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St. Paul's Hospital Millennium Medical College**

**KNOWLEDGE, PERCEIVED PREPAREDNESS AND ASSOCIATED
FACTORS FOR POSTPARTUM HEMORRHAGE MANAGEMENT
AMONG MEDICAL INTERNS AT ST. PAUL'S HOSPITAL MILLENNIUM
MEDICAL COLLEGE, ETHIOPIA: A CROSS-SECTIONAL STUDY
(2025/26)**

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**A RESEARCH PROPOSAL SUBMITTED TO THE SCHOOL OF PUBLIC
HEALTH, ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF MEDICINE.**

SEPTEMBER 2025

ADDIS ABABA, ETHIOPIA

**A STUDENT RESEARCH PROPOSAL TO BE SUBMITTED TO THE
DEPARTMENT OF PUBLIC HEALTH, SPHMMC, IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF MEDICINE**

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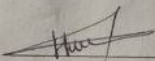
SEPTEMBER 2025

ADDIS ABABA, ETHIOPIA

Declaration

I, the undersigned student, declare that this research project is my original work in partial fulfillment of the requirement for the **Degree of Doctor in Medicine**, MD. I also declare that it has never been presented in this or any other higher institution and that all resources and materials used in the research work have been duly acknowledged.

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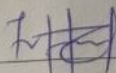
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Approval of Advisors

This research work has been submitted for examination with my approval.

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Abbreviation/ acronyms

AMTSL	Active Management of the Third Stage of Labor
ANC	Antenatal Care
CI	Confidence Interval
IM	Intramuscular
IRB	Institutional Review Board
IV	Intravenous
KPP	Knowledge and Perceived Preparedness
MCQ	Multiple Choice Questions
MOH	Ministry of Health
OBGYN	Obstetrics and Gynecology
PNC	Postnatal Care
PPH	Postpartum Hemorrhage
SD	Standard Deviation
SPHMMC	St. Paul's Hospital Millennium Medical College
SPSS	Statistical Package for the Social Sciences
UBT	Uterine Balloon Tamponade
WHO	World Health Organization

ABSTARCT

Background: Postpartum hemorrhage (PPH) remains the leading cause of maternal mortality globally, especially in low-resource settings like Ethiopia. Proper management of PPH requires timely recognition and intervention, often initiated by front line healthcare providers, including medical interns.

Objectives: To assess the knowledge and perceived preparedness of St. Paul medical interns in the management of postpartum hemorrhage during the 2025/26 clinical placement period.

Methods: An institutional-based analytical cross-sectional study and a census approach was conducted on final-year medical interns undertaking their clinical placement in 2025/26 at St. Paul's Hospital Millennium Medical College in Addis Ababa. Descriptive statics summarized knowledge and preparedness levels. Binary logistic regression was performed to identify associated factors of perceived preparedness.

Result: A total of 90 medical interns participated in the study. Based on the pre defined 70% cutoff point (scoring ≥ 7 out of 10), the majority of the study participants (74.4%, n=67) were classified as having adequate knowledge, while 25.6% (n=23) demonstrated inadequate knowledge regarding PPH management. In terms of perceived preparedness, fewer than half of the participants, 34.4% (31) were classified as prepared. diversity of information sources was identified as a significant independent predictor of perceived preparedness ($p=0.042$)

Conclusion: In conclusion, medical interns at SPHMMC possess a strong theoretical foundation in PPH management but remain significantly under-prepared for the practical and psychological demands of clinical emergencies. Addressing this disconnect requires shifting from unguided information-seeking to standardized, simulation-based training.

Keywords: PPH, Medical Interns, Preparedness, Obstetric Emergencies, Maternal Health, Cross-sectional Study, St. Paul's Hospital Millennium Medical College, Emergency Obstetric Care, Health Professional Education

1. Introduction

1.1. Background of the study

Postpartum hemorrhage (PPH) is commonly defined as blood loss of ≥ 500 ml following vaginal birth or ≥ 1000 ml after cesarean section within the first 24 hours postpartum and it affects approximately 5% of women globally(1). The clinical definition of PPH is excessive bleeding from the genital tract following the birth of the baby up to the end of the puerperium, which adversely affects the general condition of the patient evidenced by a rise in pulse rate and falling blood pressure. A 10% decline in postpartum hematocrit concentration from base line levels is also another definition of PPH(2).

The leading cause of PPH is uterine atony (insufficient uterine contraction after delivery), other potential causes include retained placental tissue, genital tract trauma, uterine rupture, and maternal coagulopathies. The potential causes of PPH were listed under four causative headings: Tone, Trauma, Tissue or Thrombin(3)(4). PPH is classified as primary PPH, which is a common form of PPH that occurs within 24 h of delivery, and about 70% of primary PPH cases are due to uterine atony. Secondary (late) postpartum hemorrhage is defined as excessive bleeding occurring between 24 hour after delivery of the baby and 12 weeks postpartum and most of the late PPH is due to retained products of conception infection, or both combined(5)(6).

PPH remains the leading preventable cause of maternal mortality worldwide, with the vast majority of these deaths occurring in low- and lower-middle-income countries(7)(7)(7)(7). Globally, PPH accounts for approximately 27% of maternal deaths, with estimates rising to 30%–50% in sub-Saharan Africa(8).

In Ethiopia, maternal mortality remains a significant public health concern, although notable progress has been made in recent years, with a maternal mortality ratio of approximately 195 deaths per 100,000 live births based on recent WHO inter-agency modeled estimates(9)(10). A recent study estimated the pooled magnitude of PPH in Ethiopia to be 11.14% (95% CI: 7.21–15.07), and identified several risk factors significantly associated with PPH: lack of antenatal care, multiparity, and a previous history of PPH(11).

Health professionals must support and advocate for women, applying their skills to act wisely when needed. They should be properly qualified and continue their education to deliver comprehensive care(12). In addition training to increase knowledge and skills of postpartum hemorrhage among all professional groups are needed to fill the gap(12).To effectively address this challenge; it is crucial that healthcare providers, particularly medical interns, possess both adequate knowledge and a strong sense of preparedness. For the purpose of this study, these terms are defined as follows:

Knowledge of PPH management refers to the provider's understanding of evidence-based guidelines and clinical practices required for prevention and treatment. Core domains include accurate definitions and classification of PPH, identification of risk factors, and application of active management of the third stage of labor (AMTSL). Knowledge also encompasses the correct choice and administration of first-line uterotonics(e.g., oxytocin 10 IU IM/IV), timely recognition and quantification of blood loss, and stepwise adherence to treatment protocols such as early tranexamic acid administration, escalation to mechanical interventions (e.g., balloon tamponade), and surgical procedures when indicated(13)(14).

Perceived preparedness refers to the confidence in one's ability to implement or carry out required actions, and is best understood as domain-specific self-efficacy(15). It has two dimensions: the first is confidence in one's own ability to perform necessary tasks, while the second is the capacity to cope with failure and setbacks. Coping in this context often involves seeking support, which has been shown to positively influence both task mastery and the ability to manage transitions and their associated challenges(16)(17). Perceived preparedness also encompasses students' self-evaluation of how well their university education has equipped them. This aligns with medical education research, where preparedness is generally defined as students' perception of how effectively medical school prepared them(18)(19) and whether they were taught "the right things"(19).

Evidence suggests that knowledge and preparedness of medical personnel regarding PPH is a key determinant in reducing maternal mortality. For example, there was a study aimed at determining the knowledge and practice of midwives related to postpartum hemorrhage management and associated factors at selected public hospitals in Addis Ababa, Ethiopia, found that only 34.3% of

respondents demonstrated adequate knowledge of PPH management, while the remaining 65.7% exhibited poor knowledge levels(20).

Most PPH related deaths are preventable through timely recognition and intervention. However, barriers to effective detection and management span multiple domains, including: resource limitations, inadequate skills and training, knowledge gaps, poor quality improvement culture, lack of guideline utilization, low confidence, and insufficient team coordination(21).

1.2. Statement of problem

Postpartum hemorrhage (PPH) remains the foremost direct cause of maternal mortality worldwide, particularly impacting low-resource settings where access to timely and adequate obstetric care is often limited(7)(22).

The global MMR in 2023 was estimated at 197 (UI 174 to 234) maternal deaths per 100 000 live births, sub-Saharan Africa accounted for approximately 70% of global maternal deaths and was the only SDG region with a “high” MMR – estimated at 454 (UI 387 to 572) maternal deaths per 100 000 live births. In Ethiopia, although maternal mortality ratio (MMR) has declined from 267 per 100,000 live births in 2020 to just 195 per 100,000 live births by 2023(23).It remains unacceptably high and far above the Sustainable Development Goal target of ≤ 70 (24).

Addressing this persistent challenge necessitates a highly knowledgeable and prepared healthcare workforce. Studies from various settings highlight existing gaps in this regard. For instance, a study at Primary Health Centers of Jos North LGA, Plateau State, Nigeria, revealed that registered qualified professionals had an 80% higher level of knowledge and management skills in PPH management(25). Conversely, a study conducted in Kenya assessed knowledge of PPH protocols among healthcare providers, finding that knowledge was lowest for prevention protocols and highest for assessment protocols. This study identified gaps in PPH knowledge and recommended training approaches emphasizing hands-on learning and teamwork to improve preparedness(26). Similarly, data from Tanzania showed that the mean knowledge score for PPH risk factors, diagnosis, and causes was 63.9%, indicating suboptimal knowledge among healthcare providers(27). While a Namibian study indicated that the majority of participants were competent and had sufficient knowledge and a positive attitude toward PPH management(28). A study conducted in Sidama, Ethiopia, revealed that among 528 obstetric care providers, only 37.7% were knowledgeable and 32.8% were skilled in managing the third stage of labor, indicating inadequate knowledge and practice in active management of the third stage of labor(29).

Despite being a major contributor to maternal mortality, particularly in countries like Ethiopia, existing literature often focuses on the knowledge and practices of nurses and midwives(10)(29) overlooking other medical professionals and students who are equally involved in obstetric care.

However, there is insufficient evidence regarding the knowledge and preparedness of medical interns who often serve as front line providers in teaching hospitals such as St. Paul's Hospital Millennium Medical College to manage PPH effectively. This gap is critical given the pivotal role interns play in early detection and initial emergency response, making their competence a direct determinant of maternal outcomes.

