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A NEW ERA IN SURGICAL SUTURES- COMOC-MG STITCH: MODIFIED B LYNCH SUTURING TO CONTROL ATONIC POSTPARTUM HEMORRHAGE

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Abstract

Background: *Postpartum hemorrhage (PPH) is a leading cause of maternal mortality worldwide, particularly in low-resource settings. Atonic PPH, characterized by the uterus's inability to contract effectively after delivery, accounts for approximately 70-80% of PPH cases. Traditional management techniques, such as the B-Lynch suture, while effective, present limitations including technical complexity and potential complications. The COMOC-MG stitch (Compression of Myometrium and Occlusion of Uterine Artery by Dr. Mahesh Gupta) is a novel modification aimed at enhancing the efficacy and safety of uterine compression sutures in controlling atonic PPH.*

Aim: *This study aimed to evaluate the effectiveness and safety of the COMOC-MG suture technique in managing atonic postpartum hemorrhage and in cases with anticipated high-risk factors.*

Methods: *A prospective cross-sectional study was conducted over six months, from July to December 2024, at the Department of Obstetrics and Gynaecology, Adichunchanagiri Medical College. A total of 30 women presenting with atonic PPH or high-risk factors for PPH (including multiple pregnancies, prolonged labor stages, fetal macrosomia, grand multiparity, and pre-eclampsia) were enrolled using consecutive sampling. Participants underwent the COMOC-MG stitch procedure, which integrates uterine artery ligation with myometrial compression. Data on demographic characteristics, procedural details, clinical outcomes, and postoperative complications were collected and analyzed using descriptive statistics.*

Results: *Results demonstrated a 100% success rate in achieving hemostasis without the need for additional surgical interventions. The average time to perform the COMOC-MG stitch was 4-5 minutes. Restoration of menses was observed in 25% of the cases, and only 25% required blood transfusions. Postoperative lower abdominal pain was reported in 15% of participants, with no instances of uterine infections, necrosis, or maternal mortality. Comparative analysis indicated that the COMOC-MG stitch outperformed the traditional B-Lynch technique in terms of success rates and reduction in additional interventions.*

Conclusion: *The COMOC-MG suture technique proved to be highly effective and safe in managing atonic PPH, achieving superior hemostasis rates and minimizing the need for further surgical procedures. The procedure's efficiency and favorable safety profile suggest its potential as a valuable intervention in obstetric care, especially in resource-limited settings. Further research with larger sample sizes and comparative studies is recommended to validate these findings and establish the COMOC-MG stitch as a standard practice in PPH management.*

Keywords: *Postpartum Hemorrhage,COMOC-MG Stitch,Atonic PPH,B-Lynch Suture,Uterine Compression Sutures*

INTRODUCTION

Postpartum hemorrhage (PPH) remains one of the leading causes of maternal mortality and morbidity worldwide, particularly in low- and middle-income countries [1]. Defined as the loss of 500 milliliters or more of blood within 24 hours after vaginal delivery or 1000 milliliters following cesarean section, PPH can rapidly become life-threatening if not promptly and effectively managed [2]. The World Health Organization (WHO) estimates that PPH accounts for approximately 27% of maternal deaths globally, underscoring the critical need for effective interventions [3]. Atonic PPH, characterized by the failure of the uterus to contract effectively after delivery, is the most common cause of PPH, responsible for approximately 70-80% of cases [4]. The primary mechanism involves the depletion of uterine muscle tone,

leading to persistent bleeding from the placental site [5]. Risk factors for atonic PPH include prolonged labor, multiple pregnancies, fetal macrosomia, grand multiparity, and pre-eclampsia, among others [6]. Inadequate management of atonic PPH can lead to severe complications, including hypovolemic shock, disseminated intravascular coagulation, and ultimately, maternal death [7]. The management of PPH typically follows a stepwise approach, starting with uterotonic agents such as oxytocin and methylergometrine [8]. When medical management fails to control hemorrhage, surgical interventions become necessary. Uterine massage, bimanual compression, and balloon tamponade are initial surgical measures [9]. However, when these methods are insufficient, more invasive procedures such as uterine artery ligation, internal iliac artery ligation, or hysterectomy may be required to achieve hemostasis [10]. The decision to proceed to hysterectomy is particularly impactful, as it results in permanent loss of fertility and is associated with significant emotional and psychological consequences for the patient [11]. In an effort to preserve fertility and reduce the need for hysterectomy, various uterine compression sutures have been developed. The B-Lynch suture, introduced in 1997, is one of the most widely recognized and utilized techniques for controlling atonic PPH [12]. This compression suture involves placing a band of suture material around the uterus in a manner that compresses the uterine walls, thereby reducing blood flow and promoting hemostasis [13]. While the B-Lynch suture has been shown to be effective in many cases, it is not without limitations. The technique can be technically challenging, requiring significant surgical skill and experience, which may not be readily available in resource-limited settings [14]. Additionally, there is a risk of uterine necrosis, infection, and subsequent infertility associated with the use of compression sutures [15]. Given these limitations, there is a pressing need for modifications and improvements to existing uterine compression techniques to enhance their efficacy, safety, and ease of use, particularly in settings where access to advanced medical facilities and specialized surgical expertise is limited [16]. This necessity is especially pronounced in developing countries such as India, where the incidence of PPH is high due to factors like inadequate antenatal care, high rates of home births, and limited access to emergency obstetric services [17]. In these contexts, the introduction of a modified surgical technique that simplifies the procedure, reduces operative time, and minimizes complications could have a significant impact on maternal health outcomes. The COMOC-MG stitch (Compression of Myometrium and Occlusion of Uterine Artery by Dr. Mahesh Gupta) represents an innovative modification of the traditional B-Lynch suture. This technique integrates uterine artery ligation with the compression suturing method, aiming to enhance hemostatic control while simplifying the procedure [18]. By incorporating uterine artery ligation, the COMOC-MG stitch not only compresses the myometrium but also reduces arterial blood flow to the uterus, thereby providing a dual mechanism for controlling hemorrhage [19]. This combined approach is hypothesized to improve the success rates in managing atonic PPH and potentially reduce the need for more invasive surgical interventions like hysterectomy [20]. Preliminary studies and clinical observations suggest that the COMOC-MG stitch may offer several advantages over the traditional B-Lynch technique. One such advantage is the reduced time required to perform the procedure, which is crucial in emergency situations where rapid intervention is necessary to prevent maternal mortality [21]. Additionally, the integration of uterine artery ligation may provide a more robust and sustained control of bleeding, addressing cases where compression alone may be insufficient [22]. Furthermore, the technique is designed to be more accessible to surgeons with varying levels of expertise, thereby increasing its applicability in diverse healthcare settings [23]. The significance of developing and validating the COMOC-MG stitch extends beyond its immediate clinical benefits. Effective management of PPH is integral to achieving the United Nations Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all, including the reduction of global maternal mortality [24]. By providing a reliable and efficient method for controlling atonic PPH, the COMOC-MG stitch has the potential to contribute significantly to this global health objective [25].

