ABSTRACT

This study To evaluate incidence of trichomonas vaginalis infection (TVI), depending on the result of GeneXpert TV (GX-TV) assay, among women and its relation to the incidence of preterm labor (PTL) among pregnant women and to determine the outcome of two metronidazole (MTZ) therapy regimens on TVI. 468 pregnant and 217 non-pregnant underwent microbiological workup and graded using Nugent score (NS). Women with NS≥7 received the appropriate therapy. Group A included responders without recurrence, Group B included women who gave negative GX-TV assay and received 2nd session of treatment and Group C included women who gave positive GX-TV assay and received either 1-wk oral MTZ 500 mg twice daily (C1 group) or 1-d single oral MTZ of 2gm (C2 group). Males who gave urine samples positive GX-TV assay received 1-wk MTZ therapy. Group A included 150 women who were responded to treatment without recurrence. The frequency of non-responders among women had NS≥7 was significantly higher among non-pregnant women. GX-TV assay defined 204 negative samples (Group B) and 331 positive sample with significantly higher frequency of positive samples compared to microscopic exam and traditional culture. In comparison to GX-TV assay, both microscopic examination and traditional culture showed missed diagnosis of 43-59% of cases. At 3-m and 6-m follow-up, recurrence rate (RR) of TVI was significantly higher in C2 than C1 group especially in non-pregnant with significantly higher RR at 6-m than at 3-m. Only 234 males undertook TV testing and 187 males gave positive urine samples. PTL rate was 9.1% and was significantly higher in women had recurrent TVI and in women of C2 than C1 group. this study revealed that Vaginitis had high prevalence among pregnant and non-pregnant women and high percentage of non-responders to treatment had TVI. Screening for TVI using GX-TV assay allows rapid and accurate identification of TVI with high sensitivity and specificity. MTZ treatment allows infection eradication but had 21% RR within 6-m especially with 1-d regimen. PTL rate was high with TVI especially if recurrent. Male partner
**must be screened and treated to prevent female re-infection.**

**INTRODUCTION**

*Trichomonas vaginalis* (TV) is a protozoan flagellate parasite that causes trichomoniasis in humans (Midlej et al., 2019). *Trichomonas vaginalis* infection (TVI) is a sexually transmitted disease with millions of annual cases worldwide (O'Donoghue et al., 2019) and is the most common, curable sexually transmitted infection (STI) (Van Gerwen & Muzny et al., 2019).

The relatively mild symptoms, and lack of evidence for any serious sequelae of TVI, have led to its under diagnosis and under research (Šoba et al., 2015). However, growing evidence that TVI is associated with other disease states with high morbidity in both men and women has increased (Asmah et al., 2017). TVI is associated with damage to the host epithelia through complex interactions between the parasite and host, commensal microbiome and accompanying symbionts (Edwards et al., 2016).

One of the most serious concerns about diagnosis of vaginitis is the co-infection, so it may be bacterial vaginosis (BV), vulvovaginal candidiasis (VC) and/or TVI (Alcaraz et al., 2016). Accurate diagnosis is essential for appropriate selection of efficacious treatment; molecular-based tests assay for vaginal swabs can accurately diagnose most common causes of vaginitis (Gaydos et al., 2017).

Another serious point is that the approved treatment options for TVI are limited to two imidazole compounds and metronidazole is the most commonly prescribed (O'Donoghue et al., 2019). However, these compounds can lead to parasite resistance and unwanted side effects (Midlej et al., 2019).

*T. vaginalis* was present in the vagina of 12.8% of women and the risk for having endometritis, infertility and pelvic inflammatory disorders were more common among women had trichomoniasis than women without (Wiringa et al., 2019). Trichomoniasis is also associated with lower pregnancy rates, adverse pregnancy outcomes and lower live birth rates (de Brum Vieira et al., 2017).

Preterm labor (PTL) is a major cause of perinatal mortality and morbidity (Lamont et al., 2017). Intrauterine infection is responsible for significant percentage of PTL, particularly at early gestations (Kanninen et al., 2019). Trichomoniasis has been associated with adverse obstetric outcomes such as PTL, low birth weight and premature rupture of membranes (Salakos et al., 2018).

