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Why Mothers Die in India: Bridging the Gap Between Healthcare Access and Maternal Mortality in a Tertiary Care Centre

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Abstract

Background

Maternal mortality remains a major public health challenge in low- and middle-income countries despite improvements in institutional deliveries and emergency obstetric care.

Objective

To determine the direct and indirect causes of maternal mortality and assess the contribution of the Three-Delay Model among maternal deaths at a tertiary care referral centre.

Methods

A retrospective observational study was conducted at the Department of Obstetrics and Gynaecology, VMMC & Safdarjung Hospital, New Delhi, India, including maternal deaths occurring between January 2020 and December 2024. Maternal deaths meeting World Health Organization criteria were identified from maternal death registers, case records, referral documents, and Maternal Death Review forms. Demographic characteristics, antenatal care status, referral patterns, causes of death, and delays in care were analysed using descriptive statistics.

Results

A total of 650 maternal deaths were analysed. Obstetric haemorrhage, sepsis, and hypertensive disorders were the leading direct causes of death, while anaemia and medical comorbidities were the predominant indirect causes. Most deaths occurred among un-booked women. Delay-1 (delay in seeking care) was the most frequent contributor, followed by Delay-2 (delay in reaching a healthcare facility). The findings identified deficiencies in antenatal care utilization, referral pathways, transport systems, and emergency obstetric preparedness.

Conclusion

Maternal mortality at tertiary referral centres is largely attributable to preventable obstetric complications compounded by delays in accessing timely care. Strengthening antenatal risk identification, referral systems, transport services, emergency obstetric care, blood transfusion facilities, and intensive care support is essential to reduce preventable maternal deaths and advance national and global maternal health goals.

Introduction

Maternal mortality continues to represent a substantial global public health challenge and serves as a critical indicator of health system performance worldwide. Despite sustained global efforts under the Sustainable Development Goals (SDGs), an estimated 260,000 women died during pregnancy, childbirth, or the postpartum period in 2023, with approximately 92% of these deaths occurring in low- and lower-middle-income countries (1).Progress in reducing maternal mortality has been uneven, with the highest burden concentrated in regions with limited access to quality antenatal care, skilled birth attendance, and comprehensive emergency obstetric services(2).

The maternal mortality ratio (MMR), defined as the number of maternal deaths per 100,000 live births, has declined globally over recent decades, largely due to the expansion of maternal health programmes and increased institutional deliveries. However, UNICEF estimates indicate that while global maternal mortality trends have improved, the pace of reduction remains inadequate to achieve the SDG target of fewer than 70 maternal deaths per 100,000 live births by 2030 (3).

India has made noteworthy progress in reducing maternal mortality over the past decade. According to the Sample Registration System (SRS) reports of the Registrar General of India, the national MMR declined from 130 per 100,000 live births in 2014–16 to 97 in 2018–20, with further improvements reported in subsequent years (4).Despite this overall decline, India continues to account for a substantial proportion of global maternal deaths, and marked inter-state, socio-economic, and rural–urban disparities persist (5).

A comprehensive understanding of the patterns and causes of maternal deaths is essential for designing targeted and effective interventions. Maternal deaths are broadly classified into direct causes, arising from obstetric complications such as haemorrhage, hypertensive disorders of pregnancy, and sepsis, and indirect causes, resulting from pre-existing or concurrent medical conditions exacerbated by pregnancy. Global systematic analyses consistently identify haemorrhage, hypertensive disorders, and sepsis as the leading direct causes of maternal mortality (6, 7). Similar trends have been observed in India, where haemorrhage and sepsis continue to contribute substantially to maternal deaths, particularly in referral and tertiary care settings (8).

Addressing maternal mortality also requires an examination of delays in accessing timely and appropriate care. The Three-Delay Model—encompassing delays in the decision to seek care, delays in reaching a healthcare facility, and delays in receiving adequate treatment—remains a valuable framework for identifying barriers within the health system and informing corrective strategies (9). Complementing this approach, maternal death surveillance and response systems offer structured mechanisms to identify avoidable factors and implement evidence-based interventions (10).

Institution-based analyses of maternal mortality provide critical insights into the distribution of causes, referral patterns, healthcare delays, and preventable factors within tertiary care centres, where high-risk and complicated cases are frequently managed. Such evidence is essential to guide strategies aimed at strengthening antenatal risk screening, optimising referral pathways, improving emergency obstetric

preparedness, ensuring timely availability of blood products, and enhancing critical care support, ultimately contributing to a reduction in preventable maternal deaths.

Methodology

This study was designed as a retrospective observational descriptive analysis conducted at a tertiary care teaching hospital in India. The hospital functions as a high-volume referral centre, managing high-risk pregnancies and providing comprehensive obstetric, surgical, and critical care services. Maternal deaths occurring at the institution over a five-year period, from January 2020 to December 2024, were evaluated to examine patterns, causes, and contributing factors. The retrospective design allowed the study to capture trends over time and assess both direct and indirect contributors to maternal mortality in a tertiary care setting.

All maternal deaths occurring during the study period were included. Maternal death was defined according to the World Health Organization (WHO) criteria as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, excluding accidental or incidental causes. Cases were included if they occurred during pregnancy, delivery, or within 42 days postpartum or after termination of pregnancy. Deaths due to accidental or incidental causes unrelated to pregnancy, as well as cases with incomplete records in which the cause of death or key clinical details could not be ascertained, were excluded from the analysis.

Data were systematically extracted from the institution's maternal mortality records and case summaries, which were compiled annually and organised into a structured master database. The sources reviewed included maternal death case summaries, detailed clinical notes, admission records, referral information, delivery and operative reports, ICU and high-dependency unit (HDU) course details, and final cause-of-death documentation. This comprehensive review ensured the accurate classification of maternal deaths and allowed the identification of contributing factors, referral patterns, and delays in care.

