

Original Research Article

PREVALENCE OF TRICHOMONS VAGINALIS INFECTION AMONG FEMALE INTERNALLY DISPLACED PERSONS IN MAIDUGURI, NIGERIA

ABSTRACT

Trichomonas vaginalis is the most common aetiological agent of sexually transmitted infection caused by a single known parasite, which serves as a vector for the spread of other pathogens to the surface into the fallopian tube, and it has been associated with an increased risk of HIV acquisition. The study was a cross-sectional survey of 200 internally displaced women aged 11 to 45 years, from the four IDP camps conducted between July to November 2016 in Maiduguri, Nigeria. An informed consent of every woman was obtained before a sample of the high vaginal swab was carefully and aseptically collected using a well-labeled, sterile, non-abrasive high vaginal swab stick and was immediately inoculated into OXOID *Trichomonas* medium and incubated for 24 to 72 hours. The presence of *T. vaginalis* was detected by its characteristic jerky motion. *Trichomonas vaginalis* infection varied in the IDPs, being highest in Dalori camp 13(26.0%) and least in National Youth Service Corp 7(14.0%). It was found that this parasite is predominantly high in age groups 25 - 30 years with 25% infection rate, while no infection was recorded among women greater than 40 years. We observed high prevalence among married women with 21.6%. Non-formal educated women had the highest infection of 22.3%, while tertiary educated women had only 1.0%. Occupational related prevalence showed that traders were the most infected with 25.0% while students had the lowest infection rate of 7.1%. The study observed the highest *T. vaginalis* infection among non-pregnant women with 20.8%. It was concluded that there is 20.5% high prevalence of *T. vaginalis* infection among female internally displaced persons in Maiduguri and as such should be controlled with extensive public health education, adequate treatment of both spouses, implementation of effective screening programmes, sex education, free treatment, and awareness creation to the public, on health implication of *T. vaginalis* infection.

Keywords: *Trichomonas vaginalis*, Infection, IDP camps, Maiduguri

INTRODUCTION

Trichomonas vaginalis is a flagellated unicellular, anaerobic protozoan with four free flagella and one free flagellum attached to the undulated membrane, it was first observed by Donne in 1836 (Arora and Arora, 2011). It is the aetiological agent of the disease trichomoniasis that is commonly non-viral sexually transmitted infection (Petrin *et al.*, 1998; Johnson and Mebey 2008). Trichomoniasis is a sexually transmitted infection which can occur in females if the normal acidity of the vagina is shifted from a healthy, semi-acidic pH

(3.8-4.2) to a much more basic or alkaline (5.0-6.0) that is conducive to *T. vaginalis* growth (Moodley, *et al.*, 2004). The infection is more common in women than men, and older women are more likely to be infected than younger ones (Johnson and Mebey, 2008). Trichomoniasis spread predominantly through unprotected sexual intercourse with an infected partner or via the fingers after masturbation (Hobbs, *et al.*, 2008). Neonatal trichomoniasis can be acquired during passage through an infected birth canal. It is estimated that 2% to 17% of female babies acquire trichomoniasis through direct vulvo vaginal contamination (Ochei, *et al.*, 2014). In women, the most commonly infected part is the lower genital tract (vulva, vagina or urethra). It is not common for the parasite to infect other parts of the body, like the hands, mouth or anus (Dinop, *et al.*, 1998).

Trichomonas infection has been associated with discomfort, psychosocial distress, pelvic inflammatory disease, post abortion infection, post-caesarean, preterm birth, low birth weight infants and preterm labour untreated infection can persist up to 5 years (Graves, *et al.*, 1993). Other complications caused by the organism include pelvic inflammatory disease and tubal infertility, vaginitis and cervicitis (Moodley, *et al.*, 2002). Trichomoniasis is not self-limiting and produces non-ulcerative inflammation of the genital epithelium that can progress to necrosis and haemorrhage (Wasserheit, 1992; Viikki, *et al.*, 2000). The infection is rarely reported in females before puberty or after menopause, but it is common during childbearing and culminating during pregnancy (Hira, 1977). The patient clinically presents with profuse creamy-greenish-yellowish vaginal discharge that is frothy and malodor, dysuria and itching or irritation. In some women, the infection results in burning sensation when urinating, pain during sexual intercourse or abdominal discomfort (Wasserheit, 1992).

