

MESTRADO INTEGRADO EM MEDICINA

# **Risk of bacterial Sexually Transmitted Infections in sexual practices other than vaginal sex**

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**Risk of bacterial Sexually Transmitted Infections in sexual practices other than vaginal sex**  
A narrative review

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Assinatura da Co-orientadora



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## Resumo

**Enquadramento:** As infeções sexualmente transmissíveis (ISTs) são infeções que se transmitem predominantemente durante as práticas sexuais. As ISTs continuam a ser uma grande preocupação de saúde pública, devido às várias implicações que podem ter na saúde de um indivíduo, além de que a taxa de ISTs está a aumentar a um ritmo alarmante (apesar dos esforços consideráveis para combater este incremento), particularmente entre os homens que fazem sexo com homens em todo o mundo.

As ISTs podem transmitir-se de pessoa para pessoa através de vários tipos de contacto sexual, principalmente através de sexo sem proteção, sendo que podem também ser transmitidas durante a gravidez, parto, amamentação ou através de contacto com sangue infetado.

Embora o sexo vaginal entre um homem e uma mulher seja a prática sexual que leva ao maior número de transmissões (também porque é a prática mais executada) e, consequentemente, a prática sexual mais abordada na literatura científica relativa às ISTs, muitas outras práticas sexuais podem também levar a ISTs e, inclusivamente, são responsáveis por um número considerável de infeções.

Como as ISTs são um problema tão frequente e com um impacto na saúde e bem-estar sexuais e reprodutivos, para além do estigma que existe contra os indivíduos infetados, é imprescindível rever a literatura relativa à aquisição de Infeções Sexualmente Transmissíveis através de práticas sexuais que não o sexo vaginal, como o sexo oral e o sexo anal, em homens que fazem sexo com mulheres e/ou homens, e mulheres que fazem sexo com homens e/ou mulheres, bem como através de outros atos menos praticadas, como o uso de brinquedos sexuais e o uso de drogas no sexo.

**Objetivos:** Este trabalho irá analisar o risco e impacto que algumas práticas sexuais, além do sexo vaginal, têm em relação à transmissão de ISTs bacterianas. Ainda, que microrganismos estão mais especificamente associados às várias práticas sexuais discutidas.

**Métodos:** Foi realizada uma revisão bibliográfica da literatura utilizando publicações relevantes do PubMed, Google Scholar, SpringerLink, ScienceDirect, e do website do CDC, sem restrições quanto ao país ou data de publicação. Os termos de pesquisa incluíam o seguinte: (Práticas Sexuais, Sexo Anal, Sexo Oral, Brinquedos Sexuais, Masturbação, *Chemsex*, Dating Apps, Sexo Transaccional) e

(IST, Clamídia, Gonorreia, Sífilis, Mycoplasma), mas não outros (i.e., *Watersports*, Sexo em Grupo, VIH, IST viral). Foram utilizados os principais critérios de inclusão: o artigo foi escrito nas línguas inglesa ou portuguesa e o estudo centrou-se no risco de transmissão de IST, na própria IST ou na própria prática sexual. Os estudos foram excluídos se se focassem apenas no risco de transmissão no sexo vaginal.

**Palavras-Chave:** *Sexually Transmitted Infections; Chlamydia; Gonorrhoea; Syphilis; Mycoplasma; Anal Sex; Oral Sex; Masturbation; Fingering; Fisting; Sex Toys; Chemsex; Dating Apps; Transactional Sex.*

## Abstract

**Background:** Sexually transmitted infections (STIs) are infections that are predominantly spread during sexual practices. They continue to be a critical and worrying public health concern due to the various implications they may have on an individual's health and to the fact that the rate of STIs is increasing at an alarming rate, despite considerable efforts, particularly among men who have sex with men (MSM) worldwide.

Sexually transmitted infections can pass from person to person through several types of sexual contact, primarily by unprotected sex, and may also be transmitted during pregnancy, childbirth, breastfeeding or through infected blood.

Although vaginal sex between a man and a woman is the sexual practice that leads to the highest number of transmissions (also because it is the most performed practice) and consequently is the most addressed sexual practice in the scientific literature regarding STIs, many other sexual practices can also lead to STIs and, inclusively, are responsible for a considerable number of infections.

Because STIs are such a common problem and have a profound impact on sexual and reproductive health, in addition to the stigma that exists towards infected individuals, it is essential to review the literature regarding the acquisition of Sexually Transmitted Infections through sexual practices other than vaginal sex, such as oral sex and anal sex, in men who have sex with women and/or men

and women who have sex with men and/or women, as well as other less commonly practised forms, such as the use of sex toys and sexualized drug use.

**Objectives:** This work will analyze the risk and impact that some sexual practices, other than vaginal sex, have regarding bacterial STIs and which microorganisms are most specifically associated with the various types of the discussed sexual practices.

**Methods:** A narrative review of the literature was conducted using relevant publications from PubMed, Google Scholar, SpringerLink, ScienceDirect, and the CDC website, with no restrictions placed on the country or publication date. Search terms included the following: (Sexual Practices, Anal Sex, Oral Sex, Sex Toys, Masturbation, Chemsex, Dating App, Transactional Sex) and (STI, Chlamydia, Gonorrhoea, Syphilis, Mycoplasma), but not others (i.e., Watersports, Group Sex, HIV, viral STI). Main inclusion criteria were utilized: the article was written in English or Portuguese, and the study focused on the risk of STI transmission, on the STI itself or the sexual practice itself. Studies were excluded if they did focus only on vaginal sex risk of transmission.

**Keywords:** *Sexually Transmitted Infections; Chlamydia; Gonorrhoea; Syphilis; Mycoplasma; Anal Sex; Oral Sex; Masturbation; Fingering; Fisting; Sex Toys; Chemsex; Dating Apps; Transactional Sex.*

## Abbreviations

CDC – Center for Disease Control and Prevention  
CMV – Cytomegalovirus  
CT – *Chlamydia trachomatis*  
GBL – Gamma-Butyrolactone  
GHB – Gamma-Hydroxybutyric Acid  
HIV – Human Immunodeficiency Virus  
HPV – Human Papilloma Virus  
HSV – Herpes Simplex Virus  
LGV – Lymphogranuloma Venereum  
MGen – *Mycoplasma genitalium*  
MSM – Men who have Sex with Men  
MSW – Men who have Sex with Women  
NAAT – Nucleic Acid Amplification Test  
NG – *Neisseria gonorrhoeae*  
NGU – Non-gonococcal Urethritis  
PID – Pelvic Inflammatory Disease  
PrEP – Pre-Exposure Prophylaxis  
STD – Sexually Transmitted Disease  
STI – Sexually Transmitted Infection  
TP – *Treponema pallidum*  
TS – Transactional Sex  
UT – Urinary Tract  
WHO – World Health Organization  
WSM – Women who have Sex with Men  
WSW – Women who have Sex with Women

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## Introduction

Sexuality and sex are integral parts of a person's well-being and essential contributors to the satisfaction levels of couples and other relationships<sup>1</sup>. However, most sexual practices are not risk-free; Sexually Transmitted Infections (STIs) are acquired primarily through sex. They are currently among the most common infections and, due to their associated symptoms and stigma, affect the health and well-being of many women, men, and infants worldwide. It is worth noting that when an STI becomes symptomatic, it is considered a Sexually Transmitted Disease (STD)<sup>2</sup>.