1.3. Significance of the study

Medical interns, especially those in high-volume teaching hospitals like St. Paul's Hospital Millennium Medical College, play an active role in maternity care and are often involved in the front line management of obstetric emergencies, including PPH. However, while studies have evaluated the competencies of midwives and other maternal health professionals, there is a notable gap in research assessing the preparedness of medical interns in this context. This study aims to fill that gap by evaluating both the knowledge and perceived readiness of medical interns to manage PPH during their clinical placement.

The findings of this research will be valuable for identifying specific areas where intern training may need to be strengthened. Insights gained can support improvements in medical education, such as updating internship orientation, enhancing supervision during obstetrics rotations, and reinforcing emergency obstetric care training.

Academically, it will contribute to the growing body of literature on competency-based medical education and maternal health service delivery in low-income countries.

2. Literature review

2.1. Introduction

Postpartum hemorrhage (PPH) remains a critical global health challenge, particularly in low-resource settings like Ethiopia, where delays in detection and management continue to contribute significantly to maternal mortality(7).

2.2. Global and Regional Context of PPH Management

Recognizing the severity of PPH, the World Health Organization (WHO) has issued comprehensive recommendations for its prevention and treatment. Oxytocin (10 IU, intramuscular or intravenously) is recommended as the first-line uterotonic agent for all births to prevent PPH. The successful implementation of these guidelines is crucial for reducing the incidence and severity of PPH, yet their effectiveness is intrinsically linked to the clinical competence and preparedness of healthcare providers, especially those directly involved in maternity care(30).

Despite the existence of clear clinical guidelines and national efforts to reduce maternal deaths, effective prevention and management of PPH continues to be a challenge, particularly in low-resource settings where trained professionals may be limited. Barriers to effective detection and management are multifaceted, encompassing resource limitations, inadequate skills and training, knowledge gaps, poor quality improvement culture, lack of guideline utilization, low confidence, and insufficient team coordination(21). These systemic challenges highlight the complexity of addressing PPH beyond mere clinical protocols, emphasizing the human element in its successful management.

Studies from various regions underscore the variability in healthcare providers' knowledge and preparedness regarding PPH. For instance, a study in Rwanda demonstrated that the use of mLearning applications could significantly improve knowledge and skills in managing PPH among nurses and midwives(31). Similarly, research in Kenya revealed gaps in healthcare providers' knowledge of clinical protocols for PPH care(32). These findings collectively suggest that while guidelines exist, their practical application is often hampered by deficiencies in knowledge and skill, necessitating targeted educational interventions.

2.3. The Ethiopian Landscape: provider knowledge and Preparedness

System level barriers further complicate PPH management in Ethiopia. These include inconsistent availability of essential drugs (e.g., oxytocin, misoprostol), shortages in skilled providers, documentation issues, and undefined roles for medical interns during obstetric emergencies, all of which hinder timely and effective intervention(33).

Several studies have assessed provider competence in PPH prevention and management in Ethiopia and East Africa. For example, a study conducted in Addis Ababa among midwives reported that only 34.3% of participants demonstrated adequate knowledge of PPH management, with major deficiencies observed in the correct use of uterotonics, timely recognition of excessive blood loss, and adherence to standard management protocols(20). Similarly, research from the Sidama Zone in Southern Ethiopia found that only 37.7% of obstetric care providers were knowledgeable and only 32.8% were skilled in the active management of the third stage of labor (AMTSL), indicating substantial gaps in both theoretical understanding and practical competency(29).

Available regional evidence further suggests gaps in familiarity with key preventive and emergency interventions, including incomplete knowledge of AMTSL components, delayed initiation of utero tonic therapy, limited confidence in escalation to mechanical interventions such as uterine balloon tamponade, and inconsistent adherence to clinical guidelines(29)(34). These gaps highlight persistent weaknesses in translating guideline knowledge into effective bedside practice among front line providers.

Importantly, existing literature predominantly focuses on nurses and midwives, with limited attention given to medical interns and newly graduated physicians who increasingly serve as first responders in teaching hospitals. Studies from Peru and Chile assessing recently graduated physicians demonstrated sub optimal self-perceived competence in managing obstetric emergencies, particularly in areas of clinical decision-making, emergency leadership, and independent procedural performance(35)(36). These findings suggest that although graduates may possess theoretical knowledge, many feel insufficiently prepared to manage high-acuity obstetric emergencies independently, raising concerns about the adequacy of undergraduate clinical training in fostering real-world preparedness.

Collectively, these findings underscore a critical evidence gap regarding the knowledge and perceived preparedness of medical interns in Ethiopia, particularly in tertiary teaching hospitals such as St. Paul's Hospital Millennium Medical College, thereby justifying the need for the current study.

2.4. Knowledge and Preparedness: literature insights

Professional qualifications and experience in maternity units are significant determinants of healthcare providers' knowledge and skills in PPH prevention and management(37). Several studies indicate that knowledge scores do not differ significantly between qualified providers and students, highlighting gaps in training during both pre-service and in-service education(31). Academic factors, such as completing extern ships and internships in specific hospital settings influence self-perceived competence among recently graduated physicians, though approximately one-third report feeling unprepared for obstetric emergencies(35)(36).

Effective training programs often incorporate hands-on learning, inter professional collaboration, and scenario-based simulations to enhance decision-making and practical application of skills. Conversely, a lack of such structured and continuous education contributes significantly to knowledge deficits. Greater clinical experience and frequent exposure to PPH cases can enhance a provider's confidence and competence. However, reliance solely on experience without structured training can lead to the perpetuation of suboptimal practices or the inability to adapt to new guidelines. The optimal balance between theoretical knowledge and practical exposure, coupled with reflective practice, is crucial for developing robust preparedness.

Access to essential resources (e.g., uterotonics, blood products, equipment for mechanical interventions) and clear, accessible clinical guidelines significantly influences a provider's ability to manage PPH effectively. In low-resource settings, the scarcity of these vital resources can hinder even knowledgeable providers from implementing appropriate interventions, leading to poorer outcomes(22). Familiarity with and adherence to national and international guidelines are also critical for standardized and evidence-based care.

Effective mentor-ship and supervision during clinical training are vital for medical interns. Guidance from experienced clinicians can help bridge knowledge-practice gaps, provide immediate feedback, and build confidence in managing complex obstetric emergencies. A supportive learning environment fosters better preparedness and skill acquisition. PPH management often requires a multidisciplinary approach involving various healthcare professionals. Effective teamwork and clear communication among team members are essential

for coordinated and timely interventions, especially during high-stress emergency situations(22). Breakdowns in communication or lack of clear roles can severely compromise patient safety.

2.5. Gap Identification and Rationale for the Current Study

The preceding review reveals a critical gap in the existing literature: a specific and in-depth assessment of the knowledge and perceived preparedness of medical interns regarding PPH management, particularly within the context of teaching hospitals in Ethiopia like St. Paul's Hospital Millennium Medical College. While the global and regional burden of PPH is well-documented, and the importance of provider competence is acknowledged, there is insufficient evidence directly addressing the readiness of medical interns who often serve as frontline providers in such settings to effectively manage PPH. This gap is particularly significant given the pivotal role interns play in early detection and initial emergency response.

Understanding the extent of knowledge and perceived preparedness among medical interns is essential for identifying specific educational needs, enhancing training programs, and ultimately improving maternal health outcomes. Without data on interns' competence and confidence in PPH management, educational institutions and healthcare policymakers lack crucial insights needed to tailor training interventions effectively. The current study, therefore, seeks to address this critical void by evaluating the knowledge and perceived preparedness of medical interns at St. Paul's Hospital Millennium Medical College in managing PPH. The findings will not only contribute to the existing body of literature but also provide actionable insights for curriculum development and in-service training programs, aiming to enhance both clinical competency and maternal health service delivery in the Ethiopian context.

2.6. Conclusion

Postpartum hemorrhage remains a significant global health challenge, particularly in low-resource settings. Effective management hinges on the knowledge and preparedness of healthcare providers. While general trends and challenges are understood, a specific focus on medical interns, especially in high-volume teaching hospitals like St. Paul's Hospital Millennium Medical College in Ethiopia, is lacking. This literature review underscores the necessity of the proposed study to bridge this

knowledge gap, ultimately contributing to improved maternal health outcomes through targeted educational interventions and enhanced clinical preparedness.

3. Objectives

3.1 General Objective

- To assess the knowledge, perceived preparedness and associated factors regarding the management of postpartum hemorrhage among medical interns at St. Paul's Hospital Millennium Medical College during the 2025/26 clinical placement period.

3.2 Specific objective

- To measure the level of knowledge among medical interns on postpartum hemorrhage management.
- To determine the interns' perceived preparedness to manage postpartum hemorrhage in clinical settings.
- To identify the independent predictors associated with medical interns' perceived preparedness for PPH management

4. Methods and materials

4.1 Study design and period

A facility-based cross-sectional study was conducted at St. Paul's Hospital Millennium Medical College in Addis Ababa, Ethiopia. This design was selected to assess the knowledge and perceived preparedness of medical interns at a single point in time, providing a snapshot of their current capacity to manage postpartum hemorrhage. St. Paul's Hospital Millennium Medical College was chosen as the study site because it is a major tertiary teaching hospital in Ethiopia, managing a high volume of obstetric cases and training a large number of medical interns, thereby offering a representative academic and clinical setting for the study.

The study included medical interns undertaking their Obstetrics and Gynecology clinical placement during the 2025/2026 academic year. The six-month study period, from September 2025 to February 2026, is strategically chosen to encompass a sufficient number of medical

interns rotating through the OBGYN Department, allowing for comprehensive data collection across different cohorts and levels of exposure.

4.2 Study setting

Study was conducted at Saint Paul's Hospital Millennium Medical College (SPHMMC) in Addis Ababa, Ethiopia, from September 2025 to February 2026 G.C. SPHMMC, second-largest governmental tertiary care hospital in Ethiopia,. More than 2800 clinical, academic, administrative, and support staff members work at the institution, The College accommodates more than 700 inpatient beds, but on a daily average, 1200 emergency and outpatient patients are seen. Since 2007, SPHMMC has functioned as a medical school, training healthcare professionals in both undergraduate and postgraduate programs. The outpatient flow averages 50–60 patients per day, three times per week(38).

4.3 Population

4.3.1 Source population

The source population included all medical interns enrolled at St. Paul's Hospital Millennium Medical College during the 2025/26 clinical placement period.