**Objectives**

The current study tried to evaluate the incidence of *trichomonas vaginalis* infection (TVI), depending on the result of GeneXpert TV assay, among pregnant women and its relation to the incidence of PTL. Also, the study targets to determine the outcome of two metronidazole (MTZ) therapy regimens on resolution and recurrence of TVI.

**Design**

Comparative prospective multicenter interventional study

**Setting**

Gynecology & Obstetrics Departments at Benha University Hospitals in conjunction with multiple private centers, Medical Parasitology Department, and
PATIENTS AND METHODS

This study was started at Feb 2016 after approval of the study protocol by the Local Ethical Committees. The study was designed as two-arm screening study; the 1st arm included non-pregnant women attending the gynecology outpatient clinic complaining of manifestations suggestive of vaginitis. The 2nd arm included pregnant women attending the Antenatal Care Unit for assurance of being pregnant irrespective of presence of manifestations of vaginitis. All women underwent history taking for presence of increased vaginal discharge, and were asked to comment on its type, consistency, color and odor. Also, women were asked to comment on the presence of vaginal dyspareunia, vulvar or vaginal itching or sensation of foul smell.

Exclusion criteria included manifest diabetes mellitus, autoimmune diseases, and for pregnant women exclusion criteria included multiple pregnancy, fetal or uterine anomalies, history of recurrent early pregnancy loss or PTL, cervical surgeries, previous pregnancy-induced complications. Also, women refused to sign the consent for study participation, or lost during follow-up were also excluded from the study.

Prior to vaginal examination, an unmoistened sterile speculum was inserted and presence of vaginal wall redness, ulcerations or cervical erosion was noticed. Characters of the vaginal discharge including color, smell, with and without addition of 10% KOH were assessed. Vaginal and cervical samples were obtained for lab investigations. Bacterial vaginosis was defined as abnormal vaginal discharge or odor with a Nugent Score (NS) of 7–10 or ≥3 Amsel’s criteria and a NS of 4–10 (Bradshaw et al., 2012).

Sampling and laboratory procedures

1. Vaginal fluid sample was taken from the upper lateral vaginal vault with a wooden Ayre’s spatula and a part was spread onto a glass slide for immediate microscopic evaluation and another part was used for measurement of vaginal pH using digital pH-meter.

2. A cotton-tipped swab was taken from the posterior vault and immediately placed in Amies’ modified Stuart medium.

3. After cleaning the ectocervix, an endocervical swab was allowed to soak for 20 seconds, and then rotated three times in the endocervical canal for chlamydia culture on McCoy cells.

4. Vaginal and cervical cultures for Gardnerella vaginalis were grown on specific ampicillin-pretreated A3 media at 37°C for 18 hours, while other micro-organisms and yeasts were cultured on blood-chocolate agar.

Grading of the vaginal smears

1. Nugent criteria: Each Gram-stained smear was evaluated for morphotypes under oil immersion (x1,000 magnification). Each morphotype was quantitated from 1 to 4+ with regard to the number of morphotypes per oil immersion field (Table 1). Total score= lactobacilli + G. vaginalis and Bacteroides spp. + curved rods (Nugent et al., 1991) and an overall score of 0–3 indicates “normal or lactobacilli-dominated microbiota, 4–6 indicates
intermediate microbiota that is incompletely characterized and 7–10 indicates bacterial vaginosis (BV).

2. Amsel’s criteria: increased homogeneous thin vaginal discharge, pH of the secretion > 4.5, amine odor on addition of KOH 10% solution to a drop of vaginal secretions or presence of clue cells in wet preparations. The presence of 3 of these four criteria shows diagnosis of BV (Amsel et al., 1983).

**Detection of TV infection**

Detection of motile trichomonads on microscopic exam of a wet mount of vaginal fluid (Hobbs & Seña, 2013).

