

## Assessment of Clinical Profile, Risk Factors and Impact of Renal Impairment on the Management of Patients with Lower Urinary Tract Obstruction

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### Abstract

**Background:** Obstruction to outflow of urine either organic or functional, below the bladder neck is considered as lower urinary tract obstruction i.e., benign prostatic hyperplasia (BPH), urethral stricture (US), post urethral valves (PUV) and Phimosis. Normal point of narrowing such as the ureteropelvic and ureterovesical junction, bladder neck, and urethral meatus are common sites of obstruction. Early diagnosis and prompt therapy are therefore essential to minimize the otherwise devastating effect of obstruction on kidney structure and function.

**Material & Methods:** This prospective study of renal impairment in the management of lower urinary tract obstruction (LUTO) had been done in department of General Surgery and Paediatric wards at Netaji Subhash Chandra Bose Medical College, Jabalpur M.P., which comprises of 42 patients. The study duration was from May 2004 and September 2005, we evaluated and treated these patients with lower urinary tract obstruction (LUTO). **Results:** In the study, among all patients who had risk factors 9 patients had severe renal impairment and 1 patient had mild renal impairment. Among patients who did not have risk factors 19 patients had normal renal function and 8 patients had mild renal impairment ( $p \leq 0.001$ ). Among age group II (16-45 years) 10 patients had normal renal function, 4 had mild renal function impairment and 1 had severe renal function impairment. Among age group III (above 45 years) 4 patients had normal renal function, 10 had mild renal function impairment and 11 had severe renal function impairment ( $p \leq 0.001$ ). Out of 10 patients 9 were having BPH; only one patient had US with mild elevated serum Creatinine levels. This shows degree of impairment was more in patient with BPH than Urethral Stricture ( $p \leq 0.001$ ). All 16 patients were of BPH, it means severity noted to be more in patients with BPH. Post-drainage procedure these patients shown normal or near normal levels of S. Creatinine ( $p \leq 0.001$ ) BPH or obstruction to the tract plays a major role in renal impairment. Blood Urea levels returned to normal or reduced after drainage procedure as compared to before drainage status ( $p \leq 0.001$ ). **Conclusion:** In patients with lower urinary tract obstruction (LUTO) majority of patients were of Benign Prostatic Hyperplasia (BPH) followed by urethral stricture (US), posterior urethral valve (PUV) and Phimosis. Degree of renal impairment was more with Benign Prostatic Hyperplasia (BPH) compared to Urethral Stricture (US), Posterior Urethral Valve (PUV) and Phimosis. All patients with associated risk factors (single or multiple) and

having benign prostatic hyperplasia (BPH) had marked renal impairment. In patients with lower urinary tract obstruction (LUTO) degree of renal impairment is aggravated if there was an associated risk factor present. In patients of lower urinary tract obstruction (LUTO) with impaired renal function, drainage procedure is recommended before planning for the definitive surgery.

**Keywords:** Renal impairment, LUTO, Benign Prostatic Hyperplasia, Posterior Urethral Valve, Urethral Stricture.

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## Introduction

The diseases of kidney and urinary tract frequently give rise to consistent arrays or clusters of clinical signs and symptoms and laboratory findings [1]. Obstruction to flow of urinary tract with stasis and elevation in urinary tract pressure impairs renal and urinary conduit functions and is a common cause of acute and chronic renal failure[2]. The urinary tract is divided into upper tract including kidney ureter and mid tract include urinary bladder as a reservoir, lower tract includes Urethra. Occurring anywhere along the tract from kidneys to urethral meatus, interruption of urinary flow can result in pain, infection, sepsis and loss of renal function[3].

Any obstruction to outflow of urine either organic or functional, below the bladder neck is considered as lower urinary tract obstruction i.e., benign prostatic hyperplasia (BPH), Urethral stricture, post urethral valves and Phimosis. Normal point of narrowing such as the ureteropelvic and ureterovesical junction, bladder neck, and urethral meatus are common sites of obstruction [4]. With early relief of obstruction, the defects in function usually disappear completely. However chronic obstruction may produce permanent loss of renal mass and excretory capabilities as well as enhanced susceptibility to local infection and stone formation. Early diagnosis and prompt therapy are therefore essential to minimize the otherwise devastating effect of

obstruction, on kidney structure and function[5].

