Original Research Article

Adverse pregnancy outcome and its association with the various determinants of current pregnancy in a district hospital, urban Bengaluru, India

Darshan Hoysanahalli Shivashankarappa[1], Neha Annet Joy[2], Sangeetha M. D.[1]*

[1]Department of Community Medicine, ESIC Medical College and PGIMSR and Model Hospital, Rajajinagar, Bangalore, Karnataka, India
[2]Department of Community Medicine, M. S. Ramaiah Medical College, Bangalore, Karnataka, India

*Correspondence:
Dr. Sangeetha M. D.,
E-mail: sangeethamd33@gmail.com

ABSTRACT

Background: Maternal health is a crucial aspect of public health, directly influencing pregnancy outcomes. Adverse outcomes, such as miscarriage, stillbirth, cesarean delivery, and abortion, reflect poor maternal health and contribute to maternal mortality and infant mortality rates. Antenatal care (ANC) and institutional delivery are pivotal strategies to mitigate maternal and fetal complications. However, the escalating rates of cesarean sections in India, surpassing the WHO-recommended threshold, present a severe public health challenge.
Methods: This retrospective cross-sectional study, conducted in urban Bengaluru from January to July 2023, aimed to identify adverse pregnancy outcomes and their determinants among women aged 15 to 49 in India. Data from maternal birth and labor records were analyzed, encompassing sociodemographic factors, obstetric characteristics, and adverse outcomes.
Results: The study revealed a 20.8% magnitude of adverse pregnancy outcomes. It was found to be higher among women in the age group above 30 years, multigravida, have low blood pressure (BP) both systolic and diastolic, B blood group, positive Rh type, a male baby. In bivariate analysis, higher odds were observed among women in the 30-49 age group, body mass index overweight category, active management of the third stage of labor, and delayed cord clamping were found to be statistically significant.
Conclusions: The study underscores the urgency for an expanded action plan to enhance maternal healthcare in India. While governmental initiatives exist, there remains a pressing need to address unnecessary caesarean deliveries and associated complications. The findings advocate for heightened awareness, community health worker training, and stringent guidelines on the necessity of caesarean sections.

Keywords: Adverse pregnancy outcomes, Antenatal care, Caesarean section, Institutional delivery, Maternal health

INTRODUCTION

Maternal health plays an important role in the society.[1] Better maternal health is directly or indirectly related to pregnancy outcomes which are significant public health priorities.[2] Adverse pregnancy outcomes such as miscarriage, stillbirth, cesarean delivery, and abortion reflect poor maternal health which is indicated mainly by maternal mortality ratio (MMR) and infant mortality rate (IMR).[2] According to National Family Health Survey-5 (NFHS-5) data in India, the MMR and IMR are 97 per 1,00,000 live births and 35 per 1,000 live births respectively.[3] Particularly high in developing countries

like India where approximately 44,000 women die from pregnancy-related complications every year.[4]

Antenatal care (ANC) and institutional delivery are the most important strategies to reduce the higher risk of maternal and fetal complications and deaths.[2] The risk of maternal and neonatal deaths due to complications of pregnancy and childbirth is higher in low-middle-income countries (LMICs).[5] Worldwide, these issues have been neglected in the absence of any formalized plan and activity involved in public health.[1] In the Indian context, social and therapeutic complications are responsible for adverse pregnancy outcomes, where C-sections have gradually become common in developing countries.[6,7] According to the WHO statement in 1985, the international healthcare community has considered a range of 10-15% to be the ideal rate for C-sections in a country.[8] Since then, C-section rates have become increasingly common in both developed and developing countries. In India, the C-section rates have crossed the WHO threshold of 15%, a severe public health concern.[9] According to NFHS-5 data, the prevalence of C-sections in India is 21.5%, compared to NFHS-4, showing an increase of almost 5% over 5 years.[10] Around 45% of C-section deliveries were reportedly planned after the onset of labor pains.[11]

The adverse pregnancy outcomes have shown overpowering pregnancy results and there is a need for an expanded action plan to distinguish the causes of preventive measures. Considering that several initiatives have been undertaken by the GoI in the last decade like Janani Suraksha Yojana-2005, Pradhan Mantri Surakshit Matritva Abhiyan-2016, Pradhan Mantri Matru Vandana Yojna-2017, and LaQshya-2017 to provide a quality of free antenatal check-ups and care during delivery, identify high-risk pregnancies and provide cash incentives.[2]

India is a diverse country, there have been quite wide differences across the geographies, religions, castes, and other socioeconomic characteristics. In the current times, unnecessary cesarean deliveries are of public health concern in India.

