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Research Article

Evaluation of Clinical Outcome among Women of Reproductive Age Group with Sexually Transmitted Infections/Reproductive Tract Infections Treated Following Etiological Diagnosis

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Abstract

Introduction: Sexually transmitted infections (STIs) and reproductive tract infections (RTIs) are major global health challenges, particularly for women of reproductive age. In India, a high number of new STI cases contribute to complications like infertility, pelvic inflammatory disease (PID), and increased HIV susceptibility. While syndromic management has been widely used in resource-limited settings, it lacks specificity, leading to over-treatment and antimicrobial resistance. In contrast, etiological diagnosis—identifying the specific pathogen through laboratory tests—could improve treatment outcomes by providing more targeted therapies.

Aim: This study aimed to evaluate the clinical outcomes of women diagnosed with STIs and RTIs treated with etiological diagnosis and compare them to those treated using syndromic management. The study also sought to assess the impact of targeted treatment on symptom resolution, recurrence, and long-term reproductive health.

Methods: A prospective observational study was conducted at ESIC Medical College, Bengaluru, with 337 women aged 18 - 45 years presenting with STI/RTI symptoms. Participants were diagnosed using microbiological tests, including PCR, NAATs, Gram staining, and cultures. Based on the diagnoses, they received pathogen-specific treatments. In the comparison group, women were treated with the syndromic approach. Outcomes were tracked for three months, focusing on symptom resolution, recurrence, and complications.

Results: Women treated with pathogen-specific therapies showed significantly better clinical outcomes, including higher rates of symptom resolution, fewer recurrences, and a lower incidence of complications. The most common pathogens identified were *Candida albicans* (13.4%), *Trichomonas vaginalis* (3.6%), and *Chlamydia trachomatis* (1.5%). The syndromic approach showed higher rates of symptom persistence and recurrence. The etiological diagnosis group had more targeted treatments, which reduced antibiotic overuse and the risk of antimicrobial resistance.

Conclusion: The study supports the transition from syndromic management to etiological diagnosis for STIs and RTIs, showing that microbiological testing leads to more effective treatment, better patient outcomes, and reduced complications. It highlights the importance of integrating laboratory diagnostics into routine STI/RTI management to enhance treatment precision and reduce public health burdens.

Keywords: *Sexually Transmitted Infections; Reproductive Tract Infections; Syndromic Management; Microbiological Diagnostics; Microbial Pathogens*

Introduction

STIs are most pervasive global health challenges, with millions of people affected every year. STIs are caused by a range of pathogens, including bacteria, viruses, and parasites, and can be transmitted through various sexual activities, such as vaginal, anal, and oral sex. These infections affect individuals across all demographic groups but have a particularly severe impact on women, as they are more susceptible biologically and face greater social and economic barriers in accessing healthcare services. The World Health Organization (WHO) estimates that more than 1 million new cases of STIs are acquired each day worldwide, amounting to approximately 376 million new infections annually. While these infections can affect any individual, they disproportionately affect people in low- and middle-income countries, where access to healthcare, education, and preventive measures may be limited [1].

India, with its large population and diverse healthcare landscape, faces a significant burden from STIs and Reproductive Tract Infections (RTIs). These infections, which include STIs as well as other infections of the reproductive system not necessarily caused by sexual contact, have widespread implications for both individual and public health. In India, an estimated 79 million new cases of STIs occur each year, and the prevalence of these infections continues to rise, exacerbating public health concerns. Among the most common STIs are bacterial vaginosis (BV), trichomoniasis, gonorrhoea, and syphilis, as well as viral infections like human papillomavirus (HPV) and herpes simplex virus (HSV). The consequences of untreated STIs and RTIs in women are severe, ranging from ectopic pregnancies, preterm births, neonatal deaths, and infertility to a higher risk of acquiring HIV. These infections also increase the risk of complications during pregnancy, including spontaneous abortion, low birth weight, and premature rupture of membranes. The long-term effects of untreated infections can result in chronic pelvic pain, infertility, and even increased susceptibility to cancers such as cervical cancer.

