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Association between Maternal Short Stature and Emergency Cesarean Section in Primigravidas

Syeda Wajeeha Ojala Shah, Neelam Hassan, Saima Iqbal, Beenish Khurram, Palwasha Najeeb, Asma Iqbal

[1]Senior Registrar Shifa College of Medicine STMU, Islamabad,
[2]Gynecologist, Lady Reading Hospital, Peshawar, [3]Gynae/Obs CMH Peshawar.
[4]Associate Professor Obs/Gynae, Bahria University college of medicine, Islamabad
[5]Gynae OBS, Lady Reading hospital Peshawar
[6]Senior registrar, Gynaecology and obstetrics, Karachi metropolitan university

Author`s Contribution

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Address of Correspondent
Dr. Neelam Hassan
Gynea/Obs Lady Reading Hospital, Peshawar
neelam.fcps@gmail.com

ABSTRACT

Objective: To investigate the relationship between mother low stature and the rate of EmCS, therefore filling in a void in the body of knowledge on the effect of height on delivery outcomes in primigravida women.

Methodology: The study concentrated on primigravida women with a height of 150 cm or less who were in their third trimester with a fetus in cephalic presentation. Participants had to fall between the ages of 15 and 35 years. Women with numerous gestations, a BMI more than 30 kg/m², pre-existing medical illnesses (e.g., eclampsia, preeclampsia, bleeding disorders, diabetes), and any disease that would affect the result of the study were among the excluded criteria. Data were gathered by means of clinical assessments, medical records, and interviews; SPSS version 20 was used for analysis. Among the main factors examined were age, BMI, height, and EmCS incidence.

Results: 61% participants were in the age group of 15–25 and 39% were in the 26–35. The body mass index (BMI) ranged from less than 27 kg/m² for 55% of the subjects to more than 27 kg/m² for 45%. Out of the total participants, 18% had an EmCS, whereas 82% gave birth naturally. With p-values of 0.8962, 0.8832, and 0.9258, respectively, there was no statistically significant correlation between maternal age, BMI and the probability of ECS.

Conclusion: Among primigravida women of shorter stature, 18% had EmCS but there was no statistically significant correlation. It appears that other characteristics, such the mother's age and BMI, may also significantly influence the necessity of surgical intervention during labor, even though being short in stature may raise the likelihood of specific issues. In order to decrease difficulties during pregnancy and delivery, the study emphasizes the need for additional research to identify other risk factors and enhance care options for short-statured primigravida women.

Keywords: Cesarean section (CS), emergency cesarean section (EmCS), Primigravida, Short stature.

Introduction

Cesarean section (CS) should only be performed when there are clear medical reasons to do so. Nevertheless, we must acknowledge that CS plays a crucial role in managing the severe pregnancy complications and the medical and surgical issues associated with labor dystocia.[1] If vaginal delivery poses risk due to fetal distress, eclampsia, or severe pre-eclampsia, emergency cesarean section (EmCS) may be a life-saving for both mother and the fetus [2]. Women who are primigravida (PG), or concieved for the first time, are generally considered to be in high-risk group. Compared to multigravidas, PGs are much more likely to experience prolonged first and second stages of labor, fetal distress during labor, and the need for close monitoring.[3]

Additionally, PGs are much more likely to have an operative vaginal delivery or EmCS. PGs are also found to have a higher risk of primary postpartum hemorrhage and perinatal morbidity.[4]

In low- and middle-income nations, short adult height,a sign of growth retardation—is a specific indicator of inadequate childhood nutrition.[5] Variations in height both within and between populations also reflect differences in nutritional status, biological deprivation, and diverse living standards.[6] Western European nations have the tallest populations, while Southeast Asian and Sub-Saharan African nations have the shortest.[7] Numerous

studies across populations have found that maternal height affects obstetric and pregnancy outcomes, with short stature directly associated with several unfavorable pregnancy outcomes. Every centimeter of maternal stature loss was linked to a 0.2-day reduction in the offspring's gestational age and a higher risk of preterm birth in a study involving 192,432 Swedish women.[8] In a study of Danish women, short stature was found to be an obstetric risk factor. Infants of mothers, under 156 cm tall, had higher prevalence of intrauterine asphyxia, intrauterine growth retardation, EmCS and elective caesarean sections, and low Apgar scores than infants of mothers between 166 and 175 cm tall.

