

Women and Sexually Transmitted Infections in Africa

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Abstract

Despite efforts to control the spread of sexually transmitted infections (STIs), these infections are still highly prevalent in the developing world, especially in Africa where the prevalence and incidence of Human immunodeficiency virus (HIV) is also very high. Unfortunately, women bear the disproportionate burden of both STIs and HIV in this region. Early diagnosis, treatment and prevention of STIs is therefore crucial in this population given the strong evidence that some STIs have been shown to facilitate the transmission of HIV. This review summarizes the epidemiology, and management of the common STIs affecting African women, and the health complications associated with these infections in the era of emerging antimicrobial resistance.

Keywords

Women, Sexually Transmitted Infections, Epidemiology, Management, Antimicrobial Resistance, Human Immunodeficiency Virus

1. Introduction

Sexually transmitted infections (STIs) are among the most prevalent infectious diseases worldwide and are a cause of morbidity and mortality [1]. STIs are a significant public health burden in developing countries predominantly due to their adverse impact on reproductive and child health and their role in facilitating the sexual transmission of Human immunodeficiency virus (HIV) infection [2]. The high prevalence of STIs has contributed to the disproportionately high HIV incidence and prevalence in Africa. According to the World Health Organization Global Health Risks report, approximately 1 million women in Africa die yearly due to infection

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with HIV, human papillomavirus and other STIs [3]. World Bank estimates indicate that STIs, excluding HIV, are the second most common cause of healthy life years lost by women in the 15 - 44 age group in Africa and account for approximately 17% of the total burden of disease [3]. Controlling STIs is the principal aspect of the WHO's Global Strategy on Reproductive Health [4], and essential for achieving Millennium Development Goals 4 (child health), 5 (maternal health), and 6 (HIV prevention) [5]. Early diagnosis of STIs is important, and the treatment of STIs needs to be effective and administered as promptly as possible [6]. In many African countries, STIs are treated using the syndromic approach. Briefly, the syndromic approach is based on managing symptoms according to treatment flow charts, which can be easily followed by clinical staff at all primary health care facilities across the country. Laboratory testing of STI patients is therefore not essential for case management [7]. Several efficacious drugs are available to treat STIs [8]. However, drug resistance to current treatment regimens is a major threat to STI control worldwide. Here, we summarize the epidemiology of STIs in women residing in the African region and discuss diagnosis of these infections, treatment challenges due to the emergence of drug resistance and health complications associated with infections.

2. Epidemiology of Sexually Transmitted Infections

The WHO estimates that about 498.9 million new cases of the four main curable STIs (*Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Treponema pallidum* [syphilis] and *Trichomonas vaginalis*) occur every year globally in adults aged 15 to 49 years. In the African region, the total incidence of curable STIs is 92.6 million, with 8.3 million cases of *C. trachomatis*, 21.1 million cases of *N. gonorrhoeae*, 3.4 million cases of syphilis and 59.7 million cases of *T. vaginalis* [9]. While *T. vaginalis* and bacterial STIs such as *C. trachomatis*, *N. gonorrhoeae* and *T. pallidum* are curable, viral STIs such as Herpes Simplex Virus (HSV) are deemed to be persistent and incurable [10]. The WHO estimates that 536 million people, aged 15 - 49 are infected with HSV-2 type 2, the causative agent of genital herpes. Annually approximately 23.6 million people in this age group become newly infected with HSV-2 [11]. The epidemiology of each STI is different and is influenced by various factors, including sexual mixing patterns (moderated by protective behaviours), the transmissibility of each pathogen, and the duration of infectiousness (moderated by access to effective treatment), demographics, and social circumstances [12]. The highest rates of incident STIs have been reported for adolescents and young adults [13].

