Comparative study of reproductive tract infections of female sex workers and gynecology clinic patients and general population in Suzhou

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ABSTRACT

Background: Reproductive tract infections (RTIs) have become international public health problem. Aim: We assessed the RTIs. A community-based study was carried out among female sex workers (FSWs), gynecology clinic patients and general population in Suzhou, China to investigate the major pathogens of RTIs and to compare the pathogens among FSWs, gynecology clinic patients and general population. Materials and methods: The study was conducted over 12 months in 1357 women. They were recruited into three groups: group I: 243 asymptomatic FSWs, group II: 629 symptomatic gynecology clinic patients, and group III: 485 women who attending physical examination. Genital specimens were collected after informed and written consent was obtained. All specimens were transported to department of clinical laboratory and processed by standard methods. Appropriate management was commenced after laboratory reports were sent to the clinicians. Data were analysed. Results: Overall, 110 out of 243 asymptomatic FSWs were detected with pathogens, equaling 45.27% showing positive, while 301 out of 629 symptomatic gynecology clinic patients were detected with pathogens, 9.27% general population were detected with pathogens. Reproductive tract infections (RTIs) were more prevalent in FSWs than general population. The distribution of pathogens among three groups was different. Conclusion: Rates of RTIs are still high among FSWs in Suzhou. Where resources allow, routine screening and treatment of RTIs should be offered. The study also highlights that health interventions aimed at reducing morbidities from RTIs should focus on prevention rather than treatment.

Key words: Female sex workers, reproductive tract infections, pathogens, distribution
Shao et al.: Reproductive tract infections in Suzhou

INTRODUCTION

Reproductive tract infections (RTIs) are a group of infectious diseases caused by bacteria, viruses, *Chlamydia, Mycoplasma* and other pathogens invading the genital tract and can cause serious physical and psychological harm such as infertility, intrauterine growth retardation, premature labour, increased vulnerability to HIV/AIDS, and a heavy socio-economic burden to the families. Female RTIs often starts in the lower genital tract as vaginitis or cervicitis with manifestation like itching, genital pain, abnormal vaginal discharge, and burning feeling with urination. It could be asymptomatic and thus pose a problem to effective control. At present, RTIs have become international public health problem, especially in developing countries. FSWs constitute the group documented as being the most exposed population to sexually transmitted infections (STIs), and also are the high prevalence rate population of RTIs. This study was carried out to present the prevalence of the major pathogens for genital tract infection of the FSWs and survey the comparison of pathogens distribution between FSWs and gynecology clinic patients and general population to develop better strategies for the treatment and prevention.

MATERIALS AND METHODS

The study was carried out at Center for Disease Control and Prevention of Soochow (Suzhou, Jiangsu Province, China) over a period of 12 months, from January 2010 to December 2010. Prior to the commencement of the study, institutional ethics committee approval was obtained.

Study population
A total of 1357 women between 14-70 years were used for the study. They were assigned to one of the three study groups. Group I was consisted of 243 asymptomatic FSWs (mean age 27.25, SD 6.42) ,who were high-risk group ,Group II comprised 629 gynecology clinic patients aged between 17-45 years old(mean age 26.55, SD 8.12), who were 100% symptomatic. Group II comprised 485 women, recruited by physical examination. Women with other infections, such as anaerobic bacteria and *Mycoplasma* and *Chlamydia*, urinary tract infections (UTIs), and gynecological surgeries were excluded from the study. The study information was collected through physical examinations carried out by Center for Disease Control and Prevention of Soochow during 2010. Prior to the commencement of the study, informed written consent was obtained from all subjects. Assurance was also given on confidentiality. Each subject was assigned a code number for future reference.

Samples collection
Physical examination including vaginal and bimanual examination was done to assess the presence of any abnormality such as discharge, genital ulcers, genital warts, and cervical erosion. Samples were collected from cervical os and sterile swab was inserted into cervical os for about 1-2 cm, then turn it around for about 20-30 seconds .All specimens were transported to department of clinical laboratory, 2nd affiliated hospital of Soochow University and processed by standard methods.

Swabs were inoculated into blood agar and chocolate agar and saponin-lysed blood agar with vancomycin, colistin, nystatin, trimethoprim (VCNT) supplement to detect *Neisseria gonorrhoeae*, then the inoculated broth was incubated for 18- 24 h at 35°C carbon dioxide. Gram-stained slides were
evaluated and graded to determine the vaginal flora pattern according to Nugent's criteria. Negative plates were subcultured and reexamined under the same incubation conditions for 48h. The *Lactobacillus* SP is a gram-positive bacillus that produces components such as lactic acid, bacteriocins and hydrogen, and which has properties that protect the vaginal flora. Anaerobic bacteria and *Mycoplasma* and *Chlamydia* were excluded in this research. Appropriate treatment was instituted to patients at their follow-up visits based on their laboratory reports.

**Statistical analyses**

Statistical analyses were performed with the SPSS software, version 13.0. Significance level was set at *P*<0.05. Statistical analysis was performed through the *χ*² and *t*-test, whose level of significance was fixed at *α*=0.05.

