Trichomoniasis in older individuals: a preliminary report from Iran

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Abstract Infection with *Trichomonas vaginalis* is one of the most common sexually transmitted diseases (STDs) in humans. The prevalence of infection in Iran has been reported 0.009–8 % depending on deferent socio-cultural conditions. This study aimed to determine the frequency of *T. vaginalis* according to age in patients referred to clinics, hospitals and medical diagnostic laboratories in Karaj city, Iran. For this purpose, fifty positive samples were collected from July 2012 to June 2014 from clinics, medical diagnostic laboratories and hospitals, then transferred to laboratory of parasitology and cultured in TYM medium. The results showed that all isolates were successfully cultured. Among 50 positive specimens, 43 cases were female and 7 cases male. The most positive cases (34 %) belonged to the ages over 50 year's group. The lowest positive cases (2 %) belonged to the ages of less than 20 years group. In Conclusion, unlike other STDs, which have a higher prevalence among adolescents and young adults, the rates of trichomoniasis are more evenly distributed among sexually active women of all age groups. However, frequency of this infection in women aged over 50 years (age of menopause) is notable and complementary studies are needed.

Keywords *Trichomonas vaginalis* · Age · Gender · Older individuals · Karaj · Iran

Introduction

Trichomoniasis, the most common non-viral sexually transmitted infection (STI), is caused by the motile parasitic protozoan *Trichomonas vaginalis*. According to the World Health Organization (WHO), an estimated 276 million individuals are infected with *T. vaginalis* (Rowley et al. 2012). In 2010, the prevalence of *T. vaginalis* was reported as 2.7 % in women and 1.4 % in men (Vos et al. 2013). While various studies have calculated the prevalence of trichomoniasis in Iran as 0.009–8 %, the rate can even reach 38.8 % considering the existing sociocultural factors in the country (Hezarjaribi et al. 2015).

Trichomoniasis often leads to vaginitis in women and urethritis and prostatitis in men. Moreover, infection with *T. vaginalis* in pregnant women has been associated with premature rupture of membranes, premature labor, abortion, low birth weight, and increased infant mortality (Cotch et al. 1997; Cherpès et al. 2006). Another serious aspect of trichomoniasis is its relationship with an increased risk for human immunodeficiency virus (HIV) and human papillomavirus (HPV) infections (Minkoff et al. 1984; McClelland et al. 2007; Lazenby et al. 2014; Van Der Pol et al. 2008). It can also cause prostatitis, balanoposthitis, epididymitis, reduced sperm function, infertility, and higher risk of prostate cancer in men (Harp and Chowdhury 2011; Petrin et al. 1998; Cudmore et al. 2004; Twu et al. 2014).

Karaj city is the center of Alborz province, northern Iran (Latitude: 35°48'N; Longitude: 51°00'E) and is located near Tehran, the capital of Iran. Now, Karaj is one of the metropolises of the country. The annual population growth of this city is the highest. The population of this city includes people of all ethnic groups of Iran, thus this city is named “small Iran”. So, it is ideal for epidemiological studies.

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In Iran, *T. vaginalis* is often diagnosed based on clinical findings and without laboratory tests. However, due to drug side effects and resistance, it should be treated after laboratory diagnosis. Considering the necessity of identification and treatment of individuals infected with this important disease, this study aimed to determine the frequency of *T. vaginalis* in different age and sex groups of patients attending clinics, hospitals, and medical laboratories in Karaj, Iran.

Materials and methods

This cross-sectional study was conducted from July 2012 to June 2014. Fifty urine sediment or vaginal samples positive for *T. vaginalis* were obtained from patients visiting Kamali Hospital and six private medical laboratories in Karaj, Iran. The samples were collected from women and men of any age and demographic characteristics including patients' age and gender along with type, date, and place of samples were recorded. Diagnostic methods were wet mount and culture (as the gold standard). All samples were first examined by wet mount. The positive samples were then cultured at 37 °C on Diamond's trypticase-yeast extract-maltose (TYM) medium (Diamond 1957) supplemented with 10 % calf serum, antibiotic (100 µg/mL ceftriaxone and 50 µg/mL ciprofloxacin), and fungicides (2.5 µg/mL amphotericin B). All samples were observed microscopically for the presence of *T. vaginalis* daily for 7 days. The culture medium was tested daily up to 7 days until the samples turned positive. All procedures performed in studies involving human participants were in accordance with the ethical standards of the Tarbiat Modares University ethical committee with number 52/2062 and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

All isolates that were diagnosed by wet mount were successfully cultured. The infected individuals' age ranged between 18 and 76 years old. Among 50 positive specimens, 43 cases were female and seven cases were male. All samples of men and 95 % samples of women (41 cases) were isolated from urine sediment. Table 1 summarizes the frequency of individuals with *T. vaginalis* infection stratified for age and gender. Figures 1 and 2 show the percentage of individuals with *T. vaginalis* in different age groups and different seasons.