2.1. *Chlamydia trachomatis*

Urogenital infection is caused by *Chlamydia trachomatis*, the most common bacterial STI in the world [14]. In 2008, the WHO estimated that 9.1 million adults were infected with *C. trachomatis* in the African region [9]. The prevalence of *C. trachomatis* in women in the African region is 2.6% with a reported incidence of 22.3 per 1000 population [9]. Community-based studies conducted in Sub-Saharan Africa (SSA) have reported prevalence estimates from 1.6% - 3.2% in the general population [15] [16]. However, the prevalence rates in targeted populations have been shown to be higher. In Uganda, the prevalence of *C. trachomatis* in female adolescents has been shown to be 4.5% [17]. In sex worker populations, the prevalence estimates range from 9% in Kenya to 28.5% in Senegal [18] [19]. In another study of high-risk women from Kenya, the incidence rate of *C. trachomatis* infections was reported to be 5.0 per 100 person-years [20]. Studies conducted in high-risk women from South Africa have reported prevalence estimates from 5% - 11% [20]-[25]. The risk factors for *C. trachomatis* infection in African women includes; younger age and having a history of *N. gonorrhoeae* infection [20] [26].

2.2. *Neisseria gonorrhoeae*

Neisseria gonorrhoeae, is the second-most-prevalent bacterial STI globally [27]. Rates of gonorrhoea vary greatly among countries in the developed and developing world. The prevalence of *N. gonorrhoeae* in women in the African region is 2.3% with a reported incidence of 49.7 per 1000 population [9]. In SSA, an estimated 17 million new cases of *N. gonorrhoeae* infections occur each year [28]. A study conducted in South Africa and Zimbabwe reported an overall prevalence of 0.7% for *N. gonorrhoeae* infections in women at risk for HIV [29]. The overall incidence rate for *N. gonorrhoeae* infections was shown to be 2.4 per 100 woman-years. A higher incidence rate was observed in South African women (3.7 per 100 women years) when compared with women

from Zimbabwe (1.3 per 100 woman-years) [29]. Other South African studies have reported prevalence rates for *N. gonorrhoeae* ranging from 3% - 11% in women from this region [30]-[32]. *N. gonorrhoeae* has been shown to be more prevalent in high risk groups such as sex workers and women attending STI clinics (10% - 31%) [33], [34]. The risk factors for *N. gonorrhoeae* infection in women includes; being <25 years old [35], having a history of *N. gonorrhoeae* infection and other STIs, having new or multiple sex partners, inconsistent condom use, commercial sex work and drug addiction [36] [37].

2.3. *Trichomonas vaginalis*

Trichomonas vaginalis is the most common, non-viral STI globally [37]. In 2008, the total number of new cases of *T. vaginalis* in adults between the ages of 15 and 49 was approximately 276.4 million [39]. The prevalence of *T. vaginalis* in women in the African region was 2.2% with a reported incidence of 146.0 per 1000 population [39]. Trichomoniasis prevalence rates ranging from approximately 6% to 42% have been reported in studies conducted in African countries [30]-[45]. A one year prospective study conducted amongst women in South Africa, Tanzania and Zambia reported the overall incidence of *T. vaginalis* to be 31.9/100 person-years at risk (PYAR) [46]. Risk factors associated with *T. vaginalis* infection in African women include; older age, multiple sex partners, being single and unmarried, low socioeconomic status and poor hygiene practises, [44] [47]-[49].

2.4. *Treponema pallidum* (Syphilis)

Syphilis is caused by the spirochete *Treponema pallidum* [50]. The infection is transmitted by sexual contact or through vertical transmission from an infected mother to her baby. The WHO estimated that in 2008 there were 36.4 million adults infected with syphilis globally [39]. In females within the African region the prevalence of syphilis was 3.5% and the incidence was reported to be 8.5 per 1000 population [39]. Syphilis prevalence rates vary depending on the population type and the associated risk factors. In Africa it is estimated that the prevalence ranges from 2.5% to 17% in pregnant women [41] [51]. Prevalence of syphilis was reported to be 9.1% in a cohort of women from a rural area in Mwanza, Tanzania [52]. In a study amongst female sex workers in Kenya, syphilis prevalence was found to be 3.4% [53]. Lower levels of education, early sexual debut, having concurrent partners, and engaging in transactional sex [49] [52] [54] are amongst the risk factors associated with syphilis infection.