**RESULTS**

110 out of 243 asymptomatic FSWs (45.27%) were detected with pathogens, while 301 out of 629 outpatients with symptoms were detected with pathogens, taking up 47.85%, in group III, 9.27% general population were detected with pathogens. There was statistical difference among them (*p*<0.05). Our findings revealed that 32.57% of women were detected with pathogens which included: ① *Gardnerella vaginalis* (group I 2.88%, group II 11.61%, group III 3.30%); ② *Candida albicans* (group I 7.41%, group II 8.43%, group III 1.85%); ③ *Escherichia coli* (group I 13.58%, group II 2.23%, group III 0.41%); ④ *Enterococcus faecalis* (group I 4.11%, group II 3.33%, group III 0%); ⑤ *Streptococcus agalactiae* (group I 6.58%, group II 16.37%, group III 1.67%) (figure 4). However, there was significant difference in the infection rate of *Gardnerella vaginalis* among three groups (*p*<0.05; Table 1), so was the same in the infection rate of *Escherichia coli* and *Enterococcus faecalis* and *Streptococcus agalactiae*. There was significant difference in the infection rate among three groups (*p*<0.05; Table 2), however, no significant difference was observed in the age among three groups (*p*>0.05).
Table 1 Infection rate of different pathogens in the study groups

<table>
<thead>
<tr>
<th>microorganism</th>
<th>Group I (n=243)</th>
<th>Group II (n=629)</th>
<th>Group III (n=485)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>infection rate (%)</td>
<td>Number</td>
</tr>
<tr>
<td><em>Gardnerella vaginalis</em></td>
<td>7</td>
<td>2.88</td>
<td>73</td>
</tr>
<tr>
<td><em>Candida albicans</em></td>
<td>18</td>
<td>7.41</td>
<td>53</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>33</td>
<td>13.58</td>
<td>14</td>
</tr>
<tr>
<td><em>Neisseria Gonorrhoeae</em></td>
<td>1</td>
<td>0.41</td>
<td>0</td>
</tr>
<tr>
<td><em>enterococcus faecalis</em></td>
<td>10</td>
<td>4.11</td>
<td>21</td>
</tr>
<tr>
<td><em>streptococcus aglactiae</em></td>
<td>16</td>
<td>6.58</td>
<td>103</td>
</tr>
</tbody>
</table>

Group I, 243 asymptomatic FSWs; Group II, 629 Symptomatic gynecology clinic patients; Group III 485 women attending physical examination.
Table 2 Comparison of infection rate in the study groups

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td>negative</td>
<td>133</td>
<td>328</td>
<td>440</td>
</tr>
<tr>
<td>positive</td>
<td>110</td>
<td>301</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>243</td>
<td>629</td>
<td>485</td>
</tr>
</tbody>
</table>

Group I, 243 asymptomatic FSWs; Group II, 629 Symptomatic gynecology clinic patients; Group III 485 women attending physical examination.

DISCUSSION

FSWs have been identified as one of the highest risk groups for the infection and transmission of STIs because most RTIs show no symptoms or symptom is too minimal to detect.\(^6\) We usually apply pathogen incubation to detect the potential infection. This screening have demonstrated that the infection rate in asymptomatic FSWs was so high as to 45.27%. We assumed that it was associated with the age of first sexual experience, high intensity of commercial sex work, the number of sexual partners >1, low level of education.\(^7\) The infection rate of asymptomatic FSWs did not match with previous reports. We analyzed it might be some of asymptomatic FSWs have washed their genitals before samples collection. In addition, *Mycoplasma* and *Chlamydia* were excluded in this research, so the real rate of RTIs was higher than the results. So our results might be an underestimation in the prevalence of RTIs.

The results of screening have shown that *Garderella* infection in asymptomatic FSWs was 3.30%, while in gynecological clinic patients with symptoms was 11.61%. The discrepancy between the infection rates of this two kinds of microorganism was associated with long-term irregular use of antibiotic, genital wash, vaginal flora caused by irregular treatment supplied by private small clinic.\(^8\) Moreover, due to the dissecting characteristics of female reproductive system, high intensity of sexual intercourse and floating sex partner, the disorder of internal endocrine hormone could break the original balanced vaginal condition. *Escherichia coli*, as one kind of conditioned pathogen, will overgrow abnormally. Furthermore, because of irregular use of antibiotic in asymptomatic FSWs, the washing of vaginal might cause resistance of *Escherichia coli*.\(^9\) According to the statistic analysis of infectious department in our hospital, the percentage of ampicillin resistance was 100%, cefazolin resistance was 96%, ceftazidime resistance was 85.7%, cefotaxime resistance was 100%, cefepime resistance was 90.5%. This analysis may reveal the reason why asymptomatic FSWs have high infection rate of *Escherichia coli*. It also demonstrated that the prevalence of *Candida albicans* in asymptomatic FSWs was 7.41%, and no significant difference was noted. However, it should get more attention because of the high infection rates.

Only one example of *Neisseria gonorrhoeae*
was detected in asymptomatic FSWs in this research, taking up 0.41%. The study demonstrated that STIs and other reproductive tract infections were still prevalent among FSWs in the area with low STIs infection rate. The infection rate of STIs was associated with local economy, income level and education level. The FSWs in this screening have almost received knowledge of STIs, and condom use was consistent in them, so it may lead to the low infection rate of STIs. But FSWs were still vulnerable to genital tract infection.  

RTIs in female can cause abdomen pain, increased the risk of sexually transmitted infections, chronic pelvic inflammatory disease, ectopic pregnancy, and infertility. Awareness and knowledge need to be improved on the subject to initiate meaningful preventive measures for control of RTIs. This implies that health intervention measures directed towards reducing morbidities from RTIs need not focus mainly on treatment of RTIs but rather on disease preventing strategies. These include reproductive and sex education on the prevention of the infections by avoidance of high risk sexual behaviours, use of barrier contraception and regular hospital visits as RTIs are often asymptomatic. Condom was confirmed as the effective way to prevent RTIs, especially in the high risk population. RTIs preventive programs should be integrated into other reproductive health care programs such as family planning, maternal and child health services with a view to providing a broad based reproductive health care. Making vaccination to prevent RTIs is very difficult, such as variation in the immune responses due to the hormonal cycle, selection of vaccine antigens and timing of the vaccine administration prior to infection exposure.

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Conflict of Interest: None declared