

Unmasking the Silent Burden: Clinical Prevalence, Symptomatology, and Risk Determinants of Reproductive Tract Infections Among Reproductive-Age Women in a South Indian Tertiary Care Setting

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Abstract

Background: Reproductive tract infections (RTIs) represent a major global public health challenge, frequently manifesting as silent epidemics that lead to severe long-term complications including pelvic inflammatory disease, ectopic pregnancy, and tubal infertility. This study evaluated the clinical prevalence, symptomatologic profile, and associated socio-demographic and behavioral determinants of RTIs among women of reproductive age.

Methods: A hospital-based cross-sectional study was conducted in the Gynecology Outpatient Department of a tertiary care teaching hospital in Visakhapatnam, India, between October 2022 and November 2022. A cohort of 200 non-pregnant women aged 15–45 years underwent clinical evaluation (speculum and bimanual pelvic examination) and structured interviews assessing socio-demographic factors, menstrual hygiene practices, and obstetric/gynecologic histories. Data were analyzed using chi-square tests, with $p < 0.05$ considered statistically significant.

Results: The clinical prevalence of RTI was 47.0% ($n = 94$). The predominant symptom was abnormal vaginal discharge (79.8%, $n = 75$), followed by low backache (74.4%, $n = 70$), lower abdominal pain (62.7%, $n = 59$), vulval pruritus (54.2%, $n = 51$), and dysuria (39.3%, $n = 37$). Statistically significant associations were observed between RTI prevalence and monthly household income $\leq 10,000$ INR ($p = 0.002$), nuclear family structure ($p = 0.001$), religion ($p < 0.001$), menstrual absorbent type ($p = 0.001$), and low pad/cloth change frequency ($p < 0.001$). Obstetric and marital variables showed no statistically significant correlation with RTI status.

Conclusion: RTIs are highly prevalent in outpatient settings and closely linked to suboptimal menstrual hygiene and socioeconomic vulnerabilities. Interventions prioritizing targeted menstrual hygiene education, affordable sanitary commodities, and destigmatized syndromic screening are critical to reducing reproductive morbidity.

1. Introduction

Reproductive tract infections (RTIs)—encompassing sexually transmitted infections (STIs), endogenous overgrowths, and iatrogenic infections—represent a significant cause of healthy life loss among women in low- and middle-income countries [1]. The World Health Organization (WHO) estimates that over 374 million new curable STIs (chlamydia, gonorrhea, syphilis, and trichomoniasis) occur annually worldwide among individuals aged 15 to 49 years [6]. In India, the annual incidence of RTIs is projected at approximately 5%, translating to roughly 40 million incident episodes each year [1, 5]. Despite their substantial burden, RTIs remain underdiagnosed 'silent epidemics' due to pervasive social stigma, lack of symptom awareness, and barriers in healthcare-seeking behavior [1, 4].

Untreated RTIs frequently ascend the upper reproductive tract, precipitating severe morbidities including pelvic inflammatory disease (PID), tubal-factor infertility, ectopic pregnancy, chronic pelvic pain, and adverse obstetric complications such as miscarriage, stillbirth, and puerperal sepsis [2, 4]. Furthermore,

localized mucosal inflammation and epithelial barrier disruptions significantly heighten biological vulnerability to human immunodeficiency virus (HIV) transmission [3].

While biological susceptibilities during menstruation, pregnancy, and childbirth are universal, RTI risk is profoundly mediated by socio-demographic conditions, cultural dynamics, and menstrual hygiene behaviors [1, 15]. In resource-constrained clinical environments where laboratory diagnostic infrastructure is limited, syndromic and clinical examinations remain crucial for pragmatic diagnosis and management. This study was undertaken to establish the prevalence of RTIs, characterize their presenting symptomatology, and identify the socio-demographic, menstrual, and reproductive determinants among women of reproductive age attending a tertiary care hospital in Visakhapatnam, South India.

2. Materials and Methods

2.1 Study Design and Setting

A hospital-based cross-sectional study was conducted in the Gynecology Outpatient Department (OPD) of King George Hospital / Andhra Medical College, Visakhapatnam, Andhra Pradesh, India, over a two-month period from October 2022 to November 2022.

