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Research Article

Prevalence of Trichomonas vaginalis and Associated Factors among Pregnant Women Attending Antenatal Care at Mattu Karl Specialized Hospital, Oromia Region, Southwest Ethiopia

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Abstract

Background: Trichomoniasis, caused by *Trichomonas vaginalis*, is a major curable infection globally, accounting for an estimated 276 million of the 499 million new curable STIs worldwide in 2018. In Ethiopia, genital infections during pregnancy cause significant health complications.

Objective: To assess the prevalence and associated factors of *T. vaginalis* among pregnant women attending antenatal care (ANC) at Mattu Karl Comprehensive Specialized Hospital, Southwest Ethiopia, 2025.

Methods: A facility-based cross-sectional study was conducted from March 10 to May 10, 2025, among 288 pregnant women selected via systematic random sampling. Data collected through pre-tested, interviewer-administered questionnaires were analyzed using SPSS version 26.0. Multicollinearity was evaluated using the variance inflation factor, and model fit was verified via the Hosmer and Lemeshow test. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) and p-values < 0.05 determined statistical significance.

Results: With a 98.3% response rate, the overall prevalence of *T. vaginalis* was 10% (29/288; 95% CI: 8.23-12.43). Factors significantly associated with higher odds of infection included having two or more sexual partners (AOR = 4.56, 95% CI: 2.31-7.45), urban residence (AOR = 2.00, 95% CI: 1.19-4.23), and practicing vaginal douching once per day (AOR = 3.75, 95% CI: 1.87-5.98).

Conclusion: The prevalence of *T. vaginalis* among ANC attendees at Mattu Karl Comprehensive Specialized Hospital is substantial (10%). Routine screening for *T. vaginalis* should be integrated into standard laboratory protocols during routine antenatal care visits to mitigate maternal and neonatal complications

Keywords: *Trichomonas vaginalis; Pregnant Women; Antenatal Care*

Abbreviations

ANC: Antenatal Care; AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; HIV: Human Immunodeficiency Virus; RPR: Rapid Plasma Reagin; STIs: Sexually Transmitted Infections; WHO: World Health Organization

Introduction

Trichomonas vaginalis is a protozoan parasite that infects the human urogenital tract and causes trichomoniasis. This anaerobic flagellated parasite has a straightforward life cycle that involves only the direct transmission of viable trophozoites. Infections with *T. vaginalis* during pregnancy have been linked to severe pregnancy outcomes [1-3]. The most common symptoms of trichomoniasis in women include foul-smelling vaginal discharge, vaginal irritation, lower abdominal pain, vulvovaginal secretion, and dysuria. Serious complications can arise, such as preterm rupture of membranes, chorioamnionitis, preterm delivery, post-abortal sepsis, ectopic pregnancy, tubal factor infertility, and low birth weight. The standard method for diagnosing trichomoniasis is through a wet mount microscopic examination [4,5]. *Trichomonas vaginalis* is a protozoan parasite that infects the human urogenital tract and is the causative agent of trichomoniasis [6].

The most common symptoms of trichomoniasis in women include foul-smelling vaginal discharge, vaginal irritation, lower abdominal pain, vulvo-vaginal secretion, and painful urination. Serious complications can arise, such as preterm rupture of membranes, chorioamnionitis, preterm delivery, post-abortal sepsis, ectopic pregnancy, tubal infertility, and low birth weight [7]. The typical means of diagnosing trichomoniasis is a wet mount microscopic examination. Metronidazole and tinidazole are first-line treatments for trichomoniasis [8].

Over a million individuals contract a sexually transmitted infection (STI) each day. The World Health Organization (WHO) estimated that in 2018, there were 499 million new cases of curable STIs among people aged 15 to 49 worldwide, which included 106 million cases of gonorrhea, 11 million cases of syphilis, and 276 million cases of trichomoniasis. Both men and women had similar rates of acquiring new STIs [9]. Untreated bacterial STIs in women can lead to pelvic inflammatory disease in as many as 40% of cases, with about one-third of those resulting in infertility. Chronic pelvic pain due to untreated bacterial STIs is a significant reason for health care visits among women. In sub-Saharan Africa, untreated genital infections may account for up to 85% of infertility cases among women seeking help for infertility [10].

