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EFFECTIVENESS OF B-LYNCH IN PRIMARY POSTPARTUM HEMORRHAGE DUE TO UTERINE ATONY

Original Research

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ABSTRACT

Background: Postpartum hemorrhage (PPH) remains one of the most critical causes of maternal morbidity and mortality worldwide, with uterine atony being its most common underlying cause. Prompt and effective management is crucial to reduce complications and preserve reproductive potential. The B-Lynch suture, a uterus-sparing surgical technique, offers a mechanical approach to control bleeding when medical interventions fail, especially in low-resource settings where hysterectomy may not be feasible or desirable.

Objective: To determine the effectiveness of the B-Lynch suture technique in controlling primary postpartum hemorrhage due to uterine atony.

Methods: This quasi-experimental study was conducted in the Department of Obstetrics and Gynecology at Khyber Teaching Hospital, Peshawar, from May 16 2024 to November 16, 2024. A total of 151 postpartum women aged 18 to 40 years were enrolled using consecutive non-probability sampling. All participants were diagnosed with uterine atony-induced PPH, defined as blood loss exceeding 500 mL within the first 24 hours of delivery. The B-Lynch suture was applied using chromic catgut No. 2 under supervision of a consultant obstetrician. Hemostasis was assessed 12 hours post-procedure. SPSS version 25 was used for data analysis, and chi-square testing assessed associations at a significance level of $p<0.05$.

Results: The mean age of participants was 27.28 ± 5.85 years, mean BMI was 25.18 ± 1.45 kg/m², and mean gestational age was 38.11 ± 2.05 weeks. Hemostasis was successfully achieved in 120 out of 151 patients, yielding an overall effectiveness rate of 79.5%. No major complications were reported, and all women retained uterine integrity.

Conclusion: The B-Lynch suture is a highly effective, fertility-preserving intervention for managing primary PPH due to uterine atony and should be incorporated into routine obstetric practice, particularly in resource-constrained environments.

Keywords: B-Lynch suture, fertility preservation, hemostasis, maternal morbidity, postpartum hemorrhage, surgical management, uterine atony.

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INTRODUCTION

Uterine atony, a condition characterized by the insufficient contraction of myometrial muscle fibers following delivery, is a leading cause of postpartum hemorrhage (PPH), which continues to represent a global obstetric emergency. Normally, the myometrium contracts in response to endogenous oxytocin released during delivery, particularly in the third stage of labor, to constrict spiral arteries and establish haemostasis at the placental site. However, when this mechanism fails, significant hemorrhage can occur due to the spiral arteries' lack of muscular support, making uterine contraction essential for bleeding control (1). Uterine atony is recognized as the most common etiology of primary PPH, ranking among the top five causes of maternal mortality globally (1,2). Multiple risk factors contribute to uterine atony, including prolonged or precipitous labor, uterine fibroids, extended oxytocin use, and magnesium sulfate infusion (3). Despite advances in obstetric care, PPH remains one of the most preventable contributors to maternal morbidity and mortality. It accounts for approximately 8% of maternal deaths in high-income countries and as high as 20% in low-resource settings (4). In the United States—one of the few developed countries with persistently high maternal mortality rates—around 11% of maternal deaths are attributed to PPH (5). Alarmingly, the incidence of PPH in the U.S. has escalated over time, with reported rates rising from 8 to 40 cases per 10,000 births between 1993 and 2014, underscoring the urgent need for robust, evidence-based interventions (6). However, variability in blood loss measurement, inconsistent PPH definitions, and heterogeneity in outcome reporting across studies complicate the evaluation of current interventions (7–9).

Among the surgical strategies available for unresponsive uterine atony, compression sutures such as the B-Lynch brace suture and Hayman technique, as well as intrauterine balloon tamponade, have demonstrated favorable results in achieving haemostasis (10,11). The B-Lynch suture operates through direct uterine compression, restricting blood flow from the uterine arteries and facilitating clot formation at the placental bed. Although its efficacy may vary depending on delivery mode, it is generally considered a viable first-line surgical option when pharmacologic methods fail, especially in vaginal births. In cesarean sections, however, some studies question its added value for controlling atonic PPH (12–14). One clinical investigation reported the success rate of B-Lynch suturing in managing primary PPH due to uterine atony to be approximately 83% (15). Despite the increasing global attention to uterine atony and its surgical management, there is a paucity of local data in this domain, particularly within resource-constrained healthcare settings. To bridge this knowledge gap, the current study aims to evaluate the effectiveness of the B-Lynch suture in managing primary postpartum hemorrhage due to uterine atony at our health institution. This research intends to provide context-specific evidence that could inform clinical decision-making and contribute to reducing the maternal burden associated with PPH.