Isolation of *T. vaginalis* using culturing sample obtained by sterile swab on modified Diamond’s medium: the swab specimen inoculated into the prewarmed media and then incubated at 37°C for 7 days in anaerobic condition. Culture examined daily as wet mount smear. (Al-saeed et al., 2011).

Mid-cavity vaginal swab was collected using the Cepheid specimen collection swab and tested with GeneXpert platform (The Xpert® TV assay, Cepheid, Sunnyvale, CA). The transport reagent containing the specimen was gently inverted 3 to 4 times, followed by transferring 0.5 ml of the sample to the Xpert cartridge using the transfer pipette supplied. The Xpert® TV assay yields results in 60–90 minutes, allowing if positive to examine urine sample of male partner (Schwebke et al., 2018).

**Grouping**

1. Women with NS score of ≥7 will receive the appropriate therapeutic lines for the identified infecting organism and will be grouped according to response to treatment as follows:

   a. Responders (Group A) were followed up for recurrence of complaints and among pregnant women for the incidence of PTL that was defined as any birth before completed 37 gestational weeks (Meher & Alfirevic, 2014).

   b. Non-responders will be investigated for TVI.

2. Women with NS score of ≤6 and non-responders of women had NS score of ≥7 undertook diagnostic workup for TVI and were categorized as follows:

   a. Group B included women who gave negative Xpert TV assay and received treatment for BV and/or candidiasis and were follow-up for resolution, persistence or recurrence of manifestations.

   b. Group C included women who gave positive Xpert TV assay and were randomly allocated into C1 group that included women who received oral MTZ 500 mg twice daily for 7 days and C2 group that included women received oral MTZ as a single dose of 2gm (Kissinger et al., 2010).

**Male partner management**

Urine samples were obtained from male-partners of women who gave positive results for TV, to be examined for TVI using the GeneXpert platform assay and those gave positive results received MTZ 500 mg twice daily for 7 days (Seña et al., 2007).
Study outcomes

1. Primary outcome is the prevalence of TVI among studied women and their male partners.

2. Secondary outcomes included
   a. The incidence of PTL among pregnant women and its relation to TVI
   b. The rate of persistent, resistant and recurrent cases
   c. The effect of MTZ treatment on TVI evaluated 3-m and 6-m after end of therapy and on rate of PTL
   d. The diagnostic performance criteria (sensitivity, specificity, positive and negative predictive values and positive and negative likelihood ratios) of GeneXpert platform assay as screening test for TVI.

Statistical analysis

The obtained data were presented as numbers, percentages, mean, standard deviation. Results were analyzed using paired t-test, One-way ANOVA Test and Chi square test. Statistical analysis was conducted using the IBM SPSS (Version 23, 2015) for Windows statistical package. P value <0.05 was considered statistically significant. Considering the fact that there was no gold standard method for diagnosis of TVI (Oliveira et al., 2016), microscopic detection of TV in wet vaginal discharge and positive growth of TV on Diamond's culture media were compared versus the results of the GeneXpert platform assay to determine its ability to detect or refute the results obtained by either microscopy or traditional culture.

Table (1): Nugent criteria for vaginal smear grading

<table>
<thead>
<tr>
<th>Score</th>
<th>Lactobacillus morphotypes</th>
<th>Gardnerella &amp; Bacteroides spp. morphotypes</th>
<th>Curved gram-variable rods</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4+</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>3+</td>
<td>1+</td>
<td>1+ or 2+</td>
</tr>
<tr>
<td>2</td>
<td>2+</td>
<td>2+</td>
<td>3+ or 4+</td>
</tr>
<tr>
<td>3</td>
<td>1+</td>
<td>3+</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0+</td>
<td>4+</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

During the duration of the study, 804 women; 533 pregnant and 271 non-pregnant were eligible for evaluation; 119 women; 65 pregnant and 54 non-pregnant were excluded for not fulfilling inclusion criteria and 685 women were enrolled in the study (Fig. 1). Inclusion data of enrolled women are shown in table 2.

