The prevalence of *Trichomonas vaginalis* among women in Zawia city

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Abstract

Introduction: *Trichomonas vaginalis* is identified as the greatest public sexually transmitted parasitic infection (STI) worldwide, therefore it is an important common health problem. This parasite is associated with many hostile human health consequences including a low-birth-weight infant and transmission of the human immunodeficiency virus (HIV).

Material and methods: This study was performed among 803 Libyan women aged 18 to 62 years old and residing in Zawia city and nearby areas. The study was conducted from the first of May 2020 to the end of May 2022. During the period of study, all 803 samples of Libyan women attending antenatal clinics in many public and private health centers in Zawia city were examined.

The results: The prevalence of *T. vaginalis* infection was 23.40%. There was a significant correlation between *Trichomonas vaginalis* infection and pregnancy (P=0.003).

The discussion: The highest rate of infection was among pregnant women at 40%, whereas the lowest rate was associated with divorced women at 7.3%. The highest rates of infection were found among the 18-27 age group with 31.4%. On the other hand, the least infected age was the age group 48-57 years (10.6%). The study results have shown a significant decrease in all accounts of blood parameters including, red blood cells, the concentration of hemoglobin, and the mean platelet count with P=0.0013. However, there was a significantly increased in white blood cells.

Conclusion: The prevalence of *T. vaginalis* infection among women in Zawia city was significantly high. Therefore, optimal control and prevention strategies for parasite infection must be introduced as a resource of cultural differences reducing hostile health results due to this infection.

Keywords: *Trichomonas vaginalis*, sexually transmitted infection (STI), Libyan women.

Introduction

Trichomonas vaginalis is an endoparasite that causes a public sexually transmitted infection (STI) worldwide, referred to as trichomoniasis, therefore it is an important common health problem. Trichomoniasis may produce superficial necrotic ulcers in the mucosa, a foamy, yellowish, or creamy odorous discharge, itching, and burning in the vulva. In obstetrics and gynecology, the illness is a primary pathology source [1,2, 3]. Infected people have reportedly experienced discomfort and mental anguish as a result of the illness [2, 3].

The sole natural host for *T. vaginalis*, is the human urogenital tract transmitted via fomites. Despite males and females are affected; however, the majority of cases have been observed among females, who also exhibit symptoms of infection more frequently than males [4]. The illness spectrum spans from patients with the severe acute, inflammatory disease to an estimated 10–50% asymptomatic carriers [6]. *T. vaginalis* has been connected to poor birth outcomes during pregnancy, including low birth weight, premature labor, neonatal morbidity, and death [7].

Age, place of residence, socioeconomic status, education, marital status, the type of contraception method used, the presence and type of vaginal discharge, the drug being used, and a history of other sexually transmitted infections are just a few risk factors that can affect the epidemiology of *Trichomonas vaginalis* infection [8]. Despite its high incidence, significant accompanying morbidity, and related HIV acquisition, *T. vaginalis* has received comparatively little public health attention [8]. The frequency of trichomoniasis varies considerably among areas according to the World Health Organization (WHO) [9,10].

The WHO reported that the African region had the highest prevalence estimates for trichomoniasis in women at 11.7%, followed by the Americas (7.7%%), Western Pacific (5.6%), East Mediterranean (4.7%), South-East Asia region (2.5%), and European region (1.6 %) [9,10]. Another study in India has revealed the prevalence of *T. vaginalis* infection extended from 1.2% to 28.5% across a range of people including attendees of Gynecology and Obstetrics clinics [8,11]. A considerable amount of literature has been published on the prevalence of *T. vaginalis* in Arab

countries. Some of these studies were performed in Egypt, one of which carried out 50 cases, and found 30 of them positive [11,12,13].

