



Consideration of Cultural Practices When Characterizing the Vaginal Microbiota Among African and African American Women

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Abstract

This manuscript considers intravaginal practices prevalent among African and African-American women, with the aim of providing a framework for how these practices may affect vaginal health and the vaginal microbiota, and consequently, impact pregnancy outcomes. Intravaginal practices are influenced by traditional socio-cultural beliefs and gender norms, with prominent practices including intravaginal insertion of substances (herbs and traditional medicines), intravaginal cleansing (douching), and anatomical modification of the female organs (labia elongation and female genital mutilation). Common motivations for such practices included hygiene, prevention of infection, enhancement of sexual pleasure, and compliance with societal or cultural norms. The use of soaps and other chemicals for vaginal douching has been reported to reduce diversity of the vaginal microbiota and lower pH, thus increasing the chances of bacterial vaginosis, but the evidence is minimal. The practice of vaginal insertion of natural or other substances is associated with physical abrasions, disruption of the vaginal flora, bacterial vaginosis, and HIV and other infections, but effects on pregnancy outcomes and the vaginal microbiota are unclear. Finally, female genital mutation has been reported to have immediate and prolonged physiological and psychological effects, including frequent infections and chronic inflammation, but similar to most other practices, consequences for preterm birth remain understudied and for the vaginal microbiota, unknown. Overall, findings identify the need for additional research, focusing on how these common practices influence both birth outcomes and the vaginal microbiota, so that nurses, midwives, physicians, and other providers worldwide are better equipped to assess and care for pregnant women.

Keywords

intravaginal practice, vaginal health, culture, preterm birth, vaginal microbiota, microbiome

The Vaginal Microbiota

The vaginal microbiota provides a physiological barrier against the proliferation and ascension of pathogenic organisms. This occurs through multiple mechanisms including the production of lactic acid and bacteriocins, principally by organisms of the acid-producing *Lactobacillus* species (Amabebe & Anumba, 2018; Breshears et al., 2015; Kaewsrichan et al., 2006; Witkin et al., 2007), and competitive exclusion (Ojala et al., 2014; Voravuthikunchai et al., 2006). Recent studies, using 16S rRNA sequencing technology, have identified ethnic/racial differences in the composition of the vaginal microbiota, with women of European ancestry significantly more likely to demonstrate a vaginal microbiota dominated by *Lactobacillus* species, especially the more protective *L. crispatus*, than women of African ancestry, including African-American women (Fettweis et al., 2014; Hyman et al., 2014; MacIntyre

et al., 2015; Ravel et al., 2011; Zhou et al., 2007). Women of African ancestry are, instead, more likely to have a bacterial community characterized by higher diversity and higher pH, with either a reduction in *Lactobacillus* species overall, or a predominance of the less protective *L. iners*. *L. iners* produces less acid than other *Lactobacillus* spp. (Callahan et al., 2017; Fettweis et al., 2014; Ravel et al., 2011) and is associated with less stable, more transitional communities (Wertz et al., 2008).

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A vaginal microbiota less dominated by *L. crispatus* is also more hospitable to the proliferation of anaerobic bacteria associated with bacterial vaginosis (BV), and to colonization by infectious organisms including *Neisseria gonorrhoeae*, *Treponema pallidum*, and human immunodeficiency virus (HIV; Bryant et al., 2010; Culhane & Goldenberg, 2011; Dareng et al., 2016; Fettweis et al., 2014; Spong et al., 2011). Intravaginal infection, in turn, increases the inflammatory milieu of the reproductive track and the risk of ascending uterine infection, a leading cause of preterm birth (PTB; Combs et al., 2014; Gomez-Lopez et al., 2019; Murphy & Mitchell, 2016; Romero et al., 2014).