Increased pressure and distention proximal to point of urinary tract obstruction usually is accompanied by pain however a slow progressive process can result in severe distension with irreversible renal damage, without significant clinical symptoms. Prolonged pressure and distension result in structural and cellular damage with subsequent loss of renal function [6]. When pressure is relieved in a timely manner, changes in function can be transient; however, when it is not, permanent damage may ensue. Obstructive urological symptoms are typically absent in uncomplicated cases. Infection may develop in an environment of prolonged urinary stasis. Any obstruction with concomitant infection requires immediate intervention. Rapid progression of localized infection to uro-sepsis can lead to life-threatening situation[7].

Progressive back pressure on the ureter and kidneys results in hydro-uretero-nephrosis. The increased intra-renal pressure observed with urinary obstruction leads to a decline in renal blood flow with progressive ischemia, compression of the papillae with decreased glomerular filtration and thinning of the parenchyma secondary to loss of nephrons. Significant cortical atrophy is associated with the renal impairment[8]. The present study was conducted to determine the clinical profile,

risk factors and impact of renal impairment on the management of patients with lower urinary tract obstruction.

### Materials & Methods

This prospective study of renal impairment in the management of lower urinary tract obstruction LUTO had been done in Department of General surgery and Pediatric ward at Netaji Subhash Chandra Bose Medical College, Jabalpur, M.P., which comprises of 42 patients. The study duration was from May 2004 and September 2005, we evaluated and treated these patients with lower urinary tract obstruction. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. Strict confidentiality was maintained with patient identity, during and after study.

A detailed history of each patient was taken with reference to age, sex, onset of symptoms and duration of symptoms particularly related to urinary tract obstruction like burning micturition, frequency of micturition, retention of urine, dysuria, straining, strangury, low backache and narrowing of stream of urine. In History of Past Illness special attention was given to Diabetes Mellitus, Hypertension and Chronic Renal Failure (CRF), retention of urine, catheterization and any type of trauma. In Personal History, history of contact with known case of venereal disease and socio-economic status, personal hygiene and habits noted. In local examination whole of the Urogenital system were examined especially external genitalia, external urinary meatus and urethra, by palpation, per rectal examination, bladder, loin and renal angle. General Examination was done thoroughly to assess any associated diseases pertaining to lower urinary tract obstruction.

We excluded from our study neurogenic bladder, Multiple Sclerosis, spinal injuries, urinary bladder cancers and various forms of pre-renal azotemias which also result in elevated serum blood urea nitrogen including dehydration, hemorrhage, cardiac dysfunction, liver diseases and Renal Artery Stenosis (RAS). All the data was recorded on Microsoft Excel spreadsheet and data analysis was done at 10% alpha and 90% confidence interval using SPSS v22 software. Test of significance were applied on collected and organized data and p-value less than 0.05 was considered as statistically significant association between study variables.

### Results

The study comprises of 42 cases of lower urinary tract obstruction admitted in General Surgery and Paediatric wards at Netaji Subhash Chandra Bose Medical College, Jabalpur (MP). Extensive clinical data pertaining to these cases in respect of laboratory investigation before and after drainage procedure, associated risk factors and treatment performed obtained. In our study, among total 42 cases, 28 had benign prostate hypertrophy (BPH), 12 had Urethral Stricture, 1 had posterior urethral valve (PUV) and 1 case had Phimosi. In the study we categorized total cases in 3 groups on the basis of age. Patients with age 0-15 years were in group I, patients with age 16-45 years were in group II and patients with age more than 45 years were in group III. According to the associated risk factors, out of the total study participants, 7 had diabetes mellitus, 7 had hypertension and 11 had urinary tract infections. (Table 1).

**Table 1: Distribution of study participants according to study parameters (n=42)**

Study Parameters		
Diseases	Benign Prostate hypertrophy	28 cases
	Stricture Urethra	12 cases
	Posterior Urethral valve	1 case
	Phimosis	1 case
	Total	42 cases
Groups (age wise category)	0-15 years	I
	16-45 years	II
	>45 years	III
Associated risk factors	Diabetes Mellitus	07 cases
	Hypertension	07 cases
	UTI	11 cases

In the present study, out of total 42 study participants, on the assessment of study participants according to risk factors and age groups it was found that, 16 patients had risk factors either single or multiple. Out of these patients 15 were in age group III and 1 in age group II. Out of patient

who did not have risk factors 2 were in age group I, 14 in group II and 10 patients in age group III. This difference was statistically significant ( $p \leq 0.001$ ). Risk factors were more with advanced age group (Age group III) (Table 2).

