ISSN (Online): 3105-5346
ISSN (Print): 3105-5338

Journal of Pak International Medical College (JPIMC)
KNOWLEDGE | RESEARCH | BETTER HEALTHCARE
A Platform for Innovative Research in Medical Sciences

Vol. 3, Issue 3 | July–September 2026
Open Access

ARTICLE METADATA

Article History
Received: 22 July 2026
Revised: 26 August 2026
Accepted: 20 September 2026
Published: 03 October 2026

Corresponding Author
Nazish gul

Specialist Registrar, Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan

Email: drnazishgul@gmail.com

Keywords: delayed emergency CS, maternal and neonatal morbidity, obstetric emergency admissions.

DOI: 10.64911/f7gcx660

Quick Response (QR) Code

Scan to read this article. on our website

Open Access

Original Article

Association of Delayed Referral with Severe Maternal Morbidity and Adverse Perinatal Outcomes among Obstetric Emergency Admissions at a Tertiary Care Hospital in Khyber Pakhtunkhwa, Pakistan.

Shazia Marwat[1], Nazish Gul[2], Nosheen Shams[3], Umm E Kalsoom[4], Kiran Muslim[5], Shumaila Noreen Malik[6]

[1]Specialist Registrar, Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan
[2]Specialist Registrar, Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan
[3]Specialist Registrar, Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan
[4]Specialist Registrar, Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan
[5]Trainee Registrar, Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan
[6]Trainee Registrar Obstetrics and Gynecology Gomal Medical College, MTI, DI Khan

Abstract

Objectives: This study aimed to determine the association between delayed referral and severe maternal morbidity and adverse perinatal outcomes among obstetric emergency admissions.

Methodology: This prospective observational cohort study was conducted at the Department of Obstetrics & Gynecology, Gomal Medical College, MTI, DI Khan, from January 2026 to June 2026. A total of 250 women with Singleton pregnancy who had an emergency cesarean section (CS) during the study period were included. The key variable in this study was cesarean section delay, defined as the time interval from the surgeon's decision to perform a cesarean section to the actual delivery of the baby. SPSS version 20 was used for data analysis.

Results: A total of 250 women were enrolled in this study. Participants were classified by decision-to-delivery interval. Of the total participants, 100 (40%) had emergency CS more than 3 hours after the surgical decision, 65 (26.0%) had a decision-to-delivery interval of 1 to 3 hours, and 85 (34.0%) had less than 1 hour**.** The most prevalent features responsible for delayed emergency CS were family decision-making/consent, followed by financial issues (65, 39.4%) and healthcare-provider-related factors (30, 18.2%). The results revealed that longer decision-to-delivery time is associated with a rising trend of serious maternal outcomes (P <0.005).

Conclusion: Our study concluded that delayed emergency cesarean sections are a major problem and strongly associated with severe maternal and neonatal morbidity in individuals with obstetric emergency admissions.

How to Cite: Marwat S, Gul N, Shams N, Kalsoom U, Muslim K, Malik SN. Association of Delayed Referral with Severe Maternal Morbidity and Adverse Perinatal Outcomes among Obstetric Emergency Admissions at a Tertiary Care Hospital in Khyber Pakhtunkhwa, Pakistan.Original Article. **J Pak Int Med Coll. 2026;3(3):202-206.**

© 2026 The Author(s) | This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

Introduction

The maternal mortality ratio (MMR) in sub-Saharan Africa is very high at 542 per 100,000 live births, despite a dramatic drop in the worldwide MMR from 342 in 2000 to 211 in 2017.[1] Furthermore, about 2.65 million fetal fatalities occur globally each year, with South Asia and sub-Saharan Africa accounting for 75% of these deaths[2]. A cesarean section (CS) is advised as a crucial intervention to prevent catastrophic maternal outcomes and neonatal mortality at delivery. When a woman experiences serious obstetric problems and almost dies during pregnancy, childbirth, or the first six weeks after giving birth, it is referred to as a maternal near miss [3]. In situations of obstructed labor, fetal distress, and other obstetric crises, a CS is therefore a crucial intervention [4]. Conflicting results suggest that a longer decision-to-delivery interval has no effect on fetal-maternal outcomes [5, 6], despite earlier research showing that delays in performing a CS negatively affect maternal and fetal outcomes in many cases [7]. While other complications, such as cephalopelvic disproportion, are less time-sensitive [6], these variations may be explained by maternal-fetal conditions, such as ruptured uterus and fetal distress, that present an immediate risk to the woman or fetus and, therefore, require a CS without delay [7]. Furthermore, previous study data have identified healthcare provider-related factors that contribute to a delay in performing a CS (henceforth referred to as "CS delay" for brevity), including poor labor and fetal monitoring, delayed action in managing obstetric complications, lack of funds for hospital expenses, and ignorance of danger signs[8]. Furthermore, previous Somaliland research found that medical professionals cannot perform an emergency CS unless the pregnant woman's extended family has given the necessary approval [9]. The present study was conducted to find out the association of delayed referral with severe maternal morbidity and adverse perinatal outcomes among obstetric emergency admissions.