To date, only minimally considered in regard to the composition of the vaginal microbiota or the risk of PTB are various common, potentially impactful, and culturally-influenced intravaginal practices (IVPs) carried out by or on women around the world (Martin Hilber et al., 2010). Intravaginal practices are influenced by traditional socio-cultural beliefs, gender norms, personal hygiene, and sexuality (Francis et al., 2013). Such practices often involve intravaginal cleansing, including washing the inside of the vagina with fingers, water, soap and/or other substances; intravaginal insertion of substances including herbs, leaves, or other traditional medicines; and anatomical modification of the female organs including labia elongation and female genital mutilation (World Health Organization [WHO], 2012). Of these practices, labia elongation and female genital mutilation (FGM) are associated with the acquisition of BV, and FGM is also a known risk factor for HIV (Gayle & Rymer, 2016; Iavazzo et al., 2013; Smolak, 2014). Moreover, each of these practices carries the potential to disrupt vaginal microbial homeostasis. For example, douching with water, soap, or herbs may alter vaginal pH, thereby favoring colonization by opportunistic organisms. The insertion of abrasive leaves or stones, labial elongation, or FGM, may all irritate, or in the case of FGM destroy, intra- or extra-vaginal tissue, initiating an inflammatory response. Given the known association between the vaginal microbiota and reproductive health (Kroon et al., 2018), and between inflammation and preterm birth (Romero et al., 2014), a better understanding of the impact of culturally related, intra-vaginal practices on maternal health, vaginal microbiota, and birth outcomes is essential.

Purpose

The purpose of this manuscript is to review common cultural and traditional customs among women of two historically and culturally unique sub-Saharan countries, Liberia, West Africa, and Rwanda, East Africa, and those among African-American women in the United States. The African-American population is ancestrally-related to West Africans as a result of the slave trade perpetuated for centuries off the western coast of Africa, but minimally if at all, ancestrally-related to East African populations (Bryc et al., 2015; Eltis & Richardson, 2010; Zakharia et al., 2009). The cultural practices of these groups will be considered in light of their known or potential influence on the

vaginal microbiota and the risk of PTB. We conclude with considerations for nursing practice and future nursing research aimed at gaining a better understanding of the cultural and ancestral factors influencing the composition of the vaginal microbiota, in order to improve women's health and birth outcomes worldwide.

Cross-Cultural Intravaginal Practices and Health Implications

Herbs, Leaves, and Roots

In sub-Saharan Africa, intravaginal practices vary from country to country based on the social and cultural norms of the ethnic groups (Francis et al., 2013; Hull et al., 2011; Martin Hilber et al., 2012; Smit et al., 2011), but often include intravaginal insertion of herbs, leaves, or roots to dry, warm, and tighten the vagina prior to sexual intercourse, with the goal of enhancing sexual pleasure for the male partner, thereby ensuring fidelity (Hull et al., 2011, Levin, 2005). In many African cultures, the use of natural products to promote “dry sex” is a social norm that women are expected to fulfill (Levin, 2005), while vaginal wetness is associated with possible infection, moral “dirtiness” and unfaithfulness or promiscuity (Francis et al., 2013; Lees et al., 2014). Typically, these traditional practices are considered part of transitioning to womanhood (Lees et al., 2014) and are often taught by older females (aunts, mothers or grandmothers) to younger females (Lees et al., 2014). Others, for example, in Zambia, are taught by “Alengizis”, the traditional marriage counselors for girls (Alcaide et al., 2014).

A multi-country study in Asia and Africa, reported that intravaginal insertion of a variety of substances was very common in African countries, with 89.4% of women in Mozambique and 79% of women in South Africa reporting the insertion of traditional herbs, cotton wool, cloth, paper, talc, and/or alum (aluminum-potassium-sulfate used to purify water; Hull et al., 2011). Adverse effects of vaginal practices specifically identified in the report included, genital irritation or pain, bleeding or sores, genital itching, and dyspareunia, suggesting that the intravaginal insertion of such substances may cause physical abrasions and disruptions of the vaginal flora (Dubey et al., 2017), and linking them potentially to BV (Mbizvo et al., 2004; Myer et al., 2005) and HIV (Low et al., 2011). In regard to the vaginal microbiota, findings from a more recent study conducted in Ghana (McCarthy et al., 2015) reported a strong negative correlation between vaginal lactobacilli colonization and the use of intravaginal herbs ($r = -0.954$, $p < 0.05$) and commercial products ($r = -0.700$, $p < 0.05$). Notably, the authors detected no *Lactobacillus* spp. in 78.7% of the sample ($n = 141$) suggesting that these practices may alter the vaginal microbiota in a way that contributes to a less protective state. Douching, reported by over 80% of those surveyed, was the least negatively correlated with *Lactobacillus* colonization.