The study variables included demographic characteristics such as maternal age, parity, and socioeconomic background, as well as obstetric factors including antenatal care status, booking status, and referral history. Causes of maternal death were categorised as direct or indirect, with direct causes including obstetric complications such as haemorrhage, hypertensive disorders, sepsis, thromboembolism, and operative complications, and indirect causes including pre-existing or pregnancy-aggravated medical conditions such as anaemia, cardiac disease, hepatic or renal dysfunction, and infections. Delays in accessing care were classified according to the Three-Delay Model: Delay-1 (delay in decision to seek care), Delay-2 (delay in reaching a healthcare facility), and Delay-3 (delay in receiving adequate care at the facility).

Data were analysed using descriptive statistics. Categorical variables, including causes of death, booking status, and delays, were reported as frequencies and percentages. Continuous variables, such

as maternal age and gestational age, were summarised as means ± standard deviation or median with interquartile range, depending on the distribution. The findings were compared with national and global maternal mortality trends to identify gaps in care, patterns of preventable deaths, and opportunities for system-level interventions.

Ethical approval

for this study was obtained from the Institutional Ethics Committee of VMMC & Safdarjung Hospital, New Delhi, ensuring that all data were handled confidentially and used solely for research purposes. Patient identifiers were anonymised during data extraction and analysis to maintain privacy and comply with ethical standards.

Results

Table 1
Year-wise distribution of maternal deaths (2020–2024)

Year	Total Cases(N)
2020	118
2021	111
2022	89
2023	175
2024	157

Distribution by Booking Status

Maternal deaths were predominantly among un-booked women across all years (Table 2), highlighting delayed linkage to antenatal care and late presentation to healthcare facilities.

Table 2
Distribution according the booking status (2020–2024)

Year	Booked(N)	Registered(N)	Un-booked(N)
2020	4	1	112
2021	7	1	102
2022	5	2	80
2023	16	3	153
2024	4	2	151

Direct Causes of Maternal Death

Haemorrhage (PPH/APH) was the leading direct cause (47%), followed by sepsis (33.5%) and hypertensive disorders (14.8%) (Table 3).

Table 3
Distribution of direct causes of maternal deaths

Direct Cause	Number of cases(N)	Percentage (%)
Haemorrhage (PPH/APH)	263	47.0
Sepsis	187	33.5
Hypertensive (Pre-eclampsia/Eclampsia)	83	14.8
Thromboembolism	20	3.6
Post-operative complications	6	1.1

Indirect Causes of Maternal Death

Indirect causes were predominantly medical comorbidities, with anaemia (35.4%) and cardiac disease (33.1%) being the most frequent (Table 4).

Table 4
Distribution of indirect causes of maternal deaths

Indirect Cause	Number of cases(N)	Percentage (%)
Anaemia	230	35.4
Cardiac disease	215	33.1
Hepatic failure	130	20
Renal failure	17	2.6
COVID/Viral pneumonia	7	1.1
Tuberculosis	5	0.8
Dengue	2	0.3
Malaria	1	0.2
Others	43	6.6

Delays in Care (Three-Delay Model)

Analysis of delays revealed that Delay-1 (decision to seek care) was most frequent (92.3%), followed by Delay-2 (reaching a facility, 52.8%) and Delay-3 (receiving adequate care, 26%) (Table 5).

Table 5
Distribution among maternal deaths by a Three-delay model

Delay Type	Percentage (%)
Delay 1 (Decision to seek care)	92.3
Delay 2 (Reaching facility)	52.8
Delay 3 (Receiving adequate care)	26.0

Comparison with National and Global Estimates

Institutional data showed a higher proportion of sepsis (28.8%) and hypertensive disorders (12.8%) compared to national averages, likely reflecting referral bias and concentration of critically ill cases (Table 6). Compared to global estimates, haemorrhage remained the leading cause, but sepsis was significantly higher at the tertiary centre (Table 7).

Table 6
Comparison of direct causes with Indian national estimates

Cause group	Hospital %	India %
Haemorrhage (PPH/APH/placenta issues)	40.5	42.5
Sepsis / pregnancy-related infection	28.8	11.5
Hypertensive disorders (Pre-eclampsia/Eclampsia/HELLP)	12.8	6.0

Table 7
Comparison of direct causes with global estimates

Cause group	Hospital %	Global %
Haemorrhage (PPH/APH/placenta issues)	40.5	27.0
Sepsis / pregnancy-related infection	28.8	10.5
Hypertensive disorders (Pre-eclampsia/Eclampsia/HELLP)	12.8	15.0

Discussion

This retrospective institutional analysis of 650 maternal deaths over five years highlights critical patterns and system-level gaps in a tertiary care setting in India. Despite national progress in reducing maternal mortality, preventable deaths continue, particularly among high-risk referred women (11, 12).

Direct Causes:

Haemorrhage was the leading direct cause (40.5%), consistent with global and national trends. Obstetric haemorrhage remains the primary cause of maternal death, especially in tertiary referral centres where women frequently present in hypovolemic shock and disseminated intravascular coagulation (6, 11, 12). These deaths underscore the importance of rapid recognition, early resuscitation, availability of blood components, timely surgical interventions, and multidisciplinary care.

Sepsis accounted for 28.8% of deaths, the second most common direct cause, which is higher than national and global averages (6, 13). This likely reflects the tertiary referral nature of the institution, where women are often transferred late with severe infections, septic shock, and multi-organ dysfunction. Strengthening infection prevention, early recognition, timely antibiotic administration, ICU escalation, and structured postnatal surveillance using standardized sepsis bundles is crucial to reduce mortality (13).