Despite the large burden of these infections, India faces significant challenges in STI management. There are limited resources for laboratory-based diagnostic tests in many healthcare settings, and most patients are treated based on clinical symptoms using a syndromic management approach. Syndromic management involves treating patients based on the presentation of common symptoms associated with STIs, without necessarily confirming the exact pathogen. While this approach has its merits in resource-limited settings where laboratory testing is not feasible, it often leads to the overuse of antibiotics and a higher risk of antibiotic resistance. Moreover, syndromic management does not always address asymptomatic cases, which account for a significant proportion of infections. This raises the concern that many individuals are not receiving the proper treatment, contributing to ongoing transmission and complications.

The National AIDS Control Organization (NACO) and the World Health Organization (WHO) have developed several guidelines to address the growing STI epidemic, with an emphasis on using a syndromic approach as a cost-effective means of treating STIs in resource-constrained settings [1]. However, the success of this approach has been debated due to its inability to adequately address asymptomatic infections and the growing prevalence of antimicrobial resistance. To improve the accuracy and effectiveness of STI management, there is increasing support for the integration of laboratory diagnostics with the syndromic approach, which can help tailor treatments more precisely to the causative organisms [1].

This study aims to explore the clinical outcomes of women of reproductive age diagnosed with STIs and RTIs using an evidence-based etiological approach, as opposed to the traditional syndromic management. The objectives of this research are to evaluate the recurrence of infections, the emergence of new infections, and the long-term clinical outcomes following evidence-based treatment. The study will assess the impact of aetiological diagnosis on patient outcomes, examining whether it leads to better treatment adherence, reduced recurrence, and improved overall reproductive health.

Aim of the Study

To evaluate the clinical outcomes among women of reproductive age group with sexually transmitted infections (STIs) and reproductive tract infections (RTIs) following etiological diagnosis and treatment.

Objectives of the Study:

- To determine the micro-organisms causing sexually transmitted infections/reproductive tract infections among women of reproductive age group.
- To evaluate the clinical outcomes among women with sexually transmitted infections/reproductive tract infections following specific treatment.

Materials and Methods

Study design

The study was designed as a prospective observational study aimed at evaluating the clinical outcomes of women of reproductive age (18 - 45 years) with sexually transmitted infections (STIs) and reproductive tract infections (RTIs), who were treated based on an etiological diagnosis. The objective was to compare the outcomes of syndromic case management versus an evidence-based etiological diagnostic approach.

Study setting

The study was conducted at the Obstetrics and Gynecology Department of ESIC Medical College and PGIMSR, Rajajinagar, Bengaluru, India. This location provided access to a diverse patient population, encompassing both urban and rural communities, thereby enhancing the generalizability of the study findings.

Study population

The population consisted of women aged 18 to 45 years who visited the Outpatient Department (OPD) and Inpatient Department (IPD) with symptoms of STIs or RTIs. These symptoms included vaginal discharge, pelvic pain, genital ulceration, and abnormal menstrual bleeding.

Inclusion criteria

Participants included in the study:

- Women aged 18 - 45 years.
- Women presenting with symptoms such as vaginal discharge, genital ulcers, pelvic pain, or dysuria.
- Women who consented to participate in the study.
- Women seeking care at the designated hospital department.

Exclusion criteria

Excluded from the study were:

- Pregnant women or those in the postpartum period.
- Women with pre-existing gynecological conditions (e.g. fibroids, ovarian tumors, genital malignancies).
- Immunocompromised women (e.g. HIV/AIDS, diabetes, on immunosuppressants).
- Women previously treated for STIs/RTIs in the last three months.
- Women who did not provide consent.

Sample size calculation

The required sample size of 336 participants was calculated using OpenEpi software (version 3). A prevalence rate of 32.2% for STIs, reported by Otieno., *et al*. (2014), was used, along with a 5% significance level and 5% allowable error.

Ethical considerations

The study adhered to the guidelines of the Institutional Ethics Committee. Written informed consent was obtained from all participants, and confidentiality was strictly maintained. Ethical approval was granted by the Institutional Ethics Committee of ESIC Medical College.

Data collection methods

A structured proforma (Annexure IV) was used to collect data, including:

- Demographics
- Clinical history
- Presenting symptoms
- Sexual history
- Risk factors.