**Table 2: Distribution of study participants according to risk factors and age groups.**

Risk Factors	Age groups			p-value
	I	II	III	
Present	0	1	15	< 0.001
Absent	2	14	10	

In our study, out of total 42 study participants, on assessment of study participants according to risk factors and severity of renal impairment it was found that, among patients who had risk factors 9 patients had severe renal impairment and 1 patient had mild renal impairment. Out of

patients who did not have risk factors 19 patients had normal renal function and 8 patients had mild renal impairment. This difference was statistically significant ( $p \leq 0.001$ ). This shows severity of renal impairment more in patients with associated risk factors. (Table3).

**Table 3: Distribution of study participants according to risk factors and severity of renal impairment.**

Risk factors	Severity of renal impairment			p-value
	Normal	mild	Severe	
Present	0	1	9	<0.001
Absent	19	8	0	

In the present study, out of total 42 study participants, on the assessment of study participants according to age groups and severity of renal impairment it was found that, among patients who were in age group I none had renal function impairment. Among age group II, 10

patients had normal renal function, 4 had mild renal function impairment and 1 had severe renal function impairment. Among age group III, 4 patients had normal renal function, 10 had mild renal function impairment and 11 had severe renal function impairment. This difference was

statistically significant ( $p \leq 0.001$ ). This shows severity of renal impairment more

with advanced age. (Table 4).

**Table 4: Distribution of study participants according to age groups and severity of renal impairment**

Age Group	Severity of renal impairment			<i>p-value</i>
	Normal	Mild	Severe	
I	02	0	0	<0.001
II	10	04	01	
III	04	10	11	

In the study, out of total 42 study participants, on the assessment of study participants according to serum Creatinine levels (Mild Elevation) it was found that, out of 10 patients 9 were having BPH; only one patient had US with mild

elevated serum Creatinine levels. This shows degree of impairment was more in patient with BPH than US. This was statistically significant using Chi Square test ( $p \leq 0.001$ ). (Table 5).

**Table 5: Distribution of study participants according to Serum Creatinine levels (Mild Elevation)**

Diagnosis	Age	Before drainage	After drainage	<i>p-value</i>
BPH	53	1.8	1.6	<0.001
BPH	65	2.0	1.0	
BPH	62	2.0	1.4	
BPH	43	1.8	1.4	
BPH	60	1.6	1.0	
US	43	1.8	1.4	
BPH	65	1.8	1.2	
BPH	64	2.0	1.4	
BPH	60	2.0	1.5	
BPH	67	2.0	1.5	

In the present study, out of total 42 study participants, on the assessment of study participants according to serum Creatinine levels (severe elevation) it was found that, all 16 patients were of BPH, it means severity noted to be more in patients with

BPH. These patients also shown normal or near normal levels of serum Creatinine recorded after drainage procedure. This was statistically significant ( $p \leq 0.001$ ). (Table 6).

**Table 6: Distribution of study participants according to Serum Creatinine levels (Severe elevation)**

Diagnosis	Age	Before drainage	After drainage	<i>p-value</i>
BPH	65	2.2	1.5	<0.001
BPH	60	2.1	1.5	
BPH	75	2.6	1.6	
BPH	72	4.2	2.0	
BPH	70	3.2	1.8	
BPH	73	2.4	1.6	
BPH	70	2.4	1.4	

<b>BPH</b>	<b>85</b>	<b>3.0</b>	<b>1.8</b>	
<b>BPH</b>	<b>73</b>	<b>2.6</b>	<b>1.6</b>	
<b>BPH</b>	<b>94</b>	<b>3.0</b>	<b>2.0</b>	
<b>BPH</b>	<b>90</b>	<b>2.8</b>	<b>1.8</b>	
<b>BPH</b>	<b>75</b>	<b>3.0</b>	<b>1.8</b>	
<b>BPH</b>	<b>75</b>	<b>3.2</b>	<b>2.0</b>	
<b>BPH</b>	<b>66</b>	<b>2.2</b>	<b>1.2</b>	
<b>BPH</b>	<b>65</b>	<b>2.4</b>	<b>1.4</b>	
<b>BPH</b>	<b>78</b>	<b>2.6</b>	<b>1.4</b>	

In the present study, out of total 42 study participants, on the assessment of study participants according to blood Urea levels (mild elevation/near normal) results were found to be statistically non-significant (p

>0.05) in the comparison between before drainage and after drainage groups among patients of BPH and Urethral Stricture. (Table 7).