Materials and method

This prospective observational cohort study was conducted at the Department of Obstetrics & Gynecology, Gomal Medical College, MTI DI Khan, from January 2026 to June 2026, following approval from the hospital ethics committee. The sample size was determined using the WHO sample size calculator, and data were collected using a non-probability consecutive sampling procedure. A total of 250 women with singleton pregnancies who had undergone emergency cesarean section (CS) during the study period were included, while women with more than one pregnancy, elective cesarean sections, and incomplete medical records were excluded. The key variable in this study was cesarean section delay, defined as the time interval from the surgeon's decision to perform a cesarean section to the actual delivery of the baby. We categorized CS delays as < 15 minutes, 15-59 minutes, 1-20 hours, and 59 minutes and 3 hours or above. We evaluated delays into the following categories: I. No delay in cesarean section (carried out within one hour following decision).ii. Delay in cesarean section (1 and 3 hours).iii. Cesarean section delay (over 3 hours) [10]. We recorded demographic and obstetric features in a structured proforma. The main variables were age, previous CS, time of actual delivery, time of surgical decision, causes of emergency CS, decision-to-delivery interval, neonatal outcomes, and maternal outcomes. SPSS version 20 was used for data analysis. Frequencies and percentages were determined for categorical variables, and continuous variables were presented as mean ± standard deviation. We used the chi-square test to evaluate categorical associations. To identify variables independently linked to severe maternal outcomes, we used multivariate logistic regression. We considered $p < 0.05$ statistically significant.

Results

We enrolled 250 women in this study. The most prevalent age group among participants was 20–34 years (175, 70%), followed by 35 or above (45, 18.0%) and younger than 20 years (30, 12.0%). In terms of educational levels, Twenty (8.0%) had higher education, 90 (36.0%) had no formal schooling, & 140 (56.0%) had elementary or secondary education. The majority of individuals were from urban areas (145, 58%), and 105 (42.0%) belonged to rural areas. Most individuals (190, 76.0%) were in term gestation (37-41 weeks). Multiparous were most common, 160 (64.0%), followed by nulliparous, 55 (22.0%), and grand multiparous, 35 (14.0%), respectively, as presented in Table 1. The study participants were classified based on the decision-to-delivery interval. Of the total participants, 100 (40%) had emergency CS more than 3 hours after the surgical decision, 65 (26.0%) had a decision-to-delivery interval of 1 to 3 hours, and 85 (34.0%) had less than 1 hour, as presented in

Table 2. The most prevalent features responsible for delayed emergency CS were family decision-making/consent, followed by financial issues, 65 (39.4%), and healthcare-provider-related factors, 30 (18.2%), as presented in Table 3. Twenty (20.0%) participants who had cesarean sections with delays of more than three hours had severe maternal outcomes, compared to ten (15.4%) in the group with delays of one to three hours and seven (8.2%) of the individuals who had cesarean sections within an hour. In contrast, the percentage of individuals who did not experience severe maternal outcomes dropped from 91.8% in the group with less than 1 hour to 80.0% in the group with more than 3 hours. The results showed that longer decision-to-delivery time is associated with a rising trend in severe maternal outcomes (P <0.005). Neonatal outcomes did not differ significantly across the three groups (p=0.003), as shown in Table 4. To identify variables independently associated with severe maternal outcomes, we used multivariate logistic regression. Compared with a decision-to-delivery time of less than one hour, a decision-to-delivery time longer than three hours was linked to a higher risk of severe maternal outcomes (p=0.033). The risks of maternal outcomes were also linked to severe obstetric indications (p=0.016). Nevertheless, maternal age of thirty-five or older (p=0.21), nulliparity (p=0.31), and a decision-to-delivery period of 1-3 hours were not statistically significant (p=0.23).