2.5. Herpes Simplex Virus

Herpes simplex virus 2 (HSV-2) is one of the most prevalent viral STIs globally, with rates as high as 78% in African women [55] [56]. Data on HSV-2 incidence in women from SSA have reported rates of 6 to 35 per 100 person years (PY) [57]-[60]. In South Africa, the prevalence estimates of HSV-2 infection is reported to be between 40% - 70% [56] [61] [62]. The prevalence of HSV-2 has been shown to be high in populations such as STI clinic attendees and sex workers (SWs) [63], with some African studies reporting greater than 70% HSV seropositivity in SWs [18] [57]. There are several reports suggesting that HSV-2 is a biological co-factor for HIV acquisition [57] [64] [65]. A meta-analysis performed by Freeman [66] showed that the relative risk of HIV acquisition associated with HSV-2 was 3.1 (95% confidence interval (CI): 1.7, 5.6). It is suggested that HSV-2 infection may contribute to >50% new HIV infections among women in SSA [67]. The factors associated with prevalent HSV-2 infection in women in Africa includes; older age [61] [62] [67] early menarche [68], low level of education [59] [62] and having a higher number of sex partners [59] [62].

2.6. Human Papillomavirus

Genital human papillomavirus (HPV) infections, one of the common viral STIs diagnosed worldwide, has been linked to cervical cancer in women [69]. More than 40 known HPV types infect the female genital tract [70]. Genital HPV genotypes are classified into either “high-risk” (HR) or “low-risk” (LR) [71]. The WHO estimates that in 2005 there were approximately 500 000 cervical cancer cases globally [72]. The prevalence of HPV is higher in African women compared to women in any other parts of the world, with the most important types of HPV being 16 and 18 [70]. HPV-16 sero-prevalence has been shown to be the highest in women aged 25 - 40 years. However, HPV-18 sero-prevalence is lower than HPV-16 sero-prevalence and is present in older women [73]. Global data on prevalence of HPV is essential for the implementation of HPV prevention strategies, such

as prophylactic vaccines [74]. A comprehensive meta-analysis of HPV genotype prevalence and distribution in Africa conducted by Ogembo and colleagues [75] showed that HPV prevalence rates varied by region. Southern Africa had the highest HPV prevalence of 57.3%, followed by Eastern Africa (42.2%), Western Africa (28.8%) and Northern Africa (12.8%). In a study amongst female sex workers in South Africa the HR- and LR-HPV prevalence was found to be very high at 70.5% (95% CI : 60.5 - 79.2) and 60.2% (95% CI: 49.9 - 70.0) respectively [71]. A prevalence of 33.2% was reported among women, aged 15 - 70 years, undergoing voluntary screening in Benin, West Africa [76]. Factors associated with increased risk of HPV infection include co-infection with HIV or other STIs such as *C. trachomatis* and HSV-2, micronutrient deficiencies, younger age, increased number of lifetime sexual partners and having had a recent new sexual partner [77].

