



Original Research Article

A comparative study of efficacy of panicker vacuum retraction cannula and intrauterine foleys balloon tamponade in atonic post partum haemorrhage

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Abstract

Introduction: According to the World Health Organization (WHO), Post-partum hemorrhage (PPH) is a leading cause of maternal deaths worldwide and the majority of these deaths take place in immediate postpartum period because of uterine atonicity. Effective non-surgical treatments are essential for managing PPH not responding to first-line management before proceeding to surgical interventions.

Materials and Methods: Hospital-based study, 100 patients were recruited with 50 patients in each group & randomly selected for Panicker's (Uterine suction Tamponade) group or Foley's Balloon Tamponade (Uterine balloon Tamponade) group designated as Group P & Group-B respectively.

Results: In Panicker's Group, 60% patients (n=30) experienced blood-loss between 150–200 mL while in Balloon Tamponade group, significantly higher proportion 40% (n=20) patients experienced blood-loss between 201–250 mL, (P=0.001). In Group P, 78% (n=39) and in Group B 62% (n=31) patients had hemoglobin deficit of less than 2.5 g/dl. In Group P, 24% (n=12) while in Group B, 48% (n=24) cases required blood transfusion, (p value =0.012). In Group P, 78% (n=39) had bleeding successfully controlled as compared to 46% (n=23) participants in Group B, (P<0.001). In Group P, 8% (n=4) participants required application of hemostatic sutures while. In Group B, 26% (n=13) needed it, (p=0.033). In Panicker's group, 8% (n=4) participants required ligation of anterior division of internal iliac arteries as compared to Group B, 14% (n=7) participants. In Group P, 6% (n=3) while in Group B, 14% (n=7) patients underwent hysterectomy.

Conclusion: Our study reflects that Panicker's cannula offers an equally cost-effective yet more physiological and effective approach with faster intra-uterine blood evacuation, superior bleeding control and seems to be a promising alternative in management of atonic PPH.

Keywords: Atonic PPH, Panicker's cannula, Foley's balloon Tamponade.

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1. Introduction

According to World Health Organization (WHO), Post-partum hemorrhage (PPH) is a leading cause of maternal deaths worldwide and is described as a blood loss of more than 500 mL within 24 hours after vaginal delivery or more than 1000 mL following cesarean delivery.^{1,2} Say et al using a new approach, updated the previous WHO systematic study by developing and analyzing global, regional, and sub-regional statistics of the causes of maternal mortality during 2003-09 and accounted for 661,000 deaths globally due to hemorrhage.³ Majority of these deaths take place in immediate postpartum period following childbirth, because

of uterine atony following placental delivery.⁴ Hypotonicity, residual products of conception or trauma to uterus or lower genital tract may result in PPH.⁵

Primary PPH and secondary PPH are the two types of PPH. Secondary PPH occurs beyond 24 hours and can occur up to 6 weeks after delivery. Atonic PPH can also be caused by certain risk factors, such as prolonged labor, pregnancy-related hypertension, accidental hemorrhage, anemia, polyhydramnios, and large newborns.⁶

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WHO suggests a series of measures as 'first-line treatment for women who start bleeding. Management consists of a series of quick, progressively more invasive procedures until bleeding stops. Fluid resuscitation, placental removal, bimanual uterine compression, tranexamic acid, uterotonics, suturing lower genital tract injury, replacement of blood products, laparotomy, balloon tamponade, stepwise uterine devascularization, uterine compression sutures, and hysterectomy are some of these interventions.⁵ The WHO suggests giving additional uterotonics, a second dose of tranexamic acid, and an intrauterine balloon tamponade (UBT) to women who still bleed after receiving first-line treatment (a condition known as "refractory PPH") before invasive surgical procedures are performed.^{4,7} The most frequent surgical procedure done to treat severe PPH not responding to standard therapy after cesarean (CS) deliveries is emergency hysterectomy.⁸ An in-depth understanding of the etiology of PPH in women who experience refractory PPH as well as the correlation between maternal features and refractory PPH is crucial.⁹ The most common medication used for preventing atonic PPH, oxytocin, has low real-world effectiveness due to its susceptibility to heat and quality problems.¹⁰