Table 1. Demographic and Obstetric Characteristics of the Study Population (n = 250)

Characteristics	**Frequency, n** (%)
Maternal age (years)	
Below 20	30 (12.0)
20–34	175 (70.0)
≥35	45 (18.0)
Parity	
Nulliparous	55 (22.0)
Multiparous	160 (64.0)
Grand multiparous	35 (14.0)
Place of residence	
Urban	145 (58.0)
Rural	105 (42.0)
Educational status	
No formal education	90 (36.0)
Primary/secondary education	140 (56.0)
Higher education	20 (8.0)
Gestational age (weeks)	
28–36	40 (16.0)
37–41	190 (76.0)
≥42	20 (8.0)

Distribution of participants according to maternal age, parity, place of residence, educational status, and gestational age at delivery. Data are presented as frequencies and percentages.

Table 2. Distribution of Patients According to Decision-to-Delivery Interval (n = 250)

Decision-to-delivery interval	Frequency, n (%)
Less than 1 hour	85 (34.0)
1–3 hours	65 (26.0)
More than 3 hours	100 (40.0)
Total	**250 (100.0)**

Distribution of patients according to the interval between the decision to perform an emergency cesarean section and actual delivery. Data are expressed as frequencies and percentages.

Table 3. Factors Contributing to Delayed Emergency Cesarean Section (n = 165)

Contributing factors	**Frequency, n** (%)
Financial difficulties	65 (39.4)
Healthcare-provider-related factors	30 (18.2)
Family decision-making/consent	70 (42.4)
Total	**165 (100.0)**

Distribution of identified factors contributing to delays in emergency cesarean section among 165 patients. Data are presented as frequencies and percentages.

Table 4. Multivariable Logistic Regression Analysis of Predictors of Severe Maternal Outcomes

Predictors	**Adjusted OR**	**95% CI**	**p-value**
Severe obstetric indication	3.82	1.11–5.87	0.016*
Nulliparity	1.45	0.54–2.63	0.31
Maternal age ≥35 years	1.74	0.75–4.03	0.21
Decision-to-delivery interval (reference: 3 hours	3.57	2.07–5.56	0.033*

Multivariable logistic regression analysis identifying factors associated with severe maternal outcomes. Results are expressed as adjusted odds ratios (ORs) with 95% confidence intervals (CIs). We used a decision-to-delivery interval of less than 1 hour as the reference category. Statistical significance was defined as p-value.

Discussion

The current study explored the association between maternal and neonatal outcomes and the decision-to-delivery interval in 250 women who underwent emergency cesarean sections. The most prevalent age group among participants was 20–34 years (70%), and most were from urban areas and had elementary or secondary education. Mostly, they were in term gestation (37-41 weeks and were multiparous. Similar demographic features were reported in the study by Kiruja et al., which support our findings [11]. In our study, the most prevalent features responsible for delayed emergency CS were family decision-making/consent, followed by financial issues (65, 39.4%) and healthcare-provider-related factors30 (18.2%). These findings are similar to the study by Molina et al., in which the most common cause of delayed emergency CS was family decision-making [12]. When emergency surgery, such as a CS, is required, healthcare professionals must be trained to communicate effectively with patients and their families, obtain consent, and encourage prompt action. Our results showed that longer decision-to-delivery times are associated with a rising trend in serious maternal outcomes (P <0.005). There was no discernible difference in neonatal outcomes across the three groups (p=0.003). These findings are similar to those of Kiruja et al. [13]. Our results are also comparable with the study by Abdulbaki et al. [14]. Compared with a period of less than one hour, a decision-to-delivery time longer than three hours was linked to greater risks of severe maternal outcomes (p=0.033). The risks of maternal outcomes were also linked to severe obstetric indications (p=0.016). Nevertheless, maternal age of thirty-five or older (p=0.21), null parity (p=0.31), and a decision-to-delivery period of 1-3 hours were not statistically significant (p=0.23). These results suggest that longer decision-to-delivery times and severe underlying obstetric causes are significant predictors of maternal outcomes. Kiruja et al. [15,16] reported similar findings. Previous research indicates that delays in individual preoperative preparation, delays in the setup of surgical kits, interruptions in the transportation of the individual from the ward to the operating room, delays in being able to pay the necessary surgical fees, a lack of funds to purchase operative kits, as well as delayed decision-making on the part of families are all potential causes of the delay in obtaining consent for CS [17,18]. The >3-hour CS delay group had a lower risk of stillbirth, according to the present study.

