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Clinical Profile and Antimicrobial Susceptibility Pattern of Neisseria gonorrhoeae in Prostatic Infections

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ABSTRACT

Introduction: *Neisseria gonorrhoeae is a sexually transmitted bacterium that mainly attacks the urogenital tract of both men and women. Urethritis is the most common symptom of N. gonorrhoeae infection in men; however, in some cases, the infection can migrate to the prostate, causing gonococcal prostatitis, which is usually accompanied by lower urinary tract symptoms like dysuria, pelvic pain, and urinary frequency. This article sought to investigate the patient profile with prostatic infections caused by N. gonorrhoeae and to identify the antibiogram of the isolates.*

Methodology: The study was a cross-sectional descriptive study, which took place at Rangpur Medical College, Rangpur, Bangladesh. The study took place from January 2024 to December 2024. It was conducted among 58 male patients who had been clinically diagnosed with prostatic infections, later confirmed positive for Neisseria gonorrhoeae. The study used SPSS version 26 for data analysis.

Outcome: In the sample of 58 patients, the majority was aged 30–39 years (37.9%) and married (58.6%), and the large percentage of them resided in urban areas (62.1%). Dysuria (79.3%), perineal pain (65.5%), and urinary frequency (58.6%) were the chief complaints. All the patients proved to be culture positive for N. gonorrhoeae, and Gram-negative intracellular diplococci and evidence of inflammatory infections were found in 75.9% and

Conclusion: *This study indicates that Neisseria gonorrhoeae–related prostatic infections in Bangladesh mainly occur among young, sexually active males and typically manifest with lower urinary tract complaints and perineal discomfort. The microbiological findings highlight substantial resistance to older antimicrobial agents, particularly fluoroquinolones and tetracyclines, whereas third-generation cephalosporins—most notably ceftriaxone and cefotaxime—as well as amoxiclav, continue to show high therapeutic efficacy.*

Keywords: *Neisseria gonorrhoeae, Prostatic Infections, Antimicrobial Susceptibility*

I. INTRODUCTION

Neisseria gonorrhoeae is a Gram-negative intracellular diplococcus and a major etiological agent of sexually transmitted infections (STIs) worldwide [1]. Although gonorrhea most commonly affects the urethra, cervix, rectum, and pharynx, ascending infection can involve the male accessory sex glands, including the prostate, leading to gonococcal prostatitis. Prostatic involvement may occur in both acute and chronic settings, presenting with lower urinary tract symptoms, perineal discomfort, dysuria, pelvic pain, and occasionally systemic features such as fever [2]. Due to overlapping clinical features with non-gonococcal bacterial prostatitis and the limited routine use of prostatic fluid cultures, gonococcal prostatitis remains underdiagnosed and under-reported, particularly in resource-limited settings. Globally, gonorrhea continues to pose a significant public health burden, with millions of new infections reported annually. The disease burden is further complicated by the extraordinary capacity of *N. gonorrhoeae* to develop resistance to antimicrobial agents [3]. Over the past decades, resistance has emerged successively to sulfonamides, penicillins, tetracyclines, and fluoroquinolones, rendering these agents largely ineffective in many regions [4]. Currently, extended-spectrum cephalosporins, particularly ceftriaxone, often combined with azithromycin, are recommended as first-line therapy for uncomplicated gonococcal infections [5]. However, declining susceptibility and documented treatment failures with these last-line agents have been increasingly reported worldwide, raising serious concerns regarding future treatment options [3]. The

World Health Organization (WHO) has designated multidrug-resistant *N. gonorrhoeae* as a high-priority pathogen and strongly advocates for continuous antimicrobial resistance (AMR) surveillance to guide evidence-based treatment strategies [6]. Surveillance data from multiple countries indicate rising resistance rates to azithromycin and reduced susceptibility to ceftriaxone, threatening the effectiveness of current treatment guidelines. These concerns are particularly relevant for deep-seated infections such as prostatitis, where antimicrobial penetration and prolonged treatment are critical for clinical cure. In Bangladesh, available studies on gonococcal infections demonstrate a concerning resistance pattern. Research conducted in tertiary care hospitals has reported high resistance rates to ciprofloxacin, penicillin, and tetracycline, with emerging resistance to azithromycin and reduced susceptibility to ceftriaxone [7]. A national antimicrobial susceptibility update revealed that while ceftriaxone and spectinomycin remained effective at the time, resistance to fluoroquinolones and doxycycline exceeded 90%, limiting therapeutic options [8]. These findings underscore the dynamic and evolving resistance landscape of *N. gonorrhoeae* in Bangladesh. Despite these alarming trends, most existing studies in Bangladesh focus on urethritis and cervicitis, with limited emphasis on gonococcal involvement in prostatic infections. Recent molecular and microbiological studies on *N. gonorrhoeae* isolates from cervicitis cases further highlight the persistence of resistance genes and the need for continuous surveillance [9]. However, data specifically addressing the clinical profile and antimicrobial susceptibility of *N. gonorrhoeae* in prostatitis remain scarce. T