The results indicate that the highest frequency of positive samples was detected in subjects over 50 years of age (34 %) and those between 31 and 40 years old (30 %). The

Table 1 The frequency of individuals with *T. vaginalis* infection according to the age and gender

Age group (years)	>20	21–30	31–40	41–50	<50	Total
Men	0	0	1	0	6	7
Women	1	8	14	9	11	43
Total	1	8	15	9	17	50
Percentage	2	16	30	18	34	100

Fig. 1 The percentage of individuals with *T. vaginalis* in segregated age groups in Karaj city, Iran (2012–2014)

Fig. 2 Seasonally distribution of *T. vaginalis* infection from 2012 to 2014

lowest frequency belonged to patients younger than 20 years old (2 %). Infection with *T. vaginalis* was most prevalent in autumn.

Discussion

According to our findings, the highest frequency of trichomoniasis was seen in individuals over 50 years of age. In addition, the infection was more prevalent in women than in men. The majority of epidemiological studies in Iran and other countries have evaluated 15–45-year-old, who were sexually active and had referred to gynecology centers (Hezarjaribi et al. 2015; Bakhtiari et al. 2008; Matini et al. 2012). The reports of trichomoniasis in Iran

are different. The prevalence of trichomoniasis in some areas of Iran is consist of: 9.2 % in Tabriz (Gavvani et al. 2008), 3.3 % Zanzan (Nourian et al. 2013), 3.2 % in Tehran (Rezaeian et al. 2009), 2 % in Yazd and Ksshan (Bafghi et al. 2009; Arbabi et al. 2014) and 1.2 % in Hamedan (Matini et al. 2012) but Karaj city has not been investigated. We, however, recruited samples from both genders and all age groups. The difference in the prevalence of infection may depend on the selected population groups, methods of examination, and sites of specimen collection. Increasing numbers of *T. vaginalis* infection cases have been recorded in recent years. Development of novel diagnostic methods, especially molecular methods, can be main accountable for such a trend (Lusk et al. 2010).

In the study by Spinillo et al. (1997), trichomoniasis was significantly more common among postmenopausal women compared with women of reproductive age. Studies in US showed that the mean age of women and men infected with *T. vaginalis* were significantly higher than those infected with other STIs and the average age of *T. vaginalis* infected men was almost a decade older than in infected women (Munson et al. 2012, 2013). In men, it may be partly due to age specific sexual partnerships with older infected women and changes in reproductive hormone levels have been suggested to contribute to higher *T. vaginalis* prevalence (Poynten et al. 2013).

Research has suggested the high prevalence of *T. vaginalis* among the 41–45-year-old population (Depuydt et al. 2010). Using polymerase chain reaction (PCR), a previous study showed that *T. vaginalis* was more prevalent among middle-aged women (≥ 45 years) in all three included states of the USA (Stemmer et al. 2012). However, some scholars believed that increased prevalence of *T. vaginalis* in middle-aged women was linked to their sexual activity rather than hormonal changes. They found in their study that a disproportionate number of immigrant women in the *T. vaginalis* positive group and confirmed a relationship between *T. vaginalis* infection and sex tourism and/or prostitution of elderly women (Depuydt et al. 2010; Donders et al. 2013). A survey of 1300 men and women ≥ 60 years of age, performed in 1998, found that 48 % of the respondents were sexually active (Dunn and Cutler 2000). Through maintaining the effects of estrogen in female genital tract, the widespread use of estrogen replacement therapy may also contribute to the higher prevalence of *T. vaginalis* among postmenopausal women. On the other hand, low concentrations of estrogen in postmenopausal women who do not use estrogen replacement therapy might promote the clearance of *T. vaginalis* infection (Bowden and Garnett 2000; Sharma et al. 1997). Also, In older, postmenopausal women, vaginitis is less likely to have for this reason that it is more likely to be the result of the atrophic effects of estrogen deficiency and the

lack of estrogen in older women leads to a thinning of the vaginal epithelium and a reduction in epithelial glycogen content, which leads to alteration in the vaginal pH and lactobacilli microflora (Calvet 2003).