Worldwide, about one-third of the 340 million new STI cases each year are found in individuals fewer than 25. More than one in every 20 adolescents contracts a curable STI annually. In developing regions like sub-Saharan Africa, the STI burden is particularly severe, with 108 million new cases reported daily. It is estimated that 80-90% of the global STI burden is concentrated in developing countries, where access to diagnostic facilities is limited or nonexistent [11].

Each year in Africa, around one million babies are stillborn, and another million die within their first month. The majority of these deaths are due to infectious diseases and neonatal complications. Sub-Saharan Africa is the hardest-hit area, with 25.6 million individuals living with HIV and about 8% infected with hepatitis B. Without interventions, 30-45% of infants born to HIV-positive mothers in developing nations may contract the virus during pregnancy, delivery, or breastfeeding. Additionally, it is estimated that only 54% of those living with HIV are aware of their status [12].

In Ethiopia, pregnant women are tested for HIV and syphilis only once during their antenatal care visits, using rapid plasma regain (RPR) test, but they do not undergo testing for *T. vaginalis*. Women who test positive for RPR receive immediate treatment with one or more doses of intramuscular benzathine penicillin G, totaling 2.4 million units [13]. A cross-sectional study conducted at Wolaita Sodo University in Southern Ethiopia found that the self-reported prevalence of STIs among students in the 12 months preceding the survey was 19.5%. Among the 35.3% of students who were sexually active, 46.0% reported infrequent condom use, 24.8% had sexual encounters with casual partners, and 13.9% engaged in sexual intercourse with commercial sex workers. Students who had sexual contact with commercial sex workers in the past year were at a higher risk of developing sexually transmitted infections [14].

Aim of the Study

This study aims to address the current lack of screening for *Trichomonas vaginalis* among pregnant women in Ethiopia, where standard antenatal care protocols currently only include testing for HIV and syphilis. Given that the study area Mattu Karl Specialized Hospital in the Oromia region is a migration hub for gold mining with a local population characterized by limited awareness of STI prevention, the research seeks to fill a critical knowledge gap regarding local disease trends. Consequently, the primary objective of this study is to evaluate the prevalence of *Trichomonas vaginalis* and identify associated risk factors among pregnant women attending antenatal care at this facility.

Materials and Methods

Study area and study period

The study was conducted at Mettu Karl Comprehensive Specialized Hospital, a public health facility situated in the Illubabor Zone of southwestern Ethiopia. Mettu is a market town within the Illubabor Zone of Oromia Region, approximately 600 km southwest of Addis Ababa, at coordinates of 8°18'N latitude and 35°35'E longitude, with an elevation of 1,605 meters (Figure 1).