Surgical procedures are not often available limited resource settings and are linked to a higher risk of morbidity and mortality.¹¹ Uterine compression sutures, such as B-Lynch brace sutures are simple and practiced by obstetricians worldwide. Total or sub-total emergency peri-partum hysterectomy (EPH) is a procedure used as last option when all conservative methods have failed to manage atonic PPH and are associated with high maternal morbidity and mortality.¹³

Effective non-surgical treatments are essential for managing refractory PPH to prevent surgery & treat patients where surgery is not a feasible option.¹¹ In recent years, number of intra-uterine devices available for treating refractory hemorrhage has rapidly increased. According to WHO, use should only be permitted in situations where care escalation and monitoring are feasible.

Two types of uterine tamponade devices are available for treatment of PPH i.e. Uterine Balloon Tamponade (UBT) and Uterine Suction Tamponade (UST). A modified Bakri balloon and suction tube uterine tamponade via Levin tubing are examples that have been documented in research.¹¹ Two hypotheses exist regarding how hemostasis is accomplished by an intra-uterine balloon tamponade. First is, the UBT device prevents bleeding from the spiral arteries by applying pressure from within that is greater than the pressure in systemic arteries similar to mechanical action of uterine artery ligation. A more recent notion suggests that the tamponade device's hydrostatic pressure directly compress the uterine arteries.¹¹

On the other hand, uterine suction tamponade device creates negative pressure inside uterus, which causes it to

shrink and prevent atonic PPH. It is comparable to physiological mechanism of uterine contraction and retraction that occurs naturally to prevent atonic PPH. It is extremely efficient, simple, economical, life and fertility-saving technique which can be made accessible in any situation and serve as the first line of treatment against atonic PPH.

Panicker's suction cannula is a quick, safe & easy device for treating and preventing atonic PPH when medical management fails. Through vagina, a 25 cm long, 12 mm diameter cannula with several 4 mm diameter holes across the distal 10 cm of the cannula is inserted into uterus to reach fundus & attached to a suction device to create and sustain a negative pressure of 700 mmHg.¹⁴ It works on principle that soft cervical tissues are pulled into small pores in cervical section of cannula when negative pressure is applied. The uterine cavity becomes closed as a result.¹⁶

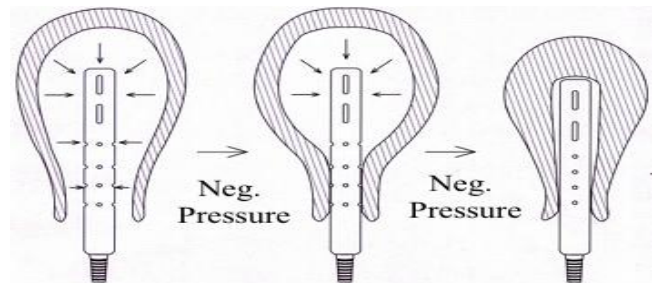


Figure 1: Mechanism of action of Panicker's suction cannula inside uterine cavity. (* Diagram Cited from link.springer.com)

Both uterine tamponade devices have been taken into consideration for treatment of refractory PPH and found effective. Uterine balloon tamponade method is quickly gaining attraction as the recommended second-line treatment.¹⁷ Devices which are improvised include balloon catheters (such as the Sengstaken–Blakemore tube, the Foley catheter, and the Rusch balloon) that are used off-label and those that rely on use of surgical gloves and condoms connected to Foley or other catheters. Bakri balloon, BT-Cath balloon, Ellavi balloon (by Sinapi Biomedical), and EBB tamponade device (Belfort-Dildy) are Purpose-designed UBTs for atonic PPH.^{18,19}

UST devices like Panicker's suction cannula due to their similar mechanism of action as that of physiological uterine retraction, may be regarded as a biologically plausible alternative for the treatment of unresponsive PPH.²⁰

This study was conducted to study efficacy and safety of Panicker Vacuum Retraction Cannula as compared to Intra-uterine Foleys Balloon Tamponade in management of atonic PPH and to compare the amount of blood loss between the two in atonic PPH after vaginal deliveries and caesarean sections.