Additionally, it has been discovered that the risk of preeclampsia, placental abruption, small for gestational age (SGA), intrauterine growth restriction, and stillbirth is negatively associated with maternal height. In addition to being inversely associated with the risk of caesarean delivery and a predictor of assisted vaginal delivery, maternal height has also been linked to fetal growth patterns and birth weight.[10, 11] It has been proposed that the variables of maternal age, height, and measurement of the baby's birth weight could be used to predict the likelihood of caesarean section.[12] In a previous study, 93.2% of 44 short-statured primigravida had cesarean sections to deliver the baby.[13] Among short-statured Primigravida women, the other recorded rates of CS are 21.3% [14] and10.3%.[15]

The goal of the current study was to ascertain how common EmCS is in short-statured primigravida. After conducting an extensive literature search, we discovered that there is a lack of data regarding the prevalence of EmCS in the local population of short-stature primigravida. The frequency of EmCS in local short-stature primigravidas will be ascertained in this study. As already mentioned, the statistics differ depending on the population. The findings of this study will serve as a roadmap for future research plans and the identification of mechanisms that Primigravida women can use to control complications like EmCS caused by their short stature. This study was designed to fill the gap in literature on frequency of C-section in short stature PG in a hospital setting. The primary objective was to evaluate the association between maternal short stature and the incidence of EmCS in primigravida women.

Methodology

This was an analytical cross-sectional study conducted at the Department of Obstetrics and Gynecology, Lady Reading Hospital, Peshawar, over a six-month period from July 14, 2023, to January 14, 2024.

A total of 278 primigravida women in their third trimester were enrolled through non-probability consecutive sampling. These participants were evenly divided into two groups: the short-stature group, consisting of women with height less than 150 cm (n = 139), and the normal-stature group, consisting of women with height equal to or greater than 150 cm (n = 139).

The sample size was calculated using the WHO sample size calculator based on a 95% confidence level, an expected EmCS proportion of 10% in short-stature women, and a 5% margin of error.

Inclusion criteria were strictly defined and included women aged between 15 and 35 years, who were primigravida, had a singleton pregnancy in cephalic presentation, and were in their third trimester with gestational age of 28 weeks or more. Women with multiple gestations, a BMI above 30 kg/m², and those with known medical conditions such as preeclampsia, eclampsia, gestational or pregestational diabetes, bleeding disorders, or fetal anomalies were excluded to reduce the potential for confounding variables. These exclusions helped ensure that any observed association could be attributed more confidently to maternal stature.

Ethical approval for the study was obtained from the hospital's Institutional Review Board. Eligible participants were identified in the outpatient department and antenatal wards. After the purpose and benefits of the study were explained, written informed consent was obtained. Data were collected using a structured data collection form, which recorded demographic information such as age, height, weight, and BMI, as well as obstetric history, fetal presentation, ultrasound findings, labor progress, and mode of delivery. Clinical assessments and anthropometric measurements were carried out by the principal investigator using standardized procedures under the supervision of a certified obstetrician from the College of Physicians and Surgeons Pakistan (CPSP).

Participants were followed throughout their intrapartum period, either during admission for labor or antenatal visits, until the final delivery outcome was noted. Labor progress was carefully monitored using partographs and fetal heart monitoring systems. The decision to perform an emergency cesarean section, if necessary, was made by an experienced obstetrician who was blinded to the objectives of the study, thereby minimizing observer bias.

Indications for EmCS included maternal distress, fetal distress, arrest of labor progression, and non-reassuring cardiotocographic findings. Women were also monitored postoperatively for 24 to 48 hours to record any immediate complications.

Data analysis was performed using SPSS version 20. Continuous variables such as age, height, weight, and BMI were reported as mean ± standard deviation. Categorical variables, including the frequency of EmCS, were presented as percentages and frequencies. To determine the association between maternal short stature and EmCS, the chi-square test was applied. Stratification was done for potential confounding factors such as age and BMI to assess effect modification. A p-value of less than 0.05 was considered statistically significant. All findings were tabulated and graphically represented for clarity and comparison.