METHODS

This quasi-experimental study was conducted in the Department of Obstetrics and Gynecology at Khyber Teaching Hospital, Peshawar, over a six-month period from May 16, 2024, to November 16, 2024, following formal approval from the institutional ethical review board. The study aimed to assess the effectiveness of B-Lynch suturing in women experiencing primary postpartum hemorrhage (PPH) due to uterine atony. A sample size of 151 patients was calculated using an assumed effectiveness rate of 83% for the B-Lynch suture based on prior evidence (15), with a 95% confidence interval and a 6% margin of error. Participants were recruited using a consecutive non-probability sampling technique. Eligible participants included postpartum women aged 18 to 40 years who were diagnosed with primary PPH, operationally defined as blood loss exceeding 500 mL within the first 24 hours following delivery. Uterine atony was confirmed on physical examination, typically presenting as a soft, flaccid, and enlarged uterus failing to exhibit the expected post-delivery firmness. Women with known coagulation disorders, placenta accreta, or uterine rupture were excluded from the study to reduce confounding factors and avoid surgical complexity. All participants provided written informed consent prior to data collection, ensuring voluntary participation and understanding of the procedure and its associated risks.

Clinical and demographic data were recorded, including age, body mass index (BMI), gestational age, educational status, occupational background, socioeconomic status, place of residence, and history of comorbidities such as hypertension and diabetes mellitus. The B-Lynch suture procedure was carried out using chromic catgut No. 2 and was performed under the direct supervision of a consultant gynecologist with a minimum of five years of post-fellowship experience. The technique involved passing the suture from the posterior

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aspect of the uterus through the myometrium, approximately 2–3 cm below the lower segment uterine incision, and looping it over the fundus in a brace-like configuration. This ensured compressive force over both anterior and posterior uterine walls to achieve mechanical hemostasis. Hemostasis was evaluated within 12 hours post-procedure, with success defined as the complete cessation of active bleeding without requiring further surgical intervention. Data were statistically analyzed using SPSS version 25. Continuous variables such as age, BMI, and gestational age were expressed as mean ± standard deviation, whereas categorical variables like efficacy of the procedure, booking status, and presence of comorbid conditions were presented as frequencies and percentages. Stratification of results by demographic features and comorbidities was conducted, and associations were evaluated using the chi-square test at a 5% level of significance to determine statistical relevance.

RESULTS

A total of 151 postpartum patients diagnosed with uterine atony-related primary postpartum hemorrhage were included in the study. The mean age of the participants was 27.28 ± 5.85 years, with a mean body mass index (BMI) of 25.18 ± 1.45 kg/m², and the average gestational age at delivery was 38.11 ± 2.05 weeks. Demographically, 83 patients (55.0%) were residents of urban areas, while 68 (45.0%) belonged to rural settings. Regarding employment status, 51 women (33.8%) were employed, and 100 (66.2%) were unemployed. In terms of socioeconomic status, 38 patients (25.2%) were categorized as low-income, 81 (53.6%) as middle-income, and 32 (21.2%) as high-income. Educationally, 63 women (41.7%) were educated, whereas 88 (58.3%) were uneducated. Medical history revealed that 30 participants (19.9%) had diabetes, and 46 (30.5%) were hypertensive. The majority, 121 patients (80.1%), did not have diabetes, and 105 (69.5%) did not report hypertension. Regarding antenatal care status, 71 patients (47.0%) were booked during pregnancy, whereas 80 (53.0%) were unbooked.

The B-Lynch suture technique effectively achieved hemostasis and controlled bleeding in 120 patients, corresponding to a success rate of 79.5%. The procedure was unsuccessful in 31 patients (20.5%). Stratified analysis based on demographic and clinical variables showed no statistically significant associations with the effectiveness of the procedure ($p > 0.05$ for all variables). Although higher success rates were observed among employed women (35.8% vs. 25.8%), non-diabetics (82.5% vs. 71.0%), and those from higher socioeconomic groups (22.5% vs. 16.1%), these differences did not reach statistical significance. Similarly, no significant variations in success were found across age groups (18–30 years: 62.5%; 31–40 years: 37.5%; $p = 0.83$), BMI ranges (≤25 kg/m²: 68.3%; >25 kg/m²: 31.7%; $p = 0.52$), or gestational age strata (35–38 weeks: 53.3%; >38 weeks: 46.7%; $p = 0.88$). The same non-significant pattern was observed with respect to education, hypertension, and booking status. These results demonstrate that the effectiveness of the B-Lynch suture technique remained consistent across various demographic profiles and clinical conditions, highlighting its broad applicability in the management of primary postpartum hemorrhage due to uterine atony.