Table (2): Baseline data of enrolled women

<table>
<thead>
<tr>
<th></th>
<th>Non-pregnant (n=217)</th>
<th>Pregnant (n=468)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>36.5±9.1</td>
<td>31.3±6.1</td>
<td>0.234</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>86.1±8</td>
<td>87±7.8</td>
<td>0.356</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>170.5±3.4</td>
<td>169.3±4.9</td>
<td>0.198</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>29.7±3</td>
<td>30.4±4.1</td>
<td>0.083</td>
</tr>
<tr>
<td>Gestational age (week)</td>
<td>-</td>
<td>19.8±5.3</td>
<td>-</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD
The results of microbiological studies defined 230 women; 167 pregnant and 63 non-pregnant women with NS of ≥7. These women received the appropriate medical treatment according to these results. Unfortunately, 57 women (17.8%) failed to respond to treatment; 31 pregnant (18.6%) and 26 non-pregnant (41.3%). The remaining 173 women responded to treatment and were followed up. During follow-up, 48 of responders had recurrent manifestations and received another session of treatment, but 23 failed to respond. Collectively, among women had NS ≥7, 150 women responded to treatment without recurrence (Group A), while 80 women were either non-responders (n=57) or recurrent (n=23) and were shifted to be investigated for TV infection (Fig. 2).

Fig. (2): Management of Flow chart of women had NS>7
Among 167 pregnant women who gave NS ≥7, 120 were responders (67.7%), 31 were non-responders (18.6%) and 16 women (11.7%) were recurrent. On contrary, among 63 non-pregnant women who gave NS ≥7, 30 were responders (47.6%), 26 were non-responders (41.3%) and 7 women (11.1%) were recurrent with significantly (p=0.001) higher frequency of non-responders among non-pregnant women.

Women who had NS≤6 (n=455) in addition to the 80 non-responders and resistant women underwent evaluation for TV infection (n=535). Microscopic examination of a wet mount of vaginal fluid defined 292 samples as positive; while traditional culture defined growth for TV in 256 samples with significantly (p=0.028) higher percentage of significant sample was detected using microscopic examination. On the other hand, Xpert TV assay defined 204 samples (38.1%) as negative samples for TV infection and defined positive sample in 331 samples (61.9%) with significantly higher percentages of positive samples versus microscopic exam (p=0.0156) and traditional culture (p=0.00004). Women who gave negative Xpert TV assay were included in group B (n=204) and received treatment for BV, while women who gave positive Xpert TV assay were divided into groups C1 (n= 165) and C2 (n=166) (Fig. 1).

In comparison to results of Xpert TV assay, 169 microscopic and 137 Diamond cultures were true positive, while 135 microscopic and 85 cultures were true negative. On the other hand, 69 microscopic and 119 cultures were false positive and 162 microscopic and 194 cultures were false negative.

Comparison of results obtained by microscopy and culture versus that obtained by Xpert TV assay defined higher sensitivity and specificity rates for microscopy with higher PPV, NPP and accuracy rates than culture. However, the negative likelihood ratio, for presence of TV infection of culture was double that of microscopy. In comparison to Xpert TV assay, both microscopic examination and traditional culture showed missed diagnosis of 43-59% of cases (Table 3).

At 3-m of follow-up after end of treatment, 26 women (7.9%); 8 in C1 group (4.8%) and 18 in C2 group (10.8%) had recurrent manifestations with significantly (p=0.043) higher recurrence rate among women of C2 group. Five pregnant women (4.7%) in C1 and 10 women (8.1%) in C2 groups had recurrence with non-significantly (p=0.289) higher incidence of recurrence among women of C2 group. On contrary, 3 non-pregnant women (5.2%) in C1 and 8 women (18.6%) in C2 group developed recurrent infection with significantly (p=0.032) higher recurrence rate in C2 group. Among women of both groups, the recurrence rate was non-significantly higher in non-pregnant versus pregnant women (Table 4).