4.3.2 Study population

A census sampling approach was employed, in which all eligible medical interns were included to ensure a comprehensive assessment of knowledge and perceived preparedness for postpartum hemorrhage management. The study population comprised interns who were currently rotating in the Obstetrics and Gynecology department as well as those who had previously completed the rotation and met the established inclusion criteria.

4.4 Eligibility Criteria

4.4.1 Inclusion criteria

- All medical interns who were enrolled at St. Paul's Hospital Millennium Medical College during the study period.

4.4.2 Exclusion criteria

- Medical interns who are critically ill or unable to give information for different reason

4.5 Sample size determination and sampling technique

To determine the sample size for this cross-sectional study assessing medical interns' knowledge and perceived preparedness toward postpartum hemorrhage (PPH) management, a census sampling approach was employed. Because the total number of eligible medical interns at St. Paul's Hospital Millennium Medical College during the 2025/2026 clinical period was 91, all interns who met the inclusion criteria were included in the study. This approach eliminated the need for formal sample size calculation, ensured complete coverage of the target population, minimized sampling error, and enhanced the representativeness and accuracy of the findings.^{4.6.}

Study variables

4.6. Study variables

Dependent Variables

- Knowledge level of medical interns on postpartum hemorrhage management.
- Perceived clinical preparedness of interns in handling PPH cases.

Independent Variables

- Age
- Sex
- Current Clinical Rotation: The department where the intern is currently assigned
- Rotation Completion Status: Whether the intern has completed at least 6 weeks of Obstetrics and Gynecology rotation.
- PPH Training History: Prior attendance at formal training, seminars, or simulations specifically for PPH management
- Information Source Diversity: The variety and types of primary resources used for PPH information

4.7. Operational definitions

Knowledge of PPH Management: The level of correct understanding a medical intern demonstrates regarding the causes, risk factors, prevention, and clinical management of postpartum hemorrhage, assessed using a structured questionnaire. A scoring system will

categorize respondents as having "adequate" or "inadequate" knowledge based on a predefined cut-off score.

Adequate Knowledge: A participant who correctly answers **7 or more out of the 10** knowledge-based multiple-choice questions (representing a score of **greater than or equal to 70%**). This threshold is based on competency standards where scores below 64% are considered suboptimal for life-saving interventions (Reference 26).

Inadequate Knowledge: A participant who correctly answers **fewer than 7** out of the 10 knowledge-based questions (representing a score of **< 70%**)

Perceived Preparedness: The interns' self-reported level of confidence and readiness to recognize and manage postpartum hemorrhage in clinical settings, handle the psychological stress of an obstetric emergency, and work within a team to manage PPH. measured using a Likert-scale questionnaire. Preparedness was categorized as "prepared" or "not prepared" based on total score.

Prepared: A participant who achieves an aggregate mean score of **4.0 or higher** on the 10-item preparedness Likert scale. This indicates that the intern, on average, "**Agrees**" or "**Strongly Agrees**" with the statements regarding their clinical readiness (Reference 39).

Not Prepared: A participant who achieves an aggregate mean score of **less than 4.0** on the Likert scale. This includes those who responded as "Neutral," "Disagree," or "Strongly Disagree," indicating a lack of clear confidence in their ability to manage the emergency independently.

Knowledge–Preparedness Gap: The numerical percentage difference between the proportion of interns with "Adequate Knowledge" and those categorized as "Prepared," representing the disconnect between theoretical education and clinical confidence.

Significant Association: A relationship between an independent variable and the dependent variable is considered statistically significant if the p-value is less than 0.05 with a 95% Confidence Interval that does not cross the null value of 1

Medical Intern: A final-year medical student enrolled at St. Paul's Hospital Millennium Medical College who is undertaking clinical rotations during the 2025/26 academic year.

Postpartum Hemorrhage (PPH): Blood loss of ≥ 500 mL after vaginal delivery or ≥ 1000 mL after cesarean section within 24 hours of delivery, as per WHO definition(1)

4.8. Data collection tool, method, and procedures

The data collection instrument was developed based on a comprehensive review of relevant literature and adaptation of questionnaires from similar previous studies (3, 26, 28, and 37). The tool was modified and contextualized to align with the objectives of the current study. A structured, self-administered questionnaire was designed and administered using an online survey platform (Kobo Toolbox).

The questionnaire consisted of three main sections.

1. Socio demographic and background information (age, sex, previous obstetrics/gynecology rotation, source of knowledge, etc.)
2. Knowledge assessment items related to postpartum hemorrhage (PPH) causes, risk factors, prevention, diagnosis, and management
3. Perceived preparedness measured using Likert-scale statements assessing confidence in PPH management.

Data Collection Method:

Eligible medical interns were invited to participate through email and Telegram communication channels and were provided with a secure link to access the online questionnaire. Participation was voluntary and anonymous, and electronic informed consent was obtained from all participants prior to accessing the survey.

Data Collection Procedure:

- The survey link remained active throughout the data collection period from September 2025 to February 2026. Periodic reminders were sent to enhance response rates.

- Completed responses were automatically recorded in the secure online platform to ensure data integrity and confidentiality..
- The data set was exported for cleaning and analysis.

4.9. Data quality control, Data processing and analysis

4.9.1 Data Quality Control

To ensure the integrity and reliability of the findings, several measures was implemented. The questionnaire was adapted from validated tools used in similar studies(29)(39), ensuring content validity. A pretest will be conducted on 5% of the sample size (medical interns at another teaching hospital) to assess the clarity and flow of the questions.

During data collection, the **Kobo Toolbox** platform will be used to prevent missing entries through mandatory response settings. Data was checked daily for completeness and consistency. Before analysis, the lead investigator will perform data cleaning to identify any outliers or entry errors.

4.9.2 Data Processing and Analysis

Data was exported from Kobo Toolbox into **SPSS Version 26.0** for cleaning and statistical analysis. Descriptive statistics, including frequencies, percentages, and standard deviations, will be used to summarize the socio-demographic characteristics of the participants.

Inferential statistics was employed to identify associated factors. Initially, a bivariate logistic regression analysis was conducted to screen candidate variables. Variables with a p-value < 0.2 in the bivariate analysis was entered into a multivariate logistic regression model to control for potential confounders. The strength of association was reported using Adjusted Odds Ratios (AOR) with 95% Confidence Intervals (CI). Statistical significance was declared at a p-value < 0.05.

4.9.3 Knowledge Scoring and Classification

Knowledge will be assessed using 10 multiple-choice questions. Following the precedent of competency-based assessments in emergency obstetric care(40) and the "sub-optimal" benchmarks identified in regional literature(27), a strict **70% cutoff point** will be applied.

Adequate Knowledge: Participants who score greater than or equal to **7 out of 10 (70% or higher)**.

Inadequate Knowledge: Participants who score **< 7 out of 10 (below 70%)**.

This binary classification is chosen to emphasize clinical safety, as PPH management requires a high threshold of theoretical accuracy to ensure maternal survival.

4.9.4 Perceived Preparedness Scoring and Classification

Perceived preparedness will be measured using a 10-item Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree). As suggested for professional transition assessments, a criterion-based threshold will be used rather than a group mean.

Prepared: Participants who achieve an average score of **4 (Agree) or 5 (Strongly Agree)** across the items.

Not Prepared: Participants with an average score **below 4**.

This classification aligns with the professional expectation that an intern should feel "confident" or "ready" (Agree/Strongly Agree) before managing life-threatening emergencies independently.

4.10. Ethical considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of St. Paul's Hospital Millennium Medical College prior to the initiation of the study. Official permission was also secured from the appropriate institutional authorities to conduct the research.

All participants received clear information regarding the purpose of the study, data collection procedures, potential risks and benefits, and their rights as participants. Digital informed consent

was obtained before participation. Participation was entirely voluntary, and participants were informed of their right to decline or withdraw from the study at any time without any consequences.

Confidentiality and anonymity were strictly maintained by avoiding the collection of personally identifiable information and restricting access to the dataset. All collected data were used exclusively for research purposes.

4.11. Plan for dissemination of results

The study findings were reviewed and discussed with academic advisors to ensure accuracy and scholarly rigor. The results were compiled as part of the academic requirements for completion of undergraduate medical training at St. Paul's Hospital Millennium Medical College.

Upon completion, the findings were presented to the relevant academic departments and faculty members. Where feasible, the results were also shared during student research forums and institutional research dissemination events. Further dissemination through national conferences and peer-reviewed journals was considered depending on the relevance and quality of the findings.

5. Result

5.1: Socio-demographic Characteristics

A total of 90 medical interns participated in the study. The socio-demographic profile of the participants is detailed in Table 1.

More than half of the participants (61.1%, n=55) were 26 years old, with ages ranging from 24 to 27 years. The gender distribution was nearly equal, with a slight male majority of 51.1% (n=46) compared to 48.8% (n=44) for females.

Regarding clinical experience, all participants (100%) had completed at least a six-week rotation in Obstetrics and Gynecology prior to the study. Furthermore, 97.8% (n=88) of the interns reported having attended formal training, seminars, or simulations specifically focused on postpartum hemorrhage (PPH) management. When assessing their primary sources of PPH information, nearly all interns cited medical school lectures (98.9%, n=89), followed by direct clinical experience (96.7%, n=87) and institutional guidelines/protocols (95.6%, n=86).

