



Vaginal Infection And Associated Risk Factors Among Tea Tribe Population In Reproductive Age Group

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Abstract

Background: Vaginal infection is a common problem among women in the reproductive age group. Normal vaginal flora (lactobacilli) colonises the vaginal epithelium and have a role in defence against infection. Disturbance in the normal bacterial flora of the vagina lead to inflammation, discomfort, anxiety affecting women's quality of life.

Materials and Methods: The present study was conducted among women in reproductive age group belonging to the tea garden community in some regions of Upper Assam. The high vaginal swab (HVS) and endocervical swab (ECS) samples were collected aseptically from the vagina and cervix, respectively by using sterile cotton swabs with proper inclusion and exclusion criteria. Further processing of the samples for the isolation of causative agents were performed using the standard protocol.

Results: Among 366 enrolled participants, 122 (33.3%) had symptoms of vaginitis and belonged to the age group of 29-38 (n= 48; 39.4%) with gynaecological complaints like burning during micturition, pain during menstruation, pain during sexual intercourse, weakness, chills and fever, pain or discomfort during micturition. Among the participants with symptoms of vaginitis, bacterial vaginosis (14/122; 30%) was the most common cause of abnormal vaginal discharge, followed by candidiasis (6/122; 13%). The prevalence of vaginal discharge was found to be 33.3%.

Conclusion: Isolation of non-albicans *Candida*, indicate the need for microbiological investigation up to species level identification to ensure appropriate antifungal management.

Keywords: Vaginal infection, Reproductive age group, Bacterial vaginosis, *Candida tropicalis*, non-albicans candida

Introduction

Vaginal infection (VI) is a common problem among women in the reproductive age group causing inflammation and infection of the vagina and the second most common problem encountered in clinical medicine ^[1]. Normal vaginal flora (lactobacilli) colonises the vaginal epithelium and have a role in defence against infection. They

maintain the normal vaginal pH between 3.8 and 4.4. Diverse pathogenic spectrums have been observed in the vaginal microflora. Of these, bacterial vaginosis (BV), candidiasis and trichomoniasis are responsible for the majority of vaginal infections. It is a considerable problem for many women causing inflammation, discomfort, anxiety affecting women's quality of life and consuming considerable resources.

Some vaginal discharges are normal and can vary with age, use of contraceptives, menstrual cycle and oestrogen level ^[2].

Vaginitis is common in adult women and uncommon in prepubertal girls. The World Health Organization (WHO) has recommended that women complaining of discharge are due to five common reproductive tract infections: Chlamydia trachomatis infection, gonorrhoea, trichomoniasis, which are sexually transmitted infections, bacterial vaginosis and candidiasis, which result from a disturbance in the normal bacterial flora of vagina ^[3]. The vagina, ectocervix and endocervix are all susceptible to various pathogens, depending on the type of epithelium present and other factors in the microenvironment. The squamous epithelium of the vagina and ectocervix is susceptible to infection with candida species and Trichomonas vaginalis and the columnar epithelium of the endocervix is susceptible to infection with Neisseria gonorrhoeae and Chlamydia trachomatis. Herpes simplex virus may infect both types of the epithelium ^[4]. In the United States, as many as 16% of pregnant women have bacterial vaginosis and 50-60% prevalence is found in female prison inmates and commercial sex workers. In India, approximately 6% of the adult population suffers from sexually transmitted infections (STIs) and Reproductive tract infections (RTIs). Though exact data is lacking, most of the studies have reported vaginal discharge as the commonest RTI/STI syndrome among women, including HIV/AIDS. Vaginal infection is the second most common problem after abnormal uterine bleeding and unfortunately one of the most neglected health problems in India because of cultural Silence. Hence, in most cases patients are deprived of proper medical diagnosis. The most common causes of abnormal vaginal discharge are bacterial vaginosis, vaginal candidiasis and trichomoniasis; yet 7-72 % of women with vaginitis remain undiagnosed. This negligence is higher amongst the rural population due to a lack of awareness. The present study was proposed to find out the burden and the risk factors of vaginal infection among women of the reproductive age group belonging to tea tribe community upper Assam.

Materials And Methods:

Screening of participants:

A systematic random sampling method was adopted to select and include the sample with proper inclusion and exclusion criteria. This field and the institutional based study was conducted among women of tea garden community in some regions of Upper Assam, in their reproductive age and also such workers attending Out Patient Department (OPD) of Obstetrics & Gynaecology (O&G), JMCH and various tea garden hospitals.