Biological differences between two sexes explain why women have a higher incidence of infection compared with men (Figuerola-Angulo et al. 2012). These parasites expose an iron-rich environment in the vagina and a hostile, zinc-rich environment in the prostatic glands. Zinc is a known antimicrobial chemical defense in humans. Men with less than 1.6 mM zinc in their prostatic secretions can suffer chronic prostatitis due to *T. vaginalis* infection (Krieger and Rein 1982; Figuerola-Angulo et al. 2012). While symptomatic *T. vaginalis* infection in men is typically treated spontaneously within 10 days, it can remain in women for year (Hobbs et al. 2008; Poole and McClelland 2013).

Conclusion

Unlike other sexually transmitted diseases, which have a higher prevalence among adolescents and young adults, the rates of trichomoniasis are more evenly distributed among sexually active women of all age groups. However, frequency of this infection in women aged over 50 years (age of menopause) is notable that it can be related to estrogen replacement therapy and sexual activities, which complementary studies are needed.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

- Arbabi M, Fakhrieh Z, Delavari M, Abdoli A (2014) Prevalence of *Trichomonas vaginalis* infection in Kashan city, Iran (2012–2013). Iran J Reprod Med 12(7):507–512
- Bafghi AF, Aflatoonian A, Barzegar K, Ghafourzadeh M (2009) Frequency distribution of trichomoniasis in pregnant women referred to health centers of Ardakan, Meibod and Yazd, Iran. Jundishapur J Microbiol 2(4):132–139
- Bakhtiari A, Hajian-Tilaki K, Pasha H (2008) Genital infection by *Trichomonas vaginalis* in women referring to Babol health centers: prevalence and risk factors. IRCMJ 10(1):16–21
- Bowden FJ, Garnett GP (2000) *Trichomonas vaginalis* epidemiology: parameterising and analysing a model of treatment interventions. Sex Transm Infect 76:248–256
- Calvet HM (2003) Sexually transmitted diseases other than human immunodeficiency virus infection in older adults. Clin Infect Dis 36:609–614

