

**Original article:**

**Prevalence of Urinary Tract Infection due to Urinary Catheterization in Obstetric and Gynaecological Operations**

Jesmin Akter<sup>1</sup>, Ahmad Seraji<sup>2</sup>, Lutfun Nahar<sup>3</sup>, Shahriar Islam Khan<sup>4</sup>, Md. Redwan Ahsanullah<sup>5</sup>

**Abstract:**

**Background:** Urinary catheterization is routinely done in major gynaecological and obstetric operations in our country. It has some advantages and disadvantages of its own. Among the advantages, it can significantly prevent retention of urine, help in measuring urinary output, avoid discomfort due to full bladder, prevent postpartum hemorrhage and reduce spinal headache due to reduced movements. On the other hand, it can be a constant source of urethral irritation leading to UTI and can cause urethral strictures. So, a quantitative research is necessary to determine the relationship between urinary catheterization and UTI, for establishing a guideline for judicious catheterization. **Methods:** Between January 2010 and December 2011, data was collected for conducting a cross-sectional observational study on 49 subjects undergoing various gynaecological and obstetric operations. Precatheterization urine for routine and culture-sensitivity findings were recorded and compared with catheter tip culture and sensitivity after removal. Besides, other factors e.g. clinical history, comorbidity status, hemoglobin status, duration of catheterization, nature of operation etc was brought into consideration. **Results:** Patients having urinary catheters for more than 5 days, were found to be more than twice as likely to be developing UTI in various operations, than the patients having catheter for one day. Preoperative albuminuria was also found to be a likely predisposing factor, as the percentage of patients with UTI who had preoperative albuminuria was double compared to the preoperative albuminuria negative patients. The direct relationship between nature of operation and development of post-catheterization UTI was difficult to establish, because of the duration of catheterization acting as a confounding variable. **Conclusion:** In most cases of LUCS and hysterectomy, catheter-associated complications can be overcome by avoiding catheterization altogether. This can be better achieved by encouraging the patient to void their bladder immediately before surgery. In long and complicated operations, catheterization cannot be avoided but the postoperative duration of catheterization can be reduced to avoid complications. Moreover, preoperative optimization of comorbid status, hemoglobin status, albuminuria etc can bring forth a favourable outcome in terms of catheter-associated complications.

**Keywords:** Catheterization; Hysterectomy; Caesarean section UTI.

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**Introduction**

Urinary tract infection in gynaecological and obstetric cases is a matter of morbidity, anxiety, long stay in hospital and of course the reason for more expenditure by the patients.<sup>1</sup> Undoubtedly surgeons feel embarrassed to get a post-operative infection.<sup>2</sup> Although this is an era of newer and more effective

antibiotics, urinary tract infection still continues to be a very common complication. Catheter associated UTI comprises perhaps the largest reservoir of nosocomial antibiotic resistant pathogens.<sup>3</sup> This could lead to complications like pyelonephritis and bacteraemia. World Health Organization (WHO) in its manual reported that urinary tract infection stood at

1. Professor Dr. Jesmin Akter, Professor, Department of Obstetrics and Gynaecology, Medical College for Women and Hospital, Uttara, Dhaka, Bangladesh.
2. Dr. Ahmad Seraji, Associate Professor and Head, Department of Burn, Plastic and Reconstructive Surgery, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh.
3. Dr. Lutfun Nahar, Associate Professor, Department of Anatomy, Z. H. Sikder Women's Medical College, Dhaka, Bangladesh.
4. Dr. Shahriar Islam Khan, Assistant Registrar, Department of Neurosurgery, Uttara Adhunik Medical College Hospital, Uttara, Dhaka, Bangladesh.
5. Dr. Md. Redwan Ahsanullah, Honorary Medical Officer, Department of Burn, Plastic and Reconstructive Surgery, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh.

