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Underserved populations and bacterial and protozoal sexually transmitted infections: a lost health-care opportunity

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Abstract. – OBJECTIVE: The purpose of our review is an update about the burden of sexually transmitted infections (STIs) among various types of underserved populations, such as migrants, substance abusers, homeless and incarcerated inmates. First-line test and treatment based on the latest available evidence according to the revised guidelines of Centers for Disease Control and Prevention have also been considered.

MATERIALS AND METHODS: We performed a comprehensive research using scientific databases such as Medline and Pubmed, followed by a review of citations and reference list. A consultation with other experts in the management of the various subpopulations was also conducted.

RESULTS: Health-care is often influenced by social determinants, which play a vital role in the diffusion of STIs. The consequence is a socio-economical and ethnic disparity in the rate of STIs. Early screening and treatment of STIs should be implemented in clinical practice, starting from marginalized social groups, which are the most affected by this health problem.

CONCLUSIONS: In the literature, there are very few papers containing information on STIs prevalence in various types of underserved populations, such as migrants, substance abusers, homeless and incarcerated inmates. The availability of more accurate epidemiological data is needed. In these groups, the most relevant barrier is the lower perception of health-care need, with an underestimation of risk and symptoms of STIs, causing a retard of diagnosis and health-care provision and use. For these populations, targeted interventions are needed, particularly on unaware people, responsible for most STIs transmissions.

Key Words

Bacterial disease, Protozoal disease, High-risk behavior, Sexual behavior, Prevention.

Introduction

Sexually transmitted infections (STIs) are defined as local or systemic infections acquired through sexual contact (vaginal, anal and/or oral-genital) or through objects used in such occasions. However, the transmission could sometimes take place parenterally through blood, blood derivatives, contaminated instruments and at childbirth. STIs are one of the most serious public health problems in both industrialized and developing countries. The World Health Organization (WHO) estimates that more than 1 million STIs are acquired every day. Each year, there are an estimated 357 million new infections with 1 of the following 4 STIs: chlamydia (131 million), gonorrhea (78 million), syphilis (5.6 million) and trichomoniasis (143 million)[1]; 47 million of curable STIs occur in the WHO European regions[2]. In addition, an STI such as syphilis increases the risk of HIV infection by three-fold or more. As some studies show, approximately 50% of STIs are among the 15-24 year-old population. In particular, HPV, trichomoniasis and chlamydia accounted for 88% of all new cases of STIs among this age range[3]. Often, consequences of STIs do not occur just immediately, but are also associated with long-term impact on sexual and reproductive health, regarding fetal and neonatal deaths and cervical cancers. For example, up to 85% of infertility among women seeking infertility-care are related to pelvic inflammatory disease (PID) with tubal factor infertility (TFI). Different studies have evaluated the linkage between female infertility and PID[4-6], and since the 1980s the rate of infertility after PID has been estimated as ranging from 5.8% to 60% in relation to severity, number of infections, and age[7]. More recent studies, as a Swedish study, showed in 1300 women eager to offspring after laparoscopic

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diagnosis acute PID, documented a rate of infertility by 16% compared to 2.7% of a control group and an increased prevalence of ectopic pregnancy (9.1%) compared to the control group (1.4%)[8]. Rates of TFI are related to severity of disease at diagnosis. Reported rates of TFI range from 10 to 21% for mild PID, 35 to 45% for moderate disease, and 40 to 67% for severe PID[9,10], with a strong influence of early or late treatment[11]. Furthermore, as studies about indoor *vs.* outdoor therapy of PID showed, there is no difference in effectiveness of inpatient and outpatient treatment strategies for women with mild-to-moderate PID. This finding could suggest the importance of the treatment before the disease becomes severe[12]. PID comprises a large spectrum of inflammatory disorders of the upper female genital tract[13], with a large spectrum of symptoms and, therefore, a diagnosis of PID is usually based on a nonspecific clinical features[14]. The persistent and consistent use of condoms reduces the risk of PID and related complications; Ness et al[15] showed as women who reported a regular use of condoms had lower rates of PID sequelae, and also a significant reduction in the risk of developing infertility. In fact, high prevalence rates of bacterial infections, such as C. trachomatis, have been shown to range from 9 to 68% in infertile women[16]. If the STIs are already an important phenomenon interesting the general population health, the literature suggests a strong linkage between medical underserved population and these infections. The prevalence and the incidence of STIs significantly change regarding underserved populations, because of social determinants such as ethnical segregation, migration, health-care provision and use, socio-economic status, substance abuse and rate of incarceration[17], creating epidemiological differences between subgroups for health disparities, with a possible impact on the rest of the general population. In fact, as past analysis highlighted, race/ethnicity, incarceration, social and sexual network segregation, represent substantial elements for higher risk of STIs than the rest of the population[18,19]. Nevertheless, the poor availability of accurate epidemiological data, does not allow an optimal definition of the problem to determine objectively of control strategies.

