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**Original article**

# Postpartum Urinary Retention after Vaginal Delivery: Assessment of Risk Factors in a Case Control Analytical Study

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## Abstract

***Objective:*** To assess the obstetric risk factors of postpartum urinary retention (PPUR) after vaginal delivery. ***Study design:*** A case control analytical study. ***Materials and methods:*** Out of 1500 women included in the study, 258 women (17.2%) who had postpartum urinary retention were cases and 1242 women (82.8%) who did not were controls. Postpartum urinary retention was defined as the inability to void within 6 hours of delivery or who had postvoid residual bladder volume ≥150 ml. Logistic regression analysis was used to identify the risk factors of post-partum urinary retention. ***Result:*** Prolonged duration of the second stage of labor [Odds Ratio (OR)=1.0858, 95% Confidence Interval (CI) for OR=1.0640 to 1.1080, p value<0.001], presence of episiotomy (OR=90.2116, 95% CI for OR=13.3786 to 608.2946, p value<0.001), perineal laceration (OR=104.3896, 95% CI for OR=32.6871 to 333.3784, p value<0.001), and birth weight of >4000 g for the newborn(OR=136.2499, 95% CI for OR=45.8096 to 423.7436, p value<0.001), were found to be independent risk factors for PPUR after vaginal delivery. ***Conclusion:*** Post-partum urinary retention is a relatively common disorder which may cause permanent harm to bladder function. The obstetrician may avoid this complication by the knowledge of risk factors. To determine whether routine postpartum bladder scanning is cost-effective and beneficial, further studies are needed.

**Keywords:** ***post-partum urinary retention, risk factors, vaginal delivery, post void residual bladder volume, covert retention***

## Introduction

Voiding difficulty or post-partum urinary retention (PPUR) is a common but disturbing phenomenon in the immediate post-partum period. The exact incidence of PPUR is unknown but in the literature, the incidence of PPUR varies between 0.05% to 37% [1]. However, the approximate incidence is likely to be higher since the majority of cases frequently remain unreported.

PPUR is not clearly defined in literature and is often described as absence of spontaneous micturition after 6 hours of vaginal delivery or no spontaneous micturition after removal of the indwelling catheter after LSCS [2]. Yip et al has classified postpartum urinary retention into overt and covert retention [3]. Women with post-void residual bladder volume (PVRBV) of more than 150 ml on ultrasound screening or catheterization, without any retention symptoms are said to have covert urinary retention. Overt urinary retention refers to the inability to void in presence of signs and symptoms of urinary retention.

The causes of PPUR have been postulating as physiological changes during pregnancy, perineal trauma, nulliparity, regional analgesia, instrumental delivery, and prolonged labor [3]. However, the pathophysiology is poorly known. It can be due to physiological, neurological, and mechanical processes in the postpartum period. Inappropriate or delayed diagnosis and management of PPUR can lead to bladder dysfunction, urinary tract infection, and catheter-related complications [4]. Every post-delivery woman should void within 6 hours, as per RCOG Incontinence in Women Study Group. Both NICE guidelines on postnatal care and the WHO technical consultation on postpartum and postnatal care state that if there is no voiding within 6 hours of birth and the voiding struggle is not successful, the bladder volume should be measured [5]. Post void residual bladder volume (PVRBV) is determined after passing a urethral catheter to drain the bladder, but this is a painful procedure and is associated with risk of infection or trauma. Ultrasound is non-invasive and easily available alternative to diagnose post-void residual urine volume. For comparison of published data and testing purposes, the most widely used volume is > 150 ml for diagnosing post-partum urinary retention [6]. In this study, we aimed at assessing the obstetric risk factors that can predict the occurrence of PPUR in women with vaginal delivery and prevent its complications.

## Materials and Methods

The study was conducted in a tertiary care hospital from December 2018 to May 2020. The institutional ethics committee approved the study. 1500 women with uncomplicated pregnancies who had term singleton vaginal delivery were included in the study. Written and informed consent was taken from all the participants of the study.

