



ASSESSMENT OF FETOMATERNAL OUTCOMES AMONG REFERRED OBSTETRIC CASES AT A TERTIARY CARE CENTER

Dr Astha Khunteta^{1*}, Dr Shagun Rampuriya², Dr KP Banerjee³

¹MS (Obstetrics and Gynaecology), NIMS Hospital, Jaipur, Rajasthan, India.

²MS, Assistant Professor, Department of Obstetrics and Gynaecology, NIMS Hospital, Jaipur, Rajasthan, India.

³Professor, Department of Obstetrics and Gynaecology, BST Hospital, Achrol, Rajasthan, India.

Corresponding Author*: Dr Astha Khunteta, MS (Obstetrics and Gynaecology), NIMS Hospital, Jaipur, Rajasthan, India.

Email ID: asthakhunteta25@gmail.com

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ABSTRACT

Background: Maternal and neonatal complications remain major contributors to morbidity and mortality in developing countries, especially among women referred to tertiary care centres with high-risk pregnancies or obstetric emergencies. Evaluating the outcomes of referred obstetric cases is essential for identifying gaps in antenatal care and referral services.

Objectives: To assess maternal and neonatal outcomes among referred obstetric patients and to analyse factors associated with adverse fetomaternal outcomes.

Methods: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology of a tertiary care teaching hospital in Jaipur, India, from July 2024 to December 2025. A total of 96 referred obstetric women with gestational age ≥ 24 weeks were included. Sociodemographic details, referral characteristics, obstetric complications, maternal outcomes, and neonatal outcomes were recorded using a structured proforma and analysed using descriptive and inferential statistics.

Results: The mean age of participants was 28.7 ± 3.5 years. Most women were from rural areas (59.4%) and were referred at term (72.9%). Previous lower segment caesarean section, anaemia, hypertensive disorders, and premature rupture of membranes were common indications for referral. Caesarean delivery was performed in 60.4% of cases. Blood transfusion was required in 31.3% of women, and 14.6% required ICU admission. Live birth occurred in 90.6% of pregnancies, while stillbirths accounted for 5.2%. Most neonates had a 5-minute APGAR score >7 (58.6%). NICU admission was common, with birth asphyxia being the leading indication.

Conclusion: The findings indicate that referred obstetric cases carry a high risk for both maternal and neonatal complications, largely influenced by avoidable factors such as delayed referral and insufficient antenatal care. Strengthening peripheral healthcare services, improving early risk identification, and ensuring timely referral and transport are crucial for reducing preventable fetomaternal complications.

KEYWORDS: Referred Obstetric Cases, Fetomaternal Outcomes, Maternal Morbidity, Neonatal Outcomes, High-risk Pregnancy.

Introduction

Maternal and neonatal health remains a major public health concern, particularly in low- and middle-income countries where access to quality obstetric care is often uneven. Although pregnancy is a physiological process, a significant proportion of women develop complications that require specialized management. Early identification of high-risk pregnancies through regular antenatal care and timely referral to appropriately equipped facilities are essential strategies for preventing maternal and perinatal morbidity and mortality[1].

The referral system forms a critical component of obstetric care. According to the World Health Organization, referral involves transferring a patient from a facility with limited resources or expertise to a better-equipped centre capable of providing appropriate management. An effective referral system should ensure timely recognition of complications, pre-referral stabilization, adequate documentation, safe transportation, and prompt treatment at the receiving facility. Failure at any of these stages may lead to deterioration of the mother or fetus before definitive care is provided[2,3].

In India, various initiatives such as the Janani Suraksha Yojana, Janani Shishu Suraksha Karyakram, and Pradhan Mantri Surakshit Matritva Abhiyan have substantially increased institutional deliveries and improved access to maternal healthcare services[4,5]. However, tertiary care hospitals continue to receive a large number of referred obstetric cases, many of whom arrive late with severe complications such as anaemia, hypertensive disorders, obstructed labour, haemorrhage, and fetal distress[6,7]. Consequently, the reduction in maternal mortality has not been proportional to the increase in institutional deliveries, highlighting persistent gaps in referral mechanisms and quality of care[8]. Adequate emergency obstetric care is central to achieving national targets under the National Health Mission, including reduction of maternal mortality ratio (MMR). Promoting institutional deliveries and ensuring access to Emergency Obstetric Care (EmOC) are key strategies in this regard[9].

