

Community-based strategies to identify the unmet need for care of individuals with sexually transmitted infection-associated symptoms in rural South Africa

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ABSTRACT

Objectives: To determine the unmet need for care and barriers for consulting sexually transmitted infection (STI) services at six primary healthcare (PHC) facilities in rural South Africa.

Methods: Cross-sectional study using three community-based strategies to mobilise adult individuals with STI-associated symptoms to access care. Participants were mobilised through clinic posters and referral by community healthcare workers (CHWs) and traditional leaders after training. Men with male urethritis syndrome and women with vaginal discharge syndrome were mobilised to visit participating PHC facilities on two designated days when an expert team visited the facility. Questionnaires were completed and HIV rapid tests offered. The minimal unmet need for care of individuals with STI-associated symptoms was calculated by dividing the number of cases over the adult catchment population of each PHC facility.

Results: We successfully mobilised 177 symptomatic individuals: 134 (76%) women and 43 (24%) men. The estimated minimal unmet need for STI care was 1:364 (95% CI 1:350–1:380) individuals in this region; the rate was higher in village than township facilities, and among women. Mobilisation through clinic posters (57%) and by CHWs (23%) was most successful. Three-quarters of individuals (132/177) reported symptoms that had been present for >30 days; 49% (87/177) had symptoms >6 months. In addition, we identified 14 individuals with untreated HIV infection amounting to a 7% HIV testing yield. Lack of awareness of symptoms (34%), and disappointment in care due to persistent (23%) or recurrent (15%) symptoms after previous treatment, or disappointment with health services in general during previous visit(s) for any reason (10%) was the most common reasons for not consulting health care.

Conclusions: We demonstrate a high unmet need for care of individuals with STI-associated symptoms in rural South Africa that requires urgent attention. A multidisciplinary approach that creates service demand through community awareness and information provision by healthcare workers combined with strengthening the quality of STI services is required to improve reproductive health and prevent complications of untreated STIs in this population.

KEY WORDS:

Unmet need; Sexually Transmitted Infections; Community-based strategies, Primary Healthcare.

INTRODUCTION

Sexually transmitted infections (STIs) are common worldwide. In particular in sub-Saharan Africa, STIs are a major problem: the region bears 40% of the global burden of STI, covers 44% of the need for STI-related services and 30% of global cost related to STI control [1]. Estimated annual incidence rates of 12.0 million infections for *Chlamydia trachomatis*, 11.4 million for *Neisseria gonorrhoeae* and 37.4 million for *Trichomonas vaginalis* are reported for the African region [2]. Also, prevalence of *Mycoplasma genitalium* of up to 10% has been reported in studies from various countries in this region [3,4]. Adequate treatment for STIs is important, since untreated STIs can lead to pelvic inflammatory disease, adverse pregnancy outcomes and an increased risk of transmitting and acquiring human immunodeficiency virus (HIV) [5,6].

In the absence of resources for diagnostics, countries in sub-Saharan Africa have adopted syndromic management guidelines for STI management and control. Vaginal discharge in women and urethral discharge in men are the most common STI-associated syndromes. Women presenting with the vaginal discharge syndrome (VDS) and men with the male urethritis syndrome (MUS) are empirically treated with antibiotics that cover the most likely aetiological cause of their symptoms; these can be STIs or other genital tract infections [7].

Although syndromic management for STI-associated symptoms at primary healthcare facilities (PHC) is available in South Africa, there remains an unmet need for care of individuals with STI-associated symptoms. Recent data using the World Health Organization (WHO) STI spectrum model for South Africa suggest that there is a considerable proportion of 40% of symptomatic individuals that do not access healthcare services and are left untreated [8]. This aligns with our experience in two previous studies from rural South Africa where, despite recruiting women regardless of the presence of symptoms, a relatively large proportion of women reported STI-associated symptoms upon recruitment [9,10]. Various factors may prevent symptomatic individuals from seeking healthcare: a lack of

knowledge and awareness of sexual health and stigmatised ideas about STIs among patients and healthcare workers [11], the poor effectiveness of the syndromic approach [12], the lack of partner notification and subsequent reinfection [13] and the rising resistance rates of *N. gonorrhoeae* and *M. genitalium* resulting in disappointment due to ineffectiveness of initial treatment [4,14].