At 6-m, additional 45 women had recurrent manifestation; 16 women (9.7%) in C1 and 29 women in C2 groups with significantly (p=0.035) higher recurrence rate among women of C2 group. Twenty-six pregnant (11.3%) women had recurrence with non-significantly (p=0.196) higher recurrence rate in C2 group, while 19 non-pregnant women (18.8%) had recurrence with significantly (p=0.044) higher incidence
of recurrence among women of C2 group. Recurrence rate was non-significantly (p=0.488) between pregnant and non-pregnant women of C1 group, while the difference was significant among women of C2 group (Table 4).

Recurrence rate among women of C1 group at 6-m was non-significantly higher than that reported at 3-m, while in C2 group recurrence rate was non-significantly higher among pregnant women, but was significantly higher among non-pregnant women at 6-m compared to 3-m recurrence rate. Total number of women had recurrent manifestations was 71 women (21.5%); 26 (7.9%) and 45 (13.6) at 3-m and 6-m, respectively with significantly (p=0.017) higher recurrence rate at 6-m than at 3-m (Table 4).

Ninety-seven male partners refused to undergo Xpert TV assay and were excluded, while 234 males (70.7%) undertook testing. These males were husbands of 174 pregnant and 60 non-pregnant women. Collectively, 187 males gave positive urine samples, while 47 males gave negative urine samples. These positive urine samples belonged to 137 husbands of pregnant women (78.7%) and 50 husbands of non-pregnant women (83.3%) with non-significant (p=0.443) differences (Fig. 3).

During follow-up of 350 pregnant women; 120 of responders, 189 of women who developed no recurrent TV infection and 41 of women had recurrent TV infection, 32 women developed PTL. Eight of responders (6.7%), 17 of women had no recurrent TV infection (9%) and 7 of those had recurrent infection (17.1%). The incidence of PTL was significantly (p=0.0067) higher among women who had recurrent TV infection in comparison to incidence among women who responded to BV treatment, but was non-significantly (p=0.125) higher than women who had no recurrence after treatment of TV. Moreover, the incidence of PTL was non-significantly (p=0.464) higher among women who had TV infection and treated without recurrence compared to women who had BV only (Fig. 4).

Twenty-four women of those had PTL; 7 were of women of group C1 and 17 women were of group C2 with significantly higher incidence of PTL among women who received MTZ once compared to those received MTZ for one week (Fig. 5).
Table (3): Diagnostic validity characters of microscopic exam and Diamond's culture versus Xpert TV assay for diagnosis of TV infection

<table>
<thead>
<tr>
<th>Character</th>
<th>Microscopy</th>
<th>Diamond's culture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensitivity rate (%)</strong></td>
<td>Value</td>
<td>51.06%</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>45.53-56.56%</td>
</tr>
<tr>
<td></td>
<td>41.39%</td>
<td>36.03-46.9%</td>
</tr>
<tr>
<td><strong>Specificity rate (%)</strong></td>
<td>Value</td>
<td>66.18%</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>59.24-72.64%</td>
</tr>
<tr>
<td></td>
<td>41.67%</td>
<td>34.82-8.76%</td>
</tr>
<tr>
<td><strong>Likelihood ratio</strong></td>
<td><strong>Positive</strong></td>
<td>Value</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>1.21-1.88</td>
</tr>
<tr>
<td></td>
<td>0.71</td>
<td>0.60-0.84</td>
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<tr>
<td></td>
<td><strong>Negative</strong></td>
<td>Value</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>0.64-0.86</td>
</tr>
<tr>
<td></td>
<td>1.41</td>
<td>1.17-1.69</td>
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<tr>
<td><strong>Positive predictive value</strong></td>
<td>Value</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>66.3-75.3%</td>
</tr>
<tr>
<td></td>
<td>53.52%</td>
<td>49.2-57.78%</td>
</tr>
<tr>
<td><strong>Negative predictive value</strong></td>
<td>Value</td>
<td>45.45%</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>41.83-49.13%</td>
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<td></td>
<td>30.47%</td>
<td>26.68-34.54%</td>
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<tr>
<td><strong>Accuracy</strong></td>
<td>Value</td>
<td>56.82%</td>
</tr>
<tr>
<td></td>
<td>95% CI</td>
<td>52.5-61.07%</td>
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<tr>
<td></td>
<td>41.5%</td>
<td>37.28-45.8%</td>
</tr>
</tbody>
</table>
Table (4): Outcome of TV treatment at 3-m and 6-m of follow-up