2.7. STIs and HIV

In SSA, women comprise 60% of adults living with HIV infection [78]. Sexual transmission is the main route of HIV infection, with an increased risk of infection in women in comparison to men [79]. There are several characteristics of the female reproductive tract (FRT) that increase susceptibility to infection, including local changes induced by infection by other microorganisms [79]. STIs increase susceptibility to HIV, by causing disruption of the genital epithelium, by increasing the number of HIV target cells and by immune activation in the genital mucosa [80]. STIs are major causes of inflammatory cytokine up-regulation and immune cell recruitment to the genital mucosa [81] [82]. Although inflammation can play an important role in STI clearance, it may also cause destruction of infected epithelial layers, allowing STI-associated microbes to access deeper tissues [83]. An association between genital infections and inflammatory cytokine concentrations has been reported in multiple studies. Of the cytokines measured, interleukin (IL)-6 appears to be commonly induced following infection with multiple STIs, while IL-8 production has been associated with trichomoniasis, cervicitis, and yeast infections [84]. Studies conducted in South Africa have shown that *C. trachomatis*, *N. gonorrhoeae* and *Mycoplasma genitalium* infections and elevated cervicovaginal lavage (CVL) concentrations of interleukin (IL)-1 β , IL-6, IL-8 and soluble CD40L (sCD40L) were associated with increased risk of HIV acquisition [30]. Several studies have found that women from SSA have increased systemic and genital immune activation compared to women from Europe and North America [85] [86].

A recent report by Wand and Ramjee highlighted that women who were at risk for STIs, including those with repeated STI diagnoses, were also at risk of acquiring HIV [87]. To date, 10 randomized controlled trials (RCTs) of STI treatment interventions with an HIV endpoint have been completed in SSA. The outcomes of five of these trials are described in the table below (Table 1). Of these trials, only the Mwanza trial [85], reported a reduction in HIV incidence in the treatment arm. The other trials did not replicate the results of the Mwanza trial due to flaws in the study designs as described recently by Stillwaggon and Sawers [88].

3. Adverse Impact of STIs on Women's Health

STIs have been related to a number of adverse pregnancy outcomes such as spontaneous abortion, stillbirth, prematurity, low birth weight (LBW), postpartum endometritis, and various sequelae in surviving neonates [93]. Untreated STIs are linked to congenital and perinatal infections in neonates, especially in high prevalence and

Table 1. Summary of RCTs of curable STIs with an HIV endpoint in Sub-Saharan Africa.

Population	Intervention	Outcome	Reference
Mwanza, Tanzania, 12 communities, 12,537 adults, 1991-4	Improved Syndromic treatment	Reduction in HIV incidence, IRR = 0.62, 95% CI = 0.45 - 0.85.	[89]
Rakai, Uganda, 10 communities, 13,623 adults, 1994-6	Periodic mass STI Treatment	No reduction in HIV incidence, IRR = 0.97, 95% CI = 0.81 - 1.16.	[90]
Masaka Uganda 18 communities, 12,819 adults 1994-2000	Information, education and communication and improved STI counselling and testing	No reduction in HIV incidence, IRR = 1.00, 95% CI = 0.63 - 1.58.	[91]
Nairobi, Kenya, 466 female sex workers, 1998-2002	Periodic presumptive STI treatment	No reduction in HIV incidence, IRR = 1.2, 95% CI = 0.6 - 2.5.	[18]
Manicaland, Zimbabwe, 12 rural and peri-rural communities, 1998-2003	Improved STI testing and counselling services	No reduction in HIV incidence, IRR = 1.27, 95% CI = 0.92 - 1.75.	[92]

incidence regions [94]. Untreated syphilis in pregnancy can result in stillbirth and neonatal death [94]. Approximately 25% of pregnant women who have untreated syphilis experience stillbirths. Additionally, a 14% neonatal mortality has been recorded [94]. Untreated gonococcal infections in pregnant women is responsible for approximately 35% of spontaneous abortions and premature deliveries as well as 10% of perinatal deaths [94]. An estimated 30% - 50% of infants born to mothers with untreated gonorrhoea and chlamydial infection develop a serious eye infection (ophthalmia neonatorum), which can lead to infant blindness [94]. Infection with *T. vaginalis* is also associated with adverse health outcomes for women. In women, *T. vaginalis* infections results in mild to severe vaginitis [95] and has been associated with an increased risk for HIV infection and cervical cancer [96]. Additionally, *T. vaginalis* infections may increase the risk of adverse pregnancy outcomes and these include preterm delivery and delivery of a low-birth-weight infant [95]. According to the WHO, cervical cancer caused by HPV is responsible for 11% of deaths globally, and is the primary cause of cancer-related deaths in African countries [3]. It is anticipated that the number of HPV-related cervical cancer cases will double by 2050 as a result of the significant increase of HPV infections in developing countries and the increase in population and life expectancy [90].