**Correspondence to:** Professor Dr. Jesmin Akter, Professor, Department of Obstetrics and Gynaecology, Medical College for Women and Hospital, Uttara, Dhaka, Bangladesh, e-mail: [drjesmin19@gmail.com](mailto:drjesmin19@gmail.com)

first position among nosocomial infections followed by pneumonia and surgical wound infection.<sup>4</sup> In a study at Dhaka Medical College Hospital (DMCH), Hussain et al found nosocomial infection in 38% of surgical patients of which over 23% was suffering from UTI.<sup>5</sup>

The fact is that urinary infection which develops following catheterization is mostly due to faulty technique of paramedics. They touch the tip of catheter to surrounding area in search of opening of urethra and contaminate the catheter. Sometimes they do not use any type of antiseptic. This ultimately causes a negative correlation with operative success. Risk factors for acquiring infection would be of following categories as host factors, surgical factors, environmental factors and the nature of microbes. Host factors contributing to increased risk of infection are age, length of hospital stay and concurrent infection at other sites of the body.<sup>3</sup> Among surgical factors, the nature and extent of operation, logistics used during and after operation and even surgeon's own technical skills are remarkable. Among microbial factors virulence and numbers of bacteria are important. Local tissue defence can combat minute inoculum of avirulent bacteria. But if host damage is extensive and premorbidity in the form of diabetes or other immunosuppressive condition remains, small inoculum of avirulent bacteria can ensue an overwhelming infection. On the other hand, virulent bacteria of drug resistant nature may be the single factor for an overt and fulminant infection.<sup>1,6,7</sup>

### **Materials and methods**

This cross sectional study was carried out at the Department of Gynaecology and Obstetrics, Medical College for Women and Hospital (MCWH), Uttara, Dhaka, and at one private clinic at Uttara, Dhaka. Duration of study was from January, 2010 to December, 2011. The patients undergoing Lower Uterine Caesarian Section (LUCS), Transabdominal Hysterectomy (TAH), Vaginal Hysterectomy (VH), Laparoscopy or Laparotomy within the period were included in this study. Urine for routine microscopic examination and culture sensitivity were carried out preoperatively in all patients selected for this study. Those patients who had signs and symptoms of UTI before catheterization and those patients who had been found positive for pre-catheter urine culture, were excluded from the study. Peroperative catheterization was done under strict aseptic precautions. Duration of catheterization was between 24 hours to 10 days. Immediately after removal, the catheter tip was introduced into a sterile test tube and

cut from the rest part of the catheter by a sterile scissor and sent to microbiology department. The urine from the catheter tip was studied for identification of bacteria by standard procedure. Initially, 53 patients with peroperative catheterization were selected for the study. But, later, the report of pre-catheter urine culture was found positive in 4 patients and were excluded from the study. So, finally 49 patients were included in this study.

All relevant findings regarding history, comorbid status, investigations like haemoglobin status and urine for routine and culture examination, name of the operation and duration of catheterization were recorded in a preset data sheet. The data were analyzed by SPSS version 17 and presented in appropriate tables and figures as required.

### **Ethical Approval**

The study was approved by Ethics Committee of Medical College for Women and Hospital (MCWH), Uttara, Dhaka.

### **Results**

Total number of patients = 49

Age range = 16 – 75 years

Average = 32.53 years

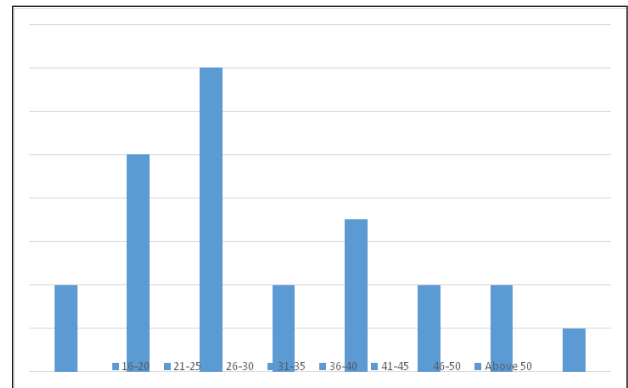


Fig.1 : Distribution of patients according to age groups

The graph shows age groups of patients included in the study. Among the different age groups 14 patients belong to the 26-30 years age group. 10 of them are between 21 years to 25 years old. 2 patients are above 50 years old.