Trichomoniasis prevalence in Egypt was reported to range from 5% to 11.7 % [12,13]. A previous study in Western Iran has investigated the occurrence of *T. vaginalis* and has estimated its prevalence at 2.1% [14]. Most studies in Libya have only been carried out in a few numbers of cities and showed their rate of infection such as Obari 1.84 % [15], Nalout (0.35%) [17], and Benghazi 1.2% [16]. Also, there was a study performed on diabatic women in the city of Benghazi and found the frequency of *Trichomonas vaginalis* was 24.5% [18]. A comparative study also between pregnant and non-pregnant women was carried out in Sebha. The highest level of infection was in non-pregnant women with a percentage of 4.5% [19]. Due to the dearth of knowledge on *Trichomonas vaginalis* infection among Libyan women living in the western region, this study was carried out to determine the incidence of trichomoniasis in Libyan women in Zawia city, which uses microscopic analysis of High Vaginal Swabs (HVS) samples.

Sample collection

This study was performed including 803 Libyan women, aged between 18 and 62 years old who reside in Zawia city and nearby areas. The study was conducted from the first of May 2020 to the end of May 2022. All women were presented with vaginitis and vaginal discharge in the Laboratory of several public and private medical centers (Royal, Balsam Elwatan, Alharsha, Dar-Alhalla, and Zawia Teaching Hospital). The fresh vaginal discharges were collected from participating women by vaginal swabs. All the sterilized swabs were used and applied to microscopical glass slides. Subsequently, two drops of normal saline were added immediately and covered with the slide cover. The samples were examined under a light microscope at low power (10x) and before a high power (40 x) to detect the trophozoite of *T. vaginalis* through their irregular movement with a swelling membrane.

Data Analysis

All collected data were analyzed using the application of the statistical package of social science (SPSS) V. 25. Comparison of the mean value of continuous data was tested by t-test and ANOVA test. Chi-square statistical analyses were done to detect significant values. The *P*-value of < 0.05 was used to establish statistical significance.

Results

During the period of study, all 803 samples of Libyan women attending antenatal in many public and private health centers in Zawia city were examined. The prevalence of *T. vaginalis* infection was 23.40%. while the presence of non-infection was 76.60%.

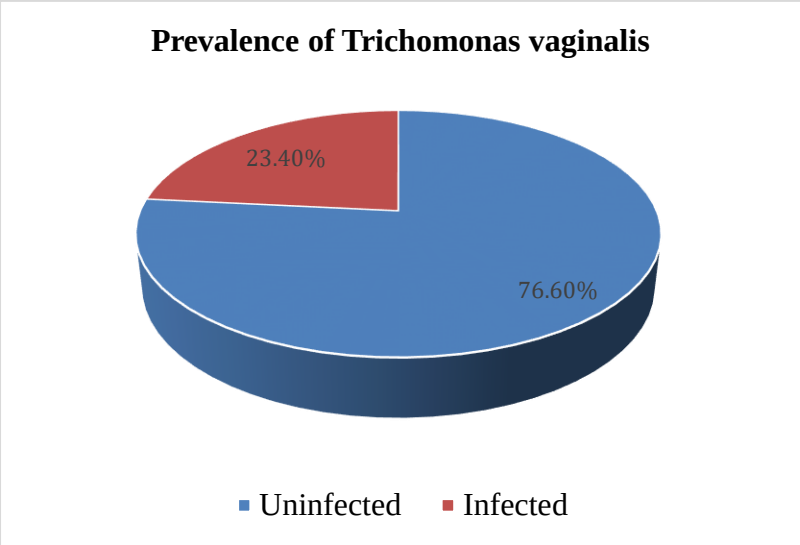

Figure .1 Prevalence of Trichomonas vaginalis infections in women in Zawia city.

The result of figure .1 shows that there was a significant variance in the prevalence of the infection at some gynecology clinics ($P = 0.05$).

