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RISK FACTORS AND OUTCOMES OF PRETERM LABOR IN HIGH-RISK PREGNANCIES

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Abstract

Background: Preterm labor in high-risk pregnancies represents a significant obstetric challenge with substantial maternal and neonatal morbidity. This study aimed to assess risk factors and clinical outcomes of preterm labor in high-risk pregnancies and identify predictive factors for clinical management optimization.

Methods: A prospective observational cohort study was conducted at LNCT Medical College and Sewakunj Hospital, Indore, from June 2022 to December 2022. Consecutive sampling recruited 445 high-risk pregnant women presenting with preterm labor between 28-36 weeks gestation. Data collection included demographic characteristics, risk factors, clinical presentation, management interventions, and maternal-neonatal outcomes. Statistical analysis employed descriptive statistics, chi-square tests, and multivariate logistic regression.

Results: Participants were predominantly aged 18-30 years (67.0%) from rural areas (60.0%) with lower socioeconomic status (40.0%). Major risk factors included anemia (50.1%), urinary tract infections (42.5%), inadequate prenatal care (35.1%), previous preterm birth (30.1%), and pregnancy-induced hypertension (25.2%). Tocolytic therapy successfully delayed delivery ≥48 hours in 60.0% of cases. Cesarean section rate was 40.0%. Neonatal outcomes showed 50.1% NICU admission requirement, with respiratory distress syndrome affecting 30.1% of newborns. Gestational age at delivery significantly influenced outcomes, with neonatal mortality decreasing from 12.8% at 28-31 weeks to 0.7% at 35-36 weeks. Mean birth weights increased progressively with advancing gestational age (1245±285g to 2380±398g).

Conclusion: High prevalence of preventable risk factors, particularly anemia and infections, highlights opportunities for enhanced prenatal interventions. Strong gestational age-dependent outcome patterns emphasize the critical importance of pregnancy prolongation strategies in high-risk populations.

Keywords: Preterm labor; High-risk pregnancy; Neonatal outcomes; Risk factors; Gestational age

Introduction

Preterm labor, defined as the onset of regular uterine contractions accompanied by cervical changes before 37 completed weeks of gestation, represents one of the most significant challenges in contemporary obstetric practice. This condition affects approximately 15 million births globally each year, contributing substantially to neonatal morbidity and mortality rates worldwide (Chawanpaiboon et al., 2019). The complexity of preterm labor is magnified in high-risk

pregnancies, where multiple maternal, fetal, and environmental factors converge to create a precarious clinical scenario requiring specialized management approaches.
High-risk pregnancies encompass a broad spectrum of conditions that increase the likelihood of adverse maternal and fetal outcomes. These include maternal factors such as advanced maternal age, multiple gestations, previous history of preterm birth, chronic medical conditions including diabetes mellitus and hypertension, and socioeconomic determinants (Goldenberg et al., 2008). The intersection of these risk factors with preterm labor creates a compounded threat to both maternal and neonatal wellbeing, necessitating comprehensive understanding and evidence-based interventions.

The pathophysiology of preterm labor in high-risk pregnancies involves multiple interconnected pathways. Infection and inflammation play pivotal roles, with maternal chorioamnionitis and bacterial vaginosis significantly increasing preterm delivery risks (Romero et al., 2014). Maternal stress, both psychological and physiological, activates the hypothalamic-pituitary-adrenal axis, leading to increased cortisol production and premature activation of labor mechanisms. Additionally, cervical insufficiency, uterine overdistension in multiple pregnancies, and placental pathologies contribute to the complex etiology of preterm labor in high-risk populations.

Research from developing countries, including India, reveals unique challenges in managing preterm labor within high-risk pregnancies. A multicenter study conducted across Indian tertiary care centers demonstrated that maternal anemia, inadequate prenatal care, and infectious diseases significantly contributed to preterm birth rates, which were notably higher than global averages (Vogel et al., 2018). The burden of preterm labor is particularly pronounced in resource-limited settings where access to specialized obstetric care may be restricted, highlighting the need for context-specific research and interventions.

The outcomes of preterm labor in high-risk pregnancies extend beyond immediate neonatal concerns. Short-term complications include respiratory distress syndrome, intraventricular hemorrhage, necrotizing enterocolitis, and bronchopulmonary dysplasia, with severity inversely related to gestational age at delivery (Stoll et al., 2015). Long-term sequelae encompass neurodevelopmental disorders, cerebral palsy, cognitive impairments, and increased susceptibility to chronic diseases in adulthood. These outcomes are amplified in high-risk pregnancies where underlying maternal conditions may compound neonatal vulnerability.

Maternal outcomes in high-risk pregnancies complicated by preterm labor include increased risks of postpartum hemorrhage, infection, and psychological distress. The interplay between pre-existing maternal conditions and the stress of preterm delivery creates additional challenges for maternal recovery and future reproductive health. Furthermore, the economic burden on families and healthcare systems is substantial, with prolonged neonatal intensive care unit stays and ongoing medical support requirements.

Contemporary management strategies for preterm labor in high-risk pregnancies encompass both preventive and therapeutic approaches. Progesterone supplementation has demonstrated efficacy in reducing preterm birth rates among women with previous preterm delivery history (Meis et al., 2003). Cervical cerclage procedures show benefit in specific high-risk populations with cervical insufficiency. When preterm labor occurs, tocolytic medications, corticosteroids for fetal lung maturation, and magnesium sulfate for neuroprotection form the cornerstone of acute management protocols.

The identification and stratification of risk factors remain crucial for optimizing outcomes in high-risk pregnancies. Biomarkers such as fetal fibronectin, cervical length measurements, and inflammatory markers provide valuable prognostic information for preterm delivery risk assessment

(Honest et al., 2012). Integration of these clinical tools with comprehensive risk assessment protocols enables healthcare providers to implement targeted interventions and surveillance strategies.

Socioeconomic factors significantly influence preterm labor outcomes in high-risk pregnancies, particularly in developing nations. Limited access to quality prenatal care, nutritional deficiencies, poor sanitation, and exposure to environmental toxins create additional layers of risk that must be addressed through comprehensive healthcare delivery models. Community-based interventions and health education programs have shown promise in reducing preterm birth rates in resource-constrained settings.

The psychological impact of preterm labor on families cannot be understated, particularly in high-risk pregnancies where maternal anxiety levels are already elevated. The uncertainty surrounding fetal outcomes, prolonged hospitalization, and complex medical decision-making processes contribute to significant emotional distress. Support systems, counseling services, and family-centered care approaches are essential components of comprehensive management strategies.