Hence the objective of the study was estimate the proportions of adverse pregnancy outcomes and their association with determinants of pregnancy outcomes among women delivering at a district hospital in urban Bangalore. The objectives were directed to show the areas that require further work towards maternal healthcare as well as to directly reflect the effects of various initiatives.

METHODS

Study design

A retrospective cross-sectional study was done from January 1st, 2023, to July 31st, 2023, at the district Hospital, in urban Bengaluru, the capital city of Karnataka.

Data source

The secondary data was taken from the hospital maternal birth and labor records which contain demographic data and outcome variables like abortion, miscarriage, birth weight, and other details of the baby. A structured and pre-tested data extraction tool was used to extract the data.

Sample size

The sample size for the present study is calculated using the formula:

$$n = \frac{\left(Z_{1-\alpha/2}\right)^2 * p * (1-p)}{d^2}$$

Based on the previous study by Gondwe et al in 2020, the proportion of delivery by caesarean section was 15.4%, at a 95% confidence level, 10% absolute allowable error the estimated sample size n=52, and a drop-out rate of 5% the total sample size n=55. Total we have included 96.[12]

Statistical analysis

Data were cleaned, coded, and entered into a Microsoft Excel spreadsheet and analyzed using SPSS software. The magnitude was expressed in percentage along with its 95% confidence interval (CI). The bivariate association was analyzed using the Chi-square and Fisher's exact test for proportions, and p<0.05 was considered statistically significant. Association and its strength with various determinants were studied using an odds ratio (OR) with 95% CIs derived.

RESULTS

Socio-demographic and obstetric characteristics

A total of 96 women's birth and labor record history were reviewed. The sociodemographic and obstetric history among the women is shown in Table 1. The majority of the women around 35.4% were in the 21-25 years of age group. Approximately 50% of them were multigravida. Around 75% were admitted to the hospital when they were in labor and around 98% of the delivered babies were term babies. The majority around 97% of the women didn't face any complications during the intranatal period and 84% had no previous history of abortions.

Adverse pregnancy outcome

The mode of delivery was found to be cesarean section among 20.8% and normal delivery among 79.2% of the women (Figure 1).

Obstetric and neonatal outcomes

Coming to Table 2, adverse pregnancy outcome caesarean section was found to be higher among women in the age group above 30 years, multigravida, who had a hospital admission during labor, no previous history of abortions, having low BP both systolic and diastolic, normal BMI, B blood group, positive Rh type, a male baby with a fetal heart rate of 141 to 150 beats per minute. In bivariate analysis, higher odds were observed among women in the 30-49 age group (p=0.0002) [0.08 (95% CI 0.02,0.3)]; body mass index overweight category (p=0.01) [0.2 (95% CI 0.06, 0.75)]; active management of the third stage of labor (p=0.0002) [26.1 (95% CI 3.324, 205.3)]; delayed cord clamping (p=0.0002) [0.08 (95% CI 0.02,0.3)]. All the above variables were found to be statistically significant in bivariate analysis.
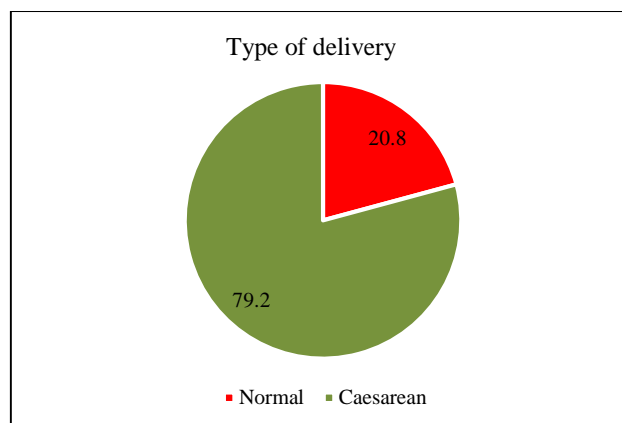

Figure 1: Distribution of modes of delivery (n=96).

Table 1: Distribution of socio-demographic and obstetric history among the women in the reproductive age group (n=96).