**Table I: Distribution of the patients according to the type of operation**

Type of operation	Number of patients	Percentage
VH	4	8.16%
Laparoscopy & Laparotomy	6	12.24%
TAH	8	16.33%
LUCS	31	63.27%
Total	n=49	

The table shows distribution of patients according to types of operation. 31(63.27%) patients underwent LUCS and 4(8.16%) patients underwent VH.

**Table II: Distribution of the patients according to Hb% estimated preoperatively**

Hb% = 8.4 – 13.1

Average = 10.88

Hb%	Number of patients	Percentage
Below 9 (8.4 – 8.9)	2	4.08%
9 – 11.9	35	71.43%
Above 12 (12 – 13.1)	12	24.49%

The table shows Hb% of the patients. 35 (71.43%) patients had Hb% within the range of 9 to 11.9 gm/dl. 2 (4.08%) patients had Hb% below 9gm/dl.

**Table III: Distribution of the patients according to Hb% and the type of operation**

Types of operation (No. of patients)	Hb% (gm/dl) Range & Average (Av)	No. of patients having Hb% Below 9.0 (% of patients within the group)	No. of patients having Hb% 9.0 – 11.9(% of patients within the group)	No. of patients having Hb% Above 12.0 (% of patients within the group)
VH (4)	9.8 – 12.6 Av 11.5	0 (0%)	2 (50%)	2 (50%)
Laparoscopy & Laparotomy (6)	10.0 – 11.8 Av 11.3	0 (0%)	6 (100%)	0 (0%)
TAH (8)	9.0 – 12.9 Av 10.95	0 (0%)	5 (62.5%)	3 (37.5%)
LUCS (31)	8.4 – 13.1 Av 10.7	2 (6.45%)	22 (70.97%)	7 (22.58%)
Total	8.4 – 13.1 Av 10.88	2	35	12

This table shows distribution of patients according to Hb% and type of operation. Amongst 31 patients undergoing LUCS, 22 (70.97%) patients had Hb% within the range of 9.0-11.9 gm/dl, 7 (22.58%) had above 12gm/dl and 2 had below 9gm/dl. Amongst the 8 patients having TAH, 5 (62.5%) patients had Hb% within the range of 9.0-11.9 gm/dl, and 3 (37.5%) had above 12.0 gm/dl.

**Table IV: Distribution of the patients according to preoperative albuminuria and the type of operation**

Types of operation (No. of patients)	No. of patients with no albuminuria (% of patients within the group)	No. of patients with mild (+) albuminuria (% of patients within the group)	No. of patients with moderate (++) albuminuria (% of patients within the group)
VH (4)	2 (50%)	2 (50%)	0
Laparoscopy & Laparotomy (6)	5 (83.33%)	1 (16.66%)	0
TAH (8)	7 (87.5%)	1 (12.5%)	0
LUCS (31)	22 (70.97%)	9 (29.03%)	0
Total	36	13	0

The table shows distribution of patients according to the presence of urinary albumin and type of operation. Amongst the 13 patients having albuminuria preoperatively, 9 of them underwent LUCS.

**Table V: Showing the relationship between preoperative albuminuria and development of postoperative UTI**

	Albuminuria absent No. of patients	Albuminuria present (+) No. of patients
Total patient	36	13
UTI developed	8 (22.22%)	7 (53.85%)

This table shows the relationship between preoperative albuminuria and development of postoperative UTI. Among the 36 patients having no albuminuria only 8 (22.22%) of them later developed UTI postoperatively. On the other hand, among 13 patients having preoperative albuminuria, 7 (53.85%) of them developed UTI postoperatively.