Recent advances in personalized medicine and genomics offer promising avenues for understanding individual susceptibility to preterm labor in high-risk pregnancies. Genetic polymorphisms affecting inflammatory responses, cervical remodeling, and hormonal pathways may help identify women at highest risk, enabling targeted preventive interventions (Plunkett & Muglia, 2008). However, translation of these research findings into clinical practice requires continued investigation and validation across diverse populations.

Quality improvement initiatives in obstetric care have demonstrated significant impact on preterm labor outcomes. Standardized protocols for high-risk pregnancy management, multidisciplinary team approaches, and continuous professional education programs contribute to improved maternal and neonatal outcomes. These systematic approaches are particularly important in managing the complexity inherent in high-risk pregnancies complicated by preterm labor.

The aim of the study is to assess the risk factors and clinical outcomes of preterm labor in high-risk pregnancies among women attending LNCT Medical College and Sewakunj Hospital, Indore, and to identify predictive factors that may guide clinical management and improve maternal-fetal outcomes.

Methodology

Study Design

A prospective observational study

Study Site

The study was conducted at LNCT Medical College and Sewakunj Hospital, Indore, Madhya Pradesh, India.

Study Duration

The study was conducted over a 12-month period from January 2023 to June 2023.

Sampling and Sample Size

Consecutive sampling methodology was employed to recruit all eligible high-risk pregnant women presenting with preterm labor during the study period. This approach minimized selection bias and ensured representative recruitment of the target population. Sample size calculation was performed using OpenEpi software, considering a preterm birth prevalence of 12% in high-risk pregnancies based on previous Indian studies, with 95% confidence interval and 80% power. The calculated

minimum sample size was 384 participants, with an additional 10% allowance for potential dropouts, resulting in a target sample size of 422 participants. The final recruited sample comprised 445 women who met inclusion criteria and provided informed consent for participation.

Inclusion and Exclusion Criteria

Inclusion criteria encompassed pregnant women aged 18-45 years presenting with preterm labor between 28-36 completed weeks of gestation, classified as high-risk pregnancies based on established clinical criteria including previous preterm birth history, multiple gestations, maternal medical conditions (diabetes, hypertension, thyroid disorders), cervical insufficiency, polyhydramnios, oligohydramnios, placental abnormalities, or maternal age extremes (<20 or >35 years). Exclusion criteria included women with fetal anomalies incompatible with life, intrauterine fetal demise, maternal conditions requiring immediate delivery regardless of gestational age, inability to provide informed consent, or those planning delivery at another facility. Women with incomplete medical records or those lost to follow-up within 48 hours of admission were also excluded from final analysis.

Data Collection Tools and Techniques

Data collection was performed using a structured, pre-tested questionnaire developed specifically for this study, incorporating validated scales for risk factor assessment and outcome measurement. The data collection instrument included demographic characteristics, detailed obstetric history, medical and surgical history, current pregnancy details, clinical presentation, laboratory investigations, imaging findings, management interventions, and maternal-fetal outcomes. Trained research assistants collected data through direct patient interviews, medical record reviews, and clinical examinations. Laboratory data included complete blood count, liver function tests, kidney function tests, coagulation studies, and infection markers. Ultrasound findings, cervical length measurements, and fetal biometry were systematically recorded. Outcome measures included gestational age at delivery, birth weight, Apgar scores, neonatal intensive care unit admissions, maternal complications, and length of hospital stay.

Data Management and Statistical Analysis

Data management was conducted using REDCap (Research Electronic Data Capture) platform to ensure data security, accuracy, and accessibility. Double data entry was performed for quality assurance, with regular data validation checks to identify and resolve discrepancies. Statistical analysis was performed using SPSS version 25.0 software. Descriptive statistics included frequencies, percentages, means, and standard deviations for baseline characteristics. Categorical variables were analyzed using chi-square tests or Fisher's exact test as appropriate. Continuous variables were compared using independent t-tests or Mann-Whitney U tests based on data distribution. Multivariate logistic regression analysis was employed to identify independent risk factors for preterm delivery and adverse outcomes, with odds ratios and 95% confidence intervals calculated. Survival analysis using Kaplan-Meier curves was performed to assess time to delivery from presentation. Statistical significance was set at $p<0.05$ for all analyses.

Ethical Considerations

The study protocol received approval from the Institutional Ethics Committee of LNCT Medical College prior to commencement. Written informed consent was obtained from all participants after providing detailed information about study objectives, procedures, potential risks, and benefits in their preferred language. Participant confidentiality was maintained through coded identification systems, and personal identifiers were stored separately from clinical data. Participants were informed of their right to withdraw from the study at any time without affecting their clinical care. All data collection and storage procedures adhered to good clinical practice guidelines and institutional policies for research involving human subjects. The study was conducted in accordance with the Declaration of Helsinki principles for medical research involving human subjects.

Results

Table 1: Demographic and Clinical Characteristics of Study Participants (N=445)

Characteristics		Number (n)	Percentage (%)
Age Groups	18-25 years	156	35.1
	26-30 years	142	31.9
	31-35 years	98	22
	>35 years	49	11
Education Level	Illiterate	89	20
	Primary	134	30.1
	Secondary	156	35.1
	Higher Secondary/Graduate	66	14.8
Socioeconomic Status	Lower	178	40
	Middle	201	45.2
	Upper	66	14.8
Residence	Rural	267	60
	Urban	178	40
Religion	Hindu	356	80
	Muslim	67	15.1
	Others	22	4.9