Forna and Galmezoglu (2002) asserted that 40% of pregnant women infected with *Trichomons vaginalis* are more likely to have infants who are both preterm and of low birth weight. The preterm childbirth is the leading cause of illness and death in newborn babies.

However, Uneke (2006) stated that infected pregnant women have risk of an adverse birth case of premature rupture of membranes, premature labour, low birth weight, and post – abortion or post-hysterectomy infection, as well as infertility and enhanced predisposition to neoplastic transformation in cervical tissues. As with other sexually transmitted infections, the trichomonas infection can also increase the risk of transmission of HIV infection (Cohen, 2000; Upcroft and Upcroft, 2002; Jatau, *et al.*, 2006). *Trichomons vaginalis* infection is one of the major health problems in the world, and one of the most commonly transmitted infections in many regions including the developed countries such as United State (Parbara, 2005). The prevalence rate estimated varies between populations studied falling in the range from 0.4 to 27.4% in women and 0.0 to 5.6% in men (Swygard *et al.*, 2004). However, World Health Organization (WHO), reported that 170 million new infections occur annually throughout the world (WHO, 2001) and it also estimated 276.4 million new cases of trichomoniasis occurred globally in 2008 (WHO, 2012). Prevalence of 15% was reported from four villages of Ekwulumili Community Anambra State, Southeastern Nigeria (Onyido *et al.*, 2014), also 10.99% prevalence of *T. vaginalis* infection among women attending antenatal in three hospitals in Maiduguri was recorded (Mairiga, *et al.*, 2011).

MATERIALS AND METHODS

Study area

The study was conducted in Maiduguri the capital of Borno State and is situated at 11.85° North latitude, 13.16° East longitude and 300 meters elevation above the sea level. Maiduguri is a very large town in Nigeria, having about 1,112,449 inhabitants. It occupies an area of 50,778Km² (square Kilometer).

The climate of Maiduguri is favourable with a mean annual maximum temperature of 34 – 38°C, the months of March and April are known to be the hottest periods of the year

with temperature ranging between 30 – 40^oC. It is usually cold during harmatan period from November to January. Like many other parts of Nigeria, the area has two major seasons, the dry and the rainy season. Dry season usually last between October to May and the rainy season from June to September. The population of the state (according to the 2006 National population census) was 4 151 193 (64.37% rural populace and 35.63% urban populace) (Federal Office of Statistics, 2006). Populations of the four IDP camps visited were as follows: 22,220 in Daloro FCT, Bakasi 21,209, NYSC 5,129 and Teacher village 9,312 (Federal Office of Statistics, 2016). Maiduguri is a cosmopolitan town; all the ethnic groups of Nigeria inhabit it.

Study population

The study was a cross-sectional survey of 200 female internally displaced persons aged above 10 years who visited IDP clinics with or without complaints of vaginal and cervical infections and enrolled in the study. The study was conducted over a period of five months between July to November 2016. Structured questionnaire was employed to obtain relevant information from the subjects. The information obtained via questionnaire include age of subjects, pregnancy status, number of sexual partners and marital status among others.

Women within the age group who declined to give consent to participate, or who took broad-spectrum antimicrobial agents three weeks before the study and who are virgins were all excluded from the study.

Ethical consideration

Ethical approval was obtained from State Ministry of Health Maiduguri, Borno State and permits were issued from Headquarters 7 Division Nigeria Army Maimalari Contonment, Maiduguri, National State Emergencies (NEMA) and State Emergency Management Agencies (SEMA). Informed consents were sought for from all the subjects that were willing to participate in the study.

Sample collection

High vaginal swab samples were carefully and aseptically obtained from the posterior fornix of the vagina using a well labelled, sterile, non-abrasive high vaginal swab stick from each subject by a qualified research assistant. The tips of the of the other swab sticks were immediately cut off and inoculated into OXOID trichomonas media the transport media.