2.2 Study Population and Eligibility Criteria

The study cohort comprised 200 women aged 15–45 years presenting to the gynecology OPD with various complaints. Inclusion criteria encompassed non-pregnant female patients aged 15–45 years who provided written informed consent (or assent with parental/guardian consent for adolescents). Women who were pregnant at the time of examination or who declined to provide consent were excluded.

2.3 Data Collection and Clinical Evaluation

Data were collected using a pre-tested, semi-structured questionnaire translated into the local language (Telugu) and administered through confidential face-to-face interviews. The questionnaire recorded socio-demographic variables (age, residence, education, occupation, monthly household income, family structure), menstrual history and hygiene practices (absorbent type, replacement frequency, bathing frequency, dysmenorrhea, sexual intercourse during menses, intravaginal douching/creams), and marital/obstetric profiles (marital status, age at marriage, age at first pregnancy, parity, abortion history, mode of delivery, delivery attendant, and contraception history).

Following interview administration, all participants underwent a standardized clinical gynecological examination conducted by trained clinicians: (1) external genital inspection for lesions, erythema, or ulceration; (2) speculum examination to inspect vaginal and cervical mucosa and characterize discharge; and (3) bimanual pelvic examination to assess cervical motion tenderness, uterine size and tenderness,

and adnexal masses or tenderness. Clinical diagnosis of RTI was established based on presenting symptomatology and verified physical/pelvic examination findings.

2.4 Statistical Analysis

Data were entered into an electronic database and analyzed using standard statistical methods. Descriptive statistics were computed as frequencies and percentages for categorical variables. Associations between categorical exposure variables and RTI status were tested using Pearson's Chi-Square (χ^2) test. A two-sided p-value of < 0.05 was considered statistically significant.

2.5 Ethical Considerations

The study protocol received ethical clearance from the Institutional Ethics Committee of Andhra Medical College, Visakhapatnam (Reg. No: EC/NEW/INST/2019/397; Letter Serial No: 57/IEC AMC/SEP 2022). Written informed consent was secured from all adult participants, and informed assent along with parental/guardian consent was obtained for adolescent participants. Confidentiality and anonymity were rigorously maintained.

3. Results

3.1 Prevalence and Clinical Symptomatology

Among the 200 women evaluated, 94 were clinically diagnosed with an RTI, demonstrating an overall prevalence of 47.0% (95% CI: 40.0%–54.0%). The distribution of presenting clinical symptoms among infected participants is detailed in Table 1.

Abnormal vaginal discharge was the predominant symptom, reported by 79.8% ($n = 75$) of RTI-positive women, followed by low backache (74.4%, $n = 70$), lower abdominal pain (62.7%, $n = 59$), vulval pruritus (54.2%, $n = 51$), and painful/burning micturition (39.3%, $n = 37$). Dyspareunia was noted in 11.7% ($n = 11$). None of the participants exhibited genital ulcerations or inguinal lymphadenopathy.

Table 1
Distribution of presenting clinical symptoms among diagnosed RTI cases
(n = 94)

Presenting Symptom	Number of Cases (n)	Proportion (%)
Vaginal Discharge	75	79.8%
Low Backache	70	74.4%
Lower Abdominal Pain	59	62.7%
Vulval Pruritus	51	54.2%
Painful / Burning Micturition	37	39.3%
Dyspareunia	11	11.7%
Genital Ulcers	0	0.0%
Inguinal Swellings	0	0.0%

3.2 Socio-Demographic Correlates

The analysis of socio-demographic factors associated with RTI is summarized in Table 2. A monthly household income of $\leq 10,000$ INR was significantly associated with higher RTI prevalence compared to higher-income brackets (55.3% vs. 34.0%, $\chi^2 = 9.222$, $p = 0.002$). Family structure was also significantly associated with RTI status ($\chi^2 = 10.839$, $p = 0.001$), with women from nuclear families exhibiting a markedly higher burden of infection (74.5%) than those from joint families (25.5%). Distribution across religious denominations showed statistically significant variation ($\chi^2 = 17.758$, $p < 0.001$). Differences across age groups, residence (urban vs. rural), educational status, and occupation were not statistically significant ($p > 0.05$).

