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PROSPECTIVE EVALUATION OF A RISK-STRATIFIED, SYMPTOM-GUIDED POSTPARTUM TRIAL WITHOUT CATHETER (TWOC) PROTOCOL AND ITS IMPACT ON BLADDER RECOVERY, MATERNAL COMFORT, AND HEALTHCARE UTILIZATION

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ABSTRACT

BACKGROUND: Postpartum urinary retention (PPUR) is a common but neglected complication of parturition. This leads to overdistension of the bladder, urinary tract infections, and long-term voiding dysfunction. Despite this evident complication, standardized postpartum bladder management protocols are lacking in many maternity units in Pakistan; therefore, this study aims to establish a postpartum trial without a urinary catheter, as recommended by developed countries.

OBJECTIVE: To evaluate the effectiveness, safety, and feasibility of a risk-stratified, symptom-guided postpartum Trial Without Catheter (TWOC) protocol.

METHODOLOGY: A prospective cohort study was conducted on 220 women in the tertiary care maternity unit of Bahawal Victoria Hospital from June 2024 to September 2025. Postpartum women at risk of PPUR underwent a structured TWOC protocol incorporating timed voiding, Voiding Efficiency Screening & Symptom Inquiry (VESSI), and post-void residual volume measurement. TWOC success, need for re-catheterization, bladder overdistension, urinary tract infection, and patient-reported satisfaction were the outcomes of the study.

RESULTS: Successful TWOC on the first attempt was observed in 70%(n=154) of patients. Overdistension (>700 ml) was in only 5%, and the median time to spontaneous voiding was 5.2 hours (IQR 4.1–6.0). Increasing post-void residual volume and higher VESSI scores were associated with progressively poorer TWOC outcomes ($\chi^2 = 55.25$, df = 2, $p < 0.001$). On multivariable analysis, residual volume ≥250 ml (adjusted OR 3.4, 95% CI 2.1–5.6), high VESSI score (≥5) (adjusted OR 2.9, 95% CI 1.8–4.7), and instrumental delivery (adjusted OR 2.2, 95% CI 1.3–3.9) independently predicted TWOC failure (all $p \leq 0.004$). Patient-reported outcomes were favorable, with over 80% reporting reduced anxiety and willingness to recommend the protocol.

CONCLUSION; The TWOC protocol is safe, effective, and associated with high patient satisfaction, supporting its integration into routine postpartum care.

KEYWORDS: Trial without catheter, Post partum urinary retention, Voiding efficiency screening and, Bladder recovery

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INTRODUCTION

Postpartum urinary retention (PPUR) is a clinically significant but underdiagnosed complication of parturition.[1] PPUR is defined as the loss of spontaneous voiding within 6 hours after parturition and/or presence of >150ml of post-void residual bladder volume (PVRBV).[2] This can be detected with catheterization or ultrasound in asymptomatic women.[3] The global incidence of PPUR is variable from 0.18 to 14.6%,[4] with high-income countries having an incidence of 0.20%[5] and in low-income countries like Nigeria, it is 17.6% as per 2022 data.[6] A national study in Sindh province of Pakistan determined 6.14% frequency of PPUR[7] while in the Punjab region of Pakistan, a recent study reported that 52.2% of females had PPUR.[8] These marked variations may be due to differences in diagnostic criteria and surveillance methods. PPUR is attributable to physiological changes during labor, perineal trauma, regional anesthesia, prolonged labor, and operative deliveries.[9]

If PPUR is undiagnosed or not adequately managed, it may lead to bladder overdistension, detrusor muscle injury, urinary tract infection, delayed postpartum recovery, and long-term voiding dysfunction.[10] Despite these risks, postpartum bladder care remains inconsistent, with substantial variation in catheter removal timing, voiding assessment, and re-catheterization thresholds.[11] Traditional management is inclined towards PVRBV and often fails to incorporate patient-reported symptoms and satisfaction.[12] There is limited evidence supporting symptom-guided strategies integrated with objective measurements, so this study evaluates a risk-stratified, symptom-guided TWOC protocol aimed at standardizing postpartum bladder care, preventing bladder injury, and improving maternal experience.

