

Applicability of Urinary Nitrites to Predict Pathogen Type in Bacterial Urinary Tract Infections

Rebecca Cino, Pharm.D., Zachary Fetske, Pharm.D., Shana Szymborski, Pharm.D., MHS, BCPS, Joseph Reilly, B.S., Pharm.D., BCGP, Alex Kardos, B.S. Pharm, MBA

AtlantiCare Regional Medical Center, Pomona, N.J.

Introduction

- Urinary tract infections (UTI) are one of the most common bacterial infections and frequently result in emergency department visitation and subsequent hospitalization. The most common etiologic cause of UTIs is Escherichia coli (E.coli), as this organism causes approximately 75% of uncomplicated UTIs and 65% of complicated UTIs.¹
- Two diagnostic methods for UTIs include urinalysis (UA) and urine culture. The presence of UA nitrites can be indicative of a UTI, although it is not a sensitive or specific marker for infection.
- Dietary nitrates are converted to urinary nitrites by many bacteria; however, some species such as Pseudomonas, Enterococcus, and Acinetobacter do not produce the necessary reduction enzyme to generate urinary nitrites.

Objective

The primary objective of this study was to determine if there is an association between UA nitrites and uropathogen species identified from the urine culture. Specifically, comparing the presence or absence of urinary nitrites in patients with UTIs caused by Escherichia coli (E.coli) or Pseudomonas.

Methods

- Patients who were admitted with urine culture results positive for either E.coli or Pseudomonas between January 2023 and August 2023 were reviewed by the investigators and separated into two groups respective to pathogen type. Two-hundred and nineteen patients who had concomitant UA were included.
- Patients with more than one uropathogen in culture results were excluded.
- Medical records were reviewed and data collection included the presence or absence of UA nitrites for both groups.
- Appropriate statistical tests were utilized. The chi-squared test was used to compare the rate of nitrite negative and positive UA results in each group. An alpha significance level of less than 0.05 denoted statistical significance.
- Institutional review board approval was obtained for this investigation.

Results

Figure 1. E.coli UA Results (n = 163)

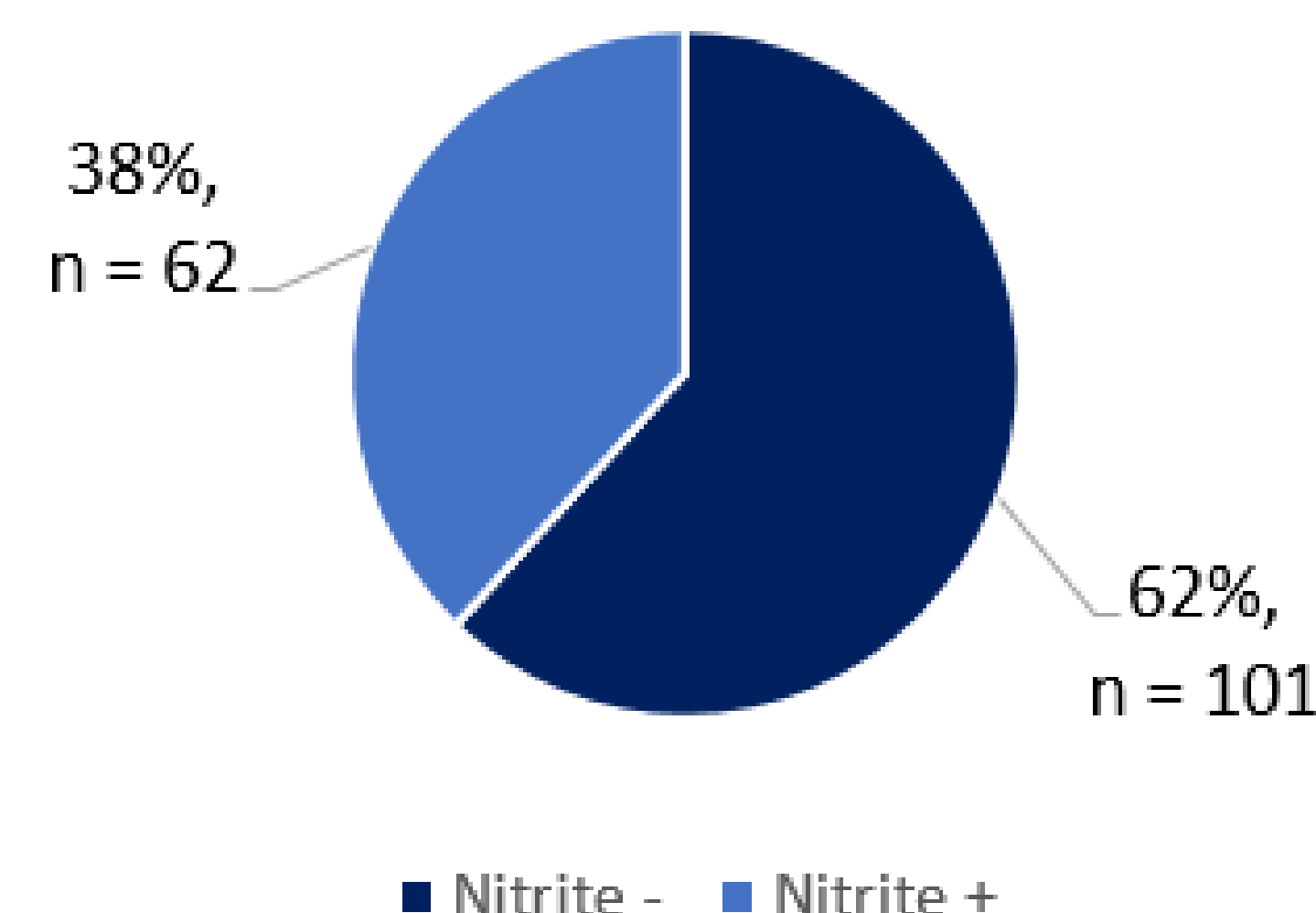


Figure 2. Pseudomonas UA Results (n = 56)