Community-based strategies have been effective for health promotion and HIV prevention in South Africa [15,16]. Community healthcare workers (CHWs) and traditional leaders are two community structures that can be used for this purpose [17]. CHWs provide community education and identify individuals in need of healthcare services for communicable and non-communicable diseases, whereas traditional leaders occupy an important place in rural communities and have a large influence on people's perception of health and disease. Both community structures have been shown effective in mobilising individuals for HIV care, but it is unknown whether the same structures could also be utilised to mobilise men and women for STI services.

In this study performed in rural South Africa, we use three community-based strategies to mobilise individuals with STI-associated symptoms to visit healthcare services in order to estimate the unmet need for STI care and to determine the underlying reasons for not consulting with these services.

MATERIALS AND METHODS

Study design and setting

This cross-sectional study was conducted in 2017-2018 in Mopani district, South Africa. Mopani district is one of the five districts of Limpopo province and has an overall population of 1.2 million, of which 53% female and 57% >20 years old and 81% of people live in rural areas [18].

Most of its inhabitants are dependent on public healthcare services. Symptomatic individuals were informed and mobilised to visit a specially organised clinical day for genital medicine specialist care in the catchment areas of six PHC facilities; the median population size of these catchment areas is 10.000 (range: 5.000 to 18.000 inhabitants per PHC) [19]. In the South African context, four of the participating catchment areas are considered a village; two a township. Each PHC was visited by an expert medical team, consisting of a specialist doctor, nurses and counsellors on two scheduled days. Individuals were eligible for participation in this study if they were adult (>18 years of age) and reported STI-associated symptoms (dysuria, discharge) as defined by the South African national treatment algorithm.

This study was approved by the Faculty of Health Sciences Research Ethics Committee of the University of Pretoria and by the Limpopo Provincial Health Research Committee of the Department of Health (Ref: 498/2016).

Community-based mobilisation strategies

We used three approaches to simultaneously mobilise men and women with STI-associated symptoms to access healthcare services on one of two consecutive designated days; mobilisation was done over a period of two weeks' time. First, based on informant interviews, posters were designed and put-up at the PHC facility to raise awareness of STI-associated symptoms among PHC visitors. These posters aimed to inform individuals about signs and symptoms of a sexually tract infection (i.e. genital discharge and dysuria), to stress the need for treatment of these often-curable infections as well as the importance of HIV testing, and the dates at which the clinical expert team would be present at the facility. Posters were put-up in English and in the two dominant local languages (Sesotho and Xitsonga) where

appropriate. The names of two study team members were provided on the poster so that individuals could access the study team directly on the designated two days.

The other two approaches involved community mobilisation through CHWs and traditional leaders. We trained both the CHWs and traditional leaders about sexual health, the symptoms associated with STIs, and the importance of recognizing and treating these infections. We gave them pamphlets with the same information as on the poster and asked them to share this knowledge in their community and to encourage symptomatic individuals to visit one of the clinical days.

Participant recruitment

Men and women (≥ 18 years) that reported STI-associated symptoms meeting the MUS or VDS criteria as described in the South African STI management guidelines were screened for eligibility and signed informed consent, before counsellors conducted a questionnaire related to demographics, clinical symptoms as well as sexual and healthcare seeking behaviour [7]. A rapid HIV test was offered to every patient not reporting to be HIV-infected and on antiretroviral therapy (ART). All patients were treated following the national guidelines for VDS or MUS or otherwise appropriate if indicated based on clinical presentation and treatment history [7]. Individuals that did not consent were not enrolled in the study and treated as per the same national guidelines by the expert medical team; no additional information was collected.