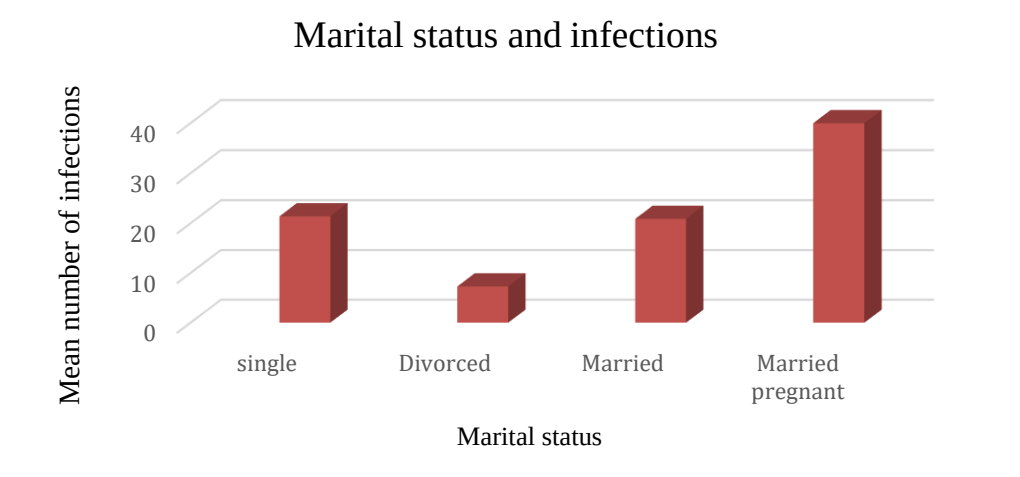

Figure .2. The prevalence of T. vaginalis according to marital status.

Figure 2: shows a significant correlation between *Trichomonas vaginalis* infection and pregnancy (P = 0.003). The highest prevalence was among pregnant women (40%) compare with married and single women (20.9% and 21.4%), respectively. In addition, the lowest prevalence of infection was initiated in divorced women (7.3%).

Table 1. Prevalence of *T. vaginalis* among women in Zawia, according to age groups.

Age group	Numbers of samples	Positive N (%)	Negative N (%)	Statistical analysis $\chi^2 = 6.57$, df=2, P = 0.01
18-27	185	59 (31.4)	126 (20.5)	
28-37	160	29 (15.4)	131 (21.3)	
38-47	136	45 (24)	91 (14.8)	
48-57	120	20 (10.6)	100 (16.2)	
≤58	202	35 (18.6)	167 (27.2)	
Total	803	188	615	

Table.1 illustrates the percentage of *T. vaginalis* infection in different age groups ranging from (18-27) to (≤58). The highest infection rate found among young women in the age group (18–27) was 31.4%. Whereas, the lowest infected age was in the age group 48-57 years at 10.6%. There was a significant difference between the varied percentage by age.

Table .2. Some symptoms of infected women attending private and public health centers.

Accompanying Symptoms	**Absent**	**Present**	***P*-value**
Bacterial vaginosis			0.004**
	32 (17.1 %)	156 (82.9%)	
Previous genital infections			0.003*
	28(14.9%)	160 (85.1%)	
Vaginal discharge			0.002**
	10 (5.9%)	177(94.1%)	
Vaginal itching			0.001**
	8(4.3%)	180 (95.7%)	
Genital ulcer			

	12(6.4)	176(93.6)	0.001**

The most commonly observed symptoms among all participants were vaginal itching (95.7%) followed by vaginal discharge (94.1%). Moreover, the further communal symptom was genital ulcer (93.6%), and bacterial vaginosis (82.9%). There was 85.1% of women had a previous genital infection upon examination (table .2).

Table.3. Socio-demographic, vaginal hygienic, education level, health awareness, and employment status of 188 women attending obstetrics and gynecology clinic for *T. vaginalis* infection.

Factor	**N (%)**	**P-value**
Vaginal hygiene		*0.05
Good	27 (14.4%)	
Medium	55 (29.3%)	
Bad	106 (56.3%)	
Education level		0.06*
Primary and secondary	76 (40.42%)	
High school	52 (27.67%)	
Undergraduate	30 (15.96%)	
Postgraduate	30 (15.96%)	
Health awareness		0.03*
High	37 (19.6%)	
Medium	55 (29.3%)	
Low	96 (51.1%)	
Employment status		0.008*
Employed	160 (85.1%)	
Housewife	28 (14.9%)	

Table .3 shows that *T. vaginalis* infection was less common among women who had good vaginal hygiene (14.4%) than those with bad vaginal hygiene (56.3%) (P = 0.05).