In addition to herbal preparations, Tanzanian women reported inserting snuff (pulverized tobacco), salt, and alum (Lees et al., 2014), while Ugandan women reported inserting

Oma (laundry detergent), Coca-Cola, and salt directly or mixed with clarified butter (ghee), into the vagina with a finger. This range of products used for vaginal insertion is consistent with research conducted in South Africa (Humphries et al., 2019) and Zimbabwe (Turner et al., 2010). In Zimbabwe, the median time that products were left in the vagina was 75 minutes (Turner et al., 2010), while in Kwa-Zulu-Natal, South Africa products were inserted for several hours before intercourse (Humphries et al., 2019). Importantly, the desire to restore or return the vagina to its “natural” or “optimal” state of “being a virgin” was identified as a strong motivator for the insertion of products intravaginally (Gafos et al., 2010; Humphries et al., 2019; Lees et al., 2014). In other instances, local botanical species, were used to elongate the labia minora (Koster & Price, 2008) in a practice purported to increase sexual wetness or dryness for the sexual pleasure of both partners.

Indications for the insertion of herbs during pregnancy vary, with one example being in Rwanda, where there exists a cultural belief that a mythic disease, known as *Ifumbi* systematically affects pregnant women (Umulisa Rwagitare, 2011). While there is no equivalent translation for *Ifumbi* in the English language, it is identified by the presence of vague symptoms, including stomachache, difficulties in defecating and urination, and other non-specific symptoms. It is also frequently cited as being responsible for wounds and sores on the nipples (Musafili et al., 2017; Umulisa Rwagitare, 2011). A variety of traditional medicines are used in East Africa to treat the symptoms and causes of *Ifumbi*, with most based on herbs, and the route of administration varying depending on the community (Beste et al., 2015). Typically, one of three routes of administration are used to treat *Ifumbi*, including oral administration, topical application, and intravaginal application. The vaginal route is used when vaginal pain is among the symptoms, and most commonly involves insertion of the chosen herb directly into the vagina (Umulisa Rwagitare, 2011). Less commonly, the woman is encouraged to bathe in water containing the herb. Users typically report positive benefits from the treatment, however, to date no controlled study has been conducted to identify a potential pharmacologically active mechanism by which the traditional treatment alleviates or prevents *Ifumbi* (Umulisa Rwagitare, 2011).

With the exception of the Ghana study described above by McCarthy and colleagues (2015), there is no other published information about whether, or how, the traditional treatments for *Ifumbi* or intravaginal insertion of traditional herbs, medicines, or other products, influence the normal vaginal flora of pregnant or non-pregnant women. Additionally, among the reported studies, there is no clarity about whether such practices provide protection against, or increase the risk of, PTB or other adverse birth outcomes. As the introduction of herb-based treatments in the vagina may alter the natural vaginal pH and/or irritate the lining of the vagina, the risk of bacterial vaginosis or other infection is possible, as is the initiation of an inflammatory chain reaction leading to PTB. To date, however, the effects of most of these intravaginal practices on PTB have not been reported, nor has modern sequencing technology been

employed to evaluate changes in the composition of the vaginal microbiota in response to traditional herbal treatments, including treatments for *Ifumbi*.

Intravaginal Cleansing

Intravaginal cleansing, or douching, with the fingers or water, with or without soap, or with a dry cloth, is a common practice during bathing and before and after sex to promote hygiene and remove menstrual blood and vaginal discharge in Sub-Saharan Africa (Hull et al., 2011; Lees et al., 2014) as well as in the U.S. (Diclemente et al., 2012). For many women, vaginal cleanliness is associated with a sense of well-being and protection from sexually transmitted infections. In Ghana (Ziba et al., 2019), women reported douching with lemon juice, antiseptics, and vinegar for the purposes of cleanliness.

