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Afr. J. Biomed. Res. Vol.19 (January, 2016); 1- 5

Opinion / Mini-Review

Candidaemia or Candidiasis: Controversy of *Staphylococcus* Sexually Transmitted Infection?

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ABSTRACT

Herbal medications are becoming increasingly popular but a most-extraordinary claim by traditional/herbal medical practitioners relates to a Gram-positive bacterium, *Staphylococcus*, which has been depicted as a *deadly sexually transmitted disease* that manifest in the form of worms and other symptoms; with contributory roles including infertility, sexual dysfunction and impotency. They further boasted that they are the only ones that possessed the remedy (herbal) for the *Staphylococcus* sexually transmitted *scourge*. In the absence of distinguishing phenotypic taxonomic tools, *Staphylococcus* and *Candida* spp. may be confused for each other. However, *Staphylococcus* is a bacterium and not an infection; therefore, there must be more to the traditional medical practitioners' boasts in ability to cure *an infection that was not an infection in the first place*. In conclusion, the common sense is that candidaemia or candidiasis is most likely the misdiagnosed sexually transmitted *Staphylococcus disease*, which is of significant human clinical health issue.

Keywords: *Candidiasis, candidaemia, clinical infectious diseases, sexually transmissible infections, Staphylococcus*

INTRODUCTION

Herbal medications are becoming increasingly popular globally, most especially in several countries of sub-Saharan Africa (David, 1997; Orisatoki and Oguntibeju, 2010). Along with the increasing popularity of herbal medications, Nigerian government promulgated a *Medical and Dental Practitioners (Amendment) Decree No. 78*, on 30 September 1992, which placed natural medicine (traditional and alternative medicine) side by side with orthodox medicine. But since then, Nigeria traditional/herbal medical practitioners became outspoken advocates of traditional and alternative medicine, with unparalleled increase in the volumes and

types of advertisements, to showcase their *infallible* medical importance of herbal therapies (Ogunshe, 2007). The most-extraordinary claim by the traditional/herbal medical practitioners relates to the Gram-positive bacterium known as *Staphylococcus*, which has been a long-standing national phenomenon among the Nigerian herbal practitioners, as a *Staphylococcus disease*. Series of inflammatory and confusing advertisements present *Staphylococcus* as, among other scourges, the deadliest sexually transmitted disease (Ogunshe, 2007).

The misconception of *Staphylococcus infection* somehow seems to be expressed beyond the shores of Nigeria. As an example, Moore (2013) claimed that methicillin-resistant Staph are serious and potentially

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Received: August, 2014

Accepted: December, 2015

Abstracted by:

Bioline International, African Journals online (AJOL), Index Copernicus, African Index Medicus (WHO), Excerpta medica (EMBASE), CAB Abstracts, SCOPUS, Global Health Abstracts, Asian Science Index, Index Veterinarius

life-threatening infections that antibiotics and conventional medicine often fail against but that fortunately, there are powerful natural and alternative remedies for handling these infections. Similarly, one of the most-confusing reports on the supposed *Staphylococcus infection* is that of Chinedi (2009), which documented that *Staphylococcus infection* was among bacterial sexually transmitted diseases (STD), that manifest in the body of infected person in form of worms and other symptoms. He also [wrongly] documented that mistreated infections of gonorrhea causes staphylococcus- aureus, the venereal or sexually transmitted disease that destroys organs in the body until death if not completely cured. Furthermore, according to Chinedi (2009), the worms that result from the sexually transmitted microorganisms in women cause painful, irregular menstruation and destroy pregnancy.

Staphylococcus is however, neither a disease nor a sexually transmitted disease for that matter but a number of people are unfortunately still confused and bothered by this continuously exhibited *Staphylococcus* sexually transmitted disease phenomenon. So, what then is the common sense that can resolve the controversy or nonsense of the *Staphylococcus sexually transmitted disease*? Colonial morphological appearances of Gram-positive bacteria known as *Staphylococcus aureus*, other *Staphylococcus* species and some strains of *Enterococcus*, *Micrococcus* and *Streptococcus* species on some differential or selective culture media are circular, low-convex, opaque, profuse, smooth and glistening, entire edged colonies. Meanwhile, *Candida* species also grow with similar colonial morphological appearances on some culture media like Sabouraud dextrose agar, etc. Even under the microscope, after Gram staining procedures, *Enterococcus*, *Micrococcus*, *Staphylococcus*, *Streptococcus* and *Candida* spp. are all Gram-positive cocci. Therefore, in the absence of further distinguishing phenotypic taxonomic tools like certain biochemical and physiological tests for proper identification, the five microbial species, especially, *Micrococcus*, *Staphylococcus* and *Candida* may be confused for each other by inexperienced microbiologists.

