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# Transperineal prostate biopsy without routine antibiotics: Infection risk and ethnicity in a diverse urban cohort

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## Abstract

**Introduction:** Transperineal prostate biopsy (TPPB) is associated with lower infectious risk than the transrectal approach, prompting reconsideration of routine antibiotic prophylaxis. In March 2024, our institution implemented a protocol change from universal prophylaxis to selective omission of antibiotics for eligible patients undergoing TPPB under local anaesthesia. This study evaluated post-biopsy infection outcomes following this change and explored demographic and procedural factors associated with infection risk.

**Methods:** A retrospective cohort study was conducted at a district general hospital serving a diverse urban population. Consecutive patients undergoing TPPB between May 2023 and April 2025 were included. Patients were categorised according to receipt of prophylactic antibiotics before and after protocol implementation. The primary outcome was infection within 30 days, defined as fever, urinary tract infection, or sepsis requiring antibiotic treatment. Categorical variables were compared using Fisher's exact test.

**Results:** A total of 306 patients were included, with 153 in each group. Overall infection incidence was 3.3% (10/306). Infection occurred in 7 of 153 patients (4.6%) receiving antibiotics and in 3 of 153 patients (1.9%) managed without antibiotics (p = 0.335). Most infections were caused by Gram-negative organisms. No statistically significant associations were observed between infection and age, ethnicity, or biopsy core number. Infection rates remained low across demographic subgroups.

**Conclusions:** Selective omission of antibiotic prophylaxis for TPPB under local anaesthesia was not associated with an increased risk of infection. These findings support antimicrobial stewardship initiatives and reinforce the safety of antibiotic-free transperineal biopsy in appropriately selected patients.

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## Introduction

Prostate cancer is a prevalent malignancy among men globally, and prostate biopsy remains a critical tool for diagnosis. The ultrasound guided transrectal prostate biopsy (TRPB) has historically been the standard of care worldwide, with more than one million procedures performed annually[1]. However, needle traversal of the rectal mucosa during TRPB increases the risk of urinary tract infections (UTIs), hospital readmission, and sepsis, largely due to translocation of rectal flora, necessitating routine antibiotic prophylaxis[2]. The increasing adoption of transperineal prostate biopsy (TPPB) reflects its lower infection risk profile. By accessing the prostate via the perineum rather than the rectum, TPPB avoids direct contact with rectal bacteria and has been shown to reduce pathogen burden during tissue sampling[3]. Multiple studies have demonstrated that TPPB provides comparable or superior diagnostic accuracy with substantially lower infection rates, including in settings where antibiotic prophylaxis is omitted[4–7]. These findings have contributed to growing interest in limiting routine antibiotic use and supporting antimicrobial stewardship in urological practice[8].

Despite this evidence, many institutions continue to administer prophylactic antibiotics during TPPB, often driven by local protocols rather than outcome data[9]. Recent prospective studies and systematic reviews suggest that antibiotic administration does not meaningfully influence post-TPPB infection rates, raising questions about the necessity of routine prophylaxis[7,8].

Accordingly, this study evaluated post-biopsy infection outcomes following an institutional change from routine antibiotic prophylaxis to selective omission in transperineal prostate biopsy. Secondary objectives were to explore associations between infection and demographic or procedural factors, including age, ethnicity, and biopsy core number.

## Methods

### *Study design and setting*

This retrospective cohort study was conducted at Queen Elizabeth Hospital, Lewisham and Greenwich NHS Trust, a district general hospital serving a large, ethnically diverse urban population in South London, United Kingdom. The hospital provides secondary care services to a socioeconomically and demographically varied catchment area. The study evaluated post-biopsy infection outcomes following a change in institutional practice from routine antibiotic prophylaxis to selective omission of antibiotics for transperineal prostate biopsy performed under local anaesthesia. The protocol change was implemented in March 2024 under local clinical governance guidance. Cases were identified over a 24-month period from May 2023 to April 2025, encompassing patients biopsied both before and after implementation of the revised protocol, thereby allowing comparison between consecutive cohorts managed under different prophylactic strategies. The study was registered and approved as a clinical audit under institutional clinical governance processes. As this was a retrospective analysis of routinely collected clinical data undertaken for service evaluation, formal research ethics committee approval was not required. The study was conducted in accordance with institutional governance standards and adhered to accepted principles for observational clinical research.