Hypertensive disorders of pregnancy (pre-eclampsia/eclampsia/HELLP) contributed 12.8% of maternal deaths. Delayed antenatal detection and late referral after complications such as eclampsia, pulmonary oedema, or HELLP syndrome were common contributors (6, 11, 12). Preventive strategies include early screening during antenatal visits, timely antihypertensive therapy, magnesium sulphate administration, and appropriate timing of delivery, complemented by vigilant postpartum monitoring.

Indirect Causes:

Medical comorbidities—including anaemia, cardiac disorders, hepatic and renal dysfunction—were prominent, reflecting the high-risk referral profile. The presence of multiple comorbidities in individual cases (direct + indirect) underscores the complexity of maternal deaths in tertiary centres (11, 12). These findings align with contemporary maternal mortality epidemiology, which shows a rising relative contribution of indirect causes as classical obstetric emergencies become better managed (6, 7). Implementation of high-risk pregnancy clinics, multidisciplinary care pathways, and early referral protocols for women with significant comorbidities is essential.

Booking Status and Delays:

Most maternal deaths occurred in un-booked women, highlighting missed opportunities for early detection and treatment of anaemia, infections, and hypertensive disorders (12). The Three-Delay Model analysis revealed Delay-1 (decision to seek care) as the most frequent contributor (92.3%), followed by Delay-2 (reaching a healthcare facility, 52.8%). Delay-3 (receiving adequate care) was less frequent (26%) but indicates intermittent facility-level constraints such as delayed ICU access, limited blood availability, and delayed emergency operative interventions (9, 12). Delay-1 reflects sociocultural barriers, low awareness of danger signs, and financial constraints, whereas Delay-2 suggests referral and transport system gaps.

Implications for Practice:

This study confirms that maternal mortality in tertiary care settings is driven primarily by haemorrhage, sepsis, and hypertensive disorders, compounded by late presentation and significant delays in care (6, 9–12). Reducing preventable deaths requires strengthening antenatal care coverage, early risk identification, improved referral and transport systems, emergency obstetric readiness, availability of blood products, ICU capacity, and multidisciplinary high-risk care pathways. Facility-based maternal death reviews and near-miss audits remain valuable tools to identify modifiable factors and implement corrective measures (10, 12).

Overall, targeted interventions addressing both community-level barriers (early care-seeking, antenatal registration) and facility-level readiness (critical care, blood products, infection control, emergency obstetric care) are essential to accelerate progress toward national and global maternal health targets (6, 9, 10).

Strengths

This study benefits from a large sample size, analysing 650 maternal deaths over a five-year period, which provides a robust dataset to examine temporal trends, causes, and health system gaps (11, 12). Conducted at a high-volume tertiary care referral centre, the study captures critically ill and high-risk cases, offering valuable insights into the complex spectrum of maternal mortality in real-world clinical settings (11, 12). The application of the Three-Delay Model allowed a systematic assessment of barriers at multiple levels—community, transport, and facility—highlighting actionable points for intervention (9, 12). Additionally, the detailed categorization of both direct and indirect causes of death emphasizes the growing role of medical comorbidities, such as anaemia and cardiac disease, in contributing to maternal mortality, reflecting trends seen in contemporary global analyses (6, 7, 11).

Limitations

Despite its strengths, this study has certain limitations. As a tertiary care centre, there is an inherent referral bias, with the dataset likely overrepresenting complicated and critically ill cases, which may limit the generalizability of the findings to community or primary care settings (11, 12). The retrospective nature of the study relies on medical records and case summaries, which may have been incomplete or lacked some socioeconomic and community-level data. Furthermore, important sociocultural determinants of maternal health—such as maternal education, household decision-making, and local beliefs—could not be fully assessed. Finally, the attribution of indirect versus direct causes in complex cases may involve some misclassification, given the overlap between medical comorbidities and obstetric complications.

Recommendations

Based on the findings, strengthening antenatal care coverage is essential to ensure early detection and management of anaemia, hypertensive disorders, infections, and other comorbidities, especially among high-risk and un-booked women (12). Community-level interventions are needed to improve awareness of pregnancy danger signs and encourage timely healthcare-seeking, thereby reducing Delay-1 in the

Three-Delay framework (9, 12). Optimizing referral systems, improving transport networks, and ensuring pre-referral stabilization can reduce delays in reaching care (Delay-2), while enhancing facility preparedness—including blood product availability, ICU beds, emergency obstetric interventions, and standardized sepsis and hemorrhage protocols—addresses Delay-3 (6, 13). Establishing structured multidisciplinary high-risk pregnancy clinics and implementing systematic maternal death reviews and near-miss audits can further identify modifiable factors and guide continuous quality improvement (10, 11, 12).

Conclusion

This five-year institutional analysis demonstrates that maternal mortality in tertiary care settings is predominantly driven by haemorrhage, sepsis, and hypertensive disorders, compounded by un-booked status and significant delays in seeking and accessing care. The findings highlight the urgent need for a dual approach that strengthens both community-level interventions—through early antenatal registration, awareness campaigns, and timely referral—and facility-level preparedness, including emergency obstetric care, ICU readiness, blood product availability, and multidisciplinary high-risk management. Addressing both direct and indirect causes through these strategies, coupled with regular maternal death audits, is essential to reduce preventable maternal deaths and advance toward national and global maternal health targets, including the Sustainable Development Goal of fewer than 70 maternal deaths per 100,000 live births by 2030.

Declarations

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study. All research activities, data analysis, and manuscript preparation were conducted independently without any financial or personal relationships that could have influenced the study outcomes or interpretation of results.