- Cherpes TL, Wiesenfeld HC, Melan MA, Kant JA, Cosentino LA, Meyn LA et al (2006) The associations between pelvic inflammatory disease, *Trichomonas vaginalis* infection, and positive herpes simplex virus type 2 serology. *Sex Transm Dis* 33(12):747–752
- Cotch MF, Pastorek JG, Nugent RP, Hillier SL, Gibbs RS, Martin DH et al (1997) *Trichomonas vaginalis* associated with low birth weight and preterm delivery. *Sex Transm Dis* 24(6):353–360
- Cudmore SL, Delgaty KL, Shannon F, Petrin DP, Garber GE, Hayward-McClelland SF et al (2004) Treatment of infections caused by metronidazole-resistant *Trichomonas vaginalis*. *Clin Microbiol Rev* 17(4):783–793
- Depuydt CE, Leuridan E, Van Damme P, Bogers J, Vereecken AJ, Donders GGG (2010) Epidemiology of *Trichomonas vaginalis* and human papillomavirus infection detected by real-time PCR in Flanders. *Gynecol Obstet Invest* 70(4):273–280
- Diamond LS (1957) The establishment of various trichomonads of animals and man in axenic cultures. *J Parasitol* 43(4):488–490
- Donders GGG, Depuydt C, Letter C (2013) Increased prevalence of *Trichomonas vaginalis* in mid-aged women is linked to sexual activity and not to hormonal changes. *J Low Genit Tract Dis* 17(4):1–2
- Dunn ME, Cutler N (2000) Sexual issues in older adults. *AIDS Patient Care STDS* 14(2):67–69
- Figuerola-Angulo EE, Rendón-Gandarilla FJ, Puente-rivera J, Calla-Choque JS, Cárdenas-Guerra RE, Ortega-López J et al (2012) The effects of environmental factors on the virulence of *Trichomonas vaginalis*. *Microb Infect* 14(15):1411–1427
- Gavvani A-SM, Namazi A, Ghazanchaei A, Alizadeh S, Sehhati F, Rostamzadeh S et al (2008) Prevalence and risk factors of trichomoniasis among women in Tabriz. *Iran J Clin Infect Dis* 3(2):67–71
- Harp DF, Chowdhury I (2011) Trichomoniasis: evaluation to execution. *Eur J Obstet Gynecol Reprod Biol* 157:3–9
- Hezarjaribi HZ, Fakhar M, Shokri A (2015) *Trichomonas vaginalis* infection among Iranian general population of women: a systematic review and meta-analysis. *Parasitol Res* 114:1291–1300
- Hobbs M, Sena A, Swygard H, Schwebke JR (2008) *Trichomonas vaginalis* and trichomoniasis. In: Holmes K, Sparling P, Stamm W (eds) *Sexually Transmitted Diseases*. McGraw Hill, New York, pp 771–794
- Krieger JN, Rein MF (1982) Zinc sensitivity of *Trichomonas vaginalis*: in vitro studies and clinical implications. *J Infect Dis* 146(3):341–345
- Lazenby GB, Taylor PT, Badman BS, Mchaki E, Korte JE, Soper DE et al (2014) An association between *Trichomonas vaginalis* and high-risk human papillomavirus in rural Tanzanian women undergoing cervical cancer screening. *Clin Ther* 36(1):38–45
- Lusk MJ, Naing Z, Rayner B, Rismanto N, McIver CJ, Cumming RG et al (2010) *Trichomonas vaginalis*: underdiagnosis in urban Australia could facilitate re-emergence. *Sex Transm Infect* 86(3):227–230
- Matini M, Rezaie S, Mohebbi M, Rabiee S, Fallah M, Rezaeian M (2012) Prevalence of *Trichomonas vaginalis* infection in Hamadan City, Western Iran. *Iran J Parasitol* 7(2):67–72
- McClelland RS, Sangaré L, Hassan WM, Lavreys L, Mandaliya K, Kiari J et al (2007) Infection with *Trichomonas vaginalis* increases the risk of HIV-1 acquisition. *J Infect Dis* 195(5):698–702
- Minkoff H, Grunebaum AN, Schwarz RH, Feldman J, Cummings M, Crombleholme W et al (1984) Risk factors for prematurity and premature rupture of membranes: a prospective study of the vaginal flora in pregnancy. *Am J Obstet Gynecol* 150(8):965–972
- Munson E, Kramme T, Napierala M, Munson KL, Miller C, Hryciuk JE (2012) Female epidemiology of transcription-mediated amplification-based *Trichomonas vaginalis* detection in a metropolitan setting with a high prevalence of sexually transmitted infection. *J Clin Microbiol* 50(12):3927–3931
- Munson KL, Napierala M, Munson E, Schell RF, Kramme T, Miller C, Hryciuk JE (2013) Screening of male patients for *Trichomonas vaginalis* with transcription-mediated amplification in a community with a high prevalence of sexually transmitted infection. *J Clin Microbiol* 51:101–104
- Nourian A, Shabani N, Fazaeli A, Mousavinasab SN (2013) Prevalence of *Trichomonas vaginalis* in pregnant women in Zanjan, Northwest of Iran. *Jundishapur J Microbiol* 6(8):e7258
- Petrin D, Delgaty K, Bhatt R, Garber G (1998) Clinical and microbiological aspects of *Trichomonas vaginalis*. *Clin Microbiol Rev* 11(2):300–317
- Poole DN, McClelland RS (2013) Global epidemiology of *Trichomonas vaginalis*. *Sex Transm Dis* 89(6):418–422
- Poynten IM, Poynten IM, Grulich AE, Templeton DJ (2013) Sexually transmitted infections in older populations. *Curr Opin Infect Dis* 26:80–85
- Rezaeian M, Vatanshenassan M, Rezaie S, Mohebbi M, Niromand N, Niyyati M et al (2009) Prevalence of *Trichomonas vaginalis* using parasitological methods in Tehran. *Iran J Parasitol* 4(4):43–47
- Rowley J, Toskin I, Ndowa F (2012) Global incidence and prevalence of selected curable sexually transmitted infections—2008. World Health Organization, Geneva, pp 1–20
- Sharma R, Pickering J, McCormack WM (1997) Trichomoniasis in a postmenopausal woman cured after discontinuation of estrogen replacement therapy. *Sex Transm Dis* 24(9):543–545
- Spinillo A, Bernuzzi AM, Cevini C, Gulminetti R, Luzi S, De Santolo A (1997) The relationship of bacterial vaginosis, *Candida* and *Trichomonas* infection to symptomatic vaginitis in postmenopausal women attending a vaginitis clinic. *Maturitas* 27(3):253–260
- Stemmer SM, Adelson ME, Trama JP, Dorak MT, Mordechai E (2012) Detection rates of *Trichomonas vaginalis*, in different age groups, using real-time polymerase chain reaction. *J Low Genit Tract Dis* 16(4):352–357
- Twu O, Dessi D, Vu A, Mercer F, Stevens GC, De Miguel N et al (2014) *Trichomonas vaginalis* homolog of macrophage migration inhibitory factor induces prostate cell growth, invasiveness, and inflammatory responses. *PNAS* 111(22):8179–8184
- Van Der Pol B, Kwok C, Pierre-Louis B, Rinaldi A, Salata RA, Chen P-L et al (2008) *Trichomonas vaginalis* infection and human immunodeficiency virus acquisition in African women. *J Infect Dis* 197(4):548–554
- Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M et al (2013) Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 380(9859):2163–2196