Data sources and statistical analysis

We used Statistics South Africa (STATSSA) data for determining the catchment population of each PHC facility [19]. The minimum unmet need for STI care with 95% confidence interval (CI) was calculated by dividing the number of individuals with STI-associated symptoms as mobilised over the catchment population stratified by gender. Data were analysed using IBM SPSS Statistics Version 25 (SPSS Inc., Chicago, USA) and are presented as numbers with proportion (%) and median with range. Comparative statistics were done using Chi-squared test, with Fisher's Exact test if appropriate, for dichotomous and Mann-Whitney U Test for continuous variables. A p -value of < 0.05 is considered statistically significant.

RESULTS

Characteristics of study participants

One-hundred and ninety-eight individuals were successfully mobilised of whom 177 (89%) met the inclusion criteria and were included in this study; 134 (76%) women and 43 (24%) men. The majority of women and men (57% and 56% respectively) was mobilised through clinic posters whereas CHWs mobilised 20% of women and 30% of men (Table 1). Fewer participants (n=31; 18%) had been mobilised through friends and relatives or through the traditional leaders (n=6; 3%). There was no association of number of participants mobilised through each mobilisation strategy for gender ($p = 0.27$), age ($p = 0.34$) or employment status ($p = 0.11$).

Table 1. Number of individuals mobilised for STI services through different community-based strategies in rural Mopani District

Mobilisation strategy	Total (n = 177)	Women		Men	
		No. (n = 134)	Median age (range)	No. (n = 43)	Median age (range)
Clinic poster	100 (57)	76 (57)	35 (20 – 78)	24 (56)	46 (25 – 82)
Traditional leader	6 (3)	4 (3)	49 (26 – 56)	2 (5)	63 (53 – 72)
Community healthcare worker	40 (23)	27 (20)	33 (22 – 73)	13 (30)	67 (26 – 88)
Friend or relative	31 (18)	27 (20)	33 (20 – 74)	4 (9)	42 (26 – 53)

The characteristics of the study participants are summarised in Table 2. The median age of participants was 37 years (range 20 – 88), the majority (84%) was literate and 33% of participants was employed. A quarter of the participants reported using a condom during the last sexual intercourse; men reported more often that they had more than one sexual partner in the past six months than women (28% compared to 8%; $p = <0.01$). Eighty-three (47%) patients had previously been treated for STI (37% of men and 50% of women; $p=0.14$), of which forty-three (52%) reported that they had not been informed about partner notification at time of treatment. We found significant difference between participants at PHC facilities in townships compared to villages considering traditional practice (5,1% vs. 32%; $p = <0.01$) and having experienced coercion (29% vs. 14%; $p = 0.05$), with tendency for literacy level (92% vs. 80%; $p = 0.05$) and reporting more than one sexual partner in the past six months (5,1% vs. 16%; $p = 0.05$).

Table 2. Characteristics of women and men mobilised for care for STI-associated symptoms in Mopani district, South Africa

	Women (n = 134)	Men (n = 43)	Total (n = 177)
Demographic factors			
Age, years			
Median (range)	35 (20 – 78)	53 (25 – 88)	37 (20 – 88)
Type of residential area			
Village	89 (66)	29 (67)	118 (67)
Township	45 (34)	14 (33)	59 (33)
Literacy level			
Illiterate	19 (14)	10 (23)	29 (16)
Literate	115 (86)	33 (77)	148 (84)
Main source of income			
Employed or self-employed	42 (31)	16 (37)	58 (33)
Grant	40 (30)	17 (40)	57 (32)
Unemployed	52 (39)	10 (23)	62 (35)
Relationship status			
Married	30 (22)	16 (37)	46 (26)
Living together	31 (23)	6 (14)	37 (21)
In relationship	55 (41)	9 (21)	64 (36)
Single	18 (14)	12 (28)	30 (17)
Type of relationship*			
Stable partner	91 (69)	23 (53)	114 (65)
Occasional partner	19 (14)	9 (21)	28 (16)
Stable and occasional partner	11 (8)	5 (12)	16 (9)
No partner	12 (9)	6 (14)	18 (10)
Currently pregnant			
Yes	7 (5)	-	-
No	127 (95)	-	-