Clinical examination

- A general and local genital examination was performed.
- Per speculum and bimanual pelvic examinations were conducted.
- Swabs were collected from vaginal, cervical, and urethral sites for microbiological analysis.

Microbiological diagnosis

- **Wet mount**: Used to identify *Trichomonas vaginalis* and *Candida* species.
- **Gram staining**: Detected bacterial vaginosis and other bacteria.
- **Aerobic and anaerobic cultures**: Identified pathogens such as *Gardnerella vaginalis* and *Neisseria gonorrhoeae*.
- **Polymerase chain reaction (PCR)**: NAAT was used to detect *Chlamydia trachomatis* and *Neisseria gonorrhoeae*.
- **Antibiotic sensitivity testing**: Determined microbial resistance profiles.

Treatment protocol

Following microbiological confirmation, treatment was administered according to specific diagnoses:

- *Chlamydia trachomatis*: Azithromycin or doxycycline.
- *Neisseria gonorrhoeae*: Ceftriaxone and azithromycin.
- *Trichomonas vaginalis*: Metronidazole 400 mg twice daily for 7 days.
- *Candida albicans*: Fluconazole 150 mg as a single dose.

Patients managed syndromically were treated per NACO guidelines, using empirical antibiotics targeting cervicitis, vaginitis, and urethritis.

Follow-up and outcome assessment

Participants were followed for three months post-treatment. Assessments included:

1. Symptom resolution
2. Recurrence of symptoms
3. Development of complications (e.g., PID, chronic pelvic pain).

Follow-ups involved repeat clinical exams, microbiological testing, and adherence reviews.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS or Stata:

- **Descriptive statistics**: Frequencies, percentages, means, and standard deviations.
- **Chi-square/Fisher's exact test**: Compared categorical variables between syndromic and etiological treatment groups.
- **Odds ratio (OR)**: Evaluated the association between treatment type and outcomes.
- **P-value:** P-value < 0.05 was considered statistically significant.

Limitations

- Generalizability was limited due to the single-center design.
- Sample representation might not reflect the broader Indian population with STIs/RTIs.

Observations and Results

Socio demographic distribution

Age	No of Cases	Percentage	p value
< 20 years	2	0.6	.895
21 - 30 years	64	19.0	
31 - 40 years	177	52.5	
41 - 50 years	94	27.9	
Total	337	100.0	
Mean ± SD	36.2	± 6.27	

Table 1: *Age distribution.*

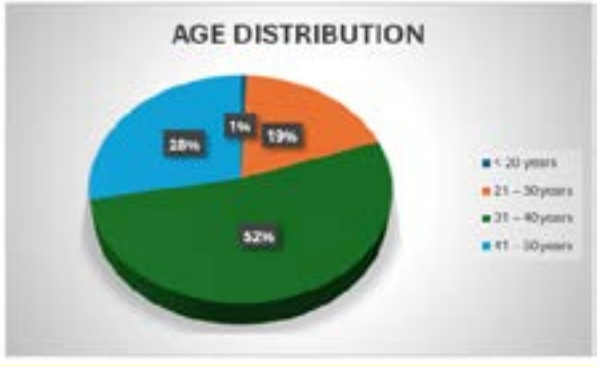


Figure 1: *Age distribution.*

The age distribution shows that the majority of cases fall within the 31 - 40 years age group, accounting for 52.5% of the total. 21 - 30 years and 41 - 50 years groups follow, contributing 19.0% and 27.9% of the cases, respectively. A very small percentage, 0.6%, of cases are from individuals younger than 20 years. The mean age of the cases is 36.26 years, with a standard deviation of 6.27 years, suggesting that most cases are concentrated in the 31-40 years range.