Human Ethics Approval and Consent to Participate

Ethical approval

for this study was obtained from the Institutional Ethics Committee of VMMC & Safdarjung Hospital (IEC approval no. IEC/VMMC/SJH/CERT/2016-June/119; approved on 03 July 2026). The study was conducted in accordance with the principles of the Declaration of Helsinki (2013 revision). Written informed consent was obtained from all participants prior to their inclusion in the study.

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All authors contributed to the interpretation of the data, critically reviewed the manuscript for important intellectual content, approved the final version for publication, and agree to be accountable for all aspects of the work.

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Author Contribution

Dr. Upma Saxena: Conceptualization, Supervision, Project administration, Resources, Validation, Writing – review & editing.Dr. Mehak M. Dilawar: Conceptualization, Data curation, Investigation, Formal analysis, Writing – original draft.Dr. Abhishek Lachyan: Methodology, Formal analysis, Data interpretation, Writing – original draft, Writing – review & editing.Dr. Kirti Purwar: Data curation, Investigation, Validation, Writing – review & editing.Dr. Bindu Bajaj: Investigation, Data validation, Writing – review & editing.Dr. Garima Kapoor: Investigation, Data curation, Writing – review & editing.Dr. Rajesh Kumari: Supervision, Validation, Writing – review & editing.All authors contributed to the interpretation of the data, critically reviewed the manuscript for important intellectual content, approved the final version for publication, and agree to be accountable for all aspects of the work.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to institutional and patient confidentiality restrictions but are available from the corresponding author on reasonable request, subject to approval by the Institutional Ethics Committee.