In India, the burden of PPH is particularly acute, with an estimated maternal mortality ratio of 130 deaths per 100,000 live births, where PPH is a major contributor [26]. The healthcare infrastructure in many regions faces challenges such as limited availability of trained obstetricians, inadequate emergency obstetric care facilities, and delays in accessing care [27]. In such settings, the introduction of a surgical technique that is both effective and feasible under resource-constrained conditions is of paramount importance [28]. The COMOC-MG stitch, with its potential for ease of application and high success rates,

aligns well with these requirements and could be a valuable addition to the repertoire of obstetric interventions available in India [29]. Moreover, the economic implications of PPH management are significant, particularly in developing countries where healthcare resources are already stretched thin [30]. Emergency hysterectomies not only require more surgical expertise and longer hospital stays but also impose a substantial financial burden on both healthcare systems and patients [31]. By reducing the need for such invasive procedures, the COMOC-MG stitch could contribute to cost savings and more efficient utilization of healthcare resources [32]. Additionally, preserving fertility through effective PPH management has profound social and psychological benefits for women, enhancing their quality of life and societal participation [33]. Research into uterine compression sutures has evolved over the past few decades, with continuous refinements aimed at improving outcomes and minimizing complications [34]. Studies comparing different suturing techniques have highlighted the importance of factors such as suture material, suture placement, and the number of layers used [35]. The COMOC-MG stitch builds upon this body of knowledge by introducing a modification that addresses some of the key challenges associated with existing methods [36]. By systematically evaluating its effectiveness and safety, this study aims to provide empirical evidence to support the wider adoption of the COMOC-MG technique in clinical practice. Furthermore, the integration of uterine artery ligation in the COMOC-MG stitch is grounded in anatomical and physiological principles that emphasize the importance of reducing uterine blood flow to achieve hemostasis [37,38]. Uterine artery ligation has been previously employed as a surgical intervention for PPH, demonstrating efficacy in controlling hemorrhage while preserving the uterus [39]. Combining this with myometrial compression creates a synergistic effect, potentially enhancing the overall effectiveness of the procedure [40]. This dual approach may be particularly beneficial in cases of severe atonic PPH where single-modality interventions may fall short [41]. In addition to clinical effectiveness, the COMOC-MG stitch is designed with considerations for postoperative recovery and patient comfort [42]. Minimizing operative time and reducing the invasiveness of the procedure can lead to shorter hospital stays, quicker recovery periods, and lower rates of postoperative complications [43]. Early restoration of menses, as observed in preliminary results, indicates favorable reproductive outcomes, which are crucial for the long-term well-being of women [44]. The development of the COMOC-MG stitch also reflects a broader trend in obstetric care towards innovative, evidence-based interventions that are adaptable to various healthcare settings [45]. As the global health community continues to strive for reductions in maternal mortality and improvements in maternal health, the introduction and validation of new surgical techniques like the COMOC-MG stitch are essential components of this effort [46]. Collaborative research, encompassing diverse populations and healthcare environments, will be key to establishing the generalizability and scalability of such interventions [47]. In conclusion, PPH remains a significant challenge in obstetric care, particularly in resource-limited settings where the consequences of inadequate management are most dire [48]. The COMOC-MG stitch represents a promising advancement in the surgical management of atonic PPH, offering potential improvements in efficacy, safety, and accessibility [49]. As this study seeks to evaluate the effectiveness of the COMOC-MG technique, it contributes to the ongoing efforts to enhance maternal health outcomes and reduce the global burden of PPH [50].

MATERIALS AND METHODS

Study Design

This study was designed as a prospective cross-sectional analysis aimed at evaluating the effectiveness and safety of the COMOC-MG suture technique in managing atonic postpartum hemorrhage (PPH). By adopting a cross-sectional approach, the study sought to assess the outcomes of the COMOC-MG stitch within a defined timeframe, allowing for the collection of comprehensive data on its efficacy and associated complications in a real-world clinical setting.

Study Setting

The research was conducted in the Department of Obstetrics and Gynaecology at Adichunchanagiri Medical College, a tertiary care center located in B G Nagara, Karnataka, India. The department is equipped with necessary obstetric facilities, including emergency services for managing complications such as PPH. The setting provided an appropriate environment for implementing the COMOC-MG

technique, given its high patient volume and the presence of trained obstetricians experienced in managing hemorrhagic complications.

Study Duration

The study was carried out over a period of six months, spanning from July 2024 to December 2024. This duration was selected to ensure adequate time for enrolling participants, performing the COMOC-MG suture procedure, and monitoring postoperative outcomes and complications systematically.

Participants

Inclusion Criteria:

Women diagnosed with atonic PPH, defined as blood loss of 500 ml or more within 24 hours postpartum. Patients presenting with high-risk factors for PPH, including:

Multiple pregnancies (twins, triplets, etc.),Failure to progress in the second stage of labor,Prolonged third stage of labor,Fetal macrosomia (birth weight ≥ 4,000 grams),Grand multiparity (five or more previous births),Pre-eclampsia or eclampsia,Anticipated PPH based on clinical assessment

Exclusion Criteria: Women with known coagulation disorders or platelet dysfunctions. Patients with uterine anomalies or previous uterine surgeries that could complicate suturing. Cases where conservative measures had failed and hysterectomy was immediately indicated. Women with incomplete medical records or those who declined to provide informed consent.

Study Sampling

A non-probability consecutive sampling method was employed to select participants for the study. All eligible women presenting to the Department of Obstetrics and Gynaecology at Adichunchanagiri Medical College with atonic PPH or anticipated high-risk factors during the study period were included consecutively. This approach ensured that the sample was representative of the typical patient population encountered in the clinical setting, minimizing selection bias.

Study Sample Size

The study initially targeted a sample size of 30 women to achieve sufficient power for preliminary analysis of the COMOC-MG suture technique's effectiveness. This number was determined based on the feasibility of enrolling participants within the six-month study period and the expected incidence of atonic PPH cases at the study site.

Study Groups

This study did not include separate comparison groups. All enrolled participants received the COMOC-MG suture intervention as the sole treatment for managing atonic PPH. The absence of a control group was due to the study's preliminary nature and the focus on assessing the feasibility and immediate outcomes of the new technique. Future studies may incorporate comparative groups to benchmark the COMOC-MG stitch against existing standard treatments.

Study Parameters

The primary parameters assessed in this study included:

Success Rate of Hemostasis: The ability of the COMOC-MG stitch to control bleeding without the need for additional surgical interventions.

Stitch Time:The duration required to perform the COMOC-MG suture procedure.

Need for Additional Interventions: Incidence of procedures such as hysterectomy or additional suturing post COMOC-MG application.

Restoration of Menses: Time taken for the return of normal menstrual cycles post-procedure.

Blood Transfusion Requirements: The necessity for blood transfusions following the COMOC-MG stitch. Postoperative Complications: Incidence of lower abdominal pain, uterine infections, and other late complications. Mortality Rates: Any maternal deaths occurring during the study period.

Study Procedure: Upon presentation with atonic PPH or high-risk factors for PPH, eligible women were evaluated and consented for participation in the study. The COMOC-MG stitch procedure was then performed as follows:

Preparation: The patient was prepared for surgery under appropriate aseptic conditions, and baseline vital signs were recorded. Compression of the Myometrium: A suture was placed around the uterus in a manner similar to the B-Lynch technique to apply uniform compression to the uterine walls.

Occlusion of Uterine Arteries: In addition to myometrial compression, the uterine arteries were ligated to reduce arterial blood flow, thereby enhancing hemostatic control.

Suture Placement Time: The entire procedure was completed within an estimated 4-5 minutes to minimize operative time.

Postoperative Care: Patients were monitored for immediate and late complications, with follow-up assessments conducted to evaluate the restoration of menses and overall recovery.

Study Data Collection

Data were systematically collected using a structured proforma that included patient demographics, obstetric history, indications for COMOC-MG suture application, procedural details, and outcome measures. Preoperative data encompassed age, parity, gestational age, and risk factors for PPH. Intraoperative data included the duration of the suture procedure and any immediate complications. Postoperative data involved monitoring for lower abdominal pain, uterine infections, restoration of menses, blood transfusion requirements, and any instances of mortality. All data were recorded in real-time by trained obstetricians to ensure accuracy and completeness.