In the U.S., vaginal douching, most often with a mixture of vinegar and water, is the most common intravaginal cleansing method practiced among reproductive-aged women, especially African-American women (Chandra et al., 2005, Cottrell, 2010; Crann et al., 2018). In a comprehensive 2010 review of the practice of douching among over 7,600 women in the U.S. (Cottrell, 2010), 32% of the total women participating in the 2002 U.S. National Survey on Family Growth reported douching in the last month, with the percentage among African-American women being 59%. In the Cottrell study, the prevalence of douching was inversely related to educational attainment. In a later study by the same team, more than 52% of college graduate Black women, as opposed to 12% of college graduate White women (Chandra et al., 2005), reported douching. Further, in a study on university women in southeastern U.S., 48% of Black women and 27% of White women reported douching regularly (Cottrell & Close, 2008). Survey and qualitative research from the U.S. support that African-American women’s frequent douching is related to advice from their mothers or other female family members (Brown et al., 2016; Funkhouser, Pulley, et al., 2002) and the belief that douching is part of feminine hygiene and a personal strategy for protecting oneself from sexually transmitted infections (Funkhouser, Hayes, & Vermund, 2002).

In a more recent, large-scale study of 1435 Canadian women (Crann et al., 2018) on the use of vaginal hygiene products, over 95% of the respondents reported engaging in some form of vaginal/genital health or hygiene practice, including “waxing and shaving pubic hair” and/or the use of naturopathic products and more traditional store bought products, such as “vaginal/genital moisturizers, anti-itch creams, feminine wipes, washes, suppositories, sprays, and powders”. While most women reported having had at least one adverse vaginal symptom over their lifetime, women who used products had a nearly 3 times greater likelihood of an adverse vaginal symptom. However, the direct correlation between the use of these products and vaginal symptoms was not determined. Recently, a report by Alcaide and colleagues (2017) found that douching is associated with increased levels of pro-inflammatory cytokines in the female reproductive track of women with BV, increasing the

risk of PTB, and that douching and BV increase the risk of HIV infection. With regard to the known effects of vaginal douching on the vaginal microbiota, the evidence is limited, although a recent, small-scale study of 25 healthy White women in the Netherlands reported that simply using an intra-vaginal douche significantly decreased vaginal diversity (van der Veer et al., 2019). Further, the use of soap, detergents, and commercial products intravaginally has been suggested to cause chemical damage to the vaginal flora and lower the pH, increasing the chances of BV (Hilber et al., 2010). Lastly, a study by Fashemi and colleagues (2013) using agar culture methods, reported that the use of the feminine moisturizer Vagisil suppressed *Lactobacillus* growth at two hours and subsequently destroyed all vaginal bacteria detected on the culture by 24-hours. In this study, no effect of douching on the microbiota was identified, however, both the feminine moisturizer and the douche were associated with increased production of the pro-inflammatory cytokine interleukin-8 (Fashemi et al., 2013).

Anatomical Modification of the Female Genitalia

Female genital mutilation (FGM), also known as genital cutting or female circumcision, is defined as the intentional partial or complete removal of external female genitalia for non-medical reasons (UNICEF, 2016). The World Health Organization [WHO] (2008) classifies FGM into four types according to the extent of injury: Type I involves removal of the prepuce or hood of the clitoris; Type II involves excision of the clitoris in addition to partial or total excision of the labia minor; Type III involves removal of part or all of the external genitalia and stitching/narrowing of the vaginal opening (infibulation); and Type IV involves pricking, piercing, or incision of the clitoris and/or labia, and stretching of the clitoris and/or labia (WHO, 2008). FGM is most commonly practiced in West Africa, the Middle East, and parts of Asia (UNICEF, 2016) with an estimated 200 million women and girls having undergone some form of FGM or cutting (UNICEF). In contrast, FGM is minimally or not at all practiced in East Africa (UNICEF). Cultural beliefs about the benefits of FGM in countries around the world where it is practiced include, but are not limited to, social acceptance, increased pleasure for male partners, preservation of fertility, and ensuring virginity (Klein et al., 2018; Odukogbe et al., 2017). In some cultures, girls who are uncut may be considered unfeminine, unclean, or sexually promiscuous, and therefore not suitable for marriage (Gebremicheal et al., 2018; Olijra et al., 2016; Tarr-Attia et al., 2019). In Liberia, West Africa, as many as 70% of women in the North-Central and North-Western regions may have undergone FGM during their childhood (Liberia Institute of Statistics, 2013). In Liberia, FGM is considered as a rite of passage into womanhood, marking a young woman's acceptance into the Sande Bush Society, an ancient secret female society purportedly recognized in the country since the seventeenth century (Richards, 1975).