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Figures

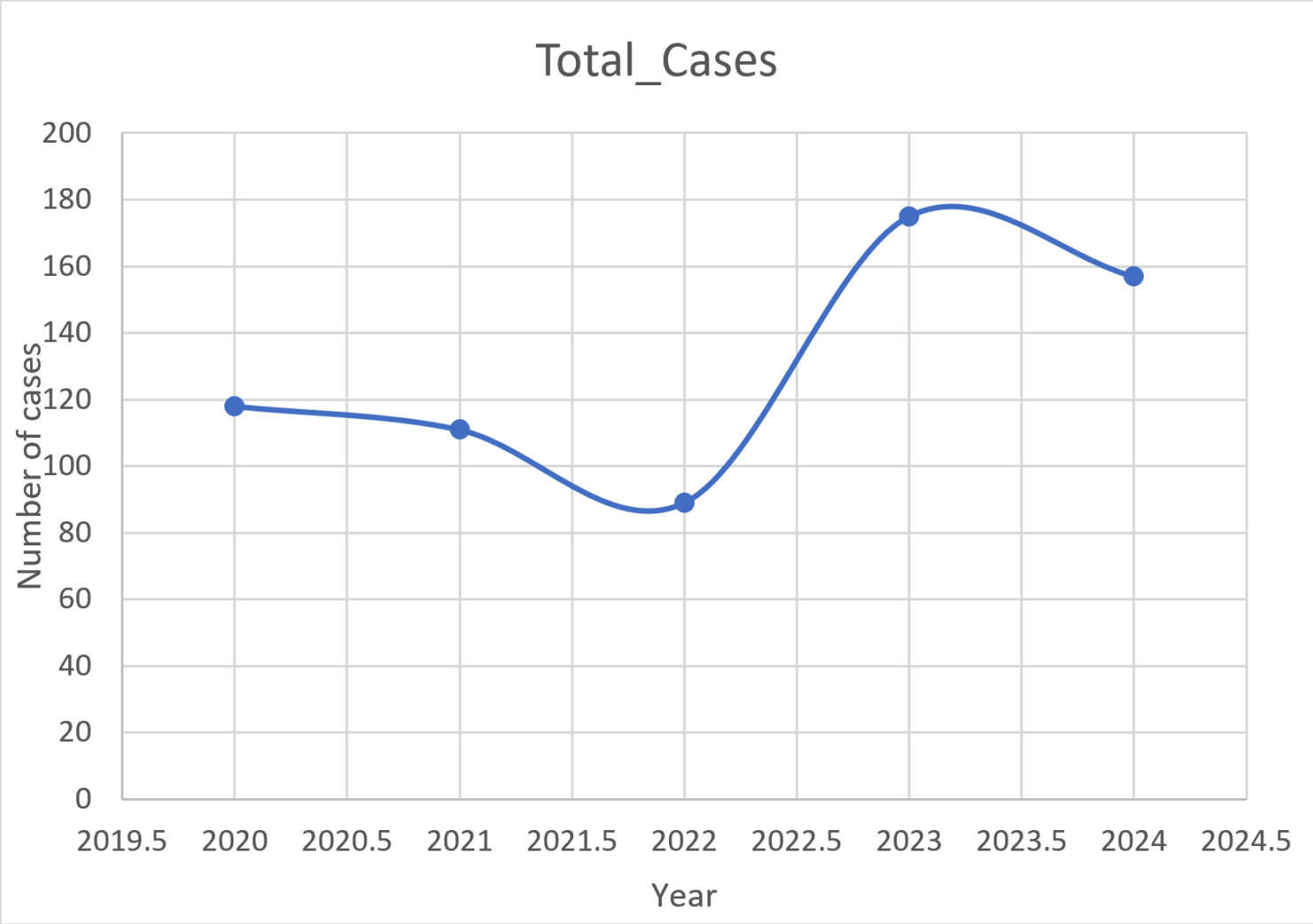


Figure 1

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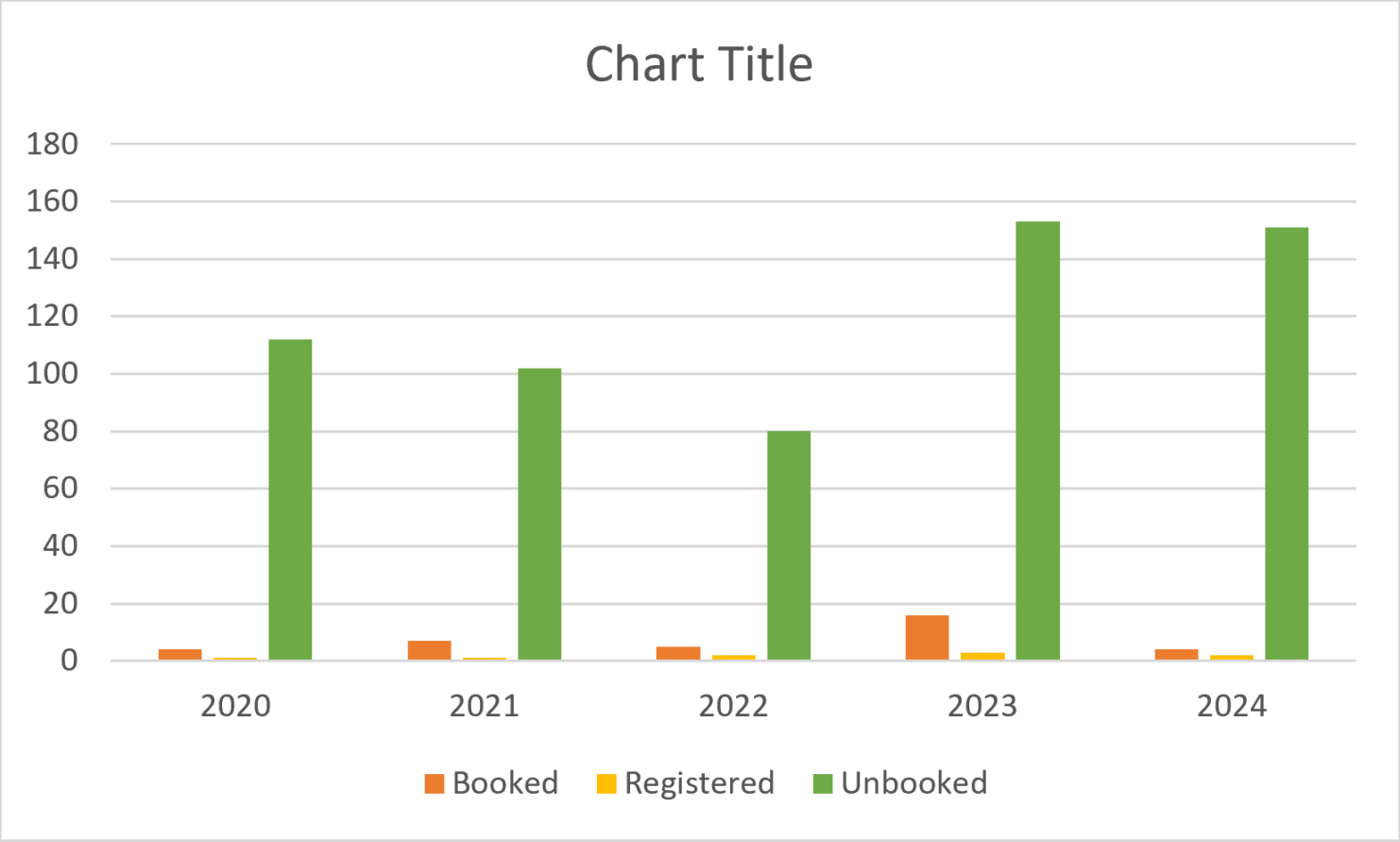


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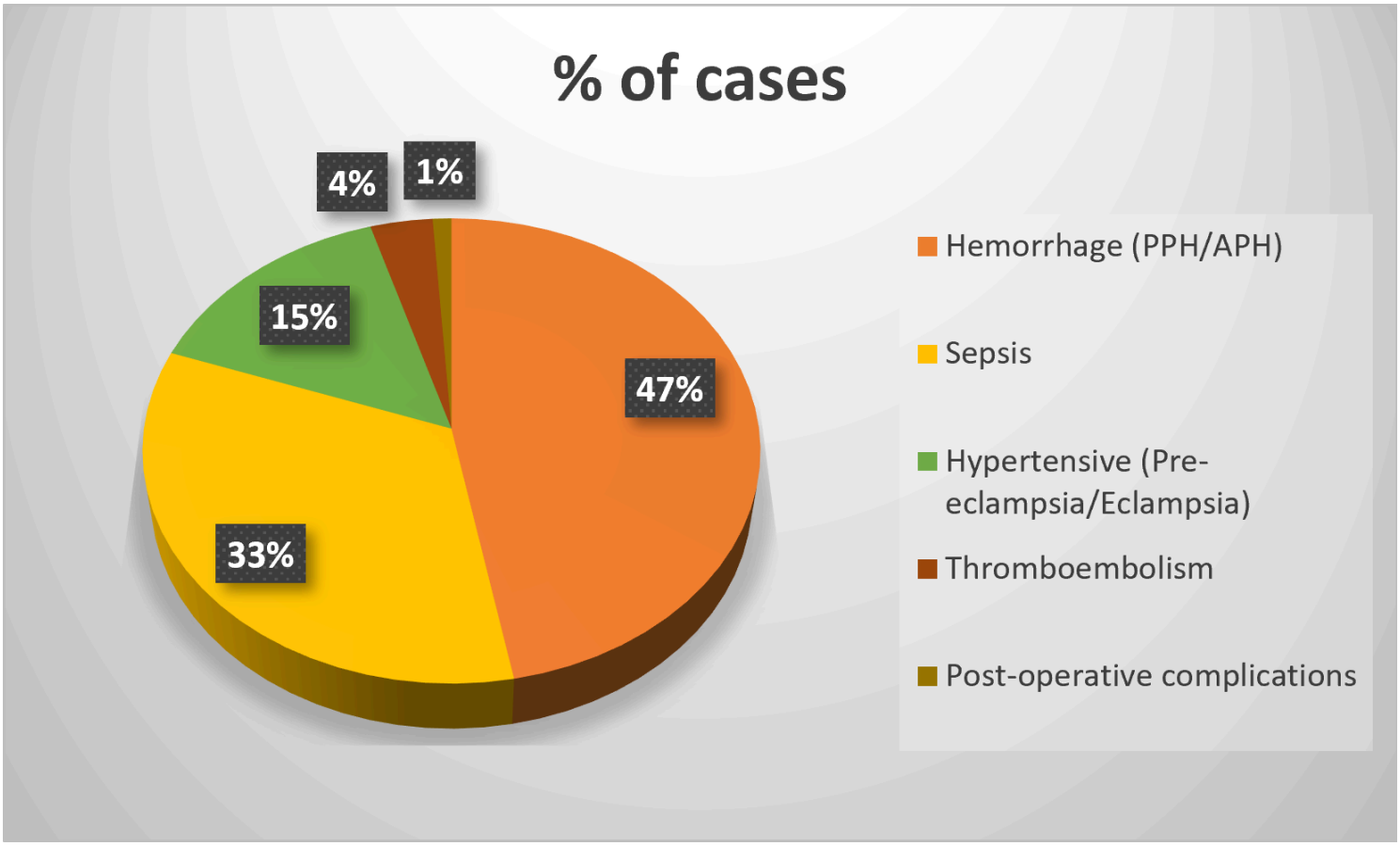