Materials and Methods

We conducted a review of the published material inherent the diffusion of non-viral STIs in medically underserved population, particularly regarding race/ethnical segregation, substance abuse, homelessness and incarceration. We used scientific databases such as Medline and Pubmed. Citation and reference list were then reviewed, searching additional studies about the topic. To implement the knowledge about the groups under analysis, we have also consulted other experts in the management of each individual area of the subpopulation. After that, we considered the actual available strategies against STIs, such as treatment of symptomatic infections, early screening, prevention and control through behavioral measures, trying to identify their possible application on all the subgroups of these populations. Furthermore, given the recent revision of the guidelines of the CDC, we included the first-line treatment of STIs.

Results

Ethnical Segregation and Migration

Published studies have shown that the most common bacterial STIs and HIV/AIDS among black people are from 5.4 to 17.8 times higher than rates in whites[20], and that young black men and women could be at risk regardless of behavior[21]. The latest CDC report on STIs surveillance highlighted the significant difference inherent in ethnicity[22]. The chlamydia prevalence among black populations was 5.7 times higher than in white for women (incidence of 1.432.6 *vs.* 253.3 per 100,000 females respectively), and 7.3 times for men, (incidence of 772.0 *vs.* 105.5 cases per 100,000 males, respectively), whereas the gonorrhea prevalence was 10.6 times higher for both genders, with an incidence of 405.4 cases per 100,000 population among blacks, and 38.3 per 100,000 among whites. The disparities persisted even analyzing the groups by age. Also, the syphilis had disparities with prevalence 9.2 times higher in black than in white women, and 5.3 times higher in black than in white men. The European global assessment published in 2014 by ECDC showed no clear conclusions due to the limited number of countries providing data, especially for gonorrhea and syphilis. On 8.992 cases of gonorrhea in Europe, 1.002 (11.1%) were in migrants and 4.514 (50.2%) were in residents, but no information on country of birth was available for the remaining 3.476 cases (38.7%). Of the total of 9.991 syphilis cases, 7.3% were in migrants and 55.4% were in non-migrants but no information on country of birth was available for the remaining 37.7% of cases. It results that these data may not be representative of the situation in the EU/EEA and they should be interpreted with

caution[23]. For example, Dutch data also identified a higher percentage of STIs among ethnic minorities with a variable prevalence from 3.1 to 20.1%, compared to the prevalence of 1,8% in the native population[24-26]. Poor depth has been dedicated to trichomoniasis. Paradoxically, the literature showed that black people are more likely to use condoms than their white peers[27,28]. This phenomenon has been explained by some authors to be related to the same high prevalence of STIs into the various racial/ethnic group, because if people select their partners from their racial-ethnic groups, and one group has a higher level of STIs than another, regardless of behavior members of this group, will be at higher risk[29]. If this is true, it is also likely the increased risk of another group in the case of change of sexual networks, for example in case of migration. Migration represents an important condition that could contribute to STI diffusion. In any population, the spread of infectious diseases depends on the possibility of contact between susceptible and infected people, and migration could concur to this mechanism[30]. Multiple factors, such as higher ethnical segregation, lower economic status and education level, as well as important differences in sexual behavior and number of partners, have been reported in migrants compared to non-migrants, turning the former into a population at higher risk[31]. Not only, in these cases the mixing of different subpopulations may represent a bridge through which a member of a community could acquire an STI from a member of another, with possible further spread in his own community[32].