2. Materials and Methods

This comparative interventional study was conducted in Department of Obstetrics & Gynecology, Nehru Hospital, BRD Medical College at Gorakhpur (Uttar Pradesh) from 01/02/2024 to 31/01/2025 after due permission from Institutional scientific committee & ethical committee. The sample size was taken as 100 patients with 50 patients in each group and were randomly selected for Panicker's (UST) group designated as Group-P or Balloon Tamponade (UBT) group designated as Group-B.

Inclusion criteria were all Primary atonic PPH women in labour room/ operation theatre with failed medical management who gave written informed consent. Patients with primary PPH due to causes other than atonicity, secondary PPH and patients in sepsis were excluded from the study. Patient's history and other study-specific relevant information was documented in a pre-structured proforma. Laboratory tests (Hb% estimation before and after PPH episode) were also done to document the amount of blood loss.

In Uterine Suction Tamponade (UST) group, specially designed stainless steel Panicker cannula was introduced into uterine cavity up to fundus and was connected to suction apparatus, and a negative pressure of 700 mmHg was created. Blood collected inside uterine cavity was aspirated out & collected in suction jar. With continued intra-uterine negative pressure, blood coming in suction cannula reduced and then stopped. The negative pressure was maintained for about 30 minutes and then cannula was slowly removed after releasing the suction. Once the blood coming out of the suction tube stopped, vaginal tears or episiotomy if given were repaired with cannula-in-situ. Bleeding per vaginum and vitals were monitored every 15 min for 2 hours. Procedure abandoned if more than 300 ml of blood collected in suction apparatus during the observation period or vitals worsened during the procedure or in observation period.

In Uterine Balloon Tamponade (UBT) group, we followed the Chhattisgarh technique. A condom-attached foley's catheter was inserted into the uterine cavity. The balloon was inflated with 200-300 ml of normal saline and connected to a collection bag. I V antibiotics were started. The pressure effect was maintained for 6 hours then removed following the protocol. Bleeding per vaginum and vitals were monitored every 15 min. for 2 hours. The procedure was abandoned if vitals worsened during observation period or UBT bag collection more than 100 ml in 1 hour.

3. Results

In our study, a total 29% women were between 20-25 years age, 37% between 25-30 years and 34% women in 30-35 years age. According to obstetric score, 45% women were primigravida, 18% women were 2nd gravida, 21% were 3rd gravidas and 16% were grand multi-gravidas.

Majority of the patients (67%) had gestational age between 36- 40 weeks, 25% were more than 40 weeks and 8% were less than 36 weeks. Total 46% women belonged to high risk pregnancy category. 32% patients in Group-P and 60% patients in Group-B were high risk pregnancies. In Panicker's group, 20% (n=10) of participants underwent induction or augmentation of labour, while the majority, 80% (n=40) had spontaneous onset and progress of labour. In contrast, balloon Tamponade Group was noted to have a higher rate of labour induction or augmentation, observed in 38% (n=19) of participants, with remaining 62% (n=31) having spontaneous onset and progress of labour. In Group-P, 70% (n=35) patients had vaginal delivery, Caesarean sections were performed in 20% (n=10) of cases while assisted vaginal deliveries using forceps or vacuum occurred in 10% (n=5) patients. In Group B, 52% (n=26) patients had vaginal deliveries, Caesarean section done in 44% (n=22) patients and Assisted vaginal deliveries in 4% (n=2) cases.