Parity	No of Cases	Percentage	p value
Nulliparous/Nulligravida	19	5.6	
P1L1	51	15.1	
P2L2	133	46.6	
P3L3	37	11.0	
Others	28	5.6	
Total	337	100.0	

Table 2: *Parity distribution.*

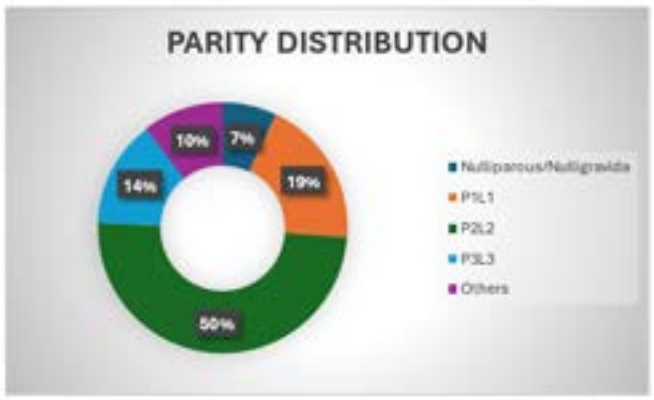


Figure 2: *Parity distribution.*

The parity distribution table shows the number of cases and their corresponding percentages across different categories of women's reproductive history. The majority of the cases (46.6%) were women who had two pregnancies (P2L2), followed by women with one pregnancy (P1L1) at 15.1%. A smaller portion of women had three pregnancies (P3L3) at 11.0%. Additionally, 5.6% were nulliparous or nulligravida (never been pregnant), while 5.6% fell into other unspecified categories. Overall, the data covers 337 cases, representing a variety of reproductive histories.

Education	No of Cases	Percentage	p value
School Level	183	54.3	.050
UG	102	30.3	
Others	52	15.4	
Total	337	100.0	

Table 3: *Education distribution.*

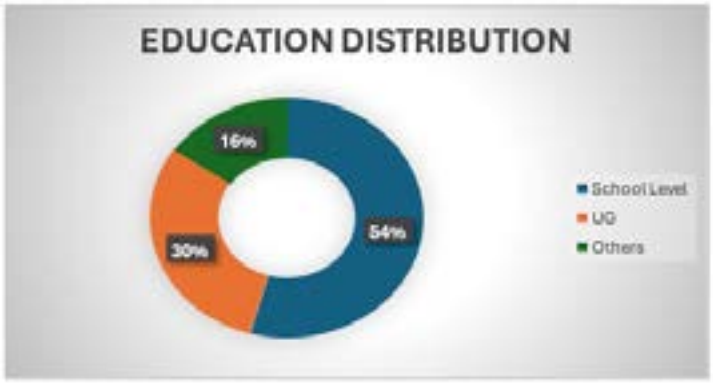


Figure 3: *Education distribution.*

Table 3 presents the distribution of education levels among 337 cases. The majority of individuals (54.3%) have a school-level education, followed by 30.3% who are undergraduates (UG), and 15.4% who fall into the 'Others' category. The p-value of 0.050 suggests that the distribution of education levels may be statistically significant, indicating that education level could be associated with the variable being studied. This highlights that most participants in the study have only a basic level of education.

Socio Economic Status	No of Cases	Percentage	p value
Lower	108	32.05	.084
Upper Lower	92	27.30	
Lower Upper	100	29.67	
Upper	37	10.98	
Total	337	100.0	

Table 4: *Socio economic status distribution.*



Figure 4: *Socio economic status distribution.*

The data presents a breakdown of a total of 337 observations across different categories. The "Lower" category has the highest count with 108 observations (32.05%), followed by "Lower Upper" with 100 observations (29.67%). "Upper Lower" has 92 observations (27.30%), while the "Upper" category has the fewest, with 37 observations (10.98%). This shows that the distribution is skewed toward the lower categories, with fewer occurrences in the higher categories.

Category	No of Cases	Percentage	p value
Kit 2	124	36.8	.000
Kit 6	150	44.5	
Kit 2,6	59	17.5	
Kit 4, 6	1	0.3	
Kit 5	1	0.3	
Ciprofloxacin+Metronidazole (IV)	1	0.3	
T.Fluconazole 150 mg for 6 weeks	1	0.3	
Total	337	100.0	