<table>
<thead>
<tr>
<th>Time</th>
<th>Group</th>
<th>Outcome</th>
<th>C1 (n=165)</th>
<th>C2 (n=166)</th>
<th>Total (n=331)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pregnant</td>
<td>Non-pregnant</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(n=107)</td>
<td>(n=58)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recurrent</td>
<td>5 (4.7%)</td>
<td>3 (5.2%)</td>
<td>8 (4.8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No recurrence</td>
<td>102 (95.3%)</td>
<td>55 (94.8%)</td>
<td>158 (95.2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Statistical significance</td>
<td>P1: 0.289</td>
<td>P2: 0.887</td>
<td>0.043</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>10 (8.1%)</td>
<td>8 (18.6%)</td>
<td>18 (10.8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>113 (61.9%)</td>
<td>36 (81.4%)</td>
<td>148 (89.2%)</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>306 (92.1%)</td>
</tr>
<tr>
<td>3-m</td>
<td></td>
<td></td>
<td>8 (4.8%)</td>
<td>18 (10.8%)</td>
<td>26 (7.9%)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Recurrent</td>
<td>9 (8.4%)</td>
<td>7 (12.1%)</td>
<td>16 (9.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No recurrence</td>
<td>98 (91.6%)</td>
<td>51 (87.9%)</td>
<td>149 (90.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Statistical significance</td>
<td>P1: 0.196</td>
<td>P2: 0.448</td>
<td>0.035</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 (27.9%)</td>
<td>17 (13.8%)</td>
<td>29 (17.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>106 (66.2%)</td>
<td>31 (72.1%)</td>
<td>137 (82.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>286 (86.4%)</td>
</tr>
<tr>
<td>6-m</td>
<td></td>
<td></td>
<td>17 (13.8%)</td>
<td>12 (27.9%)</td>
<td>29 (17.5%)</td>
</tr>
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</table>

P1: indicates significance of difference of recurrence rate between C1 and C2 groups
P2: indicates significance of difference of recurrence rate between pregnant and non-pregnant women in each of C1 and C2 groups
P3: indicates significance of difference of recurrence rate at three and six months after end of treatment
Fig. (3): Results of Xpert TV assay of male partners of pregnant and non-pregnant women

Fig. (4): Number of women who developed PTL among studied pregnant women categorized according to their response to treatment
DISCUSSION

The current study tried to evaluate the incidence of TV infection, depending on the result of GeneXpert platform assay, among pregnant women and its relation to the incidence of PTL. In line with the study target Kamal et al., (2018) recommended pregnant women screening for TVI especially those of low socioeconomic stratum, primary educational level and receding in rural area to reduce the incidence of PTL and low birth weight.

Diagnosis of TVI depended on the result of one of the modern nucleic acid amplification tests (NAAT) which outweighs the traditional methods for diagnosis with documented sensitivity (99.4-99.9%) and specificity rates (99.5-100%) for female genital specimens (Schwebke et al., 2018). Moreover, GeneXpert platform assay outweighs the primary NAAT in its applicability to detect TV in male’s urine with sensitivity (99.4-99.9%) and specificity rates (99.5-100%) as documented by Gaydos et al., (2017) and in its rapid performance time within 60-90 minutes (Badman et al., 2016) and so was the most rapid and accurate test used for diagnosis of TVI in both sexes.

In support of the efficacy of diagnostic performance of GeneXpert platform assay, Bristow et al., (2017) found GeneXpert assay for TV was easy to use
and has high overall agreement for STI testing and may be used in combination with the GeneXpert assay for *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (NG) for simultaneous testing for the three STIs using a portable and modular-based NAAT platform. Also, Mudau et al., (2017) reported high prevalence of STIs among HIV-infected pregnant women using Xpert® assays and recommended its use as a diagnostic screening approach for STIs. Thereafter, Garrett et al., (2018) documented that the Xpert® assay showed high accuracy for diagnosis of STI among young South African women with 100% sensitivity rate and 97-100% specificity rate.