METHODOLOGY:

This prospective cohort study was conducted in the Gynecology and Obstetrics ward of Bahawal Victoria Hospital, Bahawalpur. The duration of the study was from June 2024 to September 2025. All participants were recruited after a written informed consent according to the Declaration of HELSINKI. 0-3 days postpartum women, aged 18-40 years, with vaginal or cesarean delivery, and who had an indwelling urinary catheter removed postpartum, were included if they had at least one risk factor for PPUR, which are epidural analgesia, instrumental delivery, prolonged second stage of labor, severe perineal trauma, or cesarean section[13]. Women with pre-existing voiding dysfunction, neurological bladder disorders, or critical postpartum complications were excluded.

The WHO sample size calculator was used for sample size calculation. By keeping a CI of 95%, a margin of error 5%, and a population proportion of 8.3%, the estimated sample size was 117; however, we recruited 220 subjects via non-probability consecutive sampling to enhance the generalizability of the findings and account for potential dropouts or incomplete data[14].

After taking a written informed consent, demographic data, including baseline profile was collected on a study-designed questionnaire. After catheter removal, participants were encouraged to void within 4 hours. Voided volumes were recorded, the VESSI (Voiding Efficiency Screening & Symptom Inquiry)[1] assessment was applied where indicated, and post-void residual volumes were measured using in-and-out catheterization. Management decisions were based on predefined residual volume thresholds. The VESSI scale is used to assess the severity of postpartum urinary retention (PPUR) symptoms. It includes a set of patient-reported questions designed to evaluate the frequency, urgency, and discomfort associated with voiding. The scale is scored from 0 to 10, with a score of 0-2 (Low symptom severity, i.e., mild symptoms with minimal impact on daily life), score 3–4: Moderate symptom severity, i.e. some discomfort, affecting daily activities and a score of 5–10: High symptom severity, i.e. severe symptoms, significantly affecting daily activities). Low scores (0–2) suggest a lower risk of TWOC failure, Moderate to high scores (≥3) indicate a higher risk of TWOC failure and may necessitate closer monitoring or alternative strategies. The VESSI scale has been validated as an effective tool for predicting TWOC outcomes and for risk stratification in postpartum urinary retention management[1].

The primary outcome was successful TWOC, defined as spontaneous voiding with post-void residual volume <150 ml without re-catheterization. Secondary outcomes were bladder overdistension, prolonged catheterization, urinary tract infection, length of hospital stay/healthcare utilization, and maternal comfort/satisfaction.

Data were analyzed with SPSS 28.0. Descriptive statistics were used for baseline characteristics and presented in terms of mean ± SD for quantitative variables and frequency percentages for qualitative variables. Logistic regression via the backward method was applied for the identification of predictors of TWOC failure. A p-value <0.05 was considered statistically significant.

Ethical approval with reference number 2454/DME/QAMC was obtained from the Ethical Review Board of Bahawal Victoria Hospital, Bahawalpur, Pakistan.

RESULTS

The study population predominantly had young women with a mean maternal age of 29.6 years and a normal mean BMI, indicating a generally low-risk obstetric cohort. Most women were having full term delivery, and neonatal birth weight was within the expected normal range, suggesting term deliveries without significant growth abnormalities. More than half of the participants were primiparous, reflecting a population potentially at higher risk for postpartum voiding dysfunction. Modes of delivery were relatively evenly distributed, allowing assessment across different obstetric exposures. A successful TWOC on the first attempt was achieved in 70% of participants. Only a small proportion (9.1%) required prolonged catheterization beyond seven days, indicating overall favorable bladder recovery. Episodes of bladder overdistension were uncommon, and the median time to spontaneous voiding was relatively short, suggesting effective bladder management. Patient-reported outcomes were notably positive. Majority of the women reported reduced anxiety related to voiding, improved comfort and mobility, and high or very high satisfaction with bladder care. Importantly, over 80% indicated they would recommend the protocol to others, reflecting strong acceptability and perceived benefit from the care pathway. **Table 1**

Table 1: Baseline variables, outcome of TWOC, and maternal satisfaction/comfort of study population

Variables	Values
Maternal age (years), mean ± SD	29.6 ± 4.8
BMI (kg/m^2), mean ± SD	21.71±2.3
Gestational age (weeks), mean ± SD	38.5±2.3
Neonatal birth weight (grams), mean ± SD	3212 ± 291
Primiparous, n (%)	124 (56.4)
Mode of delivery, n (%)	
Spontaneous vaginal	92 (41.8)
Instrumental vaginal	42 (19.1)
Cesarean section	86 (39.1)
Epidural analgesia	128 (58.2)
Prolonged second stage (>2 h)	66 (30.0)
≥3rd degree perineal tear	28 (12.7)
Indwelling catheter duration (hours), median (IQR)	18 (12–24)
Successful TWOC on first attempt	154 (70.0)
Required repeat TWOC at 24 hours	46 (20.9)
Required prolonged catheterization (>7 days)	20 (9.1)
Bladder overdistension (>700 ml)	10 (4.5)
Median time to spontaneous voiding (hours), IQR	5.2 (4.1–6.0)
Reduced anxiety related to voiding	180 (81.8)
Improved comfort and mobility	168 (76.4)
Satisfaction with bladder care (high/very high)	174 (79.1)
Would recommend the protocol to others	186 (84.5)