Variables	Categories	Total N (%)
Age (years)	18-20	18 (18.7)
	21-25	34 (35.4)
	26-30	29 (30.2)
	30-49	15 (15.6)
Gravida	Primigravida (1)	44 (45.8)
	Multigravida (2-4)	50 (52)
	Grand multigravida (5)	2 (2.2)
Para	Nulliparous	52 (54.1)
	1-2	43 (44.7)
	>2	1 (1.2)
Type of admission	Direct in labor	72 (75)
	Safe confinement	17 (17.7)
	Referred in	7 (7.3)
Term/ Preterm	Term	94 (98)
	Preterm	2 (2)
Complications	Obstructed labor	1 (1.2)
	Others	2 (2)
	None	93 (96.8)
Abortions	Nil	81 (84.4)
	1	9 (9.4)
	2	4 (4.2)
	3	2 (2)

Table 2: Association of high-risk among the women in the reproductive age group with selected variables.

Variables	Categories	Adverse pregnancy outcomes (previous LSCS)		OR (95% CI)
		Yes (20)	No (76)	
Age (years)	18-20	0 (0)	18 (23.7)	-
	21-25	5 (25)	29 (38.3)	1
	26-30	5 (25)	24 (31.5)	0.82 (0.2,3.2)
	30-49	10 (50)	5 (6.5)	0.08 (0.02,0.3) *
Gravida	Primigravida (1)	0 (0)	44 (57.8)	-
	Multipara (2-4)	19 (95)	31 (40.7)	1
	Grandmultipara (5)	1 (5)	1 (1.5)	0.61 (0.036, 10.3)

Continued.

Variables	Categories	Adverse pregnancy outcomes (previous LSCS)		OR (95% CI)
		Yes (20)	No (76)	
Type of admission	Direct in labor	14 (70)	58 (76.3)	1.72 (0.5223, 5.705)
	Safe confinement	5 (25)	12 (15.7)	1
	Referred in	1 (5)	6 (8)	2.5 (0.2361, 26.48)
Abortions	Nil	16 (80)	65 (85.5)	1.16 (0.2199, 6.128)
	1	2 (10)	7 (9.3)	1
	2	2 (10)	2 (2.6)	0.2 (0.02317, 3.523)
	3	0 (0)	2 (2.6)	-
Systolic blood pressure	Abnormal	15 (75)	53 (69.7)	0.7 (0.2496, 2.364)
	Normal	5 (25)	23 (30.3)	1
Diastolic blood pressure	Abnormal	11 (55)	41 (53.9)	0.9 (0.3563, 2.578)
	Normal	9 (45)	35 (46.1)	1
Body mass index (BMI)	Underweight	3 (15)	11 (14.4)	0.6 (0.1547, 2.772)
	Normal	10 (50)	56 (73.6)	1
	Overweight	7 (35)	9 (12)	0.2 (0.06, 0.75)
Hemoglobin (gm/dl)	Low (<8)	10 (50)	36 (47.4)	0.9 (0.336, 2.411)
	Normal	10 (50)	40 (52.6)	1
Blood group	A	5 (25)	17 (22.3)	1.3 (0.3802, 4.498)
	B	10 (50)	26 (34.2)	1
	AB	1 (5)	10 (13.3)	3.8 (0.4343, 34.06)
	O	4 (20)	23 (30.2)	2.2 (0.61, 8.018)
RH typing	Positive	19 (95)	72 (94.7)	0.9 (0.09998, 8.977)
	Negative	1 (5)	4 (5.3)	1
Random blood sugar (gm/dl)	<110	15 (75)	64 (84.2)	1.9 (0.5857, 6.421)
	110-200	5 (25)	11 (14.3)	1
	>200	0 (0)	1 (1.5)	-
Labor	Spontaneous	15 (75)	59 (77.6)	1.4 (0.437, 4.516)
	Induced	5 (25)	14 (18.4)	1
	Augmented	0 (0)	3 (4)	-
Active management of the third stage of labour (AMTSL)	Yes	1 (5)	44 (57.8)	26.1 (3.324, 205.3)
	No	19 (95)	32 (42.2)	1
Episiotomy	Yes	0 (0)	37 (48.6)	-
	No	20 (100)	39 (51.4)	1
Delayed cord clamping	Yes	1 (5)	44 (57.8)	26.1 (3.324, 205.3)
	No	19 (95)	32 (42.2)	1
Sex of the baby	Male	12 (60)	32 (42.2)	0.4 (0.1777, 1.323)
	female	8 (40)	44 (57.8)	1
Birth weight (kg)	<2	0 (0)	4 (5.5)	-
	2-2.5	3 (20)	23 (30.2)	1
	2.5-3.5	16 (80)	43 (56.5)	0.3 (0.09244, 1.329)
	>3.5	1 (5)	6 (7.8)	0.7 (0.06856, 8.933)

[*P<0.05. OR: Odds ratio, CI: Confidence interval]

DISCUSSION

This study aimed to assess the adverse pregnancy outcomes and their associated factors. The magnitude of adverse pregnancy outcomes was 20.8%. The current study included more adverse events, i.e., obstructed labor (1.2%), abortions (15.6%), hypertensive disorders of pregnancy (75%), and prematurity (2%) was the most frequently occurring fetal/neonatal complication.