Thirty-two of 350 pregnant women (9.1%) had PTL; 8 women of group A (5.3%) and 24 women of group C (7.3%). These data point to the relation between vaginitis, irrespective of the pathogen and PTL. In support of this assumption, 7 women of those had PTL had recurrent TVI after response to MTZ therapy with significantly higher frequency of PTL in comparison to incidence of PTL among MTZ-responders who were free of recurrent TVI. Furthermore, the incidence of PTL was significantly lower in women who received 1-wk MTZ therapy compared to women who received MTZ once. This finding could be attributed to the reported lower recurrence rate after 1-wk therapy and this furtherly support the relation between infection and PTL. Similarly, Sheehy et al., (2015) documented that MTZ treatment of BV and TVI is effective in the reduction of PTL.

In line with the efficacy of MTZ, Salakos et al., (2018) documented that oral MTZ, even for asymptomatic patients is effective against *Trichomonas* and its use is safe during pregnancy and Khazaeian et al., (2018) reported improvement rate on local MTZ gel of 88.5% in clinical symptoms with elimination of three of Amsel criteria that were positive before treatment. Moreover, Kissinger et al., (2018) found patients received the 7-day-dose were less likely to be TV positive at test-of-cure than patients received the single-dose and recommended the 7-day-dose MTZ as the preferred treatment for trichomoniasis among women.

Despite of the documented efficacy of MTZ for treating trichomoniasis, 71 women (21.5%) had recurrent manifestations; similarly, Argáez-Correa et al., (2019) documented that MTZ-resistant TV was reported and contribute for increasing number of refractory cases. However, MTZ resistance may not be the only factor for recurrence owing to the reported significantly higher recurrence rate at 6-m than at 3-m of follow-up, so the possibility for committing reinfection is possible and increases with time lag between end of treatment and appearance of recurrence. Moreover, the recurrence was more prevalent among non-pregnant who were more liable to get more frequent intercourses especially if their partner was infected. In addition to a finding that 97 male partners refused to undergo investigations and 79.9% of those undertook investigations were Xpert TV assay positive, so a similar percentage of refusers may be positive and be the source for reinfection that was misdiagnosed as recurrence.

In support of these explanations, Divakaruni et al., (2019) compared the efficacy, compliance and outcomes of
various treatment regimens for trichomoniasis and found outcome is comparable between metronidazole and tinidazole, especially when combined with abstinence and treatment of the partners. Also, Donders et al., (2019) attributed persistent TVI to poor attention, low awareness and rates of proper treatment and because 60% of partners of these women were not traced, nor treated.

In trial to explore pathogenesis of resistant and easily recurred trichomoniasis, Dessi et al., (2019) attributed this to the complex relationship between TV and eubacteria of Mycoplasma genus that resides and replicates in the protzoan cell which in turn is able to pass the bacterial infection to human epithelial cells and these bacteria synergistically upregulates the proinflammatory response of human monocytes to TV. In support of this explanation, Tine et al., (2019) detected Mycoplasma hominis in 57.4% of 1257 analyzed women with a prevalence of 76% among those with trichomoniasis and concluded that TV and Mycoplasmas are two closely associated pathogens in female's urogenital tract and this clinically significant symbiotic action may require systematic screening for optimal STI management.

CONCLUSION

Vaginitis had high prevalence among pregnant and non-pregnant women who must be screened, especially recurrent and resistant cases. High percentage of non-responders to treatment of BV had TVI. Screening for TVI using GeneXpert platform assay allows rapid and accurate identification of TVI with high sensitivity and specificity. MTZ treatment using either regimen allows perfect eradication of infection but had a recurrence rate of about 21% within 6-m especially with 1-d MTZ regimen. PTL rate was high with recurrent TVI, TVI in general and BV in decreasing order. Male partner must be screened and treated to prevent female re-infection.