The “three delays model” provides a useful framework for understanding adverse maternal outcomes: delay in deciding to seek care, delay in reaching a healthcare facility, and delay in receiving appropriate treatment after arrival. These delays are often influenced by poor awareness, financial constraints, inadequate transportation, geographical barriers, and limitations within healthcare institutions. Women from rural and socioeconomically disadvantaged backgrounds are particularly vulnerable to such delays[10].

Fetomaternal outcomes including, maternal complications, intensive care requirement, blood transfusion, low birth weight, poor APGAR scores, NICU admission, stillbirth, and neonatal mortality—serve as important indicators

of the effectiveness of obstetric and referral services. Evaluating these outcomes among referred cases helps identify weaknesses in the healthcare system and provides evidence for improving referral pathways and emergency obstetric care[11].

Despite improvements in maternal health indicators in India, preventable maternal and neonatal morbidity remains substantial. Therefore, the present study was intended to evaluate fetomaternal outcomes among referred obstetric cases managed at a tertiary care centre and to analyse factors associated with adverse outcomes.

Materials and Methods

Study Design and Setting

A prospective observational study was carried out in the Department of Obstetrics and Gynecology at the National Institute of Medical Sciences and Research, Jaipur, over a period of 18 months from July 2024 to December 2025. The study was obtained the Institutional Ethical Committee Clearance and conducted according to the principles of “Declaration of Helsinki.” Written informed consent was obtained from all participants, and confidentiality of patient information was strictly maintained.

Study Population

The study included pregnant women referred from peripheral healthcare facilities to the tertiary care centre for obstetric management. Referred antenatal and intranatal women in the reproductive age group, gestational age greater than 24 weeks, and women who provided informed consent to participate, were included in the study. The study excluded: postpartum referrals, referred cases with gynecological conditions such as: Ectopic pregnancy, Hydatidiform mole, and Incomplete abortion.

Sample Size and Sampling Technique

All eligible referred obstetric cases presenting during the study period were included using a consecutive sampling method.

Methodology

Data collection was performed using a structured, predesigned, and pretested proforma specifically developed for this study. The proforma included detailed information on demographic characteristics, obstetric history, antenatal care, referral patterns, clinical findings, and fetomaternal outcomes. Maternal outcomes were evaluated based on the presence of complications such as preeclampsia, eclampsia, hemorrhage, sepsis, anemia, and maternal mortality. Fetal outcomes were assessed using standard indicators including Apgar score, birth weight, gestational age at delivery, and neonatal morbidity and mortality. Standard obstetric definitions and World Health Organization (WHO) guidelines were followed for classification and assessment

of maternal and perinatal outcomes. Referral documentation, including referral slips, patient records, and investigation reports, were carefully reviewed to verify referral indications and clinical diagnoses.

Data Management & Statistical Analysis

All collected data were systematically recorded in the study proforma. Information captured included sociodemographic details, obstetric profile, antenatal care parameters, referral characteristics, clinical findings, and maternal and neonatal outcomes, including the need for intensive care unit (ICU) admission. Data quality was ensured through regular checks for completeness and accuracy. The collected data were coded and entered into Microsoft Excel spreadsheets for analysis. Confidentiality of patient information was strictly maintained by anonymizing personal identifiers and restricting data access to authorized personnel only. Descriptive statistics were used to summarize the data. Continuous variables represented as frequencies and percentages and categorical variables represented as mean $\pm$ SD. Pearson's Chi-square test was used to assess the association between categorical variables, with a p-value <0.05 considered statistically significant.

Results

A total of 96 referred obstetric women were included in the study. The mean maternal age was 28.7 ± 3.5 years, with most participants belonging to the 26–30-year age group (37.5%), followed by 31–35 years (29.2%) and 21–25 years (28.1%). The majority of women had received only primary education (62.5%), resided in rural areas (59.4%), and belonged to lower-middle socioeconomic class (44.8%). Nearly two-fifths of the study population were primigravida (39.6%), while 72.9% were referred at term (≥ 37 weeks of gestation), shown in Table 1.