Nonetheless, our results supported those of other research showing that a CS delay of three hours or more from choice to delivery did not increase the risk of stillbirth [19,20]. This might be explained by the fact that CSs with prolonged delays had maternal indicators other than fetal distress and that CSs with a risk of fetal compromise were carried out more quickly. Additionally, since we did not gather information on other newborn outcomes like low APGAR scores, mask ventilation and/or newborn resuscitation, and transfer to the neonatal intensive care unit, it is also possible that an underestimation of babies with severe acute morbidity skews our results[21]. In addition to evaluating mother and newborn outcomes, the study considers factors that contribute to delayed emergency cesarean deliveries; however, the study has several limitations. It was a single-center study, which could limit generalizability. The sample size was small. The severity of the underlying obstetric indication may impact clinical results and the decision-to-delivery interval. Other clinical and socioeconomic variables may also affect maternal and newborn health.

Conclusion

Our study concluded that delayed emergency cesarean sections are a major problem and strongly associated with severe maternal and neonatal morbidity in individuals with obstetric emergency admissions. Family decision-making, financial challenges, and healthcare provider-related issues may cause delays. Enhancing access to surgical facilities, prompt decision-making, and emergency obstetric readiness may help lower avoidable maternal and newborn problems. In obstetric practice, delayed emergency cesarean sections are a major problem. An elevated risk of serious maternal problems may be linked to extended decision-to-delivery periods. Delays may stem from family decision-making, financial challenges, and healthcare provider-related issues. Improving access to surgical facilities, enabling prompt decision-making, and strengthening emergency obstetric readiness may help reduce avoidable maternal and newborn problems.

Ethical Approval

The study was approved by the Hospital Research and Ethics Committee (IREB) under Reference No. **1159/GMC/DIK** before the commencement of the study.

Informed Consent

We obtained written informed consent from all participants before enrolment. We informed participants and their parents or legal guardians about the study objectives, procedures, and the voluntary nature of participation. Participation was entirely voluntary.

Funding

This study received no external funding and used available institutional resources.

Conflict of Interest

The authors declare no competing interests or conflicts of interest related to this study.

Authors' Contributions

Shazia Marwat: Contributed to conceptualization, study design, data collection, interpretation of findings, manuscript drafting, critical revision, and final approval. He also accepts accountability for all aspects of the work.

Nazish Gul, Nosheen Shams, Umm e Kalsoom: Contributed to study design, data collection, data curation, literature review, data interpretation, manuscript revision, and final approval of the manuscript. He also accepts accountability for all aspects of the work.

Kiran Muslim, Shumaila Noreen Malik: Contributed to conceptualization, study supervision, clinical assessment, interpretation of findings, and critical revision of the manuscript for important intellectual content. She also approved the final version and accepts accountability for all aspects of the work.

All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work in accordance with the ICMJE authorship criteria.