Out of total 68 vaginal deliveries including assisted vaginal deliveries, both groups had a similar percentage of patients with average duration of labour {Group P 70% (n=28) vs. Group B 71.5%(n=20)} and prolonged labour {Group P 30% (n=12) vs. Group B 28.5% (n=8)}. In Panicker's Group, 2% (n=1) of participants had minimal blood loss of <100 mL, majority (60%, n=30) experienced blood loss b/w 150–200 mL, while 26% (n=13) had blood loss b/w 100–150 mL. In Group B, 4% (n=2) patients had blood loss <100 mL, and 4% (n=2) lost 100–150 mL with majority (52%, n=26) having blood loss b/w 150–200 mL and a significantly higher proportion 40% (n=20) patients experienced blood loss b/w 201–250 mL as compared to Panicker's group; this finding was statistically significant (P=0.001).

In Group P, majority of patients 78%(n=39) had hemoglobin deficit of less than 2.5 g/dl, indicating a relatively smaller drop in hemoglobin levels postpartum. A deficit between 2.5–5 g/dl was observed in 6 (12%) cases while 5 (10%) participants experienced a significant drop of more than 5 g/dl. In Group B, 62% (n=31) participants had a Hb deficit of less than 2.5 g/dl, 9 (18%) cases had a deficit between 2.5–5 g/dl and 10 (20%) patients had a deficit greater than 5 g/dl.

In Group P, 24% (n=12) of participants required blood transfusion, while the majority, 76%(n=38) did not need this intervention. In Group B, 48% (n=24) cases required a blood transfusion, which was quite higher than in Group P. The remaining 52% (n=26) required no transfusion. It was statistically significant (p value 0.012).

In Group P, 78% (n=39) patients had bleeding controlled, while in 22% (n=11) bleeding control was not achieved. In Group B, 46% (n=23) of participants had bleeding controlled, while a higher proportion, 54% (n=27), faced challenges in controlling bleeding. It was statistically significant (P<0.001).

In Group P, 8% (n=4) of participants required application of hemostatic sutures for bleeding control while majority, 92% (n=46) did not require it. In Group B, 26% (n=13) of participants needed hemostatic sutures, which was higher than Group P. The remaining 86% (n=43) did not need this intervention. And this finding was statistically significant ($p=0.033$)

In Panicker's group, 8% (n=4) of participants required bilateral ligation of anterior division of internal iliac arteries

while in UBT group, 14% (n=7) cases required internal iliac ligation, which is higher than in Group P. However, this result was statistically not significant.

In Group P, 6% (n=3) patients required hysterectomy whereas in Group B, 14% (n=7) patients underwent hysterectomy, which is slightly higher than in Group-P. However, it was also statistically not significant.

Table 1: Distribution of participants based on age & obstetric score

S. No.		Group-P (n=50) (Panicker group)	Group-B (n=50) (UBT group)	Total (n=100)
Age Category				
1	20-25 Years	19	10	29
2	25-30 Years	18	19	37
3	30-35 Years	13	21	34
Obstetric Score				
1	Primigravida	20	25	45
2	Gravida 2	10	8	18
3	Gravida 3	13	8	21
4	Gravida 4 & more	7	9	16

Table 2: Distribution of participants based on gestational age & high risk pregnancy

S. No.		Group P (n 50)	Group B (n 50)	Total (n 100)
Gestational age				
1	<36 weeks	3	5	8
2	36-40 weeks	33	34	67
3	>40 weeks	14	11	25
High risk pregnancy				
1	Yes	16 (32%)	30 (60%)	46 (46%)
2	No	34 (68%)	20 (40%)	54 (54%)

Table 3: Distribution of participants based on onset of labor

S. No.	Onset/progress of labor	Group P (n 50)	Group B (n 50)	Total (n 100)
1	Induction/ augmentation	10 (20%)	19 (38%)	29 (29%)
2	Spontaneous	40 (80%)	31 (62%)	71 (71%)

Table 4: Distribution of participants based on mode of delivery

S. No.	Mode of delivery	Group P (n 50)	Group B (n 50)	Total (n 100)
1	Vaginal delivery	35 (70%)	26 (52%)	61 (61%)
2	Caesarean section	10 (20%)	22 (44%)	32 (32%)
3	Assisted vaginal delivery	5 (10%)	2 (4%)	7 (7%)