Participant data including age, parity, obstetric history and intra-partum data such as gestational age at onset of labour, spontaneous or induced labor, use of oxytocin, epidural analgesia, duration of first, second, third stage of labour, fundal pressure during the second stage of labour, instrumental delivery, birth weight (babies with birth weight >4 kg defined as macrosomic baby ), head circumference measurement of new born, perineal laceration, episiotomy and postpartum urinary symptoms (dysuria, frequent urge to urinate without being able to pass much urine, and feeling like bladder not completely empty) was recorded.

All women underwent transabdominal ultrasound immediately after first micturition in the postpartum period to assess PVRBV. To achieve a longitudinal and transverse scan of the bladder, the transducer was placed in the midline on the top of the symphysis pubis. The widest diameter was measured in cm in the transverse scan (D1), the anteroposterior diameter in cm in the longitudinal scan (D2) and the cephalocaudal diameter in cm in the longitudinal scan (D3). Estimated PVRBV was calculated by using the formula D1×D2×D3×0.7 [7]. Women with estimated PVRBV ≥150 mL or who were unable to micturate within 6 hours after vaginal delivery were defined as the cases. Women who had an estimated PVRBV<150 mL were defined as the controls.

**1. Statistical analysis**: Statistical analysis was done with the help of SPSS Version 26. The normal distribution of the variables was analysed. Continuous variables with normal distribution are presented as mean ± standard deviation. Median (minimum-maximum) value was used where a normal distribution was absent. Quantitative variables are given as number (percentage). Statistical comparison was carried out by chi-square ($\chi 2$), and independent sample t-tests where appropriate. Logistic regression model was performed to analyse risk factors for PPUR. P<0.001 was considered statistically significant. Odds ratio and corresponding 95%confidence intervals are reported. Significant variables were analysed by bivariate and multivariate logistic regression analyses to determine which factors were independently associated with PPUR.

## Results

In our study, out of the 1500 patients recruited, 258 patients had PPUR with an overall incidence of 17.2%. Of the 258 women in the study 96.12% of patients had covert urinary retention while 3.88% of women were diagnosed to have overt retention. The characteristics of women and newborns are listed in Table 1. There were no statistically significant differences between patients with or without PPUR regarding age, gravida, parity, gestational age, time to 1st void, duration of first and third stage of labour, induction or augmentation of labour, fundal pressure, labour analgesia or presence of episiotomy. However, the mean birth weight of newborns was found to be statistically significantly higher in women with PPUR being 3969.44 ± 560.055g as compared to 3147.192 ± 400.483g in women. Also, the greater head circumference in patients with PPUR was found to be statistically significant being 34.53 ± 3.235 cm as compared to 32.94 ± 3.641 cm in patients without PPUR. Regarding obstetric characteristics, there was no significant differences between the two groups but the duration of second stage of labour was statistically significantly higher being 133.61 ± 27.109 min in patients with PPUR as compared to 79.18±23.442 min in patients without PPUR. The presence of perineal lacerations was also statistically significantly higher in patients with PPUR (94.57%) as compared to 1.37% in patients without PPUR. More women with PPUR (73.26%) gave birth to macrosomic infants as compared to women without PPUR (0.016%) and the difference was statistically significant.

Logistic regression analysis of various risk factors of PPUR show that prolonged duration of second stage of labour, presence of episiotomy, perineal lacerations and birth weight >4000g for the newborn were significant risk factors to predict PPUR after vaginal delivery.