Most referrals originated from government healthcare facilities, with government ambulance services being the predominant mode of transport. Although government ambulance utilization varied across referring centres, the mode of transport was not significantly associated with the place of referral ($\chi^2 = 6.702$, $p = 0.142$). Referral documentation was complete in 81.2% of cases, indicating satisfactory compliance with referral protocols in the majority of patients. Furthermore, 62.5% of women reached the tertiary care centres within 1–3 hours of referral, and a healthcare worker accompanied the patient during transport in 78.1% of cases, shown in Table 2.

Table 1: Demographic Characteristics & Obstetric Profile of Referred Women

Characteristics		Value, n (%) / Mean $\pm$ SD
Age Group (years)	≤ 20	5 (5.21%)
	21–25	27 (28.13%)
	26–30	36 (37.50%)
	31–35	28 (29.17%)
Mean $\pm$ SD		28.7 $\pm$ 3.5 years
Education Level	Illiterate	10 (10.42%)
	Primary education	60 (62.50%)
	Secondary education	16 (16.67%)
	Graduate	10 (10.42%)
Residence	Rural	57 (59.38%)
	Urban	39 (40.63%)
Socioeconomic Status	Lower class	12 (12.50%)
	Lower middle class	43 (44.79%)
	Middle class	39 (40.63%)
	Upper middle class	2 (2.08%)
Gravida	Primigravida	38 (39.58%)
	G2	30 (31.25%)
	G3	18 (18.75%)
	$\geq$ G4	10 (10.42%)
Gestational Age	≥ 37 weeks	70 (72.92%)
	<37 weeks	26 (27.08%)

Table 2: Association of Mode of Transport with Place of Referral

Mode of Transportation	Place of Referral				Test of Significance
	Government District Hospital (n=96)	Government CHC (n=96)	Government PHC (n=96)	MCH Centre (n=96)	
Government Ambulance	78 (81.25%)	66 (68.75%)	96 (100%)	96 (100%)	Chi-square value = 6.702 P-value = 0.142 (non-significant)
Personal Vehicle				0 (0%)	
Private Ambulance	10 (10.42%)	10 (10.42%)	0 (0%)	0 (0%)	

Table 3: Maternal Referral Characteristics and Clinical Outcomes among Referred Obstetric Women

Characteristics	Value, n (%)
Referring healthcare provider	Gynaecologist
	52 (54.17%)
	Non-gynaecologist
Mode of delivery	Caesarean section
	58 (60.42%)
	Vaginal delivery
Blood products transfused	Undelivered
	4 (4.17%)
	PRBC
ICU admission status	Platelets
	10 (10.42%)
	FFP
Duration of hospital stay	Admitted in ICU
	14 (14.58%)
	2-3 days
	4-5 days
	36 (37.50%)
	≥ 6 days
	20 (20.83%)