The target group of this study were tea garden workers. Tea tribes are a special group of population who remain largely confined to a particular geographic and social boundary. Very little research on identifying the most common causes of vaginal discharge as well as risk factors associated with it has been conducted in the upper Assam region before especially in this group.

To study the burden of vaginal discharge and risk factors, among women in the reproductive age group belonging to the tea garden community, patients having complaints of vaginal discharge, with or without itching attending the OPD of the O&G department of JMCH and tea garden hospitals were sampled after taking consent. Two healthy matched controls were selected for each case enrolled from the same population. Demographic variables such as age, religion, place of residence, age at marriage, education, occupation, childbirth, pregnancy, history of abortion, use of contraception, presence of lower abdominal pain, abnormal discharge, vaginal itching, vaginal irritation, menstrual hygiene, use of sanitary napkins, personal hygiene and use of soap or pH balanced lotion for vaginal washed etc. were noted in a peer-reviewed questionnaire. Evidence of underlying disease like diabetes, HIV, other STI's or any other immunodeficiency diseases, and the treatment history including antibiotics, antifungal agents, steroids and immunosuppressive drugs were also recorded.

Inclusion criteria

1. Participants who are married, symptomatic pregnant and non-pregnant women between 18 and 45 years of age was recruited.
2. Participants who consented to participate in the study.

3. Patients belonging to tea tribe attending OPD of Obstetrics and Gynaecology in JMCH and other tea estate hospitals.

Exclusion criteria

1. Participants who were not willing to participate.
2. Participant with any serious debilitating diseases like malignancies, tuberculosis, eczema and other chronic granulomatous diseases.
3. Participants who have undergone hysterectomy.

Institutional Ethics Committee clearance:

Ethical approval was obtained from the Institutional Ethics Committee (Human) of Jorhat Medical College, Assam, with a reference number of SMEJ/JMCH/ MEU/841/Pt-1/2011/3073. Both verbal and written informed consent was obtained from the study participants before proceeding to data collection.

Statistical Analysis:

The data obtained from the participants were tabulated on Excel worksheets. Statistical analysis was performed with MS- Excel 2016 and Graph pad software. Chi-square (χ^2) test was used to calculate significant differences between the risk factors associated with onychomycosis. Differences with $p < 0.05$ were considered statistically significant.

Sample Collection and processing:

The high vaginal swab (HVS) and endocervical swab (ECS) samples were collected aseptically from the vagina and cervix, respectively by using sterile cotton swabs for the examination of colour, character, smell and pH. Three specimens were collected from each participant and processed as follows.

Isolation, identification and screening of etiological agents:

The swab specimens of vaginal discharge were processed as follows:

- i. Firstly, the swab collected was used to prepare 10% KOH on a glass slide and examined under the microscope for the presence of fungal elements
- ii. The second swab was used to inoculate two sets of media-Sabouraud dextrose agar and Sabouraud dextrose agar with

0.05 g/L of chloramphenicol and 0.4g/L of cycloheximide.

- iii. The third swab was used to prepare Gram-stained slides and BV was evaluated using Nugent's scoring system.

The laboratory diagnosis of vaginal discharge is mainly achieved by microscopy. Important observations such as duration of growth, surface morphology, pigment production etc. were noted against each isolate. Tease and Cellophane tape mount of the growth using Lactophenol cotton blue and slide culture was made for identification. Growth of any yeast was identified by conventional procedures including germ tube test, sporulation on cornmeal agar and sugar assimilation tests. Further, yeast growth was identified by Vitek2.

Results:

A total of 122 cases and 244 age and sex-matched controls were selected from September 2019 to August 2020 from Jorhat, Golaghat, Sibsagar and Majuli districts of upper Assam. Socio-demographic characters of enrolled cases and controls are presented in Table 1. We enrolled 122 cases and 244 matched controls. More than two- third cases ($n=89$; 72.9%) and controls ($n= 184$; 75.4%) enrolled were in the age group 18-38 years. All the participants were married. Other demographic characters such as educational status, religion, occupation, socioeconomic status etc. were similar between the cases and the controls to the extent possible.

Among 122 cases, vaginal infection was found to be present mostly in the age group 29- 38yrs ($n= 48$; 39.4%). Cases were found to be more among illiterate ($n=94$; 77%), house wives ($n= 84$; 68.8%) and in women belonging to lower class (BPL) of socioeconomic status ($n= 109$; 89.3%).