Results

In the study of 139 short-stature primigravida women, age distribution revealed that the majority (61%) of the participants were between 15 and 25 years old, while 39% were between 26 and 35 years old. The mean age of the participants was 32 years with a standard deviation (SD) of ±9.84. Regarding Body Mass Index (BMI), 55% of women had a BMI ≤27 kg/m², while the remaining 45% had a BMI >27 kg/m². The mean BMI was 27 kg/m² (SD ±4.09), and the mean weight was 76 kg (SD ±10.14). In terms of height, 57% of the women had a height of 1.5 meters or less, while 43% had a height greater than 1.5 meters. Emergency Cesarean Section (EmCS) occurred in 18% (25/139) of the women, highlighting a notable proportion of women in the study requiring surgical intervention. The stratified analysis showed no significant association between EmCS and age, BMI, or height categories, as indicated by the p-values of 0.8962, 0.8832, and 0.9258, respectively.

Maternal outcomes following delivery were compared between women who underwent an emergency cesarean section (EmCS) and those who did not. Of the 25 women who had an EmCS, 12% developed febrile illness, while only 3.5% of those who had vaginal deliveries experienced the same issue (p=0.071). Wound infections were significantly more common in the EmCS group, with 8% of these women experiencing wound infection compared to none in the non-EmCS group (p=0.021). Anemia (Hb < 10 g/dL) was found in 20% of EmCS patients, while 9.6% of non-EmCS women had anemia, but this difference was not statistically significant (p=0.136). The most significant finding was in the hospital stay duration, where 28% of EmCS patients stayed more than 3 days, compared to only 7% of those who had vaginal deliveries (p=0.003), indicating a longer recovery period for women who underwent EmCS.

Table 2: Maternal Outcomes Post-Delivery by EmCS Status

Outcome	EmCS (n=25)	Non-EmCS (n=114)	P-value
Febrile Illness	3 (12%)	4 (3.5%)	0.071
Wound Infection	2 (8%)	0 (0%)	0.021
Anemia (Hb < 10 g/dL)	5 (20%)	11 (9.6%)	0.136
Hospital Stay >3 days	7 (28%)	8 (7%)	0.003*

When analyzing the relationship between height, BMI, and EmCS, the data showed that women with a height of 1.5 meters or less (57% of the study population) had a slightly lower percentage of EmCS (17.7%) compared to those with a height greater than 1.5 meters (18.3%). The BMI stratification revealed no substantial difference between the two groups, with 18% of women in both

Table 1: Demographic and Clinical Characteristics of Study Participants

Variable		Frequency (n=139)	Percentage (%)	EmCS Yes (n=25)	EmCS No (n=114)	P-value
Age Group (Years)	15 to 25	85	61%	15	70	0.8962
	26 to 35	54	39%	10	44	
BMI Category	≤ 27 kg/m²	76	55%	14	62	0.8832
	> 27 kg/m²	63	45%	11	52	
Height Category	≤ 1.5 meters	79	57%	14	65	0.9258
	> 1.5 meters	60	43%	11	49	

Table 3: Cross-Tabulation of Height, BMI, and EmCS

Height Group	Total	BMI		EmCS		
		≤ 27 kg/m²	> 27 kg/m²	Yes	No	%
≤ 1.5 meters	79	44	35	14	65	17.70%
> 1.5 meters	60	32	28	11	49	18.30%
Total	139	76	63	25	114	18%

BMI categories (≤27 kg/m² and >27 kg/m²) undergoing an EmCS. The chi-square test yielded p-values of 0.972 for height, 0.8832 for BMI, and 0.9258 for EmCS associations, indicating that differences in height and BMI had no statistically significant impact on the likelihood of requiring an emergency cesarean section.

The research investigated the reasons for emergency cesarean sections among the 25 women who required such procedures. The primary reason for emergency cesarean sections was labor duration exceeding normal limits because it occurred in 36% of patients (n=9). Fetal distress emerged as the second prevalent indication leading to EmCS procedures among the 25 respondents since it occurred in 28% (n=7) of cases. Twenty-four percent (n=6) of the cases exhibited Cephalopelvic disproportion and malpresentation affected 12% (n=3) of the patients. The results help identify clinical conditions that may lead to EmCS among primigravida women whose height is below average because prolonged labor and fetal distress stand as the main operative indications.