Table 5: Distribution of participants based on duration of labor

S. No.	Duration of labor in VD/Assisted VD	Group P (n 40)	Group B (n 28)
1	Average (6-8 hours)	28 (70%)	20 (71.5%)
2	Prolonged (>8 hours)	12 (30%)	8 (28.5%)

Table 6: Distribution of participants based on amount of blood loss, Hb deficit & blood transfusion

S. No.		Group P n50	Group B n50	p value
Blood loss (in ml)				
1	<100	1 (2%)	2 (4%)	0.001
2	100-150	13 (26%)	2 (4%)	
3	150-200	30 (60%)	26 (52%)	
4	201-250	6 (12%)	20 (40%)	
Hemoglobin deficit (g/dl)				
1	<2.5	39(78%)	31(62%)	0.20
2	2.5-5	6(12%)	9(18%)	
3	>5	5(10%)	10(20%)	
Blood transfusion				
1	Yes	12 (24%)	24(48%)	0.012
2	No	38 (76%)	26(52%)	

Table 7: Distribution of participants based on duration of labor

S. No.	Bleeding controlled	Group P	Group B	p value
1	Yes	39 (78%)	23 (46%)	<0.001
2	No	11 (22%)	27 (54%)	

Table 8: Distribution of participants based on requirement of surgical interventions

		Group P	Group B	p value
A. Haemostatic sutures				
	Yes	4 (8%)	13 (26%)	0.033
	No	46 (92%)	37 (74%)	
B. Bilateral Internal iliac artery (Anterior division) ligation				
	Yes	4 (8%)	7 (14%)	0.523
	No	46 (92%)	43 (86%)	
C. Hysterectomy				
	Yes	3 (6%)	7 (14%)	0.317
	No	47 (94%)	43 (86%)	

4. Discussion

In our study, the majority of participants in Group P (Panicker group) fell within the 20-25 years age category (n= 19, 38%), whereas Group B (Foley's UBT group) had a higher percentage in the 30-35 years category (n=21, 42%). The difference in age distribution is important to consider, as maternal age is a known influencing factor in obstetric outcomes. Younger mothers are often presumed to have better uterine contractility due to a more resilient myometrium, which may contribute to more effective response observed with Panicker's cannula in Group P. Suarez et al. have identified that women above 30 years are at a higher risk for uterine atony, particularly in multiparous women or those with prolonged labour.²¹ Additionally, Miuli et al. emphasized that advancing maternal age is linked with reduced myometrial responsiveness to oxytocin and increased rates of operative deliveries, both of which correlate with increased risk of PPH.²²

The obstetric profile revealed that 40% (n =20) of women in Group P were primigravida compared to 50% (n

=25) in Group B. However, in our study, higher primigravida representation in Balloon Tamponade group may have affected the results, as primigravidas may also often experience more intense and prolonged labour, increasing the risk of uterine exhaustion and atony.

Tindell et al. highlighted that uterine atony is not limited to multiparas and that primigravidas can equally be at risk, particularly when induction of labour or instrumental deliveries are involved.¹⁹ In our study, despite the higher number of primigravida in Foleys balloon group, Panicker group achieved better hemostatic outcomes. Moreover, Samartha et al. demonstrated successful outcomes of vacuum retraction cannula across varying parity levels, reinforcing the versatility of this approach. This further strengthens the conclusion that Panicker's device is not restricted by gravidity status and offers consistent control over PPH regardless of obstetric score.²³

In our study, the majority of participants (67%) delivered between 36 – 40 weeks of gestation-66% (n= 33) in Group P (Panicker) and 68% (n=34) in Group B (Foley's balloon). A significant proportion of our patients 46% (n = 46) belonged

to high-risk pregnancy category and 54% (n=54) were classified as low-risk pregnancy. This finding has critical implications, as PPH may occur in low-risk pregnancies but high-risk pregnancies-characterized by conditions like anemia, hypertensive disorders, polyhydramnios, multiple gestation and prolonged labour are more prone to post-partum complications including PPH. Widmer et al. emphasized importance of individualized second-line interventions in high-risk obstetric cases.⁹