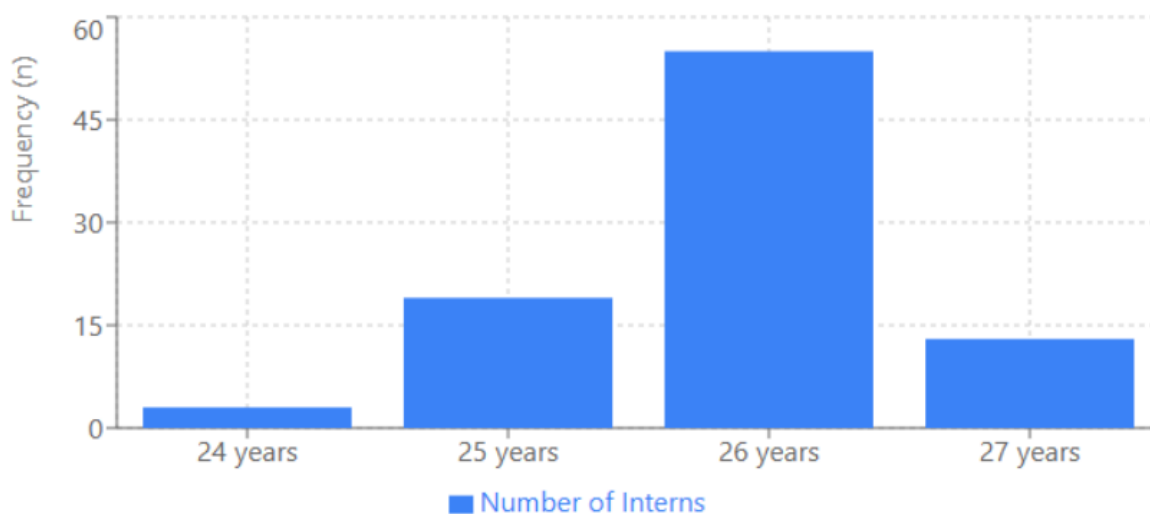
Table 1: Socio-demographic characteristics of medical interns at SPHMMC, 2025/26 (N=90)

Variables	Category	Frequency (n)	Percentage (%)
Age (in years)	24	3	3.3
	25	19	21.1
	26	55	61.1
	27	13	14.4
	Mean ($\pm$ SD)	25.87 ($\pm$ 0.69)	—
Sex	Male	46	51.1
	Female	44	48.9
Current Clinical Rotation	Internal Medicine	19	21.1
	Gynecology & Obstetrics	18	20.0
	Surgery	18	20.0
	Pediatrics	18	20.0
	Emergency Medicine	9	10.0
	Psychiatry	8	8.9
Completed $\geq$ 6 weeks OBGYN rotation	Yes	90	100.0
	No	0	0.0
Attended formal PPH training/simulation	Yes	88	97.8
	No	2	2.2

Primary Source of PPH Information*	Medical school lectures	89	98.9
	Clinical experience	87	96.7
	Guidelines and protocols	86	95.6
	Peer discussion	63	70.0
	Online resources	63	70.0

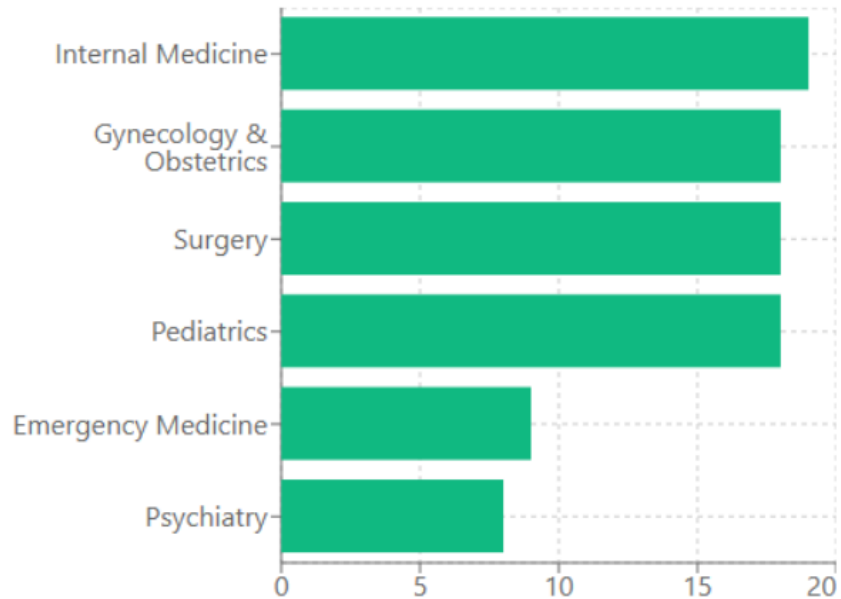
* Multiple responses allowed

Figure 1: Age Distribution of Medical Interns



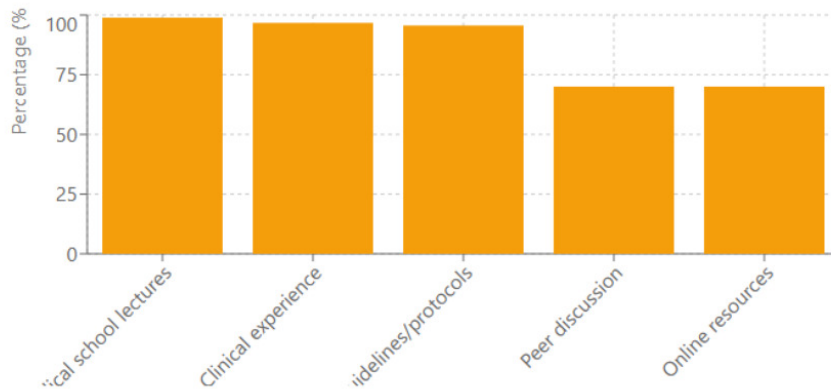
Bar chart showing frequency distribution across age groups (24-27 years). Age 26 years represents the majority with 55 interns (61.1%), followed by age 25 with 19 interns (21.1%), age 27 with 13 interns (14.4%), and age 24 with 3 interns (3.3%).

Figure 2: Current Clinical Rotation Distribution



Horizontal bar chart displaying distribution across clinical rotations. Internal Medicine (19, 21.1%), Gynecology & Obstetrics (18, 20.0%), Surgery (18, 20.0%), and Pediatrics (18, 20.0%) show similar frequencies. Emergency Medicine (9, 10.0%) and Psychiatry (8, 8.9%)

Figure 3: Primary Sources of PPH Information



Vertical bar chart showing percentage of interns citing each information source. Medical school lectures (98.9%) leads, followed by clinical experience (96.7%), guidelines/protocols (95.6%), peer discussion (70.0%), and online resources (70.0%).

5.2: Knowledge Assessment regarding PPH

The participants' knowledge of PPH definition, etiology, risk factors, and management was assessed using a 10-item questionnaire. The results are summarized in Table 2, Table 3, and Table 4.

The majority of interns (91.1%, n=82) correctly identified the standard definition of PPH. However, a lower proportion (76.7%, n=69) correctly identified the 24-hour time frame for primary PPH. Awareness of the "4 T's" mnemonic was high at 93.3% (n=84), and 84.4% (n=76) correctly identified uterine atony as the single most common cause of PPH.

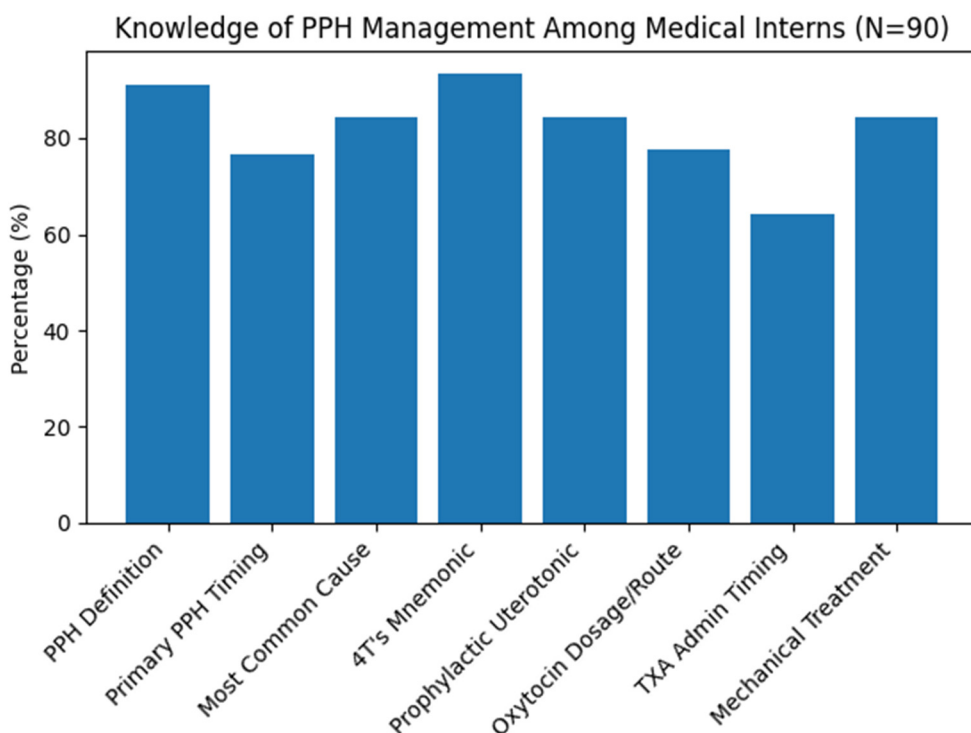
Regarding pharmacological management, 84.4% (n=76) correctly identified oxytocin as the first-line prophylactic utero tonic in routine delivery. Knowledge regarding the recommended initial dose and route for oxytocin in AMTSL was 77.8% (n=70). The lowest performance in the knowledge domain was related to the timing of Tranexamic Acid (TXA) administration, with only 64.4% (n=58) correctly identifying the 3-hour window according to WHO guidelines. Conversely, 84.4% (n=76) were aware of Uterine Balloon Tamponade (UBT) as a non-surgical mechanical method for controlling refractory PPH due to atony.

Table 2: Knowledge of PPH management among medical interns (N=90)

Knowledge Variables/Questions	Correct Answer	Frequency (n)	Percentage (%)
PPH Definition	≥ 500 mL (vag) or ≥ 1000 mL (CS)	82	91.1
Primary PPH Timing	Within 24 hours of delivery	69	76.7
Most Common Cause	Uterine atony	76	84.4

Mnemonic for Causes	Tone, Trauma, Tissue, Thrombin	84	93.3
Prophylactic Uterotonic	Oxytocin	76	84.4
Oxytocin Dosage/Route	10 IU IM or IV	70	77.8
TXA Admin Timing	Within 3 hours of birth	58	64.4
Mechanical Treatment	Uterine Balloon Tamponade (UBT)	76	84.4

Figure 4: Knowledge Assessment Results - Percentage of Correct Answers



Bar chart displaying the percentage of correct responses for each knowledge question. Highest performance was observed for the mnemonic for causes (96.7%), followed by PPH definition (91.1%) and prophylactic uterotonic (90.0%). Lowest performance was noted in TXA

administration timing (64.4%), followed by primary PPH timing (76.7%) and oxytocin dosage/route (77.8%)

Knowledge of Risk Factors and AMTSL Components (Multiple Response Analysis)

Participants' knowledge regarding the clinical risk factors for postpartum hemorrhage (PPH) and the specific components of Active Management of the Third Stage of Labor (AMTSL) was assessed using multiple-response questions where participants were required to "select all that apply."