In the current study, one in four mothers developed at least one pregnancy complication. This was comparable with findings in Nepal, Bangladesh (25%), and sub-Saharan Africa, in which 27.8%, 25%, and 29.7% of women developed adverse pregnancy outcomes, respectively.[13-15] A large survey in north Gondar also reported that 28.5% of women developed at least one obstetric complication.[16] However, it was higher than 15.6% of adverse pregnancy outcomes in Zimbabwe.[17] This might be connected to variations in outcome variable

measurement. The study considered only caesarean section delivery as adverse pregnancy outcomes. Where one in four women has undergone C section. Similar to a study where more than one-fifth of the institutional deliveries are C-section deliveries in most of the states of India.[11] Moreover, C-section deliveries are performed mostly in the southern states of India (Andhra Pradesh, Telangana, Kerala).[11] These findings of the C-section rates will enable effective health policy changes.[18] Literacy plays an important role in C-section deliveries.[19] However, only literacy will not help in reducing the incidence of unnecessary C-section deliveries. Maternal and child health literacy is also important as it is being implemented by many national health programs.[11] Additionally, in our study increasing age of the women is associated with C-section deliveries. Similar to the study where increasing age at birth is also directly proportionate to the increasing rate of C-section deliveries.[11] These kinds of deliveries, reportedly, are prevalent more in urban areas than rural areas.[11] All these variations might be due to the differences in sample size, and study setting, and the current study was done at the district level hence the magnitude may increase because of an increasing number of referral cases from primary health centers and hospitals. It may be also attributable to the socio-economic and methodological variations, and quality of maternal healthcare facilities and services in the respective study areas.

The most frequently recorded obstetric complications were obstructed labor (1.2%), abortions (15.6%), and hypertensive disorders of pregnancy (75%). Whereas prematurity (2%) was the most frequently occurring fetal/neonatal complication. Similarly, a systematic review in Malawi, South Africa, Uganda, and Zimbabwe found 4.4% of hypertension in pregnancy.[20] In southern Ethiopia, hypertensive disorders of pregnancy, APH, PROM, and obstructed labor were the commonest adverse obstetric outcomes.[21] The possible explanation could be related to a methodological difference in that the previous studies were prospective but in the current study the methodology used was a review of birth and labor records, and hence this may limit the type and number of pregnancy complications.

There are some limitations of the study. Since secondary data were used, some variables of interest such as income, residence, alcohol use, and smoking status could not be obtained. Also, we cannot establish any causal relationship because of a cross-sectional study.

CONCLUSION

The magnitude of adverse pregnancy outcomes was one in four women. The most frequently recorded obstetric complications were obstructed labor, abortions, and hypertensive disorders of pregnancy, and prematurity was the most frequently occurring fetal/neonatal complication. Training the community health workers on the knowledge of the obstetric danger signs and the importance of normal deliveries for mothers not facing any complications along with clinical leadership among the primary care physicians on promoting healthy deliveries and raising awareness on postpartum maternal health outcomes of normal deliveries among healthy mothers could be some of the immediate implementation strategies as part of maternal, newborn, and child health (MNCH) health programs.

Recommendations

The government should take a primary initiative of raising awareness of the importance of normal deliveries which can be done with the help of frontline workers who are the first point of contact for pregnant mothers. During these check-up sessions, they can raise awareness of the deliveries and their implications so that the mothers can decide for themselves before labor and the incidences of sudden decisions of unnecessary C-section deliveries are reduced in the future. Sensitization of the importance of normal delivery when no medical complications are seen in women also needs to be conducted. Therefore, it is crucial to formulate a mandate where it should be noted that C-section deliveries should only be executed when medically necessary and implement the directives in the states where C-section is too high.