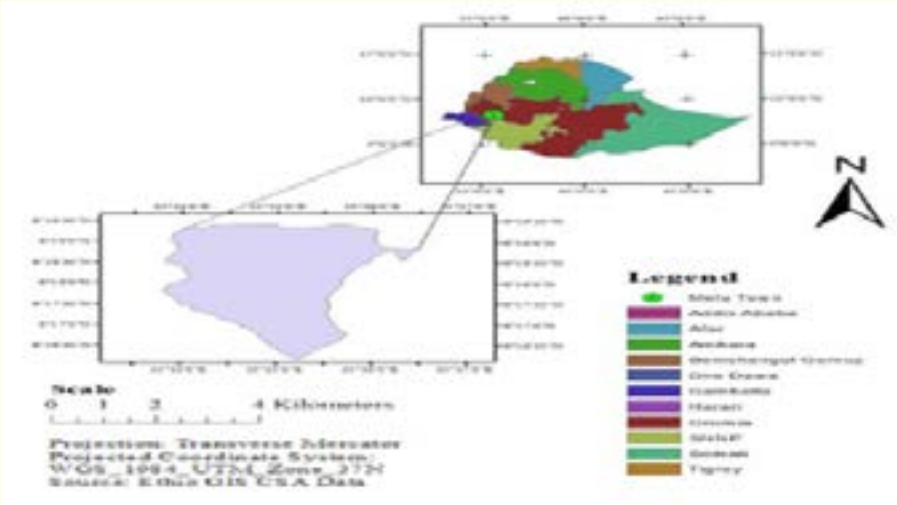


Figure 1: *Sketch map of study area.*

Mettu Karl Hospital serves as the sole referral hospital for the region, providing care to an estimated population of 2.1 million from Illubabor, the Gambella Regional State, and neighboring areas of the Southern Nations, Nationalities, and Peoples' Region. The hospital offers a range of services, including outpatient care, an Intensive Care Unit, obstetrics and gynecology, and inpatient services across medical, pediatric, and surgical wards. It also operates medical, surgical, and gynecological referral clinics, an emergency intervention unit, and is recognized as one of Ethiopia's fistula treatment centers. The hospital employs 123 technical staff and 157 support staff. According to the Illubabor Zone Health Office, there are approximately 10,963 women of reproductive age (15-49 years) in the area. In the previous Ethiopian calendar year (2012 E.C.), the hospital recorded a total of 1,722 antenatal care (ANC) visits, including 1,337 first visits (ANC1) and 385 fourth visits (ANC4). Prior to the current data collection, ANC follow-up stood at 234 visits (176 for ANC1 and 58 for ANC4). Data for this study were collected from March 10 to May 10, 2025.

Study design

An institutional based cross-sectional study was conducted.

Study population

All pregnant women attending antenatal care (ANC) at Mettu Karl Comprehensive Specialized Hospital who were between 35 and 37 weeks of gestation.

Eligibility criteria

Eligibility for this study was determined based on specific clinical and situational criteria. Pregnant women between 35 and 37 weeks of gestation who were willing to provide information were included. Those who had used antibiotics within the two weeks prior to recruitment, presented with emergency obstetric conditions requiring immediate intervention, were critically ill on the day of data collection, or had been referred from facilities outside Mettu Karl Comprehensive Specialized Hospital were excluded.

Sample size determination and sampling technique

The sample size was calculated using single population proportion formula:, considering the following assumptions: Prevalence of bacterial vaginitis and its associated factors among pregnant women attending antenatal care clinics at public hospitals in West Shoa Zone, Oromia, Ethiopia (22.3%) (22)With confidence interval of 95% and, 3% margin of error

$$n = (za)^2 \frac{p(1-p)}{d^2}$$

$$n = (1.96)^2 \frac{0.223(1-0.223)}{0.05^2} = 266$$

Finally, 293 pregnant women were included in this study by adding 10% non-response rate.

Sampling technique

Study participants was selected using a systematic random sampling technique, based on the annual Antenatal Care (ANC) report from the same month of the previous year, namely in the April. The sampling frame will consist of the ANC reports from Mattu Karl Comprehensive Specialized Hospital for those months. According to last year's data, there were 695 cases during the same two months, which was serving as the frame for this study. During the data collection process, individual study participants will be chosen using a systematic random sampling method with a K value of 2, meaning that every second eligible participant was interviewed in the selection.

Dependent variable: *Trichomonas vaginalis* (Yes/No).

Independent variables

- **Socio demographic and economic factors of mother**: Age, religion, educational status, house hold monthly income, occupation, marital status and place of residence
- **Obstetric related factors of mother**: Obstetric factors, gravidity, ANC visit, history of Contraceptives, history of antibiotic use, no of sexual partner, HIV status, vaginal discharge, history of chronic illness, pain on urination, history of abortion and trimester
- **Hygiene behavior factors**: Vaginal douching per day, use of soup for douching, washing pants with disinfectants, number of pants used per week and showering frequency per week.