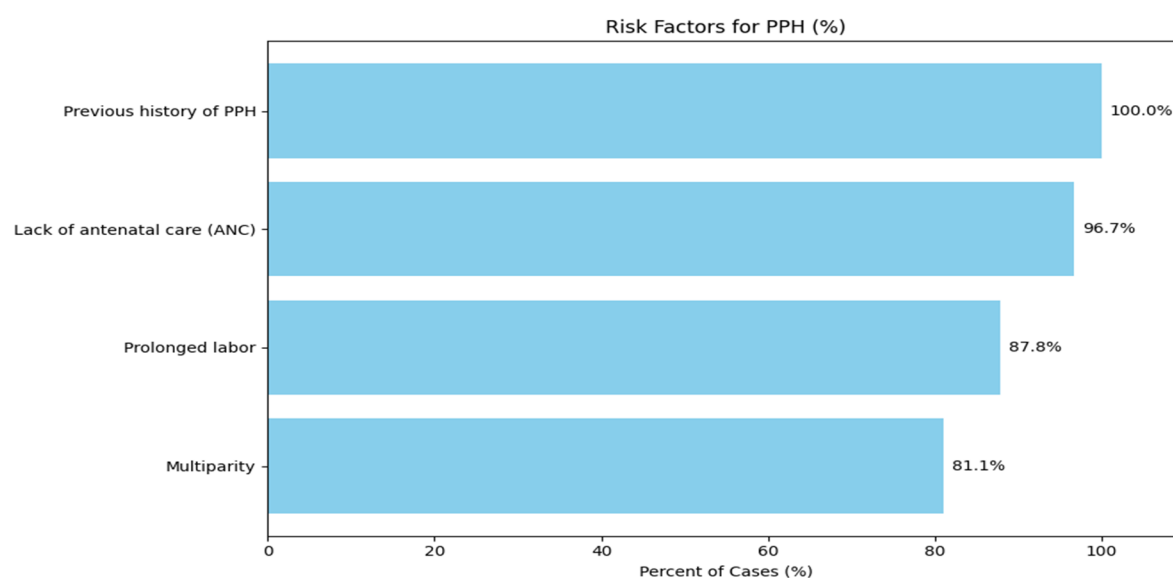
All participants (100%) correctly identified previous history of PPH as a significant risk factor. This was followed by the identification of lack of antenatal care (ANC) by 96.7% of interns and prolonged labor by 87.8%. Multiparity was correctly identified as a risk factor by 81.1% of the respondents.

Regarding components of AMTSL, the three core components were identified with high frequency. Uterine massage after delivery of the placenta was recognized by 97.8% of participants, while the administration of a uterotonic drug and controlled cord traction were identified by 95.6% and 94.4% respectively. A small proportion of participants (20.0%) incorrectly identified delayed cord clamping as one of the three core components of AMTSL or selected an "all of the above" style response. Table 3: multiple response questions - risk factors and components of AMTSL

Knowledge Categories and Items	Frequency (n)	Percent of Cases (%)
Risk Factors for PPH (Select all that apply)		
Previous history of PPH	90	100.0%
Lack of antenatal care (ANC)	87	96.7%
Prolonged labor	79	87.8%
Multiparity	73	81.1%

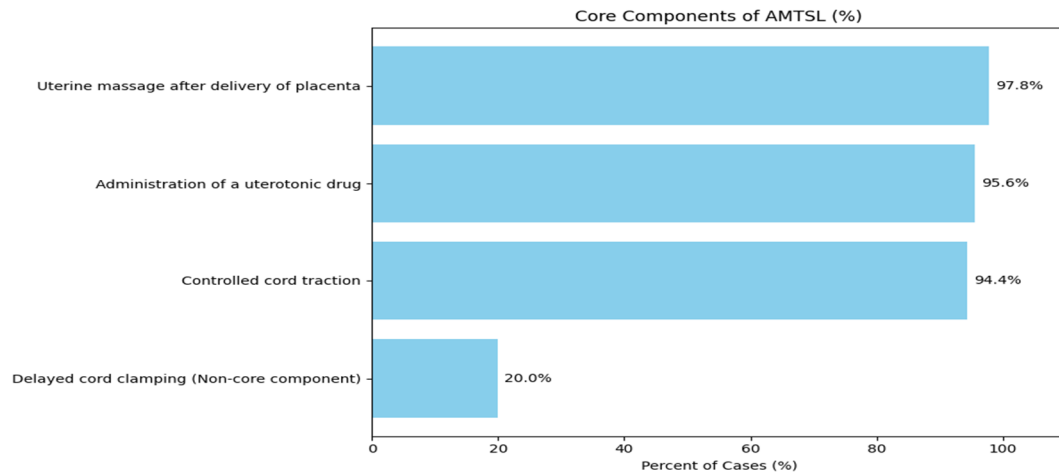
Core Components of AMTSL (Select all that apply)		
Uterine massage after delivery of placenta	88	97.8%
Administration of a uterotonic drug	86	95.6%
Controlled cord traction	85	94.4%
Delayed cord clamping (Non-core component)	18	20.0%

Figure 5: Risk factors for PPH - percentage of correct answers



Bar chart showing percentage of correct responses for each PPH risk factor. Highest performance: Previous History of PPH (100%), Lack of ANC (96.7%). Lowest performance: Multi parity (81.1%), Prolonged Labor (87.8%).

Figure 6: components of AMTSL - percentage of answers



Bar chart showing percentage of responses for components of AMTSL. Uterine Massage (97.8%), Uterotonic Administration (95.6%), Controlled Cord Traction (94.4%). Incorrect answer: Delayed Cord Clamping (Non-core) (20.0%).

Overall Knowledge Level

The mean knowledge score for the medical interns was 8.41 (± 1.45 SD) out of a maximum of 10. Based on the pre defined 70% cutoff point (scoring ≥ 7 out of 10), the majority of the study participants (74.4%, n=67) were classified as having adequate knowledge, while 25.6% (n=23) demonstrated inadequate knowledge regarding PPH management.

Table 4: Overall Knowledge Score Distribution

Metric	Value
Mean Knowledge Score	8.41 $\pm$ 1.45
Adequate Knowledge(Score ≥ 7)	74.4% (n=67)
Inadequate Knowledge(Score < 7)	25.6% (n=23)

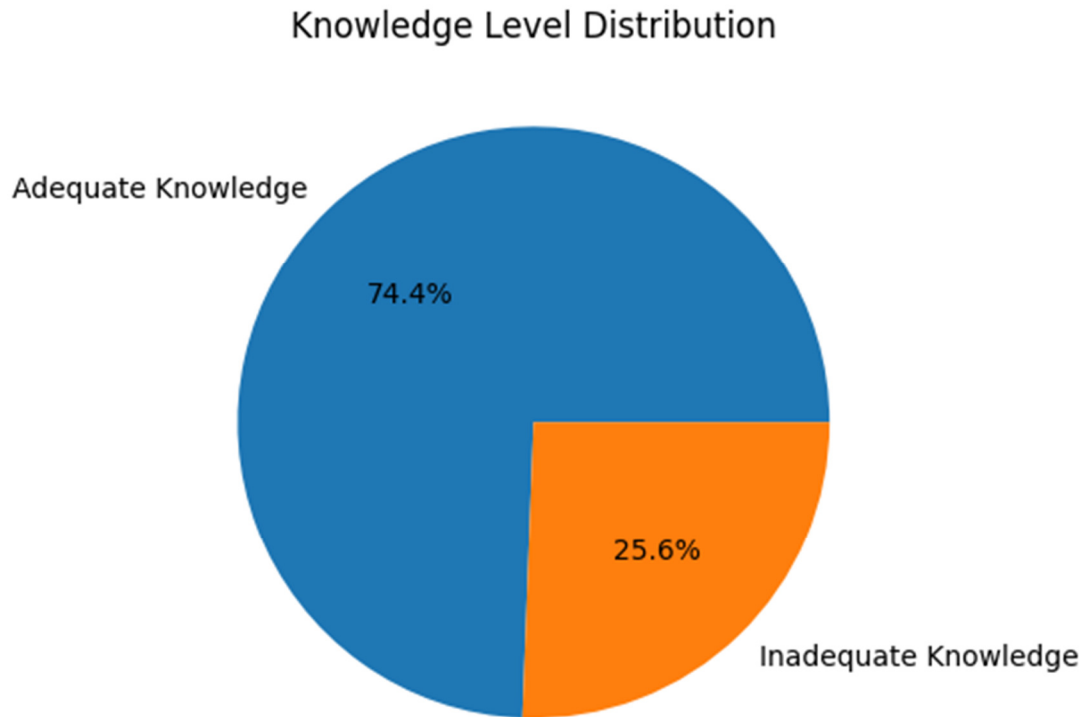


Figure 5: Overall Knowledge Level regarding PPH management among medical interns at st. paul's hospital millennium medical college, Ethiopia, 2025/26

5.3: Perceived Preparedness towards PPH Management

The perceived preparedness of medical interns was evaluated using a 10-item Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). As shown in Table 5, the participants demonstrated varied levels of clinical confidence. Participants were classified as "Prepared" only if they achieved an average score of 4 (Agree) or 5 (Strongly Agree) across the items.

The highest level of preparedness was reported for the administration of first-line uterotonics, with 53.4% of interns agreeing or strongly agreeing with their ability to perform this task. Similarly, interns showed moderate confidence in initiating PPH management protocols (46.6%) and quantifying blood loss accurately (46.6%).

However, significant gaps in preparedness were identified in higher-stakes clinical tasks. Only 32.2% of interns felt prepared to manage hemorrhagic shock, which was the item with the lowest reported confidence. Furthermore, only 36.7% of participants believed their medical school education had adequately prepared them for the clinical management of PPH. This same percentage (36.7%) felt confident in their ability to cope with the stress of a PPH emergency.

Overall, as shown in Table 6, only 34.4% (n=31) of the medical interns were categorized as "prepared" for PPH management based on the criterion-based threshold (average score ≥ 4), while the majority (65.6%, n=59) were classified as "not prepared".