Out of 366 women screened, 122 (33.3%) had symptoms of vaginitis. The majority of the women with vaginal discharge had another coexisting gynaecological complaint (Table 2) such as itching in the genital area, sores/ blisters in the genital area, pain in the lower abdomen, burning during micturition, pain during menstruation, pain during sexual intercourse, weakness, chills and fever, pain or discomfort during micturition.

Of all the gynecological complaints considered, significant association between vaginal infection and itching in genital area (96.7%; $p = <0.0001$), sores/blisters in genital area (67.2%; $p= <0.0001$), pain in lower abdomen (88.5%; $p= <0.0001$), pain during sexual intercourse (75.4%; $p=<0.0001$) and burning during micturition (60.6%; $p= 0.0186$). There was no association between vaginal infection and pain during menstruation (47.5%; $p = 0.587$) and weakness/ fever (50.8%; $p = 0.8563$).

Results of odd ratio suggested that poor personal hygiene practices of the women (non-use of sanitary napkins, change of panties, washing of intimate area, change of cloth or napkins during menstruation), history of abortion, contraceptive use, use of broad-spectrum antibiotics, place of delivery were found as potential risk factors associated with vaginal infection. Of the 366 women screened, 122 (33.3%)

had symptoms of vaginitis. The attributes of vaginal discharge are presented in Table 4.

Among symptomatic cases of vaginitis, bacterial vaginosis (14/122; 30%) was the most common cause of abnormal vaginal discharge, followed by candidiasis (6/122; 13%). Figure 1 shows the etiological agents of vaginitis. The identification of the isolates was done based on macroscopic and microscopic features. Candidiasis was detected in 6/122 (5%) cases. *C. tropicalis* was isolated in 5/6 (83.3%) cases, while 1/6 (16.6%) was *Candida* sp. Intermediate Bacterial vaginosis (Nugent’s score 4-6) was detected in 14/122 (11.4%) cases. Commonly identified bacterial isolates were *Staphylococcus aureus*, *Klebsiella pneumoniae*, *E. coli*, *Klebsiella oxytoca* and *Acinetobacter baumannii*. Mixed etiologies detected were *E. coli* with *Candida* spp. in three cases.

Table 1 Sociodemographic characters

| Characters | Cases (n=122) | | Controls (n=244) | |
|--------------------|---------------|------|------------------|------|
| | n | % | n | % |
| Age (years) | | | | |
| 18-28 | 41 | 33.6 | 86 | 35.2 |
| 29-38 | 48 | 39.4 | 98 | 40.1 |
| 39-45 | 33 | 27 | 60 | 24.5 |
| Marital status | | | | |
| Married | 122 | 100 | 244 | 100 |
| Unmarried | - | - | - | - |
| Educational status | | | | |
| Literate | 28 | 22.9 | 62 | 25.4 |
| Illiterate | 94 | 77 | 182 | 74.5 |
| Religion | | | | |
| Hindu | 112 | 91.8 | 232 | 95 |
| Muslim | 10 | 8.1 | 12 | 4.9 |
| Sikh | - | - | - | - |
| Christian | - | - | - | - |
| Occupation | | | | |

| | | | | |
|----------------------|-----|------|-----|------|
| Working | 38 | 31 | 124 | 50.8 |
| Housewife | 84 | 68.8 | 120 | 49.2 |
| Socioeconomic status | | | | |
| Lower class (BPL) | 109 | 89.3 | 214 | 87.7 |
| Lower middle class | 13 | 10.6 | 30 | 12.2 |
| Average middle class | - | - | - | - |
| Upper Middle class | - | - | - | - |
| Upper class | - | - | - | - |

[Socioeconomic status classifications Lower class: BPL (Below Property Line), Gets subsidies for family maintenance; Lower Middle class: Can look after food need but not Health and Education; Average Middle class: Can look after the Health and Education but cannot spent for Luxury; Upper Middle class: Apart from looking after Health and Education they have Luxury items in the family, May or may not be giving tax return; Upper class: Paying Income tax to the Government].