Substance Abuse

Alcohol and drug use have been identified as one the most important predictors for STIs, by impairing judgment, causing psychoses[33] and modifying sexual behavior[34-36], with increasing cases of unprotected sex, inconsistent use of condom and multiple sexual partners under the effect of drugs and alcohol. Furthermore, for more than 10 years, the strong link between sexual behavior, severity of dependence, and use of drugs and alcohol has been studied[37]. As well it is known, viral infections have been widely studied in substance abusers, particularly among people who inject drugs. However, more data are needed on the part of the literature about bacterial and protozoal STIs in this subpopulation. Nowadays, one of the goals of prevention should be the education of the community regarding alcohol and drugs abuse and their link with STIs, using social, behavioral and motivational interventions[34].

Homelessness

The homeless are defined as people who have spent at least one night in the street, a public space or a refuge[38,39]. This population has a high-risk sexual behavior and consequently is at high risk for STIs[40,41]. It is singular how the homeless have a gender difference in sexual risk behavior and STIs rate[42,43], and how ethnicity and substance abuse are associated with this condition. A study on STIs among the sexually active homeless showed a high prevalence of other ethnicities than white and high substance abuse. Regarding sexual behavior, very high rates of vaginal sex, similar for males and females have been reported (prevalence about 89%), but with rates for anal sex and more frequent change of partner with anonymous sex in males. Nevertheless, females were more likely to report positive STI results to males (46% *vs.* 9% of prevalence) [44]. Therefore, the presence of STIs should always be considered in special populations independently of sexual behavior, due to the high proportion of unaware carriers[45]. More data would be needed by the literature to clearly understand the real distribution of bacterial and protozoal STIs in homeless.

Correctional Systems

Correctional systems play a fundamental role in the diffusion of STIs and their prevalence is very high in people entering correction facilities[46]. This finding is extremely important given the possibility of monitoring, early diagnosis and treatment, reducing impact and risk at the return to freedom both in inmates and their partners[47]. Incarceration directly influences socioeconomic status and segregation and it is associated with the creation of high-risk sexual networks, causing an increase of STIs in inmates[48,49]. Studies which estimated the prevalence rates of STIs among juvenile offenders, revealed alarmingly high prevalence of STIs. For example, in 2002 12 detention centers were included in the use of screening on adolescents, finding female prevalence rates of 15.6% for chlamydia and 5.2% for gonorrhea, and male rates of these diseases of 7.6% and 0.9%, respectively[50]. Also, data from 2006 showed a similar condition, with an estimated prevalence from 13.0% to 24.7% in incarcerated adolescent female populations, 4.8% to 8.1% in incarcerated adolescent male populations, and gonorrhea prevalence rates range from 4.5% to 7.3% for females and from 0.9% to 6.7% for males[51]. A more recent report by the Arizona Arrestee Reporting Information Network (AARIN) and Arizona State University's Center for Violence Prevention and Community Safety confirmed high