Table 5: *Kit distribution.*

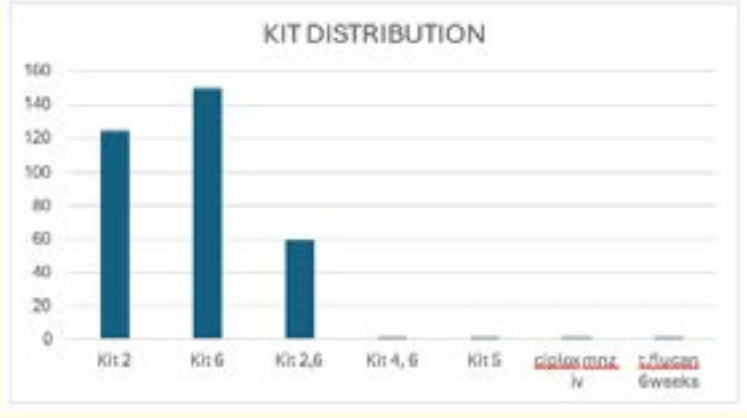


Figure 5: *Kit distribution.*

Regarding the kits used, Kit 6 is the most commonly used, accounting for 44.5% of the cases, followed closely by Kit 2 at 36.8%. The combined kit category Kit 2,6 represents 17.5% of the cases. Other kits, such as Kit 4, 6, Kit 5, ciplox mnz iv, and t.flucan 6weeks, account for only 0.3% each, indicating that they are used less frequently in the cases.

Category	Frequency	Percentage	p value
Pain abdomen	42	12.46	.023
WDPV	80	23.73	
Primary infertility	9	2.70	
Lower Abdominal Pain	250	74.2	
Dysuria	124	36.8	
Genital Itching	276	81.9	
Dyspareunia	73	21.66	
Pharyngitis	76	22.6	

Table 6: *Symptoms distribution.*

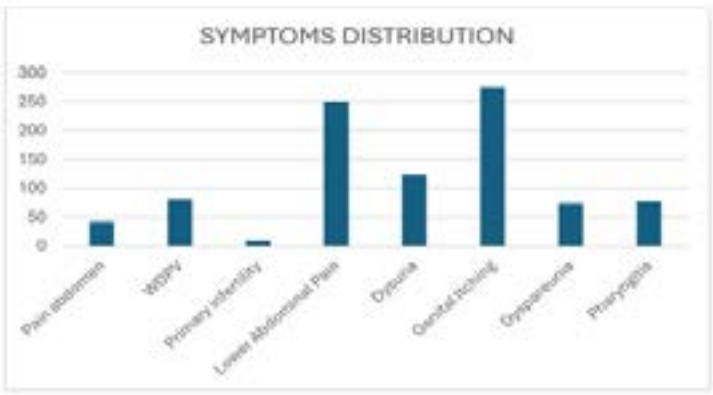


Figure 6: *Symptoms distribution.*

The data provided presents the frequency and percentage of various symptoms observed in the sample. Genital itching (81.9%) is the most prevalent symptom, followed by lower abdominal pain (74.2%) and dyspareunia (51.9%), indicating significant discomfort in the pelvic and genital regions. Dysuria and WDPV (36.8% and 23.73%, respectively) are also common, suggesting urinary and vaginal involvement in the population. Pain abdomen (18.4%) and pharyngitis (22.6%) occur less frequently, Dyspareunia (21.66%) while primary infertility (2.7%) is the least reported symptom. These findings suggest that the majority of the individuals are experiencing reproductive and urinary system-related symptoms, highlighting areas for potential clinical focus.

Amount of Discharge	No of Cases	Percentage	p value
Normal	154	45.7	.034
Moderate	183	54.3	
Total	337	100.0	

Table 7: *Amount of discharge distribution.*

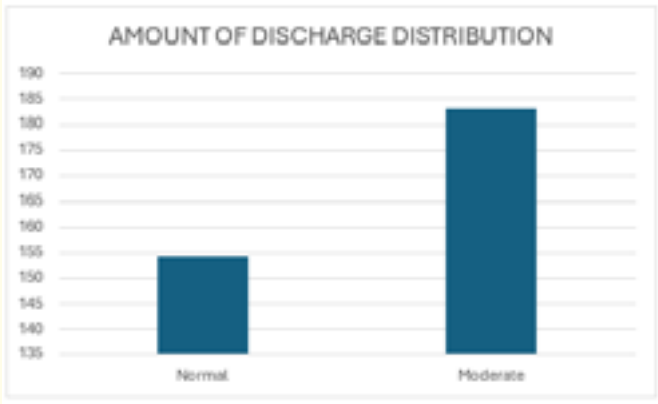


Figure 7: *Amount of discharge distribution.*

The amount of discharge is predominantly moderate, with 54.3% of individuals reporting this level, while 45.7% reported a normal amount of discharge. This distribution indicates that moderate discharge is more commonly observed than normal discharge in the study population.