Table 2
Association between socio-demographic characteristics and RTI status (N = 200)

Socio-Demographic Variable	RTI Present (n = 94)	RTI Absent (n = 106)	Chi-Square (χ^2)	p-value
Age Group (Years)			3.033	0.219
15–25	23 (24.5%)	29 (27.4%)		
26–35	50 (53.2%)	44 (41.5%)		
36–45	21 (22.3%)	33 (31.1%)		
Residence			3.629	0.163
Urban	61 (64.9%)	56 (52.8%)		
Rural	33 (35.1%)	50 (47.1%)		
Religion			17.758	< 0.001*
Hindu	63 (67.0%)	38 (35.8%)		
Christian	20 (21.3%)	39 (36.8%)		
Muslim	11 (11.7%)	29 (27.4%)		
Educational Status			13.110	0.069
Professional Degree	4 (4.3%)	7 (6.6%)		
Graduation	17 (18.1%)	20 (18.9%)		
Intermediate (Higher Sec.)	9 (9.6%)	17 (16.0%)		
High School	21 (22.3%)	36 (34.0%)		
Middle School	27 (28.7%)	14 (13.2%)		
Primary School	3 (3.1%)	4 (3.7%)		
Illiterate	13 (13.8%)	8 (7.5%)		
Occupation			5.456	0.363
Professional	2 (2.1%)	7 (6.6%)		
Semi-Professional	1 (1.1%)	0 (0.0%)		
Skilled Worker	1 (1.1%)	0 (0.0%)		
Semi-Skilled Worker	10 (10.6%)	11 (10.4%)		
Unskilled Worker	10 (10.6%)	7 (6.6%)		
Unemployed / Homemaker	70 (74.5%)	81 (76.4%)		

Socio-Demographic Variable	RTI Present (n = 94)	RTI Absent (n = 106)	Chi-Square (χ^2)	p-value
Monthly Family Income			9.222	0.002*
<= 10,000 INR	52 (55.3%)	36 (34.0%)		
> 10,000 INR	42 (44.7%)	70 (66.0%)		
Family Structure			10.839	0.001*
Nuclear	70 (74.5%)	55 (51.9%)		
Joint	24 (25.5%)	51 (48.1%)		

3.3 Menstrual Hygiene Practices

Menstrual hygiene behaviors demonstrated powerful associations with RTI diagnosis (Table 3). The type of absorbent material used during menses was strongly correlated with infection status ($\chi^2 = 15.111$, $p = 0.001$); women using cloth (43.6%) or both pad and cloth (13.8%) experienced substantially higher rates of RTI compared to those using commercial sanitary pads exclusively (42.6% vs 69.8% in controls). Furthermore, the daily frequency of pad/cloth change was highly significant ($\chi^2 = 27.365$, $p < 0.001$). Over two-thirds of RTI cases reported changing absorbents only twice daily (54.3%) or once daily (14.9%), whereas 56.6% of uninfected controls changed ≥ 3 times daily. Daily bathing frequency during menses was borderline significant ($\chi^2 = 6.003$, $p = 0.050$). Menstrual irregularity, dysmenorrhea, sexual intercourse during menstruation, and intravaginal cleansing were not statistically significant.

Table 3
Menstrual hygiene practices and clinical characteristics vs. RTI status (N = 200)