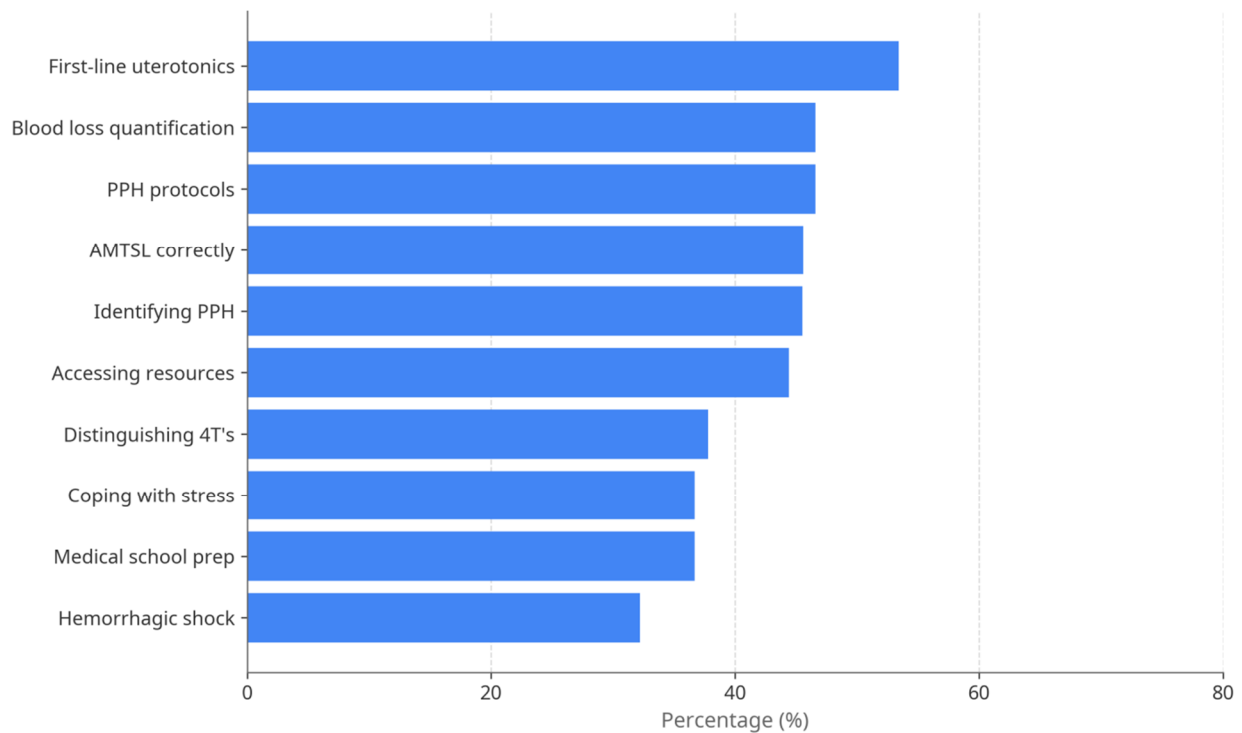
Table 5: Perceived preparedness for PPH management among medical interns at st. paul's hospital millennium medical college, Ethiopia, 2025/26 (N=90)

Preparedness Statements (Confidence in...)	St. Disa (%)	Disagree (%)	Neutral (%)	Agree (%)	Str Agree (%)	Total Prepared (%)
Administering first-line uterotonics	16.7	25.6	4.4	36.7	16.7	53.4
Initiating PPH management protocols	11.1	40.0	2.2	33.3	13.3	46.6
Quantifying blood loss accurately	13.3	33.3	6.7	34.4	12.2	46.6
Performing AMTSL correctly	15.6	37.8	1.1	30.0	15.6	45.6

Identifying PPH in clinical settings	24.4	30.0	0.0	34.4	11.1	45.5
Accessing necessary resources	18.9	22.2	14.4	32.2	12.2	44.4
Distinguishing the "4 T's" causes	20.0	37.8	4.4	28.9	8.9	37.8
Medical school education preparation	15.6	35.6	12.2	26.7	10.0	36.7
Coping with stress of emergency	24.4	36.7	2.2	27.8	8.9	36.7
Managing hemorrhagic shock	21.1	38.9	7.8	24.4	7.8	32.2

Abbreviations: St. disa = Strongly Disagree, Disagree = Disagree, Neutral= Neutral, Agree = Agree, Stro agre = Strongly Agree. Total Prepared = Agree + Strongly Agree.

Figure 8: Preparedness Confidence Levels by Task (Agree + Strongly Agree)



Horizontal bar chart displaying confidence levels for each preparedness statement. Highest confidence: administering first line uterotonics (53.4%), initiating PPH management protocol(46.6%), and quantifying blood loss accurately(46.6%). lowest confidence: managing hemorrhagic shock(32.2%), coping with stress of emergency(36.7), and medical school education preparation(36.7)

The mean score of perceived preparedness among medical interns regarding management of PPH is 3.05 with SD of ± 1.15 . As shown in Table 6, out of 90 study participants, 31 (34.4%) were classified as prepared, while 59 (65.6%) were not prepared for managing PPH.

Table 5: Overall Preparedness Classification

Classification	Value
Mean Preparedness Score	3.05 ± 1.15
Prepared (Agree + Strongly Agree)	34.4% (n=31)
Not Prepared (Average Score < 4)	65.6% (n=56)

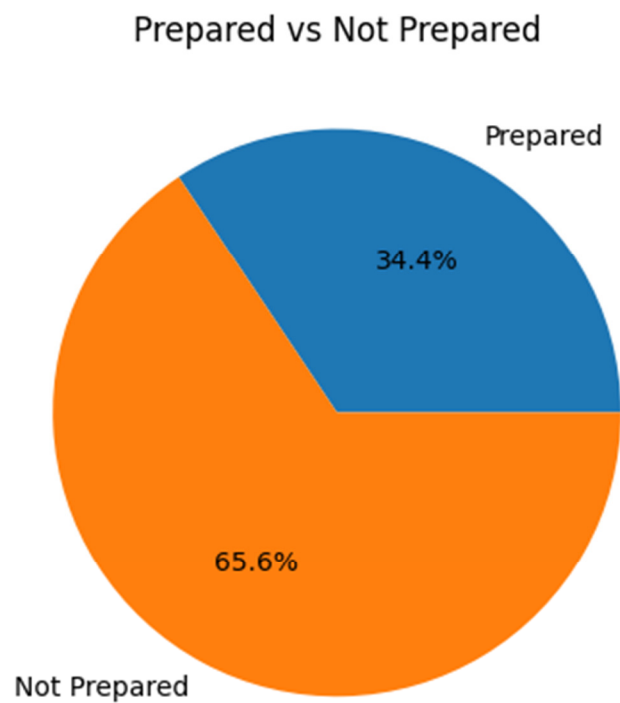


Figure 8: 34.4% of interns reported being prepared for PPH management, while 65.6% reported not being prepared. This indicates that a clear majority of interns do not feel clinically ready to manage PPH emergencies, despite the measured level of knowledge

5.4: Factors Associated with Knowledge and Perceived Preparedness: Logistic Regression Analysis

To identify the independent predictors of knowledge and perceived preparedness among medical interns, binary logistic regression analysis was performed. This analysis allows for a more robust understanding of the relationships by accounting for the odds of achieving adequate knowledge or feeling prepared based on specific independent variables.

5.4.1: Predictors of Adequate Knowledge

Binary logistic regression was conducted to assess whether socio-demographic factors, clinical rotation, or information source diversity could predict the likelihood of an intern having adequate knowledge regarding PPH management. As shown in Table 7, none of the assessed variables were significant independent predictors of knowledge level.

Table 7: Logistic Regression Analysis of Factors Associated with Adequate Knowledge (N=90)

Variable	B	S.E.	Wald	df	Sig. (p)	Exp(B) (AOR)
Age	0.134	0.356	0.141	1	0.707	1.143
Sex (Male vs Female)	-0.057	0.484	0.014	1	0.906	0.944
Clinical Rotation	0.105	0.174	0.367	1	0.545	1.111
Source Diversity Score	0.134	0.275	0.237	1	0.627	1.143

5.4.2: Predictors of Perceived Preparedness

Logistic regression was also applied to identify predictors of perceived preparedness. While most factors remained non-significant, the analysis revealed a significant relationship involving the diversity of information sources.

- **Source Diversity Score:** Interestingly, the source diversity score was a significant predictor of preparedness ($B = -0.499$, $p = 0.042$). The Adjusted Odds Ratio (AOR) of 0.607 indicates that for every one-unit increase in the diversity of information sources, the odds of an intern feeling prepared decrease by approximately 39.3%. This suggests that exposure to a wider, perhaps less structured, variety of information sources may be associated with lower clinical confidence in this cohort.

- **Knowledge Level:** Having adequate knowledge did not significantly predict a higher likelihood of feeling prepared ($AOR = 0.464$, $p = 0.121$), reinforcing the "Knowledge-Preparedness Gap" identified earlier.

- **Other Factors:** Age ($AOR = 1.014$, $p = 0.966$), sex ($AOR = 0.891$, $p = 0.708$), and clinical rotation ($AOR = 0.809$, $p = 0.190$) were not significant predictors of preparedness.

Table 7: Logistic Regression Analysis of Factors Associated with Adequate Knowledge (N = 90)

Variable	B	S.E.	Wald	df	Sig. (p)	Exp(B) (AOR)
Source Diversity Score	-0.499	0.245	4.134	1	0.042*	0.607
Knowledge Level (Adequate)	-0.767	0.495	2.399	1	0.121	0.464
Age	0.014	0.323	0.002	1	0.966	1.014
Sex (Male vs Female)	-0.116	0.311	0.140	1	0.708	0.891

Clinical Rotation	-0.212	0.162	1.716	1	0.190	0.809
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Note: *Statistically significant at $p < 0.05$.

6. Discussion

Overview of Key Findings

This study investigated the knowledge and perceived preparedness of medical interns regarding postpartum hemorrhage (PPH) management at St. Paul's Hospital Millennium Medical College (SPHMMC). The findings reveal a critical and concerning discrepancy between interns' theoretical knowledge and their perceived clinical preparedness to manage PPH in real-world settings. Although 74.4% of interns demonstrated adequate knowledge with a mean score of 8.41 out of 10, only 34.4% reported feeling adequately prepared to manage PPH clinically. This knowledge–preparedness gap represents a significant vulnerability in the healthcare system's capacity to address one of the leading causes of maternal mortality globally.