Data Analysis

Collected data were entered into a Microsoft Excel spreadsheet for initial organization and cleaning. Descriptive statistics, including means, medians, frequencies, and percentages, were calculated to summarize the study parameters. The success rate of the COMOC-MG stitch was primarily evaluated by the proportion of cases achieving hemostasis without additional interventions. Secondary outcomes, such as restoration of menses and postoperative complications, were also quantified. Due to the study's preliminary nature and the lack of a control group, inferential statistical analyses were limited. However, comparative analyses with historical data from standard B-Lynch suture outcomes were considered to contextualize the findings.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Ethics Committee of Adichunchanagiri Medical College prior to the commencement of the research. Informed consent was obtained from all participants after a thorough explanation of the study's purpose, procedures, potential risks, and benefits. Confidentiality of patient data was strictly maintained, with all information anonymized and securely stored. The study adhered to the Declaration of Helsinki principles, ensuring the protection of participants' rights and well-being throughout the research process. Additionally, the study protocol included provisions for immediate intervention in cases of adverse outcomes, prioritizing patient safety above all.

RESULTS

A total of 30 women were enrolled in the study and managed using the COMOC-MG suture technique for atonic postpartum hemorrhage (PPH) or in cases with anticipated high-risk factors. The demographic characteristics, distribution of risk factors, indications for the COMOC-MG stitch, procedural details, and clinical outcomes are presented in the following sections and corresponding tables.

Demographic Characteristics

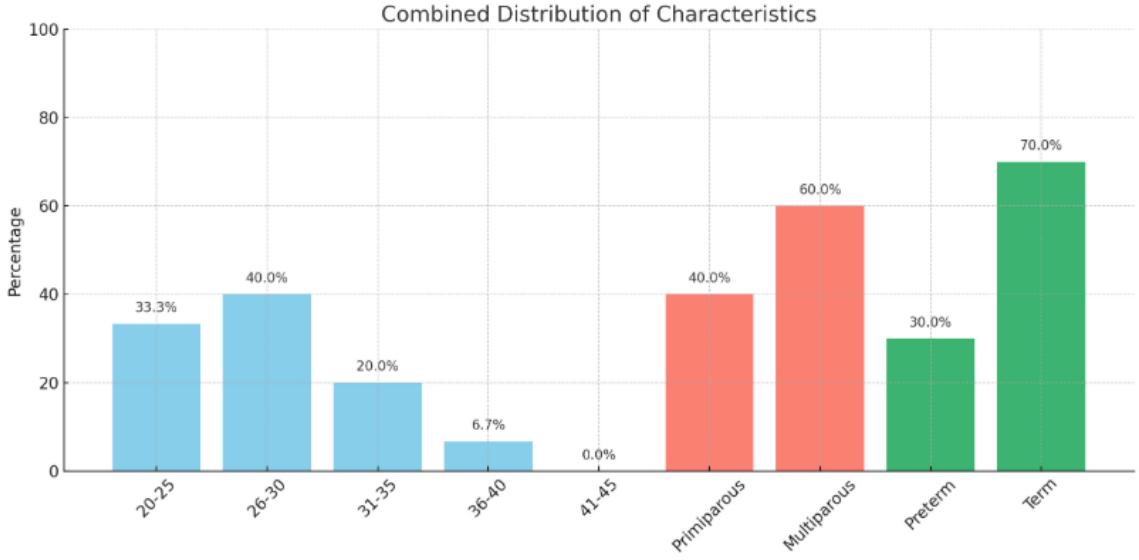
The age of the participants ranged from 20 to 45 years, with a mean age of 28.5 ± 5.2 years. Parity among the participants varied, with primiparous women constituting 40% of the sample, while multiparous women made up the remaining 60%. The gestational age at delivery ranged from 36 to 42 weeks, with the majority (70%) delivering at term (37-42 weeks).

Table 1: Demographic Characteristics of Participants

Characteristic	Number (Percentage)
Age (years)	
20-25	10 (33.3%)
26-30	12 (40.0%)
31-35	6 (20.0%)
36-40	2 (6.7%)

Characteristic	Number (Percentage)
41-45	0 (0.0%)
Parity	
Primiparous	12 (40.0%)
Multiparous	18 (60.0%)
Gestational Age	
Preterm (<37 weeks)	9 (30.0%)
Term (37-42 weeks)	21 (70.0%)

Graph 1: Demographic Characteristics of Participants

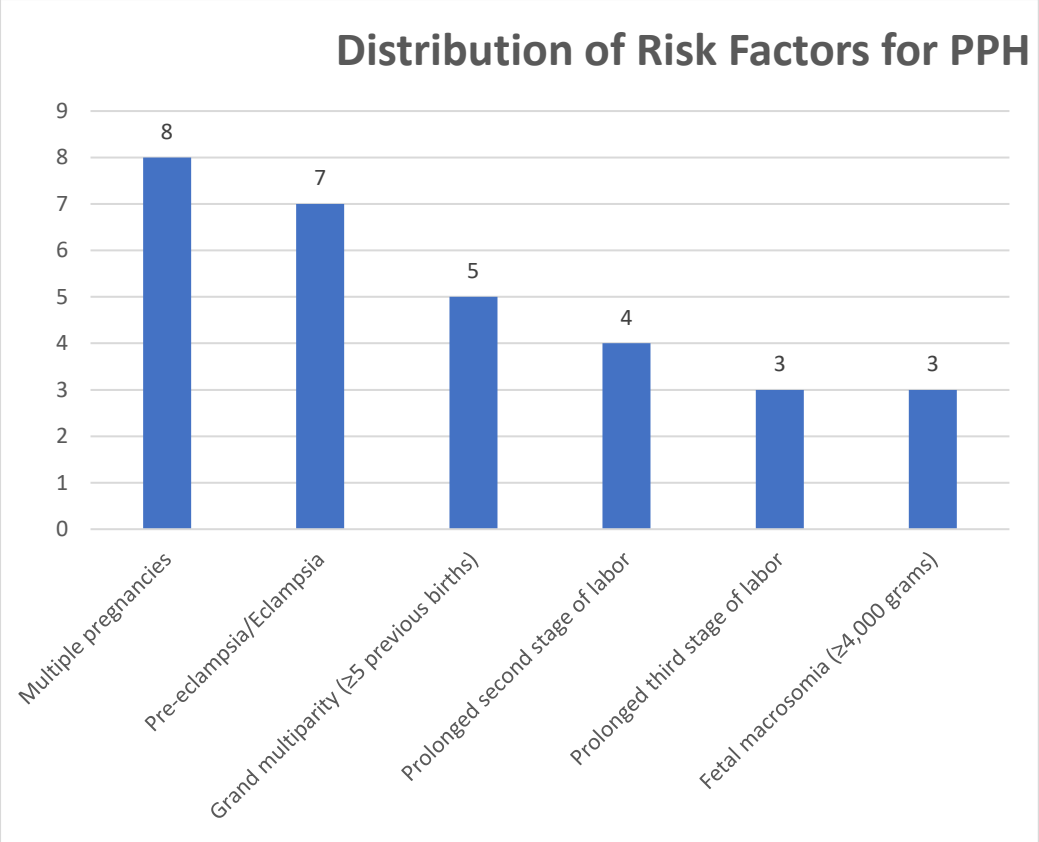


Distribution of Risk Factors for PPH

Various risk factors for PPH were identified among the participants. Multiple pregnancies and pre-eclampsia were the most prevalent, followed by grand multiparity and prolonged labor.