ACKNOWLEDGEMENTS

REFERENCES

1. Patel KK, Saroj RK, Kumar M. Prevalence and determinants of adverse pregnancy outcomes among women in India: A secondary data analysis. Indian J Community Med. 2021;46(3):434.
2. Kuppusamy P, Prusty RK, Chaaithanya IK, Gajbhiye RK, Sachdeva G. Pregnancy outcomes among Indian women: increased prevalence of miscarriage and stillbirth during 2015-2021. BMC Pregnancy Childbirth. 2023;23(1):1-9.
3. National Family Health Survey (NFHS-5), 2019-21 for India. Ministry of Health and Family Welfare. Available from: https://main.mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf. Accessed on 3 January 2024.

4. Singh M, Sonkaria LK, Raghav P. Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA): new initiative to deliver quality maternal health care in India. MOJ Womens Health. 2017;4(2):00081.

5. Ahmed I, Ali SM, Amenga-Etego S, Ariff S, Bahl R, Baqui AH, et al. Population-based rates, timing, and causes of maternal deaths, stillbirths, and neonatal deaths in south Asia and sub-Saharan Africa: a multi-country prospective cohort study. Lancet Global Health. 2018;6(12):e1297-308.

6. Altijani N, Carson C, Choudhury SS, Rani A, Sarma UC, Knight M, et al. Stillbirth among women in nine states in India: rate and risk factors in study of 886,505 women from the annual health survey. BMJ Open. 2018;8(11):e022583.

7. Feodor Nilsson S, Andersen PK, Strandberg-Larsen K, Nybo Andersen AM. Risk factors for miscarriage from a prevention perspective: a nationwide follow-up study. BJOG. 2014;121(11):1375-85.

8. Betrán AP, Torloni MR, Zhang JJ, Gülmezoglu AM, Aleem HA, Althabe F, et al. WHO statement on caesarean section rates. BJOG. 2016;123(5):667.

9. Ronsmans C, Holtz S, Stanton C. Socioeconomic differentials in caesarean rates in developing countries: a retrospective analysis. Lancet. 2006;368(9546):1516-23.

10. Torloni MR, Betran AP, Souza JP, Widmer M, Allen T, Gulmezoglu M, et al. Classifications for cesarean section: a systematic review. PloS One. 2011;6(1):e14566.

11. Roy N, Mishra PK, Mishra VK, Chattu VK, Varandani S, Batham SK. Changing scenario of C-section delivery in India: Understanding the maternal health concern and its associated predictors. J Fam Med Prim Care. 2021;10(11):4182.

12. Gondwe T, Betha K, Kusneniwar GN, Bunker CH, Tang G, Simhan H, et al. Adverse infant outcomes associated with caesarean section delivery in India. Int Health. 2020;12(5):411-6.

13. Khanal V, Karkee R, Lee AH, Binns CW. Adverse obstetric symptoms and rural-urban difference in cesarean delivery in Rupandehi district, Western Nepal: a cohort study. Reprod Health. 2016;13:1-6.

14. Sikder SS, Labrique AB, Shamim AA, Ali H, Mehra S, Wu L, et al. Risk factors for reported obstetric complications and near misses in rural northwest Bangladesh: analysis from a prospective cohort study. BMC Pregnancy Childbirth. 2014;14:1-3.

15. Tamirat KS, Sisay MM, Tesema GA, Tessema ZT. Determinants of adverse birth outcome in sub-Saharan Africa: analysis of recent demographic and health surveys. BMC Public Health. 2021;21(1):1-10.

16. Worku AG, Yalew AW, Afework MF. Maternal complications and women's behavior in seeking care from skilled providers in North Gondar, Ethiopia. PloS One. 2013;8(3):e60171.

17. Chaibva BV, Olorunju S, Nyadundu S, Beke A. Adverse pregnancy outcomes, 'stillbirths and early neonatal deaths' in Mutare district, Zimbabwe (2014): a descriptive study. BMC Pregnancy Childbirth. 2019;19:1-7.

18. Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, et al. Short-term and long-term effects of caesarean section on the health of women and children. Lancet. 2018;392(10155):1349-57.

19. Mishra VK. Geo-spatial analysis of cesarean section in India. OAJ Gerontol Geriatr Med. 2019;5:555658.

20. Balkus JE, Neradilek M, Fairlie L, Makanani B, Mgodi N, Mhlanga F, et al. Assessing pregnancy and neonatal outcomes in Malawi, South Africa, Uganda, and Zimbabwe: results from a systematic chart review. PloS One. 2021;16(3):e0248423.

21. Yimer NB, Gedefaw A, Tenaw Z, Liben ML, Meikena HK, Amano A, et al. Adverse obstetric outcomes in public hospitals of southern Ethiopia: the role of parity. J Matern Fet Neonat Med. 2022;35(10):1915-22.