4. Management of STIs

Since the 1990s, the WHO has recommended a syndromic approach for the diagnosis and management of STIs in patients presenting with signs and symptoms of STIs. This approach was developed for particular implementation in countries that have no or limited access to STI diagnostic services. The syndromic management approach allows for immediate treatment based on the presentation of signs and symptoms of infection. Syndromic case management remains the foundation for treatment of STIs in many countries around the world. The WHO supports syndromic case management as a part of its core STI management strategy [97]. The overall objective of syndromic management guidelines is to prevent the transmission of STIs. The management of vaginal discharge syndrome (VDS) and genital ulcer syndrome (GUS) in women presenting with symptoms is described in the table below (Table 2). Male discharge and GUS is more accurately identified when compared to VDS. VDS

Table 2. STI treatment guidelines for women based on syndromic management approach [100].

Syndrome	Causative organisms	Recommended treatment
Vaginal discharge syndrome	<i>Neisseria gonorrhoeae</i>	Treat with 3 drugs Cefixime, oral, 400 mg single dose** Doxycycline, oral, 100 mg 12 hourly for 7 days Metronidazole 2 g immediately as a single dose
	<i>Chlamydia trachomatis</i>	In pregnancy/during breast feeding Cefixime, oral, 400 mg single dose Amoxicillin, oral 500 mg 8 hourly for 7 days*** Metronidazole 2 g immediately as a single dose
	<i>Trichomonas vaginalis</i>	People who are penicillin allergic may also react to cephalosporins. **If severe penicillin allergic, i.e. angioedema, anaphylactic shock or bronchospasm Replace Cefixime with: Ciprofloxacin, 500 mg oral (non-pregnant, non-breastfeeding) Spectinomycin, IM 2 g single dose (pregnant, breastfeeding) ***Penicillin allergic pregnant/breastfeeding women Replace amoxicillin with: Erythromycin, oral, 500 mg, 6 hourly for 7 days
Genital ulcer syndrome	<i>Herpes simplex virus (HSV) type 2</i> <i>Treponema pallidum (syphilis)</i>	Treat with 3 drugs Benzathine Penicillin**, 1 M, 2.4 MU immediately as a single dose Erythromycin, oral 500 mg 6 hourly for 7 days Acyclovir, oral, 400 mg 8 hourly for 7 days **If severe penicillin allergic, i.e. angioedema, anaphylactic shock or bronchospasm. Non-pregnant, non-breastfeeding women: Replace Benzathine Penicillin with doxycycline, oral 100 mg 12 hourly for 14 days Erythromycin with ciprofloxacin, oral 500 mg, 12 hourly for 3 days Pregnant, breastfeeding women: Replace Benzathine Penicillin with erythromycin, oral 500 mg, 6 hourly for 14 days

can be divided as discharge from the vagina and/or cervix, dysuria, vulvo-vaginal itch and lower abdominal pain. Women with a discharge can present with one or a combination of these symptoms [98]. Despite this, vaginal discharge is often difficult to treat and is not an appropriate lead symptom for the diagnosis of cervical infections because these are mostly asymptomatic [99]. In a cohort of high risk women in South Africa tested for STIs, only 12% of women who tested positive for a STI had visible clinical symptoms. These women would have gone untreated in a syndromic management setting. Symptom driven management of STIs may therefore not be feasible in high risk populations [30] as untreated STIs may facilitate continued transmission of STIs, resulting in genitourinary and maternal complications and an increased risk of HIV acquisition.