**Table VI: Showing the relationship between the type of operation and the duration of catheterization**

Types of operation	Catheter remained in days Range & Average (Av)	No. of patients having catheter for 1 day	No. of patients having catheter for 2 days	No. of patients having catheter for 3 days	No. of patients having catheter for 5 days	No. of patients having catheter for 7 days	No. of patients having catheter for 10 days
VH	5 – 10 Av 6.75	0	0	0	2	1	1
Laparoscopy & Laparotomy	2 – 5 Av 3.17	0	3	1	2	0	0
TAH	1 – 3 Av 2.38	1	3	4	0	0	0
LUCS	1 – 2 Av 1.16	26	5	0	0	0	0
Total	1 – 10 Av 2.06 days	27	11	5	4	1	1

This table shows relationship between type of operation and duration of catheterization. Here, of the total 49 subjects, 27 patients had their catheter for 1 day, 11 of them remained catheterized for 2 days and 1 patient remained catheterized for 10 days. Among 31 patients undergoing LUCS, 26 patients had their catheter for 1 day.

**Table VII: Showing the relationship between the type of operation, the duration of catheterization and the development of UTI postoperatively**

Types of operation	Number of patients	Catheter remained in days Range & Average (Av)	UTI developed No. of patients (percentage)
VH	4	5 – 10 Av 6.75	3 (75.00%)
Laparoscopy & Laparotomy	6	2 – 5 Av 3.17	3 (50.00%)
TAH	8	1 – 3 Av 2.38	3 (37.50%)
LUCS	31	1 – 2 Av 1.16	6 (19.35%)
Total	n=49	1 – 10 Av 2.06 days	15 (30.61%)

**Table VIII: Showing the relationship between the duration of catheterization and development of UTI in the catheterized patients**

Types of operation	No. of patients having catheter for 1 day	No. of patients having catheter for 2 days	No. of patients having catheter for 3 days	No. of patients having catheter for 5 days	No. of patients having catheter for 7 days	No. of patients having catheter for 10 days
Total patients	27	11	5	4	1	1
UTI developed	5 (18.52%)	4 (36.36%)	2 (40.00%)	2 (50.00%)	1 (100%)	1 (100%)

The table shows relationship between duration of catheterization and the development of UTI in the catheterized patients. Among the 27 patients who had their catheters for 1 day, only 5 patients developed UTI. But, for the 4 patients having catheters for 5 days, half of them developed UTI. It can also be noted that, every patient, who had been catheterized for 7 days or more, had developed UTI.

**Table IX: Showing the organisms isolated in catheter-tip urine Culture**

	<i>E. coli</i>	<i>Acinetobacter</i>	<i>Proteus</i>	<i>Pseudomonas</i>
Number of patients having UTI (=15)	11	3	1	1

Among the 15 patients who developed UTI, 11 of them had growths of *E. coli* in the catheter-tip urine Culture. *Acinetobacter* was isolated from 3 of the patients, 1 of them simultaneously had a growth of *Pseudomonas*.

### **Discussion**

Urinary tract infection is among the most common infections in human, which can occur in otherwise healthy individual or in compromised patients from newborn to the elderly. The urinary tract is normally sterile. UTI is commonly caused by bacteria from the patient's own intestinal flora, which enter the urinary tract via the urethra. The specimens should be cultured within 2 hours after collection or refrigerated until processed.<sup>8,9</sup> The following are some observations that came out from analysis of the data obtained from selected patients attending and operated at MCWH and one Private clinic. Here we have observed that among the 27 patients who had their catheters for 1 day, only 5 patients developed UTI. But, for the 4 patients having catheters for 5 days, half of them developed UTI. It can also be noted that, every patient, who had been catheterized for 7 days or more, had developed UTI. This is obviously owing to susceptibility of the urinary tract towards ascending infection by organisms for a prolonged period of time. This association between duration of catheter and UTI is supported by previously published literatures and suggests a mechanism through which postoperative morbidity and mortality is increased.<sup>10,11</sup> HL Wald et al, in a retrospective cohort study<sup>12</sup> conducted among 35,904 patients undergoing various surgeries, report that patients undergoing catheterization for 2 or more days are twice as likely to develop UTI in the postoperative