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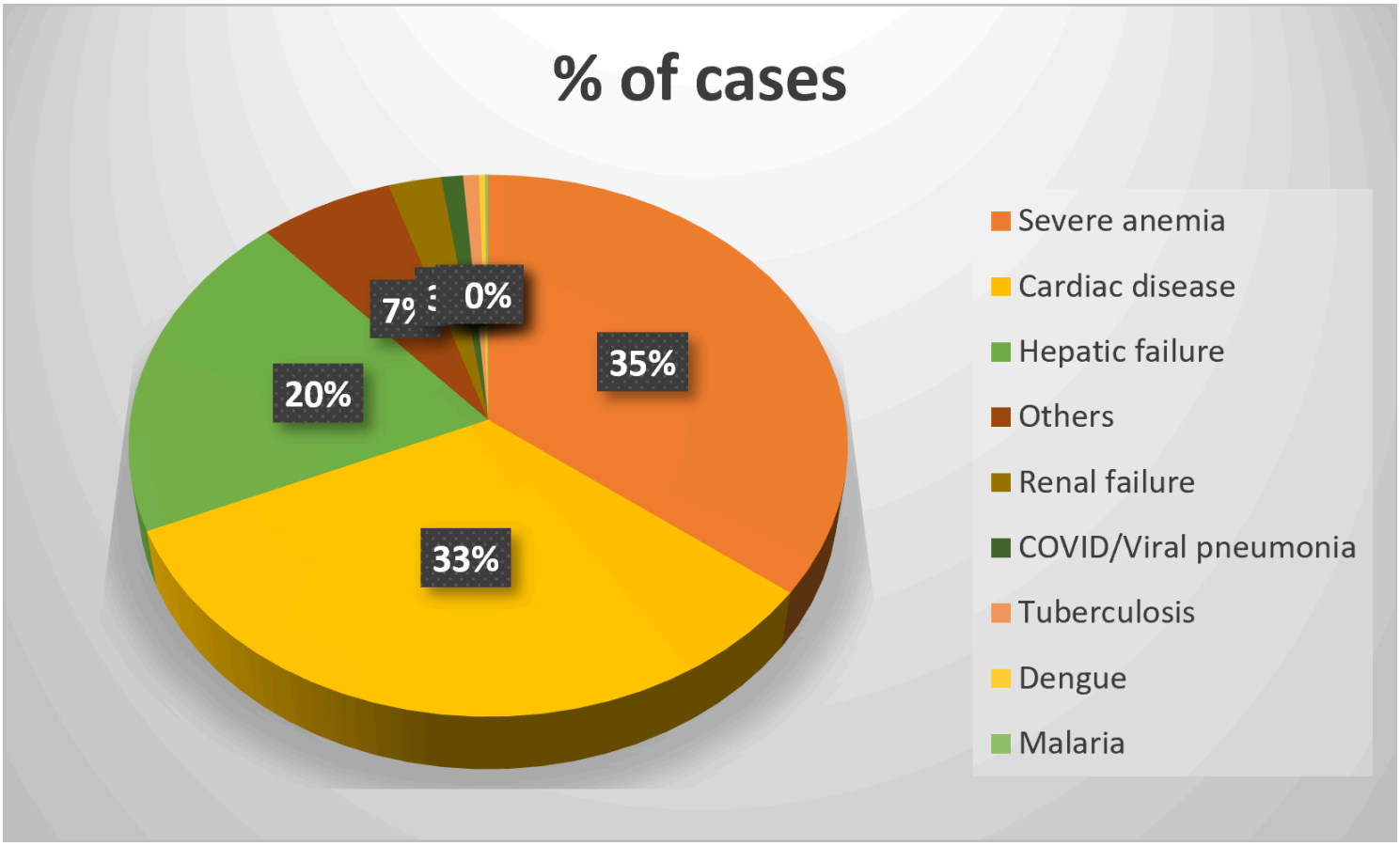