**Table 7: Distribution of study participants according Blood Urea levels (Mild Elevation/near normal)**

<b>Diagnosis</b>	<b>Age</b>	<b>Before drainage</b>	<b>After drainage</b>	<b>p-value</b>
<b>BPH</b>	<b>53</b>	<b>34</b>	<b>30</b>	<b>&gt;0.05</b>
<b>US</b>	<b>40</b>	<b>36</b>	<b>26</b>	
<b>BPH</b>	<b>37</b>	<b>34</b>	<b>28</b>	
<b>BPH</b>	<b>65</b>	<b>34</b>	<b>26</b>	
<b>US</b>	<b>43</b>	<b>40</b>	<b>30</b>	

In the study, out of total 42 study participants, on the assessment of study participants according to blood Urea levels (high elevation/above normal) it was found that BPH or obstruction to the urinary tract plays a major role in renal impairment.

Urea levels returned to normal or reduced after drainage procedure as compared to before drainage status. This was statistically significant (p ≤0.001). (Table 8).

**Table 8: Distribution of study participants according Blood Urea levels (high elevation/above normal)**

<b>Diagnosis</b>	<b>Age</b>	<b>Before drainage</b>	<b>After drainage</b>	<b>p-value</b>
<b>BPH</b>	<b>64</b>	<b>46</b>	<b>26</b>	<b>&lt;0.001</b>
<b>BPH</b>	<b>65</b>	<b>44</b>	<b>32</b>	
<b>BPH</b>	<b>60</b>	<b>46</b>	<b>30</b>	
<b>BPH</b>	<b>60</b>	<b>42</b>	<b>30</b>	
<b>BPH</b>	<b>67</b>	<b>46</b>	<b>30</b>	
<b>BPH</b>	<b>75</b>	<b>50</b>	<b>32</b>	
<b>BPH</b>	<b>72</b>	<b>66</b>	<b>38</b>	
<b>BPH</b>	<b>70</b>	<b>54</b>	<b>38</b>	
<b>BPH</b>	<b>65</b>	<b>46</b>	<b>28</b>	
<b>BPH</b>	<b>73</b>	<b>48</b>	<b>34</b>	
<b>BPH</b>	<b>62</b>	<b>42</b>	<b>32</b>	
<b>BPH</b>	<b>70</b>	<b>48</b>	<b>32</b>	
<b>BPH</b>	<b>43</b>	<b>44</b>	<b>34</b>	
<b>BPH</b>	<b>60</b>	<b>44</b>	<b>30</b>	

<b>BPH</b>	<b>85</b>	<b>62</b>	<b>40</b>
<b>BPH</b>	<b>73</b>	<b>46</b>	<b>34</b>
<b>BPH</b>	<b>94</b>	<b>70</b>	<b>48</b>
<b>BPH</b>	<b>90</b>	<b>64</b>	<b>46</b>
<b>BPH</b>	<b>50</b>	<b>46</b>	<b>36</b>
<b>BPH</b>	<b>75</b>	<b>54</b>	<b>38</b>
<b>BPH</b>	<b>75</b>	<b>50</b>	<b>36</b>
<b>BPH</b>	<b>66</b>	<b>46</b>	<b>30</b>
<b>BPH</b>	<b>65</b>	<b>48</b>	<b>34</b>
<b>BPH</b>	<b>78</b>	<b>48</b>	<b>32</b>

## Discussion

The measurement of serum Creatinine or Urea is advocated to detect occult renal failure in patients with LUTO. This study shows that abnormalities of these parameters are uncommon in this group if no other risk factors are present. Serum Creatinine or blood Urea measurement as a test to avoid a missing high pressure chronic retention with failure is a safe approach. There is a point during which there is high pressure retention without impairment of renal function and just testing the renal function will miss this group of patients. Lutzeyer and associates believed that if left untreated, most patients with BPH will progress to bladder decompensation, atony, hydronephrosis and renal failure[9].