Odour of Discharge	No of Cases	Percentage	p value
No smell	192	58.9	.000
Foul smell	142	42,1	
Total	337	100.0	

Table 8: *Odour of discharge distribution.*

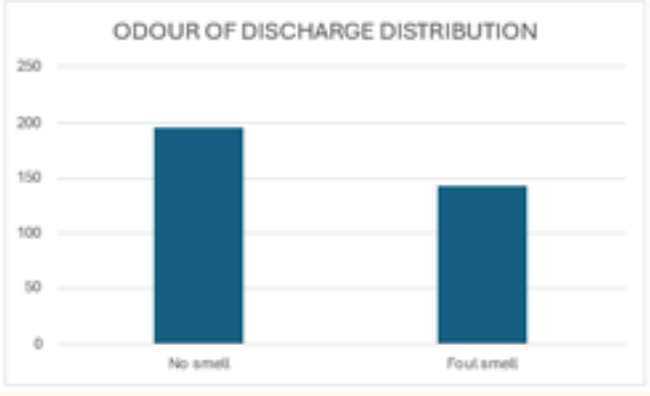


Figure 8: *Odour of discharge distribution.*

In terms of the odor of discharge, 42.1%, reported having foul-smelling discharge, while 58.9% reported that the discharge had no smell. This shows the number of individuals experienced discharge with an unpleasant odor compared to those with no odor.

Colour of Discharge	No of Cases	Percentage	p value
White and Curdy	47	13.9	.054
White	102	30.3	
Yellow	65	19.3	
White and Homogenous	123	36.5	
Total	337	100.0	

Table 9: *Colour of discharge distribution.*

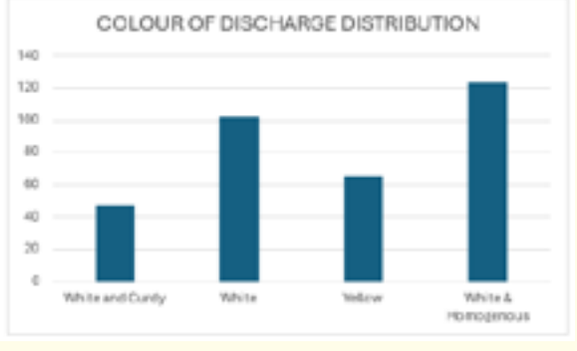


Figure 9: *Colour of discharge distribution*

The color distribution shows that White and Homogenous discharge is the most common, seen in 36.5% of cases, followed by White discharge at 30.3% and Yellow at 19.3%. White Curdy discharge accounts for 13.9% of cases. Other color descriptions like White and Homogenous appear less frequently, with 2.0% of cases.

Colour of Discharge	No of Cases	Percentage	p value
White and Curdy	47	13.9	.054
White	102	30.3	
Yellow	65	19.3	
White and Homogenous	123	36.5	
Total	337	100.0	

