancy which goes in agreement with a study done in India by Jawa et al., who found that 77% of the patients delivered by CS at full term⁽²⁴⁾.

In the present study, 92.1% had regular antenatal care. This may indicate that regular antenatal care had a role in early detection and diagnosis of high risk patients and who had absolute CS indications. This goes in agreement with a study done by Begum et al., who found that undergoing CS was associated with higher number of antenatal visits⁽²⁵⁾. About 80% of CS indications in this study were due to maternal indications and this goes in agreement with Bragg et al., study who reported that the likelihood of a caesarean section is strongly associated with maternal characteristics and clinical risk factors. Women were more likely to have caesarean delivery if they had a previous CS.

The most common indication for CS in this study was previous CS (63% out of maternal indications)⁽²⁶⁾. This goes in agreement with Helal et al., (repeated CS 35.8%)⁽¹⁶⁾. Patel and Jain found that a previous CS does not necessarily mean a required cesarean delivery in subsequent pregnancies. The American College of Obstetricians and Gynecologists (ACOG) has clearly instructed that previous CS should not be an indication in absence of any obstetric emergencies⁽¹³⁾. The sense of security of physicians, mingled with other previously mentioned factors, may be responsible for repeated cesarean deliveries and decline in vaginal births after cesarean (VBAC). On the contrary, this result disagrees with a study performed in Karachi, Pakistan by Karim et al., who found that the most common indication was obstructed labor which represented 25% in the present study. They justified the high percentage of obstructed labor in their study by the un-wise use of oxytocic drugs or unjustified induction with prostaglandins without full assessment of risk factors like fetal size, presentation, stage of labor, position and pelvic adequacy⁽²⁷⁾.

Current study results also disagree with a study done in China by Liu et al., who found that the most common indication for CS was caesarean delivery on maternal request. Liu and co-workers explained their finding by the fact that with increasing living standards, more women are likely to choose CS as their preferred mode of delivery to avoid pain during childbirth, subsequent pelvic floor collapse, and incontinence which may be caused by vaginal delivery⁽²⁸⁾. Cultural difference may have caused this disagreement. The National Collaborating Centre for Women's and Children Health in the UK report by Dick et al., who listed mal-presentations, cephalo-pelvic disproportion and acute fetal distress as main indications for CS⁽²⁹⁾. In the present study, unfavorable outcomes of cesarean deliveries were significantly higher among grand-multiparous and multiparous compared to primigravida or para-one females (12.5%, 3.4% and 2% respectively). This disagrees with a study done in Libya by Ziyoo and coworkers. They showed that the rates of unfavorable outcomes as pre-term delivery, LBW, low APGAR score and neonatal mortality were higher in teenage pregnancies

and they consistently increased with decreasing maternal age⁽³⁰⁾.

Early gestational age at delivery <37 weeks significantly increased the risk of neonatal death. This agrees with Wilmink et al., who confirmed that neonatal death decreased with increasing gestational age up to 39 weeks of gestation. The ACOG recommendation to delay scheduling elective cesarean delivery until 39 weeks of gestation was released after pile of evidence showing that the lowest rate of neonatal complications occurred when delivery took place at 39 weeks of gestation⁽³¹⁾.

Maternal indications in the present study for CS were four times as fetal indications (80 versus 20% of indications) which agrees with Patel et al., who found that maternal indications for CS were as twice as fetal indications. This result might reflect the overuse of CS due to previous CS⁽³²⁾.

CONCLUSION AND RECOMMENDATIONS

CS rate in the present study is three times higher than WHO recommendation. Preterm CS and maternal cause of CS showed significant, consistent association with poor fetal outcome. It is highly recommended for "Ain Shams Maternity Hospital" to adopt Evidence-based protocols for deliveries or update them if present and to have clear criteria as well as a written policy for when a CS should be performed. House-officers and Obs/Gyn residents should be taught on how to manage cases with previous CS.

Effectiveness of Ante-natal care should be investigated in a separate research. Antenatal care counseling to pregnant woman should be a good opportunity to inform her about the advantages of vaginal deliveries, the risks of unnecessary CS and the possibility of VBAC in case of previous CS delivery. With improved technology and experienced staff, careful controlled selection of patients for normal delivery among patients with previous CS, mal-presentation and experienced induction of labor will satisfy concerns for maternal and newborn safety while keeping the CS rate similar to reported standards.

Adopting Robson's classification proposed by the WHO as an international standard is highly recommended. This classification can be used for monitoring and comparing caesarean section rates within healthcare facilities and between different facilities as well. The system classifies all women into one of 10 categories based on 5 basic obstetric criteria routinely collected in all maternity hospitals (parity, number of fetuses, previous caesarean section, onset of labour, gestational age, and fetal presentation).

Point of Strength

This study had a large sample size (1305 patient files) and focused on maternal and fetal indications in addition to fetal outcome of CS and its determinants.

Study limitations

Data of the present study were not nationally representative, which limits the generalizability of current

study findings. Moreover, certain data concerning risk factors of caesarean section such as smoking and other behavioral data were lacking.

FUNDING

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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