References

1. Kitaw TM, Limenh SK, Chekole FA, Getie SA, Gemeda BN, Engda AS. Decision to delivery interval and associated factors for emergency cesarean section: a cross-sectional study. BMC Pregnancy and Childbirth. 2021;21:224. doi:10.1186/s12884-021-03706-8.
2. Kitaw TM, Taye BT, Tadese M, Getaneh T. Effect of decision to delivery interval on perinatal outcomes during emergency cesarean deliveries in Ethiopia: a prospective cohort study. PLoS One. 2021;16(11):e0258742. doi:10.1371/journal.pone.0258742.
3. Prawitasari S, Widyandana D, Hakimi M, Utarini A. Decision to delivery interval in emergency cesarean section at two academic hospitals in Yogyakarta and Central Java, Indonesia. Bali Med J. 2021;10(1):266-72. doi:10.15562/bmj.v10i1.2030.
4. Boriboonhirunsarn D, Sunsaneevithayakul P. A specific protocol to shorten the decision-to-delivery interval for emergency cesarean section. J Obstet Gynaecol. 2022;42(5):999-1003. doi:10.1080/01443615.2021.1981267.
5. Kotera A. The evaluation of decision-to-delivery interval in category-1 emergency cesarean section: a report of six cases. JA Clin Rep. 2022;8(1):32. doi:10.1186/s40981-022-00523-6.
6. Sunsaneevithayakul P, Talungchit P, Wayuphak T, Sirisomboon R, Sompagdee N. Decision-to-delivery interval after implementation of a specific protocol for emergency cesarean delivery because of category III fetal heart rate tracings. J Obstet Gynaecol Can. 2022;44(11):1153-8. doi:10.1016/j.jogc.2022.09.001.
7. Kiruja J, Essén B, Erlandsson K, Klingberg-Allvin M, Osman F. Healthcare providers' experiences of comprehensive emergency obstetric care in Somaliland: an exploratory study with focus on cesarean deliveries. Sex Reprod Healthc. 2022;34:100768. doi:10.1016/j.srhc.2022.100768.
8. Beyene K, Fekadu K, Yihune M, Alemayehu Y, Alelign D, Ashebir G, et al. Decision to delivery interval, perinatal outcome and factors following emergency cesarean section in Southern Ethiopia. Ethiop J Health Sci. 2023;33(1):39-48. doi:10.4314/ejhs.v33i1.6.
9. Parveen S, Waqar S. Decision to delivery interval of emergency cesarean sections: evaluating adherence to timeframe and its impact on feto-maternal outcomes. Life Sci. 2023;4(4):445-51. doi:10.37185/LnS.1.1.424.
10. Kiruja J, Osman F, Egal JA, Klingberg-Allvin M, Litorp H. Association between delayed cesarean section and severe maternal and adverse newborn outcomes in the Somaliland context: a cohort study in a national referral hospital. Glob Health Action. 2023;16(1):2207862. doi:10.1080/16549716.2023.2207862.
11. Hussein BA, Damtew BS, Abdi HB, Gudayu TW. Decision to delivery time and its predictors among mothers who underwent emergency cesarean delivery at selected hospitals of Northwest Ethiopia, 2023: prospective cohort study. Int J Womens Health. 2024;16:249-64. doi:10.2147/IJWH.S436755.
12. Damtew BS, Gudayu TW, Temesgan WZ, Hailu AM. Effect of decision-to-delivery time of emergency cesarean section on adverse newborn outcomes at East Gojjam Zone Public Hospital, Ethiopia, March 2023: multicenter prospective observational study design. Int J Womens Health. 2024;16:433-50. doi:10.2147/IJWH.S451101.
13. Abdulbaki M, Aliyu FO, Ayinde M, Issa A, Adeniran AS, Ibrahim OR. Impact of decision-to-delivery interval on maternal and perinatal outcomes: a retrospective study of emergency cesarean section from 2017 to 2021 at a secondary health facility in Nigeria. BMC Pregnancy Childbirth. 2024;24(1):493. doi:10.1186/s12884-024-06700-y.
14. Murtaza H, Panhyar S, Memon E, Uroosa B, Liaquat F, Hussain M. Evaluation of maternal near-miss (MNM) events and maternal mortality at a tertiary care hospital. Pak J Health Sci. 2024;5(11):155-9. doi:10.54393/pjhs.v5i11.2538.
15. Khowaja BMH, Ahmed SI, Naz S, Valliani K, Shalwani TA, Maknojia AN, et al. Indications and outcomes of emergency and elective cesarean section deliveries in a tertiary care hospital in Karachi, Pakistan: a retrospective study. J Asian Midwives. 2024;11(2):12-23. doi:10.71071/JAM/v11i2.1.12.
16. Chauke L. Improving access to emergency obstetric care in low- and middle-income countries—best Pract Res Clin Obstet Gynaecol. 2025;98:102572. doi:10.1016/j.bpobgyn.2024.102572.
17. Chekole FA, Tesfu AA, Beyene FY, Getie SA, Nega AT, Bante SA, et al. Decision to delivery interval for emergency cesarean section and associated factors in Africa: systematic review and meta-analysis. BMC Women's Health. 2025;25:299. doi:10.1186/s12905-025-03854-5.
18. Businge J, Turanzomwe S, Akol MA, Kakama C, Kajabwangu R, Kanyesigye M, et al. Decision to delivery interval and predictors for delayed decision to delivery interval among women delivering by emergency cesarean section at a tertiary hospital, Southwestern Uganda: a prospective cohort study. BMC Pregnancy Childbirth. 2025;25:546. doi:10.1186/s12884-025-07680-3.
19. Gudu W, Wondafrash M, Sium AF. Challenging rule of 30-min decision-to-delivery interval during emergency cesarean section in a low-middle income country: a prospective study. Int J Gynaecol Obstet. 2025;171(2):784-8. doi:10.1002/ijgo.70235.
20. Wasim T, Raana GE, Wasim M, Mushtaq J, Amin Z, Asghar S. Maternal near-miss, mortality and their correlates at a tertiary care hospital. J Pak Med Assoc. 2021;71(7):1843-8. doi:10.47391/JPMA.05-678.
21. Ansari A, Akram U, Khattak S. Using World Health Organization near-miss approach to assess preventable maternal morbidity and mortality at a tertiary care hospital. J Pak Med Assoc. 2021;71(12):2721-5. doi:10.47391/JPMA.299.