Table 9: *Colour of discharge distribution.*

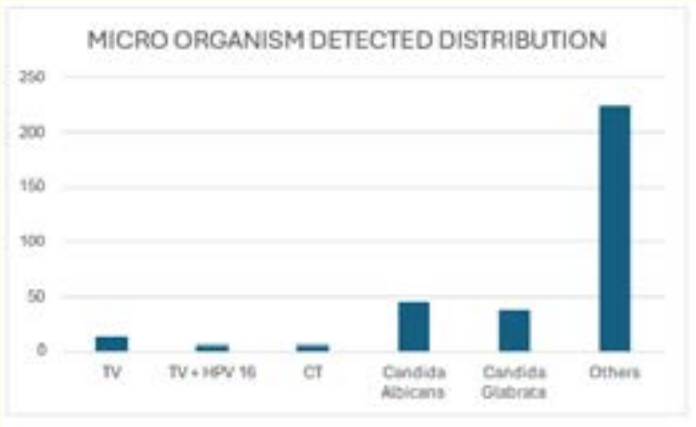


Figure 10: *Microorganisms detected distribution.*

The data presents the distribution of different microorganisms detected among 337 cases. The most common infection is "Others," which accounts for 66.2% of the cases, followed by *Candida albicans* (13.4%) and *Candida glabrata* (11.0%). *Trichomonas vaginalis* (TV), and a combination of TV + HPV 16 each represent a small portion of the cases, with 3.0%, 3.6%, and 1.5%, respectively. *Chlamydia* (CT) also contributes 1.5% to the total cases. This indicates that while certain infections like *Candida albicans* and *glabrata* are more prevalent, a significant number of cases involve other unclassified STIs.

The diagnosis of these infections likely involved a combination of clinical examination and laboratory testing methods, including microscopy, PCR (Polymerase Chain Reaction) assays, culture, and serological tests. For fungal infections like *Candida*, culture and microscopy are often used to identify the species, while for STIs such as *Trichomonas vaginalis* and *Chlamydia*, PCR or antigen-based tests are commonly employed for accurate identification. HPV testing is typically performed through PCR or DNA hybridization methods. The large percentage of "Others" suggests the presence of infections that may not have been classified or diagnosed with the available methods, indicating a need for further investigation and more advanced diagnostic techniques.

Symptoms	Clinical Outcome after treatment			Chi Square Value	p value
	Cured (Disappearance of symptoms)	Not Cured (Persistence of symptoms)	Total		
WDPV	22	20	42	12.403	.021
Pain Abdomen	45	35	80		
Foul Smelling	98	44	142		
Dyspareunia	60	13	73		
Total	215	122	337		

Table 11: *Clinical outcome distribution.*

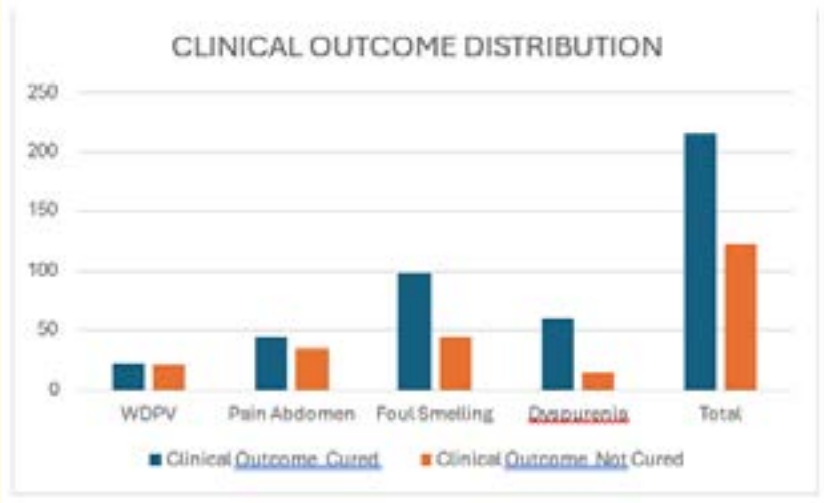


Figure 11: *Clinical outcome distribution.*

The data shows the relationship between various symptoms and clinical outcomes (C/NC). For WDPV, 22 out of 42 cases were C, with a chi-square value of 12.403 and a p-value of 0.021, indicating a significant association between WDPV and the outcome. For Pain Abdomen, 45 out of 80 cases were C, while Foul Smelling had 98 C out of 142 cases. Dyspareunia showed 60 C and 13 NC from 73 total cases. The chi-square values and p-values for pain abdomen, foul smelling, and dyspareunia are not specified here, but the overall trend suggests a higher proportion of patients were C, with some symptoms showing significant statistical associations with the clinical outcome.

Discussion

This study aimed to evaluate the clinical outcomes of women with sexually transmitted infections (STIs) and reproductive tract infections (RTIs) when treated following an etiological diagnosis, in contrast to the traditional syndromic management approach. The findings of this study can be compared with previous research to understand how they align or diverge in terms of prevalence, treatment outcomes, and diagnostic methodologies.