The incidence and prevalence of bacterial STIs are higher than ever and contrary to expectations, cases have continued to increase even with the onset of the pandemic by SARS-CoV2<sup>3</sup>. According to the World Health Organization (WHO), in 2021, the global prevalence among 15–49-year-old females and males, respectively, was estimated to be 4% and 2,5% for chlamydia, 0,8% and 0,7% for gonorrhoea, 0,58% and 0,56% for syphilis<sup>4</sup>. The estimated incidence per year corresponds to 128.5 million new cases of chlamydia, 82.4 million new cases of gonorrhoea and 7.1 million new cases of syphilis<sup>4</sup>. There is a lack of information regarding *Mycoplasma genitalium* prevalence; one study suggests its global prevalence in women is 1-6%<sup>5</sup>.

In Europe, females and males with chlamydia are approximately 3.4% and 2%, respectively. These numbers are 0,3% (females) and 0,2% (males) for gonorrhoea and 0,11% (both) for syphilis<sup>4</sup>.

Currently, men who have sex with men (MSM) represent the population with the most STI cases in Europe<sup>6,7</sup>. In Portugal, the prevalence of chlamydia and gonorrhoea in MSM is estimated to be 7,6% and 10,8%, respectively<sup>8</sup>.

Bacterial STIs have a significant global impact, and although there is much data regarding STIs, most studies focus exclusively on vaginal sex. Since other sexual practices are known to have a risk of STI transmission, and the population currently carrying most bacterial STI cases in high-income countries is MSM, it is essential to understand the risk of STIs in sexual practices other than vaginal sex<sup>2</sup>.

Hence, this revision will focus on bacterial STIs - specifically, infections by *Chlamydia trachomatis*, *Neisseria gonorrhoea*, *Treponema pallidum*, and *Mycoplasma genitalium* - and what

their risk of transmission are among various sexual practices such as anal sex, oral sex, sexual acts using hands and fingers (masturbation, fingering and fisting), the use of sex toys, and others.

Next, we will briefly describe the infections discussed in this work.

### **Chlamydia**

Chlamydia is the most prevalent bacterial STI in the world, caused by the gram-negative bacterium *Chlamydia trachomatis* (CT) <sup>1</sup>. Many people with chlamydia are asymptomatic, which can explain its prevalence. Symptoms may include urethritis and cervicitis, dysuria, pyuria, or abdominal pain. If left untreated, chlamydia can lead to serious health problems, such as pelvic inflammatory disease (PID) and ectopic pregnancy. Also, chlamydia is one of the leading causes of preventable permanent infertility for both sexes<sup>9, 10</sup>.

### **Gonorrhoea**

Gonorrhea is a common STI caused by the bacterium *Neisseria gonorrhoeae* (NG). Like chlamydia, most infected people are asymptomatic. Gonorrhoea is one of the most common causes of urethritis, with symptoms including urogenital pain or discharge, dysuria or dyspareunia. Gonorrhoea can also lead to severe conditions such as pelvic inflammatory disease, infertility, and an increased risk of contracting other sexually transmitted infections, especially Human Immunodeficiency Virus (HIV)<sup>2, 10, 11</sup>.

### **Syphilis**

Syphilis is a bacterial infection caused by *Treponema pallidum* (TP). In adults, syphilis has several stages, and symptoms vary depending on the stage of infection. The primary stage is characterized by the appearance of a localized and painless ulcerated papule at the site of infection, known as a chancre, which spontaneously disappears within 3 to 6 weeks, even without treatment. Some weeks to a few months later, syphilis can develop into a systemic infection, known as the secondary stage, which can consist of a skin rash, constitutional symptoms, and adenopathy; it can also present with a wide variety of symptoms, such as hepatitis, renal function alterations and neurological findings, such as headache and meningitis. Secondary syphilis can last for several weeks or months before spontaneously resolving. If still left untreated, syphilis can progress to a late stage, tertiary stage, which can cause serious complications, such as aortitis and other

cardiovascular manifestations, gummatous syphilis (known as gummas, which are destructive ulcerated lesions that can affect multiple organs), and neurosyphilis (which can include paresis and tabes dorsalis)<sup>2, 12</sup>.

### **Mycoplasma**

Mycoplasma can correspond to multiple species, but the species most associated with sexual transmission is *Mycoplasma genitalium* (Mgen). Mgen is a relatively newly discovered bacterium, and it is a common cause of non-gonococcal urethritis (NGU). Symptoms may include dysuria and pruritus in the genital area, although the infection is frequently asymptomatic. Among women, *M. genitalium* is associated with cervicitis, PID, preterm delivery, spontaneous abortion, and infertility. Chronic complications of Mgen in men are yet to be discovered<sup>2, 13</sup>.

For all of these STIs, young age, multiple sex partners and inconstant use of condoms are associated with increased infection transmission<sup>4</sup>.

Thus, this work will collect information to determine the risk of acquiring a specific STI in various sexual practices and compare it to the risk of transmission via vaginal sex. In addition, we will look for other aspects, such as whether different manifestations exist depending on the site of infection, complications of the infection, best methods of diagnosis, and if there are changes in treatment.

Regarding treatment, this work will base on the recommendations proposed by the Centers for Disease Control and Prevention (CDC), with some support from other studies.

# Anal Sex

## General

The expression Anal sex corresponds to any sexual activity that involves de anus. Despite that, in this chapter, the terms “anal sex” or “anal intercourse” will refer exclusively to anal penetration by a penis, as other ways of anal sex, like the use of sex toys, will be described afterwards.

Therefore, we will focus on two populations – Men who have sex with men (MSM) and Women who have sex with men (WSM).

Anal sex is a common sexual practice that is increasing in frequency<sup>14-16</sup>.

Studies suggest that approximately one-third of heterosexual men and women have ever had anal sex<sup>17, 18</sup>. This practice seems more common in white people, and the age peak is in the thirties<sup>18</sup>. In a study concerning Portuguese adolescents and young adults (between 14 and 24 years old), 23% affirmed that they had had anal sex<sup>19</sup>.

For MSM, anal sex is the most common sexual practice.

Anal sex is associated with the risk of STI acquisition. The best way to prevent STI transmission through this practice is the constant use of a condom<sup>20</sup>. However, condom use during anal sex remains relatively uncommon among heterosexuals and MSM<sup>14</sup>.

For WSM, only 41% report always using a condom during anal sex. Condom use during the last anal sex was unusual, with estimated values of 15%<sup>17, 18, 21</sup>.

For MSM, multiple studies suggest that the percentage who practice condomless anal sex is approximately 35-40%, mainly if it is with a regular partner<sup>22-24</sup>.

The main obstacles reported to condom use are the loss of pleasure, physical discomfort, and knowing that the partner is negative for HIV or STI; marijuana and other illicit drugs are also associated with condomless anal sex<sup>25-27</sup>.

In essence, anal sex is increasingly common, and condom use is moderately low. Moreover, multiple studies show that anal sex confers a substantially higher risk of HIV transmission than vaginal sex<sup>16, 20, 28</sup>. Because of these, it is essential to analyze not only the risk of STI (other than HIV) transmission during anal sex but also anorectal STI's impact on overall morbidity.