### *Patient selection and diagnostic pathway*

All patients undergoing transperineal prostate biopsy during the study period were screened for eligibility. Patients were included if the procedure was performed under local anaesthesia and complete peri-procedural and follow-up data were available within the electronic patient record. Indications for biopsy included elevated prostate-specific antigen levels, abnormal findings on digital rectal examination, suspicious lesions identified on biparametric magnetic resonance imaging, or histological surveillance in men with previously diagnosed prostate cancer. As part of routine institutional practice, all patients underwent pre-biopsy urine microscopy, culture, and sensitivity testing to exclude active urinary infection prior to the procedure. Patients were considered ineligible for antibiotic omission if they were deemed at increased risk of infection. Exclusion criteria for the antibiotic-

free protocol included recent urinary tract infection, immunosuppression, diabetes mellitus, presence of an indwelling urinary catheter, absence of documented pre-biopsy urine testing, or procedures performed under general anaesthesia. Patients meeting any of these criteria continued to receive prophylactic antibiotics in accordance with previous institutional practice. Only patients considered clinically suitable under the revised protocol were included in the antibiotic-free cohort.

*Exposure definition: antibiotic prophylaxis*

Patients were categorised according to whether prophylactic antibiotics were administered at the time of biopsy. The antibiotic group comprised patients who underwent transperineal prostate biopsy prior to implementation of the revised institutional guidance in March 2024, during which routine prophylactic antibiotics were administered in accordance with established departmental practice. The no-antibiotic group comprised consecutive eligible patients who underwent biopsy after adoption of the antibiotic-free protocol. Omission of antibiotics was protocol-driven and applied consistently in patients meeting predefined eligibility criteria. The protocol change formed part of a structured institutional governance process and was subject to internal audit and clinical oversight.

*Biopsy procedure*

All biopsies were performed under local anaesthesia with the patient positioned in lithotomy. The perineal skin was prepared using chlorhexidine antiseptic solution in accordance with standard sterile technique. Local anaesthesia was achieved using subcutaneous infiltration combined with periprostatic infiltration of lidocaine. Topical cooling was applied prior to infiltration to improve patient comfort, and adequate time was allowed for the onset of anaesthesia before tissue sampling commenced. Biopsies were obtained using the PrecisionPoint® transperineal access system in conjunction with a spring-loaded biopsy device. The number of cores obtained was determined by magnetic resonance imaging findings and clinical indication, with systematic sampling performed where appropriate. Following completion of the procedure, patients were observed for a short period and discharged on the same day with standardised post-biopsy aftercare instructions and advice regarding signs and symptoms of infection requiring medical review.

*Outcome definition*

The primary outcome was post-biopsy infection occurring within 30 days of the procedure. Infection was defined as the development of clinical symptoms necessitating antibiotic treatment, including fever of 38 degrees Celsius or greater, symptomatic urinary tract infection, or sepsis. Outcome ascertainment was performed through structured review of electronic medical records, including emergency department attendances, inpatient admissions, outpatient documentation, microbiology reports, and recorded antibiotic prescriptions within the hospital system. Infections were categorised according to management setting as either outpatient-managed infections requiring oral antibiotics or infections requiring hospital admission and intravenous antibiotic therapy. Microbiological data were recorded where available, and culture-negative infections were included if clinical features were consistent with infection and antibiotic treatment was initiated.