Laboratory diagnoses

The specimens were inoculated into the medium immediately after collection by cutting the tip of the swab sticks into the medium, which was also gently rolled. The inoculated medium in Bijou bottles were labeled and incubated at 37°C for 24 to 72 hours. Finally, microscopic examination was done at intervals of 24, 48 and 72 hours under x10 and x40 magnification in identifying the characteristic pear-shaped morphology and quick jerky or darting motility of *Trichomonads*.

Statistical analysis

Data generated from the study were analyzed using Statistical Package for the Social Sciences (SPSS) version 20 (IBM SPSS Inc, USA). Proportions were compared using Chi-square with p-value of < 0.05 considered significant.

RESULTS

Of the overall 200 internally displaced women studied 41(20.5%) were infected with *Trichomons vaginalis*, with the highest prevalence rate among women in Dalori camp having 26.0%, Teachers' village had 22.0%, while 20.0% and 14.0% were recorded Bakasi and NYSC respectively indicating no statistical significant difference among IDP camps ($\chi^2 = 2.301$; $p = 0.512$) (in Table 1).

Prevalence of *Trichomonas vaginalis* infection in relation to socio-demographic factors shown in Table 2. The highest prevalence rate was 25.0% recorded in age groups 21 -

25 years with the low prevalence rates of 11.1% on 11 – 15 years and 0.0% among women above 40 years. The prevalence rates tend to decrease in elderly women but the difference was not statistically significant with other age groups ($\chi^2 = 4.168$ $p = 0.657$). In relation to marital status, the highest infection rate was observed among married women (21.6%), while singles and divorce had 20.0% each and 18.6% was observed and widows. The results showed no statistically significant difference in relation to marital status. Similar difference was also in relation to educational status but the highest was among non-formal educated women with 22.3% infection rate, while 18.8% primary, 14.3% secondary and 12.5% lowest prevalence rate among tertiary educated women respectively (Table 2). The study observed 25.0% high infection rate among traders, which could be attributed to poor personal hygiene and students had the lowest infection rate of 7.1% among others. The difference in the occupational status was not statistically significant (Table 2). High prevalence rate of 20.8% was recorded among non-pregnant women indicates no statistical significant difference in relationship to pregnant status ($p > 0.05$).

Table 1. Prevalence of *Trichomonas vaginalis* infections among female in four internally displaced persons' camps in Maiduguri, Nigeria

Camps	No. examined	No. positive	Prevalence (%)	χ^2	p. value
Dalori	50	13	26.0	2.301	.512
Teachers' village	50	11	22.0		
Bakasi	50	10	20.0		
NYSC	50	7	14.0		
Total	200	41	20.5		

Table 2. Prevalence of *Trichomonas vaginalis* infection in relation to socio-demographic factors in internally displaced persons' camps in Maiduguri, Nigeria

Factors	No. examined	No. Positive	Prevalence (%)	χ^2	p. value
Age (years)					
11 – 15	18	2	11.1	4.168	.657
16 – 20	34	7	17.6		
21 – 25	36	9	25.0		
26 – 30	52	12	23.1		
31 – 35	30	7	23.3		
36 – 40	24	4	16.7		
≥ 41	6	0	0.0		
Women status					
Single	40	8	20.0	.850	.997
Married	102	22	21.6		
Divorce	15	3	20.0		
Widow	43	8	18.6		
Educational level					
Primary	32	6	18.8	1.147	.765
Secondary	21	3	14.3		
Tertiary	8	1	12.5		
Non formal	139	31	22.3		
Occupation					
Civil servants	11	2	18.2	2.240	.692
Students	14	1	7.1		
Traders	32	8	25.0		
Knitters	61	14	23.0		
House wives	82	16	19.5		
Pregnancy status					
Pregnant	27	5	18.6	3.004	.539
Non pregnant	173	36	20.8		

DISCUSSION

This study observed an overall prevalence of 20.5% among 41 of 200 women in four IDP camps in Maiduguri and this high prevalence of trichomoniasis could be attributed to different factors such as poor sanitary condition, low level of education, socioeconomic, poor personal hygiene, drug abuse among others. On the contrary, the result is higher compared to Onyido, *et al.* (2014) who observed a prevalence of 15% among 100 women from four villages of Ekwulumili Community Anambra State, Southeastern Nigeria. The prevalence rate observed in this study was lower than Anosike *et al.* (1993) who observed 24.70% among students of higher institutions in southern Nigeria. The result of the study is contrary to Mairiga *et al.* (2011) who observed 10.99% prevalence among women attending antenatal visits in three hospitals in Maiduguri. The present infection rate was above the normal range in a healthy women population and this could be attributed to environmental and socioeconomic factors.