Contextualizing Knowledge Levels within the Ethiopian and Global Landscape

Comparison with Existing Evidence in Ethiopia and Sub-Saharan Africa

The relatively high level of knowledge (74.4% adequate) observed among SPHMMC interns is notably superior to findings from other healthcare cadres in Ethiopia and the broader sub-Saharan African region. A previous study conducted in Addis Ababa reported that only 34.3% of midwives possessed adequate PPH knowledge(20), while research in the Sidama Zone found that only 37.7% of obstetric care providers were knowledgeable regarding active management of the third stage of labor (AMTSL), with only 32.8% demonstrating adequate skills in this critical intervention(29). This substantial difference with interns achieving 74.4% versus 34.3 and 37.7% in other cadres suggests that medical interns may be entering clinical practice with a stronger

theoretical foundation than earlier-generation providers, likely due to recent improvements in pre-service medical education at tertiary teaching institutions.

The superior performance of SPHMMC interns can be attributed to several institutional factors. First, the specialized nature of SPHMMC as a tertiary teaching center provides exposure to high-volume obstetric cases and evidence-based clinical protocols. Second, 97.8% of participants reported having attended formal training, seminars, or simulation-based instruction specifically focused on PPH management. This near-universal participation in structured educational interventions reflects institutional commitment to competency-based training, which has been demonstrated in multi-country research to significantly improve knowledge acquisition.

A multi-country study conducted across seven sub-Saharan African and Asian countries evaluated knowledge and skills among 5,939 healthcare providers before and after 3–5 days of competency-based "skills and drills" training in emergency obstetric and newborn care (EmOC&NC)(41). This study demonstrated moderate to good baseline knowledge of emergency obstetric care among healthcare providers, with a median improvement of 5–15% following competency-based training. These findings corroborate the observation that exposure to obstetric training and clinical experience contributes positively to theoretical knowledge acquisition.

Specific Knowledge Strengths and Gaps

Within the knowledge domain, interns demonstrated particular strength in foundational concepts. The majority (91.1%) correctly identified the standard definition of PPH, and 93.3% demonstrated awareness of the "4 T's" mnemonic (Tone, Trauma, Tissue, Thrombin) for classifying causes of PPH. Additionally, 84.4% correctly identified uterine atony as the leading cause of PPH, and 84.4% recognized oxytocin as the first-line prophylactic uterotonic. These high percentages reflect successful transmission of core clinical knowledge through medical school curricula and institutional training programs.

However, important knowledge gaps persisted in areas requiring more nuanced clinical judgment. Only 64.4% of interns correctly identified the 3-hour window for tranexamic acid (TXA) administration; a critical intervention for reducing PPH related mortality. Similarly, only

77.8% correctly identified the 24-hour time frame for defining primary PPH, suggesting that some interns may lack precision in applying standardized definitions during clinical practice. These gaps, while less pronounced than those observed in other healthcare cadres, nonetheless represent areas where targeted educational reinforcement could improve clinical decision-making and adherence to evidence-based protocols.

The Knowledge–Preparedness Gap: A Critical Disconnect

Magnitude and Significance of the Gap

The most defining result of this research is the substantial discrepancy between theoretical knowledge and perceived preparedness. While a robust 74.4% of interns achieved adequate knowledge scores, only 34.4% reported feeling prepared to manage PPH in a clinical setting. This suggests that academic mastery does not inherently translate into clinical confidence. Notably, the logistic regression analysis confirmed that the association between having adequate knowledge and feeling prepared was not statistically significant ($p=.121$). This finding underscores that being "knowledgeable" on paper does not guarantee that an intern feels "ready" to act during a life-threatening obstetric emergency.

Mechanisms Underlying the Knowledge–Preparedness Gap

Several interconnected mechanisms likely account for this gap:

1. Distinction between Cognitive Knowledge and Applied Competence

The knowledge assessment in this study measured factual recall and conceptual understanding through multiple-choice questions; a cognitive domain that medical interns demonstrated relatively well. However, preparedness encompasses not only cognitive knowledge but also psycho-motor skills, decision-making capacity under pressure, and psychological resilience during high-stress emergencies. As defined in this study, perceived preparedness reflects domain-specific self-efficacy, which encompasses both confidence in one's ability to perform necessary tasks and the capacity to cope with failure and setbacks(15)(16)(17). These dimensions extend beyond what traditional written examinations or knowledge questionnaires can assess.

2. Limitations of Undergraduate Clinical Training

Previous literature indicates that while undergraduate curricula may successfully convey foundational concepts, they are often less effective in cultivating hands-on skills, decision-making capacity, and psychological readiness required during high-pressure obstetric emergencies(40). The interns in this study, despite high knowledge scores, may have had limited exposure to realistic clinical scenarios involving actual hemorrhage, hemodynamic instability, and the psychological demands of emergency management. Only 36.7% of interns felt their medical school education adequately prepared them for clinical PPH management.

3. Complexity of PPH Management in Real-Time Clinical Settings

The management of PPH requires rapid assessment, simultaneous execution of multiple interventions, effective team communication, and adaptive decision-making when initial interventions fail. In the preparedness assessment, interns expressed highest confidence in performing discrete, well-defined tasks such as administering first-line uterotonics (53.4%), initiating PPH management protocols (46.6%), and quantifying blood loss accurately (46.6%). In contrast, confidence was lowest for more complex or integrative tasks, including managing hemorrhagic shock (32.2%), coping with the stress of emergencies (36.7%), and preparation from medical school education (36.7%). This pattern suggests that while interns feel reasonably confident with individual procedural skills, they experience lower preparedness for dynamic, high-stakes situations requiring simultaneous interventions, critical decision-making, and stress management, highlighting areas for targeted training in real-time PPH management.

4. Psychological and Emotional Dimensions of Preparedness

Perceived preparedness also reflects psychological readiness, the confidence to make critical decisions, the ability to lead a team during chaos, and the emotional resilience to manage the stress of potentially life-threatening situations. Only 36.7% of interns felt prepared to cope with emergency stress and related challenges, indicating that a substantial proportion lack confidence in their ability to function effectively in high-pressure, life-threatening situations. These findings highlight that psychological readiness cannot be developed through knowledge-based training

alone but requires experiential learning, mentor ship, and progressive exposure to increasingly complex clinical scenarios.

Factors Influencing Preparedness

Although several factors were assessed, only the source diversity score which included exposure to medical school lectures, clinical experience, institutional guidelines/protocols, peer discussions, and online resources showed a statistically significant association with perceived preparedness. Interestingly, increased diversity of these information sources was associated with a decreased likelihood of feeling prepared (AOR = 0.607, $p = 0.042$). This finding may reflect the possibility that exposure to multiple, and potentially inconsistent, sources of information could lead to cognitive overload or uncertainty, thereby reducing confidence in clinical decision-making. Although this association should be interpreted with caution, it highlights the potential importance of structured, standardized learning approaches over fragmented information exposure.

Comparison with International Evidence

Global Prevalence of the Knowledge–Preparedness Gap

The perceived lack of preparedness observed in this study is not unique to Ethiopia. Comparable studies conducted among recently graduated physicians in Peru and Chile reported similarly low levels of self-perceived competence in managing obstetric emergencies, despite adequate academic performance(39). In the Peruvian study, only 33.3% of recently graduated physicians reported feeling competent in obstetric emergencies, despite successful completion of medical school. This indicates that the knowledge–preparedness gap is a global issue in medical education, not a localized phenomenon specific to Ethiopian training institutions.

Contrasts with Structured Internship Programs

In contrast, the proportion of interns who perceived themselves as prepared in this study (34.4%) was considerably lower than reports from South Africa, where internship training frameworks emphasize structured supervision and defined competency benchmarks(42). A recent South African study found that 71% of interns felt their obstetrics and gynecology rotation prepared

them adequately for independent practice, substantially higher than the 34.4% observed at SPHMMC(43). This difference may be attributable to variations in training models, assessment strategies, sample size, and study methodology. However, it also suggests that structured, competency-based internship frameworks with clear benchmarks and systematic supervision may be more effective in bridging the knowledge–preparedness gap than less formalized training approaches.

The Role of Simulation-Based Training and Experiential Learning

Evidence for Simulation-Based Interventions

Evidence from peer-reviewed literature shows that medical trainees may correctly identify PPH management steps but still feel unprepared to execute them in real-time clinical scenarios. In contrast, training environments that incorporate simulation-based learning, emergency drills, and structured mentor ship consistently report higher levels of preparedness and self-confidence among trainees. A hospital-based cluster randomized trial conducted in Mexico evaluated the impact of a simulation and team-training program (PRONTO) on the adoption of evidence-based practices at birth(44). The intervention demonstrated significant improvements in clinical practice, including a 20 percentage-point increase in complete Active Management of Third Stage of Labor (AMTSL) at 4 months post-intervention and a 25 percentage-point increase in the first step of AMTSL at 12 months. These findings emphasize that theoretical instruction alone is insufficient and must be reinforced through experiential learning approaches.

Implications for SPHMMC and Similar Institutions

The findings from the Mexico trial and similar international evidence suggest that while SPHMMC interns have achieved relatively high knowledge scores, their lower perceived preparedness may reflect insufficient exposure to high-fidelity simulation, realistic emergency drills, and structured mentor ship during clinical rotations. Incorporating high-fidelity simulation and competency-based education strategies could offer interns a safe and effective environment to practice critical components of PPH management, including rapid decision-making, fluid resuscitation, team leadership, and psychological resilience during emergencies. Such

interventions have demonstrated sustained improvements in clinical practice and provider confidence.

Barriers to Effective PPH Management: Systemic and Individual Factors

Multifaceted Barriers Beyond Knowledge

While knowledge is necessary, it is not sufficient for effective PPH management. A qualitative study exploring barriers to effective management of primary PPH following in-hospital births in northwest Ethiopia identified multiple modifiable issues linked to delays in receiving appropriate and quality care, including workforce limitations, communication issues between healthcare providers, systemic resource constraints, inadequate education and training, and lack of identification and referral protocols(33). These findings underscore that even knowledgeable and well-prepared providers may face substantial barriers to implementing evidence-based care due to systemic constraints.

System-Level Barriers at SPHMMC

Although SPHMMC is a tertiary teaching hospital with relatively good resource availability compared to lower-level facilities, system-level barriers may still impede effective PPH management. These include inconsistent availability of essential drugs (e.g., oxytocin, misoprostol, tranexamic acid), potential shortages in skilled personnel during peak obstetric activity, documentation and communication issues between clinical teams, and potentially undefined roles for medical interns during obstetric emergencies. Additionally, the psychological burden of managing life-threatening emergencies without clear institutional support structures or debriefing protocols may contribute to interns' perception of being unprepared, even when knowledge is adequate.