rates of STIs in Arizona jails, revealing rates of gonorrhea and chlamydia infection about 80.6 and 14.5 (prevalence about 5% and 10% for gonorrhea and chlamydia respectively) times higher, respectively, than in the general population in female prisoners, and about 54.4 and 23.7 (prevalence about 4,6% and 7% for gonorrhea and chlamydia respectively) times higher in male prisoners[52]. The prison setting is a phenomenon similar to that of homelessness, with a greater involvement and more severe consequences for women than men, particularly for bacterial STIs, as highlighted by other published studies[53,54]. Official epidemiologic surveys of STIs among prison inmates in EU/EEA are not available. Instead, a different context has been showed in Australia, where published studies conducted in New South Wales (NSW) prisons showed that untreated syphilis was uncommon (2% of men and 1% of women). A low prevalence was also found for chlamydia in a 2001 survey, with rates of 1% among females and 2% among males[55]. A 2003 survey of NSW Department of Juvenile Justice among incarcerated youth revealed a chlamydia prevalence of 6% [56], but continuing the evaluation in the following years until 2007, it was identified a decreasing trend with an average prevalence of 4.4% [57]. Also, Australian studies[58], which tested prisoners for gonorrhea, showed in this case a low prevalence, which was 3.4%. It follows that in Australian prisons there is a lower prevalence of STIs compared to other countries, and probably any differences could be related to the easy possibility of access to condoms through condom dispensing machine in Australian jails. Anyhow, incarceration causes a further problem in the community concerning changes in sexual relationship patterns both for inmates and their partners. On the one hand, inmates who return to the community after contracting STIs in jail could infect their partners. On the other hand, people with an incarcerated partner may suffer the effect of emotional and physical distance and look for both emotional and financial support, thus increasing the risk of partner exchange and consequently risk for STIs[59]. Therefore, it is important to improve strategies of prevention, screening and early treatment of STIs in inmates before their release from jail[32], in association with support programs for their partners.

Discussion

STIs are one of most important health problems in the world and their diffusion in underserved populations is substantial. In fact, ethnical segregation, migration, substance abuse, homelessness and incarceration have been demonstrated to be linked to STIs disparities[60]. Nevertheless, in literature there are very few papers containing information on STIs prevalence in various types of underserved populations. The availability of more accurate epidemiological data could allow a better use of economic resources, by creating specific programs not only for symptomatic patients, but for the early screening and treatment of these diseases in unaware people, combined with behavioral interventions.

Treatment of Symptomatic Patients

The treatment of most common bacterial and protozoal STIs has been widely studied by CDC (Atlanta, GA)[61,62]. Recommended first-line therapy is summarized in Table I. The treatment of symptomatic patients is very important both for general and underserved populations, but this in-

Table I. Recommended regimens for the treatment of sexually transmitted infections (STIs), according to the Centers for Disease Control and Prevention (CDC), based on 2015 guidelines.

STI	CDC recommended regimens
Chlamydia infection	Azythromycin 1 g orally single dose or Doxicycline 100 mg orally b.i.d. for 7 days.
Gonococcal infection	Ceftriaxone 250 mg IM single dose plus Azithromycin 1g orally single dose.
Syphilis	
• Primary, secondary, early latent	• Benzathine penicillin G 2.4 million U i.m. single dose.
• Late latent	• Benzathine penicillin G 7.2 million U, divided in 3 doses of 2.4 million U i.m. each at 1 week of interval.
• Neurosyphilis	• Aqueous crystalline penicillin G 18-24 million units per day, divided as 3-4 million units IV every 4 hours or in continuous infusion, for 10-14 days.
Trichomoniasis	Metronidazole 2 g orally single dose or Tinidazole 2 g orally in a single dose.

STI: Sexually Transmitted Infection; CDC: Centers for Disease Control and Prevention; IM: Intra Muscle; IV: Intra Venous.

tervention is not sufficient to ensure the reduction of transmission rate or the disease burden. Only the control of STIs can guarantee the reduction of prevalence and incidence in a population, giving a real public health outcome, including community-based interventions with the promotion and the provision of prevention means and clinical services[63].

Early Screening and Treatment

Nowadays, marginalized social groups represent an important challenge in STIs control strategies[64], and as CDC guidelines suggest, more prevention programs are needed, promoting early screening and treatment of STIs, with the goal of early detection and the treatment of asymptomatic infections in unaware people and their partners, breaking the chain of infection. In this context, partner notification and treatment has been described as a successful practice[65,66]. Although it is paradoxical, offering screening in underserved populations may be easier than in the general population because of the possibility of programs within facilities for migrants, methadone clinics, jails, and homeless shelters, leading to early treatment of one of the most important reservoirs of STIs. This approach could also be effective in protecting the rest of the general population.