*Data missing for one woman

The unmet need for STI care

Based on the population catchment size of the area around the PHC and the total number of symptomatic individuals in our study, the estimated minimum unmet need for STI care was 1:364 individuals (95% CI 1:350 – 1:380) (Table 3). Significantly more women than men (1:273 vs. 1:646 respectively; $p < 0.05$) were mobilised for STI services; the number of individuals mobilised was significantly higher in the four villages than in the two townships (1:320 vs. 1:452 respectively; $p < 0.05$).

Table 3. Unmet need of symptomatic individuals for STI services in rural Mopani District

	Number of inhabitants in the catchment size	Number of symptomatic individuals mobilised	Unmet need for STI treatment (95% CI)	<i>p</i>-value
Total	64.400	177	1:364 (1:350 – 1:380)	
Gender				
Men	27.786	43	1:646 (1:500 – 1:909)	
Women	36.614	134	1:273 (1:265 – 1:286)	< 0.05
Type of clinic				
Village	37.704	118	1:320 (1:304 – 1:338)	
Township	26.696	59	1:452 (1:392 – 1:529)	< 0.05

The main presenting symptom in women was genital discharge (83%), followed by dysuria (69%), lower abdominal pain (66%) and genital itch (31%). Almost all men (98%) reported dysuria; lower abdominal pain and genital discharge were other common symptoms (42% and 23% respectively). The median reported duration of genital discharge was 180 days (range: 3 – 2880) and dysuria 240 days (range: 1 – 3600). In 101 of 134 (75%) women and 31 of 43 (72%) men that reported discharge or dysuria the symptoms had been present for more than 30 days. Almost half of the patients (49%) had symptoms more than 6 months.

Fifty-eight (33%) participants reported to be HIV-positive, of whom six (10%) were not yet on ART: 1 man and 5 women. Of the remaining 119 individuals, 116 (97%) tested for HIV-infection of whom 8 (7%) tested HIV-positive; 3 men and 5 women. All of these had STI-associated symptoms. Altogether, 14 HIV-infected individuals (8%) were identified that were not on ART and were initiated on ART.

Reasons for not seeking healthcare

We observed three types of reasons for not seeking healthcare (Table 4): patient knowledge and beliefs (46%), previous adverse healthcare experience (16%) and treatment-related factors (38%). The most common reason for not seeking healthcare was lack of awareness of symptoms (34%), followed by disappointment in care due to persistent (23%) or recurrent (15%) symptoms after previous treatment as well as disappointment with health services in general during previous visit(s) for any reason (10%). For men, the lack of male healthcare workers was a reason for not attending STI services in 9/43 (21%).

Table 4. Reasons reported by participants for not seeking healthcare for their STI-associated symptoms

	Women (n = 134)	Men (n = 43)	Total (n = 177)
Patient knowledge and beliefs	64 (48)	16 (37)	80 (46)
Not aware of symptoms	50 (37)	10 (23)	60 (34)
Clinic is too far / no money to visit	2 (1)	2 (5)	4 (2)
Embarrassed or afraid of reaction clinic staff	10 (7)	1 (3)	11 (6)
Traditional beliefs	0 (0)	3 (7)	3 (2)
Partner does not allow	2 (1)	0 (0)	2 (1)
Healthcare-associated factors	14 (11)	14 (33)	28 (16)
Do not trust clinic staff	0 (0)	1 (2)	1 (1)
Disappointed with health services previously	14 (10)	4 (9)	18 (10)
Lack of male healthcare workers	0	9 (21)	9 (5)
Treatment-related factors	54 (41)	13 (30)	67 (38)
Disappointed with previous quality of care as symptoms are persistent	35 (26)	6 (14)	41 (23)
Disappointed with previous quality of care as symptoms are recurrent	19 (14)	7 (16)	26 (15)