Prevalence in relation to age was high among women aged 25 to 30 years (25%) compared to elderly women above 40 years, which may be related to the development of acquired immunity to infection with increase of age and this is in agreement with (Adeoye and Akande 2007). *Trichomonas vaginalis* has a worldwide distribution and has been found in all age, racial and socioeconomic groups (Apalata *et al.*, 2014). The prevalence of *Trichomonas vaginalis* recorded in this study showed an increase in the reproductive age which is in agreement with (Joyner *et al.*, 2000; Ginocchio *et al.*, 2012). The anatomical structure of women makes them more vulnerable to factors such as lack of proper parental guidance and hard economic situation. The low infection rates among women aged greater than 40 years may probably be related to the development of acquired immunity to infection with increase in age. Prevalence was less among widows than married women, which is in agreement with Onyido *et al.* (2014) among rural women of Ekwulumili Community in

188 Nigeria.

189 Our study observed a high prevalence rate among non-formal educated women which
190 is in agreement with (Cotch, *et al.*, 1991; Aboyeji and Nwabuisi 2003). The high prevalence
191 rate could be attributed to sexual promiscuity among the non-formal educated women.
192 Therefore, there is the need for the provision of proper counseling and education on sexual
193 behaviour and genital hygiene, besides treatment, to control and prevent trichomoniasis
194 especially during pregnancy.

195 The prevalence of *Trichomonas vaginalis* infections among women occupational
196 groups in the camps showed that traders had the highest prevalence (25.0%) compared to
197 students with 7.1%. The high infection rate observed could be due to distance between the
198 spouses and also the reason for this outcome is somehow obscure but may be attributed to
199 low level of toilet sanitation in camps, or no personal preventive measures. Sexual liberalism
200 associated with wealth, poverty and ignorance, and lack of awareness of the public health
201 repercussions may likely be the foremost in the list of risk factors (Adeoye and Akande,
202 2007). The findings of this our study agrees with (Woken, 2006; Onyido 2014) who observed
203 equal prevalence among traders and stated that it could be attributed to their socioeconomic
204 status. We found no statistically significant difference in the frequency of trichomoniasis in
205 relation to Marital status. Similar lack of significance was also reported in other studies
206 (Buv'e *et al.*, 2001; Mahdi *et al.*, 2001).

207 Infection of *Trichomonas vaginalis* was less among pregnant women than among
208 pregnant women. This gives more evidence for the importance of regular clinical
209 investigations for early diagnosis and treatment of such urino-genital infections in women as
210 pregnant women are regularly visiting health units for routine check-up of pregnancy.
211 However, in other studies in Nigeria for example pregnancy status did not affect the
212 prevalence of trichomoniasis (Adeoye and Akande, 2007). This study reported 18.6% and

20.8% prevalence of trichomoniasis among pregnant and non-pregnant women. On the contrary, Onyido *et al.* (2014) observed 16.30% among non-pregnant women of Ekwulumili community Anambra State, Southeastern Nigeria *Trichomonas vaginalis* infections were not detected in pregnant women while a prevalence of 16.30% was observed among non-pregnant women. Several authors have shown a greater prevalence of trichomoniasis in multiparous women, women who married at an early age and during pregnancy. This is because the growth and multiplication of *Trichomonas vaginalis* is optimal in most milieus with temperatures between 35°C and 37°C and pH between 4.9 and 7.5. Also host factors which increase vaginal pH such as pregnancy, menses and co-incident anaerobic infections in the vaginal wall, appear to encourage the development of symptomatic trichomonal vaginitis (Agboola, 2006). Usanga *et al.* (2009) posited that pregnant women admitted that frequency of sexual intercourse decreases as pregnancy advances, which could be the reason for the low incidence of infection at second and third trimesters. Therefore, there is no consensus as to pregnancy predisposing the subjects to infection by *Trichomonas vaginalis*. Several other studies observed that pregnant women infected with *Trichomonas vaginalis* were 30% more likely than uninfected women to have low birth weight infants infected with conjunctivitis (Afoke *et al.*, 2005; Okonkwo *et al.*, 2010). However, Uneke, (2006) stated that infected pregnant women have risk of an adverse birth cases of premature rupture of membranes, premature labour, low birth weight, and post – abortion or post-hysterectomy infection, as well as infertility and enhanced predisposition to neoplastic transformation in cervical tissues. As for infection of trichomoniasis in relation to pregnancy status, prevalence rates were less among aborted and pregnant women than among non pregnant women. However, in other studies in Nigeria pregnancy status did not affect the prevalence of trichomoniasis (Adeoye and Akande, 2007).