period. Among patients with UTIs, there is a risk of developing bacteremia in a significant portion—a condition that adds significantly to length of hospital stay<sup>13</sup> and is a risk factor for death among elderly patients.<sup>14</sup> Another randomized controlled trial conducted by CC Liang et al.<sup>15</sup> suggests that duration of catheterization was the most important predictor for postoperative adverse urinary events. The type of operation is also an important predictor for duration of catheterization and subsequent UTI development. In our study, 19.35% patients undergoing LUCS, 75% patients undergoing VH and 37.5% patients undergoing TAH developed postoperative UTI. However, comparing published data of catheter-associated UTI following hysterectomy becomes difficult due to variations in catheterization times reported; furthermore, some investigations are confounded by the use of prophylactic antibiotics. Among the 94 patients undergoing vaginal prolapse surgery reported by Hakvoort et al.<sup>16</sup>, postoperative bacteriuria occurred in 40% (18/46) of patients in the 4-day catheterization group versus 4% (2/48) of patients in the 1-day catheterization group. Dobbs et al.<sup>17</sup> found that 13% (6/47) of the in-and-out catheterization group had bacteriuria compared with 29% (14/48) of those in the 36-hour catheterization group following abdominal hysterectomy. We have noted that, among the 36 patients having no albuminuria only 8 (22.22%) of them later developed UTI postoperatively. On the other hand,

among 13 patients having preoperative albuminuria, 7 (53.85%) of them developed UTI postoperatively. We could not find any prior literature denoting a direct relationship between urinary albumin and UTI, but RA Bianchi et al. evaluated microalbuminuria amongst other markers for assessing postoperative adverse outcomes and reports that in their experience microalbuminuria did not result as a good indicator.<sup>18</sup> Microalbuminuria is an indicator of increased capillary leak resulting from endothelial damage that is observed as a consequence of the systemic inflammatory response<sup>19</sup>. This is in turn accompanied by a higher percentage of complication, especially respiratory distress and Multiple Organ Dysfunction.

#### **Conclusion and Recommendation**

Urethral catheterization has long been recognized to be the primary cause of bacteriuria and urinary infections. Mustafa and Pinkerton suggested that catheterization is usually unnecessary when the urethra is not surgically involved.<sup>20</sup> Authors have drawn attention to the high incidence of urinary tract infection in gynaecology, related to the use of postoperative catheterization, and antibiotic prophylaxis has been recommended. The complete avoidance of the use of a catheter, however has been shown to have a profound beneficial effect in reducing the urinary infection rate. Clearly, in some patients, particularly where the urethra and bladder neck are involved, it is not possible to avoid the use of a

catheter. In most patients having a Caesarean section or hysterectomy, the most common complication can be virtually eliminated if catheterization is avoided. This can be better achieved if the patient is advised to empty her bladder as close to the operation starting time as possible. The catheter cannot be avoided in lengthy or complicated surgery. If catheterization is mandatory, we believe reducing the catheterized time to a minimum of 2 postoperative days result in best outcome. In addition, optimization of preoperative Hb%, urinary albumin etc. has a beneficial effect on the patients' outcome. The sample size of this study was small and we believe a large RCT based study in multiple centres needs to be conducted, to identify the risk factors and predictors of postoperative UTI in the catheterized patients.

**Conflicts of interest:** No conflict of interest was declared.

#### **Authors's contribution:**

Data gathering and idea owner of this study: Akter J, Seraji A, Nahar L

Study design: Akter J, Seraji A, Nahar L, Khan SI

Data gathering: Akter J, Seraji A, Ahsanullah MR

Writing and submitting manuscript: Akter J, Seraji A, Nahar L, Khan SI

Editing and approval of final draft: Akter J, Seraji A, Nahar L, Khan SI, Ahsanullah MR

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