Operation definition

Laboratory analysis

The wet saline smear and Giemsa staining were prepared from the first and second vaginal swabs, respectively. The wet saline smear was promptly created using clean, grease-free microscopic slides covered with a coverslip and examined for motile *T. vaginalis* under a 10x objective lens, with confirmation using a 40x objective lens [26]. Giemsa stain was utilized to verify any negative results from the wet saline smear. The smear was fixed by immersion in methanol for one minute and then allowed to dry before applying the Giemsa stain. After staining with Giemsa dye (HiMedia Laboratories, India), the specimen was examined for *T. vaginalis* at 100x magnification using a phosphate buffer solution diluted at a ratio of 1:19 at a pH of 7.2 for 10 minutes. Both the internal and external structures of the organism were clearly visible in the specimen, confirming the presence of *T. vaginalis* trophozoites [27].

Data collection tools and techniques

A structured, interviewer-administered questionnaire was developed based on previously published literature [15,16,19,21,23]. A quantitative approach was used, employing a pre-tested, semi-structured instrument created after reviewing relevant sources. The tool comprised three sections: socio-demographic characteristics, obstetric factors, and hygiene behavior factors. The questionnaire was prepared in English and then translated into Afan Oromo. Nurses and midwives from non-MCH wards, selected for their prior experience and proficiency in the local language, served as data collectors and were supervised by one midwife. A pre-test was conducted on 5% of the total sample at Darimu Hospital, located outside the study area, two weeks before data collection [28].

Data quality assurance

Quality assurance measures were established during the design phase, fieldwork, and data entry. Data collectors and supervisors underwent two days of training that focused on the study's objectives, data collection methods, and questionnaire content. After the data collection, supervisors and the principal investigator performed daily checks to ensure completeness, accuracy, and consistency. The questionnaires were initially written in English, then translated into Oromigna, and subsequently retranslated into English by a different individual to maintain consistency. A pretest was conducted on 5% of the sample at Darimu hospital, which has a similar background, two weeks prior to the main data collection. This pretest, which was excluded from the main data analysis, aimed to evaluate the clarity of the questions, the order of the questions, identify any gaps in the data collection process, and help familiarize the data collectors with the instruments.

Data entry and analysis

Data was collected through semi-structured interviews and then exported to SPSS version 26.0 for analysis. Inconsistencies and missing values were identified using frequency checks and other exploratory data analyses. Descriptive statistics were computed; including frequency distributions, means, and standard deviations for normally distributed data, as well as medians and interquartile ranges (IQR) for skewed data. Bivariate analysis was done primarily to check which independent variables had an association with that of the dependent variable. Independent variables with marginal associations ($P < 0.25$) in the bivariate analysis, which are biologically plausible and showed significant association in the previous studies was entered in to a multivariable logistic regression analysis in order to detect association with *T. Vaginalis*. The Hosmer-Lemeshow test was used to check the appropriateness of the model for analysis. Finally, OR with 95% CI was estimated to assess the strength of associations and statistical significance was declared at a p-value < 0.05 and results was presented using tables, figures, and texts.

Results

Socio-demographic characteristics of study participants

A total of 288 women participated in the interviews, resulting in a response rate of 98.3%. Among the participants, the majority (182 or 63.3%) were urban residents. Respondents' ages ranged from 18 to 45, with a mean age of 29.7. Less than half of the respondents (126

or 43.6%) were in the 25-29 age groups. A significant majority (263or 91.3%) of the participants were married. In terms of occupational status, 257 (89.3%) were employed, and 229 (79.4%) identified as Protestants. Regarding educational attainment, 98 (34.2%) had not had any formal education, while 40 (14%) had attended up to college level education (Table 1).