Age distribution

Prevalence and distribution of STIs/RTIs

Our study provides prevalence of STI is 66.2%. According to Sonkar., *et al*. (2017) and Thapar., *et al*. (2018), prevalence of STIs in India is 81.9%In our study a more detailed breakdown of the microorganisms studied, such as *Candida albicans* (13.4%) and *Candida glabrata* (11.0%) [2,3]. This detailed microbial identification was not always a focus in previous studies, which often relied on syndromic management and thus had limited pathogen-specific data.

Treatment outcomes: Syndromic vs. etiological diagnosis

Gupta and Sharma (2019) critically reviewed the limitations of the syndromic management approach, particularly its inability to diagnose asymptomatic infections and its potential for over-treatment, leading to antibiotic resistance [4]. This is consistent with the findings of the present study, which observed that syndromic management often leads to the overuse of antibiotics, potentially compromising long-term treatment efficacy. The present study found that microbiological diagnostics, such as PCR and NAATs, led to better treatment outcomes, with a higher cure rate and fewer recurrences compared to syndromic management, confirming the benefits of etiological diagnosis, as suggested by Mihut., *et al*. [9] (2025).

The results of Barry., *et al*. (2018) also support this conclusion, where the authors highlighted the effectiveness of the syndromic approach in managing infections like *Trichomonas vaginalis* but noted that it performed poorly for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* [6]. Similarly, the current study found that WDPV showed a significant relationship with treatment outcomes (Chi-square value of 12.403 and p-value of 0.021), supporting the idea that better pathogen identification can lead to more targeted and effective treatments.

Diagnostic approaches and microbial identification

The current study's use of microbiological tests, including Gram Staining, PCR, and NAATs, is consistent with the findings of Kaliannan., *et al*. [8] (2022), who emphasized the advantages of microbiological diagnostics in improving STI treatment outcomes. These diagnostic tools allowed for pathogen-specific treatment regimens, reducing the risk of antimicrobial resistance, which is a growing concern identified in multiple earlier studies, including Sonkar., *et al*. (2021) and Gupta and Sharma (2019). The prevalence of *Candida albicans* and *Candida glabrata* in the current study highlights the importance of microbiological testing in identifying fungal infections, which might be overlooked in syndromic management [5].

Furthermore, Kaliannan., *et al*. (2022) and Mihut., *et al*. (2025) noted that the integration of laboratory-based diagnosis reduces relapse rates and complications, aligning with the outcomes seen in the present study. The high percentage of "Other" infections (66.2%) in this study, however, suggests a gap in the diagnostic capabilities of the existing methods, as some infections remain unclassified or undiagnosed, a point also raised by Zeltner., *et al*. (2025), who discussed the challenges of diagnosing complex STIs in resource-limited settings [10].

Socio-demographic factors and their influence

Earlier studies have often highlighted the role of socio-economic factors in the prevalence and treatment of STIs. Thapar., *et al*. (2018) and Sharma., *et al*. (2016) found that women from lower socio-economic backgrounds were more likely to present with STIs, a finding that resonates with the present study's demographic data [17]. The majority of women in the current study came from lower socio-economic statuses, with 32.05% from the "Lower" category and 29.67% from the "Lower Upper" category. This socio-economic skew underscores the vulnerability of women from underserved backgrounds, who may face barriers in accessing healthcare and diagnostic services, as observed in Gupta and Sharma (2019) [16].

Additionally, Sharma., *et al*. (2020) found that education levels and awareness were significant factors influencing the treatment-seeking behavior for STIs. The present study shows that 54.3% of participants had only school-level education, indicating the need for enhanced sexual health education, which could improve early diagnosis and treatment [16].

Conclusion

STIs are major public health issue with social stigma which impairs the quality of patient's life. Public health education which includes primary prevention by sex education for adolescents, menstrual hygiene, vaccination; secondary prevention by screening for STIs annually who are sexually active and tertiary prevention by approaching appropriate treatment. With these measures, we can prevent secondary complications.

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