Etiology of Vaginal/Cervical Discharge Syndrome: Analysis of Data from a Referral Laboratory in Eastern India

Ishita Ghosh, Bandhan Paul, Nibedita Das, Debabrata Bandyopadhyay, Manas Kumar Chakrabarti

Abstract
Context: Sexually transmitted infections (STIs) and reproductive tract infections (RTIs) constitute important public health problem worldwide. Syndromic diagnosis of vaginal/cervical discharge (VCD) is often inaccurate leading to over- or under-treatment. Aims: This study aimed to ascertain the laboratory-confirmed diagnosis of VCD and their relative frequency in a group of patients presenting to a STI clinic in eastern India and to determine the sensitivity and specificity of clinical diagnosis. Settings and Design: This was a cross-sectional study. Materials and Methods: Data of 5301 consecutive patients with VCD were analyzed for etiological diagnosis and the findings were compared with laboratory data of 3110 asymptomatic cases. Statistical Analysis Used: Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of clinical diagnosis of vaginal discharge syndrome were obtained considering the results of the laboratory diagnosis as gold standard. The strength of agreement was computed using Kappa statistic. Results: Of 5301 cases of VCD, 90.83% had STI/RTIs. The most prevalent infection was trichomoniasis (35.23%), followed by bacterial vaginosis (33.05%) and vulvovaginal candidiasis (19.67%). Sensitivity, specificity, PPV, and NPV of vaginal discharge as an indicator of STI/RTI were 85.5%, 99.0%, 99.3%, and 80%, respectively, with agreement of 90.49% and kappa value of 0.8, indicating “almost perfect” agreement. Many cases with VCD also suffered from other STIs such as herpes simplex virus-2, hepatitis B, human immunodeficiency syndrome, and syphilis and some asymptomatic cases suffered from one or more STIs. Conclusions: All patients with VCD with high-risk behavior should preferably undergo laboratory evaluation of the VCD syndrome to avoid over- or under-treatment.

Key Words: Clinical diagnosis, correlation, laboratory diagnosis, vaginal/cervical discharge syndrome

Introduction
Sexually transmitted infections (STIs) and reproductive tract infections (RTIs) constitute important public health problem worldwide. Development of new diagnostic techniques in recent years has facilitated better management of these infections. In spite of these advancements, a huge burden of new cases occurs annually. This creates serious health problem and enhances the risk of acquiring human immunodeficiency virus (HIV) since inflammation of the genital mucosa associated with vaginal/cervical discharge (VCD) causes infiltration by lymphocytes which are the target cells of HIV and may lead to long-term complications such as infertility, pelvic inflammatory disease, ectopic pregnancy, and carcinoma. Varying trends of STIs/RTIs have been reported, the disease pattern being affected by socioeconomic factors and locoregional conditions. Further, many of the infections are often asymptomatic and remain undiagnosed. Patients are reluctant to visit the STI clinics because of social stigma and lack of awareness. Proper education, adoption of safe sexual practices, accurate diagnosis, and treatment form the mainstay to control such infections.

Treatment, based on symptoms and clinical diagnosis, is often offered to patients since conduction of different laboratory tests for all patients is time consuming.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Ghosh I, Paul B, Das N, Bandyopadhyay D, Chakrabarti MK. Etiology of vaginal/cervical discharge syndrome: Analysis of data from a referral laboratory in Eastern India. Indian J Dermatol 2018;63:484-9.

Received: July, 2018. Accepted: September, 2018.
and resource intensive and many of the patients fail to attend STI clinics a second time when recalled. To circumvent these problems, a syndromic approach has been recommended by the National AIDS Control Organization (NACO), India.\[2\] However, syndromic approach is often inaccurate and may lead to over- or under-treatment. Nevertheless, some studies have shown a high cure rate of STIs/RTIs with the syndromic approach.\[3-7\]

**Aim**

This study aimed to ascertain the laboratory-confirmed diagnosis of VCD and their relative frequency in a group of patients presenting to a STI clinic in eastern India and to determine the sensitivity and specificity of clinical diagnosis.

**Subjects and Methods**

**Study population**

This study was conducted at the Regional Sexually Transmitted Disease Reference Laboratory in eastern India based on analysis of data from January 2011 to December 2016.

**Study design**

This was a cross-sectional study.