Variable		Frequency	Percent
Age (years)	15-19	27	9.6
	20-24	75	26.0
	25-29	107	36.7
	30-34	63	21.9
	≥35	16	5.6
Residence	Urban	182	63.3
	Rural	107	36.7
Religion	Protestant	228	79.3
	Orthodox	52	17.9
	Muslim	6	2.3
	Catholic	2	0.6
Marital status	Single	10	3.6
	Married	263	91.3
	Divorced	9	3.1
	Widowed	6	2.0
Occupation	Employed	30	10.7
	Unemployed	257	89.3
Educational status	No formal education	98	34.2
	Grades 1-8	88	30.6
	Grades 9-12	62	21.4
	College and above	40	13.8
Monthly income	<1050	171	59.5
	≥ 1050	117	40.5

Table 1: *Socio-demographic characteristics of study participants at Mettu Karl comprehensive hospital, Oromia region, southwest Ethiopia, 2025 (N = 288).*

Obstetric and clinical information

The majority of participants in the study were multigravida, with 156 individuals (55.1%) falling into this category. A significant 216 participants (75.0%) attended eight or more antenatal care (ANC) visits. Additionally, 226 participants (78.4%) reported having only one sexual partner. Contraceptive use was low, as 207 individuals (71.9%) had no prior history of using contraceptives. Furthermore, 263 participants (91.4%) indicated they had not taken antibiotics recently. The study also found that 253 participants (87.8%) had no history of abortion, while 261 (90.5%) reported no chronic illnesses. Moreover, 235 participants (81.6%) reported no symptoms of vaginal discharge or itching. Notably, approximately 276 respondents (96.0%) were HIV negative. However, nearly half of the participants, specifically 122 individuals (42.4%), reported experiencing vaginal discharge table 2.

Variable		Frequency	Percent
ANC visit	<8 Contacts	72	25.0
	≥ 8 contacts	216	75.0
Gravidity	Primigravida	161	55.9
	Multigravida	127	44.1
Recent antibiotic use	Yes	25	8.6
	No	263	91.4
History of contraceptive use	Yes	81	28.1
	No	207	71.9
History of abortion	Yes	38	13.2
	No	253	87.8
Maternal HIV status	Positive	12	4.0
	Negative	276	96.0
Number of sexual partners	One	226	78.4
	≥2	62	21.6
History of chronic illness	Yes	27	9.5
	No	261	90.5
Pain on urination	Yes	53	18.4
	No	235	81.6
Vaginal discharge	Yes	122	42.4
	No	166	57.6

Table 2: *Obstetric and clinical information of pregnant women following antenatal care at Mettu Karl comprehensive hospital, Oromia region, southwest Ethiopia, 2025 (N = 288).*

Hygienic behaviors and practices of study subjects

Over three-fourths of the study participants, specifically 76.54% (220 individuals), reported douching their vagina more than once daily. Among these participants, 48.5% (140) indicated they used soap for douching. Additionally, 31% of the subjects reported using disinfectants to wash their underwear, while a majority (70%; 202 individuals) wore only one pair of underwear for an entire week. In terms of showering frequency, 55.38% (159 participants) stated they showered just once a week (Table 3).

Variable		Frequency	Percent
Vaginal douching per day	Once	67	23.46
	More than once	220	76.54
Use of soup for douching	Yes	140	48.5
	No	148	51.5
Washing pants with disinfectants	Yes	89	31.0
	No	204	71.0
Number of pants used per week	None	22	7.69
	One	202	70.0
	Two or more	64	22.31
Showering frequency per week	Once	158	55.0
	Twice	79	27.3
	Three or more	80	27.7

Table 3: *Hygienic behaviors and practices of study subjects of pregnant women following antenatal care at Mettu Karl comprehensive hospital, Oromia region, southwest Ethiopia, 2025 (N = 288).*

Prevalence of *Trichomonas vaginalis* among pregnant mothers

The overall prevalence of bacterial *Trichomonas vaginalis* among the study participants was found to be 29 (10%) with a 95% confidence interval (CI) of 8.23 to 12.43 (Figure 2).