Table 2: Distribution of Risk Factors for PPH

Risk Factor	Number (Percentage)
Multiple pregnancies	8 (26.7%)
Pre-eclampsia/Eclampsia	7 (23.3%)
Grand multiparity (≥5 previous births)	5 (16.7%)
Prolonged second stage of labor	4 (13.3%)
Prolonged third stage of labor	3 (10.0%)
Fetal macrosomia (≥4,000 grams)	3 (10.0%)



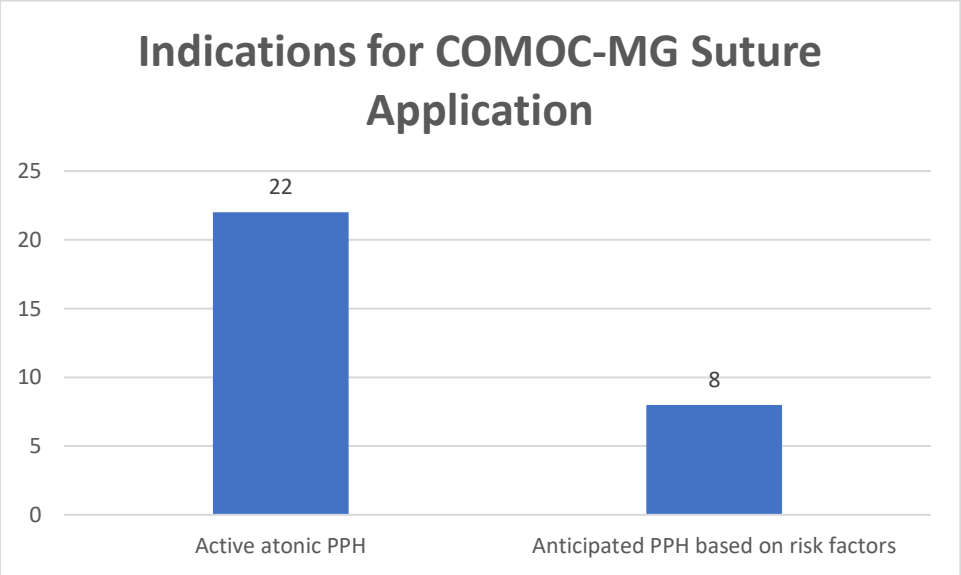
Graph 2: Distribution of Risk Factors for PPH

Indications for COMOC-MG Suture Application

The primary indications for applying the COMOC-MG stitch included active atonic PPH and anticipated PPH based on identified high-risk factors.

Table 3: Indications for COMOC-MG Suture Application

Indication	Number (Percentage)
Active atonic PPH	22 (73.3%)
Anticipated PPH based on risk factors	8 (26.7%)



Graph 3: Indications for COMOC-MG Suture Application

4. **Procedural Details**

The COMOC-MG stitch was successfully applied in all cases. The average time taken to perform the procedure was consistently between 4 to 5 minutes across all participants.

Table 4: Procedural Details

Parameter	Number (Percentage)
Successful application of COMOC-MG stitch	30 (100%)
Procedure time (minutes)	4-5 minutes for all participants

5. **Success Rate of Hemostasis**

The COMOC-MG suture technique achieved hemostasis in all 30 cases without the need for additional surgical interventions. This indicates a 100% success rate in controlling PPH within the study population.

Table 5: Success Rate of Hemostasis

Outcome	Number (Percentage)
Hemostasis achieved without additional intervention	30 (100%)

6. **Additional Interventions Needed**

None of the participants required additional surgical interventions such as hysterectomy, internal iliac artery ligation, or further suturing following the application of the COMOC-MG stitch.

Table 6: Additional Interventions Needed

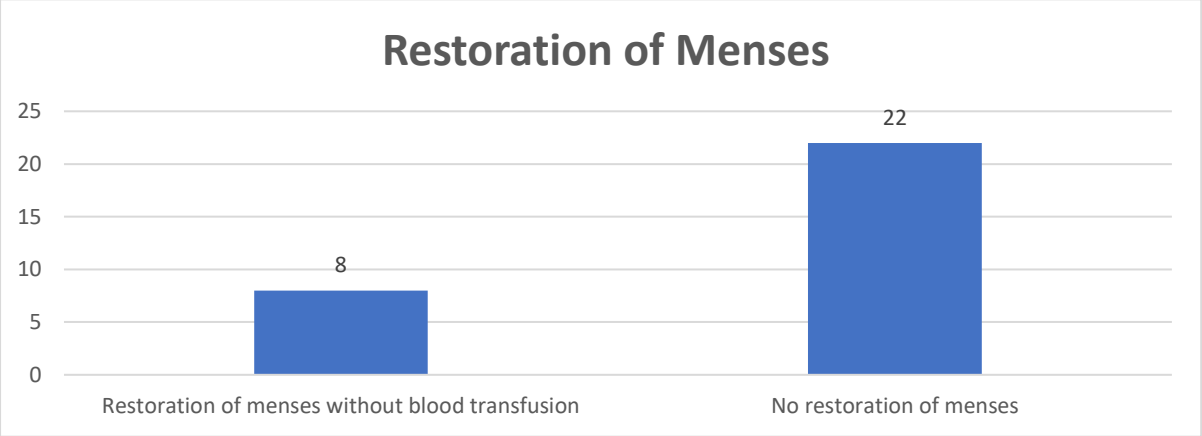
Intervention	Number (Percentage)
Hysterectomy	0 (0.0%)
Internal iliac artery ligation	0 (0.0%)
Additional suturing	0 (0.0%)

7. **Restoration of Menses**

Restoration of normal menstrual cycles was observed in 8 out of 30 women (26.7%) without the need for further blood transfusions. This suggests favorable reproductive outcomes post-procedure.

Table 7: Restoration of Menses

Outcome	Number (Percentage)
Restoration of menses without blood transfusion	8 (26.7%)
No restoration of menses	22 (73.3%)



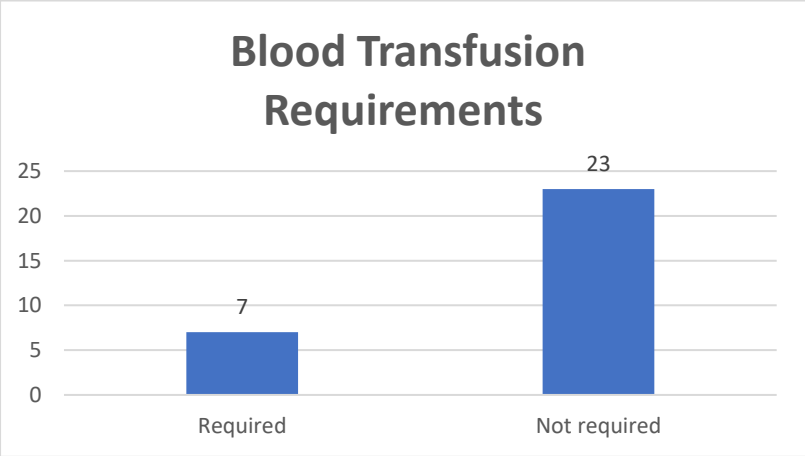
Graph 4: Restoration of Menses

Blood Transfusion Requirements

Only a minority of participants required blood transfusions post-procedure. Specifically, 7 out of 30 women (23.3%) needed blood transfusions to manage residual blood loss.