**Inclusion criteria**

(i) All consecutive patients presenting with vaginal discharge irrespective of whether they had vaginitis or cervicitis were included in the study, (ii) asymptomatic cases were recruited from Gynecological Outpatient Department (OPD) and included the women undergoing routine cervical cytological screening, and (iii) patients who provided informed consent for sample collection.

**Exclusion criteria**

 Patients who had menstrual bleeding at the time of examination or who had received antibiotic treatment in the previous 2 weeks were excluded from the study.

**Ethical clearance**

The Institutional Ethics Committee approval was obtained prior to the study.

**Syndromic diagnosis**

All the patients were counseled by a trained counselor and clinically examined by a physician. After obtaining informed consent, proper history taking including elicitation of treatment history, and thorough clinical examination including speculum examination of all patients, a diagnosis of VCD was made according to the NACO guidelines.\[2\]

**Sample collection**

The clinical specimens for the laboratory tests that were obtained from the clinic attendees comprised of three vaginal swabs and two endocervical swabs. Blood samples were collected from all the patients. The diagnostic tests were performed according to the NACO guidelines.\[3\] The tests performed are shown in Table 1.

**Investigations**

The vaginal samples were tested for *Trichomonas vaginalis* (TV), *Candida* species, and bacterial vaginosis. The endocervical samples were tested for *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. Serological tests were performed for detection of syphilis, hepatitis B, herpes simplex virus (HSV)-2, and HIV.

For detection of *Neisseria gonorrhoeae*, culture on *Gonococcus* agar followed by Gram staining on smears from colonies to detect Gram-negative diplococci was performed. For detection of *Candida* species, potassium hydroxide (KOH) wet mount was performed at the

| Sample | Diseases               | Target for detection                                      | Test                                      |
|--------|------------------------|----------------------------------------------------------|------------------------------------------|
| Endocervical swab | *Gonorhea* | *N. gonorrhoeae* | Culture on GC agar                           |
|         | *Chlamydiasis*         | Antibody against *C. trachomatis*                        | *C. trachomatis* IgM ELISA               |
|         | *Candidiasis*          | *Candida* spp.                                            | KOH wet mount, culture on Sabouraud’s dextrose agar |
|         | *Trichomoniasis*       | *T. vaginalis*                                            | Wet mount, culture in Kupferberg media   |
|         | *Bacterial vaginosis*  | *G. vaginalis, Mobiluncus species*                        | Amsel’s criteria, Gram stain              |
|         | *NSGI*                 | Five or more leukocytes per high-power field, negative tests for specific STIs | Gram stain                              |
| Vaginal swab | *Syphilis*            | Antibody against *T. pallidum*                           | VDRL test (positive: VDRL ≥1:8), TPHA test |
|         | *Herpes type 2*        | Antibody against HSV-2                                    | ELISA for HSV-2 IgM                      |
|         | *Hepatitis B*          | HBsAg                                                    | ELISA for HBsAg                          |
| Serum   | *HIV*                  | Antibody against HIV 1 and 2                             | Immunochromatography                     |

*Gonorhea*: *Neisseria gonorrhoeae*, *C. trachomatis*: *Chlamydia trachomatis*, *T. vaginalis*: *Trichomonas vaginalis*, *G. vaginalis*: *Gardnerella vaginalis*, *T. pallidum*: *Treponema pallidum*, GC: *Gonococcus*, ELISA: Enzyme-linked immunosorbent assay, KOH: Potassium hydroxide, VDRL: Venereal Disease Research Laboratory, IgM: Immunoglobulin M, STIs: Sexually transmitted infections, HSV-2: Herpes simplex virus-2, TPHA: *T. pallidum* Hemagglutination, NSGI: Nonspecific genital infection, HBsAg: Surface antigen of Hepatitis B virus
Further, culture on Sabouraud’s dextrose agar followed by Gram staining on smears from colonies to visualize budding yeast cells was conducted. For detection of TV, wet mount examination was performed at the clinic and culture on Kupferberg’s media was carried out.

For diagnosing bacterial vaginosis, Amsel’s criteria were followed comprising of a thin homogenous discharge, elevated vaginal pH (>4.5), fishy odor on addition of 10% KOH (Whiff test) and >20% clue cells on Gram-stain.