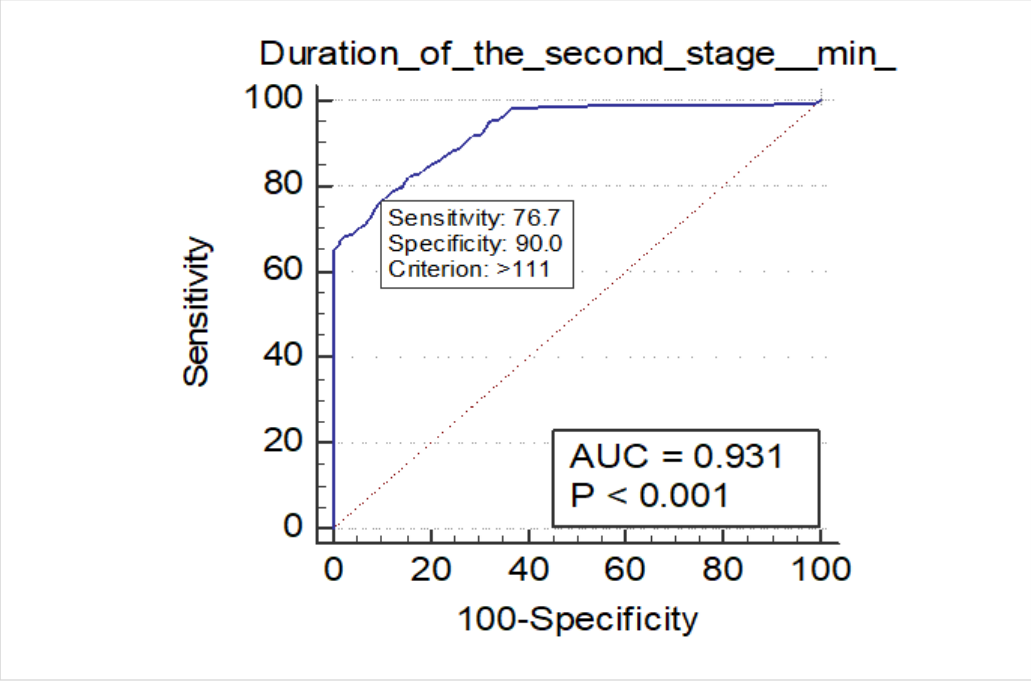


**Figure 1: ROC curve analysis of 2nd stage of Labour**

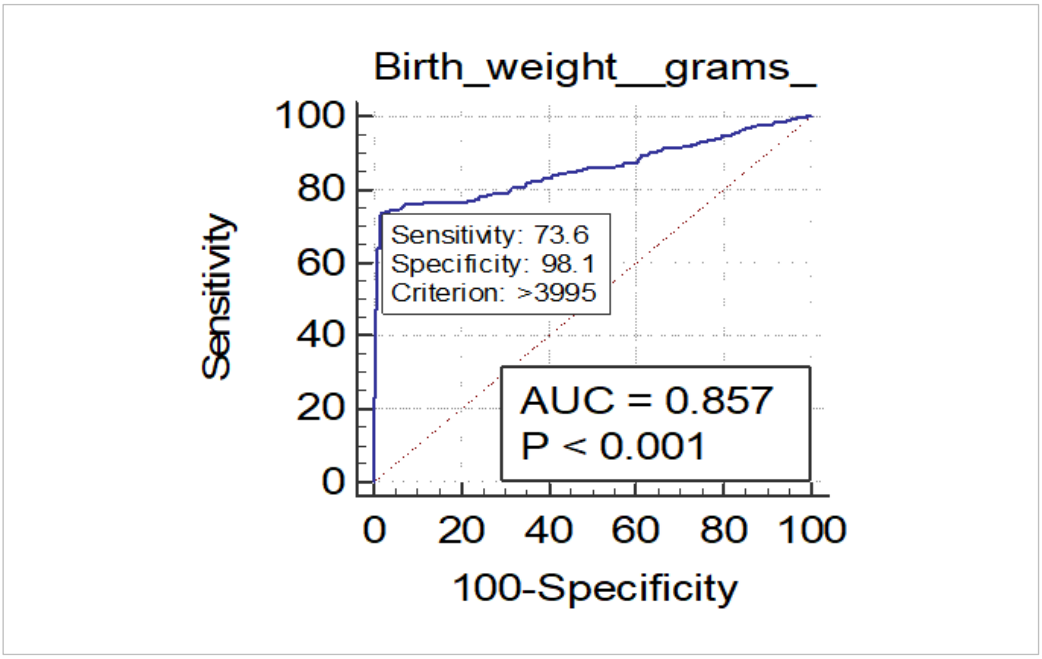


**Figure 2. ROC curve analysis of Birthweight**

**Table 1: Characteristics of patients and labour with or without PPUR**

| | **No PPUR n=1242** | **PPUR n=258** | **P value** |
|---|---|---|---|
| Age (in yrs) | 28.67 ± 6.203 | 28.11 ± 6.398 | 0.1896 |
| Primigravida | 49 | 160 | 0.4351 |
| Primipara | 168 | 90 | 0.4025 |
| Gestational age (in days) | 280.05 ± 8.337 | 279.05 ± 6.235 | 0.1806 |
| Birth weight (in grams) | 3147.192 ± 400.483 | 3969.44 ± 560.055 | 0.0001 |
| Head circumference (in cm) | 34.53 ± 3.235 | 32.94 ± 3.641 | 0.0001 |
| Time to first void (in hrs) | 3.79 | 3.67 | 0.29 |
| PVRBV (ml) | 87.94± 63.27 | 173.11± 75.32 | 0.0001 |
| 1st stage duration (in min) | 534.98 ± 206.850 | 527.59 ± 202.022 | 0.6002 |
| 2nd stage duration (in min) | 79.18±23.442 | 133.61 ± 27.109 | 0.0001 |
| 3rd stage duration (in min) | 34.63 ± 14.768 | 35.80 ± 14.572 | 0.2409 |
| Labour augmentation with oxytocin | 599 (48.22%) | 135 (52.32%) | 0.2311 |
| Labour induction with oxytocin or misoprostol | 639 (51.44%) | 123 (47.67%) | 0.2744 |
| Labour analgesia | 620 (49.91%) | 136 (60.46%) | 0.227 |
| Fundal pressure | 416 (33.49%) | 94 (36.43%) | 0.201 |
| Macrosomic newborn (>4000g) | 20 (0.016%) | 189 (73.26%) | 0.0001 |
| Episiotomy | 665 (53.54%) | 149 (57.75%) | 0.2430 |
| Perineal laceration | 14 (1.37%) | 244 (94.57%) | 0.0001 |

**Table 2: Logistic regression analysis of risk factors for PPUR**

| **Variable** | **Wald** | **P** | **Odds ratio** | **95% CI** |
|---|---|---|---|---|
| Parity | 2.4100 | 0.1206 | 1.9300 | 0.8414 to 4.4269 |
| Analgesia during labour | 0.1324 | 0.7160 | 0.8767 | 0.4314 to 1.7816 |
| Duration of the first stage | 2.5793 | 0.1083 | 1.0018 | 0.9996 to 1.0040 |
| Duration of the second stage | 63.2812 | <0.0001 | 1.0858 | 1.0640 to 1.1080 |
| Labour induction with IV oxytocin | 0.5724 | 0.4493 | 1.3247 | 0.6394 to 2.7446 |
| Fundal pressure | 3.7161 | 0.0539 | 0.2657 | 0.0691 to 1.0224 |
| Episiotomy | 21.3781 | <0.0001 | 90.2116 | 13.3786 to 608.2946 |
| Perineal laceration | 61.5592 | <0.0001 | 104.3896 | 32.6871 to 333.3784 |
| Macrosomic newborn | 72.0700 | <0.0001 | 136.2499 | 43.8096 to 423.7436 |
| Time birth to the first void hours | 9.2592 | 0.0023 | 0.4608 | 0.2797 to 0.7590 |

## Discussion

In our study it was found that PPUR is a relatively common occurrence with an incidence of 17.2%. In the literature, the incidence of PPUR varies widely between 0.05% to 37% [8-9]. The difference may be due to different study designs and underdiagnosis of covert urinary retention. Overt retention is easily detected, although covert retention is only known by ultrasound or catheterization, as there are no symptoms in most women. The average maternal age has been found to be between 25 and 28 years in the literature [3]. In this study, the mean age of the patients with post-partum urinary retention was 28.11 ± 6.398 years compared to

28.67 ± 6.203 years in those without urinary retention. Many different obstetrical risk factors have been considered for the pathogenesis of PPUR in the literature but the exact etiology of PPUR is not known. Nulliparity is often perceived as a risk factor [10,1]. They are exposed to pelvic floor tenderness and pudendal nerve damage during vaginal birth. In the literature, the incidence of PPUR has been found to be higher in primigravida than in multigravida [9,11]. However, in the present study, parity was not a risk factor for PPUR. Prolonged stages of labour may result in PPUR. The possible mechanism is applied mechanical strength leading to pelvic nerve damage which results in neurologic impairment of the bladder. Kekre et al noted that the periods of the first and second phases of labour were directly related to the residual amount of postpartum urine, and a higher incidence of PPUR was also correlated with the labour period of 700 minutes [12]. We also identified prolonged second stage of labour as a risk factor for PPUR. Delivery of a marosomic newborn was also identified as a risk factor of PPUR in our study. The rise in abdominal pressure with a macrosomic baby, may lead to pelvic and pudendal nerve damage. This causes neurologic impairment of micturition and, therefore, urinary retention. This is similar to the study by Cavkaytar S et al but in contrast to the study by Polat et al which showed that fetal birth weight does not increase the risk of PPUR [13,14]. In contrast to our findings, Pifarotti et al detected fundal pressure as a major risk factor for PPUR development during the second stage of labour [15]. We also found a higher incidence of PPUR in women with perineal lacerations and episiotomy than in women without them. Episiotomy may cause edema in the perineal region and hence result in damage to the perineal nerve innervation, leading to PUR. Musselwhite et al reported that second- and third-degree perineal tears, which might result in reflex urethral spasm, had a relationship with PPUR. However, the same study showed that episiotomy had no impact on PPUR [16]. In contrast, Yip et al reported that perineal trauma had no effect on the incidence of PPUR [3]. There is insensitivity of the bladder muscle due to the hormonal changes. This together with bladder edema and the injury to the pelvic nerve plexus (leading to neuropraxia) from compression of the presenting part, increases the chances of PUR after delivery. Early identification and treatment results in recovery of most of the cases with PUR. In a study on 11,332 women, Carley et al found that 45% of symptomatic PPUR resolved within 48 hours and 25% of women had persistence for more than 72 hours [9]. In case of delay in detection of PPUR, it can result in bladder under-activity, retention, recurrent urinary tract infections and prolonged voiding dysfunction. Many short-term complications of PPUR have been mentioned, but it is uncertain whether PPUR results in any long-term morbidity. Yip et al found no significant difference between women with and without urinary retention in a four year follow up in terms of urinary stress incontinence, fecal incontinence, frequency, urgency, nocturia and coital incontinence [17]. Mulder et al, did not find any difference in voiding difficulty or the development of lower urinary tract symptoms in a 1-year follow-up of women with covert PUR defined as PVRBV >150 mL [18]. No guidelines recommend routine bladder scanning for the diagnosis of PPUR, due to the size of the uterus after delivery, and the accuracy of USG measurements of residual volume is debatable [19]. The benefits and cost-effectiveness of routine post void bladder screening can be confirmed only by further research. Further studies are also needed to establish a cut-off for defining covert urinary retention to assess long term complications such as voiding dysfunction.

## Conclusions

To conclude, PPUR is a relatively common condition that can cause bladder dysfunction. Longer second stage of labor, delivery of a macrosomic newborn, the presence of episiotomy and perineal lacerations are significant risk factors for the development of PPUR. Awareness of risk factors may allow the obstetrician to prevent this complication.

## Consent

Written and informed consent was obtained from all the participants of the study.

## Ethics approval

Approval for the study was obtained from Tata Main Hospital Institutional Ethics Committee.
Ethics Committee Approval document no.
TMH/FRM/QMS/ALL/19

## List of abbreviations

OR: odds ratio
CI: Confidence interval
PPUR: post-partum urinary retention
PVRBV: Post void residual bladder volume

## Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

## Funding Statement

None

## Authors' contributions

SA-Study design, data collection, preliminary draft. OS-supervising, final draft. All authors read and approved the final manuscript.

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## References

[1] Lim JL. Post-partum voiding dysfunction and urinary retention. Aust N Z J Obstet Gynaecol 2010; 50: 502-5.
[2] Andolf, E., Iosif, C., Jörgensen, C., & Rydhström, H. (1994). Insidious urinary retention after vaginal delivery: prevalence and symptoms at follow-up in a population-based study. Gynecol Obstet Invest, 38(1), 51-3.
[3] Yip SK, Brieger G, Hin LY, Chung T. Urinary retention in the post¬partum period: The relationship between obstetrics factors and the postpartum post-void residual bladder volume. Acta Obstet Gynaecol Scand 1997; 76: 667-72
[4] Zaki MM, Pandit M, Jackson S. National survey for intrapartum and postpartum bladder care: Assessing the need for guidelines. BJOG 2004; 111: 874-6
[5] Chaurasia, A., & Tyagi, K. (2013, September). Persistent postpartum urinary retention following vaginal delivery: a rare complication in obstetrics practice. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 2(3), 475-477.
[6] National Institute for Health and Care Excellence. (2006, October). Urinary incontinence and pelvic organ prolapse in women: management. Urinary Incontinence, NICE Clinical Guidelines, pp. 1-249.
[7] Poston GJ, Joseph AEA, Riddle PT. The accuracy of ultrasound in the measurement of changes in bladder volume. Br J Urol 1983; 55: 361

[8] Buchanan J, Beckmann M. Postpartum voiding dysfunction: identifying the risk factors. Aust N Z J Obstet Gynaecol 2014; 54:41-5.
[9] Carley ME, Carley JM, Vasder G, Lesnick TG, Webb MJ, Ramin KD. Factors that are associated with clinically overt postpartum urinary retention after vaginal delivery. Am J Obstet Gynecol 2002; 187:430-3.
[10] Mulder FE, Schoffelmeer MA, Hakvoort RA, Limpens J, Mol BW, van der Post JA, et al. Risk factors for postpartum urinary retention: a systematic review and meta-analysis. BJOG 2012; 119:1440-6.
[11] Liang CC, Chang SD, Chang YL, Chen SH, Chueh HY, Cheng PJ. Postpartum urinary retention after cesarean delivery. Int J Gynecol Obstet 2007; 99: 229-32.
[12] Kekre AN, Vijayanand S, Dasgupta R, Kekre N. Postpartum urinary retention after vaginal delivery. Int J Gynaecol Obstet 2011; 112:112- 5.
[13] Cavkaytar S, Kokanalı MK, Baylas A, Topçu HO, Laleli B, Taşçı Y. Postpartum urinary retention after vaginal delivery: Assessment of risk factors in a case-control study. J Turk Ger Gynecol Assoc. 2014 Aug 8;15(3):140-3. doi: 10.5152/jtgga.2014.13102. PMID: 25317040; PMCID: PMC4195322.
[14] Polat M, Şentürk MB, Pulatoğlu Ç, Doğan O, Kılıççı Ç, Budak MŞ. Postpartum urinary retention: Evaluation of risk factors. Turk J Obstet Gynecol. 2018 Jun;15(2):70-74. doi: 10.4274/tjod.43931. Epub 2018 Jun 21. PMID: 29971181; PMCID: PMC6022424.
[15] Pifarotti P, Gargasole C, Folcini C, Gattei U, Nieddu E, Sofi G, et al. Acute post-partum urinary retention: analysis of risk factors, a casecontrol study. Arch Gynecol Obstet 2014; 289:1249-53.
[16] Musselwhite KL, Faris P, Moore K, Berci D, King KM. Use of epidural anesthesia and the risk of acute postpartum urinary retention. Am J Obstet Gynecol 2007; 196:472.
[17] Yip SK, Sahota D, Chang AM, Chung TK. Four-year follow-up of women who were diagnosed to have postpartum urinary retention. Am J Obstet Gynecol 2002; 187:648-52.
[18] Mulder FEM, Hakvoort RA, de Bruin JP, Janszen EW, van der Post JAM, Roovers JWR. Long term micturition problems of asymptomatic postpartum urinary retention: a prospective case-control study. Int Urogynecol J. 2018; 29:481-488.
[19] Routine Postnatal Care of Women and their Babies. National Institute for Health and Clinical Excellence Guideline 37. London; 2006. World Health Organization. World Health Organization Technical Consultation on Postpartum and Postnatal Care. Geneva: World Health Organization; 2010.