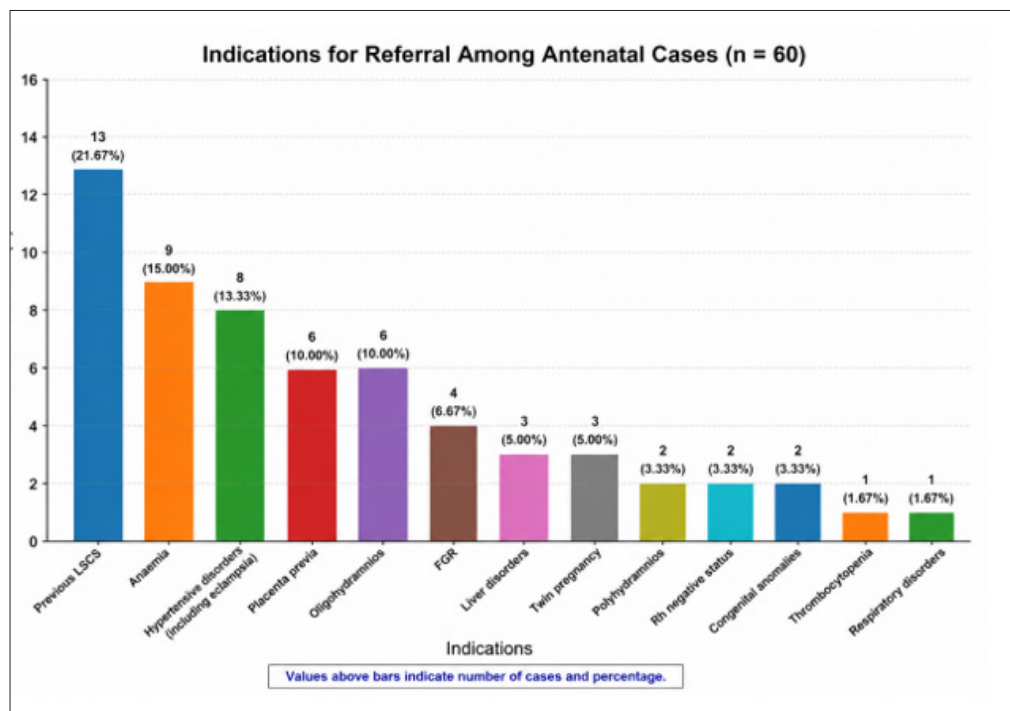


Figure 1. Antenatal Complications

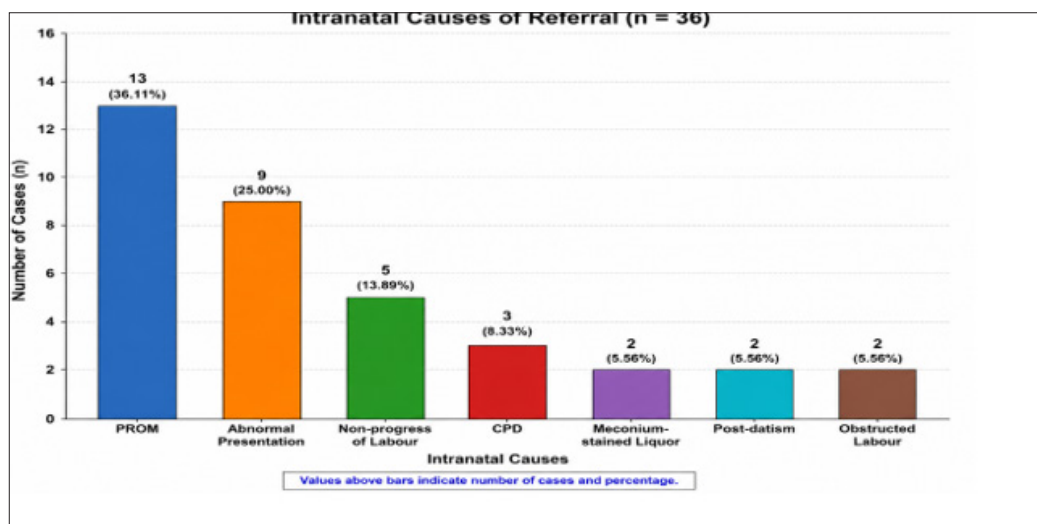


Figure 2. Intranatal Complications

Specialist obstetricians initiated more than half of the referrals (54.2%), while referrals by non-specialists and Accredited Social Health Activists (ASHAs) accounted for 29.2% and 16.7%, respectively. Operative delivery was frequent among referred women, with 60.4% undergoing caesarean section, whereas 35.4% delivered vaginally. Four women (4.2%) remained undelivered during the study period. Blood component therapy was commonly required, particularly packed red blood cells (PRBC), which were transfused in 31.3% of patients. Maternal intensive care admission (ICU) was necessary in 14.6% of women, reflecting the severity of complications at presentation. Most women (41.7%) were discharged within 2–3 days, while one-fifth required hospitalization for six days or longer (Table 3).

Antenatal complications represented the major indication for referral (62.5%). Previous lower segment caesarean section was the leading antenatal indication (21.7%), followed by anaemia (15.0%) and hypertensive disorders, including eclampsia (13.3%). Among intrapartum referrals, premature rupture of membranes (36.1%), abnormal fetal presentation (25.0%), and non-progress of labour (13.9%) were the most common indications, illustrated in Figure 1.