For detection of syphilis, Venereal Disease Research Laboratory (VDRL) test and Treponema pallidum hemagglutination (TPHA) test were used. A VDRL titer of >1:8 was considered as positive.

For the diagnosis of hepatitis B, enzyme-linked immunosorbent assay (ELISA) technique was used. HSV-2 detection was done by immunoglobulin M (IgM) ELISA technique. HIV rapid detection was done by a membrane-based flow-through immunoassay for detection of antibodies to HIV 1 and HIV 2 in serum.

**Prevalence of sexually transmitted infections/reproductive tract infections**

A total of 9839 female patients were evaluated out of which STI syndromes were present in 6729 (68.39%) cases, while 3110 (31.61%) of cases were asymptomatic. In the syndromic group, 5301 (78.78%) patients presented with VCD syndrome. For this study, 5301 consecutive patients with VCD syndrome and 3110 asymptomatic cases were analyzed at a regional referral center.

Of the 5301 cases of vaginal discharge, 4815 (90.83%) were diagnosed with STIs, out of which 4531 (94.10%) cases suffered from one or more infections causing VCD, namely trichomoniasis, vulvovaginal candidiasis, bacterial vaginosis, chlamydiasis, and gonorrhea. Although the total number of patients was 4815, the total number of laboratory diagnoses for different STIs was 5186 as many cases had multiple infections.

The most prevalent infections were TV (1827, 35.23%), followed by bacterial vaginosis (1714, 33.05%) and *Candida* species (1020, 19.67%). We obtained *Chlamydia trachomatis* IgM positivity in 156 (3.0%) samples and gonorrhea in 4 (0.10%) samples. We also observed VDRL and TPHA positivity for syphilis in 235 (4.53%) samples, HIV by immunochromatography in 107 (2.06%) samples, HSV-2 IgM ELISA positivity in 106 (2.04%) samples, and ELISA for hepatitis B surface antigen positivity in 17 (0.33%) samples. The diagnoses of individual diseases in cases with vaginal discharge syndrome in the study population are shown in Table 2.

Among the total number of 3110 asymptomatic women, a diagnosis of STI/RTI was made in 136 (4.37%) cases. Among them, 30 (22.06%) had infections that cause VCD. Although the total number of asymptomatic women was 136, the total number of laboratory diagnosis for different STIs was 146 as some cases had multiple infections. The breakup of 146 individual diagnoses was as follows: syphilis (64, 43.84%), hepatitis B (36, 24.66%), *Chlamydia trachomatis* (14, 9.6%), TV (10, 6.85%), *Candida* spp. (4, 2.75%).

**Table 2: Diagnosis of individual sexually transmitted infections in cases with vaginal/cervical discharge syndrome (there were 5186 diagnoses among 4815 patients)**

| Laboratory diagnosis                  | n (%)   |
|---------------------------------------|---------|
| Gonorrhea                             | 4 (0.10) |
| Chlamydia                              | 156 (3.0) |
| Candidias                              | 1020 (19.67) |
| Trichomonias                           | 1827 (35.23) |
| Bacterial vaginosis                    | 1714 (33.05) |
| Syphilis                               | 235 (4.53) |
| Herpes simplex virus type 2            | 106 (2.04) |
| Hepatitis B                            | 17 (0.33) |
| HIV                                    | 107 (2.06) |

**Place of study**

The symptomatic group comprised of patients attending STI clinic. The asymptomatic group comprised of cases recruited from the Gynecological OPD and included women undergoing routine cervical cytological screening. Laboratory tests and analysis were conducted at a regional referral center.

**Statistical analysis**

The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the syndromic diagnoses including 95% confidence intervals (CIs) were obtained considering the results of the laboratory diagnosis as gold standard; the tests performed in the laboratory are summarized in Table 1. To test the concordance between clinical diagnosis and laboratory diagnosis, the strength of agreement was computed using Kappa statistic. The weighed and unweighed kappa values with standard error and 95% CI were calculated using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA).

**Results**

**Demographic characteristics of the study population**

The age of the cases ranged from 11 to 69 years, the mean age being 40.0 years; 38.9% were in the age group of 25–34 years. Majority of the patients were from rural area, belonging to low socioeconomic group and with a low level of literacy.
2.7%), bacterial vaginosis (8, 5.5%), HIV (9, 6.16%) and HSV-2 (1, 0.68%). The diagnoses of individual infections in the asymptomatic group are shown in Table 3.