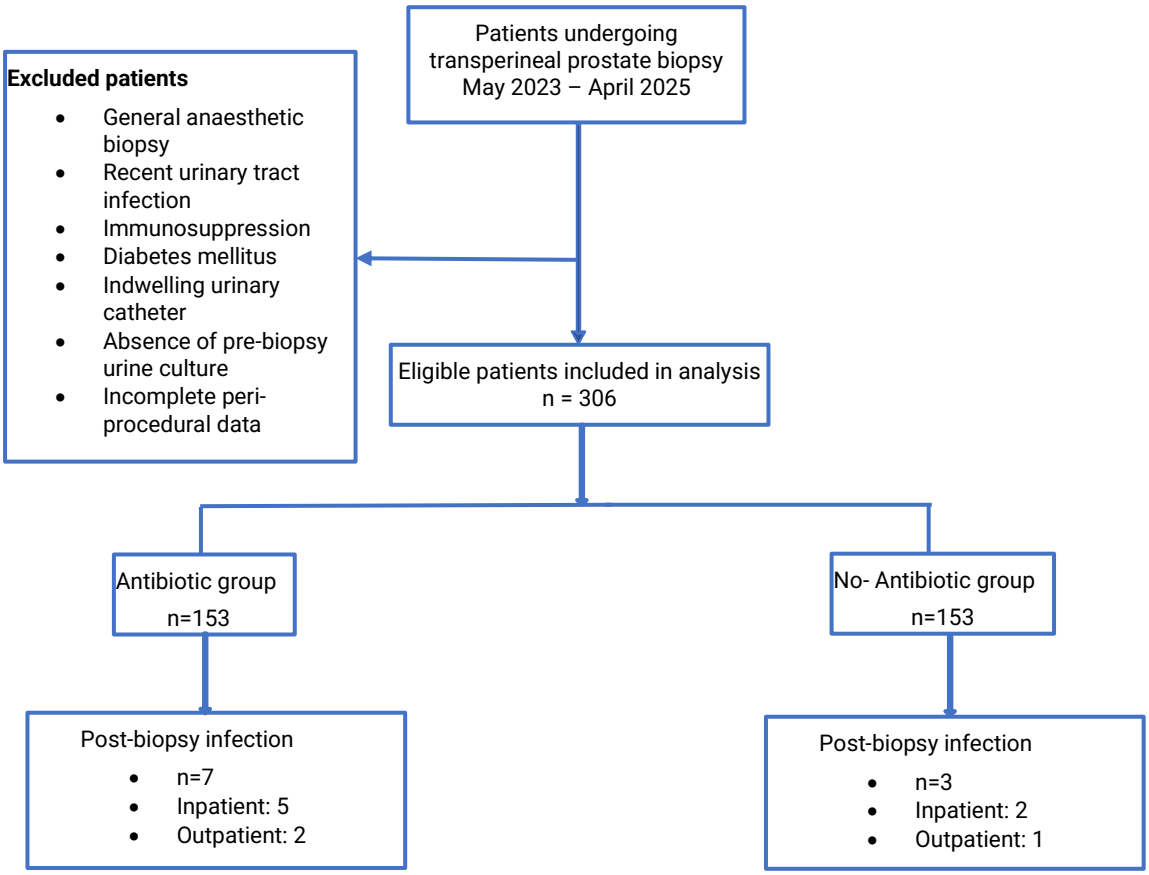
*Covariates*

Demographic and procedural variables assessed included age at biopsy, self-reported ethnicity, and number of biopsy cores obtained. Age was analysed both as a continuous variable and in grouped categories of 40 to 49 years, 50 to 59 years, 60 to 69 years, and 70 years or older in order to explore potential associations with infection risk. Ethnicity was recorded according to patient self-report in electronic health records and grouped into White, Black, Asian, Mixed, and Unknown categories for analysis. The number of biopsy cores obtained was analysed descriptively and categorised into predefined ranges of 10 or fewer cores, 11 to 14 cores, 15 to 20 cores, and 21 to 30 cores to assess potential associations with infection risk.

*Statistical analysis*

No formal sample size calculation was undertaken, as this was an exploratory retrospective cohort analysis conducted as part of institutional service evaluation. Given the limited number of infection events, analyses were descriptive and exploratory in

**Figure 1**: Flow diagram illustrating patient inclusion over the 24- month study period (May 2023 to April 2025)




nature. Categorical variables were compared using Fisher's exact test due to small event counts, and continuous variables were analysed using the Mann–Whitney U test where appropriate. Two-tailed p-values of less than 0.05 were considered statistically significant. In view of the low number of outcome events, multivariable modelling was not performed, as the number of infections was insufficient to support stable regression analysis according to established events-per-variable principles. Results are therefore presented as unadjusted comparisons between groups. All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 27.0.