II. METHODS

This cross-sectional descriptive study was conducted at Rangpur Medical College, Rangpur, Bangladesh, from January 2024 to December 2024. A total of 58 male patients clinically suspected of having prostatic infections and subsequently confirmed by culture to be positive for *Neisseria gonorrhoeae* were included. Patients with prior antibiotic therapy within two weeks or with other co-existing urogenital infections were excluded. Clinical data, including age, marital status, residence, and presenting symptoms such as dysuria, perineal pain, urinary frequency, and urethral discharge, were collected using a structured proforma. Laboratory evaluation included prostatic fluid collection, Gram staining for intracellular diplococci, complete blood count, and C-reactive protein measurement. Prostatic fluid samples were cultured on selective media for *N. gonorrhoeae* and confirmed by standard microbiological techniques. Antimicrobial susceptibility testing was performed using the disk diffusion method and/or E-test according to Clinical and Laboratory Standards Institute (CLSI) guidelines, testing commonly used antibiotics including ceftriaxone, cefotaxime, amoxiclav, azithromycin, ciprofloxacin, and doxycycline. Data were analyzed using SPSS version 26, with results expressed as frequencies, percentages, and mean ± standard deviation for descriptive variables. Clinical outcomes were monitored after culture-guided therapy, and response was categorized as complete resolution, partial improvement, or treatment failure. This study was conducted following ethical approval from the institutional review board, and informed consent was obtained from all participants.

III. RESULTS

The majority of patients were aged 30–39 years (37.9%), followed by 18–29 years (31.0%). More than half were married (58.6%), and most patients resided in urban areas (62.1%) [Table 1]. Dysuria was the most common presenting symptom (79.3%), followed by perineal pain (65.5%) and increased urinary frequency (58.6%). Urethral discharge was present in approximately one-third of cases. [Table 2]. All patients demonstrated culture positivity for *N. gonorrhoeae*. Gram-negative intracellular diplococci were identified on direct microscopy in 75.9% of cases. Laboratory evidence of inflammation was common, while co-infection with other uropathogens was infrequent [Table 3]. High sensitivity was observed to ceftriaxone (96.6%), cefotaxime (93.1%), and amoxiclav (87.9%). In contrast, marked resistance was noted to ciprofloxacin and doxycycline. Azithromycin demonstrated moderate sensitivity, with resistance observed in nearly one-third of isolates [Table 4]. The majority of patients (81.0%) achieved complete clinical resolution following culture-guided antimicrobial therapy. Partial improvement was noted in 13.8% of cases, while treatment failure occurred in a small proportion (5.2%), predominantly associated with resistant isolates [Table 5].

Table 1: Socio-demographic Characteristics of the Study Participants (n = 58)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
18–29	18	31.0
30–39	22	37.9
40–49	12	20.7
≥50	6	10.4
Marital status		

Married	34	58.6
Unmarried	24	41.4
Residence		
Urban	36	62.1
Rural	22	37.9

Table 2: Clinical Presentation of Patients with Gonococcal Prostatic Infection (n = 58)

Clinical feature	Frequency (n)	Percentage (%)
Dysuria	46	79.3
Perineal pain	38	65.5
Increased urinary frequency	34	58.6
Pelvic discomfort	29	50.0
Fever	21	36.2
Urethral discharge	19	32.8

Table 3: Laboratory and Microbiological Findings (n = 58)

Parameter	Frequency (n)	Percentage (%)
Positive prostatic fluid culture	58	100
Gram-negative intracellular diplococci on smear	44	75.9
Elevated total leukocyte count	31	53.4
Raised C-reactive protein	27	46.6
Co-infection with other uropathogens	6	10.3

Table 4: Antimicrobial Susceptibility Pattern of *Neisseria gonorrhoeae* Isolates (n = 58)

Antibiotic	Sensitive n (%)	Resistant n (%)
Ceftriaxone	56 (96.6)	2 (3.4)
Cefotaxime	54 (93.1)	4 (6.9)
Amoxiclav	51 (87.9)	7 (12.1)
Azithromycin	39 (67.2)	19 (32.8)
Ciprofloxacin	9 (15.5)	49 (84.5)
Doxycycline	12 (20.7)	46 (79.3)