Mixed infection was found in 755 (14.24%) cases with VCD syndrome and in 30 (1.0%) asymptomatic cases. In cases with mixed infections, two or more STIs were present, of which at least one infection was causative of VCD, namely trichomoniasis, vulvovaginal candidiasis, bacterial vaginosis, chlamydia, and gonorrhea. In the syndromic group, 639 (12.05%) cases suffered from two infections and 116 (2.19%) suffered from more than two infections. A total of 573 (10.8%) patients with vaginal discharge syndrome suffered from concomitant pelvic inflammatory disease.

**Correlation between vaginal/cervical discharge syndrome and laboratory diagnosis**

The correlation between VCD syndrome and laboratory diagnosis is summarized in Table 4. Trichomoniasis, bacterial vaginosis, candidiasis, chlamydia, and gonorrhea, the five major causes of VCD in women, were diagnosed in 4531 (85.47%) women with discharge and in 30 (1.0%) women without discharge, demonstrating a statistically significant difference between the two groups (P<0.001, Chi-square test). The sensitivity of VCD syndrome as a marker of STI was 85.5% (95% CI: 84.5%–86.4%), specificity was 99.0% (95% CI: 98.6%–99.3%), PPV was 99.3% (95% CI: 99.0%–99.5%), and NPV was 80% (95% CI: 78.7%–81.2%). It is clear from Table 4 that a number of patients (770, 14.5%) did not have disease but presented with discharge, most likely due to physiological causes.

### Table 3: Diagnoses of individual sexually transmitted infections in asymptomatic cases (there were 146 diagnoses among 136 patients)

| Laboratory diagnosis   | n (%)   |
|------------------------|---------|
| Gonorrhea              | 0 (0.0) |
| Chlamydia              | 14 (9.6)|
| Candidiasis            | 4 (2.7) |
| Trichomoniasis         | 10 (6.85)|
| Bacterial vaginosis    | 8 (5.5) |
| Syphilis               | 64 (43.84)|
| Herpes simplex virus type 2 | 1 (0.68) |
| Hepatitis B            | 36 (24.66)|
| HIV                    | 9 (6.16) |

### Table 4: Correlation between clinical diagnosis and laboratory diagnosis

| Disease positive | Disease negative | Total |
|------------------|------------------|-------|
| Discharge positive | 4531            | 770   | 5301 |
| Discharge negative | 30              | 3080  | 3110 |
| Total            | 4561            | 3850  | 8411 |

Disease included trichomoniasis, candidiasis, bacterial vaginosis, chlamydia, and gonorrhea.

The agreement between clinical and laboratory diagnosis was 90.5% (95% CI: 89.84%–91.10%) and kappa value was 0.8 (95% CI: 0.79%–0.81%), indicating “almost perfect agreement.”

**Discussion**

The most common syndromic diagnosis among the STI clinic attendees was VCD (78.78%), as has been found in other studies. In the present study, the most common cause of VCD was TV, which was found in 35.23% cases of vaginal discharge syndrome. TV was also reported to be the most prevalent STI by Arora et al. with a prevalence of 24.2% and 17.4% in rural and urban populations, respectively. In the study by Yin et al., more than half (54.37%) of the patients were infected with TV. Other studies have reported varying prevalence of TV as follows: 20.2%, 6.9%, 17.3%, 11%, and 3.8%. A meta-analysis conducted by Zemouri et al. reported that prevalence rate of TV ranged from 0.9% to 17.3%. The prevalence of gonorrhea in cases with VCD syndrome in the present study was 0.1%. Low prevalence of the disease had been observed by other authors as follows: 0.6% by Ray et al., 3.8% by George et al., 0.2% by Musie Ghebremichael, and 1.7% by Chauhan et al.