DISCUSSION

In this cross-sectional study we confirmed the unmet need for care for individuals that reported STI-associated symptoms in a rural area of South Africa. This study is unique in using an active community-based strategy to mobilise symptomatic individuals for care. We confirm the promise of such community-based strategies to reach individuals in need of care, in this case care of STI-associated symptoms as well as identification of individuals with untreated HIV-infection.

We successfully mobilised individuals for care for STI-associated symptoms through three community-based strategies that have been used to mobilise individuals for HIV testing before but not for STI care. Interestingly, most participants (57%) were mobilised through clinic posters: they did not consult with clinic staff, but attended to our specialist team at another day after having seen the posters at their PHC facility. This suggests that investment in the quality of care is highly warranted to reduce barriers that may currently exist in accessing services at PHC facilities. CHWs have been proven to be important to address the unmet need for (health)care in urban communities [20]; in our study, following training, they also managed to mobilise a substantial number of individuals for care of STI-associated symptoms. The traditional structure did not result in mobilisation of a large number of individuals for

care despite the strong role of traditional leaders in these communities [21]. Working with traditional leaders may thus require a different approach to be successful.

The prevalence of STI-associated symptoms reported in other studies from rural South Africa is high, with rates of 7-35% in community- and PHC-based studies [9,10]. We estimate the unmet need for care at 1:273 for women and 1:646 for men, which equates 2185 untreated, symptomatic women and 776 men in Mopani district at any point in time. This is likely an underestimation of the true number of individuals with STI-associated symptoms in the population since we do not know how many symptomatic individuals were not reached through this study. Of note is the relatively long duration of symptoms of the individuals that were mobilised suggesting that these would not likely have accessed healthcare at their own initiative. Recognition and treatment of STI-associated symptoms is important to prevent complications and morbidity resulting from untreated STIs and non-sexually transmitted diseases such as bacterial vaginosis and *Candida albicans* [5,22,23], but also to reduce its negative effect on the quality of life [24].

Another major reason for active mobilisation and treatment of symptomatic STIs is apparent from the proved effectivity of detecting undiagnosed and untreated HIV-infection in individuals at increased risk of untreated HIV-infection compared to the general population: it reveals a higher positivity rate of HIV testing than reported as routine at PHC and by local community-based HIV testing campaigns [25,26].

Three-quarters of symptomatic individuals had untreated complaints for more than one month suggesting that these individuals were unlikely to access healthcare at their own initiative. Poor healthcare seeking behaviour for STI-associated symptoms has a variety of underlying reasons [27]. Unawareness of symptoms, the “genitally unaware”, was a major reason (34%) for individuals to not seek healthcare, especially among women. This confirms results of other studies, in which approximately one-third of individuals reported a lack of knowledge about signs and symptoms of STIs [24,28,29]. Also, perceptions, beliefs and stigma related to sexual health contribute to the burden of untreated STIs. Community education and disclosure support are needed to raise community awareness, tackle common myths and alter attitudes towards sexual health [11,24]. Sexuality education for healthcare workers should address recognition of STIs, the possible (non-sexually transmitted) causes,

complications if left untreated and opportunities for treatment including the role of partner notification. Almost half of the individuals (47%) had sought healthcare before, but was disappointed with previous treatment since symptoms were persistent (23%) or recurrent (15%). These proportions might have been even higher since we did not enquire about over-the-counter medication from private pharmacies. These findings may be due to the lack of partner notification, which was reported by 52% of our participants as not have happened, the poor effectiveness of the syndromic approach, administration of incorrect or incomplete treatment and possibly by rising resistance rates of *N. gonorrhoeae* and *M. genitalium* [4,12-14]. For men, creating a more male-friendly environment is needed, since 21% of men in our study reported the lack of male healthcare workers working in PHC as reason for not consulting sooner. Further analysis of these cases is warranted to better understand the clinical, behavioural and microbiological factors associated with persistent or recurrent symptoms in our population.