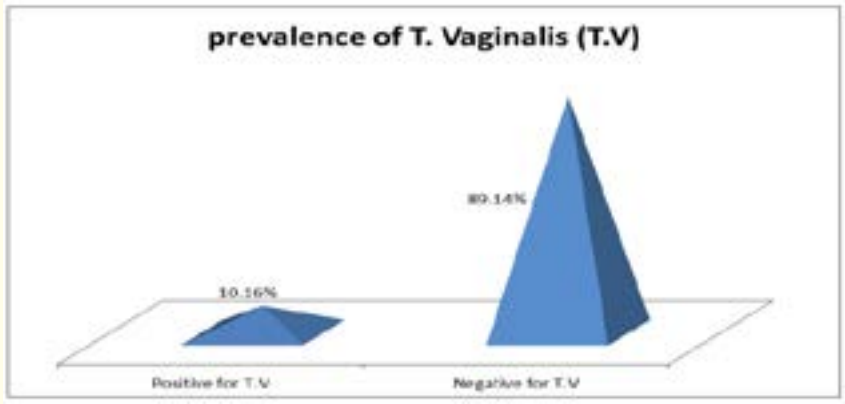


Figure 2: *Prevalence of T. vaginalis infection among pregnant women who followed ANC at Mettu Karl comprehensive hospital, Oromia region, southwest Ethiopia, 2025 (N = 288).*

Factors associated with the occurrence of *Trichomonas vaginalis*

Assumptions for logistic regression like large enough sample (minimum of 10 observation for each independent variables), residuals (>3), normal distribution (Shapiro wilk's test (p>0.05) and visual inspection of histogram, normal Q-Q plots and box plots) and no multicollinearity (with <0.7 spearman correlation or collinearity diagnosis (tolerance >0.1 & VIF<10)) before categorization of variables were checked and finally Hosmer-Lemeshow test checked for model fitness (sig=0.499).

In the bivariate binary logistic regression, variables with a p-value less than 0.25 were considered candidates for multiple logistic regressions, with statistical significance set at a p-value of less than 0.05. The following variables were identified as candidates for multivariate analysis: residence, antenatal care (ANC) visit, history of contraceptive use, maternal occupation, history of abortion, number of sexual partners, vaginal douching per day and washing pants with disinfectants.

This study's multivariable logistic regression analysis revealed that residence, number of sexual partner and vaginal douching per day all had a statistically significant association with the outcome variable, *Trichomonas vaginalis*.

Among the independent variables evaluated, the number of sexual partners, place of residence, and vaginal douching were significantly linked to the prevalence of *T. vaginalis* infection. The number of sexual partners emerged as a key independent factor associated with the infection, those mothers who had two and more sexual partners were almost five times more likely to develop bacterial *T. vaginalis* when compared to those had only one sexual partner (AOR = 4.56, 95CI: 2.31-7.45). The likelihood of having bacterial *T. vaginalis* was greater among rural residents than urban ones. Those pregnant mothers came from rural areas were two times more like to develop bacterial vaginalis as compared to those urban residents (AOR = 2.0, 95CI: 1.19-4.23). Additionally, vaginal douching was statistically correlated with the occurrence of *T. vaginalis* infection. Those mothers' practices vaginal douching only once in a day were about four times more likely to acquire *T. vaginalis* when compared to those had douching two and more in a day (AOR = 3.75, 95CI: 1.87-5.98).