The sensitivity, specificity, PPV, and NPV of VCD as an indicator of STI in women in the present study were 85.5%, 99.0%, 99.3%, and 80%, respectively, with agreement of 90.49% and kappa value of 0.8, indicating “almost perfect” agreement. The risk assessment-inclusive flowchart developed by the WHO for diagnosing cervical infections in clinical settings was found to have a sensitivity of 84% (95% CI: 80%–89%) and a specificity of 40% (95% CI: 34%–36%); PPVs for diagnosing cervical infection with the use of the algorithms ranged from 42% to 43% and NVPs ranged from 78% to 81%. These were the data recorded by one observer; however, comparable figures as obtained in our study had been recorded by other authors like Choudhry et al., who had reported a sensitivity of 96% and 91% and a specificity of 76% and 72% of VCD syndrome for Neisseria gonorrhoea and Chlamydia trachomatis, respectively. In the study by Ray et al., the sensitivity of syndromic approach for VCD syndrome was 93.8% but the specificity was low (37.5%). A study in Uganda observed that the sensitivity of the syndromic diagnosis in detecting bacterial vaginosis was 50% and in detecting TV was 66.7%. In the study by Wang et al., in patients with vaginal discharge, the sensitivity was 90.8%, specificity was 46.9%, PPV was 50.9%, and NPV was 89.3% for the diagnosis of gonorrhea and/or chlamydial infection by syndromic approach. Our study shows a low sensitivity, higher specificity, high PPV, and low NPV in diagnosing VCD using the syndromic approach. This indicated that in
our clinical setting, false-negative results were few. We also obtained high PPVs with the syndromic diagnosis, implying that the majority of the clinically diagnosed STI cases truly had the disease. Several studies obtained a low sensitivity and high specificity on comparing syndromic and laboratory diagnoses. Clark et al. compared STI symptoms with laboratory-based diagnosis and obtained a low sensitivity and higher specificity in cases with vaginal discharge.[23] Yin et al. observed that the sensitivity of physician assessment of STI was low (10%), while the specificity was higher (>95%).[14] The sensitivity, specificity, and PPV of the algorithm for VCD, comprising of symptoms and clinical examination, were 27%, 82%, and 12%, respectively, in the study by Mayaud et al.[23]

A poor sensitivity of syndromic diagnosis of STI had been obtained by Mathews et al. in a public health clinic in Cape Town and by Mukenge-Tshibaka et al. among female sex workers in Benin.[24,25] In our laboratory, due to resource constraints, we did not have access to highly sensitive and specific molecular techniques such as nucleic acid amplification tests for STI detection which could have increased the detection rate of STIs.

Few studies on VCD syndrome included investigations for other STIs over and above those for the specific etiological agents pertaining to the particular syndrome. In our study, among the cases with syndromic diagnosis of VCD, 106 (2.04%) samples showed positivity for HSV-2, 17 (0.33%) samples demonstrated positivity for hepatitis B, 235 (4.53%) samples were positive for syphilis, and 107 (2.06%) samples were positive for HIV. Other studies also obtained HSV-2 seropositivity in patients with vaginal discharge and other nonherpetic STI syndromes.[26,27] HSV-2 seropositivity was often found without concomitant clinical symptoms.[21,27,28] This might be due to seroconversion in primary herpetic infection before clinical symptoms became apparent or reactivated IgM in cases with recurrent infection rather than false positivity.[27] As obtained in 0.33% of our samples, hepatitis B infection might be present in patients with vaginal discharge syndrome as a concomitant STI, reflecting high-risk sexual behavior. Shah et al. obtained 0.5% prevalence of hepatitis B and 0.4% prevalence of syphilis in cases with vaginal discharge syndrome.[9]

In the present study, 107 (2.06%) samples from patients with vaginal discharge syndrome had concomitant HIV infection. In the study by Ray et al., 0.3% of the cases with STI symptoms were infected with HIV.[29] High rate of mixed infection in cases of VCD had been obtained by many studies, which corroborated with our findings.[24,20]

In addition to the symptomatic cases, we also investigated a large number of asymptomatic cases and analyzed the data. It was observed that 136 (4.37%) asymptomatic cases suffered from one or more STIs, out of which 30 (22.06%) cases suffered from STIs causing VCD.

The syndrome-based management of STIs is easy to implement in resource-poor, developing countries, particularly in the peripheral areas with a large patient burden but lacking well-established laboratory amenities. Transport of samples to distant laboratories is difficult, time consuming and, if ideal transport conditions are not adhered to, may lower the probability of obtaining accurate results. There is heterogeneity of data obtained from different studies implying that syndromic diagnosis is often subjective. A consensus opinion on the performance of syndromic diagnosis is difficult to formulate. Further, the use of different algorithm, different study population, and regional variation in STI prevalence reduces effective comparison between reports.[31] The signs and symptoms of different STIs are often overlapping; asymptomatic cases and cases with mixed infections add to the difficulty of syndromic diagnosis.