Table 1: Demographics and comorbidities

Demographics and comorbidities		N	%
Residence	Urban	83	55.0%
	Rural	68	45.0%
Employment status	Employed	51	33.8%
	Unemployed	100	66.2%
Socioeconomic status	Low	38	25.2%
	Middle	81	53.6%
	High	32	21.2%
Education	Educated	63	41.7%
	Uneducated	88	58.3%
Diabetes	Yes	30	19.9%
	No	121	80.1%
Hypertension	Yes	46	30.5%
	No	105	69.5%

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Table 2: Effectiveness of B-Lynch Suture in Achieving Hemostasis in Primary Postpartum Hemorrhage

Effectiveness (Hemostasis and control bleeding)	N	%
Yes	120	79.5%
No	31	20.5%

Table 3: Stratification of effectiveness with demographics and comorbidities

Demographics and comorbidities		Effectiveness (Hemostasis and control bleeding)				P value
		Yes		No		
		N	%	N	%	
Residence	Urban	67	55.8%	16	51.6%	0.67
	Rural	53	44.2%	15	48.4%	
Employment status	Employed	43	35.8%	8	25.8%	0.29
	Unemployed	77	64.2%	23	74.2%	
Socioeconomic status	Low	29	24.2%	9	29.0%	0.70
	Middle	64	53.3%	17	54.8%	
	High	27	22.5%	5	16.1%	
Education	Educated	48	40.0%	15	48.4%	0.39
	Uneducated	72	60.0%	16	51.6%	
Diabetes	Yes	21	17.5%	9	29.0%	0.15
	No	99	82.5%	22	71.0%	
Hypertension	Yes	39	32.5%	7	22.6%	0.28
	No	81	67.5%	24	77.4%	
Booking status	Yes	56	46.7%	15	48.4%	0.86
	No	64	53.3%	16	51.6%	
Age distribution (Years)	18 to 30	75	62.5%	20	64.5%	0.83
	31 to 40	45	37.5%	11	35.5%	
BMI (Kg/m2)	18 to 25	82	68.3%	23	74.2%	0.52
	> 25	38	31.7%	8	25.8%	
Gestational age (Weeks)	35 to 38	64	53.3%	17	54.8%	0.88
	> 38	56	46.7%	14	45.2%	