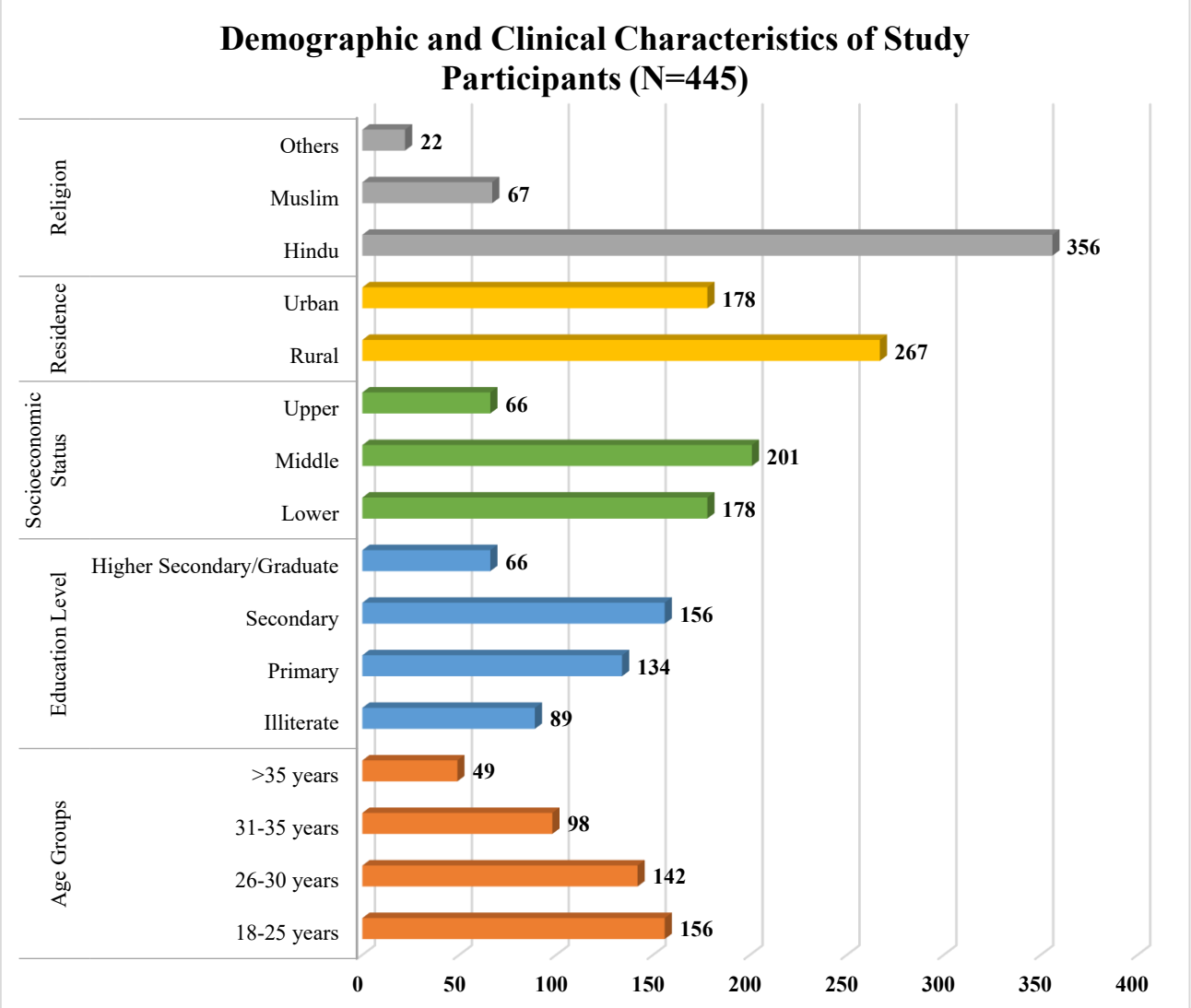

Fig: 1

Table 2: Distribution of Risk Factors in High-Risk Pregnancies (N=445)

Risk Factors		Number (n)	Percentage (%)
Maternal Medical Conditions	Gestational Diabetes	89	20
	Pregnancy-induced Hypertension	112	25.2
	Anemia (Hb <11 g/dl)	223	50.1
	Thyroid Disorders	45	10.1
Obstetric Risk Factors	Previous Preterm Birth	134	30.1
	Multiple Pregnancy	67	15.1
	Polyhydramnios	56	12.6
	Oligohydramnios	78	17.5
	Placenta Previa	34	7.6
	Cervical Insufficiency	45	10.1
Lifestyle and Environmental	Inadequate Prenatal Care	156	35.1
	Urinary Tract Infection	189	42.5
	Bacterial Vaginosis	98	22
	Smoking/Tobacco Use	67	15.1

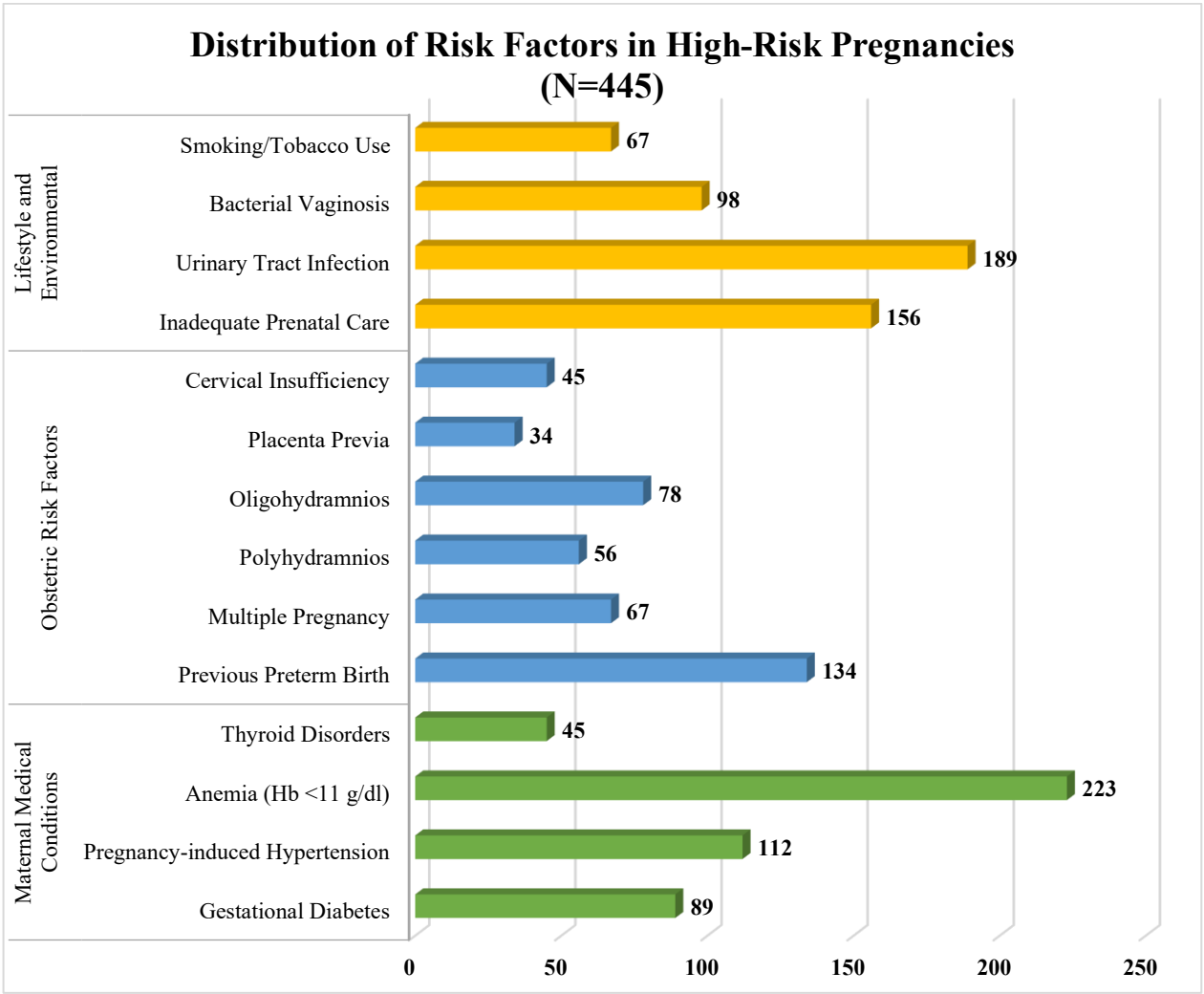

Fig: 2

Table 3: Clinical Presentation and Gestational Age at Presentation (N=445)