Table 5: Treatment Outcome Following Targeted Antimicrobial Therapy (n = 58)

Outcome	Frequency (n)	Percentage (%)
Complete clinical resolution	47	81.0
Partial improvement	8	13.8
Treatment failure	3	5.2

IV. DISCUSSION

In the present study, the majority of patients belonged to the 30–39-year age group (37.9%), followed by 18–29 years (31.0%), indicating that gonococcal prostatic infections predominantly affect sexually active young adults. Khanam et al. from Bangladesh reported that 41.5% of male gonorrhea patients were aged 25–35 years, with declining frequency after 40 years [8]. Similarly, Unemo et al. noted that gonococcal infections peak in men aged 20–39 years globally, reflecting comparable age susceptibility [10]. The age distribution in our study, therefore, aligns with both national and global epidemiological trends. Clinically, dysuria (79.3%), perineal pain (65.5%), and urinary frequency (58.6%) were the most common presenting symptoms in our cohort. In contrast, a Bangladeshi surveillance study by Mowla et al. reported dysuria in 85% and urethral discharge in 72% of male gonorrhea patients, with less emphasis on perineal pain [11]. The lower frequency of urethral discharge (32.8%) in our study likely reflects deeper glandular involvement rather than isolated urethritis, supporting the clinical distinction of prostatic infection. Regarding laboratory findings, 75.9% of patients showed Gram-negative intracellular diplococci on smear, while all cases were culture positive. Khanam et al. reported Gram-stain positivity in 82.4% of gonococcal isolates in Bangladesh [8], slightly higher than our findings, possibly due to specimen type differences (urethral swab vs prostatic secretion). Elevated inflammatory markers in our study (TLC raised in 53.4%) were comparable to findings in STI-associated systemic inflammatory responses described by WHO surveillance reports [12]. Antimicrobial susceptibility patterns formed the core strength of this study.

We observed 96.6% sensitivity to ceftriaxone, 93.1% to cefotaxime, and 87.9% to amoxiclav. In comparison, the 2014 Bangladesh national update demonstrated 100% susceptibility to ceftriaxone and 98.6% to cefixime, confirming sustained cephalosporin efficacy [13]. However, later data from Mowla et al. showed emerging reduced susceptibility, with ceftriaxone sensitivity falling to 93.5% [11], closely matching our observed values and indicating a gradual decline. High resistance to older antibiotics was evident in our study, with ciprofloxacin resistance at 84.5% and doxycycline resistance at 79.3%. Ahmed et al. reported ciprofloxacin resistance of 95.2% and doxycycline resistance of 88.1% [8], which were higher than our findings but demonstrate the same resistance pattern. Long-term surveillance from Bangladesh (1997–2006) documented ciprofloxacin resistance rising from 9% to 87%, highlighting a sustained and worsening trend [14]. Azithromycin sensitivity in our study was 67.2%, with resistance in 32.8% of isolates. In contrast, the WHO Southeast Asia Region surveillance reported azithromycin resistance ranging from 5–15%, though recent studies indicate increasing resistance [12]. The higher resistance rate in our study may reflect indiscriminate macrolide use and underscores the need for cautious dual-therapy strategies. Treatment outcomes in our cohort were favorable, with 81.0% achieving complete clinical resolution and only 5.2% treatment failure. Similar cure rates (>85%) with ceftriaxone-based regimens were reported in international studies where isolates remained susceptible [11-13]. Lower cure rates were associated with resistant strains, reinforcing the importance of culture-guided therapy.

Limitations of The Study

The sample size was relatively small and drawn from a single tertiary care center, which may limit the generalizability of the findings to the broader population. Additionally, molecular methods for detecting resistance genes were not performed, and follow-up to assess long-term recurrence or complications was limited.

V. CONCLUSION

This study demonstrates that *Neisseria gonorrhoeae*–associated prostatic infections in Bangladesh predominantly affect young, sexually active men and commonly present with lower urinary tract and perineal symptoms. Microbiological analysis revealed a high burden of antimicrobial resistance to older antibiotics, particularly fluoroquinolones and tetracyclines, while third-generation cephalosporins—especially ceftriaxone and cefotaxime—along with amoxiclav, retained high effectiveness.

VI. RECOMMENDATION

Based on the findings of this study, it is recommended that clinicians managing prostatic infections consider routine microbiological testing and antimicrobial susceptibility profiling to guide targeted therapy. Third-generation cephalosporins such as ceftriaxone and cefotaxime should be preferred as first-line treatment, while the use of older antibiotics like fluoroquinolones and tetracyclines should be avoided due to high resistance rates.

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