Labour was spontaneous in onset and progress in 80% patients of Group P and in 62% of Group B, while induction or augmentation was done in 20% of Group P and 38% patients of Group B. Labour induction, especially when done with high-dose oxytocin or prostaglandins, increases risk of uterine muscle fatigue, which can lead to atony and refractory PPH. Hence, higher use of labour induction/augmentation in Group B may have influenced higher rates of uncontrolled hemorrhage and surgical interventions observed in that group. This observation is strongly supported by Overton et al., who noted that pharmacologically induced labour is a significant contributor to uterine atony, especially when active management of third stage of labour is not optimally timed or executed.¹¹

In this study, a prolonged duration of labour (>8 hours) was observed in 30% of participants in Group P and 28.5% in Group B which was almost similar in both groups. Prolonged labour leads to uterine muscle fatigue, impairing the uterus's ability to contract efficiently after delivery, thereby increasing the risk of refractory atonic PPH. Numerous studies, including Tindell et al. have established prolonged labour as an independent predictor of atonic PPH.¹⁹ It suggests that when labour extends beyond 8-10 hours, particularly in primigravidas or augmented labours, likelihood of uterine exhaustion increases substantially. Panicker's Group had a higher number of vaginal deliveries (70%) compared to UBT Group (52%), while cesarean sections were more common in Group B (44%) than Group P (20%). This is an important distinction, as the risk of PPH, particularly refractory PPH, is known to be higher after cesarean sections. The reason lies in possible uterine incision extensions and longer surgical durations that contribute to increased blood loss in caesarean sections. According to Suarez et al., UBT is slightly less effective in cesarean sections than in vaginal deliveries, with success rates of 81.7% and 87.0% respectively.²¹ These figures align with our findings where the Balloon Tamponade group having more cesarean cases showed reduced effectiveness in controlling hemorrhage. Conversely, the Panicker group, with more vaginal deliveries, achieved better hemostatic results. Moreover, Haslinger et al. observed that vacuum-induced uterine tamponade not only helped preserve hemoglobin but also minimized the need for escalation to blood transfusions and ICU care.²⁴

In our study, favourable outcome was seen in Panicker's group with respect to blood loss, 60% had blood loss between 150-200 ml, and only 12% crossed 200 mL. In contrast, balloon Tamponade Group had 40% of women losing blood between 201-250 ml- a clear indicator of higher and more uncontrolled bleeding and this finding was statistically significant. Blood loss of 150–250 mL was observed in most patients treated with vacuum suction, which was comparable to our findings in Group P.

A hemoglobin deficit of <2.5 g/dl was seen in 78% of Group P indicating a relatively smaller drop in Haemoglobin levels post partum and in 62% patients of Group B. Conversely, 20% in Group B had a deficit >5 g/dl, which was double that of Group P (10%). This stark difference highlights the superior performance of Panicker's vacuum cannula in controlling blood loss. Gulersen et al. reported that intra-uterine vacuum devices significantly reduce hemoglobin deficit and massive transfusion needs compared to balloon tamponade.²⁵ Similarly, Suarez et al., in a meta-analysis, noted that balloon tamponade is associated with variable results and greater hemoglobin drops in cesarean-associated PPH.²¹ Blood transfusions were required in 24% patients of Group P and in 48% patients of Group B with a statistically significant difference ($p=0.012$). This again highlights superior blood - sparing capacity of the Panicker device. Blood transfusions, while life-saving, carry their own risks including transfusion reactions, transmission of infections, and increased hospital stay. Raouf and Abdullah (2020) showed that early control of bleeding with mechanical interventions significantly reduced need for transfusion.²⁶ Bleeding was successfully controlled in 78% (n= 39) patients of Group P, whereas only 46% (n=23) of Group B achieved similar outcomes. This finding was highly statistically significant ($p<0.001$) and underlines the core conclusion of this study that Panicker's vacuum retraction cannula is markedly more effective in achieving hemostasis in atonic PPH compared to UBT. This aligns with findings from D'Alton et al. who reported a 94% success rate with vacuum-induced hemorrhage control devices.²⁷ Furthermore, Singata-Madliki et al. in a direct comparison between suction tube uterine tamponade (STUT) and UBT, found higher success and lower discomfort in the suction group.²⁸ In our study, 8% patients in Group P and 26% in Group B required application of uterine hemostatic sutures for bleeding control which was higher and the difference was statistically significant ($p=0.033$) and the trend was consistent that Panicker group had fewer surgical interventions overall. Surgical procedures increase surgical risk, lengthen recovery and add to healthcare costs. As noted by B-Lynch et al., while compression sutures during laparotomy are highly effective, they are invasive and ideally reserved for when all other measures fail. In Panicker's group, 8% (n= 4) of women required bilateral ligation of Anterior division of internal iliac arteries for securing hemostasis as compared to 14% (n=7) in balloon Tamponade Group ($p=0.523$). While not statistically significant, this difference reflects the trend toward greater