Table 2 Gynaecological symptoms with the complaints of vaginal discharge

| Complaints | | Number | % | <i>p</i> value |
|---------------------------------|-----|--------|------|----------------|
| Itching in genital area | Yes | 118 | 96.7 | <0.0001* |
| | No | 4 | 3.2 | |
| Sores/ blisters in genital area | Yes | 82 | 67.2 | <0.0001* |
| | No | 40 | 32.7 | |
| Pain in lower abdomen | Yes | 108 | 88.5 | <0.0001* |
| | No | 14 | 11.4 | |
| Burning during micturition | Yes | 74 | 60.6 | 0.0186* |
| | No | 48 | 39.3 | |
| Pain during menstruation | Yes | 58 | 47.5 | 0.587 |
| | No | 64 | 52.4 | |
| Pain during sexual intercourse | Yes | 92 | 75.4 | <0.0001* |
| | No | 30 | 24.5 | |
| Weakness/ fever | Yes | 62 | 50.8 | 0.8563 |
| | No | 60 | 49 | |

[*p*- value*: statistically significant]

Table 3 Possible risk factors associated with vaginal infection

| Possible risk | Odd ratio (OR) |
|---------------|----------------|
|---------------|----------------|

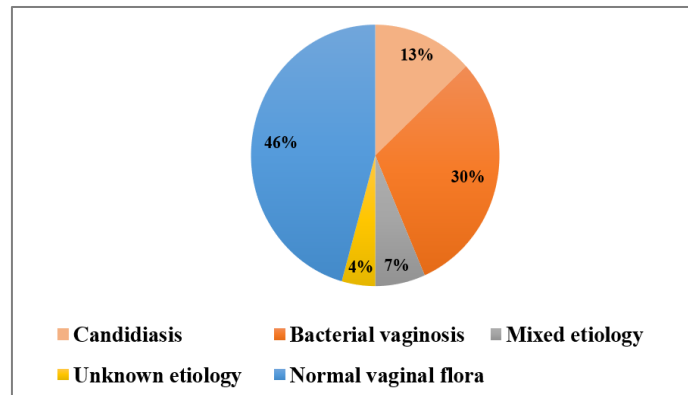
| | |
|---------------------------------------|-------|
| Poor Personal hygiene of women | 3.6* |
| History of abortion | 3.2* |
| History of induced abortion | - |
| Contraceptive use | 1.5* |
| Use of antibiotics | 2.3* |
| Place of delivery (non-Institutional) | 2.56* |

[OR>1*: Association present; OR=1: No association; OR<1 Risk is protective]

Table 4. Attributes of vaginal discharge

| Attribute | Number (N=122) | Percentage |
|-----------------------|----------------|------------|
| Color | | |
| White | 93 | 76.2 |
| White Curdy | 29 | 23.7 |
| Duration of infection | | |
| <15 days | 56 | 46 |
| >15 days | 66 | 54 |
| pH | | |
| 4-4.5 | 97 | 79.5 |
| >4.5 | 25 | 20.4 |
| Malodour | | |
| Present | 23 | 18.8 |
| Absent | 99 | 81 |
| | | |

Figure 1 Etiological agents of vaginitis



Discussion:

Vaginal discharge is the second most common gynaecological problem and probably the most frequently narrated complaint of women in the reproductive age group. Although it may not be considered a serious condition, it may have repercussions on a woman's life [5]. In the present study, we have investigated vaginal infection and its risk factors among tea garden workers in the reproductive age group of upper Assam.

This study found a 33.3% prevalence of vaginal discharge among the women of the tea garden community of Upper Assam areas in reproductive age and tea garden workers attending OPD of O&G, JMCH. Vaginal infection ranges from 1-14% of all women of reproductive age throughout the world and the reported prevalence in India is 30% [6,7]. These variations may be because of differences in the study population, economic status, educational background, geographic location and method of diagnosis [8,9]. Variable prevalence rates of infectious vaginitis can be attributed to the varied etiologies studied, the detection techniques applied, patient groups involved, and the geographical locales as having been reported by studies conducted globally as well as in India [9-13].

Three hundred and sixty-six women were enrolled in this study, out of which 122 presented with abnormal vaginal discharge. The majority of the cases were found to be more among participants aged 18-38 years (n=89/122, 73%). All of them were married and illiterate and belonged to lower socioeconomic class. Chaudhary et al. 2012 reported vaginal discharge among married women aged >43 (59.1%); in contrast to this Patel et al. 2005 and Patel et al. 2006 found a higher percentage of vaginal discharge in younger unmarried females [3,14, 15]. Chaudhary et al. 2012 also