This study has several limitations. First, the exact number of individuals that was actually reached by using the three mobilisation approaches is unsure; individuals that were not reached lead to an underestimation of the total unmet need. Another limitation is the impossibility for certain (working) individuals to visit the PHC during the short period of two days that we offered specialist medical care.

We demonstrate that there is a concerning high unmet need for care for individuals with STI-associated symptoms in this rural South African setting, with a variety of underlying patient and healthcare-related factors. This neglected burden of disease requires multidisciplinary combination intervention to improve reproductive health and to prevent complications of untreated STIs. This combination intervention package should include efforts to strengthen the quality of STI services through community awareness, stigma reduction, clinical training and information provision by healthcare workers and be supported by community mobilisation efforts to successfully address this burden of disease.

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COMPETING INTERESTS

The authors declare that there is no conflict of interest.

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REFERENCES

1. Global health sector strategy on sexually transmitted infections 2016–2021: towards ending STIs. Geneva: World Health Organization; 2016. (Available from: <http://www.who.int/reproductivehealth/publications/rtis/ghss-stis/en/>) [25 July 2018]
2. Unemo M, Bradshaw CS, Hocking JS, et al. Sexually transmitted infections: challenges ahead. *Lancet Infect Dis* 2017; **17**: e235-e279.
3. Baumann L, Cina M, Egli-Gany D, et al. Prevalence of *Mycoplasma genitalium* in different population groups: systematic review and meta-analysis. *Sex Transm Infect* 2018; **94**: 255-262.
4. Hay B, Dubbink JH, Ouburg S, et al. Prevalence and macrolide resistance of *Mycoplasma genitalium* in South African women. *Sex Transm Dis* 2015; **42**: 140–142.
5. World Health Organization. WHO Sexually Transmitted Infections (STIs) Fact Sheet 2017. (Available from: <http://who.int/mediacentre/factsheets/fs110/en/>) [25 July 2018]
6. Galvin S, Cohen M. The role of sexually transmitted diseases in HIV transmission. *Nat Rev Microbiol* 2004; **2**: 33–42.
7. Department of Health; Republic of South Africa. Sexually transmitted infections management guidelines, 2015. (Available from: [https://sahivsoc.org/Files/STIguidelines-1-28-15\(LC\).pdf](https://sahivsoc.org/Files/STIguidelines-1-28-15(LC).pdf)) [10 Dec 2018]
8. Kularatne RS, Niit R, Rowley J, et al. Adult gonorrhoea, chlamydia and syphilis prevalence, incidence, treatment and syndromic case reporting in South Africa: Estimates using the Spectrum-STI model, 1990-2017. *PLoS ONE* 2018; **13**: e0205863.
9. Peters RP, Dubbink JH, van der Eem L, et al. Cross-Sectional Study of Genital, Rectal, and Pharyngeal Chlamydia and Gonorrhoea in Women in Rural South Africa. *Sex Transm Dis* 2014; **41**: 564-9.
10. Hoffman CM, Mbambazela N, Sithole P, et al. Provision of STI services in a mobile clinic reveals high unmet need in remote areas of South Africa: a cross-sectional study. *Sex Transm Dis* 2018; Epub 2018 Oct 22. DOI: 10.1097/OLQ.0000000000000931