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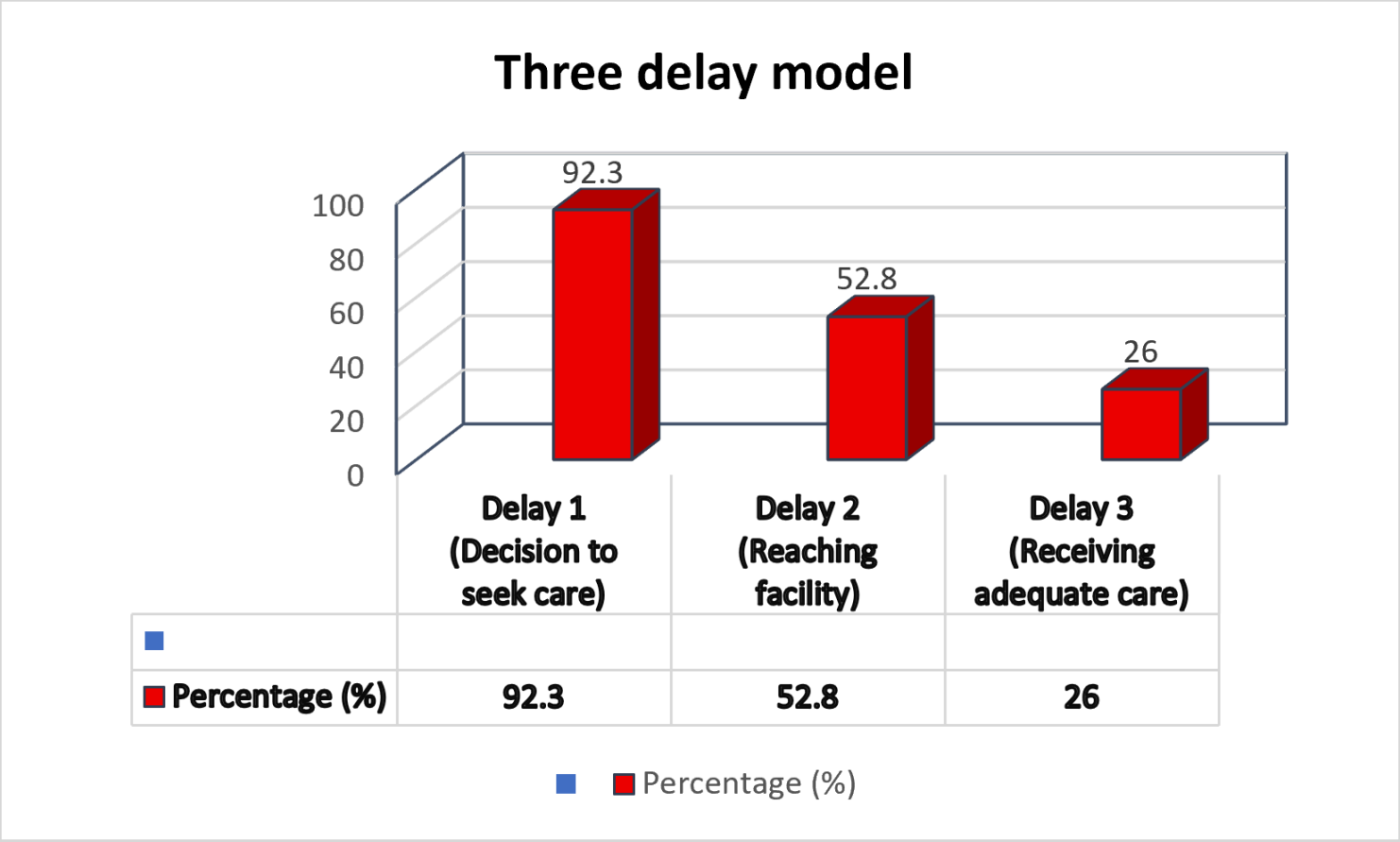


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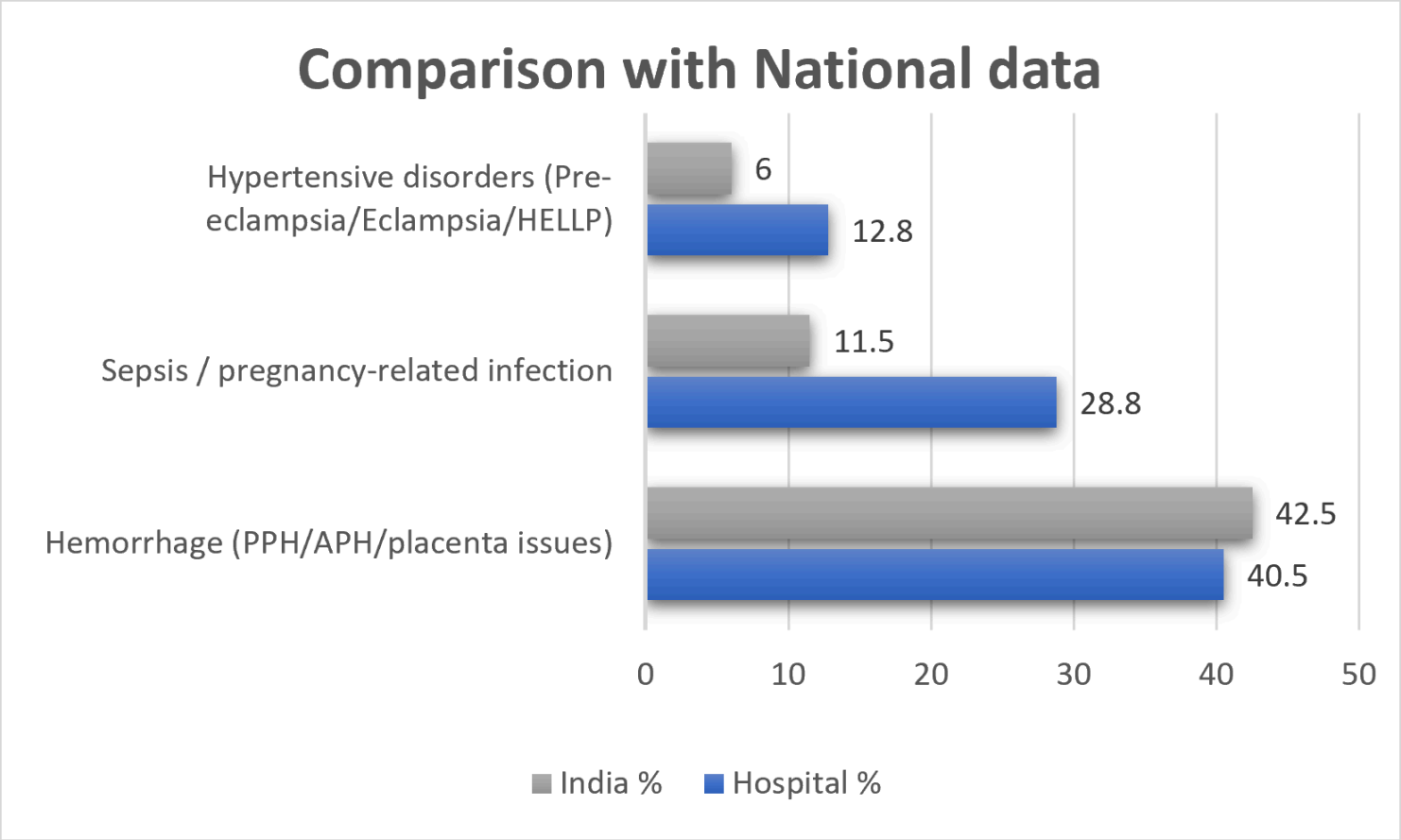