Behavioral Measures

Counseling and behavioral interventions represent an important tool in the fight against STIs[67], and the presence of primary prevention programs have been demonstrated to have an important impact on health outcomes, increasing health-care and social services use[68]. The improvement of health status represents probably one of the most important interventions in underserved populations. The increase in knowledge of risk factors for STIs in high-risk groups could represent an important link between provision and use of the health-care system. Behavioral measures have a strong association with the risk reduction for STIs, particularly the number of sex partners and the number of sexual intercourse with or without the condom use[69,70]. Furthermore, condoms use programs are essential for STIs prevention and control by educating people as to the necessity of their use and ensuring their availability with targeted distribution[71]. Prevention through avoiding exposure is the best strategy for controlling the spread of STIs. For example, condom distribution programs in jails and prisons have been successfully applied in the USA, Canada, some European nations and Australia, proving to be feasible, effective and sustainable[72-74]. Behavior changes that eliminate or reduce the risk of one STI, reduce the risk of all, such as a proper use of the condom in each sexual intercourse[75]. In the available literature, there are a few studies which highlighted the effectiveness of the condom distribution and the good response of the targeted group highlighted in the available literature, such as on high-risk youth[76,77], high-risk clinic patients and settings[78,79], as well as high-risk venues (Table II)[80,81]. This same measure could be easily considered in migrant facilities, methadone clinics and shelters for the homeless, as well as in prisons. The use of condoms has a fundamental impact on diffusion of STIs. Even if the condom is not considered 100% effective, its use significantly reduces the spread of STIs, and published studies have demonstrated that the persistent and consistent use of condoms

Table II. Studies on efficacy of targeted distribution of condoms and its success.

Study	Population group	Result
Alstead et al[76]	High-risk youth	73% of target youth reported exposure to the Condom Campaign.
Cohen et al[78]	High-risk clinic patients	Increased condom use, particularly among persons at high-risk for STIs. and high STIs rate areas
Egger et al[79]	High-risk settings	Increased condom use related to the easy availability.
Meekers et al[77]	High-risk youth	Significant changes in perceived condom attributes and access, self-efficacy, and perceived social support.
Renaud et al[80]	Venues where people at high-risk for human immunodeficiency virus congregate	Increased condom use related to the easy availability.
Sandøy et al[81]	High-risk places	Reduction in reported sexual risk, increased condom use.

provides significantly more protection compared with no use, against the acquisition of syphilis and chlamydial infections by men and women, gonorrhea and trichomoniasis by women, urethral infections among men[82-84], and serious complications such as infertility, ectopic pregnancy, chronic pelvic pain, newborn disease, neonatal deaths and increased risk of HIV infection, as well as other issues related to the STIs, such as the shame and the stigmata of being sick[12]. For these reasons, the core of STIs prevention and control programs should be considered as the identification of targeted high-risk groups on whom to apply clinical strategies and behavioral interventions, above all combined with the promotion of condom use.

Conclusions

STIs are one of most important health problems in the world and social determinants have been demonstrated to play a vital role in their diffusion. Migrants, substance abusers, homeless and prisoners represent hard to reach groups and require a broad approach[85]. Clinically-based interventions on symptomatic patients are very important for the treatment, but are not sufficient for the STIs control. Only the control of STIs can guarantee the reduction of prevalence and incidence, particularly in marginalized social groups, giving a real public health outcome, including community-based interventions with the promotion and the provision of prevention means and clinical services[63]. In conclusion, as Australian data from jails suggest[55-57], specific plans should be implemented and tailored to underserved populations, eliminating the social determinants in the prevention and control of STIs. This will be possible not only by screening, treatment and early management of source patients and their partners, but with a bigger support of counseling and promotion of the easy access to condoms in migrants facilities, shelters and prisons, ensuring the elimination of health disparities[17]. These populations represent one of the main reservoirs for the infection, and the few data in peer-reviewed literature indicate high prevalence of STIs among these people, with unaware patient rates sometimes exceeding 80%. Therefore, more specific programs are needed, including specific modalities, to reach underserved populations, and this can only be possible when the social barriers that affect the health-care systems are overcome.

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Conflict of Interests

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