## Results

*Study Cohort*

A total of 306 patients underwent transperineal prostate biopsy during the study period and met inclusion criteria (figure 1). Of these,153 patients received prophylactic antibiotics and 153 underwent biopsy without antibiotics following implementation of the revised institutional protocol. Baseline characteristics, including age, ethnicity distribution, and biopsy core number, were similar between groups (table 1).

*Infection outcomes by antibiotic exposure*

Overall, 10 infections occurred within 30 days of biopsy, corresponding to an infection rate of 3.3%. Infection occurred in 3 of 153 patients (1.9%) in the no-antibiotic group and in 7 of 153 patients (4.6%) in the antibiotic group (table 2). Although infection rates were numerically lower among patients who did not receive antibiotics, this difference was not statistically significant (Fisher's exact test p=0.335). Of the three infections in the no-antibiotic group, two required hospital admission for intravenous antibiotics and one was managed in the outpatient setting. In the antibiotic group, five of seven infections required inpatient admission. Gram-negative organisms predominated among culture-positive infections in both groups.

**Table 1.** Baseline cohort characteristics and infection outcomes stratified by antibiotic exposure

| Characteristic | Antibiotics (n=153) | No antibiotics (n=153) | Total | Infection Rate % |
|---|---|---|---|---|
| Infections, n (%) | 7 (4.6%) | 3 (1.9%) | 10 | - |
| Inpatient admission, n | 5 | 2 | 7 | - |
| White ethnicity, n | 85 | 92 | 177 | 3.95 |
| Black ethnicity, n | 34 | 38 | 82 | 2.44 |
| Asian ethnicity, n | 6 | 8 | 14 | 0 |
| Mixed ethnicity, n | 8 | 6 | 14 | 0 |
| Unknown ethnicity, n | 14 | 5 | 19 | 5.26 |
| ≤10 cores, n | 48 | 36 | 84 | 2.38 |
| 11–14 cores, n | 61 | 39 | 100 | 6 |
| 15–20 cores, n | 32 | 55 | 87 | 0 |
| 21–30 cores, n | 13 | 22 | 35 | 5.71 |
| Age Group 40-49, n | 3 | 3 | 6 | 0 |
| Age Group 50-59, n | 42 | 35 | 77 | 3.9 |
| Age Group 60-69, n | 78 | 86 | 164 | 3.6 |
| Age Group ≥70, n | 30 | 29 | 59 | 1.69 |
| Mean Age, n | 63.4 | 63.8 | - | - |
| Median Age, n | 65 | 65 | - | - |

**Table 2:** Comparison of infection outcomes between antibiotic and no-antibiotic groups

| Group | No infection (n) | Infection (n) | Total (n) | Infection rate % (95% CI) | p-value (Fisher's Exact) |
|---|---|---|---|---|---|
| No antibiotics | 150 | 3 | 153 | 1.96 (0.41–5.63) | – |
| Antibiotics | 146 | 7 | 153 | 4.58 (1.86–9.22) | 0.335 |

*Demographic factors and infection risk*

Age was similar between patients with and without infection. Median age did not differ between the antibiotic and no-antibiotic groups, and no statistically significant association was observed between age and infection risk when analysed either as a continuous variable or in age categories. Self-reported ethnicity was available for the majority of patients. Infection rates were low across all ethnic groups, and no statistically significant association between ethnicity and post-biopsy infection was observed. Subgroup analyses were limited by small numbers of infection events within individual ethnic categories.

*Biopsy Core number*

The number of biopsy cores obtained varied across the cohort. No consistent trend was observed between biopsy core number and infection risk. Although numerically higher infection rates were observed in some intermediate core-count groups, there was no evidence of a dose–response relationship, and observed differences were likely attributable to chance given the small number of events.

*Microbiological Findings*

Among patients who developed infection, urine or semen cultures most commonly yielded Gram-negative organisms, including Escherichia coli and Klebsiella pneumoniae. Several infections were culture-negative or lacked documented microbiological results, reflecting real-world clinical practice.

## Discussion

This study adds evidence regarding infection outcomes following an institutional change in antibiotic prophylaxis practice for transperineal prostate biopsy. In our study, the overall infection

risk was 10/306 or 3.3%. Overall, Gram-negative organisms predominated, consistent with the typical urinary tract flora associated with post-biopsy infections.