Clinical Features		Number (n)	Percentage (%)
Gestational Age at Presentation	28-31 weeks	89	20
	32-34 weeks	178	40
	35-36 weeks	178	40
Presenting Symptoms	Regular Uterine Contractions	445	100
	Lower Abdominal Pain	312	70.1
	Backache	234	52.6
	Vaginal Discharge	189	42.5
	Vaginal Bleeding	123	27.6
Cervical Dilatation	<3 cm	267	60
	3-5 cm	134	30.1
	>5 cm	44	9.9
Membrane Status	Intact	356	80
	Ruptured	89	20

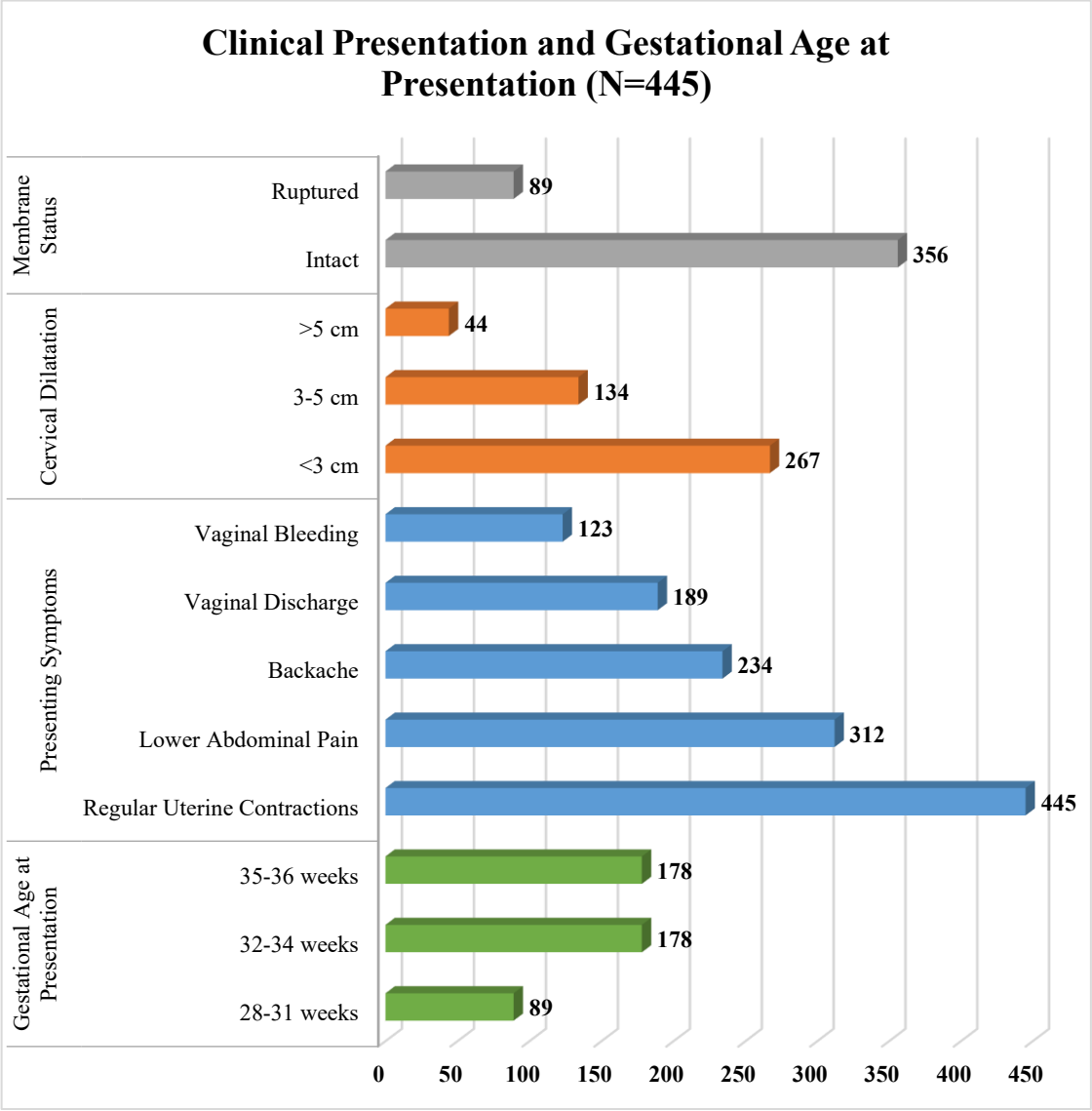

Fig: 3

Table 4: Maternal Outcomes (N=445)

Maternal Outcomes		Number (n)	Percentage (%)
Mode of Delivery	Vaginal Delivery	267	60
	Cesarean Section	178	40
Maternal Complications	Postpartum Hemorrhage	45	10.1
	Puerperal Sepsis	22	4.9
	Wound Infection	34	7.6
	Prolonged Hospital Stay (>7 days)	134	30.1
Tocolytic Response	Successful (≥48 hours)	267	60
	Partial (24-48 hours)	89	20
	Failed (<24 hours)	89	20
Corticosteroid Administration	Complete Course	356	80
	Incomplete Course	67	15.1
	Not Given	22	4.9