Intranatal causes contributed to 36 cases (37.5%) of the total

referrals. premature rupture of membranes (PROM) was the most frequent cause, observed in 13 cases (36.11%), followed by abnormal presentation in 9 cases (25.00%). Non-progress of labour was seen in 5 cases (13.89%), while Cephalopelvic disproportion (CPD) accounted for 3 cases (8.33%). Meconium-stained liquor, post-datism, and obstructed labour were noted in 2 cases each (5.56%). These findings highlight that both antenatal and intranatal complications significantly contributed to obstetric referrals, with a higher proportion attributed to antenatal risk factors (Figure 2).

Fetal survival was achieved in 90.6% of pregnancies, whereas stillbirth occurred in 5.2% of cases. The majority of newborns demonstrated satisfactory neonatal adaptation, with a five-minute APGAR score greater than seven in 58.6% of deliveries. Most neonates (73.6%) had a birth weight between 2 and 3 kg, while low birth weight (< 2 kg) was observed in 10.3% of cases. Among live-born neonates, NICU admission was required in a substantial proportion, primarily because of birth asphyxia (65.8%), followed by meconium aspiration syndrome (10.5%), congenital anomalies (3.9%), and other neonatal complications (19.7%). These findings highlight the considerable burden of neonatal morbidity associated with referred obstetric pregnancies, shown in Table 4.

Table 4: Fetal and Neonatal Outcomes of Referred Obstetric Cases

Outcome Variable	n (%)
Fetal outcome	
Live birth	87 (90.6)
Stillbirth	5 (5.2)
Undelivered	4 (4.2)
5-minute APGAR score	
0	2 (2.3)
1–4	7 (8.0)
5–7	27 (31.0)

Outcome Variable	n (%)
>7	51 (58.6)
Birth weight	
<2 kg	9 (10.3)
2–3 kg	64 (73.6)
>3 kg	14 (16.1)
NICU admission (n = 88)	
Yes	76 (87.4)
No	11 (12.6)
Primary indication for NICU admission (n = 76)	
Birth asphyxia	50 (65.8)
Meconium aspiration syndrome	8 (10.5)
Congenital anomaly	3 (3.9)
Other causes ^s	15 (19.7)

^sOther causes included miscellaneous neonatal conditions recorded in the hospital case records that did not fall under the predefined categories.

Discussion

The present prospective observational study evaluated the fetomaternal outcomes of referred obstetric cases managed at a tertiary care centre. The findings reaffirm that referred pregnancies constitute a high-risk group requiring timely multidisciplinary management to minimize adverse maternal and neonatal outcomes. Despite considerable progress in institutional deliveries and maternal healthcare services in India, delayed referrals and inadequate peripheral management continue to contribute significantly to maternal and neonatal morbidity.

Most women in the present study were between 26 and 30 years of age, which corresponds to the peak reproductive period. Similar observations have been reported by Khade et al. and Bangal et al., who also found that the majority of referred obstetric patients belonged to the third decade of life. This suggests that obstetric complications are not restricted to extremes of reproductive age but may occur even among women in the biologically favourable reproductive years, particularly when antenatal surveillance is inadequate[1,12].

The predominance of women from rural and lower-middle socioeconomic backgrounds reflects persistent disparities in access to quality maternal healthcare. Rural residence has consistently been associated with delayed diagnosis, inadequate antenatal care, poor transportation facilities, and late referral. Similar demographic characteristics have been reported in studies conducted across different regions of India, emphasizing the continuing inequity in maternal healthcare utilization[13].

Nearly three-fourths of women were referred at term, indicating that many complications become clinically significant during late pregnancy or labour. Parity analysis revealed that multigravida women constituted a larger share of referred cases, likely due to accumulated obstetric risks such as previous cesarean deliveries, anemia, or hypertensive

disorders. Joe et al. also documented a higher proportion of multigravida referrals due to prior complications[14]. However, Singh et al. reported more referrals among primigravida women, attributing it to delayed recognition of danger signs and lack of experience[15]. These contrasting findings indicate that both groups are vulnerable, though for different reasons. The high prevalence of anaemia further reflects the ongoing burden of maternal nutritional deficiencies in developing countries and underscores the need for strengthening antenatal nutritional interventions.