5. Treatment Challenges in the Era of Emerging Drug Resistance

Clinical treatment failures for chlamydia are beginning to be reported in the literature. In one report, three chlamydial isolates were shown to be resistant to doxycycline, azithromycin, and ofloxacin [99]. One of the primary reasons for transmission of chlamydia is the frequency of repeat infections [36]. Untreated infections can result in complications such as pelvic inflammatory disease, ectopic pregnancy and infertility [101]. Additionally, infection in pregnant women increases the risk of preterm delivery. *C. trachomatis* infections also increases the risk of HIV acquisition [102]. Improving partner treatment strategies to reduce repeat infections and validation of new chlamydia rapid tests are essential for infection control. However, based on the difficulties associated with the reduction of chlamydia prevalence there is a need for continued work toward an effective chlamydia vaccine [103].

Antimicrobial resistance (AMR) is making the clinical management of *N. gonorrhoeae* increasingly challenging and this challenge has been experienced on a global scale [104]. One of the reasons contributing to AMR, is the remarkable ability of *N. gonorrhoeae* to develop and acquire antibiotic resistance mechanisms [105]. The emergence of AMR of *N. gonorrhoeae* to various classes of antibiotics including penicillins, sulfonamides, tetracyclines, quinolones and macrolides has limited the currently available treatment options. In South Africa, in 2003, resistance to ciprofloxacin was reported as a clinical problem based on the sudden appearance of quinolone resistant *N. gonorrhoeae* (QRNG) at a prevalence of 22% [106]. Third generation cephalosporins are the only remaining class being used however there has already been evidence of resistance to cefixime with verified treatment failures in Japan [107], Norway [108] and the United Kingdom [109]. Of concern is that the first case of resistance to ceftriaxone has also been detected in Japan [27].

Presently, in South Africa, antimicrobial resistant *N. gonorrhoeae* infections is a huge public health issue since there are concerns that *N. gonorrhoeae* infections may become untreatable in the coming years [7]. Untreated infections can result in numerous complications such as pelvic inflammatory disease, ectopic pregnancy, tubal infertility, neonatal eye infections, and consequences such as facilitation of HIV co-transmission [104] especially in regions where the prevalence of both these diseases is high [7] [110]. In the absence of a vaccine, antibiotics is the most effective way for curing *N. gonorrhoeae* infections as well as stopping the local spread of infection [111]. The rapid development and evaluation of new antibiotics for the treatment of *N. gonorrhoeae* infections is urgently needed. Currently, there are two clinical trials of new regimens being tested [13].

For more than 20 years Acyclovir (ACV) has been used as the first-line treatment for the management of herpes simplex virus 1 (HSV-1) and 2 (HSV-2) diseases. However, viral resistance towards ACV is increasingly observed [112] [113]. The prevalence of ACV resistant HSV isolates differs for immunocompetent and immunocompromised patients [114]. Previously a low prevalence of resistance to ACV was reported for immunocompetent patients in [115]. However, there was a later report on a prevalence rate of 6.4% for ACV resistance in immunocompetent patients [114]. In the immunocompromised patients, the reported prevalence of ACV resistance has been shown to be higher (3.5% - 6%) [116].

A vaccine against HSV-2 infection could have tremendous impact on HIV spread [13], since HSV-2 is a biological co-factor for HIV acquisition [57] [64] [65]. During the development of the vaccine against HSV-2, the following should be taken into account; the viral latency, the herpes immune escape, and the high seroprevalence [117]. The availability of a vaccine will aid in preventing neonatal herpes and alleviating the pain associated with genital herpes symptoms [13].

Resistance of *T. vaginalis* strains to metronidazole has been emerging and there is evidence that resistance may be on the increase [118]. In South Africa, a 6% prevalence of metronidazole resistance was reported for women attending an antiretroviral clinic [119]. Other drugs that may have efficacy against *T. vaginalis* infec-

tions include nitazoxanide and miltefosine [96]. However, the appropriate route of administration and safety of these drugs are yet to be published, since nitazoxanide may only be available as an intravaginal gel due to poor absorption in the gut and the safety of miltefosine for pregnant women is yet to be investigated [96]. To this end, continued efforts toward developing trichomoniasis vaccines should be pursued [13].

