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Original Research Article

## Hydroureteronephrosis in women with pelvic organ prolapse: a prospective cohort study

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### ABSTRACT

**Background:** Pelvic organ prolapses (POP) is a common problem in women. The prevalence of POP increase with age. The true prevalence and risk factor for developing hydroureteronephrosis (HUN) in women with pelvic organ prolapse is still unclear due to lack of prospective studies on sufficiently large cohorts. This prospective study was done to study the prevalence of HUN in women with POP and to identify the risk factors for developing HUN.

**Methods:** In this prospective observational study 219 patients were recruited for surgical repair for pelvic organ prolapse for 2 years. Preoperatively, all patients had transabdominal scan to assess the uterus, adnexa and to look for Hydroureteronephrosis (HUN). Women with presence of HUN were followed postoperatively look for the resolution of HUN.

**Results:** The prevalence of bilateral HUN was 6.85%. The mean age of women with HUN ranged from 51-69 years. Diabetes and hypertension were significant risk factor for development of HUN (OR 4.70, 95% CI -1.59-13.88 and OR 3.72, 95% CI- 1.23-11.1 respectively). There was a statistically significant correlation between chronic kidney disease and HUN. (OR 1 with 95%: CI 9.49-30.42). The correlation between stage of pelvic organ prolapse and HUN was not statistically significant ( $p = 0.062$ ). There was a statistically significant correlation between the duration (2years -15 years) of POP to HUN. (OR 0.233, 95%0.13-0.419). Patients were followed up post operatively for resolution of HUN. HUN resolved in 9 women (60%) and persisted in 6 (40%).

**Conclusions:** The prevalence of bilateral HUN in women with pelvic organ prolapse was 6.8%. Presence of hypertension, diabetes and chronic kidney disease was a risk factor for HUN. HUN resolved in 60% of women after pelvic reconstructive surgery.

**Keywords:** Hydroureteronephrosis, Pelvic organ prolapse, POP-Q

### INTRODUCTION

Pelvic organ prolapses (POP) is protrusion of pelvic organs (bladder, uterus, rectum) through the vagina from its normal position. The prevalence of POP in the general population is about 37% which increases to 64.8% in older women.<sup>1</sup> Among them at least 30% may require surgery. The reported prevalence of hydroureteronephrosis (HUN) in women with pelvic

organ prolapse is 7-50%. However, the true prevalence still unclear due to lack of prospective studies on sufficiently large cohorts.

POP interferes with daily activity of a woman's life because of symptoms related to lower urogenital and gastrointestinal tract. In 1930s, the association of fatal uremia with complete prolapse of uterus was recognized by Frank RT et al.<sup>2</sup> Following that there have been

multiple studies that have described the association of HUN with POP.<sup>3,4</sup> However, there is insufficient data on the prevalence and risk factor for development of HUN in POP due to lack of well-designed prospective cohort study with appropriately large sample.

The pathophysiology behind the development of HUN in pelvic organ prolapse is well understood. However, the factors which predict the development of HUN and persistence after surgery for prolapse still remain unclear. This study has looked at the prevalence of HUN and the clinical profile of women who have undergone surgical repair for pelvic organ prolapse. Authors have also studied the risk factors for development of HUN in women with POP.

This prospective study was done to study the prevalence and risk factors for HUN in patients with pelvic organ prolapse and to follow up these patients for the resolution of HUN after pelvic reconstructive surgery.

## METHODS

This is a prospective cohort study done at Christian Medical College Hospital Vellore India from January 2012 to March 2014. The study was approved by the IRB and the Ethics committee. Study group was patients with pelvic organ prolapse who are planned for pelvic reconstructive surgery. Women with POP who were planned for vaginal hysterectomy with pelvic floor repair were included after obtaining an informed consent.