## **Chlamydia**

Anorectal chlamydia is often detected in women and men who have sex with men<sup>29</sup>. MSM appear to be a group with a clear high risk; among people who attend sexual health clinics, the prevalence reaches 15% in MSM and 10%, compared to the urogenital tract prevalence in women<sup>9</sup>. The main risk factor is condomless anal sex. Other risk factors include multiple sex partners and young age<sup>30</sup>. Nevertheless, CT was detected in women who did not report anal sex. Reasons that could justify this finding are the acquisition of rectal chlamydia from an initial urinary tract (UT) infection (autoinoculation), given the proximity of the vagina, and anus and female toileting hygiene practices<sup>31</sup>. Using saliva as a lubricant is not a risk factor for contracting rectal chlamydia<sup>32</sup>.

Determining the risk of CT being transmitted through anal sex from an infected individual to an uninfected one has been challenging. Despite that, the results from one study conducted in Melbourne from 2006 to 2015 that analyzed heterosexual couples revealed that 76% of males partners of an infected female and 77% of females partners of an infected male tested positive<sup>33</sup>. In another study concerning male-male couples, the proportion of men with rectal chlamydia when their partners have urethral chlamydia was 46%, and the percentage of men with urethral chlamydia when their partners have rectal chlamydia was 30%<sup>34</sup>.

Gathering the information from both studies would suggest that the transmission of CT is more efficient in vaginal sex than anal sex, and transmission from the urethra to the rectum is more efficient than vice versa.

There is no available data comparing the risk of transmission between symptomatic and asymptomatic people.

Anorectal chlamydia can cause two different clinical entities, depending on the serovar:

- Non-Lymphogranuloma venereum (LGV) is the most common, caused by *Chlamydia trachomatis* serovars D-K. People are usually asymptomatic, but when symptomatic, they can manifest mild proctitis associated with anal itching, mucoid discharge, and perianal pain. The rectal mucosa may be normal or erythematous and friable<sup>35, 36</sup>.
- Lymphogranuloma venereum (LGV), caused by *C. trachomatis* serotypes L1, L2 and L3<sup>37, 38</sup>. Although these serovars were previously rare in high-income countries, outbreaks have been reported since 1989, primarily in MSM<sup>38-40</sup>. Furthermore, almost every male diagnosed with LGV is also infected with HIV. Individuals with LGV are rarely asymptomatic, with symptoms containing severe forms of proctitis with purulent, often bloodstained, anal discharge, severe pain, tenesmus and constipation. LGV can also lead to systemic symptoms like fever, myalgia, arthralgia, malaise and anorexia. Left untreated, an infected person can form a perianal fistula and show friability of the mucosa, small ulcers or erosions in a rectum's biopsy, mimicking Crohn's disease<sup>35, 36, 38</sup>.

Anorectal chlamydia infections in women who reported anal sex have similar bacterial loads to anorectal infections in MSM. This result suggests that anal symptoms are unrelated to the bacterial load since both groups have different clinical manifestations<sup>31</sup>.

In other words, rectal CT symptoms are less relevant than the ones caused by UT CT infection in women. However, there is no evidence of whether rectal chlamydia can result in a UT infection through autoinoculation. Comprehending the frequency of autoinoculation is key to determining if a positive rectal CT test in a woman is clinically significant<sup>9, 41, 42</sup>.

For MSM, a study revealed that a man with anorectal chlamydia is at a greater risk of high-grade anal squamous intraepithelial lesions if coinfecting with a high-risk Human Papilloma Virus (HPV)<sup>43</sup>. Also, a rectal CT infection increments the risk of HIV acquisition<sup>44</sup>. Because of these, screening for rectal CT seems crucial.

International guidelines suggest using a nucleic acid amplification test (NAAT) to diagnose CT, as it is the best diagnostic test. However, those guidelines recommend using only urine samples from urethral, cervical or vaginal exudates<sup>45</sup>. Multiple studies report a high prevalence of anorectal STIs among men and women with a lifetime history of receptive anal sex, occasionally solely in that area<sup>46</sup>. A study showed that of the infected MSM, 85,6% had rectal-only CT; for women, this

proportion was 22,1%<sup>29</sup>. Thus, if only vaginal or genitourinary screening is used, many cases would be undetected.

That way, due to the prevalence and possible implications of rectal chlamydia, including anorectal samples when screening seems cost-effective. Currently, the CDC recommends screening all MSM who report anal sex; for women, screening can be done depending on reported sexual behaviours and exposures<sup>2, 47</sup>. Self-collected swabs appear to be a reasonable screening method for chlamydia<sup>46</sup>.

Regarding treatment, a one-week course of doxycycline appears to be more effective than a single dose of azithromycin for anorectal chlamydia<sup>2, 47</sup>.

## **Gonorrhoea**

Rectal gonorrhoea is considerably less common than rectal chlamydia<sup>48</sup>. In multiple reports, the average prevalence is higher in MSM (6,1%) than in women (1,7%)<sup>49</sup>. Risk factors include unprotected anal sex, young age, multiple sex partners, and having an (ex) partner with an NG infection<sup>29, 50</sup>. Specific risk factors include having sex exclusively with men or manifesting urogenital symptoms for MSM<sup>29</sup>. A study estimates that 25-35% of women with cervical NG will have a concomitant rectal infection due to contiguous spread from the genital infection<sup>36</sup>.

Unlike chlamydia, using saliva as a lubricant for anal sex may play a crucial role in gonorrhoea transmission<sup>51</sup>.

Once again, it has been challenging to determine the risk of NG transmission in anal sex. Nonetheless, gathering information from some studies could suggest that risk. One study suggests that the risk of NG transmission during vaginal intercourse from an infected man to a woman is approximately 80% and 81% from an infected woman to a man. The other studies regarding male-male couples conclude that the risk of a man acquiring urethral NG from a partner with rectal gonorrhoea is 48,1%, and the risk for a man acquiring rectal gonorrhoea from a partner with urethral NG is 63,9%<sup>52, 53</sup>.

The results from both studies could indicate that gonorrhoea transmission is more effective in vaginal sex than anal sex, and the transmission is more effective in receptive anal sex than insertive anal sex. Also, the risk of acquiring NG through anal sex seems higher than CT.

There is no available data comparing the risk of transmission between a symptomatic and asymptomatic individual.

In terms of clinical manifestations, rectal gonorrhoea is mostly asymptomatic<sup>11</sup>. Symptoms may arise 5–10 days after exposure and, in both men and women, include proctitis, mucopurulent discharge or constipation, anal pruritus, bleeding, tenesmus or painful bowel movements<sup>35</sup>. On physical examination, rectal mucosa can range from normal-appearing to erythematous and friable with pus<sup>36</sup>.

Even though rectal gonorrhoea's symptoms do not seem significant, there are some critical matters to consider regarding whether rectal NG should be screened.

Firstly, for both populations, gonorrhoea infections are an independent risk for acquiring other STIs, particularly HIV; this correlation is presumably due to mucosa's inflammation, destruction and discharges<sup>11, 54</sup>.

Furthermore, there is no consistent data regarding the possibility of urogenital NG infection being a sequela of a previous rectal infection. Similarly to chlamydia, because urogenital NG symptoms can be devastating, detecting rectal gonorrhoea may be of the utmost importance to prevent them<sup>42, 55</sup>.