Table.4. Comparison of some blood parameters between women who were uninfected and infected with *T. vaginalis*.

Parameters	**Infected (cells count)**	**Uninfected (cells count)**	**P-value**
RBCs ($X\,10^6/\,\mu L$)	3.34 ± 0.04	4.964± 0.061	0.05*
Hb (g/dl)	8.56 ± 1.09	12.138±1.09	0.0013**
WBCs ($X\,10^3/\mu L$)	7.53 ± 0.25	5.252 ± 0.198	0.0026**
Platelets($X\,10^3/\mu L$)	260.2 ± 7.56	310.940± 8.28	0.070

PCV (%)	29.806 ± 0.870	38.657 ± 0.298	0.001**

The results showed a significant decline in all accounts of blood parameters including white blood cells (P = 0.0026), and the concentration of hemoglobin (P = 0.0013) in patients with *T. vaginalis* infection compared to the healthy control group.

Discussion

T. vaginalis is discovered to be the main common parasite causing remediable sexually transmitted disease [9,10]. Hence, to find the prevalence of *T. vaginalis* infection in the Zawia city, this study was carried out. The current study found a significantly high prevalence at 23.40 % of *T. vaginalis* infection among Libyan women. This finding is comparable to a low prevalence of other Libyan cities including Obari 1.84 % [15], Nalout (0.35%) [17], and Benghazi 1.2% [16]. This result was similar to a previous study in Benghazi 2016 confirming the high prevalence of 24.5 % [18]. Meanwhile, there are several possible explanations for this result, firstly, may reflect the ongoing transmission of parasites among the general population in Libya after the civil war situation. Secondly, Zawia city, like other coastal cities in Libya, is a crossing point for African illegal immigration. This makes it the epicenter of many infectious diseases including sexually transmitted infections (STIs) such as *T. vaginalis.* Another important finding of this study is that there was a significant correlation between *T. vaginalis* infection and pregnancy (P = 0.003). Whereas, the lowest prevalence of infection was initiated in divorced women (7.3%).

This result is similar to other studies that have been performed in Obari and Benghazi [15, 18, 19]. In Libya, the diagnosis of trichomoniasis should be made when clinical signs and public health symptoms of trichomoniasis are present in patients. This is because Libya does not have an active national or regional surveillance and control program for trichomoniasis. The other initial aim of this work was to determine any relationship between *Trichomonas vaginalis* infection and age as well as some symptoms of infection. The highest infection rate was found among the age group (18 – 27) which was (31.4 %). Whereas, the lowest infected age was in the age group 48 – 57 years (10.6 %) P = 0.01. This interesting finding is in contrast with Abdulkadir's study in Sebha, which found that the highest age group was 29-34 years (6.4 %) [19]. However, this result is similar to Benghazi's outcome, which showed the highest age group was 17-29 (21.4%) [18] and might be related to the different marrying ages of these studied regions.

In the current study, the most commonly observed symptoms among all participants were significantly high vaginal discharge (94.1%) and vaginal itching (95.7%) P = 0.001, and 0.002, respectively. Remarkably, the majority of women who had genital ulcers (93.6%), were strongly associated with the presence of bacterial vaginosis (82.9%) as well as previous genital infection (85.1%). These findings are in agreement with the results in other studies [15, 17, 18], even though they were in different environments.

The study has revealed that majority of participants had a lack of knowledge about a good way of vaginal hygiene. This was reflected in the statical analysis of results which showed a significant dissimilar between different groups of women (P = 0.05). Unfortunately, the hygiene question did not differentiate between urination and excretion, or asked whether the cleaning style included both anus and vagina. It is possible that such cleaning may carry some pathogens from the perianal area to the vagina, as bacteria causing vagina infection may be found in pregenital areas [19]. One of the most important risk factors for the distribution of any infection is education, therefore, the research has also focused on its effect. The results found a strong association between education level and health cognizance in the prevalence of *T. vaginalis* infection. Women who had a low education level have the highest percentage of infection (40.42 %), (P = 0.06). this finding was similar to many studies around the world [8, 12, 16, 17, 18]. However, the low percentage of infection was associated with the participants who had a high, undergraduate, and postgraduate level of education a 27.67%, 15.16%, respectively (P = 0.06). Health awareness is another risk factor associated with infection that was investigated. The statical analysis of results showed that women who had a high level of health awareness showed a less fortuitous infection (19.6%) compared to those with a low level of health awareness (51.1%) P = 0.03. In bivariable analysis, independent interpreters associated with *T. vaginalis* involved employment women (85.1%) compared to housewife women (14.9) P = 0.008 (Table .3).