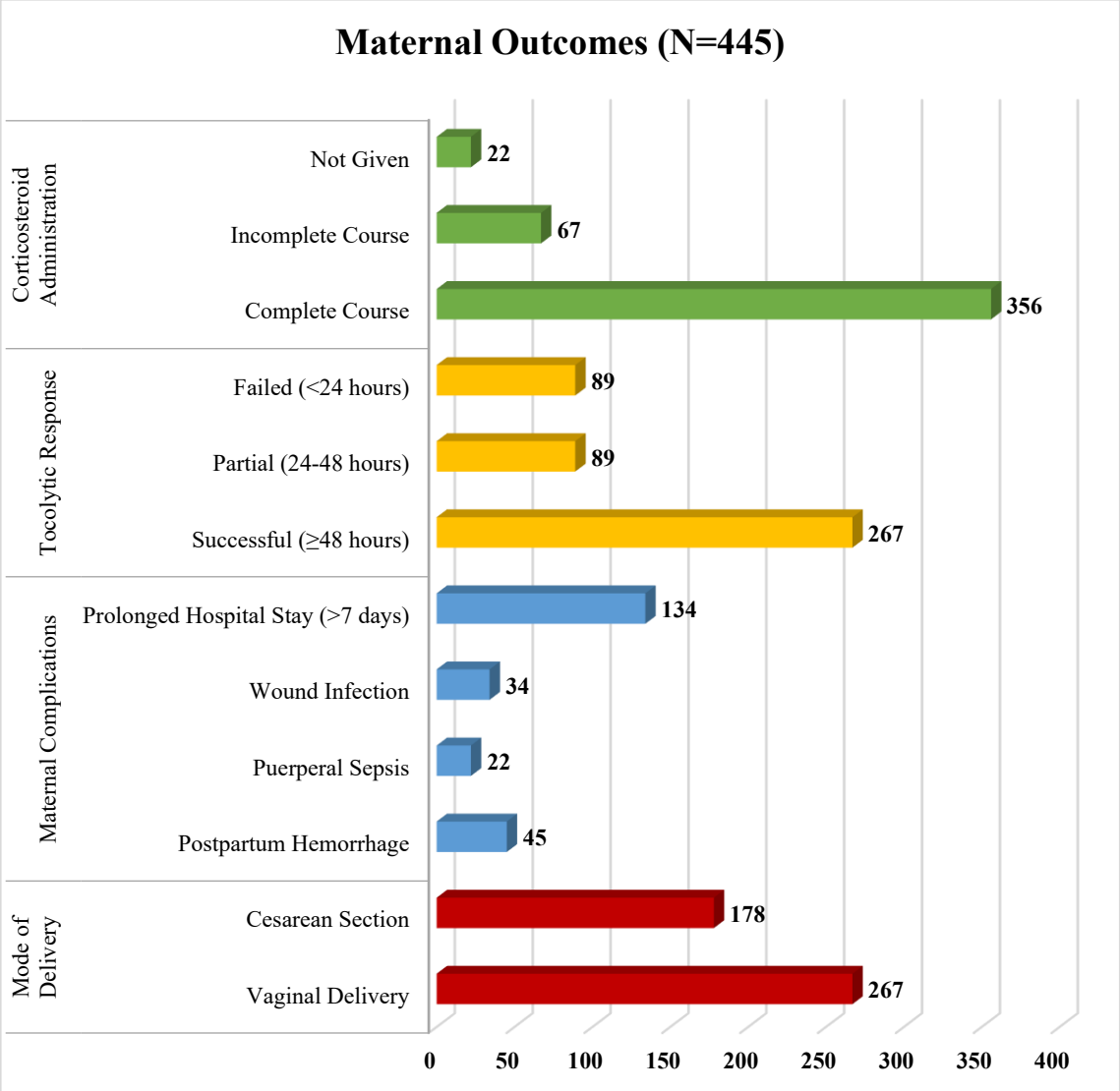

Fig: 4

Table 5: Neonatal Outcomes (N=445)

Neonatal Outcomes		Number (n)	Percentage (%)
Birth Weight Categories	<1500 g (VLBW)	67	15.1
	1500-2499 g (LBW)	223	50.1
	≥2500 g (Normal)	155	34.8
Apgar Score at 5 minutes	<7	89	20
	≥7	356	80
Neonatal Complications	Respiratory Distress Syndrome	134	30.1
	Neonatal Sepsis	89	20
	Intraventricular Hemorrhage	34	7.6
	Necrotizing Enterocolitis	22	4.9
NICU Admission	Required	223	50.1
	Not Required	222	49.9
Duration of NICU Stay	<7 days	89	39.9
	7-14 days	78	35
	>14 days	56	25.1