Variables	Category	*Trichomonas vaginalis*		COR (95%CI)	AOR (95%CI)	P-value
		Positive	Negative			
Antenatal care (ANC) visit	<8 contacts	12	23	2.54 (1.02-4.64)	1.12 (0.99-1.6)	0.1233
	≥8 contacts	17	83	1	1	-
Maternal occupation	Employed	10	8	1	1	-
	Unemployed	19	98	0.15 (0.09-0.96)	0.95 (0.89-1.76)	0.051
Residence	Urban	10	69	1	1	-
	Rural	19	37	3.54 (1.85-6.54)	2.0 (1.19-4.23)	0.0318*
History of contraceptive use	Yes	12	28	1	1	-
	No	17	68	0.41 (0.12-0.98)	1.02 (0.78-2.45)	0.3755
History of abortion	Yes	14	10	8.9 (3.42-12.8)	3.85 (0.99-6.87)	0.2219
	No	15	96	1	1	-
Number of sexual partner	One	10	88	1	1	-
	Two and more	19	8	21.0 (15.87-34.56)	4.56 (2.31-7.45)	0.001*
Vaginal douching per day	Once	19	20	8.17 (5.43-11.31)	3.75 (1.87-5.98)	0.002*
	Two and more	10	86	1	1	-
Washing pants with disinfectants	Yes	17	30	1	1	-
	No	12	79	1.20 (.976-2.75)	0.77 (.13-1.92)	0.0279
Number of pants used per week	None	10	12	0.73(0.13-1.98)	1.2 (0.54-3.43)	.765
	One	98	104	0.83 (0.17-1.83)	1.50 (0.64-2.90)	.183
	Two or more	34	30	1	1	-
Gravidity	Primigravida	97	64	0.64 (0.09-0.98)	0.88 (0.76-2.53)	.072
	Multigravida	88	39	1	1	-
Pain on urination	Yes	28	25	1.4 (.99-2.89)	1.20 (0.89-2.75)	.086
	No	118	143	1	1	-

Table 4: *Factors associated with T. vaginalis infection among pregnant women who followed ANC at Mettu Karl comprehensive hospital, Oromia region, southwest Ethiopia, 2025 (N = 288).*

*Note: 1="Reference category"; "COR"="Crude Odds Ratio"; "AOR"="Adjusted Odds Ratio"; "CI"="Confidence Interval". * Statistically significant at p < 0.05 in the multivariable logistic regression model.*

Discussion

This study assessed the prevalence of *Trichomonas vaginalis* infection and its associated factors among pregnant women attending antenatal care at Mattu Karl Specialized Hospital, Southwest Ethiopia. The overall prevalence of *T. vaginalis* infection was 10.0% (95% CI: 8.23-12.43). This finding is comparable with reports from Nigeria, where prevalence estimates ranged from 8.1% to 10% [29,30], South America (9%) [30], and Asia (7.1%) [31]. However, the prevalence observed in the current study was considerably higher than findings reported from Southern Ethiopia (3.1%) [23], Ghana (1.7%) [32], Benin (2.8%) [33], South Africa (1.2%) [34] and Portugal (1.0%) [35].

The relatively higher prevalence observed in the present study may be attributed to differences in sociodemographic characteristics, sexual behaviors, access to reproductive health services, and diagnostic approaches across study settings. Previous evidence has shown that low educational attainment, limited access to sexual and reproductive health services, and high-risk sexual behaviors are important determinants of *T. vaginalis* infection and other sexually transmitted infections (STIs) [41,42]. Furthermore, *T. vaginalis* infection has been associated with an increased risk of HIV acquisition and transmission due to genital mucosal inflammation and epithelial disruption, which may contribute to a higher burden of infection in populations with elevated STI risk factors [43,44]. Conversely, the prevalence identified in this study was lower than reports from Nigeria (12.5%) [27], South Africa (20%) [34], and Yemen (11.1%) [36]. These discrepancies may be explained by differences in study populations, geographic settings, sample sizes, and laboratory diagnostic methods, all of which can influence the measured prevalence of *T. vaginalis* infection [42,45].

In the present study, having two or more sexual partners was independently associated with *T. vaginalis* infection. Pregnant women who reported multiple sexual partners were nearly five times more likely to be infected than those who had only one sexual partner. This finding is consistent with studies conducted in Ethiopia [37], Nigeria [29], and Brazil [30]. The observed association is biologically plausible because an increasing number of sexual partners increases the likelihood of exposure to infected individuals and facilitates the transmission of sexually transmitted pathogens, including *T. vaginalis* [44,46]. Similar associations between multiple sexual partnerships and trichomoniasis have been reported in several epidemiological studies across diverse settings [29,30,46].