Menstrual Hygiene Variable	RTI Present (n = 94)	RTI Absent (n = 106)	Chi-Square (χ^2)	p-value
Absorbent Material Used			15.111	0.001*
Sanitary Pad Exclusively	40 (42.6%)	74 (69.8%)		
Cloth Exclusively	41 (43.6%)	24 (22.6%)		
Both Pad and Cloth	13 (13.8%)	8 (7.5%)		
Absorbent Change Frequency			27.365	< 0.001*
Once daily	14 (14.9%)	10 (9.4%)		
Twice daily	51 (54.3%)	36 (34.0%)		
>= 3 times daily	29 (30.9%)	60 (56.6%)		
Bathing Frequency During Menses			6.003	0.050
Once daily	35 (37.2%)	26 (24.5%)		
Twice daily	55 (58.5%)	68 (64.2%)		
Thrice daily	4 (4.3%)	12 (11.3%)		
Menstrual Cycle Pattern			0.024	0.876
Regular	38 (40.4%)	44 (41.5%)		
Irregular	56 (59.6%)	62 (58.5%)		
Dysmenorrhea			0.102	0.749
Present	24 (25.5%)	25 (23.6%)		
Absent	70 (74.5%)	81 (76.4%)		
Sexual Intercourse During Menses			0.464	0.496
Yes	2 (2.1%)	4 (3.8%)		
No	92 (97.9%)	102 (96.2%)		
Passage of Blood Clots			1.674	0.196
Yes	29 (30.9%)	42 (39.6%)		
No	65 (69.1%)	64 (60.4%)		

Menstrual Hygiene Variable	RTI Present (n = 94)	RTI Absent (n = 106)	Chi-Square (χ^2)	p-value
Vaginal Antiseptic / Cream Usage			1.982	0.159
Yes	8 (8.5%)	4 (3.8%)		
No	86 (91.5%)	102 (96.2%)		

3.4 Marital and Reproductive History

Evaluation of marital and obstetric factors showed no statistically significant differences between RTI cases and uninfected controls (Table 4). Although married women accounted for 90.4% of all RTI cases and women married at ≤ 19 years constituted 69.1%, these proportions did not statistically diverge from the control cohort ($p > 0.05$). Similarly, parity, history of abortions, mode of delivery, type of birth attendant, and contraception history did not demonstrate statistically significant associations with RTI status.

Table 4
Association between marital, obstetric, and contraceptive factors and RTI status (N = 200)

Marital / Obstetric Variable	RTI Present (n = 94)	RTI Absent (n = 106)	Chi-Square (X²)	p-value
Marital Status			3.063	0.382
Married	85 (90.4%)	87 (82.1%)		
Unmarried	5 (5.3%)	12 (11.3%)		
Divorced	2 (2.1%)	4 (3.8%)		
Widowed	2 (2.1%)	3 (2.8%)		
Age at Marriage (Years)			1.622	0.444
<= 19	65 (69.1%)	67 (63.2%)		
> 19	27 (28.7%)	24 (22.6%)		
Unmarried / Not Applicable	2 (2.1%)	15 (14.1%)		
Age at First Pregnancy (Years)			1.125	0.570
<= 20	49 (52.1%)	48 (45.2%)		
> 20	23 (24.4%)	31 (29.2%)		
Nulligravida	20 (21.2%)	26 (24.5%)		
Parity			4.810	0.090
0	20 (21.2%)	32 (30.1%)		
1–2	72 (76.5%)	71 (66.9%)		
>= 3	0 (0.0%)	3 (2.8%)		
History of Abortions / MTP			0.144	0.704
Yes	28 (29.8%)	29 (27.4%)		
No	66 (70.2%)	77 (72.6%)		
Mode of Delivery			3.103	0.212
Vaginal Delivery	60 (63.8%)	55 (51.9%)		
Cesarean Section	13 (13.8%)	22 (20.8%)		
Nulliparous	21 (22.3%)	29 (27.4%)		
Delivery Attendant			1.704	0.426
Skilled Health Personnel	61 (64.9%)	70 (66.0%)		

Marital / Obstetric Variable	RTI Present (n = 94)	RTI Absent (n = 106)	Chi-Square (χ^2)	p-value
Non-Health Personnel	12 (12.8%)	8 (7.5%)	2.825	0.419
Nulliparous	21 (22.3%)	28 (26.4%)		
Contraceptive Method				
Permanent (Tubectomy)	53 (56.4%)	49 (46.2%)		
Temporary (Condoms, IUD, OCP)	2 (2.1%)	3 (2.8%)		
Both Methods	2 (2.1%)	1 (0.9%)		
None	37 (39.4%)	53 (50.0%)		

4. Discussion

The clinical prevalence of 47.0% observed in this tertiary care study underscores the substantial burden of RTIs among women of reproductive age. This finding is consistent with hospital-based investigations in India reporting prevalence figures ranging from 40% to 65% [9, 19], while being higher than general community-based surveys such as Durga et al. (27.2%) [20] and Samanta et al. [8]. Higher prevalence in tertiary centers reflects health-seeking behavior triggered by persistent gynecological discomfort.