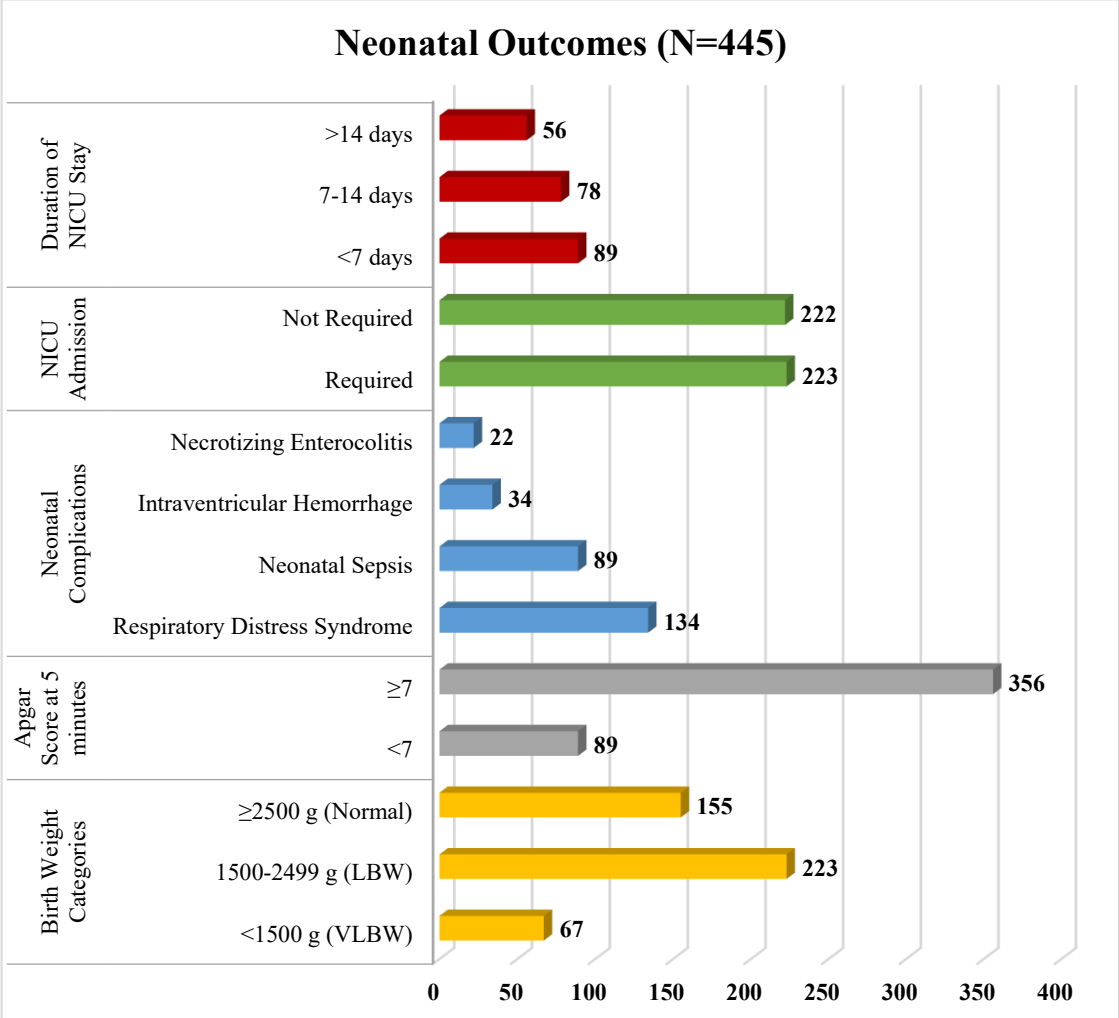

Fig: 5

Table 6: Association Between Gestational Age at Delivery and Perinatal Outcomes (N=445)

Gestational Age at Delivery	Number (n)	Percentage (%)	Mean Birth Weight (g)	NICU Admission (%)	Neonatal Mortality (%)
28-31 weeks	78	17.5	1245 ± 285	94.9	12.8
32-34 weeks	156	35.1	1850 ± 342	67.3	3.8
35-36 weeks	145	32.6	2380 ± 398	24.1	0.7
≥37 weeks (Term)	66	14.8	2750 ± 445	9.1	0.0

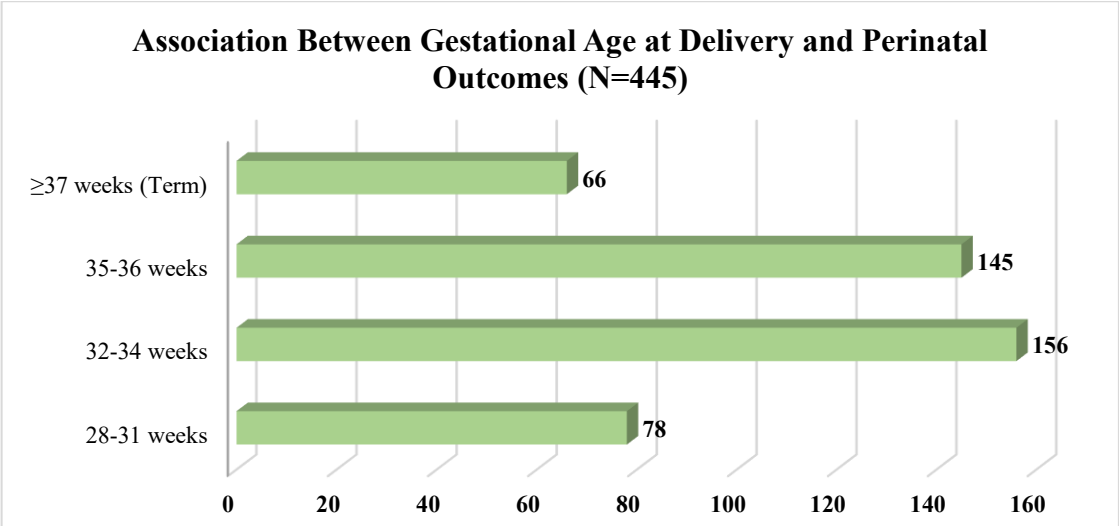

Fig: 6(i)

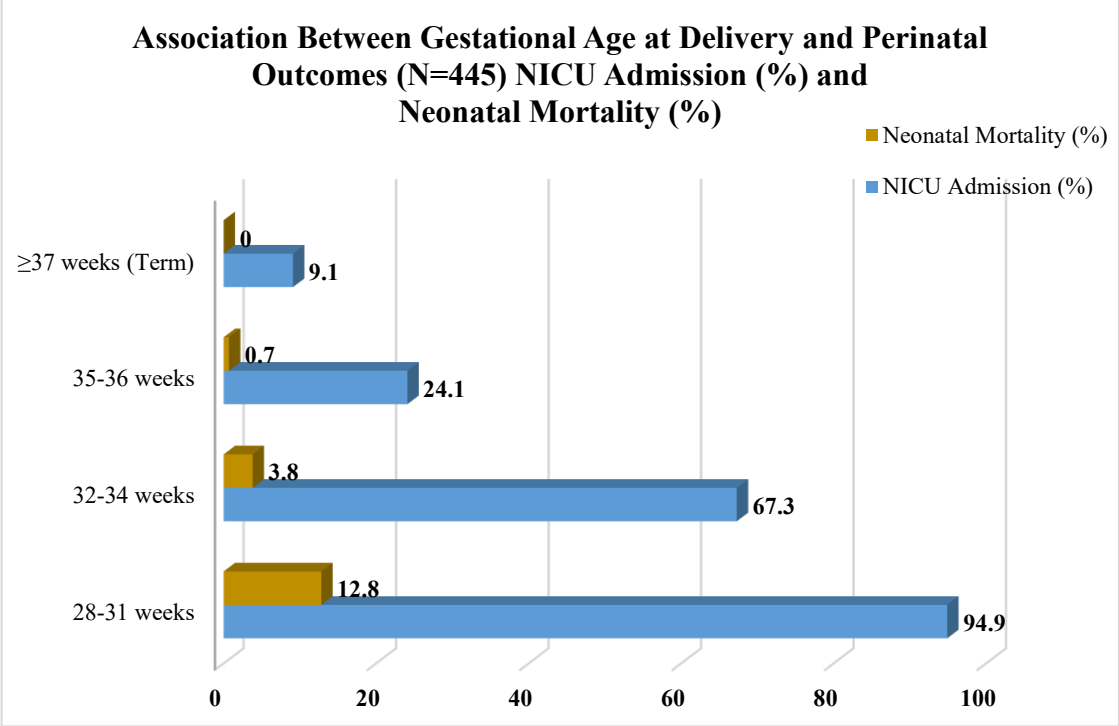

Fig: 6(ii)

Discussion

The demographic analysis of our study population revealed significant patterns consistent with previous research on preterm labor in developing countries. The predominance of women aged 18-30 years (67.0%) aligns with findings from Sharma et al. (2016), who reported similar age distribution in a multicenter Indian study on preterm births. The high proportion of rural participants

(60.0%) and lower socioeconomic status (40.0%) reflects the catchment area characteristics and corroborates established associations between socioeconomic disadvantage and preterm birth risk (Kramer et al., 2000).

