

Comparison of Culture, Microscopy, and Molecular Methods for Diagnosing Gonorrhea: A Short Communication

Abstract:

Gonorrhea, caused by *Neisseria gonorrhoeae*, poses a persistent global public health threat, necessitating timely and accurate diagnosis. This study conducted at the Apex Regional STD Centre in New Delhi, India, from January 1, 2022, to December 31, 2022, scrutinizes diagnostic methodologies for gonorrhea, particularly focusing on the evolving landscape of molecular methods like nucleic acid amplification tests (NAATs), exemplified by Real-Time PCR. The study highlights the growing prominence of NAATs, underscoring their adoption due to their attributes of rapidity, precision, and labor-efficiency. It additionally emphasizes the collaborative potential of diagnostic methods, where polymerase chain reaction (PCR), smear examination, and culture collectively provide a comprehensive diagnostic strategy. Notably, the study underscores culture's pivotal role in antibiotic susceptibility testing, essential in the face of mounting antibiotic resistance challenges. The importance of confirmatory testing is stressed, especially when diagnostic accuracy drops below 90%, a crucial consideration in reducing false positives. In a constantly evolving diagnostic landscape, laboratories are urged to remain adaptable, fortified by stringent quality control measures, proficiency testing, and updated protocols. Beyond individual patient care, laboratory testing assumes a broader public health significance, extending its reach to asymptomatic population screening and aiding in disease control and epidemiological surveillance. This study illuminates the dynamic nature of gonorrhea diagnosis, positioning NAATs alongside culture and smear examination while advocating proactive quality control, proficiency testing, and protocol adaptation to meet evolving diagnostic demands. Such efforts transcend individual healthcare, ultimately serving the greater public health objectives and disease control.

Keywords: Gonorrhea, *Neisseria gonorrhoeae*, nucleic acid amplification tests (NAAT), Real-Time PCR, culture, smear examination, antibiotic susceptibility testing, confirmatory testing, diagnostic methods, public health.

Comment [U1]: Italicize botanical names.

Introduction:

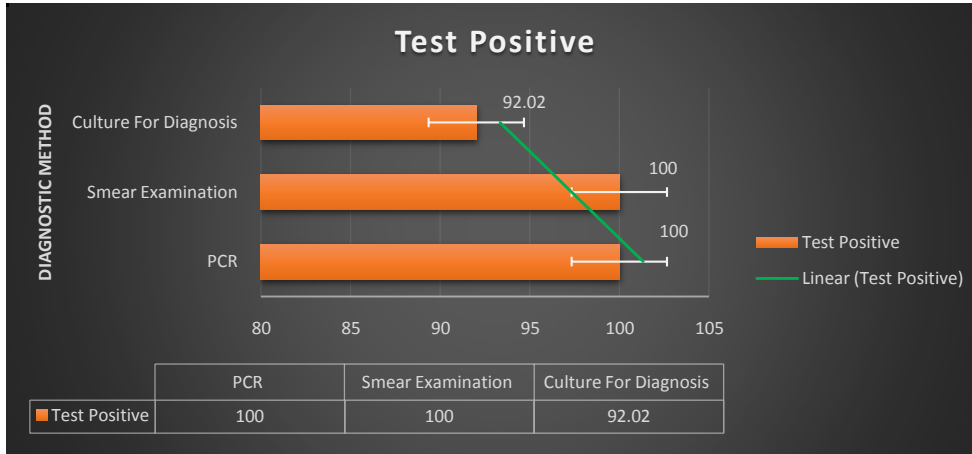
Gonorrhea, caused by *Neisseria gonorrhoeae*, is a significant global public health concern, as reported by the World Health Organization (WHO) in 2020. Timely and accurate diagnosis is crucial for managing this sexually transmitted infection. Traditionally, culture was the gold standard for gonorrhea diagnosis. However, the advent of nucleic acid amplification tests (NAATs), such as Real-Time PCR, has revolutionized diagnostics. Currently, the Centers for Disease Control and Prevention (CDC) recommends NAAT as the primary method, with culture used, when necessary, especially for antibiotic susceptibility testing in suspected treatment failure cases [1]. The International Union against Sexually Transmitted Infections (IUSTI) advocates for NAAT or culture use, depending on clinical scenarios. Culture is preferred for antibiotic susceptibility testing, while NAAT is recommended for asymptomatic cases and sample transportation. A confirmatory test is advised when the positive predictive value falls below 90%, often due to test specificity, case scarcity, and sample source issues [2].

Methods:

This study compared culture, Real-Time PCR, and smear examination for gonorrhea diagnosis at the Apex Regional STD Centre in New Delhi, India, in a retrospective comparative study from January 1, 2022, to December 31, 2022, adhering to ethical protocols. Samples were collected from the STD center, processed, and analyzed in the laboratory. Culture identification involved colony morphology, oxidase tests, and sugar fermentation testing (API NH, bioMérieux). PCR utilized Tran system transport swabs (Copan Italia SpA) with results matching smear examination with 100% consistency (Graph 1).

Comment [U2]: Which laboratory? Be specific

Graph 1: Comparison of PCR, smear examination, and culture for diagnosis of gonorrhea



Result and Discussion:

Shift towards Molecular Methods:

This study highlights the global trend towards molecular methods, particularly NAAT, for gonorrhea diagnosis. NAAT offers speed, accuracy, and reduced labor, aligning with the CDC's endorsement as the primary diagnostic method [3].

Complementarity of Methods:

The study emphasizes the complementary nature of methods. Combining PCR, smear, and culture provides valuable insights, especially for antibiotic susceptibility testing and addressing smear examination limitations [4].

The Role of Culture:

Culture retains its crucial role in gonorrhea diagnosis, primarily for antibiotic susceptibility assessment, essential in the context of rising antibiotic resistance concerns [5].

Importance of Confirmatory Testing:

Recommendations for confirmatory testing when predictive values drop below 90% emphasize the need for reliable diagnostics to reduce false positives and their clinical and psychological consequences [6].

The Evolving Diagnostic Landscape:

Laboratories must stay adaptive and vigilant as gonorrhoea diagnostic methods evolve. Continuous quality control, proficiency testing, and updated protocols are essential to keep pace with diagnostic advancements [7].

Public Health Significance:

Laboratory testing extends beyond individual patient care to screening asymptomatic populations and facilitating disease control and epidemiological surveillance. Adapting to evolving diagnostics is vital in addressing the challenge of gonorrhoea and other sexually transmitted infections [8].

Conclusion:

This study illuminates the dynamic nature of gonorrhoea diagnosis, highlighting the growing importance of molecular methods like NAAT, while recognizing the enduring significance of culture and smear examination. Adapting to the evolving diagnostic landscape requires proactive quality control, proficiency testing, and protocol adaptation. These efforts contribute not only to individual patient care but also to broader public health goals and disease control.

Ethics approval and consent to participate

This study was approved by the Institutional Ethics Committee.

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