The study indicated that, city of Zawia is characterized by medium literacy levels, mostly among young aged of women. Basic and cultural fluctuations focusing on the financial empowerment of communities, including improved knowledge of education, and laws protecting women from early marriage will be necessary to reduce the high infection of *T. vaginalis* among Libyan women. Contrary to expectations, this study found a significant difference between the rate of infection between employment women (85.1%) compared to housewife women (14.9) P = 0.008. The

current study's findings supported that of Thornton's previous research [20]. In contrast, this finding disagreed with a study performed in Southwest Ethiopia, which have found that occupation is not associated with *T. vaginalis* infection [4]. A possible explanation for these results may be due to the lack of satisfactory toilets and poor facilities in many workplaces in most areas around Libya, particularly in Zawia city.

The number of red blood cells significantly decreased ($P = 0.05$) as well as the Hb concentration ($P = 0.0013$) in infected women compared with uninfected ones. This finding might be resulting in the haemolysis of red blood cells to limit the infection progression of *T. vaginalis* by phagocytosing parasites. One of the most common reasons for anemia in *T. vaginalis* infection is bleeding in the catamenial and the rise of the haemolysis of RBCs that result from iron deficiency anemia (IDA). These results are in agreement with Demirezens's findings [20]. Moreover, the present findings have indicated a significant increase in white blood cell count in patients with *T. vaginalis* infection associated with the uninfected group. In contrast, the statistical analysis of our data indicated a decline in the concentration of both PCV and platelets in infected women with *T. vaginalis* compared to healthy women. This result might lead to decrease in red blood cell counts in women, however the disease found also in men and cause similar pathogenicity [21]. A possible explanation for these results may be due to the response of WBCs against the parasite infection as it is the main first line of immune defense that attack any microbes. Also, the white blood cells can also produce IL-8 which acts against this parasite infection.

Conclusion: The study concluded that the prevalence of *T. vaginalis* infection among women in Zawia city was significantly high. Therefore, optimal control and prevention strategies for parasite infection must be introduced as a resource of cultural differences reducing hostile health results due to this infection. However further research work still required to study the association between the blood parameters and pathogenicity of trichomoniasis in Libyan women.

Conflict of interest

The authors declare that they have no conflict of interest.

References

1. Schwebke, J. Screening for *Trichomonas vaginalis* in a large high-risk population: prevalence among men and women determined by nucleic acid amplification testing. *Sex Transm Dis*. 2018; 45(5): e23-e24.