The clinical details of the patients including the age, parity, duration, stage of prolapse and associated comorbidities like Hypertension, Diabetes mellitus, chronic kidney disease were noted. Type and degree of prolapse was staged according to the standard Pelvic organ Prolapse-Quantification (POP-Q) system by the International Continence Society.<sup>5</sup>

Transabdominal ultrasonography was performed in all the patient to assess the back-pressure changes in the kidney after emptying the bladder. Measurement of the maximum length of both the kidneys were taken in the coronal plane and the size of dilatation of bilateral renal pelvis in the transverse plane. HUN was defined as distention of the renal calyces and pelvis with urine as a result of obstruction of the outflow of urine distal to the renal pelvis. Degree of HUN was graded as mild, moderate and severe as described by Martin I et al.<sup>6</sup> Mild HUN is mild separation of the central sinus echo complex by tubular anechoic urine filled-renal pelvis and calyces. Moderate HUN is a definite anechoic separation of the entire renal sinus, which is easily seen to extend into the calyces. Severe HUN is marked dilatation of the collecting system with parenchymal thinning.

All patients underwent vaginal Hysterectomy with pelvic floor repair. Patient with pre-operative.

Hydroureteronephrosis were followed up at 3, 6 and 12 months after surgery for resolution of HUN.

## Statistical analysis

Measured outcome was the prevalence of bilateral HUN in women with POP. Chi square and Fisher's exact test were used to finding out the significance. P value of <0.05 was considered significant. Multivariate logistic regression analysis was used to determine the association between the different risk factors and presence or absence of HUN. Data was coded and stored in Microsoft excel 2000 and analyzed with SPSS statistical program.

## RESULTS

Over the period of 2 years, 219 women with Pelvic organ prolapse underwent vaginal hysterectomy with pelvic reconstructive surgery. The median age of the women was 50 years (range 40-60 years). 76.4% (n=156) of women had stage 3 POP while and 23.53% (n=48) had stage 4 POP.

Preoperative ultrasound was done in all patients for the evidence of HUN. Bilateral HUN was seen in women with stage 3 and 4 POP. Out of 219 patients, Bilateral HUN was present in 15 women giving a prevalence of 6.85%. According to the grades of HUN, 7 patients had mild and 8 patients had moderate degree of HUN.

**Table 1: Demographic characters of the patients.**

Demography	HUN* (n=15)	Without HUN (n=204)	p value
<b>Age (in years)</b>			0.128
<40	2 (13.33%)	70 (34.31%)	
40-59	7 (46.67%)	91 (44.61%)	
>60	6 (40%)	43 (21.08%)	
Diabetes mellitus	7 (46.67%)	32 (16.89%)	0.007
Hypertension	6 (40%)	31 (15.2%)	0.024
Chronic kidney disease	3 (20%)	Nil	0.000
<b>POP# stage</b>			0.062
Stage 2	0	19 (9.3%)	
Stage 3	8 (53.33%)	137 (67.2 %)	
Stage 4	7 (46.67%)	48 (23.5 %)	
<b>Duration of POP</b>			0.000
<5 years	8	12	
5-15 years	3	122	
15 years	4	70	

\*HUN- hydroureteronephrosis, #POP- pelvic organ prolapse

Of the 219 women with POP 204 patients did not have HUN. 34.31% (n=70) patients were between 40-49 years of age, 44.61% (n=91) were between 50-59 years and 21.08% (n=43) were more than 60 years of age. The prevalence of HUN was 2.8%, 7.1% and 12.2% among women in these three age groups. The duration of prolapse in these patients ranged from 2 years to 15

years. Diabetes mellitus and hypertension were found in 16.89% (n=32) and 15.2% (n=31) patients respectively. (Table 1).

The backward logistic regression analysis was performed to assess the impact of 5 factors (age, diabetes mellitus, and hypertension, stages and duration of POPP) in the development of HUN. Age, hypertension and duration of prolapse had a trend toward increased risk but were not statistically significant. Diabetes and stage of POP were significant risk factors for development of HUN (OR 3.743 95% CI: 1.093-12.825, p value 0.036 and OR 3.130 95% CI: 1.045-9.372 p value 0.041 respectively) (Table 2).