CONCLUSION

This study was concluded based on the findings that *Trichomonas vaginalis* infection among female internally displaced persons in Maiduguri, Nigeria is one of the important diseases with a high prevalence of 20.5%, and that the control of this disease is possible with extensive public health education and adequate treatment of infected people and their sexual partners. A routine vaginal swab screening of *T. vaginalis* for pregnant women in the third trimester is recommended.

REFERENCES

- Aboyeji, A. P. & Nwabuisi, C. (2003).Prevalence of Sexually transmitted diseases among pregnant women in Ilorin, Nigeria.*Journal of Obstetric Gynecology*, 23:637 – 639.
- Adeoye G, & Akande A (2007). Epidemiology of Trichomonas vaginalis among women in Lagos Metropolis, Nigeria.*Pakistan Journal of Biological Science*, 10(13): 2198-2201.
- Agboola, A. (2006). Vaginal Discharge: In the Textbook of Obstetrics and Gynecology for Medical Students; 2nd ed Heinemann Educational Books. (Nigeria) plc 548pp.
- Alcamo, I. E. (2000). *Fundamentals of Microbiology* – Boston: Jones and Bartlett Publishers, 486 – 487. Anosike, J.C., Onwuliri, C.O, Inyang, R.E., Nwoke, B.E,
- Okoye, S.N. & Akogun, O.B. (1993). Trichomonas among Students of Higher Institutions in Nigeria. *Applied Parasitology*.34:19-25.
- Apalata, T., Carr, W.H., Sturm, W.A., Longo-Mbenza, B., & Moodley, P. (2014) Determinants of Symptomatic Vulvovaginal Candidiasis among Human Immunodeficiency Virus Type 1 Infected Women in Rural KwaZulu-Natal, South Africa.*Infectious Diseases in Obstetrics and Gynecology*, Article ID 387070: 10 pages.
- Arab-Mazar Z, Niyati M. (2015). *Trichomonas vaginalis* Pathogenesis: a Narrative Review. *Novelty in Biomedicine*; 3(3):148-54.
- Arora H. & Arora B. B (2014) Flagellates: *Trichomonas vaginalis*. *Medical Parasitology*, 4th Ed. CBS Publishers and Distributors Pvt Ltd.45-48
- Borchardt K,& Smith R. (1991). An evaluation of an in-pouch TV culture method for diagnosing *Trichomonas vaginalis*infection. *Genitourin Medicine*; 67:149-152.
- Buv'e A, Weiss HA, Laga M, Van Dyck E, Musonda R, Zekeng L, *et al.* (2001) The epidemiology of trichomoniasis in women in four African cities. *AIDS*;15:589-96.