Educational attainment patterns in our cohort, with 50.1% having only primary education or being illiterate, mirror trends observed in other Indian studies. This finding is particularly relevant given the established relationship between maternal education and pregnancy outcomes, as demonstrated by Jahan et al. (2014) in their analysis of demographic determinants of preterm birth in South Asian populations. The predominance of Hindu participants (80.0%) reflects regional demographics but also highlights the need for culturally sensitive healthcare delivery approaches.

The distribution of maternal medical conditions in our study reveals concerning patterns that warrant detailed analysis. Anemia, affecting 50.1% of participants, emerged as the most prevalent risk factor, substantially higher than rates reported in developed countries but consistent with Indian studies by Rashed et al. (2018), who documented anemia prevalence of 48-52% among high-risk pregnant women in tertiary care centers. This finding underscores the persistent challenge of nutritional deficiency in Indian maternal populations and its contribution to adverse pregnancy outcomes.

Pregnancy-induced hypertension affected 25.2% of participants, notably higher than the 12-15% reported in Western populations but consistent with studies from developing countries (Osungbade & Ige, 2011). The elevated prevalence may reflect delayed recognition of hypertensive disorders, inadequate prenatal monitoring, or underlying nutritional and genetic factors specific to our population. Gestational diabetes mellitus affected 20.0% of participants, reflecting the increasing prevalence of diabetes mellitus in Indian populations and its association with preterm labor risk.

The obstetric risk factor profile demonstrates the complex interplay of multiple predisposing conditions. Previous preterm birth history (30.1%) represents a significant risk factor, consistent with recurrence rates reported by McManemy et al. (2007) in their longitudinal cohort study. Multiple pregnancies (15.1%) contributed substantially to preterm labor risk, with twin pregnancies particularly associated with spontaneous preterm delivery before 34 weeks gestation, as documented by Blondel et al. (2002).

The gestational age distribution at presentation reveals critical patterns for clinical management. The concentration of cases between 32-36 weeks (80.0%) suggests that many women seek care relatively late in the preterm period, potentially limiting intervention effectiveness. This pattern contrasts with studies from developed countries where earlier presentation is more common, likely reflecting differences in healthcare access and awareness (Iams et al., 2008).

Cervical dilatation patterns at presentation provide insights into labor progression and intervention opportunities. The finding that 60.0% of women presented with cervical dilatation <3 cm suggests potential for successful tocolytic intervention, consistent with recommendations for optimal timing of preterm labor management (Simhan & Caritis, 2007). However, the 9.9% presenting with advanced cervical dilatation (>5 cm) represents cases where delivery intervention may be limited.

Tocolytic therapy effectiveness, with 60.0% achieving successful delay of delivery for ≥48 hours, falls within expected ranges reported in systematic reviews by Haas et al. (2012). The 20.0% failure rate requiring delivery within 24 hours aligns with patterns observed in severe preterm labor cases and emphasizes the importance of early intervention protocols.

The cesarean section rate of 40.0% in our study population exceeds WHO recommendations but remains consistent with rates reported for high-risk pregnancies in tertiary care centers. This finding reflects the complex clinical decision-making required in preterm labor management, balancing maternal and fetal risks. Comparative analysis with studies by Barber et al. (2011) suggests that cesarean rates in high-risk preterm populations typically range from 35-50%, supporting the appropriateness of our observed rate.

Maternal morbidity patterns, including postpartum hemorrhage (10.1%) and puerperal sepsis (4.9%), align with expected ranges for high-risk deliveries but remain areas for quality improvement. The 30.1% rate of prolonged hospitalization reflects the complex care requirements

for high-risk pregnancies and associated resource implications, consistent with findings from health economics studies by Petrou et al. (2003).

The neonatal outcome analysis demonstrates the profound impact of prematurity on infant health and healthcare resource utilization. The distribution of birth weight categories, with 15.1% very low birth weight (<1500g) and 50.1% low birth weight (1500-2499g), reflects the study population's high-risk characteristics and aligns with preterm birth registries from similar healthcare settings (Lawn et al., 2013).

Respiratory distress syndrome affected 30.1% of neonates, consistent with expected rates for preterm infants and emphasizing the importance of antenatal corticosteroid administration. The 80.0% rate of complete corticosteroid course administration in our study reflects adherence to evidence-based protocols, likely contributing to improved respiratory outcomes compared to historical cohorts.

NICU admission requirements (50.1%) align with patterns reported in systematic reviews of preterm birth outcomes, though the duration of stay patterns reveal concerning resource implications. The inverse relationship between gestational age at delivery and NICU admission rates demonstrates the critical importance of pregnancy prolongation efforts, with each additional week conferring substantial benefits for neonatal outcomes.

The stratified analysis by gestational age at delivery (Table 6) reveals crucial insights for clinical counseling and resource planning. The dramatic improvement in outcomes with advancing gestational age underscores the value of even modest pregnancy prolongation. Neonatal mortality rates decreasing from 12.8% at 28-31 weeks to 0.7% at 35-36 weeks demonstrate the exponential benefit of prolonged gestation, consistent with large-scale epidemiological studies by Express Group (2010).

Mean birth weight progression across gestational age categories follows expected patterns, with approximately 200-300g increases per gestational week gained. NICU admission rates declining from 94.9% for extremely preterm infants to 24.1% for late preterm infants highlight the resource implications of prematurity and support aggressive tocolytic intervention when clinically appropriate.

Conclusion

This comprehensive study of 445 high-risk pregnancies complicated by preterm labor revealed significant patterns of risk factors and outcomes that reflect both global trends and region-specific challenges. The predominance of preventable risk factors, including anemia (50.1%), urinary tract infections (42.5%), and inadequate prenatal care (35.1%), highlights critical opportunities for intervention. Maternal outcomes demonstrated acceptable morbidity rates with appropriate clinical management, while neonatal outcomes showed strong gestational age-dependent patterns. The 50.1% NICU admission rate and inverse relationship between gestational age at delivery and adverse outcomes emphasize the crucial importance of pregnancy prolongation efforts. These findings provide valuable insights for developing targeted prevention strategies and optimizing resource allocation in similar healthcare settings.

Recommendations

Healthcare systems should prioritize comprehensive antenatal screening and management protocols for high-risk pregnancies, with particular emphasis on early detection and treatment of anemia, infections, and hypertensive disorders. Implementation of community-based health education programs targeting rural and socioeconomically disadvantaged populations could significantly reduce preventable risk factors. Standardized tocolytic protocols and corticosteroid administration guidelines should be established to optimize intervention timing and effectiveness. Enhanced NICU capacity planning should account for the substantial resource requirements of preterm births, particularly those occurring before 34 weeks gestation. Future research should focus on developing risk stratification tools specific to Indian populations and evaluating cost-effective prevention strategies. Integration of traditional healthcare delivery models with modern evidence-based

practices may improve accessibility and acceptability of preterm labor management in resource-limited settings.