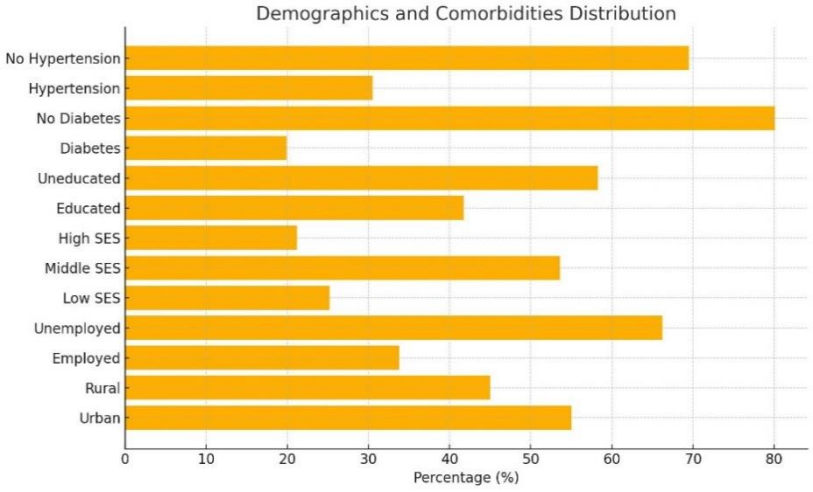


Figure 1 Demographic and Comorbidities Distribution

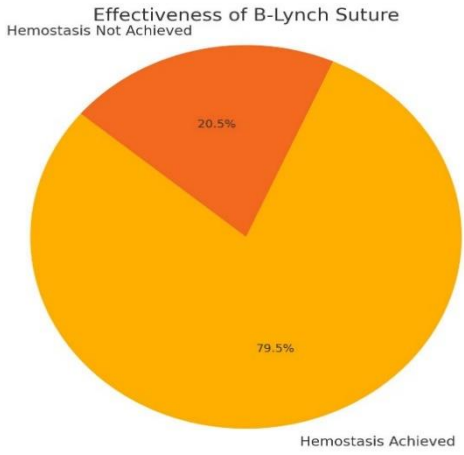


Figure 2 Effectiveness of B-Lynch Suture

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DISCUSSION

The present study evaluated the effectiveness of the B-Lynch suture in the management of primary postpartum hemorrhage (PPH) secondary to uterine atony and demonstrated a hemostatic success rate of 79.5% among 151 patients. This finding positions the B-Lynch suture as a reliable intervention in clinical settings, particularly where pharmacological approaches have failed. The mean maternal age was 27.28 ± 5.85 years, with an average BMI of 25.18 ± 1.45 kg/m² and gestational age at delivery of 38.11 ± 2.05 weeks, indicating a relatively young and clinically stable obstetric population. The procedure showed consistent effectiveness across various demographic and clinical variables, suggesting its broad applicability without a significant dependency on socioeconomic or health status (16). When compared with prior investigations, success rates with the B-Lynch suture have ranged from 80% to 100%, albeit in smaller cohorts. A number of studies have reported a 100% effectiveness rate; however, these studies often involved smaller sample sizes, typically fewer than 20 participants, and selectively excluded high-risk conditions such as uterine anomalies or coagulopathies. The smaller cohort sizes and controlled case selection in these reports may contribute to the higher success rates observed. Furthermore, some studies focused on primigravida women or younger age groups, factors which may influence uterine tone and tissue responsiveness (17,18). In contrast, the current study included a more diverse population, potentially providing a more generalizable estimate of real-world outcomes.

The effectiveness observed in this study was consistent with a larger body of literature that places the B-Lynch success rate above 75%, even in the context of varying patient characteristics and institutional resources. Additional findings from other prospective studies have highlighted associated complications such as postoperative fever or wound infection. Interestingly, such adverse events were not reported in this study, although the absence of complication data may reflect underreporting or limited follow-up rather than a true lack of adverse outcomes. The current study's strength lies in its relatively large sample size, inclusion of a clinically diverse cohort, and use of standardized surgical supervision, which collectively enhance the reliability and reproducibility of the findings (19,20). Nonetheless, certain limitations must be acknowledged. The study design did not include a comparison group, limiting the ability to assess relative efficacy against alternative surgical or pharmacologic interventions. Moreover, the lack of long-term follow-up data precludes assessment of delayed complications, uterine ischemia, or subsequent fertility outcomes. Blood loss quantification was also not stratified, which may have provided further granularity in evaluating the efficacy of the intervention across mild, moderate, and massive PPH cases. Additionally, no data were collected on the number of transfusions required or the need for secondary interventions such as hysterectomy, which are critical metrics in evaluating overall clinical success.

The consistency in success across different subgroups in this study reinforces the potential of the B-Lynch suture as a frontline surgical option, particularly in low-resource settings where access to advanced interventions is limited. Its utility, simplicity, and fertility-sparing nature make it a pragmatic choice in both emergency and routine obstetric care. However, to further optimize outcomes, future research should prioritize multicentric randomized controlled trials with long-term follow-up, standardized blood loss assessment, and fertility evaluation. Establishing structured training programs for obstetricians, especially in peripheral and rural healthcare centers, may bridge skill gaps and reduce the variability in procedural outcomes. Through such efforts, the broader implementation of the B-Lynch technique could significantly contribute to reducing maternal morbidity and mortality linked to uterine atony-induced PPH.

CONCLUSION

The findings of this study affirm the clinical value of the B-Lynch suture as an effective and practical intervention for managing postpartum hemorrhage resulting from uterine atony. By providing timely hemostasis while preserving the uterus, this technique offers a fertility-sparing alternative to more invasive procedures, particularly in emergency settings. Its ease of application and reliability make it an essential component of obstetric hemorrhage management, especially in resource-limited environments. The study reinforces the importance of integrating the B-Lynch suture into standardized protocols to improve maternal outcomes and reduce preventable complications associated with severe postpartum bleeding.

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AUTHOR CONTRIBUTION

Author	Contribution
Lala Rukh*	Data Acquisition, Data entry & Analysis, Manuscript Writing, Conception of Study Design
Naila Qurat ul Ain Fayaz Bukhari	Critical Input, Conception of Study Design, Final Approval of Draft

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