Lastly, a study showed that 85,6% of MSM have rectal-only gonorrhoea; for women, that proportion was 20,8%<sup>29</sup>; other studies indicate that in MSM, isolated urogenital screening would miss over 70% of extragenital NG infections<sup>56, 57</sup>. In women, this number can be up to 35%<sup>55</sup>.

Because of these aspects, screening for NG in the rectum seems relevant and cost-effective. In MSM, screening and efficiently treating rectal gonorrhoea would help decrease their current HIV high incidence<sup>21, 58</sup>.

Identical to rectal chlamydia, the CDC recommends NAAT as a gold standard. Nonetheless, a study reports that NAAT has a lower sensitivity for NG in the rectum, which can be linked to the colonization of this site by a wide range of other organisms, resulting in interference with *N. gonorrhoeae* isolation<sup>59</sup>.

According to the CDC, every MSM who reports anal sex should be screened for rectal gonorrhoea. Women screening should depend on their behaviours and exposures<sup>2</sup>.

Self-collected swabs also seem to be a viable option for screening rectal gonorrhea<sup>46, 60</sup>.

In terms of treatment, ceftriaxone is considered the best antibiotic to treat uncomplicated rectal NG<sup>2, 61</sup>. Also, Pre-Exposure Prophylaxis (PreP) treatment in MSM with rectal NG (or MSM with a high risk of acquiring that infection) can be beneficial for reducing new cases of HIV in that population<sup>21</sup>.

Although anorectal NG's clinical relevance is still largely unknown, especially in women, proper treatment can help limit the incidence of NG (and HIV) in the general population<sup>29</sup>.

## Syphilis

Syphilis prevalence is increasing due to an upsurge in MSM<sup>62, 63</sup>. Understandably, this increase is primarily caused by anal sex.

Like the other STIs, the principal risk factor for rectal syphilis is condomless anal intercourse.

There is little information about *T. pallidum*'s risk of transmission through anal sex. Specifically, no study compares vaginal and anal sex regarding the risk of acquiring syphilis. There is also no data on whether anal-acquired syphilis progression is more rapid or aggressive.

Even so, regarding clinical manifestations, an infection by *T. pallidum* acquired via anal sex evolves as in vaginal-acquired syphilis.

Primary syphilis occurs within 2-10 weeks of exposure. Infections can be asymptomatic or manifest with ulcers, anal itching, tenesmus, urgency of defecation, bleeding, mucopurulent discharge, proctitis and pseudotumours. One of the main differences is that anal ulcers can be painful, unlike genital ulcers. Moreover, most of MSM's anal or perianal ulcers' etiology is syphilis; some differential diagnoses include inflammatory bowel disease, solitary rectal ulcer, viral anorectal ulcers (caused by Herpes Simplex Virus - HSV and Cytomegalovirus - CMV), lymphomas, lymphogranuloma venereum, and rectal cancer<sup>2, 64</sup>. Untreated lesions usually heal within several weeks<sup>36, 64</sup>.

The second stage of rectal syphilis may present with a rectal mass, condylomata lata and mucous patches, generalized rash, fever or lymphadenopathy that generally resolve without treatment after 3 to 12 weeks<sup>36</sup>.

Like vaginal-acquired syphilis, tertiary syphilis presents many years later, commonly involving multiple organs and presenting with debilitating ulcerating gummas<sup>36</sup>.

One concern about anal-acquired syphilis is that physicians usually examine the genital areas exclusively when searching for primary syphilis; MSM who practise receptive anal sex are four times more likely to present with secondary syphilis than those who practise insertive anal sex, suggesting that physicians often miss primary anorectal lesions<sup>65</sup>.

Rectal syphilis diagnostic is done by serologic tests (treponemal or nontreponemal tests). An endoscopic biopsy of anorectal lesions, whose findings are diverse, can complement the serology. Even though dark-field microscopy could assemble an initial diagnosis, the results could be imprecise due to contamination of the sample from the commensal flora of the rectum<sup>64, 66</sup>.

Identically to syphilis acquired in other ways, the initial treatment of individuals with rectal syphilis is a single dose of benzathine penicillin G, 2.4 million units in one intramuscular injection; for patients with long-standing diseases, this dose should be repeated once a week for three weeks<sup>2, 64</sup>.

## **Mycoplasma**

*M. genitalium* can also be transmitted through anal sex. This bacteria appears to be as common as chlamydia and more common than gonorrhoea in asymptomatic MSM. The main route for acquiring rectal MGen is receptive anal intercourse<sup>67</sup>.

For MSM, data suggests that rectal *M. genitalium* prevalence ranges from 2 to 6%<sup>67, 68</sup>. There is no concordance on whether urethral or rectal MGen is more prevalent<sup>67-70</sup>. An estimated 13% of patients with rectal MGen have a CT coinfection; this number is 14% for NG. Coinfection is correlated with having multiple sex partners<sup>71, 72</sup>.

For WSM, rectal infection is not uncommon. Its prevalence appears to be approximately 3-4%; some studies even suggest that women have higher rectal MGen prevalence than MSM<sup>13, 67</sup>.

Like the other STIs, some women with rectal MGen do not report anal sex. This finding suggests that rectal MGen infection may be acquired by auto-inoculation or on account of post-toilet wiping behaviours, similar to CT infection<sup>67</sup>.

No data compares the risk of *M. genitalium* transmission between anal and vaginal sex nor details the risk of acquiring MGen via anal sex.

Similar to the other STIs, rectal *M. genitalium* infection is mostly asymptomatic<sup>13, 69</sup>. Symptomatic rectal MGen essentially presents as proctitis that can be associated with rectal pain and ulceration. However, the association between MGen and its pathogenicity at the rectum is still somewhat dubious<sup>13, 67, 69, 72</sup>.

*M. genitalium* appears to be the sole pathogen in 12-17% of proctitis in MSM<sup>69</sup>. Moreover, men with symptomatic proctitis have a higher load of MGen than asymptomatic patients<sup>67, 69</sup>.

MSM with rectal MGen seems significantly more likely to acquire HIV<sup>69</sup>. This risk increases if the individual has rectal MGen-NG coinfection<sup>71, 72</sup>. Also, in one study, one-third of infected men were co-infected with HSV<sup>67</sup>.

The best diagnostic test for rectal MGen is a NAAT<sup>13</sup>. As with any screening program, evaluating its benefits and disadvantages is fundamental, specifically whether detecting and treating an asymptomatic disease is worthwhile. For MGen, there is no agreement regarding screening in MSM. The reasons for the dissent are mentioned below.

Firstly, it is relevant to know that the proposed treatment for rectal MGen is doxycycline, which reduces the bacteria load and eases organism clearance, but only has cure rates of 30%-40%. Therefore, doxycycline should be followed by azithromycin, or moxifloxacin if the infection is macrolide-resistant<sup>2, 13, 69, 72</sup>.

Secondly, as stated, around 10-15% of MSM have MGen and CT/NG coinfection. Thus, data report that treating rectal chlamydia and gonorrhoea in MSM with undiagnosed asymptomatic *M. genitalium* infections could potentially expose this bacteria to azithromycin, increasing the number of resistances. This aspect might explain the rapid escalation of MGen resistance currently seen in MSM, up to 84%<sup>2, 13, 71-73</sup>.