Limitation
Our study population was restricted to STI clinic and Gynaecology OPD attendees, thus our data might not be representative of the entire population due to selection bias.

Conclusions
In our study, many cases presenting with VCD syndrome also suffered from other STIs such as HSV-2, hepatitis B, and syphilis, and 4.37% of the asymptomatic cases suffered from one or more STI/RTIs. This showed that syndromic diagnosis alone was not suitable for delivering appropriate therapy to STI patients. Therefore, all patients with STIs and with high-risk behavior should preferably undergo laboratory evaluation to avoid over- and under-treatment and development of antimicrobial resistance. Larger population-based studies need to be conducted to get a general overview of the performance of the syndromic approach to diagnosis. Patients with one STI syndrome should be investigated for all STIs since they are prone to acquire them. The algorithm for syndromic diagnosis of STIs needs evaluation to enable the development of more effective interventions suited to the changing profile and geographical variations of STI.

Acknowledgement
National AIDS Control Organization.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Centre for Disease Control. Sexually Transmitted Disease Surveillance. Available from: http://www.cdc.gov/std/stats. [Last accessed on 2017 May 01].
2. National AIDS Control Organization (NACO), Ministry of Health
and Family Welfare, Government of India. Diagnosis and Management of RTIs/STIs. National Guidelines on Prevention, Management and Control of Reproductive Tract Infections Including Sexually Transmitted Infections. National AIDS Control Organization (NACO), Ministry of Health and Family Welfare, Government of India; 2007. p. 22-58.

3. La Ruche G, Lorougnon F, Digbeu N. Therapeutic algorithms for the management of sexually transmitted diseases at the peripheral level in Côte d'Ivoire: Assessment of efficacy and cost. Bull World Health Organ 1995;73:305-13.

4. Mwijarabbi E, Mayaud P. Tanzania: Integrating STD management. Lancet 1997;349:28.

5. Hansson S, Sunkutu RM, Kamanga J, Höjer B, Sandström E. STD care in zambia: An evaluation of the guidelines for case management through a syndromic approach. Int J STD AIDS 1996;7:324-32.

6. Bogaerts J, Vuylysteke B, Martinez Tello W, Mukantabana V, Akingeneje J, Laga M, et al. Simple algorithms for the management of genital ulcers: Evaluation in a primary health care centre in Kigali, Rwanda. Bull World Health Organ 1995;73:761-7.

7. Liu H, Jamison D, Li X, Ma E, Yin Y, Detels R, et al. Is syndromic management better than the current approach for treatment of STDs in China? Evaluation of the cost-effectiveness of syndromic management for male STD patients. Sex Transm Dis 2003;30:327-30.

8. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159-74.

9. Shah M, Deshmukh S, Patel SV, Mehta K, Marfatia Y. Validation of vaginal discharge syndrome among pregnant women attending obstetrics clinic, in the tertiary hospital of Western India. Indian J Sex Transm Dis AIDS 2014;35:118-23.

10. Goel SS, Goel SS. Study of syndromic management approach in the management of sexually transmitted diseases in rural population. Indian J Sex Transm Dis AIDS 2012;33:146-7.

11. Ray K, Muralidhar S, Bala M, Kumari M, Salhan S, Gupta SM, et al. Comparative study of syndromic and etiological diagnosis of reproductive tract infections/sexually transmitted infections in women in Delhi. Int J Infect Dis 2009;13:e352-9.

12. George R, Thomas K, Thyagarajan SP, Jeyaseelan L, Peedicayil A, Jeyaseelan V, et al. Genital syndromes and syndromic management of vaginal discharge in a community setting. Int J STD AIDS 2004;15:367-70.

13. Arora BB, Maheshwari M, Devgan N, Arora DR. Prevalence of trichomoniasis, vaginal candidiasis, genital herpes, chlamydiais, and actinomycosis among urban and rural women of Haryana, India. J Sex Transm Dis 2014;2014:963812.

14. Yin YP, Wu Z, Lin C, Guan J, Wen Y, Li L, et al. Syndromic and laboratory diagnosis of sexually transmitted infection: A comparative study in China. Int J STD AIDS 2008;19:381-4.