It is slightly higher than the national rate quoted in the BAUS consent form. This difference may reflect variation in patient demographics and comorbidity profiles, differences in the definition and capture of infection events, and the inclusion of patients who did not receive prophylactic antibiotics. Additionally, the relatively small sample size and single-centre design will impact infection events, and would not reflect larger and multi-centre experience, over a prolonged period.

Following implementation of the antibiotic-free protocol, post-biopsy infection rates remained low. Potential explanations for observed infections include rising antimicrobial resistance, which can undermine the effectiveness of standard regimens [11]. In addition, antibiotic exposure has been hypothesized to disrupt the protective gut and urinary microbiome, potentially facilitating colonization by resistant organisms [12]. Procedural factors, including variations in procedure technique or antibiotic timing and dosing, could also contribute. Collectively, these findings support re-evaluation of routine prophylaxis and underscore the importance of antibiotic stewardship in prostate biopsy practice.

Although infection rates appeared higher prior to implementation of the antibiotic-free protocol, this difference was not statistically significant ($p = 0.335$) but suggests that routine prophylactic antibiotics may not be mandatory for TPPB in selected patients as shown in our methodology. In our study, no statistically significant increase in infection was observed following omission of routine antibiotic prophylaxis, consistent with findings from the NORAPP randomised trial [11].

Our study does further to suggest that differences are not limited to one cohort of ethnicity or biopsy core count. The NORAPP study set a non-inferiority margin of 4% between their groups. However, in this cohort, infection events occurred both before and after protocol implementation, without a statistically significant difference.

Some studies suggest minor contributions of age, while others show no statistically significant association [13,14]. Age was distributed similarly in both groups in our study, and the lack of significant differences suggests that this was not a factor in the analysis of infection risk. Analysis of age by groups, also showed no significant association with infection consistent with previous reports [4].

Ethnicity showed no statistically significant relationship with infection risk. This was a key area in our study, given the diversity of our patient population, with our study cohort being made up of 27% black patients. This study is unique in that it analyses a diverse population, since the UK Census [15] states 4% of the overall population are black. The infection rates are relatively low across all racial groups. While minor variations were observed, such as 5.26% in patients among unknown or not documented ethnicity vs. 2.44% among Black patients, these were not statistically significant. This aligns with studies indicating no consistent pattern of infection risk by ethnicity in TPPB cohorts [11]. Racial disparities exist in prostate cancer incidence, diagnostics and treatment, and requires ongoing research. Studies cite socioeconomic, psychosocial, and healthcare access play a role in increased cancer burden and outcomes in black patients [16]. In our experience we observe black patients engaged in our diagnostic pathway.

Furthermore, a higher expression of genes related to the immune response, apoptosis, hypoxia, and reactive oxygen species is seen in black patients[17]. It was hypothesized by authors, clinically significant infection related cases after TPPB might be observed in black patients. Regarding UTI incidence post TPPB among black patients, there is no study to the authors' knowledge that examined this to date. The opportunity to understand how ethnicity impacts TPPB outcomes should continue to be undertaken.

In our cohort, variation in infection rates was observed across biopsy core-count categories. However, no consistent dose–response relationship was identified, and the observed differences may not be attributable to a true biological effect related to biopsy extent. Our findings suggest that infection risk does not appear to be systematically associated with the number of cores obtained during TPPB.

This study's limitations are that it was conducted at a single centre, with a small sample size. In

particular, the low number of Asian and mixed-ethnicity men limits the interpretability of results for these subgroups. This highlights the need for large, multi-centre studies, with randomisation to apply our findings widely.

This study reinforces emerging evidence that routine prophylactic antibiotic use may not be warranted in selected cases for TPPB procedures. The infection rates in our diverse patients, showed no clinical group or subgroup developed a significantly higher risk or susceptibility compared to the other. These findings have strong implications for enhancing antimicrobial stewardship and support the growing adoption of antibiotic-free TPPB protocols in the UK and internationally.