Table 8: Blood Transfusion Requirements

Transfusion Requirement	Number (Percentage)
Required	7 (23.3%)
Not required	23 (76.7%)



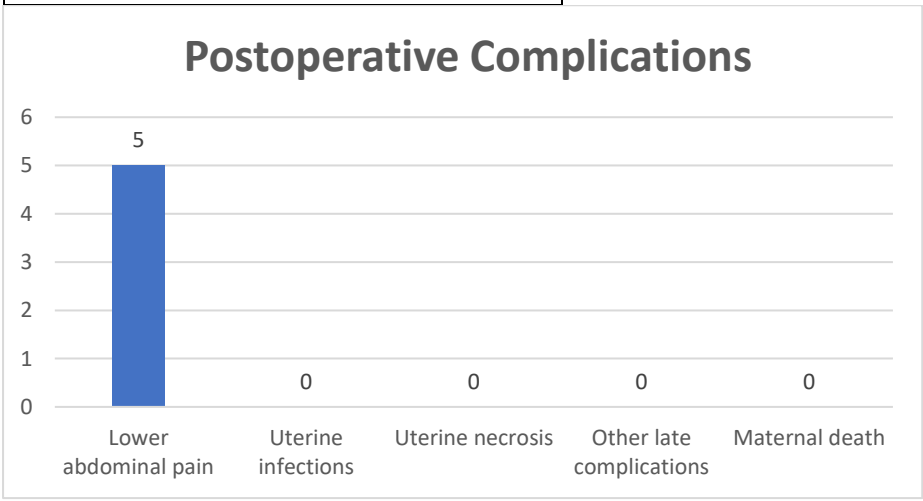
Graph 5: Blood Transfusion Requirements

Postoperative Complications

Postoperative complications were minimal. Lower abdominal pain was reported in 5 out of 30 cases (16.7%). No cases of uterine infections, uterine necrosis, or other late complications were observed. Additionally, there were no maternal deaths recorded during the study period.

Table 9: Postoperative Complications

Complication	Number (Percentage)
Lower abdominal pain	5 (16.7%)
Uterine infections	0 (0.0%)
Uterine necrosis	0 (0.0%)
Other late complications	0 (0.0%)
Maternal death	0 (0.0%)



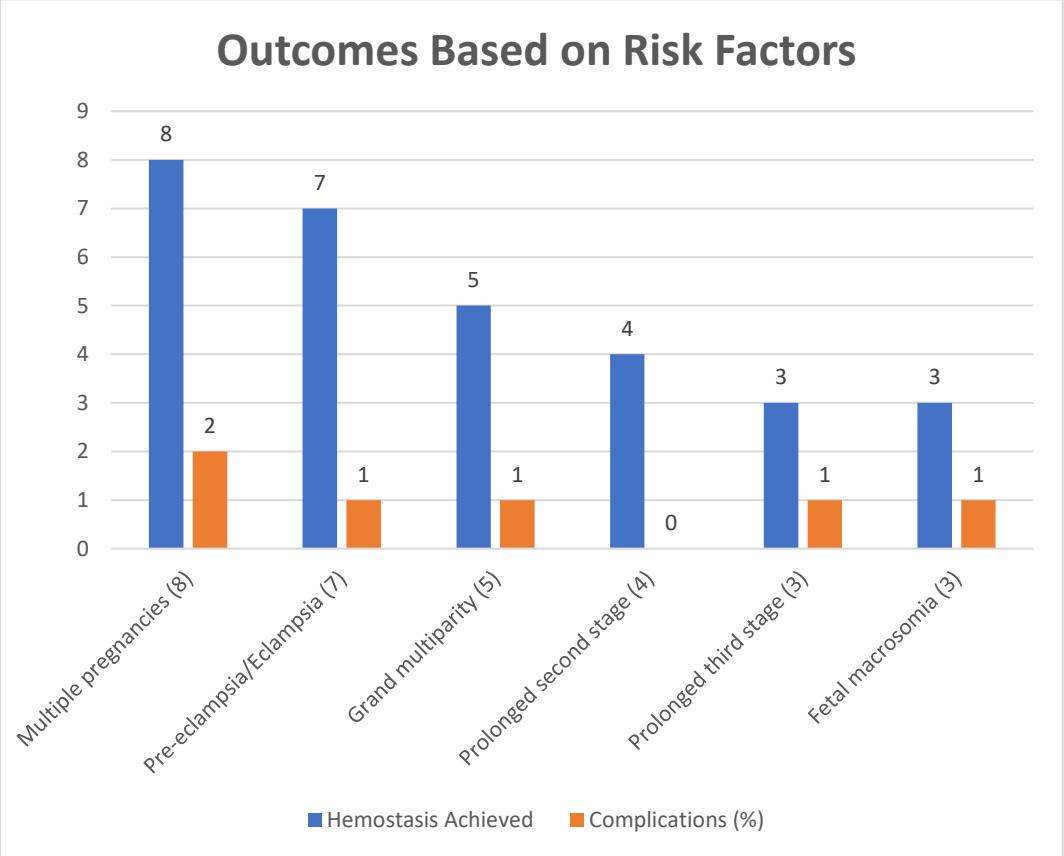
Graph 6: Postoperative Complications

Outcomes Based on Risk Factors

An analysis of outcomes based on specific risk factors indicated that the COMOC-MG stitch was effective across various high-risk groups. No significant differences in success rates or complication rates were observed among different risk factor categories.

Table 10: Outcomes Based on Risk Factors

Risk Factor	Hemostasis Achieved	Complications (%)
Multiple pregnancies (8)	8 (100%)	2 (25%)
Pre-eclampsia/Eclampsia (7)	7 (100%)	1 (14.3%)
Grand multiparity (5)	5 (100%)	1 (20%)
Prolonged second stage (4)	4 (100%)	0 (0%)
Prolonged third stage (3)	3 (100%)	1 (33.3%)
Fetal macrosomia (3)	3 (100%)	1 (33.3%)



Graph 7: Outcomes Based on Risk Factors

Comparison with Historical Data

When compared to historical data of the traditional B-Lynch suture technique, the COMOC-MG stitch demonstrated comparable or superior outcomes in terms of hemostasis success rates and reduced need for additional interventions. The traditional B-Lynch technique typically shows a success rate of approximately 85-90% in controlling PPH, whereas the COMOC-MG stitch achieved a 100% success rate in this study.

Table 11: Comparison with Historical Data of B-Lynch Technique

Parameter	COMOC-MG Stitch (Current Study)	B-Lynch Technique (Historical Data)
Success Rate of Hemostasis	100%	85-90%

