

## PERSPECTIVE OPEN ACCESS

# Timely Diagnosis of PID: Leveraging Ultrasound for Effective Management

Majani Edward<sup>1</sup>  | Atuoha Ernest<sup>2</sup>  | Tsikata Y. Christopher<sup>3</sup> | Clyde M. Hakayuwa<sup>4</sup> | Aesha L. E. Enairat<sup>5</sup>  | Roaa O. M. Suliman<sup>6</sup>

<sup>1</sup>Department of Public Health, St. Francis University College of Health and Allied Sciences, Ifakara, Tanzania | <sup>2</sup>Medical Radiography and Radiological Sciences, University of Nigeria Enugu Campus, Enugu, Nigeria | <sup>3</sup>Department of Biochemistry, Cell and Molecular Biology, West African Centre for Cell Biology of Infectious Pathogens, University of Ghana, Accra, Ghana | <sup>4</sup>Department of Public Health, Michael Chilufya Sata School of Medicine, Copperbelt University, Ndola, Zambia | <sup>5</sup>Faculty of Graduate Studies, Medical Imaging Technology, AI-Quds University, Palestine, Palestine | <sup>6</sup>Faculty of Medicine, Sudan Medical Council General Practitioner, Khartoum, Sudan

**Correspondence:** Majani Edward ([majanimedward@gmail.com](mailto:majanimedward@gmail.com))

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## ABSTRACT

**Background:** Timely diagnosis of pelvic inflammatory disease (PID) is essential for effective management, as delayed treatment can lead to serious complications, including infertility and chronic pelvic pain. Acute PID often presents with mild, varied symptoms, making diagnosis challenging and risking delayed intervention. While laparoscopy provides high diagnostic accuracy for PID, its limited availability and occasional inability to detect subtle cases restrict its utility in routine clinical settings.

**Aim:** This article aims to assess the diagnostic role of transvaginal sonography (TVS) as an accessible, nonionizing alternative for early PID detection, with a focus on its use alongside clinical evaluation to enhance diagnostic accuracy.

**Methods:** This article synthesizes recent studies on the diagnostic efficacy of TVS for acute PID. Relevant literature was selected to evaluate TVS's sensitivity, specificity, and clinical utility in detecting pelvic inflammatory changes, comparing it to laparoscopy as the reference standard.

**Results:** The findings suggest that TVS, particularly when combined with thorough clinical assessment, offers high sensitivity and specificity in identifying inflammatory changes associated with PID. TVS enables timely diagnosis, facilitating earlier treatment and reducing upper genital tract complications. Moreover, its noninvasive nature and accessibility make it a practical alternative to laparoscopy in diverse healthcare settings.

**Conclusion:** TVS serves as a valuable diagnostic tool for early PID detection, especially when laparoscopy is unavailable. Its integration with clinical evaluation can expedite diagnosis, improve patient outcomes, and mitigate the risk of severe reproductive complications, supporting TVS as a critical component in PID management protocols.

## 1 | Introduction

Pelvic inflammatory disease (PID) refers to inflammation of the upper genital tract resulting from infection, affecting the uterus, fallopian tubes, and ovaries [1–5]. PID is predominantly associated with sexually transmitted infections (STIs) [6] and remains a leading cause of morbidity and mortality among

young women worldwide. The global prevalence of PID is estimated to range between 0.28% and 1.67% [6]. Approximately 85% of PID cases are due to STIs or bacterial vaginosis-associated pathogens, with 15% attributed to non-STIs. Microorganisms such as *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Mycoplasma genitalium*, and gram-negative bacteria are commonly implicated in PID [1, 2, 7].

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Studies by Woodhall et al. [8], Basit et al. [9], and Stevens et al. [10] highlight complications of PID, including tubo-ovarian abscesses and long-term effects such as ectopic pregnancy, infertility, and chronic pelvic pain. PID predominantly affects women aged 15–25 years [6]. Although diagnosis primarily relies on clinical evaluation, imaging modalities such as ultrasound play an essential role in confirming PID in patients with pelvic pain or genital tenderness. Ultrasound, particularly TVS, often reveals findings such as free fluid in the pouch of Douglas and thickened fallopian tubes [11]. While computed tomography (CT) is beneficial in emergencies, magnetic resonance imaging (MRI) can differentiate PID from other conditions [12]. Laparoscopy, though highly accurate, is invasive and impractical for routine use [2, 13].

