

Retrospective Study on Hospital Admissions due to Pyelonephritis in Type II Diabetic Patients

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ABSTRACT

Background: Pyelonephritis is a urinary tract infection that ascends to involve the kidneys. It can also occur as an infection secondary to bacteremia. Some pathogens that commonly cause pyelonephritis are *E. coli*, enterobacteriaceae, staphylococci, and pseudomonas. The initial patient presentation usually involves fever, chills, nausea, vomiting, costovertebral angle tenderness, and flank pain. Other cystitis symptoms such as dysuria, increased urinary frequency, malodorous urine, and hematuria may or may not be present. Symptoms of pyelonephritis with bacteriuria are sufficient for the diagnosis of pyelonephritis.

Aim: The aim of this study was to investigate a potential link between Type II Diabetes Mellitus and pyelonephritis.

Methods: In this retrospective study, hospitalized patients during the study period were reviewed. Variables examined were sex, age, and length of stay. Patients were excluded if they had known urogenital abnormalities, indwelling catheters (Foley, nephrostomy, suprapubic, or who regularly perform clean intermittent catheterization), were pregnant, or were on dialysis.

Results: Of 333 patients analyzed, diabetics had a longer length of stay than non-diabetics (4.49 vs 3.67 days respectively; $p=0.0041$) and females were significantly younger than men in hospitalized patients for pyelonephritis were (50.0 vs 63.5 years; $p<0.0001$). Further, it was found that diabetics were significantly older than nondiabetics were (60.4 vs 47.3; $p<0.0001$) and more diabetics getting admitted with pyelonephritis were men vs women (59.32% vs 35.27%; $p=0.0007$).

Conclusion: Results of the study were significant in showing that of all pyelonephritis-hospitalized patients on average the length of stay was longer for diabetics and it demonstrated that female patients with pyelonephritis are significantly younger than male patients hospitalized with pyelonephritis. Of note, there was no significant difference in the length of stay for diabetic patients based on their treatment modality (diet controlled vs. oral medications vs. insulin dependent vs. combined). The study also showed that diabetics getting admitted for pyelonephritis are more men and older in age compared to the nondiabetics.

Keywords

Pyelonephritis, Diabetic, Length of stay, Gender.

Introduction

Between 2006 and 2009, 10.8 million patients presented to the emergency department (ED) in the United States (US) for the treatment of urinary tract infection (UTI). 1.8million patients (16.7 % of UTI patients) were admitted to the hospital for further management. Admitted patients were generally older, male, and had Medicare [1]. A 2019 study shows an annual US economic burden of about \$1.6 billion annually due to UTIs [2].

A prior study showed that, both biological and psychosocial factors are responsible for sex and gender differences in diabetes risk and outcome [3]. This retrospective study will also look into whether gender is associated with diabetes. The results found in this study can be further used to educate providers to provide further preventative care and knowledge to the respective populations.

Previous research done indicates that diabetes is a risk factor for increased frequency of UTIs. We conducted a retrospective study at St. Joseph's Medical Center in Stockton, California to investigate risk factors associated with the diabetic population increases the risk of pyelonephritis compared to the non-diabetic population. This research can help physicians determine risk factors associated with diabetic patients who develop UTIs.

Methods

The study provided retrospective data from St. Joseph's Medical Center in Stockton, CA. Initial sample collection was taken from the community hospital over the time period of December 2016 to March 2020 after approval from the Dignity Health Research Institute (California & Nevada). Eight hundred and sixty-five patients were reviewed for the correlation between diabetic and non-diabetic patients admitted with the primary diagnosis of pyelonephritis. Exclusion criteria for the study included patients with urogenital abnormalities (incl. recent/acute kidney stone, bladder diverticula, vesicoureteral reflux, kidney transplant within the last 6 months, neurogenic bladder, colovesical fistula), indwelling catheters (incl. foley, nephrostomy, suprapubic, or those who regularly perform clean intermittent catheterization), were pregnant, on hemodialysis, and duplicate admissions of the same patient. Of the 865 initially surveyed, 333 patients met criteria and were used for data analysis.

Demographic variables (age, gender), length-of-stay, presence of and type of diabetes, and if diabetic, diabetic treatment modality (oral hypoglycemics, insulin-dependent, and no active diabetic treatment) were collected.

Results

333 patients were included in the analysis. Of the 333 patients, the two groups compared were diabetics (n=127) to non-diabetics (n=206). The first analysis assessed the Mean and the Standard Deviation for length-of-stay (LOS) between the two groups. For the patients with diabetes, a prior analysis showed no statistical

significance between type of diabetic treatment (oral, insulin-dependent, combined, lifestyle). Utilizing the two-sample t-test, diabetic patients were found to have a longer LOS (4.49 +/- 2.58 versus 3.67 +/- 2.36 days; p=0.0041; 95% CI = -1.376 - 0.263).

In addition, hospitalized adult (>17 years) female patients were significantly younger (n=258; 50.0 +/- 19.5 years) than adult male patients (n=59; 63.5 +/- 15.2 years) with pyelonephritis: p=<0.0001. We can conclude that there indeed is a significant difference between the two genders in terms of age.

Further, hospitalized diabetic patients were significantly older (n= 126; 60.48 +/- 15.71) than hospitalized nondiabetics (n=191; 47.30 +/- 19.99), p=<0.0001.

Lastly, it was also found that diabetics admitted for pyelonephritis had a higher rate of males (59.32%) vs nondiabetics who were more females (64.7%) p=0.0007. With this, it can be concluded that gender and diabetes status are associated.

Conclusion

This descriptive study utilizing retrospective data demonstrates a link between an increased length of stay in diabetic patients compared to nondiabetic patients diagnosed with pyelonephritis. Diabetic patients in this population had an average length of stay of approximately 1 day longer compared to the nondiabetic population.

There was also a demonstrated significant difference in average age of hospitalized patients diagnosed with pyelonephritis between male and female patients. Male patients tended to have a higher average age at time of hospitalization, at 63.5 years, with less variability in age. Female patients tended to be on average younger when hospitalized for pyelonephritis, at 50 years of age, but with more variability in age. Diabetic patients overall tended to be older in age with mean of 60.5 years versus nondiabetics mean age of 47.3 years. Diabetics also tended to be more men, whereas more females were noted to be nondiabetic.

This study did not demonstrate any significant difference in length of stay in hospitalized diabetic patients with a diagnosis of pyelonephritis based on treatment modality; those controlled with diet alone, oral medications, insulin, or combination thereof. The diagnosis of diabetes itself conveys an increased likelihood of increased length of hospital stay, not the treatment modality itself.

With the information gained from this study, practitioners may be better able to educate diabetic patients concerning the risk for increased length of stay for complicated urinary tract infections compared to the nondiabetic population, as well as to give education to diabetic women after age 30, and men after age 50, of the increased risk for hospitalization, and increased length of stay from complicated UTI/pyelonephritis. Practitioners can also be reassured that treatment modality should be selected based on appropriateness to their patient, and that it has no demonstrable bearing on increased duration of hospitalization in diabetic patients hospitalized with pyelonephritis.

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