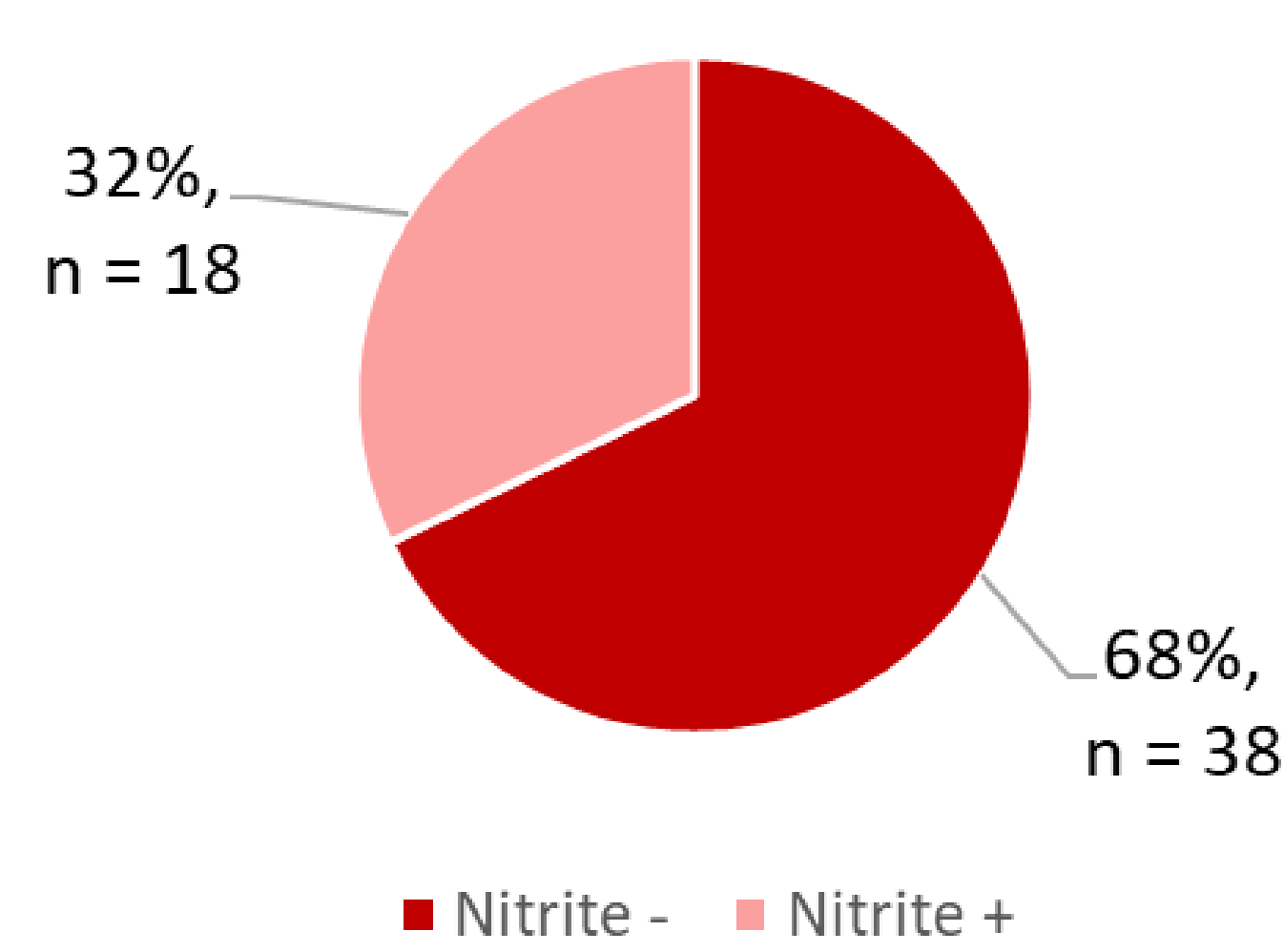


Table 1. Chi-Squared Analysis

	Nitrite Negative	Nitrite Positive
E. Coli (n = 163)	101	62
Pseudomonas (n = 56)	38	18
P value	0.43	

Discussion

- Of 219 total UTIs, 163 urine culture results were categorized in the E.coli group and 56 in the Pseudomonas group.
- There were 101 (62%) and 38 (68%) nitrite negative results in the E.coli and Pseudomonas groups, respectively (Figures 1 and 2).
- Furthermore, there were 62 (38%) and 18 (32%) nitrite positive results in the E.coli and Pseudomonas groups, respectively (Figures 1 and 2).
- The findings show similar rates of nitrite negative and nitrite positive results between groups.
- Statistical significance was not demonstrated in rates of nitrite negative and positive UA results between uropathogen species. This was shown by the p-value of 0.43 (Table 1).
- The results demonstrate that urinary nitrite results are not a useful diagnostic test to predict uropathogen speciation while urine cultures remain pending. These findings are consistent with those in the published literature.

Conclusion

Our study results demonstrate there is not a significant association between the presence of UA nitrites and uropathogen species. Nitrite UA results should not be used to guide antimicrobial selection as culture results remain pending.

References

1. Medina M, Castillo-Pino E. An introduction to the epidemiology and burden of urinary tract infections. Ther Adv Urol. 2019 May 2;11:1756287219832172. doi: 10.1177/1756287219832172. PMID: 31105774; PMCID: PMC6502976.