2. Vargas, L. High prevalence of syphilis in parturient women and congenital syphilis cases in public maternities in Salvador-Bahia Brazil. *Bjog*. 2018.
3. Jatau ED, Olonitola OS, Olayinka AT. Prevalence of trichomonas infection among women attending antenatal clinics in Zaria, Nigeria. *Ann Afr Med.* 2006; 5:178-81
4. Abdurehman Eshete, Zeleke Mekonnen, and Ahmed Zeynudin. *Trichomonas vaginalis* Infection among Pregnant Women in Jimma University Specialized Hospital, Southwest Ethiopia. ISRN *Infectious Diseases*.2013; ID 485439.
5. Sanders, E.J. High prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae infections among HIV-1 negative men who have sex with men in coastal Kenya. *Sex Transm Infect*. 2010;86 (6):440-1.
6. Madico G, Quinn TC, Rompalo A. Diagnosis of *Trichomonas vaginalis* infection by PCR using vaginal swab samples. J Clin *Microbiol* 1998; 36: 3205–3210.
7. Silver BJ, Guy RJ, Kaldor JM. Trichomonas vaginalis as a cause of perinatal morbidity: a systematic review and meta-analysis. *Sex Trans Dis* 2014; 41: 369–376
8. Torok, M. R., W. C. Miller, M. M. Hobbs, P. D. Macdonald, P. A. Leone, J. R. Schwebke, and A. C. Sena. The association between oral contraceptives, depot-medroxyprogesterone acetate, and trichomoniasis', *Sex Transm Dis*, 2009; 36: 336–40
9. World Health Organization: Global incidence and prevalence of selected curable sexually transmitted infections – 2008: World Health Organization, Geneva, 2012. www.who.int/reproductive health/publications/rtis/2008-STI-estimates.pdf
10. WHO. Trichomoniasis – CDC Fact Sheet. Centers for Disease Control and Prevention, 2017.
11. Sharma A. K, Ranjan R, and Meheta G. Prevalence and determinants of reproductive tract infections among women. *J. Commun. Dis*. 2004, 36: 93-9.
12. Mahmoud, A., N. A. Sherif, R. Abdella, A. R. El-Genedy, A. Y. El Kateb, and A. N. Askalani. Prevalence of Trichomonas vaginalis infection among Egyptian women using culture and Latex agglutination: a cross-sectional study, *BMC Women's Health*, 2015:15: 7
13. Abdel-Magied, A. A., E. I. El-Kholya, S. M. Abou El-Khair, E. S. Abdelmegeed, M. M. Hamoudaa, S. A Mohamed, and N. L. El-Tantawy. 'The genetic diversity of metronidazole susceptibility in Trichomonas vaginalis clinical isolates in an Egyptian population, *Parasitol Res*, 2017:116: 3125–30.
14. Mahdi Delavari, Zohreh Fakhrieh-Kashan, Hossein Hooshyar, Review of *Trichomonas vaginalis* in Iran, Based on Epidemiological Situation Mohsen ArbabiJ Reprod Infertil. 2018;19(2):82-88.
15. Rugaia Algazaui, Abdul Hafeez Khan,Yosef Kubti .. Trichomonas vaginalis among Pregnant Women in Obari, Libya, *Sebha Medical Journal*. 2007; Vol. 6(2)
16. Kassem, H. H. and Majoud, O. A. Trichomonas among women with vaginal discharge in Benghazi City, Libya. *J Egyp Soc Parasitol*. 2006; 36: 1007- 16.
17. Al- Kilani, M. K., Dahesh, S. M. and El Tawed, H. A. Human urinary parasites in Nalout Popularity, Libya. *J Egyp Soc Parasitol*. 2008; 38: 393- 398.
18. Eman Z Younis, Adela H Elamami. Trichomonas vaginalis Infection in Women with Type 2 Diabetes Mellitus and Vaginal Discharge in Benghazi, Libya, *Ibnosina Journal of Medicine and Biomedical Sciences* · DOI: 10.4103/1947-489X.210222.
19. Abdulkadir Abugrara Ali Bernawi, AbdulHafeez Khan,SalhaAli Sallam. Prevalence of Trichomonas vaginalis among married women attending some Clinics and Medical Centers at Sebha.Libya. *Journal of Sebha University, Pure and Applied Sciences*. 2006; Vol.15 No.2.

20. Thornton, A.C., Dale, T., Fortenberry, D. and Logan, T.K. Occurrence of trichomoniasis in college of women. *J Adolesc Gynecol*. 2003;12(2): 34-38.
21. Zhang Z, Sang Y, Wu P, Shang Y, Li l, Duan Y, Zhao L, Gao M, Guo L, Tin X, Yang Z, Wang S, Hao L, Mei X. Prevelance and Genotype of *Trichomonas vaginalis* among men in Xinxiang city, Henan Province, China. *J Trop Med*. 2023. Feb 28;2023:4119956. Doi:10.1155/2023/4119956. PMID:36895425; PMCID: PMC991476.