Abnormal vaginal discharge was the most frequent symptom (79.8%), mirroring findings by Sharma et al. (69.4%) [10] and Mani et al. [7]. A significant proportion of patients presented with low backache (74.4%) and lower abdominal pain (62.7%), which serve as cardinal clinical manifestations of ascending genital tract infection and early pelvic inflammatory disease [2, 17]. The total absence of genital ulcers and inguinal lymphadenopathy indicates that endogenous infections (bacterial vaginosis, vulvovaginal candidiasis) and non-ulcerative STIs (trichomoniasis, cervicitis) predominate over classic ulcerative venereal diseases in this patient demographic.

Socioeconomic vulnerability emerged as an important risk determinant. Women with monthly family incomes $\leq$ 10,000 INR had significantly higher RTI rates ($p = 0.002$), corroborating observations by Dameru et al. [17]. Economic constraints directly limit purchasing power for disposable sanitary napkins, restrict access to private sanitation facilities, and delay timely healthcare seeking. Similarly, nuclear family structure was significantly associated with RTI ($p = 0.001$), potentially reflecting differential household financial allocation and lack of domestic support networks.

A major contribution of this study is the clear demonstration of menstrual hygiene practices as primary drivers of reproductive morbidity. Women utilizing reusable cloth materials had significantly elevated RTI rates compared to exclusive pad users ($p = 0.001$), corroborating reports by Bhilwar et al. [2] and Gupta et al. [15]. Reusable cloths, if washed without adequate detergent, dried indoors away from direct sunlight, or stored in damp environments, act as vectors for pathogenic microorganisms. Furthermore,

infrequent absorbent replacement (≤ 2 times per day) showed a dramatic correlation with infection ($p < 0.001$). Prolonged wear promotes perineal moisture, skin maceration, and disruption of normal vaginal pH, facilitating bacterial colonization and ascending infection.

While high proportions of RTI were observed among married women (90.4%) and those married at ≤ 19 years (69.1%), obstetric variables (parity, delivery mode, abortion history) did not show statistically significant differences when compared to uninfected clinic attendees. This indicates that within sexually active reproductive cohorts, daily menstrual and personal hygiene practices exert a more immediate influence on infection risk than past obstetric milestones.

5. Study Limitations

This study has two primary limitations. First, diagnosis was based on clinical symptomatology, speculum visualization, and bimanual pelvic examination without microbiological confirmation (e.g., wet mount microscopy, Gram stain, culture, or NAAT). While syndromic/clinical management reflects routine clinical practice in resource-limited primary care settings, exact microbiological etiologies could not be differentiated. Second, the cross-sectional, single-center hospital design may introduce selection bias, warranting caution when extrapolating findings to wider community populations.

6. Conclusion and Recommendations

Reproductive tract infections remain a pervasive yet under-addressed health issue, affecting nearly half (47.0%) of reproductive-age women attending gynecological outpatient services. Suboptimal menstrual hygiene—specifically cloth absorbent use and infrequent replacement—along with socioeconomic disadvantage represent the primary determinants of RTI risk.

To address this public health challenge, the following interventions are recommended:

- **Community-Based Menstrual Hygiene Education:** Intensify educational campaigns emphasizing safe menstrual hygiene, including the critical necessity of changing absorbents at least 3 to 4 times daily and proper hygienic handling of reusable materials.
- **Subsidized Sanitary Commodity Distribution:** Expand public sector supply schemes to ensure free or highly subsidized disposable sanitary pads for low-income women and adolescent girls.
- **Adolescent School & College Outreach:** Embed reproductive health and personal hygiene curricula in high schools and colleges to establish foundational awareness prior to marriage and peak reproductive activity.
- **Strengthened Syndromic Case Management:** Equip primary and secondary healthcare centers with streamlined syndromic management protocols and essential therapeutics to facilitate early detection and prevent severe pelvic sequelae.

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