**Table 2: Logistic regression analysis of HUN\* and related factors.**

Variables	Odds ratio	95% confidence interval	p value
Age	1.181	0.472-2.953	0.722
Diabetes mellitus	3.743	1.093-12.825	0.036
Hypertension	1.542	0.384-6.196	0.542
Stage of POP <sup>#</sup>	3.130	1.045-9.372	0.041
Duration of POP	1.839	0.580-5.835	0.301

\*HUN- hydroureteronephrosis, <sup>#</sup>POP- pelvic organ prolapse

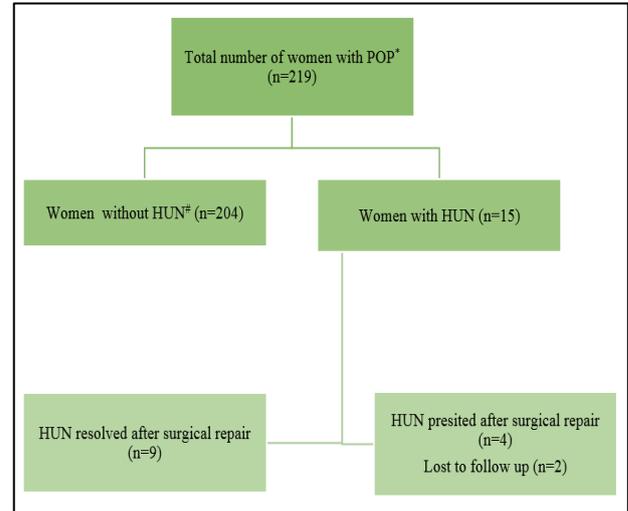
Among the 15 patients with bilateral HUN, 13.33% (n=2) patients were between 40-49 years of age, 46.67% (n=7) patients were between 50-59 years of age and 40% (n=6) patients were more than 60 years of age. Diabetes, hypertension and chronic kidney disease were found in 7 (46.67%), 6 (40%) and 3 (20%) patients respectively. Eight (53.3%) patient had stage 3 POP whereas seven (46.67%) of them had stage 4 prolapse (Table 3).

**Table 3: Characteristics of the patient with HUN that has either persisted or resolved.**

Demography	HUN* Persisted	HUN Resolved	p-value
<b>Age (in years)</b>			0.897
<40	1 (16.7%)	1 (11.1%)	
40-59	3 (50%)	4 (44.4%)	
>60	2 (33.3%)	4 (44.4%)	
Diabetes mellitus	1 (16.7%)	6 (66.7%)	0.119
Hypertension	2 (33.3%)	4 (44.4%)	1
Chronic kidney disease	0	3 (33.3%)	0.229
<b>POP<sup>#</sup> stage</b>			0.608
Stage 1	0	0	
Stage 2	0	0	
Stage 3	4 (66.7%)	4 (44.4%)	
Stage 4	2 (33.3%)	5 (55.6%)	
<b>Duration of POP</b>			0.060
<5 years	1 (16.7%)	3 (33.3%)	
5-15 years	3 (50%)	0	
15 years	2 (33.3%)	6 (66.7%)	

\*HUN- hydroureteronephrosis, <sup>#</sup>POP- pelvic organ prolapse

All 15 women with HUN were followed up after pelvic reconstruction surgery for resolution of the same at 3, 6 and 12 months. In 9 (60%) women HUN resolved 4 (26.6%) women with mild HUN persisted and 2 (13.3%) loss of follow up (Figure 1).