Residence was another significant factor associated with *T. vaginalis* infection. Pregnant women residing in rural areas were approximately twice as likely to have the infection compared with their urban counterparts. This finding is partially consistent with studies conducted in Cameroon, which reported a higher burden of genital tract infections among women living in rural settings. However, studies from eastern Ethiopia [37] and Tanzania [38] did not find a significant association between place of residence and infection status. The increased risk among rural residents may be related to reduced access to healthcare services, limited STI screening opportunities, lower health literacy, and delayed treatment-seeking behaviors, which have been identified as important contributors to STI transmission and persistence in low-resource settings [41,47].

The study also found a significant association between vaginal douching practices and *T. vaginalis* infection. Women who practiced vaginal douching once per day had higher odds of infection compared with those who douched more frequently. This finding is supported by studies conducted among African-American women, which demonstrated a positive association between vaginal douching and genital tract infections [39]. A possible explanation is that vaginal douching may disrupt the normal vaginal microbiota, reduce protective lactobacilli, and alter vaginal pH, thereby creating conditions favorable for the establishment and persistence of pathogenic organisms [48,49]. Nevertheless, evidence regarding the relationship between douching and genital infections remains inconsistent. For example, a study conducted at Johns Hopkins Bayview Medical Center reported that cessation of vaginal douching reduced the odds of bacterial vaginosis by 77%, particularly among women who practiced douching for menstrual hygiene purposes [40]. The inconsistency across studies may be related to variations in douching frequency, methods, substances used, and sociocultural practices. Therefore, further prospective studies are needed to better understand the relationship between vaginal douching and *T. vaginalis* infection among pregnant women.

Conclusion and Recommendations

The study concludes that the overall prevalence of *T. vaginalis* among pregnant women attending antenatal care at Mattu Karl Comprehensive Specialized Hospital is substantial, standing at 10%. Additionally, the research successfully identifies key behavioral and demographic risk factors significantly associated with higher odds of infection, which include having two or more sexual partners, residing in rural areas, and practicing vaginal douching only once per day.

To mitigate this health challenge, it is highly recommended that routine screening for *T. vaginalis* be formally integrated into the standard laboratory testing protocols mandatory for all pregnant women during their routine antenatal care visits. Furthermore, healthcare institutions should implement continuous, targeted health education campaigns within antenatal clinics to raise awareness about safe sexual behaviors, proper personal hygiene, and the risks of vaginal douching, while expanding maternal health outreach programs to reach vulnerable rural communities.

Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board (IRB) of Mattu University, College of Health Sciences. Following approval, an official letter of cooperation was submitted to the administration of Mattu Karl Comprehensive Specialized Hospital. The study was conducted in strict accordance with the ethical principles of the Declaration of Helsinki. The objectives, procedures, and risks of the study were clearly explained to all eligible participants. Formal ethical consent was established, and both written or witnessed oral informed consent was obtained from each individual prior to enrollment, depending on the participant's literacy level. Participants were explicitly informed of their right to refuse participation or withdraw from the study at any stage without penalty or impact on their routine antenatal care. To guarantee participant anonymity and strict data confidentiality, no personal identifiers or names were recorded on the questionnaires, and all collected data were securely stored.

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Credit Authors Contribution Statement

All authors contributed to all aspects of the study including conceptualization, methodology development, data collection, data analysis, writing of the original draft, and review and editing of the manuscript, with supervision provided by senior academic advisors where applicable.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of Generative AI Use

The authors report that generative AI was not used in the design, analysis, or writing of this manuscript.

Data Availability Statement

Data are available from the corresponding author upon reasonable request due to ethical and privacy restrictions.

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