- 272 Cohen J (2000). HIV Transmission – AIDS researchers look to Africa for new
273 insights. *Science*, 287: 942.
- 274 Cotch MF, Pastorek JG, Nugent RP, Yerg DE, Martin DH, & Eschenbach DA. (1991)
275 Demographic and behavioral predictors of *Trichomons vaginalis* infection among
276 pregnant women. The Vaginal Infections and Prematurity Study Group. *Obstetric*
277 *Gynecology*; 78:1087-92.
- 278 Dinop, P., Kiera D. & Gary G., (1998) Clinical & microbiological Aspect of
279 *Trichomonas vaginalis* *Clinical Microbiology*, 11(2): 300 – 317.
- 280 Federal Office of Statistics (2006). National Population census, Est., Federal Office of
281 Statistics Abuja, Nigeria
- 282 Forna, F., & Gulmezzoglu, A. M. (2002) Interventions for treating trichomoniasis in
283 women (Cochrane Review): In: *The Cochrane library*, issue 4. Update software: Oxford.
- 284 Fouts AC. & Kraus SJ. (1980). *Trichomons vaginalis*: re - evaluation of its clinical
285 presentation and laboratory diagnosis. *Journal of Infectious Disease*; 141:137.
- 286 Fox K K, & Behets F. M. (1995). Vaginal discharge, how to pin point the cause. *Post*
287 *graduates medicine*; 8:87-90, 93-96, 101.
- 288 Ginocchio, C.C., Chapin, K., Smith, J.S., Aslanzadeh, J., Snook, J., Hill, C.S., & Gaydos,
289 C.A. (2012). Prevalence of *Trichomons vaginalis* and coinfection with Chlamydia
290 trachomatis and Neisseria gonorrhoeae in the United States as determined by the Aptima
291 *Trichomons vaginalis* nucleic acid amplification assay. *Journal of Clinical Microbiology*,
292 50(8):2601-2608.
- 293 Graves A, & Gardner WA jr. (1993). Pathogenicity of *Trichomons vaginalis*. *Clinical*
294 *Obstetric Gynaecol*; 6:145-151.
- 295 Hira, P (1977) Observation on *Trichomons vaginalis* infections in Zambia. *Journal of*
296 *hyegine, epidemiology, microbiology and immunology*, 21:215-24
- 297 Hobbs, M., Sefia, E.C., Swygard, H. & Schwebke, J. (2008) *Trichomons vaginalis*
298 and Trichomoniasis, In: KK. Holmes, PF. Sparling, WE. Stamm, P. Piot, JN. Wasserheit,
299 L. Corey, DH. Watts (Editors). *Sexually Transmitted Diseases*, 4th edition. New York:
300 McGraw-Hill, 771-793
- 301 21 (1) 56 – 64
- 302 Jatau, E. D., Olonitola, O. S. & Olayinka, A. T. (2006). Prevalence of *Trichomonas*
303 infection among women attending antenatal clinics in Zaria, Nigeria. *Annals of African*
304 *Medicine*, 5 (4): 178 – 181
- 305 Johnson, V.J, & Mabey D.C. (2008) Global Epidemiology and control of *Trichomons*
306 *vaginalis* current option in infectious diseases. *Clinical Microbiology*,
- 307 Joyner, J.L., Douglas, J.M., Ragsdale, S., Foster, M., & Judson, F.N. (2000) Comparative
308 prevalence of infection with *Trichomons vaginalis* among men attending a sexually