Micrococcus spp. are usually denoted as non-pathogenic saprophytic contaminants that inhabit or contaminate the skin, mucosa and perhaps the oropharynx; although, they can be opportunistic pathogens in immunocompromised persons (Kocur, *et al.*, 2006; Bannerman and Peacock, 2007). Transmission is possible through contact with contaminated objects and/or surfaces (demonstrated by bacterial transfer associated with paper-towel dispensing) (Harrison *et al.*, 2003), although transmission via inhalation of

contaminated droplets and/or aerosols may also be possible. *Micrococcus* spp. have been associated with various infections, including bacteremia, continuous ambulatory peritoneal dialysis peritonitis, infections associated with ventricular shunts and central venous catheters (Bannerman and Peacock, 2007), and have also been isolated from blood and surgical specimens in some patients with coronary and infectious conditions (Kocur *et al.*, 2006). *Micrococcus luteus* has similarly been reported as a causative agent in cases of intracranial abscesses, pneumonia, septic arthritis, endocarditis and meningitis (Bannerman and Peacock, 2007) but *Micrococcus* spp. have not been implicated in sexually transmissible infections.

Enterococcus spp. are typical commensals that inhabit the intestines of humans and animals, while some species inhabit the urinary tract, in addition to being isolated from environmental and animal sources. Many of the infecting strains originate from the patient's intestinal flora but can spread to other anatomical areas, and are even capable of surviving in high concentrations of bile and sodium chloride. *Enterococcus* spp. are implicated in important life-threatening nosocomial infections, as well as urinary tract infections, catheter-related infections, bacteremia, sub-acute endocarditis, foodborne diseases, meningitis, surgical and wound infections, intra-abdominal and pelvic infections, although abscesses are generally polymicrobial in nature. Pleural space infections, septic arthritis, skin and soft-tissue infections, iatrogenic infections and pelvic inflammatory disease have also been reported, while occasionally, prostatitis and perinephric or liver abscesses may develop. However, sexually transmissible or any related sexually-implicated diseases have not been documented (Tendolkar *et al.*, 2003; Fisher and Phillips, 2009; Sava *et al.*, 2010; Vu and Carvalho, 2011).

Streptococci are normal commensals but acute *Streptococcus pyogenes* infections may take the form of pharyngitis, scarlet fever, necrotising fasciitis, myositis and *streptococcal toxic shock syndrome*. However, involvement of few *Streptococcus* spp. such as *S. mutans* and *S. sanguis* in reproductive infections in sexual partners and low risk of neonatal disease were reported (Patterson, 1996; Willey *et al.*, 2008). Systemic infections of *Staphylococcus* species include staphylococcal pneumonia, staphylococcal bacteremia, staphylococcal endocarditis, staphylococcal meningitis; osteomyelitis, while staphylococcal scalded skin syndrome and impetigo symptoms are examples of localised infections caused by *Staphylococcus* spp (Willey *et al.*, 2008). The closest diagnosis and microbial significance of *Staphylococcus* to human

reproductive infection is either as a pathogen in urinary tract infection (UTI) in males and females or in toxic shock syndrome (TSS) in some females using tampons as sanitary towels (Willey *et al.*, 2008; <http://www.nlm.nih.gov/medlineplus/streptococcalinfections.html>).

Furthermore, many of the further consistent, though outrageous and unscientific claims implicating *Staphylococcus* as a sexually transmitted disease include its supposed contributory roles in infertility, sexual dysfunction and even impotency. 'Staph' has also been implicated as being responsible for a wide variety of systemic symptoms, such as worm-like movements around the body, as well as hotness of the head and body (Ogunshe, 2007; Moore, 2013). But the common, scientifically-reported symptoms of various infections caused by *Staphylococcus* range from localised to systemic infections, depending on the type of toxin(s) or other virulence factor(s) produced. Although a rise in temperature at an affected site may be observed in certain types of impetigo and in case of serious complications, while high fever may be the first reported symptom of *Staphylococcus*-implicated impetigo in humans.