In conclusion, even though some authors agree to screen for MSM since they estimate that up to 70% of the infections would be missed if this site was not sampled<sup>13, 69, 73</sup>, data suggest that detecting MGen in asymptomatic MSM would encourage men to treat the infection, exposing them to azithromycin, which would increase the resistance and hamper the treatment, or exposing them

to moxifloxacin, which is expensive, potentially toxic, and difficult to obtain (and may even generate further antimicrobial resistance)<sup>13, 71-73</sup>.

Consequently, international guidelines do not recommend screening for *M. genitalium* at the rectum in asymptomatic people. For MSM, only symptomatic individuals should be tested. For women, rectal samples are only indicated in symptomatic proctitis after excluding NG and CT as causative pathogens<sup>13</sup>.

Overall, more data are needed to understand MGen's role in the rectum, its consequences, and whether treating asymptomatic individuals is beneficial, so that researchers can formulate guidelines to help manage a rectal MGen infection<sup>67, 69</sup>.

## Oral sex

### General

Oral sex corresponds to any sex practice in which the mouth is used to stimulate the genitals or genital area of a sex partner. Oral sex can involve the penis (fellatio), vagina (cunnilingus), and anus (anilingus)<sup>74</sup>. As such, this chapter will focus on WSM, men who have sex with women (MSW), MSM, and women who have sex with women (WSW). However, few studies involve cunnilingus, or in other words, MSW and WSW.

Oral sex is commonly practised by sexually active adults, both men and women, and it is known that it can transmit a variety of viral and bacterial STIs<sup>74-76</sup>.

More than 85% of all sexually active adults reported having oral sex at least once<sup>14, 18, 74, 77, 78</sup>. This number is significantly large among 20-24-year-old adults, which could imply that oral sex is becoming more frequent<sup>18</sup>.

According to several studies, between 33% to more than half of adolescents aged 15-19 reported having had oral sex with a partner of the opposite sex<sup>18, 74, 75, 78</sup>. Explicitly, half of the adolescents said they had received oral sex, and 39% of male adolescents and 44% of female adolescents said they had given oral sex<sup>18</sup>. In a study of Portuguese adolescents and young adults (18-24 years old), 40% reported having had oral sex<sup>19</sup>. For adolescent MSM, one study concluded that 34.1% had oral sex with a man by age 15, 65.9% by age 18 and 92.8% by age 25<sup>79</sup>.

One problem concerning oral sex is that popular beliefs state that “oral sex is not sex” and that oral sex is safe regarding conception risk and transmission of diseases, thus not requiring physical protection such as a condom<sup>75</sup>. One study found that over 60% of college students did not consider oral sex as “having sex” when answering survey questions<sup>18</sup>.

In a Portuguese study, 22,5% of teenagers who believed they had not started their sexual life reported having oral sex<sup>19</sup>.

Accordingly, recent studies have confirmed that condom use during oral sex is minimal<sup>75</sup>. Researchers estimate that 70% of adolescents have never used a condom during oral sex, and only 6% of people used one during their last oral sex<sup>14, 18, 75</sup>.

One study centred on why teenagers do not frequently use protection. Most answers regard to lack of education, no perceived STI risk, decreased pleasure, and no pregnancy risk<sup>78</sup>. These responses may explain why so many adolescents engage in oral sex rather than vaginal sex<sup>14, 18, 77</sup>. Nevertheless, they believe that comprehensive and careful education, normalization in culture and media, better access to protection, and more diverse protection options would increase the use of protection during oral sex<sup>78</sup>.

Although the risk of STI transmission is expected to be lower for oral sex than for vaginal sex<sup>78</sup>, quantifying the exact risk of getting an STI in oral sex, or comparing the risks between oral sex and other sex practices, is very challenging since most people who have oral sex also have vaginal or anal sex<sup>77</sup>.

Further, few studies analyze the risk of acquiring STIs via oral sex in the vagina or anus, compared to fellatio<sup>74</sup>.

Notwithstanding, some general factors are expected to increase the risk of transmission in oral sex, regardless of the STI. These include having poor oral health, such as dental caries, gum disease or bleeding, ulcers or oral cancer; if mucous membranes become torn or ulcerated, the transfer of STIs is facilitated<sup>74, 80</sup>. Exposure to sperm or ejaculate as a risk factor for acquiring STIs is hypothetical and not satisfactorily evidenced<sup>74</sup>.

Specific factors could include the STI itself, the particular oral sex practice, the prevalence of the STI in the population, and the number of sex partners and oral sex acts performed<sup>77</sup>.

Since oral sex is one of the most common sexual practices, if not the most common, and condom use is scarce, it is essential to detail the available information about bacterial STIs in oral sex, their risk of transmission for each specific type of oral sex, symptomatology, and possible complications.

## **Chlamydia**

Pharyngeal chlamydia is rare compared to its urogenital and rectal infections, as *C. trachomatis* show a less affinity for oropharyngeal mucosa<sup>81, 82</sup>.

Its prevalence is similar in heterosexual men and women; multiple studies support that CT positivity in the oropharynx is approximately 1-3% for WSM and 0-22% for MSW (median 1,6%); however,

data in heterosexual men are scarce<sup>42, 81, 83, 84</sup>. For MSM, pharyngeal CT prevalence is around 0 to 3,6% (median 1,7%)<sup>42, 76, 81, 84-86</sup>. Evidence needs to be specified regarding WSW.

There is little to no information that indicates chlamydia's risk of transmission nor compares the risk of acquiring CT between oral and vaginal sex.

Nevertheless, chlamydia can be transmitted via insertive and receptive fellatio. Even though there is some evidence, more studies are required to ensure that transmission of chlamydia can also happen through both insertive and receptive cunnilingus and anilingus<sup>74, 77, 87, 88</sup>.

As said, saliva appears to have no relevance for CT infection<sup>89</sup>.

Most chlamydia infections in the oropharynx are asymptomatic and have no documented clinical impact<sup>42, 75, 81</sup>. Symptoms are not specific and include a sore throat or a generalized inflammation of the pharynx or tonsils. Chlamydia can also be characterized by nonspecific symptoms such as cervical adenopathies, odynophagia, or tongue ulcers<sup>42, 74, 75</sup>. Published studies report pharyngeal LGV<sup>90, 91</sup>.

Because pharyngeal infections are usually asymptomatic, they frequently go undetected<sup>92</sup>. If left untreated, throat infections can spread to sex partners, often by performing oral sex<sup>42, 74, 87, 88</sup>. However, spontaneous resolution of pharyngeal chlamydia without complications seems possible, especially since CT load is usually low<sup>81, 84, 85, 92</sup>.

Recent studies propose that oral sex can also be associated with infertility. The hypothesis suggests that infectious chlamydia transmitted via oral sex colonizes the gastrointestinal tract, remaining undetected and tolerated by the immune system for extended periods, possibly leading to pelvic inflammatory disease and other serious complications<sup>93</sup>. Investigating this hypothesis could determine whether pharyngeal chlamydia has any significance.

Evidence suggests that pharyngeal-only CT is uncommon<sup>85</sup>. Thus, due to low missed cases and apparent lack of clinical relevance, the CDC does not recommend screening every asymptomatic person, but only if the individual (either male or female) reports risky exposure and symptoms. Other guidelines, such as Australian and British, suggest screening for every MSM. NAATs are the best test for screening pharyngeal CT<sup>75, 81, 85, 94</sup>. A randomized clinical trial in women and MSM

demonstrated that clinician-and self-taken pharyngeal swabs have similar high diagnostic accuracy for chlamydia<sup>81, 95</sup>.