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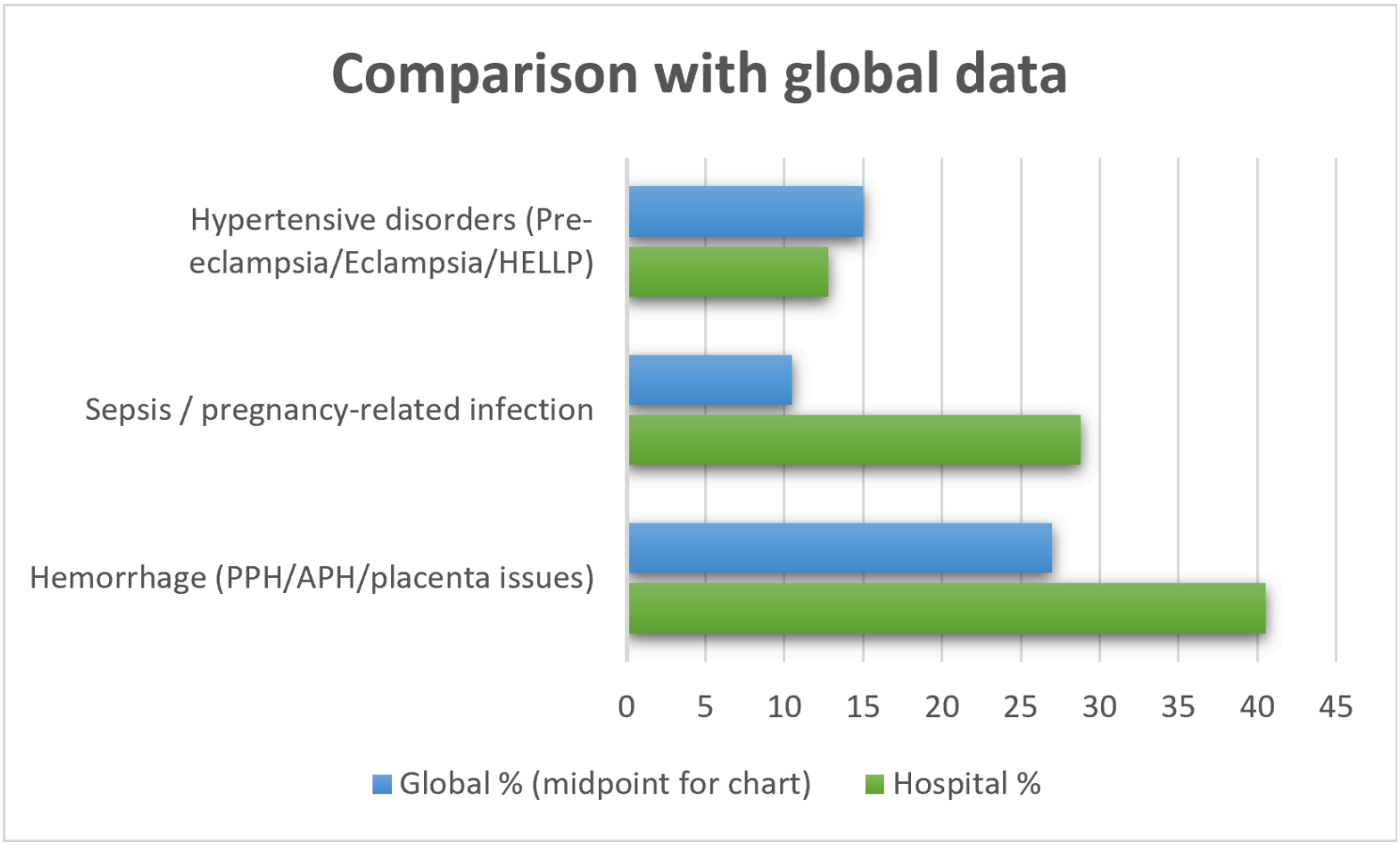


Figure 7

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