reported a high prevalence of vaginal discharge among illiterates and in Muslim women [3]. In this study, the majority of women with vaginal discharge belonged to lower socioeconomic status (89.3%, n=109). This is in concordance with findings by Tiwari et al. 2001 and Kulkarni et al. 2005 [16, 17]. Factors like poor personal hygiene practices, history of abortion, contraceptive use, use of broad-spectrum antibiotics, place of delivery etc. were found to be possible risk factors associated with vaginal infection (OR>1) and could be a contributory factor for the occurrence of vaginal discharge. A study by Chaudhary et al. 2012 found vaginal discharge to be more among women with a history of abortion, induced abortion and last non-institutional delivery [3]. Sharma et al. 2004 reported a history of abortion to be significantly associated with reproductive infection whereas Rathore et al. 2007 found no association of place of delivery with reproductive tract infection [18, 19]. Knowledge of these risk factors is important for treating and educating women who suffer from this kind of gynaecological problem. Moreover, vaginal discharge was found to be more common among women with gynaecological complaints such as itching in the genital area, sores/blisters in the genital area, pain in the lower abdomen, pain during sexual intercourse and burning during micturition etc. These variables showed a highly significant association ($p = <0.0001$) with vaginal infection. A similar association was shown by Chaudhary et al. 2012 who reported a strong association between vaginal discharge and gynaecological symptoms like itching in the genital area, blisters in the genital area, pain in the lower abdomen and burning during micturition [3].

Among symptomatic cases of vaginitis, bacterial vaginosis (14/122; 30%) was the most common cause of abnormal vaginal discharge, followed by

candidiasis (6/122; 13%) (Figure 1). BV was found to be the most common cause of abnormal vaginal discharge (30%) in this study which is similar to the study conducted by Yusuf et al. 2011^[20]. In this study, intermediate bacterial vaginosis (Nugent's score 4-6) was detected in 14/122 (11.4%) cases. Commonly identified bacterial isolates were *Staphylococcus aureus*, *Klebsiella pneumoniae*, *E. coli*, *Klebsiella oxytoca* and *Acinetobacter baumannii*. Khan et al. 2008 reported, the predominant bacterial pathogen associated with vaginal infection as *Escherichia coli*, Coagulase-negative *Staphylococci* (CoNS), *Staphylococcus aureus*, *Klebsiella* while the *Staphylococcus aureus*, *Streptococcus* spp. and *Proteus* spp. were the most prevalent organism in high vaginal swab samples^[5]. In addition, BV has been associated with early termination of pregnancy, insertion of intrauterine devices, and hysterectomy, both vaginal and abdominal^[21]. Various studies show the prevalence of BV ranging from 2.5% to 48%^[9]. Koumans et al. 2007 had also found a 29.2% prevalence of BV which is similar to the findings in the present study. National Health and Nutrition Examination Survey (2001-2004) in the United States reported that almost one-third of women were positive for bacterial vaginosis with 29% prevalence rate among women between the ages of 14 and 49 years^[20, 22, 23]. A higher prevalence of bacterial vaginosis (48%) among the sex workers were reported by Nessa et al. 2005 in Bangladesh. This high prevalence may be the result of disturbance of vaginal microflora resulting from frequent sexual intercourse and the subsequent frequent washing with water and disinfectant (Nessa et al. 2005)^[24]. In the current study, the information regarding the number of sexual partners could not be recorded considering the cultural sentiments among this closed and deprived community. This may be considered a limitation of the study.

Vaginal candidiasis (VC) is the second most common cause of vaginitis^[1]. *Candida* spp. is normal flora of the vagina that eventually become pathogenic under some prevailing conditions, this could lead to devastating genital discomfort and thus present as a common aetiology of vulvovaginitis^[25]. The distribution of *Candida* spp. identified in women with VI varies widely depending on the studied populations^[26]. *C. albicans* remained the predominant species isolated from VC infection.

However, several studies have shown an increasing trend of non-candida albicans (NCA) infection^[27]. In our study, we found the *C. tropicalis* to be the predominant pathogen causing VC (5/6, 83.3%) followed by *Candida* sp. (1/6, 16.6%). According to Narayankhedkar et al. 2015 with higher resistance levels of most NCA spp. to the commonly prescribed azole-based treatment regimen may have serious consequences for women affected by these isolates^[9]. Hence laboratory investigation up to species level and knowing the possible risk factors will help the physicians for better diagnosis and thereafter treatments.

Conclusion:

In this study, the burden of vaginal infection with clinic-etiological characterization was done amongst 366 women of reproductive age group (18-45 years) belonging to tea tribes from upper Assam. The prevalence of vaginal discharge was found to be 33.3%. It is evident that VI remains one of the most neglected health problems in the Upper Assam region. Because of cultural silence, health care negligence and poor personal hygiene practices, most of the patients are deprived of proper medical diagnosis. Hence, there is a need for creating community awareness on personal hygiene and self-concern in women for their own healthy life. Isolation of non-albicans *Candida*, indicate the need for microbiological investigation up to species level in cases of *Candida* infections, to ensure appropriate antifungal management.

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