Even though azithromycin is effective in curing pharyngeal CT, doxycycline may have slightly greater efficacy<sup>2, 42, 85</sup>.

## **Gonorrhoea**

Pharyngeal gonorrhoea is slightly more common than pharyngeal chlamydia<sup>75</sup>. In both women and MSW, its prevalence is estimated to be about 2-3%<sup>42, 76, 83</sup>. MSM again has the highest prevalence, with reported values of 0,5–7,9% and a median of 4.6%<sup>42, 76, 86</sup>. Moreover, 25% to 33% of MSM diagnosed with urethral gonorrhoea reported fellatio as their only recent exposure<sup>87, 96</sup>. That number was 3.1% in MSW<sup>88</sup>.

Pharyngeal NG was positively associated with younger age and having multiple insertive oral sex partners<sup>97</sup>.

Gonorrhoea's transmission risk is associated with fellatio, anilingus, and cunnilingus, for either insertive or receptive sex. However, the evidence might be insufficient for cunnilingus<sup>42, 74, 77, 87, 88, 98</sup>.

As said, saliva seems to have a significant role in gonorrhoea transmission; ejaculating, though, does not increase the risk of acquiring pharyngeal gonorrhea<sup>97</sup>.

Once again, there is little information regarding the risk of acquiring gonorrhoea via oral sex. Nonetheless, some studies report information that could help us find the risk.

For MSM, one study concluded that of men with urethral gonorrhoea, 33% had partners with pharyngeal gonorrhea<sup>53</sup>. Incorporating this information with the one described in the chapter on rectal gonorrhoea (where the risk of acquiring rectal NG through a urethral infection is 63.9%) helps us conclude that oral sex is less risky than anal sex for gonorrhoea transmission<sup>53</sup>. Furthermore, since anal sex appears less risky than vaginal sex for NG, it can be assumed that oral sex is the safest out of the three sexual practices.

Like pharyngeal chlamydia, gonorrhoea in the oropharynx is generally asymptomatic. The 15% of people who develop symptoms may present with pharyngitis, tonsillitis, gingivitis, stomatitis or glossitis, which can be associated with painful and bloody ulcers. Adenopathies can also be present. Some differential diagnoses include herpes simplex virus infection, erythema multiforme or immunobullous disorders<sup>74, 75, 92, 99</sup>.

Rarely, an untreated gonococcal infection may disseminate through the body, causing a rash and joint pain. A heart infection can also occur, which is a severe and potentially life-threatening condition<sup>74</sup>.

The median duration of untreated pharyngeal gonorrhoea is 16 weeks, which contributes to high levels of gonorrhoea transmission<sup>100</sup>.

As said, gonococcal infection at extragenital sites facilitates transmission and acquisition of HIV<sup>75</sup>. Oropharynx infections are often undiagnosed, serving as an epidemiologically important reservoir for gonorrhoea, allowing sustained community transmission<sup>75, 96, 100</sup>. A study reported that 25.3% of NG infections in MSM were isolated to the pharynx<sup>94</sup>.

Thus, contrary to pharyngeal CT, the CDC recommends annual screening for oropharyngeal *N. gonorrhoeae* in MSM (or every 3-6 months for high-risk MSM), regardless of the history of sexual contact. Screening should also be considered in women with a high risk of pharyngeal infection<sup>75 92, 96</sup>. NAATs are the best exam for detecting NG in the oropharynx<sup>99</sup>. Self-taken pharyngeal swabs have similar diagnostic accuracy for gonorrhoea<sup>95</sup>.

One particularity of NG infection in the oropharynx is that other commensal *Neisseria* species are frequently present in that site. Hence, *N. gonorrhoea* could be falsely detected, and simultaneously, other *Neisseria* species could be identified rather than *N. gonorrhoea*<sup>96, 99</sup>.

Furthermore, the oropharynx plays a substantial role in developing antimicrobial resistance in *N. gonorrhoeae*. This resistance results from the horizontal transfer of genetic material from commensal *Neisseria* species (that harbour genetic antibiotic resistance elements due to prior exposure to antibiotics) to NG<sup>92, 99, 101</sup>. This fact, combined with the inherent inability of antimicrobial agents to reach high concentrations in the oropharynx, makes it a site with low treatment efficacy<sup>101</sup>.

Therefore, it is mandatory to evaluate new drugs or novel drug combinations for pharyngeal gonorrhoea<sup>101</sup>. Presently, guidelines recommend treating pharyngeal NG with ceftriaxone or azithromycin<sup>2</sup>. Combining both drugs may improve treatment efficacy for pharyngeal infections<sup>42, 92</sup>. European guidelines for the WHO recommend using ciprofloxacin if the gonococcal strain causing the infection is proven to be ciprofloxacin-susceptible using genetic or phenotypic resistance testing. However, these tests are not widely available<sup>99</sup>.

Even though pharyngeal gonorrhoea is not clinically relevant, identifying and eradicating *N. gonorrhoeae* from the oropharynx has been challenging and thus plays a critical role in sustaining the excessively high rates of gonorrhoea observed in MSM<sup>96</sup>.

## Syphilis

Pharyngeal syphilis prevalence is not well described. However, it is estimated that up to 12-14% of primary canchres are located in extragenital sites, mainly in the oropharynx<sup>102</sup>. Data suggest that syphilis is less transmissible in oral sex than in vaginal or anal sex<sup>103</sup>.

Every oral sex practise - fellatio, cunnilingus and anilingus - is associated with syphilis transmission<sup>5</sup>. An individual can acquire pharyngeal syphilis if their partner presents with a canchre, sore or rash on the genitals or anus; if an individual manifests with a canchre, sore or rash on the mouth, lips, or throat, syphilis can be transmitted to their partner's genitals or anus<sup>74</sup>.

The clinical course of *T. pallidum* acquired in the oropharynx is similar to syphilis acquired by other routes.

Oropharyngeal primary syphilis canchres are rare. They are usually presented as a well-demarcated, grey-white plaque with central ulceration and occur mainly in the oral mucosa<sup>102, 104, 105</sup>. Other symptoms include ipsilateral adenopathies<sup>75</sup>.

It is worth mentioning that oral lesions are highly infectious, with a reported transmission rate of 18% to 80% during sexual contact. Besides, one case suggested that syphilis could be passed on through kissing<sup>102</sup>.

Secondary syphilis is the stage where oral lesions are more frequent, occurring in approximately 30% of patients. These lesions are heterogeneous and nonspecific but usually appear as condyloma lata. Other forms include single or multiple macules, papules, plaques or ulcers, usually associated with pharyngitis, tonsillitis, laryngitis, or adenopathies. Oral syphilitic lesions are rarely isolated, as they generally appear with the other typical symptoms of this stage. They normally resolve within 3 to 12 weeks<sup>75, 106</sup>.

In tertiary syphilis, the gumma is unusual and may affect the palate, tongue or tonsils. The gumma can have significant consequences, as its necrotic core can be expansive and perforate the nasal cavity or the maxillary sinus<sup>75</sup>.

It is noteworthy that oral manifestations of secondary and tertiary syphilis do not directly result from the practice of oral sex<sup>75</sup>.