Most referrals originated from government district hospitals and community health centres, reflecting the crucial role of peripheral healthcare institutions in the referral network. This is consistent with findings by Gupta et al.[16]. In contrast, Fatma et al. reported a higher proportion of referrals from private facilities in urban settings,[17] indicating variations in healthcare infrastructure across regions. Ambulances were the most common mode of transport in this study, suggesting improved access to emergency transport services. Singh et al. also highlighted the positive impact of ambulance services on maternal outcomes[18]. However, reliance on private or unregulated transport in some settings, as reported by Gupta et al., continues to contribute to delays[19].

The majority of referrals were made by gynaecologists, followed by non-specialists and community health workers, indicating a relatively appropriate referral pattern. Singh et al. reported similar observations[15]. However, in resource-limited settings, non-specialists often initiate referrals due to the shortage of trained personnel. Common indications for referral included PROM, malpresentation, and non-progress of labour, all of which require advanced obstetric care. Hussain et al. reported similar indications, highlighting variation in case profiles[20].

Maternal outcomes in the present study revealed a high prevalence of anaemia, postpartum haemorrhage, and the

need for blood transfusion. Anaemia remains a major public health concern and is strongly associated with adverse maternal and perinatal outcomes. Similar findings have been reported by Nair et al., who demonstrated that moderate-to-severe maternal anaemia significantly increased the risk of postpartum haemorrhage, low birth weight, and perinatal death[21]. Likewise, Mohi et al. highlighted that anaemia and obstetric haemorrhage were among the leading indications for blood transfusion in women with severe obstetric complications[22]. Severe complications such as disseminated intravascular coagulation (DIC), eclampsia, acute renal failure, and ICU admission further reflect the critical condition of referred obstetric patients. Similar findings have been reported in studies of critically ill obstetric women, where hypertensive disorders, obstetric haemorrhage, renal dysfunction, and the need for intensive care were major contributors to severe maternal morbidity. Furthermore, referral audits have demonstrated that timely referral and prompt management at tertiary care centres are associated with improved maternal and fetal outcomes[23,24].

Neonatal outcomes also reflected the severity of maternal illness. Although more than 90% of pregnancies resulted in live births, NICU admission was required for a substantial proportion of neonates, with birth asphyxia representing the leading indication. Birth asphyxia was the leading indication for NICU admission in the present study, reflecting the severity of intrapartum complications among referred obstetric cases. Similar findings have been reported in tertiary care studies, where birth asphyxia was a major contributor to neonatal morbidity. However, other studies have identified neonatal sepsis as the predominant cause of NICU admission and neonatal mortality, highlighting variations in referral patterns, infection control practices, and the quality of neonatal care across healthcare settings[25,26].

The findings of the present study strongly support the “three delays” model proposed by Thaddeus and Maine. Delays in recognising danger signs, reaching an appropriate healthcare facility, and receiving definitive treatment continue to influence pregnancy outcomes. Although improvements have been made in emergency transportation and institutional delivery rates, strengthening peripheral healthcare facilities, enhancing risk identification during antenatal care, and improving communication between referral centres remain essential for further reducing maternal and neonatal morbidity[10].

However, the present study has certain limitations. First, it was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other healthcare settings. Second, the relatively modest sample size may have reduced the statistical power to detect associations for less common maternal and neonatal outcomes. Third, long-term maternal and neonatal follow-up after hospital discharge was not performed; therefore, delayed complications and

developmental outcomes could not be assessed.

Conclusion

The present study demonstrates that referred obstetric pregnancies constitute a high-risk population with substantial maternal and neonatal morbidity requiring specialized management at tertiary care centres. Most women were referred during late pregnancy because of preventable or manageable obstetric complications, including previous caesarean section, anaemia, hypertensive disorders, and labour-related emergencies. The high rates of caesarean delivery, blood transfusion, intensive care admission, and neonatal intensive care utilization reflect the severity of illness at presentation and the challenges associated with delayed referral. Overall, this study demonstrates that improving referral quality is not solely dependent on transportation but also requires comprehensive strengthening of antenatal services, early identification of high-risk pregnancies, prompt referral, standardized referral documentation, and availability of skilled personnel at all levels of the healthcare system.

Conflict of interest

None declared

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