\*POP- pelvic organ prolapse <sup>#</sup>HUN- hydroureteronephrosis

**Figure 1: Flow chart showing patient recruitment and the follow-up.**

**DISCUSSION**

In this study, out of the 219 patients who presented with pelvic organ prolapse 15 patients had Hydroureteronephrosis, giving a prevalence of 6.85%. The prevalence of HUN was similar to study conducted by Costantini et al and Beverly et al which were 5% and 7.7 % respectively.<sup>7,8</sup> A prospective observational study from China by Hui et al have reported a 10.3% prevalence of HUN in their study.<sup>9</sup> While in a study by Dancz et al the prevalence was 30.6%.<sup>10</sup>

Seven women in this study had mild HUN and eight had moderate HUN. In study by Beverly et al majority of the women (22 out of 25 women) had mild and moderate HUN.<sup>8</sup> However, 8 (61.5 %) out of 13 cases studied by Costantini et al had severe HUN.<sup>7</sup>

There was a strong correlation between age of the patient and HUN. The prevalence was 2.8%, 7.1% and 12.2% in age group of 40-49, 50-59 and more than 60 years respectively. Other studies also concluded that percentage of HUN is more in older women.<sup>7,9</sup>

In this study 5.5% (8 out of 145) women had HUN in stage 3 POP whereas 12.7% (7 out of 55) had HUN in stage 4 POP. The prevalence of HUN in study by Hui et al was 17.7% and 33.3% in stage 3 and 4 POP respectively.<sup>9</sup> While in another prospective study by Dancz et al the prevalence of HUN in stage 3 and 4 POP was 22.2% and 63.1% respectively.<sup>10</sup>

The women with bilateral HUN had significantly higher prevalence of Diabetes Mellitus (46.67% versus 16.89%,  $p=0.007$ ), Hypertension (40% versus 15.2%,  $p=0.024$ ) and Chronic Kidney disease (20% versus Nil,  $p=0.000$ ) in comparison to women without HUN. The prevalence of diabetes mellitus (54.2% versus 22.5%;  $p=0.002$ ) and hypertension (70.8% versus 44.0%;  $p=0.023$ ) were significantly higher in women with HUN group.<sup>9</sup> In study by Dancz et al Diabetes mellitus (21.1% versus 10%,  $p=0.009$ ) was significantly higher in women with HUN however, hypertension was not significant (21.8% versus 22.4%,  $p=0.93$ ).<sup>10</sup>

Out of the five factors that were used for backward logistic regression to determine the risk factors for development of HUN, diabetes mellitus and stage of POP were found to be statistically significant (OR 3.743 95% CI: 1.093-12.825,  $p$  value 0.036 and OR 3.130 95% CI: 1.045-9.372  $p$  value 0.041 respectively). Hui et al had found stage of POP as only statistically significant risk factor (OR 3.42, 95% CI 1.29-9.06) on multiple logistic regression analysis on six risk factors.<sup>9</sup> Dancz et al has also found the degree of prolapse (OR 1.68, 95% CI 1.22-2.12) as significant risk factor after controlling for various other factors.<sup>10</sup>

Out of the 15 patients who had bilateral HUN preoperatively, HUN resolved in 9 (60%) women, persisted in 4 (26.6%) women and 2 (13.3%) loss of follow up. In a study by Costantini et al, HUN resolved in 77.8% (7 out of 9) women after pelvic floor repair.<sup>7</sup> The complete resolution of HUN after surgical repair was 95.2% (20 out of 21 patients, 3 lost to follow up) in study by Hui et al.<sup>9</sup> Age of the presentation, medical morbidities (diabetes mellitus, hypertension, chronic kidney disease), stage of pelvic organ prolapse and duration of POP was not significantly difference in the two group of women whose HUN either persisted or resolved after pelvic floor repair.

## CONCLUSION

The prevalence of bilateral HUN in women with POP our study was 6.85%. Bilateral HUN was found in women with stage 3 and 4 POP. The statistically significant risk factor for development of HUN was diabetes mellitus and stages of POP. The complete resolution of HUN after surgery was observed in 60% of women.

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