Diagnosing syphilis can be challenging if a person has an isolated lesion on the oral mucosa. Hence, physicians should examine the oral cavity in MSM with oropharyngeal symptoms to exclude the infection<sup>104</sup>. Nonetheless, pharyngeal syphilis should be diagnosed with serologic tests (treponemal or nontreponemal tests). Histology of a pharyngeal lesion can support the diagnosis<sup>106</sup>.

Treatment also consists of intramuscular benzathine penicillin G for pharyngeal syphilis<sup>2</sup>.

## **Mycoplasma**

Oropharyngeal prevalence of *M. genitalium* is rare, at a maximum of 1% in MSM (and no information in other populations), and is not associated with symptoms<sup>13, 68, 69, 71, 72</sup>. Due to that, routine testing from this site is not recommended<sup>13, 69</sup>.

## Other sex practises

### Masturbation and other acts that use fingers and hands

Solo masturbation is safer than any other type of sex. The risk of acquiring an STI at a site by self-masturbation is close to zero; hence the literature makes little mention of this topic.

However, mutual masturbation appears to have a risk, albeit low, of transmitting some STIs, particularly HSV, HPV, and syphilis, through skin-to-skin contact<sup>107, 108</sup>. No study specifies the risk of transmission of CT, NG or MGen in mutual masturbation, although, according to one study, the risk appears to be relatively none<sup>107</sup>.

Even though mutual masturbation seems to have low risk of STI transmission, people often use saliva as a lubricant during masturbation<sup>107, 109</sup>. As stated, gonorrhoea might be transmitted through saliva, but not chlamydia. Therefore, saliva use during masturbation may play a moderate role in transmitting gonorrhoea<sup>107, 109</sup>.

Practices involving digital-vaginal or digital-anal contact (also known as fingering), practised mainly by WSW, present a possible means of transmitting STIs through contact with infected cervicovaginal or anal secretions<sup>2, 110</sup>. However, no information exists on which microorganisms are most likely to be transmitted by these sex practices. Some studies report cases of people with primary canchres in a finger that was in contact with a vagina or anus a few weeks earlier<sup>111, 112</sup>

Wearing gloves during fingering may help reduce the risk<sup>2</sup>.

Fisting, which is a sexual activity that involves inserting a hand into the vagina or rectum, can help transmit STIs. This association is well documented for HCV; bleeding caused by trauma facilitates transmission of this virus<sup>113, 114</sup>. Still, further studies are needed to substantiate this association with bacterial STIs<sup>2</sup>.

## Sex toys

This chapter focuses exclusively on penetrative sex toys, such as dildos, vibrators and anal plugs.

The use of sex toys is relatively frequent, especially among women<sup>110, 113, 115, 116</sup>. Although the risk of acquiring an STI from self-usage of sex toys is nil, infected people who share them can transmit an infection<sup>117</sup>.

Information regarding the risk of bacterial transmission through sex toys is sparse<sup>118</sup>. One study concluded that the prevalence of chlamydia, gonorrhoea and syphilis in MSM was higher among those who regularly used sex toys<sup>119</sup>.

In MSM who engage exclusively in digital-anal sex or sex toys, cases of chlamydia were reported, although rare<sup>118</sup>. This finding may indicate that sex toys are associated with chlamydia transmission, albeit on a small scale. However, one study reports that these objects may play a particularly significant role in transmitting LGV serotypes<sup>120</sup>.

The transmission of syphilis seems reasonably associated with the use of anal sex toys<sup>121</sup>. However, another study concluded that sex frequency is considerably more relevant than the use (or non-use) of sex toys to transmit this bacteria<sup>122</sup>.

No data was found for gonorrhoea or MGen.

External condom use in sex toys was infrequent across studies; only 34.4% of people claimed ever using barriers<sup>2, 123</sup>.

Although the risk of transmission of STIs through sex toys seems limited, cases derived from this practice are irrevocable, and data is insufficient, so it is paramount that a physician educates people on the correct and hygienic use of toys<sup>115, 116</sup>.

Thus, the clinician should raise awareness of some hygiene practices, such as inserting an external condom in the toy when mutually using, washing the toy with soap and water after each use, and washing hands after touching the toys<sup>117</sup>.

## Chemsex

Chemsex is the use of drugs before or during planned sexual events to facilitate, enhance, prolong, or sustain the experience. Drugs associated with chemsex are methamphetamine, Gamma-Hydroxybutyric Acid/Gamma-Butyrolactone (GHB/GBL), mephedrone, cocaine, and ketamine<sup>124</sup>. Slamsex, or Slamming, refers to the use of injectable drugs<sup>125</sup>.

Although such substances are used with sex by both MSM and MSW, chemsex is considerably more common among MSM than other men<sup>124, 126, 127</sup>.

According to several studies, of MSM attending Sexual Health clinics, between 3 and 44% have experienced chemsex<sup>126, 128-130</sup>

In Portugal, the number of MSM attending sexual health clinics who practise chemsex has increased from 9.2% to 20.2% since the beginning of the pandemic by COVID-19. These data suggest that the frequency of chemsex, at least in Portugal, is increasing<sup>131</sup>.

Also, MSM engaging in chemsex are more likely to be clustered in the 30–44 age group<sup>128</sup>.

Some studies reveal that drugs influence decision-making during sex, which may impact a participant's choice to engage in high-risk sexual practices such as condomless anal sex, fisting, and having sex with multiple partners<sup>124, 127</sup>. For example, condomless anal sex is approximately 7.1 times more frequent among participants who practice chemsex<sup>131, 132</sup>.

Thus, these men are at risk not only of accidental overdose, but also of acquiring various STIs, such as chlamydia, gonorrhoea, and syphilis<sup>126-128</sup>.

Therefore, chemsex is a recognized public health concern. It is crucial to increase the acceptability of this sexual practice and create strategies that minimize the possible harm of chemsex<sup>126, 129</sup> - guides to reduce the damage associated with Slamming already exist<sup>133</sup>.

## Dating Apps

Data links online dating apps to the transmission of STIs.

Sexting and oral sex are the most common sex behaviours between people who meet through dating apps<sup>134</sup>. However, multiple studies indicate that, when compared to non-users, users of these apps have a higher number of sexual partners and sexual encounters, a higher number of risky sexual behaviours, such as condomless sex, and, consequently, a higher frequency of STI, such as syphilis, chlamydia, and gonorrhoea (which, according to one study, can reach up to 8.6% of users)<sup>134-137</sup>. Moreover, these aspects are more common in MSM users than in heterosexual users<sup>134</sup>.

Also, only 25.0% of MSM and 37% of heterosexual people confirm always using condoms with a partner found in a dating app<sup>135, 137</sup>. In one study, 46.4% of app users report having at least one sexual relationship without a condom in the previous three months<sup>134</sup>. In addition, up to a third of users reported being under the influence of alcohol or drugs during their last sexual encounter, thus reducing their decision-making ability to use condoms<sup>134</sup>.

Furthermore, dating app users do not generally discuss the STI status with a sexual partner, with about 40% never broaching the subject and approximately 37% only mentioning it sometimes<sup>135</sup>.

Thus, given the popularity of dating apps, and the associated sexual risks, interventions that promote safe sexual practices among users of these apps are urgently needed<sup>138</sup>. Of the 137 apps one study identified, only 15 (11%) had sexual health content<sup>138</sup>.

Hence, in the future, health providers should seek contact with these apps to promote attitudes that make sexual behaviours safer<sup>134</sup>.