**Conflict of Interest:** None declared.

**References**


1. Loeb S, Vellekoop A, Ahmed HU, Catto J, Emberton M, Nam R, et al. Systematic review of complications of prostate biopsy. *Eur Urol*. 2013;64(6):876–92.
2. Islam M, Da Silva RD, Quach A, Gustafson D. Are outpatient transperineal prostate biopsies without antibiotic prophylaxis equivalent to standard transrectal biopsies for patient safety and cancer detection rates? *J Clin Urol*. 2021;14(6):421–7.
3. Werneburg GT, Adler A, Zhang A, Mukherjee SD. Transperineal prostate biopsy is associated with lower tissue core pathogen burden relative to transrectal biopsy. *Urology*. 2022;168:152–8.
4. Setia SA, Smith J, Cendo D, Yoder J. Outcomes of freehand transperineal prostate biopsy with omission of antibiotic prophylaxis. *BJU Int*. 2022;129(2):143–9.
5. Bryant RJ, Marian IR, Williams R, Lopez JF. Local anaesthetic transperineal biopsy versus transrectal prostate biopsy in prostate cancer detection (TRANSLATE): a multicentre, randomised, controlled trial. *Lancet Oncol*. 2025;26(5):601–10.
6. Wu Q, Tu X, Zhang C, Ye J, Lin T, Liu Z, et al. Transperineal magnetic resonance imaging targeted biopsy versus transrectal route in the detection of prostate cancer: a systematic review and meta-analysis. *Prostate Cancer Prostatic Dis*. 2024;27(2):212–21.
7. Perneta N, Tims R. Complications of local anaesthetic transperineal ultrasound-guided prostate biopsy: a systematic literature review. *Int J Urol Nurs*. 2023;17(2):85–95.
8. Castellani D, Pirola GM, Law YXT, Gubbiotti M, Giulioni C, Scarcella S, et al. Infection rate after transperineal prostate biopsy with and without prophylactic antibiotics: results from a systematic review and meta-analysis of comparative studies. *J Urol*. 2022;208(3):456–64.
9. Boevé LMS, Bloemendal FT, de Bie KCC. Cancer detection and complications of transperineal prostate biopsy with antibiotics when indicated. *BJU Int*. 2023;131(4):482–9.
10. Ng ABCD, Asif A, Agarwal R, Panebianco V, Girometti R, Ghai S, et al. Biparametric vs multiparametric MRI for prostate cancer diagnosis: the PRIME Diagnostic Clinical Trial. *JAMA*. 2025;Sep 10:e2513722.
11. Jacewicz M, Günzel K, Rud E, Sandbæk G, Magheli A, Busch J, et al. Antibiotic prophylaxis versus no antibiotic prophylaxis in transperineal prostate biopsies (NORAPP): a randomised, open-label, non-inferiority trial. *Eur Urol*. 2024;86(1):45–53.
12. Pérez-Losada M, Crandall KA, Freishtat RJ. The role of the microbiome in urologic health and disease. *Nat Rev Urol*. 2023;20(3):155–70.
13. Ramacciotti LS, Strauss D, Cei F, Kaneko M. Transperineal versus transrectal MRI/TRUS fusion-guided prostate biopsy in a large, ethnically diverse cohort. *Int Braz J Urol*. 2024;50(3):454–62.
14. Gravestock BP, Shaw MA. Prostate cancer diagnosis: biopsy approaches. In: *Advances in Prostate Cancer Research*. Brisbane: Exon Publications; 2022. p. 45–68.
15. Population of England and Wales. GOV.UK. 2021 Census. Available from: https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/national-and-regional-populations/population-of-england-and-wales/latest/. Accessed 3 Sep 2025.
16. Friedlander DF, Trinh QD, Krasnova A, Lipsitz SR, Sun M, Nguyen PL, et al. Racial disparity in delivering definitive therapy for intermediate/high-risk localized prostate cancer: the impact of facility features and socioeconomic characteristics. *Cancer*. 2017;123(2):294–301.
17. Rayford W, Beksac AT, Alger J, Aryee MJ, Ayyatan A, et al. Comparative gene expression in African-American vs European-American prostate cancer patients. *Prostate Cancer Prostatic Dis*. 2021;24:863–71.