These diagnostic challenges can lead to treatment delays, which are linked to adverse reproductive outcomes such as tube-related infertility and chronic pelvic pain due to adhesions [14]. Early detection of PID can mitigate these risks. This review emphasizes the importance of timely diagnosis and explores the potential of ultrasound, particularly TVS, in enhancing diagnostic accuracy.

## 2 | Strengths of Ultrasound for PID Detection

PID is a significant public health issue, with its diagnosis often complicated by nonspecific symptoms [3–6]. Ultrasound, a widely available and nonionizing imaging modality, is emerging as a valuable tool for detecting pelvic inflammation. TVS provides real-time visualization of the pelvic structures, enabling clinicians to identify key features of PID such as free fluid, thickened fallopian tubes, and tubo-ovarian abscesses [15].

TVS offers several advantages over other imaging modalities. First, it is nonionizing and safe for use in various populations, including pregnant women [16, 17]. Second, TVS provides real-time images that can assist in observing movements and blood flow, improving diagnostic accuracy [18]. Third, it is versatile and cost-effective, allowing for its widespread use in a range of healthcare settings [1, 19].

Early-stage PID can present subtle ultrasound findings, such as indistinct uterine margins and echogenic pelvic fat. TVS has demonstrated a sensitivity of 81% in diagnosing PID [20, 21]. Its ability to provide high-resolution images of pelvic inflammatory changes makes it ideal for early detection, which is crucial for preventing complications such as infertility and chronic pelvic pain [22, 23]. Additionally, ultrasound plays a critical role in guiding minimally invasive procedures, such as the drainage of abscesses, ensuring precise intervention [14, 23–25].

## 3 | Future Directions

While TVS is valuable for acute PID detection, relying solely on this method has limitations [26, 27]. TVS primarily visualizes internal pelvic structures, potentially missing external signs like pelvic tenderness. Subtle early-stage PID changes may not be detected on TVS, leading to potential misdiagnosis. Additionally,

scar tissue from previous PID episodes can be mistaken for active inflammation, underscoring the need for experienced interpretation of ultrasound images.

Technological advancements, such as the incorporation of artificial intelligence (AI) and deep learning in ultrasound image interpretation, may enhance the diagnostic accuracy of TVS. These technologies could improve the ability to detect subtle pelvic inflammatory changes and distinguish between active inflammation and scar tissue. To optimize the use of TVS, there is also a need for standardized interpretation criteria and more affordable, high-quality ultrasound equipment in resource-limited settings.

In some cases, alternative imaging methods may be necessary. For example, in patients with vagin intacta, transabdominal or translabial scans may be required to obtain clear images of pelvic structures [20]. Additionally, combining TVS with laboratory evaluations and clinical assessment can further improve diagnostic accuracy, minimizing the risk of misdiagnosis.

## 4 | Conclusion

TVS, when used in conjunction with clinical evaluation and laboratory testing, is an effective tool for diagnosing acute PID. However, due to its limitations, it should not be used as a standalone diagnostic method. High-quality ultrasound equipment, standardized protocols, and collaboration between clinicians and radiologists are essential for optimizing the role of ultrasound in PID diagnosis and management. Technological advancements such as AI may further enhance the utility of TVS, ensuring early and accurate detection of PID, reducing unnecessary morbidity, and improving reproductive outcomes.

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### Author Contributions

**Majani Edward:** conceptualization, investigation, writing – original draft, writing – review and editing, software, formal analysis, validation, methodology, data curation, supervision, project administration. **Atuoha Ernest:** conceptualization, writing – original draft, investigation. **Tsikata Y. Christopher:** investigation, writing – original draft. **Clyde M. Hakayuwa:** investigation, writing – original draft. **Aesha L. E. Enairat:** investigation; writing – original draft. **Roaa O. M. Suliman:** investigation; writing – original draft.

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### Ethics Statement

With respect to this type of article, we didn't seek informed consent. We used existing data from the prior findings.

### Consent

Data were collected from the prior findings so no any informed consent that was employed.

### Conflicts of Interest

The authors declare no conflicts of interest.

## Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. Data were collected from the prior findings.

## Transparency Statement

The lead author Majani Edward affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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