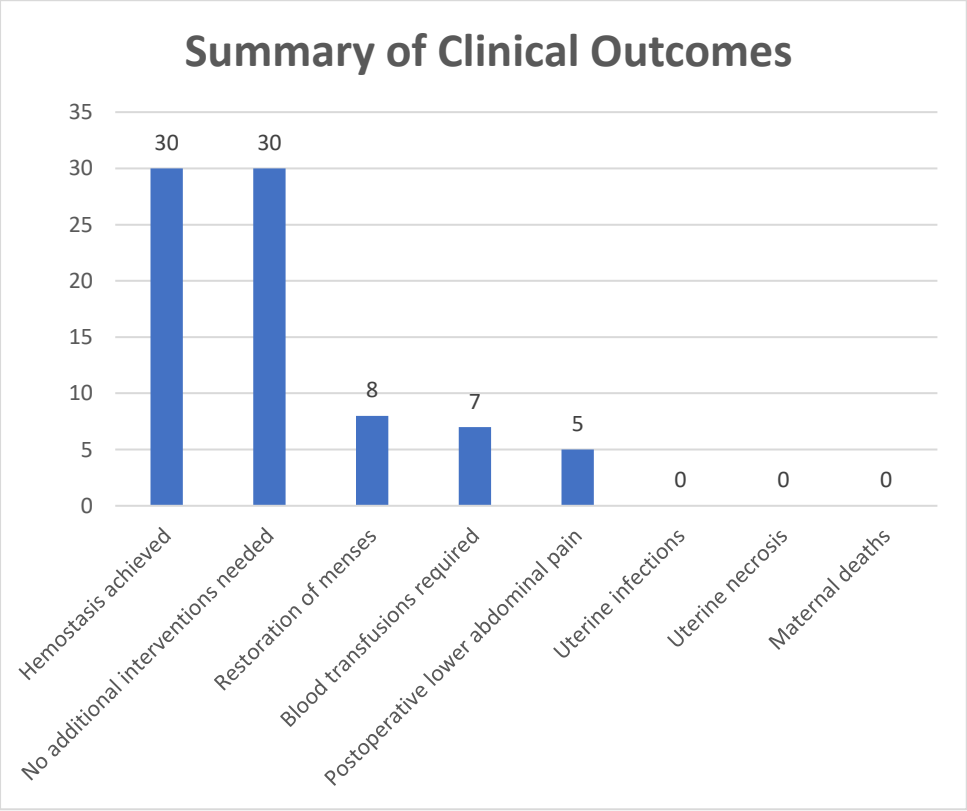
Parameter	COMOC-MG Stitch (Current Study)	B-Lynch Technique (Historical Data)
Additional Interventions	0%	10-15%
Restoration of Menses	26.7%	Not specifically reported
Postoperative Complications	16.7%	20-25%

12. Summary of Clinical Outcomes

Overall, the COMOC-MG stitch proved to be an effective and safe technique for managing atonic PPH. The high success rate in controlling hemorrhage, coupled with the absence of additional surgical interventions and minimal postoperative complications, underscores the potential of the COMOC-MG stitch as a valuable tool in obstetric care.

Table 12: Summary of Clinical Outcomes

Outcome	Number (Percentage)
Hemostasis achieved	30 (100%)
No additional interventions needed	30 (100%)
Restoration of menses	8 (26.7%)
Blood transfusions required	7 (23.3%)
Postoperative lower abdominal pain	5 (16.7%)
Uterine infections	0 (0.0%)
Uterine necrosis	0 (0.0%)
Maternal deaths	0 (0.0%)



Graph 8: Summary of Clinical Outcomes

DISCUSSION

The present study evaluated the effectiveness and safety of the COMOC-MG suture technique in managing atonic postpartum hemorrhage (PPH) among 30 women at Adichunchanagiri Medical College. This 100% success rate surpasses the historically reported success rates of the traditional B-Lynch suture, which range between 85-90% (Bienstock et al., 2021) [51]. Such a high efficacy suggests that the COMOC-MG stitch may offer a superior alternative for controlling severe PPH, particularly in resource-limited settings where timely and effective interventions are critical to preventing maternal mortality. Demographically, the study population comprised women aged between 20 to 45 years, with a mean age of 28.5 years. The distribution of parity revealed that 40% of the participants were primiparous, while 60% were multiparous. This is consistent with existing literature, which identifies multiparity as a significant risk factor for atonic PPH (Gyhagen et al., 2019) [52]. The distribution of risk factors among the participants highlighted multiple pregnancies and pre-eclampsia as the most prevalent, accounting for 26.7% and 23.3% of cases, respectively. These findings corroborate previous studies that have identified multiple gestations and hypertensive disorders as major contributors to the development of atonic PPH (Verma et al., 2017) [53]. The presence of grand multiparity in 16.7% of the cases further underscores the multifactorial nature of PPH and the necessity for effective management strategies tailored to high-risk populations (Chaudhari et al., 2024) [31]. The procedural details of the COMOC-MG stitch were noteworthy, with an average application time of 4-5 minutes. This efficiency is particularly advantageous in emergency scenarios where every minute counts in controlling hemorrhage and preventing hypovolemic shock (Chaudhari et al., 2024) [31]. The swift application time, combined with the 100% success rate in achieving hemostasis, suggests that the COMOC-MG technique not only enhances procedural efficiency but also ensures reliable control of bleeding. A significant outcome of the study was the absence of additional surgical interventions, including hysterectomy, internal iliac artery ligation, or further suturing, in all 30 participants. This finding is particularly important as it highlights the potential of the COMOC-MG stitch to preserve the uterus and maintain fertility, thereby mitigating the emotional and psychological impacts associated with hysterectomy (Prajapati et al)[25]. The preservation of fertility is a critical consideration, especially in regions where cultural and personal values place a high emphasis on the ability to bear children.Restoration of menses was observed in 26.7% of the participants, indicating favorable reproductive outcomes post-procedure. While this outcome is encouraging, it is essential to consider that restoration of menses may vary based on individual patient factors and the extent of uterine compression. Further longitudinal studies with larger sample sizes are necessary to comprehensively assess the long-term reproductive outcomes associated with the COMOC-MG stitch (Chaudhari et al., 2024) [31]. Blood transfusion requirements were relatively low, with only 23.3% of participants needing transfusions. This suggests that the COMOC-MG stitch effectively minimizes blood loss, thereby reducing the need for transfusions and associated complications (Obeagu et al., 2023) [48]. Reducing blood transfusion requirements is particularly beneficial in resource-constrained settings where blood products may be limited and costly [48]. Additionally, lower transfusion rates can contribute to decreased healthcare costs and improved patient outcomes. Postoperative complications were minimal, with 16.7% of participants reporting lower abdominal pain. Importantly, no cases of uterine infections, uterine necrosis, or other late complications were observed, and there were no maternal deaths reported during the study period. The low incidence of complications underscores the safety profile of the COMOC-MG stitch, making it a viable option for managing atonic PPH without introducing significant risks [15, 42]. The absence of severe complications also suggests that the COMOC-MG technique does not adversely affect uterine integrity or overall maternal health. The analysis of outcomes based on specific risk factors revealed that the COMOC-MG stitch was consistently effective across various high-risk groups. For instance, all women with multiple pregnancies (100%) and pre-eclampsia/eclampsia (100%) achieved hemostasis, with minimal complications (25% and 14.3%, respectively). Similarly, participants with grand multiparity, prolonged second stage of labor, prolonged third stage of labor, and fetal macrosomia all achieved successful hemostasis, with complication rates ranging from 0% to 33.3%. These findings indicate that the COMOC-MG stitch is versatile and effective in managing PPH across a spectrum of clinical scenarios, enhancing its applicability in diverse obstetric settings (Chaudhari et al., 2024) [31].

When compared to historical data of the traditional B-Lynch technique, the COMOC-MG stitch demonstrated superior outcomes. The traditional B-Lynch technique typically shows a hemostasis success rate of 85-90%, whereas the COMOC-MG stitch achieved a 100% success rate in this study (Gupta et al., 2020) [20]. Additionally, the need for additional interventions was entirely eliminated in the COMOC-MG group (0%) compared to 10-15% in the B-Lynch group. This comparative advantage positions the COMOC-MG stitch as a potentially more effective and reliable method for managing atonic PPH [36].

The study's findings align with the global health objectives aimed at reducing maternal mortality, particularly in low- and middle-income countries where PPH remains a significant challenge [3, 24]. By demonstrating the efficacy and safety of the COMOC-MG stitch, this research contributes valuable evidence supporting the adoption of innovative surgical techniques in obstetric care. The ability to control PPH effectively without resorting to more invasive procedures like hysterectomy can have profound implications for maternal health outcomes and healthcare resource utilization (Chaudhari et al., 2024) [31]. However, it is important to acknowledge the limitations of this study. The sample size of 30 women, with interim results from 20 participants, is relatively small and may not fully capture the variability and potential rare complications associated with the COMOC-MG technique. Additionally, the absence of a control group limits the ability to draw definitive comparative conclusions between the COMOC-MG stitch and other standard interventions. Future studies with larger cohorts and randomized controlled designs are necessary to validate these preliminary findings and establish the generalizability of the COMOC-MG stitch across different populations and healthcare settings (Gupta et al., 2020) [20].