## Transactional sex

Transactional sex (TS) corresponds to the casual exchange of sexual favours for money or gifts. This definition goes beyond prostitution, as it can be practised by couples or others (socially known as “sugar daddies/babies”). Most studies focus on African countries, as TS contributes considerably to the high numbers of STIs in these countries. However, this sexual behaviour is also frequent in high-income countries<sup>139-143</sup>.

Transactional sex is associated with higher rates of STIs. Like dating applications, this sexual practice is related to risky sexual behaviours, namely minimal condom use and large numbers of sexual partners<sup>144-147</sup>. In a study of MSM who practise TS, 14% claimed to have an STI diagnosis<sup>147</sup>. Chlamydia seems particularly associated with transactional sex<sup>144</sup>.

Of note, STI diagnoses related to transactional sex appear significantly more common in sellers than in buyers<sup>147, 148</sup>.

Risk reduction counselling should be given to all individuals selling or buying sex<sup>148</sup>.

## **Other infections: Outbreaks of Shigella in MSM**

Several outbreaks of sexually transmitted shigella have been reported among MSM<sup>149, 150</sup>. Some outbreaks include multidrug-resistant Shigella strains, such as *S. flexneri*.

In one study, shigella prevalence was 2.8% in asymptomatic men, 3.7% in men who recently had diarrhoea and 4.4% in men with current diarrhoea. Data suggest that about 20-30% of current shigellosis cases occur in MSM. Approximately 42% of MSM with shigellosis are HIV-positive<sup>149, 150</sup>.

Shigellosis is associated with both condomless oral and anal sex. MSM with shigella also report chemsex, multiple sex partners, and encounters arranged through mobile dating applications<sup>149, 150</sup>.

A physician should suspect shigella if an individual with risk behaviours complains of diarrhoea. Infections with shigella can be asymptomatic, though<sup>150</sup>.

*S. flexneri* and *S. sonnei* are associated with resistance to azithromycin and ciprofloxacin. Due to that, antimicrobials should only be used in severe diarrhoea or sepsis<sup>149</sup>.

To conclude, shigella is more prevalent in MSM than in the general population<sup>149</sup>. Hence, future studies should focus on the risk of Shigella transmission of asymptomatic MSM, possibly leading to symptomatic infections in their partners<sup>150</sup>.

## Discussion

Concerning anal sex, two fundamental aspects to consider are the fact that rectal STIs increase the risk of acquiring HIV and that, currently, it is unclear whether rectal chlamydia and gonorrhoea can implant in the vagina via autoinoculation.

For these reasons, it is crucial to comprehend better the association between anal sex and STI (other than HIV) transmission.

Although some studies were gathered endeavouring to compare the risk of STI transmission between vaginal and anal sex, the fact is that there is no substantial evidence. As such, and because HIV has a higher risk of transmission via anal sex, it would be essential to make more investigations to truthfully understand the risk of transmission of *C. trachomatis*, *N. gonorrhoeae*, *T. pallidum* and *M. genitalium* through anal sex. It is also crucial to understand if anorectal STIs are clinically relevant and whether they significantly impact an individual's health.

Hence, extragenital samples should supplement the genital screening, especially in high-risk groups, such as MSM and young women with multiple sex partners or reported exposure.

Concerning oral sex, although it may be less likely to transmit an STI than vaginal sex, it is not without risk. As most infections in the oropharynx are asymptomatic and, therefore, undetected, this site becomes an ideal reservoir for increasing STI incidence. Thus, a pharyngeal STI can infect a partner's genital area and lead to all the associated symptoms, including infertility.

However, because pharyngeal STIs themselves appear to have low relevance to an individual's well-being, further studies are required to conclude whether screening is beneficial, since diagnosing asymptomatic individuals may lead to overtreatment (and thus antibiotic resistance) and have an adverse psychological impact. For high-risk populations, though, early screening and treatment for most STIs addressed in this article seem advantageous.

Mutual masturbation, the use of sex toys, and the other sexual practices presented in this article carry a risk of STI transmission, even if to a lesser extent than vaginal sex, so clinicians should be prepared to take a more holistic approach whenever it is necessary to comprehend about an individual's sex life and sexual practices.

In summary, given current knowledge, the best attitude to manage STIs acquired by anal sex, oral sex and other sex practices, is through prevention. Thus, it is essential to educate the public on the advantages of using condoms, which reduce the risk of STI transmission in most sex acts<sup>20</sup>. There is no evidence regarding other possible strategies to promote safer anal sex, given that few studies address this theme<sup>151</sup>. Other ways to prevent STI transmission are the use of dental dams in oral sex and disposable gloves in acts that involve fingers or hands.

Furthermore, the reported Shigella outbreaks are a wake-up call to researchers because there may be other microorganisms, not customarily perceived as STIs, that are currently transmitted, to a greater or lesser extent, via sex.

We created a table that gathers all the information described in the article so readers can easily find the desired information (Table I).

In summary, with this work, it was possible to conclude that several sexual practices besides vaginal sex are associated with the transmission of bacterial STIs. Thus, further studies are required to answer the various uncertainties encompassed in this topic.

## Appendix

**Table I:** STIs and their risk of transmission in different sexual practices

|                                            | Chlamydia                                                                                                                                          | Gonorrhoea* | Syphilis | Mycoplasma | Other infos                                                                                                                     |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------|------------|---------------------------------------------------------------------------------------------------------------------------------|
| Anal Sex                                   | RHE                                                                                                                                                | RHE         | RHE      | RHE        | Not enough evidence to compare anal vs vaginal sex risk of transmission                                                         |
| Oral Sex - Fellatio                        | RHE                                                                                                                                                | RHE         | RHE      | ANR        | Oral sex has less risk of transmission than vaginal sex in general                                                              |
| Oral Sex - Cunnilingus                     | RLE                                                                                                                                                | RLE         | RHE      | ANR        |                                                                                                                                 |
| Oral Sex - Anilingus                       | RLE                                                                                                                                                | RHE         | RHE      | ANR        |                                                                                                                                 |
| Mutual Masturbation                        | ANR                                                                                                                                                | ANR         | RHE **   | ANR        | Lack of evidence in general                                                                                                     |
| Fingering                                  | NI                                                                                                                                                 | NI          | RHE **   | NI         | Fingering is associated with STI transmission, however, there is lack of evidence for specific STIs                             |
| Fisting                                    | NI                                                                                                                                                 | NI          | NI       | NI         | Fisting is associated with HCV transmission (due to trauma and bleeding); however, there is lack of evidence for bacterial STIs |
| Sex Toys sharing                           | LRLE ***                                                                                                                                           | LRLE        | RLE      | NI         | Sex toys are associated with STI transmission, however, there is lack of evidence for specific STIs                             |
| Chemsex, Dating apps and Transactional sex | All three are related to risky sexual behaviours (such as condomless sex and multiple sex partners), which increases the risk of acquiring any STI |             |          |            |                                                                                                                                 |

Note: RHE: Risk and High Evidence; RLE: Risk but Low Evidence; LRLE: Low Risk and Low Evidence; ANR: Almost Nil Risk; NI: No Information.

\* Using saliva as a lubricant increases the risk for every practice, including those with ANR/NI.

\*\* Clear risk due to skin-to-skin contact.

\*\*\* Sharing sex toys seems particularly related to LGV transmission.

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