The study comprises of 42 cases of lower urinary tract obstruction admitted in General Surgery and Pediatric wards at Netaji Subhash Chandra Bose Medical College, Jabalpur (M.P.). Extensive clinical data pertaining to these cases in respect of laboratory investigation before and after drainage, associated risk factors and treatment performed was obtained. In the this study, out of the total 42 cases, 28 had benign prostate hypertrophy (BPH), 12 had Urethral Stricture, 1 had Posterior Urethral valve and 1 case had Phimosi. In the present study we categorized total cases in 3 groups on the basis of age. Patients with age 0-15 years were in group I, patients with age 16-45 years were in group II and patients with age more than 45 years were in group III. According to

associated risk factors, out of the total study participants, 7 had Diabetes Mellitus, 7 had Hypertension and 11 had urinary tract infections (UTI). Similar results were observed in a study conducted by D Wilson et al among patients of lower urinary tract obstruction. They reported similar results as present study[10].

Among 42 study participants, on the assessment of risk factors and age groups it was found that, 16 patients had risk factors single or multiple. Out of these patients 15 were in age group III (age more than 45 years) and 1 in age group II (age 16-45 years). Among the patients who did not have risk factors 2 were in age group I (age 0-15 years), 14 in group II (age 16-45 years) and 10 patients in age group III (age more than 45 years) this difference was statistically significant ( $p \leq 0.001$ ). Risk factors were more associated with advanced age group (Age group III). Similar results were observed in a study conducted by Gerber et al among patients of lower urinary tract obstruction (11). They reported similar results as this study[11].

Among 42 study participants, on the assessment of risk factors and severity of renal impairment it was found that, among patients who had risk factors 9 patients had severe renal impairment and 1 patient had mild renal impairment. Out of patients who did not have risk factors 19 patients had normal renal function and 8 patients had mild renal impairment. This difference was statistically significant ( $p \leq 0.001$ ). This shows severity of renal impairment

more in patients with associated risk factors. Similar results were observed in a study conducted by Chisholm G et al among patients of lower urinary tract obstruction[12].

Among 42 study participants, on the assessment of age groups and severity of renal impairment it was found that, among patients who were in age group I none had renal function impairment. Among age group II, 10 patients had normal renal function, 4 had mild renal function impairment and 1 had severe renal function impairment. Among age group III, 4 patients had normal renal function, 10 had mild renal function impairment and 11 had severe renal function impairment. This difference was statistically significant ( $p \leq 0.001$ ). This shows severity of renal impairment more with advanced age. Similar results were observed in a study conducted by Rule A et al among patients of lower urinary tract obstruction. They reported similar results as present study[13].

Among 42 study participants, on the assessment of serum Creatinine levels (Mild Elevation) it was found that, out of 10 patients 9 were having BPH; only one patient had Urethral Stricture with mild elevated serum Creatinine levels. This shows degree of impairment was more in patient with BPH than Urethral Stricture ( $p \leq 0.001$ ). All 16 patients were of benign prostatic hyperplasia (BPH), it means severity noted to be more in patients with BPH. These patients also shown normal or near normal levels of S. Creatinine after drainage procedure ( $p \leq 0.001$ ). BPH or obstruction to urinary tract plays a major role in renal impairment. Blood Urea levels returned to normal or reduced after

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drainage procedure as compared to before drainage status ( $p \leq 0.001$ ). The most important factor to determine the final outcome in these patients appears to be the degree of renal damage sustained before catheter drainage and relief of obstruction. Patients should be evaluated with careful history with the intent to identify subtle but significant urological symptoms such as hypertension with edema and enuresis. All patients in our study with elevated serum Creatinine and blood Urea levels had delayed surgery and required prolonged preoperative hospitalization chiefly to correct deranged renal parameters by continuous bladder drainage which resulted in favourable outcomes[14].

#### Conclusion

We concluded from the study that in patients with lower urinary tract obstruction (LUTO) majority of patients were of Benign Prostatic Hyperplasia (BPH) followed by Urethral Stricture (US), Posterior Urethral Valve (PUV) and Phimosis. Degree of renal impairment was more with Benign Prostatic Hyperplasia (BPH) compared to Urethral Stricture (US), Posterior Urethral Valve and Phimosis. All patients with associated risk factors (single or multiple) having benign prostatic hyperplasia (BPH) had marked renal impairment, which emphasizes the fact that in patients with lower urinary tract obstruction (LUTO) degree of renal impairment is aggravated if there was an associated risk factor present. In patients of lower urinary tract obstruction (LUTO) with impaired renal function, drainage procedure is recommended before planning for the definitive surgery.

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