- 309 transmitted disease clinic. *Sexually Transmitted Diseases*, 27(4):236-240.
- 310 Kulda, J., Vojtechovska, M., Tachezy, J., Demes, P., & Kunzova, E. (1982) Metronidazole
311 resistance of *Trichomons vaginalis* as a cause of treatment failure in trichomoniasis. A
312 case report. *British Journal of Venereal Disease*, 58:394-399.
- 313 Löfmark, S., Edlund, C., & Nord, C.E. (2010) Metronidazole is still the drug of choice for
314 treatment of anaerobic infections. *Clinical Infectious Diseases*, 50(S1):S16-S23.
- 315 Mahdi NK, Gany ZH, Sharief M. (2001) Risk factors for vaginal trichomoniasis among
316 women in Basra, Iraq. *Eastern Med health J*;7:918-24.
- 317 Mairiga, A. G., Balla, H. J. & Ahmad, M. I. (2011) Prevalence of *Trichomonas*
318 *vaginalis* infections among antenatal clients in Maiduguri, Nigeria. *International Journal*
319 *of Biology in Medicine Research*, 2 (4): 998 – 1002.
- 320 Meingasser, J.G., & Thurner, J. (1979) Strain of *Trichomons vaginalis* resistant to
321 metronidazole and other 5-nitroimidazoles. *Antimicrobial Agents and Chemotherapy*,
322 5:254- 259.
- 323 Moodley P. (2002). *Trichomons vaginalis* associated with pelvic inflammatory disease in
324 women infected with human immunodeficiency virus. *Clinical Infectious*
325 *Diseases*, 34:519–522.
- 326 Ochei K.C., Obeagu E.I., Ugwu G.U. & George C.N. (2014). Prevalence of *Trichomons*
327 *vaginalis* among pregnant women attending hospital in Irrua specialist teaching
328 hospital in Edo State, Nigeria. *IOSR – JOMS.*, 13 (a):79- 82. O – ISSN: 2279 –
329 0858, P – ISSN: 2279 – 0861.
- 330 Onyido A.E, Umeanaeto P.U., Irikannu K.C, Ekwunife C.A, Ezeanya L.C., Nwangwu U.C.,
331 Ugha C.N, & Obiechina, I.O (2014). Prevalence of *Trichomons vaginalis* Among The
332 Rural Women Of Ekwulumili Community Anambra State, Southeastern Nigeria. *Journal*
333 *of Natural Science* 12(5)
- 334 Parbara & Van Der P (2005). Prevalence, incidence, natural history and response to treatment
335 of *Trichomons vaginalis* infection among adolescent women. *Journal of Infectious*
336 *Diseases*, 192: 2039-2043.
- 337 Petrin, D., Delgaty, K., Bhatt, R., & Garber, G. (1998) Clinical and microbiological aspects of
338 *Trichomons vaginalis*. *Journal of Clinical Microbiology Reviews*, 11(2):300-317.
- 339 Quon, D. V. C. E. d'Oliveira, & P. J. Johnson. (1992). Reduced transcription of the ferredoxin
340 gene in metronidazole-resistant *Trichomons vaginalis*. *Proc for National Academic of*
341 *Science USA* 89:4402–4406.
- 342 Secor, W.E. (2012) *Trichomons vaginalis*: treatment questions and challenges. *Expert Review*
343 *of Anti-infective Therapy*, 10(2):107–109
- 344 Singh S, Singh G, Gautam B, Varadwaj P & Farmer R. (2010) *Trichomons vaginalis* Genome
345 Analysis using Bioinformatics Approaches. *International Journal of Pharmaceutical*
346 *Sciences Review and Research*, 3:40

- 347 Swygard, H., Sena, A.C. & Hobbs M.M. (2004) Trichomoniasis.Clinical manifestation,
348 Diagnosis and Management. Sexually transmitted infection; 80:71-92.
- 349 Uneke CJ, Ugwuoru CDC, Ali E. & Ali M (2006)*Trichomons vaginalis* infection among
350 pregnant women in South-Eastern Nigeira. The public Health significance.*The Internet*
351 *Journal of Gynaecology and obstetrics*. 6(1):17-21.
- 352 Upcroft, J.A., & Upcroft, P. (2001a) Drug susceptibility testing of the anaerobic
353 protozoa.*Antimicrobial Agents and Chemotherapy*, 45(6):1810-1814.
- 354 Usanga VU, Abia-Bassey L, Inyang-etoh PC, Udoh S, et al. (2010) *Trichomons vaginalis*
355 Infection Among Pregnant Women In Calabar, Cross River State, Nigeria.. *The Internet*
356 *Journal of Gynecology and Obstetrics*.14 (2): 101-107.
- 357 Viikki M (2000). Gynaecological infections as risk determinants of subsequent cervical
358 neoplasia.*Acta Oncologica*, 39:71–75.
- 359 Wasserheit JN. (1992) The interrelationship between human 3. immunodeficiency virus
360 infection and other sexually transmitted diseases. *Sexually Transmitted Diseases*,
361 pp19:61–77.
- 362 Wiese W, Patel S R, & Such Patel Oli C A (2000), “A Meta-analysis of the Papanicolaou
363 Smear And Wet Mount for the Diagnosis of Vaginal Trichomoniasis”,
364 *American J ournal Medical*, Vol. 108, pp. 301-308.
- 365 World Health Organization (2001).*Global Prevalence and Incidence of Selected Curable*
366 *Sexually Transmitted Infections: Overview and Estimates*.Geneva, Switzerland:
367 World Health Organization.
- 368 World Health Organisation (2012) Global prevalence and incidence of selected curable
369 sexually transmitted infections—2008: overview and estimates. Geneva, WHO:
370 http://www.who.int/reproductivehealth/publications/rtis/2008_STI_estimates.pdf.

371