REFERENCES


ينصح فحص النساء المصابات بداء المشعرات باستخدام فحص الحبل اكسبرت

بالمعالجة المبكرة التي تهدف إلى الحد من حالات الولادة المبكرة بين النساء الحوامل

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قسم الباثولوجيا الالكترونية - كلية الطب - جامعة بنها

هذه الدراسة لتقديم حدوث عدوى المشعرة المهبلية، اعتمادًا على نتائج فحص

الжен اكسبرت (GX-TV)، بين النساء وعلاقته بوقوع الولادة المبكرة بين النساء

الحوامل وتحديد نتائج اثنين من نظم العلاج بالميترونيدازول على العدوى بالمشعرة

المهبلية. خضع 428 حاملًا و 217 غير حامل للعمل الميترونيودازول وتم تصنيفهم

NS باستخدام نقاط نوجينت (NS). تلقت النساء مع NS≥20 الاستجابة المناسبة. وشملت

المجموعة (A) المستجيبين دون تكرار، وشملت المجموعة B النساء الذين أعطوا

الفحص السليم للجن اكسبرت وتلقي الدورة الثانية من العلاج. وشملت المجموعة ج

النساء الثلاثي أعطين اختبار الجن اكسبرت (GX-TV) الإيجابي وتلقين إما 500 مللي

جرام ميترودازول عن طريق الفم لمدة أسبوع واحد (مجموعة ج1) أو 2 جم من

الميترودازول جرعة واحدة عن طريق الفم (مجموعة ج2). تلقي النموذج الذين أعطوا

عينات البول فحص إيجابي للجن اكسبرت تلقوا العلاج لمدة أسبوع واحد من

الميترودازول. شملت المجموعة أ 150 امرأة استجابت للعلاج دون تكرار. كان

توتر غير المستجيبين بين النساء 7≥4 أعلى بكثير بين النساء غير الحوامل. حدد

اختبار الجن اكسبرت (GX-TV) 204 عينة سلبية (المجموعة B) و 321 عينة

ايجابية مع تردد أعلى بكثير من العينات الإيجابية مقارنة مع الفحص المجهر

والمزروع التقليدي. المقارنة مع اختبار الجن اكسبرت (GX-TV)، أظهر كل من

الفحص المجهر والمزروع التقليدي تشخيص تميزه من 43.5% - 9.5% من الحالات. في

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3-6 شهور المتابعة، كان معدل تكرار الاصابات بالمشعره المهبلية أعلى بكثير في المجموعة ج من المجموعة ح وخاصة في غير الحوامل مع معدل التكرار أعلى بكثير في 6 شهور من عند 3 شهور. قام 234 من الذكور فقط بإجراء اختبارات المشعره المهبلية، وقدم 187 من الذكور عينات بول إيجابية. كان معدل الولادة المبكره 9.1% وكان أعلى بكثير في النساء المصابة بالمشعره المهبلية المتكررة والنساء في ج 3 من المجموعة ج. و كشفت هذه الدراسة أن كان لالتهاب المهبل معدل انتشار مرتفع بين النساء الحوامل وغير الحوامل ونسبة عالية من غير المستجيبين للعلاج لديهم عدوى المشعره المهبلية. يتيح فحص عدوى المشعره المهبلية باستخدام اختبار الجين اكسيرت التعرف السريع والدقيق على عدوى المشعره المهبلية بحساسية وخصوصية عالية. يسمح علاج الميترونيدازول باستئصال العدوى، لكن كان له 21% من معدل التكرار في غضون 6 شهور خاصة مع نظام اليوم الواحد. كان معدل الولادة المبكره مرتفعًا مع عدوى المشعره المهبلية خاصة إذا كان متكررًا، يجب فحص الشريك الذكر وعلاجه لمنع إعادة إصابة الإناث.

1. المجلة المصرية للعلوم الطبية (2) 2019: 542-547.