11. Ham DC, Hariri S, Kamb M, et al. Quality of Sexually Transmitted Infection Case Management Services in Gauteng Province, South Africa: An Evaluation of Health Providers' Knowledge, Attitudes, and Practices. *Sex Transm Dis* 2016; **43**: 23-9.
12. van der Eem L, Dubbink JH, Struthers HE, et al. Evaluation of syndromic management guidelines for treatment of sexually transmitted infections in South African women. *Trop Med Int Health* 2016; **21**: 1138–1146.
13. Kalichman SC, Mathews C, Kalichman M, et al. Perceived barriers to partner notification among sexually transmitted infection clinic patients, Cape Town, South Africa. *J Public Health* 2017; **39**: 407–414.
14. Kularatne R, Maseko V, Gumede L, Kufa T. Trends in Neisseria gonorrhoeae Antimicrobial Resistance over a Ten-Year Surveillance Period, Johannesburg, South Africa, 2008–2017. *Antibiotics* 2018; **7**: 58.
15. Tedrow VA, Zelaya CE, Kennedy CE, et al. No “Magic Bullet”: Exploring Community Mobilization Strategies Used in a Multi-site Community Based Randomized Controlled Trial: Project Accept (HPTN 043). *AIDS Behav* 2012; **16**: 1217-1226.
16. Lippman SA, Maman S, MacPhail C, et al. Conceptualizing Community Mobilization for HIV Prevention: Implications for HIV Prevention Programming in the African Context. *PLoS ONE* 2013; **8**: e78208.
17. Naidoo N, Railton JP, Khosa SN, et al. Fidelity of HIV programme implementation by community health workers in rural Mopani district, South Africa: a community survey. *BMC Public Health* 2018; **18**: 1099.
18. Statistics South Africa. Community Survey 2016; Statistical release P0301. StatsSA, Pretoria. (Available from: http://cs2016.statssa.gov.za/wp-content/uploads/2016/06/CS-2016-Technical-report_Web.pdf) [10 Dec 2018].
19. Statistics South Africa. Census 2011. StatsSA, Pretoria.
20. Van Rie A, West NS, Schwartz SR, et al. The unmet needs and health priorities of the urban poor: generating the evidence base for urban community health worker programmes in South Africa. *S Afr Med J* 2018; **108**: 734-740.

21. Campbell C. Political will, traditional leaders and the fight against HIV/AIDS: a South African case study. *AIDS Care* 2010; **22 Suppl 2**: 1637-43.
22. Bagnall P, Rizzolo D. Bacterial vaginosis: a practical review. *JAAPA*. 2017; **30**: 15-21.
23. Farr A, Kiss H, Holzer I, et al. Effect of asymptomatic vaginal colonization with *Candida albicans* on pregnancy outcome. *Acta Obstet Gynecol Scand* 2015; **94**: 989–996.
24. Valsangkar S, Selvaraju D, Rameswarapu R, Kamutapu S. Impairment of quality of life in symptomatic reproductive tract infection and sexually transmitted infection. *J Reprod Infertil* 2014; **15**: 87-93.
25. Bassett IV, Chetty S, Giddy J, et al. Screening for acute HIV infection in South Africa: finding acute and chronic disease. *HIV Med* 2011; **12**: 46-53.
26. Shisana O, Rehle T, Simbayi LC, et al. South African National HIV Prevalence, Incidence, Behaviour and Communication Survey 2012. Cape Town, South Africa: HSRC Press; 2013.
27. Meyer-Weitz A, Reddy P, Van den Borne HW, et al. Health care seeking behaviour of patients with sexually transmitted diseases: determinants of delay behaviour. *Patient Educ Couns* 2000; **41**: 263-74.
28. Lal SS, Vasan RS, Sarma PS. Knowledge and attitude of college students in Kerala towards HIV/AIDS, sexually transmitted diseases and sexuality. *Natl Med J India* 2000; **13**: 231-6.
29. McManus A, Dhar L. Study of knowledge, perception and attitude of adolescent girls towards STIs/HIV, safer sex and sex education: A cross sectional survey of urban adolescent school girls in South Delhi, India. *BMC Women's Health* 2008; **8**: 12.