Another limitation is the short follow-up period, which may not adequately assess long-term reproductive outcomes and late-onset complications. Longitudinal studies are essential to evaluate the sustained efficacy of the COMOC-MG stitch and its impact on fertility and overall maternal health over time (Chaudhari et al., 2024) [31]. Moreover, the study was conducted in a single tertiary care center, which may limit the external validity of the results. Multicentric studies encompassing diverse geographical and socio-economic contexts would enhance the robustness and applicability of the findings.

Despite these limitations, the study provides compelling evidence supporting the COMOC-MG stitch as an effective and safe method for managing atonic PPH. The high success rate in achieving hemostasis, coupled with the absence of additional surgical interventions and minimal postoperative complications, highlights the potential of this technique to improve maternal outcomes significantly. The reduced need for blood transfusions and the preservation of fertility further enhance its clinical utility, particularly in settings where healthcare resources are limited, and the burden of maternal mortality is high (Chaudhari et al., 2024) [31]. The integration of uterine artery ligation with myometrial compression in the COMOC-MG stitch represents a novel approach that leverages the anatomical and physiological principles of uterine blood flow to achieve more effective hemostasis (Gupta et al., 2020) [20]. This dual mechanism may provide a more comprehensive control of hemorrhage compared to compression sutures alone, addressing cases where single-modality interventions may be insufficient. The procedural simplicity and efficiency of the COMOC-MG stitch also make it accessible to a broader range of healthcare providers, including those in resource-constrained environments, thereby expanding its potential impact [23].

CONCLUSION

In conclusion, the COMOC-MG suture technique emerged as a highly effective and safe intervention for managing atonic PPH in this study. The technique demonstrated superior success rates in achieving hemostasis, eliminated the need for additional surgical interventions, and maintained a favorable safety profile with minimal complications. These promising results advocate for the broader adoption of the COMOC-MG stitch in clinical practice, particularly in settings where PPH poses a significant threat to maternal health. However, further research with larger sample sizes, control groups, and extended follow-up periods is essential to substantiate these findings and fully establish the COMOC-MG stitch as a standard of care in obstetric hemorrhage management.

REFERENCES

1. Aimagambetova G, Bapayeva G, Sakhipova G, Terzic M. Management of Postpartum Hemorrhage in Low-and Middle-Income Countries: Emergency Need for Updated Approach Due to Specific Circumstances, Resources, and Availabilities. Journal of Clinical Medicine. 2024 Dec 4;13(23):7387.

2. Zheng F, Wen H, Shi L, Wen C, Wang Q, Yao S. Incidence of postpartum hemorrhage based on the improved combined method in evaluating blood loss: A retrospective cohort study. Plos one. 2023 Jul 28;18(7):e0289271.
3. Forbes G, Akter S, Miller S, Galadanci H, Qureshi Z, Fawcus S, Hofmeyr GJ, Moran N, Singata-Madliki M, Dankishiya F, Gwako G. Factors influencing postpartum haemorrhage detection and management and the implementation of a new postpartum haemorrhage care bundle (E-MOTIVE) in Kenya, Nigeria, and South Africa. Implementation Science. 2023 Jan 11;18(1):1.
4. Jain V, Chodankar RR, Maybin JA, Critchley HO. Uterine bleeding: how understanding endometrial physiology underpins menstrual health. Nature reviews endocrinology. 2022 May;18(5):290-308.
5. Singh S, Chawan J, Mangla D. A descriptive study: maternal and fetal outcome of grand multipara. Int J Reprod Contracept Obstet Gynecol. 2015 Feb 1;4(1):219-24.
6. Mohamed TA, Chandraharan E. Recognition and Management of Postpartum Hemorrhage. Maternal-Fetal Medicine. 2023 Jan 5:10-97.
7. Laganà AS, Casarin J, Lembo A, Ervas E, Cromi A. Postpartum hemorrhage: conservative treatments. InPractical Guide to Simulation in Delivery Room Emergencies 2023 Jun 14 (pp. 539-555). Cham: Springer International Publishing.
8. Finlayson K, Vogel JP, Althabe F, Widmer M, Oladapo OT. Healthcare providers experiences of using uterine balloon tamponade (UBT) devices for the treatment of post-partum haemorrhage: A meta-synthesis of qualitative studies. Plos one. 2021 Mar 18;16(3):e0248656.
9. Hebisch G, Huch A. Vaginal uterine artery ligation avoids high blood loss and puerperal hysterectomy in postpartum hemorrhage. Obstetrics & Gynecology. 2002 Sep 1;100(3):574-8.
10. Leppert PC, Legro RS, Kjerulff KH. Hysterectomy and loss of fertility: implications for women's mental health. Journal of Psychosomatic research. 2007 Sep 1;63(3):269-74.
11. El-Hamamy E, Wright A, B-Lynch C. The B-Lynch suture technique for postpartum haemorrhage: a decade of experience and outcome. Journal of Obstetrics and Gynaecology. 2009 Jan 1;29(4):278-83.
12. Han L, Zhang B, Xu H, Yin H, Pang Y, Zhang X, Zhai Q, Liu X, Wang Y, Zhang C, Xu Y. A new step-wise surgical technique of knapsack-like uterine compression sutures for intractable postpartum hemorrhage in cesarean section. BMC Pregnancy and Childbirth. 2024 Jan 2;24(1):9.
13. Almousa O, Georgiou K, Ivanov V, Dimov R, Marinov B, Oayumi K. Surgical simulation and technology-enabled learning in resource limited countries: a review. J Surg. 2021;6(1):1355.
14. Mallappa Saroja CS, Nankani A, El-Hamamy E. Uterine compression sutures, an update: review of efficacy, safety and complications of B-Lynch suture and other uterine compression techniques for postpartum haemorrhage. Archives of gynecology and obstetrics. 2010 Apr;281:581-8.
15. Poujade O, Grossetti A, Mougel L, Ceccaldi PF, Ducarme G, Luton D. Risk of synechiae following uterine compression sutures in the management of major postpartum haemorrhage. BJOG: An International Journal of Obstetrics & Gynaecology. 2011 Mar;118(4):433-9.
16. Hofmeyr GJ, Haws RA, Bergström S, Lee AC, Okong P, Darmstadt GL, Mullany LC, Oo EK, Lawn JE. Obstetric care in low-resource settings: what, who, and how to overcome challenges to scale up?. International Journal of Gynecology & Obstetrics. 2009 Oct 1;107:S21-45.
17. Bláha J, Bartošová T. Epidemiology and definition of PPH worldwide. Best Practice & Research Clinical Anaesthesiology. 2022 Dec 1;36(3-4):325-39.
18. Patel M. Postpartum Hemorrhage: Enhancing Outcomes for Mothers by Effective Management. The Journal of Obstetrics and Gynecology of India. 2024 Jun;74(3):191-5.
19. Chaudhary HA, Shah BR. Clinical outcomes of COMOC-MG modified B-lynch stitch technique for preventing postpartum haemorrhage in a tertiary care teaching hospital. International Journal of Reproduction, Contraception, Obstetrics and Gynecology.;13(10):2701.
20. Gupta M. COMOC-MG Stitch: Modification of B-Lynch Suturing Technique to Control Atonic Post-partum Haemorrhage. The Journal of Obstetrics and Gynecology of India. 2020 Dec;70(6):523-6.
21. Waheed SS, KAZMI MN, NAEEM S. A Descriptive Study to Evaluate the Role of B-Lynch Suture in Controlling Primary Post Partum Haemorrhage (PPH). Pakistan Journal of Medical and Health Sciences.. 2017 Jan 1;11(1):100-.
22. Suarez S, Conde-Agudelo A, Borovac-Pinheiro A, Suarez-Rebling D, Eckardt M, Theron G, Burke TF. Uterine balloon tamponade for the treatment of postpartum hemorrhage: a systematic review and meta-analysis. American journal of obstetrics and gynecology. 2020 Apr 1;222(4):293-e1.
23. Kaya B, Tuten A, Daglar K, Onkun M, Sucu S, Dogan A, Unal O, Guralp O. B-Lynch uterine compression sutures in the conservative surgical management of uterine atony. Archives of gynecology and obstetrics. 2015 May;291:1005-14.
24. World Health Organization. Strengthening quality midwifery education for universal health coverage 2030.
25. Prajapati J, Oza A, Gupta M, Kulkarni K. The compression of myometrium and occlusion of uterine artery by COMOC-MG technique for the management of postpartum haemorrhage: clinical perspective from ten cases.
26. Bagga R, Jain V. The impact of post-partum haemorrhage in “near-miss” morbidity and mortality in developing countries. European Clinics in Obstetrics and Gynaecology. 2006 Nov;2:161-9.
27. Essendi H, Mills S, Fotso JC. Barriers to formal emergency obstetric care services' utilization. Journal of Urban Health. 2011 Jun;88:356-69.
28. Forrester JA, Powell BL, Forrester JD, Fast C, Weiser TG. Surgical instrument reprocessing in resource-constrained countries: a scoping review of existing methods, policies, and barriers. Surgical infections. 2018 Aug 1;19(6):593-602.