Cook *et al.* (2007a) regarded the possible heterosexual transmission of community-associated methicillin-resistant *Staphylococcus aureus* (MRSA), due to observed shared genital-area MRSA infections in 3 couples, clinically and by concordance of MRSA strains found between partners. Similarly, in the study of Keleekai (2011), which investigated the cross-sectional, correlational secondary analysis to describe patterns of *S. aureus* co-infection with HIV and STIs, it was recorded that rates of *S. aureus* carriage could be uniformly elevated across many risk groups in prisons. However, Handsfield (2007) disagreed with these assertions, based on the claim that exchange of traditional sexually transmitted pathogens requires direct genital, oral-genital or anal-genital contact. Handsfield (2007) further opined that staphylococci and other cutaneous flora are readily exchanged by intimate, non-sexual exposure like sharing beds, perhaps towels or other fomites. Also, although warmth and moisture undoubtedly enhance susceptibility of genitals and perigenital areas to staphylococcal colonisation and symptomatic infection, the affected human anatomic areas do not necessarily imply a route of staphylococci transmission (Handsfield, 2007).

Another claim by the Nigerian herbal traditional practitioners is that *Staphylococcus* is a hereditary disease, which is quite wrong. *Streptococcus agalactiae* (also known as Group B *Streptococcus*) is a beta-haemolytic *Streptococcus* species, of the normal flora of

the female urogenital tract and rectum. Its main clinical importance however, is that it can cause serious non-hereditary group B streptococcal infection in neonates and infants when new-born babies pass through the birth canal

(http://bodyandhealth.canada.com/channel_condition_info_details.asp?disease_id=26&channel_id=1020&relation_id=70907; <http://www.nlm.nih.gov/medlineplus/streptococcalinfections.html>). Considering that other purportedly presented *Staphylococcus* infection symptoms by the traditional herbal practitioners are not related to the acclaimed infections that are caused by *Streptococcus* species, the remaining implicated related microbes are still *Staphylococcus* and *Candida* species. In contrast, symptoms of *Candida* infections (candidemia or candidiasis) (Gevezier da Costa *et al.*, 2014; Turner and Butler, 2014; Valerio *et al.*, 2014; Jacobs *et al.*, 2015; Trabasso *et al.*, 2015) are much more similar to the symptoms presented by the Nigerian traditional herbal practitioners. Moreover, *Candida* can be transmitted (not hereditary) from infected mothers to new born babies as mucocutaneous candidiasis, which includes oropharyngeal (oral thrush) or diaper dermatitis (Gafer-Gvili *et al.* 2008; Richards, 2011 White, 2011).

The term candidemia (invasive candidiasis or fungaemia) describes the presence of *Candida* in blood, while candidiasis is an overgrowth of *Candida* in the body, leading to superficial and systemic infections like oropharyngeal candidiasis (thrush) and vulvovaginal candidiasis, etc. Symptoms of vulvo-vaginal *Candida* infections include leakage of white, thick, cheese-like substance, itch or burn with pain or discomfort, especially during urination or sex. Similarly, yeast infections of the penis are rare but may cause the penile tip to be red, swollen and painful (http://bodyandhealth.canada.com/channel_condition_info_details.asp?disease_id=26&channel_id=1020&relation_id=70907). Patients with candidemia may exhibit a more indolent course manifested by fever of unknown origin (Cheng *et al.*, 2005) or unexplained hypotension despite broad-spectrum antibacterial agents. Some of the most common indications of *candidemia* are presence of flu-like symptoms, head congestion, throbbing headaches, nasal stuffiness and a general sense of feeling run down, which may be mild at first but later begin to increase over time. Problems with memory or an increase in irritability may also be present, while some sufferers may sometimes experience mental disorders like anxiety or mild depression (<http://www.wisegeek.com/what-is-candidemia.htm>).