surgical escalation in the Foley group. Cebekhulu et al. emphasize that suction methods like STUT are more acceptable and practical alternatives in such cases.²⁹ Avoiding need for surgical interventions, not only reduces patient morbidity but also the strain on healthcare systems—which the Panicker group in our study better achieved. Only 6%(n=3) patients of panicker's group required hysterectomy compared to 14% (n =7) in balloon Tamponade Group. Though, the difference was not statistically significant (p=0.317), still this finding points toward a uterine-sparing advantage with this suction device. Hysterectomy, although life-saving results in permanent loss of fertility, and hence, avoiding it is a major goal in modern obstetrics. Studies by Makhija et al. and Pandey & Kumari documented cases where vacuum retraction methods helped avoid hysterectomy even in severe haemorrhage.^{30,31} Panicker's device, by quickly establishing a negative-pressure seal and collapsing the uterus from within, often prevents the hemorrhage from progressing to a stage requiring surgical interventions. This is crucial in resource-constrained settings, emergency cases, or in patients with comorbidities.

5. Conclusion

Post-partum hemorrhage continues to be a major contributor to maternal morbidity and mortality, particularly in low-resource settings where access to advanced medical interventions is limited. Atonic PPH, caused by failure of uterus to contract effectively after delivery, represents the most common variant. When first-line pharmacologic therapies fail, timely and effective second-line interventions are crucial in achieving hemostasis and preserving uterine integrity. Our study reflects superior physiological compatibility and efficacy of vacuum-assisted Uterine Suction Tamponade using Panicker's cannula as compared to uterine Foley's Balloon Tamponade in cases of atonic PPH. Panicker's group demonstrated significantly higher success rate in achieving haemostasis with reduced blood loss, lower Hb% deficit, lesser need for blood transfusion and application of uterine haemostatic sutures as compared to UBT group. Although the differences in surgical interventions such as ligation of anterior division of internal iliac arteries and hysterectomy did not reach statistical significance, these findings favoured Panicker's cannula method in reduced requirement of these procedures. Importantly, in our study, several demographic and clinical variables were unevenly distributed between the two groups due to random selection of patients such as higher number of patients with High risk pregnancy, cesarean section and labour induction/augmentation in Foley's balloon Tamponade group – which may have partially influenced outcomes. Despite these confounding factors, the consistent better results in Panicker's group across a range of parameters underscore the device's robustness and reliability in real-world settings. At present, intra-uterine Foley's balloon Tamponade (UBT) remains a widely accepted, practiced and effective method in obstetric practice especially in low resource settings yet UST

with Panicker's cannula offers an equally cost-effective yet more physiological and effective approach with faster intra-uterine blood evacuation, superior bleeding control, shorter time to application & lesser technical skills requirement and seems to be a promising alternative in management of atonic PPH in future.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. Ethical Approval

The study was approved by the Institutional Ethics Committee (Ref. No. 143/IEC/2024).

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