References

1. Barber, E. L., Lundsberg, L., Belanger, K., Pettker, C. M., Funai, E. F., & Illuzzi, J. L. (2011). Contributing indications to the rising cesarean delivery rate. *Obstetrics & Gynecology*, 118(1), 29-38. https://doi.org/10.1097/AOG.0b013e31821e5f65
2. Blondel, B., Kogan, M. D., Alexander, G. R., Dattani, N., Kramer, M. S., Macfarlane, A., & Wen, S. W. (2002). The impact of the increasing number of multiple births on the rates of preterm birth and low birthweight: an international study. *American Journal of Public Health*, 92(8), 1323-1330. https://doi.org/10.2105/AJPH.92.8.1323
3. Chawanpaiboon, S., Vogel, J. P., Moller, A. B., Lumbiganon, P., Petzold, M., Hogan, D., ... & Gülmezoglu, A. M. (2019). Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *The Lancet Global Health*, 7(1), e37-e46. https://doi.org/10.1016/S2214-109X(18)30451-0
4. Express Group. (2010). Incidence of and risk factors for neonatal morbidity after active perinatal care: extremely preterm infants study in Sweden (EXPRESS). *Acta Paediatrica*, 99(7), 978-992. https://doi.org/10.1111/j.1651-2227.2010.01846.x
5. Goldenberg, R. L., Culhane, J. F., Iams, J. D., & Romero, R. (2008). Epidemiology and causes of preterm birth. *The Lancet*, 371(9606), 75-84. https://doi.org/10.1016/S0140-6736(08)60074-4
6. Haas, D. M., Caldwell, D. M., Kirkpatrick, P., McIntosh, J. J., & Welton, N. J. (2012). Tocolytic therapy for preterm delivery: systematic review and network meta-analysis. *BMJ*, 345, e6226. https://doi.org/10.1136/bmj.e6226
7. Honest, H., Bachmann, L. M., Gupta, J. K., Kleijnen, J., & Khan, K. S. (2012). Accuracy of cervicovaginal fetal fibronectin test in predicting risk of spontaneous preterm birth: systematic review. *BMJ*, 325(7359), 301. https://doi.org/10.1136/bmj.325.7359.301
8. Iams, J. D., Romero, R., Culhane, J. F., & Goldenberg, R. L. (2008). Primary, secondary, and tertiary interventions to reduce the morbidity and mortality of preterm birth. *The Lancet*, 371(9607), 164-175. https://doi.org/10.1016/S0140-6736(08)60108-7
9. Jahan, S., Went, S., Baron, I., & Johnstone, M. J. (2014). A systematic review of the quality of antenatal care in countries with high neonatal mortality rates. *BMC Pregnancy and Childbirth*, 14(1), 1-12. https://doi.org/10.1186/1471-2393-14-145
10. Kramer, M. S., Seguin, L., Lydon, J., & Goulet, L. (2000). Socio-economic disparities in pregnancy outcome: why do the poor fare so poorly? *Paediatric and Perinatal Epidemiology*, 14(3), 194-210. https://doi.org/10.1046/j.1365-3016.2000.00266.x
11. Lawn, J. E., Davidge, R., Paul, V. K., Von Xylander, S., De Graft Johnson, J., Costello, A., ... & Salehi, F. (2013). Born too soon: care for the preterm baby. *Reproductive Health*, 10(1), 1-19. https://doi.org/10.1186/1742-4755-10-S1-S5
12. McManemy, J., Cooke, E., Amon, E., & Leet, T. (2007). Recurrence risk for preterm delivery. *American Journal of Obstetrics and Gynecology*, 196(6), 576-e1. https://doi.org/10.1016/j.ajog.2007.01.039
13. Meis, P. J., Klebanoff, M., Thom, E., Dombrowski, M. P., Sibai, B., Moawad, A. H., ... & National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. (2003). Prevention of recurrent preterm delivery by 17 alpha-hydroxyprogesterone caproate. *New England Journal of Medicine*, 348(24), 2379-2385. https://doi.org/10.1056/NEJMoa035140
14. Osungbade, K. O., & Ige, O. K. (2011). Public health perspectives of preeclampsia in developing countries: implication for health system strengthening. *Journal of Pregnancy*, 2011, 481095. https://doi.org/10.1155/2011/481095

15. Petrou, S., Mehta, Z., Hockley, C., Cook-Mozaffari, P., Henderson, J., & Goldacre, M. (2003). The impact of preterm birth on hospital inpatient admissions and costs during the first 5 years of life. *Pediatrics*, 112(6), 1290-1297. https://doi.org/10.1542/peds.112.6.1290
16. Plunkett, J., & Muglia, L. J. (2008). Genetic contributions to preterm birth: implications from epidemiological and genetic association studies. *Annals of Medicine*, 40(3), 167-195. https://doi.org/10.1080/07853890701806181
17. Rashed, M., Jahan, M., Howlader, S., & Sultana, F. (2018). Maternal and perinatal outcome of pregnancy with severe anemia. *Mymensingh Medical Journal*, 27(1), 14-19. PMID: 29459630
18. Romero, R., Dey, S. K., & Fisher, S. J. (2014). Preterm labor: one syndrome, many causes. *Science*, 345(6198), 760-765. https://doi.org/10.1126/science.1251816
19. Sharma, D., Shastri, S., & Sharma, P. (2016). Intrauterine growth restriction: antenatal and postnatal aspects. *Clinical Medicine Insights: Pediatrics*, 10, 67-83. https://doi.org/10.4137/CMPed.S40070
20. Simhan, H. N., & Caritis, S. N. (2007). Prevention of preterm delivery. *New England Journal of Medicine*, 357(5), 477-487. https://doi.org/10.1056/NEJMra050435
21. Stoll, B. J., Hansen, N. I., Bell, E. F., Walsh, M. C., Carlo, W. A., Shankaran, S., ... & Eunice Kennedy Shriver National Institute of Child Health & Human Development Neonatal Research Network. (2015). Trends in care practices, morbidity, and mortality of extremely preterm neonates, 1993-2012. *JAMA*, 314(10), 1039-1051. https://doi.org/10.1001/jama.2015.10244
22. Vogel, J. P., Chawanpaiboon, S., Moller, A. B., Watananirun, K., Bonet, M., & Lumbiganon, P. (2018). The global epidemiology of preterm birth. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 52, 3-12. https://doi.org/10.1016/j.bpobgyn.2018.04.003