15. Tann CJ, Mpailwe H, Morison L, Nassimk K, Hughes P, Omara M, et al. Lack of effectiveness of syndromic management in targeting vaginal infections in pregnancy in Entebbe, Uganda. Sex Transm Infect 2006;82:285-9.

16. Musie Ghebremichael. The Syndromic Versus Laboratory Diagnosis of Sexually Transmitted Infections in Resource Limited Settings. ISRN AIDS; 2014. Available from: http://www.dx.doi.org/10.1155/2014/103452. [Last accessed on 2017 Apr 05].

17. Chauhan V, Shah M, Thakkar S, Patel SV, Marfatia Y. Sexually transmitted infections in women: A correlation of clinical and laboratory diagnosis in cases of vaginal discharge syndrome. Indian Dermatol Online J 2016;5:S1-5.

18. Zemouri C, Wi TE, Kiarie J, Secu A, Mogasale V, Latif A, et al. The performance of the vaginal discharge syndromic management in treating vaginal and cervical infection: A Systematic review and meta-analysis. PLoS One 2016;11:e0163365.

19. Behets FM, Williams Y, Brathwaite A, Hytton-Kong T, Hoffman IF, Dallabatta G, et al. Management of vaginal discharge in women treated at a Jamaican sexually transmitted disease clinic: Use of diagnostic algorithms versus laboratory testing. Clin Infect Dis 1995;21:1450-5.

20. Choudhry S, Ramachandran VG, Das S, Bhattacharya SN, Mogha NS. Pattern of sexually transmitted infections and performance of syndromic management against etiological diagnosis in patients attending the sexually transmitted infection clinic of a tertiary care hospital. Indian J Sex Transm Dis AIDS 2010;31:104-8.

21. Wang Q, Yang P, Zhong M, Wang G. Validation of diagnostic algorithms for syndromic management of sexually transmitted diseases. Chin Med J (Engl) 2003;116:181-6.

22. Clark JL, Lescano AG, Konda KA, Leon SR, Jones FR, Klausner JD, et al. Syndromic management and STI control in urban Peru. PLoS One 2009;4:e7201.

23. Mayaud P, Grosskurth H, Changalucha J, Todd J, West B, Gabone R, et al. Risk assessment and other screening options for gonorrhoea and chlamydial infections in women attending rural Tanzanian antenatal clinics. Bull World Health Organ 1995;73:621-30.

24. Mathews C, van Rensburg A, Coetzee N. The sensitivity of a syndromic management approach in detecting sexually transmitted diseases in patients at a public health clinic in Cape Town. S Afr Med J 1998;88:1337-40.

25. Mukenge-Tshibaka L, Alary M, Lowndes CM, Van Dyck E, Guédou A, Geraldo M, et al. Syndromic versus laboratory-based diagnosis of cervical infections among female sex workers in Benin: Implications of nonattendance for return visits. Sex Transm Dis 2002;29:324-30.

26. Aggarwal A, Kaur R. Seroprevalence of herpes simplex virus-1 and 2 antibodies in STD clinic patients. Indian J Med Microbiol 2004;22:244-6.

27. Tada DG, Khandelwal N. Serum HSV-1 and 2 IgM in sexually transmitted diseases – More for screening less for diagnosis: An evaluation of clinical manifestation. J Glob Infect Dis 2012;4:S1-4.

28. Santos FC, de Oliveira SA, Setúbal S, Camacho LA, Faillace T, Leite JP, et al. Seroepidemiological study of herpes simplex virus type 2 in patients with the acquired immunodeficiency syndrome in the city of Niterói, Rio de Janeiro, Brazil. Mem Inst Oswaldo Cruz 2006;101:315-9.

29. Ray K, Bala M, Bhattacharya M, Muralidhar S, Kumari M, Salhan S, et al. Prevalence of RTI/STI agents and HIV infection in symptomatic and asymptomatic women attending peripheral health set-ups in Delhi, India. Epidemiol Infect 2008;136:1432-40.

30. Sullivan EA, Abel M, Tabrizi S, Garland SM, Grice A, Poumerol G, et al. Prevalence of sexually transmitted infections among antenatal women in Vanuatu, 1999-2000. Sex Transm Dis 2003;30:362-6.

31. Bosu WK. Syndromic management of sexually transmitted diseases: Is it rational or scientific? Trop Med Int Health 1999;4:114-9.