7. Strengths and Limitations of This Study

Strengths

This study possesses several notable strengths. Firstly, the use of a census sampling approach, including all eligible medical interns at SPHMMC, minimizes sampling bias and enhances the representativeness of the findings for the target population. Secondly, the focus on medical interns, a critical cadre of frontline healthcare providers, addresses a significant gap in the literature regarding their specific knowledge and preparedness for PPH management in low-resource settings. Thirdly, the study's design allowed for a comprehensive assessment of both theoretical knowledge and perceived clinical preparedness, enabling the identification of the crucial knowledge-preparedness gap. Finally, the use of a structured, pretested questionnaire adapted from validated tools ensures the reliability and validity of the data collected.

Limitations

Despite its strengths, this study is subject to several limitations. Firstly, its cross-sectional design precludes the establishment of causal relationships between variables. While associations were identified, particularly with the diversity of information sources, longitudinal studies would be necessary to understand the temporal dynamics of knowledge acquisition and preparedness development. Secondly, the reliance on self-reported data for perceived preparedness introduces the potential for social desirability bias, where participants may over- or under-estimate their abilities. Thirdly, the study was conducted at a single institution (SPHMMC), which may limit the generalizability of the findings to other medical colleges or healthcare settings with different curricula, training environments, or resource availability. Fourthly, while the study identified a significant association between information source diversity and perceived preparedness, the qualitative nature of this relationship and the specific mechanisms underlying it require further in-depth exploration. Lastly, Although a census of the batch was conducted, the total number (N=90) may have limited the statistical power to detect smaller associations between certain demographic variables and the outcome of preparedness.

8. Conclusion

This study highlights a significant knowledge-preparedness gap among medical interns at St. Paul's Hospital Millennium Medical College regarding postpartum hemorrhage management. While interns demonstrate a strong theoretical foundation(74.4%), their perceived clinical readiness(34.4) remains suboptimal, underscoring a critical area for intervention in medical education. The finding that a greater diversity of information sources was associated with lower perceived preparedness suggests a need for more structured and integrated educational approaches. Addressing this disconnect through enhanced simulation-based training, structured mentorship, and targeted psychological preparedness initiatives is essential to empower the next generation of physicians. Ultimately, by bridging this gap, healthcare systems can significantly improve maternal health outcomes and reduce mortality related to postpartum hemorrhage, particularly in resource-limited settings like Ethiopia. The insights from this research provide a foundation for developing more effective educational strategies that translate theoretical knowledge into confident and competent clinical practice.

9. Recommendation

1. Institutional Protocol Standardization (Primary Recommendation)

The study found that a high diversity of unstandardized information sources significantly predicts lower clinical preparedness. Therefore, SPHMMC should establish a single, authoritative PPH management "Gold Standard" protocol. This protocol should be digitized and made available as a primary resource to minimize cognitive load and eliminate the confusion caused by conflicting external sources.

2. Transition from Knowledge-Based to Simulation-Based Mastery

Despite high theoretical knowledge (74.4%) and high training attendance, preparedness remains sub-optimal. SPHMMC should transition from lecture-heavy seminars to high-fidelity, simulation-based training. Training should focus on "stress-testing" clinical skills in real-time emergency scenarios to bridge the gap between knowing the steps and performing them confidently.

3. Curated Resource Packages

To address the negative impact of fragmented source diversity, the medical education department should provide interns with a curated digital resource package (e.g., specific videos, e-manuals, and decision-support tools). By narrowing the information funnel to high-quality, institution-approved materials, interns can build more consistent and reliable clinical mental models.

4. Structured Bedside Mentorship

To translate high theoretical knowledge into clinical readiness, clinical rotations should prioritize graduated exposure and direct observation. Mentors should focus on practical "on-the-spot" coaching during actual PPH cases, ensuring that interns can apply their theoretical foundation to the psychological and practical demands of the delivery room.

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ANNEXES

Annex one: Information Sheet and Informed Voluntary Consent

Good Morning/Afternoon, My name is _____ I am here on the behalf of Dr. H/Michael Bishaw who is a medical intern student at St. Paul's Hospital Millennium Medical College. He is working this research on knowledge and perceived preparedness of st Paul Hospital's medical interns towards management of post-partum hemorrhage in 2025/26 clinical placement period; A cross sectional study. Prior to this I will be explaining information about the study and requesting you to participate in the study.

Purpose of study: on knowledge and perceived preparedness of st Paul Hospital's medical interns towards management of post-partum hemorrhage in 2025/26 clinical placement period; cross sectional study.

Benefit: This study will help to determine knowledge and perceived preparedness of st Paul Hospital's medical interns towards management of post-partum hemorrhage in 2025/26 clinical placement period; cross sectional study which is one of deadly traids of maternal mortality and morbidity.

Harm: The study will take time of you and it will cause no harm on you.

Confidentiality: - All the responses given by you and results obtained will be kept confidential. Without permission from you and legal body, any part of this study will not be disclosed to third person. You are not expected to give your name or phone number.

Right of participant: Your participation in this research is voluntary. You have full right to refuse to a question that you don't want to answer and withdraw from the participation at any time if you don't wish to continue. If you have any question you can ask at any time or communicate the principal investigator. I hope you will be considering the issue you will participate in and if you agree you will sign the consent form.

Contact address: If you have any questions about the study, the procedure, or anything else related to the study, please contact through the following address:

Annex two:-Declaration of informed voluntary consent

I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating, and contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I will be informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore,

1. I agree to participate ☐

2. I refuse to participate ☐

If the participant agrees to participate skip to the next page. If no, skip to the next participant by writing reasons refusal below.

Name of investigator: H/Michael Bishaw

Address: Mob +251900005582 E-mails: hmichaelbishaw@gmail.com

Date of interview _____

Time started _____

Time completed _____

Name of data collector_____

Checked by

Supervisor name _____ Signature _____ Date_____

Section 1: Socio-demographic Characteristics

1. Age: _____ years
2. Sex:
☐ Male ☐ Female
3. Current clinical rotation:
☐ Gynecology & Obstetrics ☐ Surgery ☐ Internal Medicine ☐ Pediatrics
☐ Other(please specify): _____
4. Have you completed at least 6 week of Obstetrics and Gynecology rotation?
☐ Yes ☐ No
5. Have you ever attended a formal training, seminar, or simulation on postpartum hemorrhage (PPH) management?
☐ Yes ☐ No
6. What is your primary source of information on PPH? (Choose all that apply)
☐ Medical school lectures
☐ Clinical experience
☐ Guidelines/protocols
☐ Peer discussion
☐ Online resources
☐ Other(please specify): _____

Section 2: Knowledge on PPH

1: Which of the following is the most common definition of Postpartum Hemorrhage (PPH)?

- A. Blood loss of ≥ 500 ml following vaginal birth or ≥ 1000 ml after cesarean section within the first 24 hours postpartum.
- B. Blood loss of ≥ 1000 ml following vaginal birth or ≥ 1500 ml after cesarean section within the first 24 hours postpartum.
- C. Any blood loss that cause 10% decline in postpartum hemoglobin concentration from baseline levels.
- D. Blood loss ≥ 600 ml after vaginal birth

2: Primary PPH is defined as excessive bleeding occurring:

- A. Within 24 hours of delivery.
- B. Between 24 hours and 12 weeks postpartum.
- C. After 12 weeks postpartum.
- D. Before the delivery of the placenta.

3: What is the single most common cause of Postpartum Hemorrhage (PPH)?

- A. Retained placental tissue
- B. Uterine atony
- C. Genital tract trauma
- D. Coagulopathy

4: Which of the following conditions increases a woman's risk of experiencing postpartum hemorrhage?(select all that apply)

- A. Multiparity
- B. Previous history of PPH
- C. Lack of antenatal care (ANC)
- D. Prolonged labor

5: Which of the following are the three core components of Active Management of the Third Stage of Labor (AMTSL)? (Select all that apply)

- A. Administration of a uterotonic drug.
- B. Controlled cord traction.
- C. Uterine massage after delivery of the placenta.
- D. Delayed cord clamping.

6: What is the first-line uterotonic drug for PPH prevention (prophylaxis) in a routine delivery?

- A. Misoprostol
- B. Methylergonovine
- C. Oxytocin
- D. Carboprost
- E. Heat-stable Carbetocin

7: What is the recommended initial dose and route of administration for Oxytocin in the active management of the third stage of labor (AMTSL)?

- A. 5 IU Intramuscular (IM)

- B. 10 IU Intramuscular (IM) or Intravenous (IV)
- C. 20 IU in 500ml IV infusion
- D. 10 IU Intravenous (IV) bolus

8: According to WHO guidelines, when should Tranexamic Acid (TXA) be administered to a patient with PPH?

- A. Within 3 hours of birth after the onset of PPH.
- B. After 3 hours of the onset of bleeding.
- C. Only after surgical management has failed.
- D. Only if the PPH is due to trauma.

9: The "4 T's" mnemonic for the causes of PPH includes:

- A. Tone, Trauma, Thrombin, Temperature
- B. Tone, Trauma, Tissue, Thrombin
- C. Time, Tone, Trauma, Tissue
- D. Trauma, Thrombin, Tension, Tone

10: Which of the following is a non-surgical, mechanical method for controlling refractory PPH due to atony?

- A. B-Lynch suture
- B. Uterine artery embolization
- C. Uterine Balloon Tamponade (UBT)

D. Hysterectomy

Section 3: Perceived Preparedness

Please indicate your level of agreement with the following statements regarding your preparedness to manage PPH (Use a 5-point Likert scale: 1 = Strongly Disagree, 5 = Strongly Agree)

Statement	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
I feel confident in my ability to accurately identify PPH in a clinical setting.					
I feel confident in my ability to distinguish between the four main causes of PPH					
I feel confident in my ability to quantify blood loss accurately in a PPH scenario.					
I feel confident in my ability to initiate the PPH management protocol					
I feel confident in my ability to correctly administer first-line uterotonics for treatment.					
I feel confident in my ability to perform the Active Management of the Third Stage of Labor (AMTSL) correctly.					
I feel confident in my ability to manage a patient in hemorrhagic shock (e.g., fluid resuscitation, monitoring).					
My medical school education has adequately prepared me for the clinical management of PPH					

I believe I have access to the necessary resources (e.g., medications, blood products, equipment) to manage PPH effectively in my current clinical setting					
I feel confident in my ability to cope with the stress and pressure of a PPH emergency.					