An analysis of EmCS predictors through logistic regression yielded no substantial correlations because the results showed no statistically significant findings. The odds ratio for height of ≤1.5 meters equaled 1.06 (95% CI: 0.45–2.51) without showing any substantial effect on the need for EmCS. BMI levels above 27 kg/m² showed an OR of 0.95 while subjects over 25 years old had a resulting OR of 1.07. Statistical analysis showed that the p-values exceeded 0.05 in all tests thus proving that none of these variables demonstrated significance as EmCS predictors among primigravida women with short stature. Research needs to continue investigating other variables that affect short-stature primigravida women's likelihood of requiring emergency cesarean section in this specific population.

Discussion

Mother and newborn safety depends greatly on CS to treat severe pregnancy troubles along with medical and surgical problems that result from dystocia. Interventional childbirth occurs through EmCS which serve as lifesaving procedures in case fetus faces distress during vaginal delivery or when eclampsia and severe pre-eclampsia emerge.

The study enrolled 139 primigravida women where 61% were 15 to 25 years old and 39% were between 26 and 35 years with an average age of 32 years (SD ±9.84). The study group showed that 55% of women possessed a body mass index that was 27 kg/m² or lower while 45% of women had a BMI that exceeded 27 kg/m². The study results showed that 57% of the participants measured less than 1.5 meters while 43% exceeded this threshold. The survey included 18% of women who received an EmCS and 82% who did not receive this procedure.

The relationship between maternal height and cesarean section rates received further evidence through research that examined nationwide single birth statistics from India. Research showed that women with 120 cm stature had 5.08 times higher risk (AOR: 5.08 and 95% CI: 3.83 to 6.74) of CS when compared to mothers with 150 cm height. The risk of cesarean delivery among mothers measuring 180 cm in height was 23% lower (AOR: 0.77; 95% CI: 0.62 to 0.95) than those with 150 cm height. The evidence shows maternal height directly affects the chances of needing a cesarean section thus it becomes essential during prenatal screenings to take maternal stature into account. [16,17]

Additionally, a population-based study in Sweden involving 192,432 women demonstrated that shorter maternal height was associated with increased odds of preterm birth and cesarean delivery. The study found that each centimeter decrease in maternal height was linked to a 0.2-day reduction in gestational age and higher risks of adverse pregnancy outcomes. These findings further emphasize the significance of maternal height as a predictor of delivery outcomes and the necessity for tailored obstetric care for shorter women. [18]

The Chi-square test showed that the differences were statistically significant ($P < 0.05$). These findings suggest a strong correlation between short stature and increased cesarean section rates. Another study by Sheiner E. et al.,[19] which involved 159,210 deliveries, found that women with short stature (defined as a height of <155 cm) had a significantly higher rate of cesarean sections compared to those of average height (21.3% vs. 11.9%). The odds ratio for cesarean section was found to be 2.0 (95% CI: 1.9-2.1, $P<0.001$), indicating that short stature is an independent risk factor for emergency cesarean delivery.

Recent studies also found that women with short stature in the study group had a higher incidence of cesarean sections.[20, 21] The study also noted a higher incidence of major genital tract disease (12%), postpartum hemorrhage (9%), and low birth weight (15%) among short-statured women, suggesting that shorter women may face additional challenges during pregnancy and

delivery. Additionally, babies born to shorter mothers were more likely to be admitted to the special care baby unit.

In our study, the most common indications for EmCS were prolonged labor and fetal distress which are consistent with the complications associated with short maternal stature. These findings underscore the importance of considering maternal height in prenatal assessments and the need for tailored obstetric care for shorter women.

Conclusion

The conclusion of our study is that frequency of EmCS among short stature primigravida is 18 %. Maternal height plays a significant role in pregnancy outcomes, with women of shorter stature (especially those shorter than 150 cm) being at an increased risk for EmCS and other complications such as cephalopelvic disproportion. Local population characteristics influence the threshold height considered high-risk, but overall, shorter stature appears to be an important indicator for obstetric complications. Height can thus serve as a useful predictor for identifying high-risk pregnancies, enabling healthcare providers to better anticipate and manage potential complications during delivery.

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