BMI=body mass index

Increasing post-void residual volume was associated with progressively poorer voiding outcomes, ranging from successful immediate TWOC at low volumes to prolonged catheterization in cases of severe bladder overdistension, demonstrating a clear dose–response relationship between residual volume and bladder recovery.

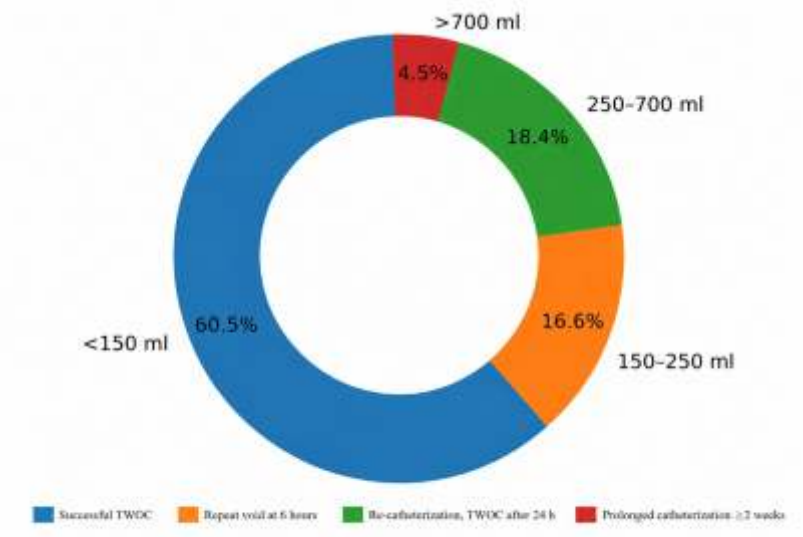

Figure 1: Residual Volume–Based Decision Pathway. Initial post-void residual volumes (mL) were categorized into different ranges. Management decisions were made based on predefined thresholds of residual volume, including recommendations for TWOC success, repeat TWOC, or prolonged catheterization.

Figure 2: Association Between VESSI Score and TWOC Outcome. The figure shows the distribution of participants across three VESSI categories (low, moderate, and high) and their corresponding TWOC outcomes (successful or failed). The sample sizes within each VESSI category are as follows: low (n=52), moderate (n=102), and high (n=66). TWOC success rates were progressively lower as VESSI scores increased, with a significant statistical association ($\chi^2 = 55.25$, $p < 0.001$).

Figure 2 demonstrates a strong, graded association between VESSI symptom severity and trial without catheter (TWOC) outcome. The association is statistically significant at the level of $p < 0.001$. The stepwise change across categories supports a dose–response relationship, strengthening the argument for predictive validity of the VESSI score. VESSI can be used as a risk stratification tool before TWOC. If the VESSI is low, TWOC can be attempted confidently. For moderate VESSI, the consultant should consider optimization (e.g., α-blockers, timing, monitoring), and for high VESSI, there is a high risk of failure, so alternative strategies or delayed TWOC may be warranted.