6. Interventions for Prevention and Management of STIs in Women

6.1. Condom Use

Both male and female condoms are extensively promoted as an important component of STI control programmes [120]. Consistent and correct condom use should protect an uninfected individual from acquiring an infection (primary prevention) and an infected individual from transmitting infections (secondary prevention) if the site of infection is protected by the condom. In prospective studies, consistent condom use has been shown to reduce, though not eliminate, the acquisition of chlamydia, gonorrhoea, syphilis and genital herpes in men and women, as well as trichomonal and HPV infections in women [121] [122]. The reasons for condom failure are mostly behavioural rather than mechanical (breakage, slippage). Reports from several national surveys conducted in South Africa, Burkina Faso, Ghana, Malawi and Uganda, indicated that women used condoms less consistently than men [123]. This was mainly due to religious beliefs and the inability of women to negotiate condom use with their male partners.

6.2. Vaccines

A milestone in the prevention of cervical cancer in women has been the development of the HPV vaccine. There are currently two commercially available HPV vaccines, Cervarix™ (GlaxoSmithKline Biologicals) and Gardasil™ (Merck & Co), which are protective against HR-HPV types, 16 and 18 [124]. HPV vaccination programmes will impact significantly in African countries where there are limited screening and treatment facilities to manage HPV-associated cancer [125]. Rwanda was the first country in SSA to introduce school-based HPV vaccination in 2011. Since then other African countries including Uganda, Tanzania, Lesotho and South Africa have implemented the roll out of the HPV vaccine [75].

6.3. Partnership Interventions

An important component of STI management includes partner notification for STIs which aids in interrupting transmission of infections, averting possible re-infection, and preventing STI-related health complications [126]. Partner management (notification and treatment) is a key component of the syndromic management system. The process of partner notification involves notifying the sexual partners of infected individuals of their exposure, administering presumptive treatment, and providing counseling and education on future STI prevention [127]. Partner notification and treatment may be inadequate due to gender and cultural issues which prevent effective communication between partners and thus impact on their ability to convey information acquired from clinics [128].

7. Future Research Directions

Although, the syndromic case management remains the foundation for STI treatment in numerous countries around the world including South Africa [97], there are, however, several limitations of syndromic management including failing to treat asymptomatic infections, over-treatment, as well as poor sensitivity and specificity of algorithms in accurately diagnosing the infections, specifically for women [129]. To address these gaps, inexpensive point of care (POC) tests are now commercially available for screening of STIs [130]. The use of these diagnostic tests could result in the treatment of a larger number of infected individuals as compared to provision of treatment at the return visit [130]. These POC tests may have a significant impact at the population level. This impact can be measured by calculating future prevalence and incidence rates of STIs in the general population. To the best of our knowledge, there have been a limited number of studies that have explored the diagnostic performance as well as the feasibility of introducing STI POC tests in clinical settings in Africa. Such studies are urgently needed, since the data generated from these studies may be used to modify the current STI management algorithm provided the tests are shown to be cost effective with a high sensitivity and specificity.

8. Conclusion

Although STIs may be treated and most are curable, they still remain a major public health problem in developing countries where the HIV epidemic is also severe. Comprehensive STI screening and surveillance programmes should be implemented to assess the true burden of these infections in the African region. Given that many STIs are asymptomatic, integration of STI screening services within HIV testing facilities may allow for more early diagnosis, treatment and prevention of both HIV and STIs in at-risk populations. There still remains an urgent need for female-controlled STI and HIV prevention methods, and the development of more cost-effective rapid POC tests that may be used for efficient diagnosis of STIs in resource-limited settings.

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