The traditional practitioners further boasted that they are the only ones that possessed the remedy (herbal) to rid the body of this *Staphylococcus scourge* (Ogunshe, 2007; Moore, 2013). Whereas, approach to infection

therapy will differ according to the host and severity of the infection, while the choice of effective medication for any infection must be guided by several clinical considerations, beyond the comprehension of the misdiagnosed case scenario of the *Staphylococcus scourge* in the first place! If it can be inferred that the misrepresented *Staphylococcus disease* is a *Candida* infection, then there must be more to the boast of the ability of the traditional herbal practitioners to cure *an infection that was not an infection in the first place*. This is because *Staphylococcus* is a bacterium and not an infection!

The incidence of fungal infections caused by *Candida* species has drastically increased significantly, and has been simultaneously accompanied by increased innate and acquired resistance to antifungal drugs (Cheng *et al.*, 2005; Lyon *et al.*, 2010; Vandeputte *et al.*, 2012; <http://www.wisegeek.com/what-is-candidemia.htm>]. *Candida* infections are not to be taken for granted, more especially, since when it comes to candidiasis and candidemia treatment, there are no over the counter medications or home remedies that are universally accepted as effective. Instead, in spite of geographic differences in the aetiologic strains of *Candida* spp. in the incidence of candidiasis and candidemia (Milazzo *et al.*, 2014), therapeutic antifungal agents like polyenes (amphotericin B, amphotericin B deoxycholate), azoles (including fluconazole itraconazole, voriconazole, posaconazole) and echinocandins (caspofungin, anidulafungin and micafungin) etc. are commonly administered (Pfaller *et al.* 2011; Vandeputte *et al.*, 2012; Valerio *et al.*, 2014; Trabasso *et al.*, 2015). Although, in most cases of invasive fungal infections, intravenous administration is the most effective method of treatment (<http://www.wisegeek.com/what-is-candidemia.htm>); while blood cultures are checked daily after initiating antifungal therapy until they become negative. Even as a measure of ophthalmologic evaluation, patients who have candidemia are made to undergo ophthalmologic examinations by an ophthalmologist, whether or not they have ocular symptoms, as recommended in the Infectious Diseases Society of America guidelines for treatment of candidiasis (Pappas *et al.*, 2009). Recovering from candidemia can take anywhere from several days to weeks, depending on the severity of the infection at the time it is diagnosed and treatment commenced (<http://www.wisegeek.com/what-is-candidemia.htm>). Thus, severity of invasive fungal infections suggests that they must be adequately diagnosed with proven clinical competence, for appropriate treatments. In as much as indigenous (herbal) therapy cannot be overlooked, underestimated

or not taken into serious health considerations; it is of highly significant public health importance that traditional medical practitioners understand the concepts of the *infections* they claim to have remedies to cure. Considering that certain limitations in antifungal treatments are even reported in orthodox medicine, patients must seek second opinion on their health status; the expertise of the traditional medical practitioners they consult for cure, as well as the effectiveness of the advertised alternative treatments for their infections, instead of ignorantly believing in for example, the nonsense of *staphylococcus sexually transmitted infection*.

In the classification of STD, it is very useful to determine if sex, *per se*, is a route of transmission, and if the incidence or prevalence is significantly affected by sexual behaviours and practices, i.e., would the epidemiology of the condition be materially different if sex is not implicated? These conditions are true for the traditional STDs and for enteric infections in men who have sex with men (MSM), hepatitis B, HIV infection, and also recently documented, Epstein-Barr virus infection (Crawford *et al.*, 2006) but not true for MRSA and other staphylococcal infections. Thus, Handsfield (2007), an STD specialist did not accept MRSA as an STD agent. However, in a follow-up paper, Cook *et al.* (2007b) claimed that the focus of their earlier article Cook *et al.* (2007a) was that heterosexual activity was a potentially important and previously unappreciated means of community-associated MRSA transmission, and not that community-associated MRSA was an STD. Thus, the discussion as to whether community-associated MRSA infection should be considered to be a sexually transmitted disease was left to the *specialists*. Whereas, in a most recent study, it was also suggested that sexual activity should be considered as a potentially important and previously underappreciated means of transmission of *Tinea interdigitale* (Luchsinger *et al.*, 2015). In conclusion, the common sense in human health issues is that there is no sexually transmitted *Staphylococcus disease* / *Staphylococcus scourge* that is of local or global significance. *Staphylococcus* is simply a bacterium. However, the symptoms presented by the traditional herbal practitioners for *Staphylococcus sexually transmitted disease* suit candidemia or candidiasis better.

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