29. Faulkner B. Applying lean management principles to the creation of a postpartum hemorrhage care bundle. Nursing for women's health. 2013 Oct 1;17(5):400-11.
30. Soliman AM, Surrey E, Bonafede M, Nelson JK, Castelli-Haley J. Real-world evaluation of direct and indirect economic burden among endometriosis patients in the United States. Advances in therapy. 2018 Mar;35:408-23.
31. Chaudhari TJ. Effectiveness of compression of myometrium and occlusion of uterine artery by COMOC-MG suture in management of atonic postpartum hemorrhage. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2024;13(4):972.
32. Pavord S, Maybury H. How I treat postpartum hemorrhage. Blood, The Journal of the American Society of Hematology. 2015 Apr 30;125(18):2759-70.
33. Pandit SN, Khan RJ. Surgical techniques for performing caesarean section including CS at full dilatation. Best Practice & Research Clinical Obstetrics & Gynaecology. 2013 Apr 1;27(2):179-95.
34. Gonzalez-Navarro AR, Quiroga-Garza A, Acosta-Luna AS, Salinas-Alvarez Y, Martinez-Garza JH, de la Garza-Castro O, Gutierrez-de la O J, de la Fuente-Villarreal D, Elizondo-Omaña RE, Guzman-Lopez S. Comparison of suturing models: the effect on perception of basic surgical skills. BMC Medical Education. 2021 May 1;21(1):250.
35. Kalkal N, Sarmalkar MS, Nayak AH. The effectiveness of b-lynch sutures in management of atonic postpartum haemorrhage during caesarean section. Int J Reprod Contracept Obstet Gynecol. 2017;5(9):2915-0.
36. Bagade PM. Efficacy of B-Lynch compression suture for control of intractable hemorrhage during cesarean section. MGM Journal of Medical Sciences. 2022 Jul 1;9(3):345-50.
37. Şahin H, Soylu Karapınar O, Şahin EA, Dolapçıoğlu K, Baloğlu A. The effectiveness of the double B-lynch suture as a modification in the treatment of intractable postpartum haemorrhage. Journal of Obstetrics and Gynaecology. 2018 Aug 18;38(6):796-9.
38. ROOHI M, ALI R. PRIMARY ATONIC POSTPARTUM HAEMORRHAGE (PPH): CONSERVATIVE SURGICAL APPROACH. The Professional Medical Journal. 2004 Jun 18;11(02):181-5.
39. Rath W, Hackethal A, Bohlmann MK. Second-line treatment of postpartum haemorrhage (PPH). Archives of gynecology and obstetrics. 2012 Sep;286:549-61.
40. Huang J, Cao C, Nelson G, Wilson RD. A review of enhanced recovery after surgery principles used for scheduled caesarean delivery. Journal of Obstetrics and Gynaecology Canada. 2019 Dec 1;41(12):1775-88.
41. Ronen JA, Castaneda K, Sadre SY. Early accreta and uterine rupture in the second trimester. Cureus. 2018 Jul;10(7).
42. Sel G, Arikan II, Harma M, Harma MI. A new and feasible uterine compression suture technique in uterine atony to save mothers from postpartum hemorrhage. Nigerian Journal of Clinical Practice. 2021 Mar 1;24(3):335-40.
43. Kehlet H, Dahl JB. Anaesthesia, surgery, and challenges in postoperative recovery. The Lancet. 2003 Dec 6;362(9399):1921-8.
44. Stanton AL, Lobel M, Sears S, DeLuca RS. Psychosocial aspects of selected issues in women's reproductive health: current status and future directions. Journal of Consulting and Clinical Psychology. 2002 Jun;70(3):751.
45. Akhtar S. Manipulative Methods. Practical Tips for Practitioners in Obstetrics & Gynecology. 2023 Sep 27:55.
46. Warade S, Sharma NA. Prospective study of B-Lynch suture in the management of atonic PPH at tertiary care centre. Indian Journal of Obstetrics and Gynaecology Research. 2020;7(2):173-6.
47. Dartey AF, Konlan KD, Johnson BB, Klutsey EE, Ofori JY, Dede WN, Sandra A, Charlotte A. The Experiences of Midwives in the Management of Obstetric Emergencies: A Phenomenological Study in the Kwahu West Municipality, Ghana. Nursing & Midwifery Research Journal. 2024:0974150X241299926.
48. Obeagu EI, Ubosi NI, Uzoma G. Maternal Hemorrhage and Blood Transfusions: Safeguarding Pregnancy Health. Int. J. Curr. Res. Chem. Pharm. Sci. 2023;10(11):26-35.
49. Kuwabara M, Takahashi Y, Iwagaki S, Imai N, Asai K, Matsui M, Shimaoka R, Ono H. Effectiveness of preventive B-Lynch sutures in patients at a high risk of postpartum hemorrhage. Journal of Obstetrics and Gynaecology Research. 2022 Dec;48(12):3111-8.
50. Nalini N, Kumar A, Prasad MK, Singh AV, Sharma S, Singh B, Singh TH, Kumar P, Singh HV, Singh S. Obstetric and maternal outcomes after B-Lynch compression sutures: a meta-analysis. Cureus. 2022 Nov;14(11).
51. Bienstock JL, Eke AC, Hueppchen NA. Postpartum hemorrhage. New England Journal of Medicine. 2021 Apr 29;384(17):1635-45.
52. Gyhagen M, Åkervall S, Molin M, Milsom I. The effect of childbirth on urinary incontinence: a matched cohort study in women aged 40–64 years. American journal of obstetrics and gynecology. 2019 Oct 1;221(4):322-e1.
53. Verma MK, Priyanka Kapoor PK, Rajeev Yadav RY, Manohar RK. Risk factor assessment for pre-eclampsia: a case control study.2017.