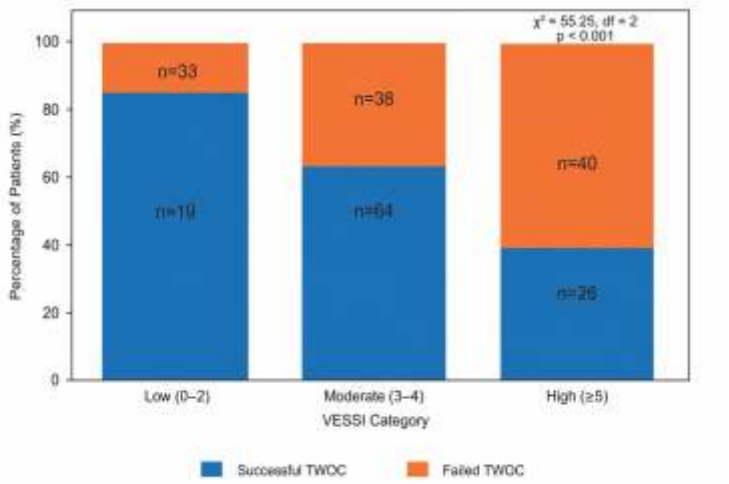

Table 2. Multivariable logistic regression analysis for TWOC failure

Predictor	Adjusted OR	95% CI	p-value
Residual volume ≥250 ml	3.4	2.1–5.6	<0.001
High VESSI score (≥5)	2.9	1.8–4.7	<0.001
Instrumental delivery	2.2	1.3–3.9	0.004
Epidural analgesia	1.6	0.9–2.8	0.08

In multivariable analysis, residual volume ≥250 ml and high VESSI score (≥5) were the strongest independent predictors of TWO C failure, while instrumental delivery also conferred significantly increased risk; epidural analgesia was not independently associated after adjustment. **Table 2**

DISCUSSION

The present study evaluated the effectiveness and safety of a risk-stratified, symptom-guided postpartum Trial Without Catheter (TWOC) protocol in women at increased risk of postpartum urinary retention (PPUR). Findings from the current study demonstrate that the TWOC leads to the timely identification of voiding dysfunction, with an 70% successful spontaneous voiding, and minimized prolonged catheterization and bladder overdistension. The integration of VESSI symptom assessment with residual-volume thresholds improved risk stratification and decision-making (Figure 1) and the superior predictive performance of the combined model (Table 2). These findings directly support the primary aim of standardizing postpartum bladder care to improve maternal outcomes while preventing avoidable complications.

The current study achieved a first-attempt TWOC success rate of 70%, similar to the recently reported success rate of 61.9[15]. Elevated post-void residual volume as a strong predictor of persistent voiding dysfunction aligns with prior studies demonstrating clinically relevant thresholds between 250 and 300 ml, supporting the robustness of residual volume as an objective prognostic marker[3]. The association between instrumental vaginal delivery and increased risk of TWOC failure is consistent with earlier reports attributing this relationship to pelvic floor trauma and transient neuropraxia affecting bladder function[16].

Unlike most prior studies[17], which have relied predominantly on

objective measures, this study demonstrates that a VESSI shows a strong, graded association with TWOC outcomes and remains an independent predictor after adjustment, highlighting the added prognostic value of patient-reported symptoms that have previously been underutilized. Additionally, while epidural analgesia has often been reported as a risk factor for postpartum urinary retention[18]. It was not independently associated with TWOC failure in the present multivariable model; this discrepancy is likely explained by confounding in earlier studies, as epidural use is closely linked with prolonged labor and instrumental delivery rather than being a direct causal factor. A recent study reported nulliparity (adjusted OR = 4.05, 95% CI 2.02-8), and prolonged second stage (OR = 3.96, 95% CI 1.53-10.25) as strong predictors of PPUR[19]. The current study has shown a low incidence of severe bladder overdistension (>700 mL) in comparison to earlier studies[4,20], which may reflect differences in study design. The implementation of an early residual-volume–guided bladder care protocol in the present study likely facilitated timely intervention and prevention of progressive overdistension.

A single tertiary center as a study setting, lack of long-term follow-up and potential selection bias are limitations of the current study. Longer-term follow-up is recommended to assess persistent voiding dysfunction beyond the early postpartum period. Implementing the TWOC protocol in low-resource settings may face challenges such as limited training, lack of diagnostic tools, and financial constraints. These can be addressed by developing cost-effective training programs, using alternative diagnostic methods like manual palpation, and seeking funding through NGOs. Cultural resistance can be mitigated with education campaigns, while the lack of standardized protocols can be overcome by integrating TWOC into national health guidelines. These strategies can help integrate TWOC into routine postpartum care in resource-limited settings, improving maternal outcomes.

CONCLUSION

This study demonstrates that a risk-stratified, symptom-guided postpartum TWOC protocol is effective, safe, and acceptable in a high-risk postpartum population. The integration of VESSI with residual-volume assessment improves the prediction of TWOC outcomes and supports individualized clinical decision-making. These findings are particularly relevant for Pakistan and similar low- and middle-income settings, where standardized postpartum bladder care can substantially improve maternal outcomes.

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A.Conception or Design

B.Acquisition, Analysis, or Interpretation of Data

C.Manuscript writing

D.Critical Review and approval

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved