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ORIGINAL ARTICLE

Evaluation of risk factors of postpartum urinary retention after vaginal delivery

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ABSTRACT

BACKGROUND
Urinary retention is a condition where a person is unable to urinate even after making sufficient efforts. It can be classified as either acute or chronic, as well as overt or covert. Urinary retention can be caused by various factors such as poor detrusor muscle contraction, a decrease in bladder contractility, anatomical anomalies, impaired neurological coordination while urinating, and disruption of outlet relaxation. The objective of this study was to identify the risk factors of postpartum urinary retention (PPUR) after vaginal delivery.

METHODS
A cross-sectional study was conducted involving 500 female subjects who were in labor. All data obtained including variables such as age, parity, perineal rupture, episiotomy, history of using assisted vaginal birth during labor, and newborn weight, were compared between female subjects with and without postpartum urinary retention. The data were was analyzed using chi square test and multiple logistic regression analyses as a means to identify risk factors for PPUR.

RESULTS
Among the 500 patients recruited to our study, 68 (13.6%) had PPUR. Episiotomy and parity were found to be potential risk factors for PPUR (OR=1.84;95% CI = 1.06-3.18 and OR=2.19;95% CI = 1.16-4.12, respectively). Severe perineal rupture was not a risk factor of PPUR (OR= 0.82;95% CI =0.82-5.89).

CONCLUSION
The prevalence of PPUR was quite high. Risk factors identified for PPUR were parity and episiotomy. In clinical practice, healthcare providers should pay more attention to women with these risk factors to prevent PPUR.

Keywords: Risk factor, vaginal birth, post partum urinary retention.

INTRODUCTION

Injuries to the various pelvic floor anatomical structures are referred to as pelvic floor trauma, and they typically occur during vaginal delivery, especially in primipara. Various parts of the pelvic floor can become affected due to tissue rupturing, compression, and stretching, which can also result in damage to the nerves, muscles, and connective tissues. Obstetric pelvic floor trauma may cause urinary tract symptoms, such as postpartum urinary retention (PPUR).[1]

The definitions of PPUR are actually diverse among studies. Postpartum urinary retention is a complaint of the inability to empty the bladder normally as on previous occasions (to distinguish from predelivery/pre-pregnancy difficulties), despite the ability to pass some urine during the postpartum period and up to 12 months after delivery.[1] Postpartum urinary retention can be divided into two categories, overt and covert. Overt PPUR (oPPUR) is the inability to urinate on the patient's own effort in six hours after vaginal delivery or the necessity for re-catheterization in six hours after the removal of the catheter following a cesarean section.[2] Meanwhile, covert PPUR (cPPUR) is defined as a condition when post-void residual volume >150mL with voided volume of at least 150mL with no symptoms of retention.[1] Based on the onset, PPUR is classified into acute, chronic, and acute on chronic urinary retention.[3] Due to these inconsistencies in the diagnostic criteria, there are large variations in the reported incidence of PPUR which ranges from 0.05 to 45%,[4-7] while Perú Biurrun et al.[8] reported an incidence of 9.85%.

Additionally, PPUR is a common postpartum complication characterized by absence or lack of perceived bladder sensation in the woman and may be associated with acute pain during the early stages of retention, or with small frequent voids that do not empty the bladder completely.[1,2] Postpartum urinary retention may be resolved in a few hours or days if properly recognized and treated.[1] Meanwhile, if neglected, PPUR could damage the musculature and innervation of the bladder and their function, and increase the risk of urinary tract infection, which could lead to persistent urinary retention, resulting in a negative impact on quality of life.[2]

Postpartum urinary retention has an uncertain pathophysiology. The smooth muscles of the bladder play a role in bladder emptying, therefore any urinary retention may cause overdistension of the bladder.[9] The pelvic floor muscles may be damaged due to vaginal delivery, which leads to reduced bladder sensitivity, while peri-urethral and vulvar edema may cause obstruction. Due to the uncertain pathophysiology of PPUR, research has mainly focused on its risk factors.[2,10] A number of studies have indicated that primiparity, epidural analgesia, instrument–assisted delivery, vaginal or perineal trauma, length of labor, and neonatal birth weight are independent risk factors for PPUR.[8,11] A retrospective observational study showed that epidural analgesia, birth weight, operative vaginal birth, and previous cesarean delivery are independent risk factors for postpartum voiding dysfunction (PPVD).[8] Another study involving 462 cases of women undergoing vaginal delivery with labor epidural analgesia showed that forceps-assisted delivery and lateral episiotomy were factors affecting overt postpartum urinary retention (PPUR) for these women.[11] A systematic review indicated that the independent risk factors for PPUR were found to include episiotomy, epidural analgesia, instrumental delivery, primiparity, and a longer second stage of labor.[12] In contrast, a retrospective study involving 560 female subjects showed that there were no statistically significant differences between patients with and without PPUR regarding age, body mass index (BMI), gravida, parity, use of vacuum or forceps, duration of the second and third stages, infant birth weight, presence of episiotomy or deep perineal laceration, and duration of the active phase.[10] A new study is needed due to these inconsistent results in determining the risk factors of PPUR. In our study, we aimed to determine and identify the risk factors of PPUR after vaginal delivery.

METHODS

Research design

This cross-sectional study was conducted in Dr. Cipto Mangunkusumo National Central General Hospital, Central Jakarta and Fatmawati Central General Hospital, South Jakarta, from September 2014 to January 2015.

Research subjects

A total of 500 pregnant women who visited the emergency and delivery rooms at Dr. Cipto Mangunkusumo National Central General Hospital and Fatmawati Central General Hospital were included in the study. The inclusion criteria in this study were pregnant women who had either

spontaneous or assisted vaginal delivery with any kind of indications, age of pregnancy of at least 34 weeks, and estimated fetal weight of more than 2000 grams. The exclusion criteria were pregnant women with a history of any kind of urinary retention, with an indication for using catheterization postpartum, age of pregnancy less than 34 weeks, or estimated fetal weight less than 2000 grams.

Measurements

Collected maternal demographic data comprised age at delivery, occupation, and risk factors of PPUR, such as type of vaginal delivery (with or without assisted vaginal birth such as forceps and vacuum), episiotomy during labor, degree of perineal rupture, and neonatal birth weight. Patients were considered to have PPUR if the patient was not able to spontaneously urinate within 6 hours of vaginal delivery or was able to spontaneously urinate but residual urine was more than 200 mL. The residual urine volume was measured using a measuring cup after catheterization.

Statistical analysis

SPSS version 20 for Windows was used for data management and statistical analysis. Both bivariate and multivariate analyses were done. We used the chi-square test for the bivariate analyses followed by multiple logistic regression, in which 95% confidence interval and p-value were calculated.

Ethical clearance

The research was approved by the Ethics Committee of the Faculty of Medicine, University of Indonesia. (No. KET-/626/UN2/F1/ETIK/ PPM.00.02/2023). Informed consent was acquired from each patient.

RESULTS

Among the 500 patients recruited for our study, we determined the demography of our subjects by their age and occupation. The mean age of patients with and without PPUR was 28.05 ± 8.71 years and 91.8% (459) of them were housewives. We then characterized the .subjects by PPUR risk factors such as parity, perineal rupture, episiotomy, newborn weight, and assisted vaginal birth. Among the 500 patients we found 68 (13.6%) with PPUR. Table 1 describes the characteristics of the subjects.

Table 1. Demographic and obstetric characteristics of the study subjects (n=500)

Parameter	n (%)
Age (years)*	28.05 ± 8.71
≤25	201 (40.20)
>25	299 (59.80)
Occupation	
Housewife	459 (91.80)
Formal worker	32 (6.40)
Student	9 (1.80)
Parity	
Primiparity	219 (43.80
Multiparity	281 (56.20
Perineal rupture	
Severe	22 (1.40
Mild	478 (95.60)
Episiotomy	
Yes	200 (40.0)
No	300 (60.)
Newborn weight (g)*	2975.9 ± 341.1
>3000	272 (54.40)
<3000	228 (45.60)
Assisted vaginal birth	
Without forceps or vacuum	474 (94.80)
With forceps or vacuum	26 (5.20)
PPUR	
Yes	68 (13.60)
No	432 (86.40)

*Age classification determined by receiver operating characteristic (ROC) analysis. Data presented as n (%) except for age and newborn weight; PPUR: postpartum urinary retention

The risk factors discussed in this study are age, parity, perineal rupture grade, history of episiotomy during labor, newborn weight, and history of using assisted vaginal birth during labor (Table 2). Comparison between patients with and without PPUR showed that a higher number of up to 20.4% of PPUR patients were of younger age (<25 years). Compared to multiparity, primiparity had a higher PPUR prevalence ($p<0.001$). From 68 PPUR patients, the analyses showed that 61 experienced mild perineal rupture and 36 had episiotomy during labor. No significant differences were found in terms of newborn weight ($p=0.664$) and use of assisted vaginal birth during labor ($p=0.147$). Based on Table 2, we found that the variables that were risk factors of PPUR were age, parity, perineal rupture grade, and episiotomy. Therefore the data analyses were continued using the multivariate logistic regression, resulting in the PPUR predictors as shown in Table 3.

Table 2. Demographic and obstetric characteristics of women with (n=68) and without postpartum urinary retention (n=432)

Parameter	PPUR (+) (n = 68)	PPUR (-) (n = 432)	OR	95% CI	p value
Age (years)					
≤ 25	41 (20.4)	160 (79.6)	2.58	1.48-4.54	0.003
> 25	27 (9.0)	272 (91.0)			
Parity					
Primiparity	46 (21.0)	173 (79.0)	3.13	177-5.66	<0.001
Multiparity	22 (7.8)	259 (92.2)			
Perineal rupture					
Severe	7 (31.8)	15 (68.2)	3.19	1.05-8.70	0.011
Mild	61 (12.8)	417 (87.2)			
Episiotomy					
Yes	36 (18.0)	164 (82.0)	1.84	1.06-3.18	0.019
No	32 (10.7)	268 (89.3)			
Newborn weight (g)*					
> 3000	24 (10.3)	204 (89.5)	0.61	0.34-1.07	0.066
< 3000	44 (16.2)	228 (83.8)			
Assisted vaginal birth					
Without forceps or vacuum	62 (13.1)	412 (86.9)	1.99	0.63-5.40	0.147
With forceps or vacuum	6 (23.1)	20 (76.9)			

*Newborn weight classification determined by receiver operating characteristic (ROC) analysis; OR: odds ratio; PPUR: postpartum urinary retention

On multivariate logistic regression, only parity (OR=2.19; 95% CI=1.16-4.12) and episiotomy (OR=1.84; 95% CI=1.06-3.18) remained independently associated with increased odds for PPUR (Table 3).

DISCUSSION

The reported PPUR incidence in previous studies varies between 0.05% and 37%.[10] Another study mentioned a PPUR prevalence range of between 1.5% and 45% of postpartum mothers,[13] whereas our study found a PPUR prevalence of 13.6%. These differences may be due to different study designs, terminology, and/or ways to establish the diagnoses. One study mentioned that PPUR maternal age ranges between 25 and 28 years.[10] In our study, the mean age in the study population was 27.47 ± 8.71 years.

The pathophysiology of PPUR is unclear, although there are several factors that could contribute to the development of PPUR, such as physiological, neurological, and mechanical factors.[12] Urinary retention may result from the inhibition of the detrusor muscle by elevated progesterone levels. Vaginal delivery can cause trauma to pelvic floor muscles and innervations, which may lead to hypotonicity or decreased bladder sensitivity. Moreover, obstruction may be caused by peri-urethral and vulvar edema due to vaginal delivery.[10] In our study, several factors have been identified for the occurrence of PPUR.

Table 3. Multivariate analysis of factors associated with postpartum urinary retention

Parameter	OR	95% CI	p value
Age (≤ 25 years)	1.70	0,92-3.11	0.089
Parity (primipara)	2.19	1.16-4.12	0.015
Perineal rupture (severe)	2.19	0.82-5.89	0.120
Episiotomy	1.84	1.06-3.18	0.019

Note: OR= odds ratio; CI: confidence interval

With age, the muscles of the urinary system tend to degenerate, which can lead to a decrease in renal function. Additionally, the structural abnormalities and dysfunction of the bladder due to aging can increase the risk of urinary tract infections and block bladder emptying.[13] The study by Oktharina et al.[13] found a mean age of 27.90± 6.69 years in patients with PPUR, whereas a Japanese study found a mean age of 33.1±3.81 years.[14] In contrast, in this study we found that the group aged under 25 years was susceptible to PPUR. These differences may be due to different age ranges in the study populations, where the age range in our study population age was very large, with a minimum age of 15 years and a maximum of 45 years.

In this study, we also found that primiparity affected the occurrence of PPUR. Our results are similar to the findings of many previous studies, in that primiparity is an obstetric parameter associated with PPUR.[12] Primiparous women, especially those who gave birth by vaginal delivery, may suffer more severe damage and more extreme changes to their pelvic floor due to anatomical changes associated with pregnancy, when compared to multiparous women.[15]

In our study, we found that the group of women with severe perineal rupture had a higher but non-significant risk of PPUR. In contrast, according to Agrawal and Shanker [16], second and third-degree perineal rupture may lead to PPUR. Lamblin et al.[17] explained that perineal rupture caused by assisted devices may also lead to a mechanical obstruction, such as edema or hematoma, which then results in urethral and bladder injury, thereby causing local pain and increased urethral activity.

As per the previous studies, it is known that one of the risk factors for PPUR is episiotomy.[12,18] The reason behind this could be the pain caused by an episiotomy which can result in reflex urethral spasms.[12] Cavkaytar et al.[19] stated that pain sensation caused by episiotomy or laceration could trigger urethral spasm reflex, giving rise to PPUR, which could damage the detrusor muscle and parasympathetic nerves in the bladder wall and also change the function of the detrusor muscle. This result was in line with our study, namely that episiotomy is a risk factor of PPUR. However, these findings were different from those of the study by Oktharina et al.[13] that showed no significant correlation between episiotomy and PPUR.

A study conducted by Buchanan and Beckmann [18] found that newborns weighing more than 3285 grams had a significantly higher risk of PPUR, while Pifarotti et al.[20] stated that newborns weighing more than 3500 grams had the same risk. However, other studies such as those of Kawasoe et al.[14] and Humburg et al.[21] have found no correlation between newborn weight and PPUR. Our study also showed that newborn weight did not have a significant correlation with PPUR. These differences may be due to lack of study participants or human errors in measurement. Theoretically, newborn weight may be correlated with the incidence of PPUR due to excessive stretching of the bladder and/or to pressure of the baby's head on the cervix and urethra. This can decrease bladder stimulation due to disrupted motoric impulses and nerves, which may lead to local bladder injury. The result should be that the greater the baby's weight, the greater the pressure on the bladder and urethra when the baby's head drops.[20]

We found no correlation between assisted vaginal birth and PPUR. This finding contradicts the study results of Oktharina et al.[13] which had shown that labor with instruments was a substantial risk factor of PPUR due to its potential to impair the function of the urethral sphincter and surrounding areas. Furthermore, the instrument may cause perineal edema or vesical trauma.[4] Another study has also shown that forceps, as one of the devices used during assisted vaginal birth, play a role as a risk factor for PPUR.[2] The difference between our study and previous ones may have been due to lack of data, given the limited number of subjects undergoing assisted vaginal birth in this study.

We acknowledge that our study has some limitations. Although we had a fairly large number of participants, we did not establish the minimum and maximum age of the patients, resulting in a wide age range. We should have made the inclusion and exclusion criteria of our study population more specific. Furthermore, the cross-sectional design of our study cannot be used to define cause and effect relationships.

We aimed to reduce the number of incidents related to PPUR by understanding its risk factors so that we can take preventive measures. Although PPUR is not a fatal condition, it can cause discomfort to patients and lead to several complications.

To gain a better understanding, it is essential to conduct more research, particularly on the issue of risk factors. Increasing the number of facilities and subjects can also be helpful. As the definition of PPUR varies and there is no consensus on PPUR, it is crucial to establish a consensus on its definition and develop protocols for postpartum voiding management.

CONCLUSION

The risk factors that were identified for PPUR included parity and episiotomy. Women with these exposures should be assessed for PPUR given the potential for short-term and long-term urinary complications.

Conflict of Interest

The author declare no conflicts of interest.

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Author Contributions

Not applicable.

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Data Availability Statement

Raw data were generated at Dr. Cipto Mangunkusumo National Central General Hospital and Fatmawati Central General Hospital. The data that support the findings of the study are available on request from the author. The data are not publicly available due to ethical restrictions.

Declaration of Use of AI in Scientific Writing

The author declares no use of AI during the preparation of this work.

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