Complications of FGM are dependent on the degree of mutilation, the skills of the circumciser, the age of the victim, operating conditions, instruments used, hygiene, and the quality of traditional bleeding-reducing techniques (Doucet et al., 2017; Odukogbe et al., 2017). FGM, especially as the degree of mutilation advances from Type 1 to Type IV, leads to immediate and late adverse physical, psychological, psychosocial, and reproductive consequences (Anikwe et al., 2019; Gebremicheal et al., 2018; Reisel & Creighton, 2015; Utz-Billing & Kentenich, 2008). The potential immediate physical complications include bleeding that may result in hemorrhagic shock, damage to adjacent tissues, and infections ranging from local infections to septicemia, and the acquisition of HIV (Berg et al., 2014; Kaplan et al., 2011). The scar resulting from the healing process of the mutilation contributes to late-complications, including dyspareunia (Esho et al., 2017; Yassin et al., 2018), recurrent vaginal infections (Iavazzo et al., 2013), vesicovaginal fistulas (Matanda et al., 2019; Sharfi et al., 2013), recurrent urinary tract infections (Amin et al., 2013; Geynisman-Tan et al., 2019), and higher prevalence of bacterial vaginosis and herpes simplex virus (Morison et al., 2001), all of which perpetuate an inflammatory milieu. One large-scale prospective study found that women with genital mutilation were more than twice as likely to deliver preterm ($OR\ 2.6, 95\%CI = 0.9-3.7$) than women without genital mutilation (Chibber et al., 2011). No reports of the effects of FGM on the composition or diversity of the vaginal microbiota are available.

Although in many East African countries, including Rwanda and Uganda, surgical mutilation similar to what is practiced in West Africa is not generally observed, elongation of the labia minora through non-surgical means, called *Gukuna* is common (Koster & Price, 2008; Pérez et al., 2013). Despite its technical distinction, *Gukuna* is classified by the World Health Organization (WHO, 2008) as type IV FGM, which carries a negative connotation even if it is not a mutilation per se (Koster & Price, 2008). The aim of labial elongation is to provide enhanced sexual pleasure during intercourse to both the female and her partner through *Kunyaza*, which is a rhythmic sexual technique aimed at providing multiple orgasms and female ejaculation during intercourse among other supposed benefits (Audet et al., 2017; Bizimana, 2010). To date, there are no reports on the effect of elongation of the labia minora on genitourinary tract infection, any other inflammatory process, or on the vaginal microbiota.

Discussion

Over the past decade, the critical role played by the vaginal microbiota in ensuring the reproductive health of both pregnant and non-pregnant women has become increasingly clear. An important part of the protection provided by a healthy vaginal microbiota comes from its ability to establish a stable community, i.e. one resistant to opportunistic colonization by more virulent or infectious agents. For most women, the most stable vaginal community is one dominated by acid-producing species of *Lactobacillus*, especially *L. crispatus* (Callahan et al.,

2017; Gajer et al., 2012; Zhou et al., 2007). Although *L. crispatus* is the most common vaginal species identified in white women (Zhou et al., 2007) and maintains the lowest vaginal pH (O'Hanlon et al., 2013), a different *Lactobacillus* species, *L. iners* is more common among African and African-American women (Callahan et al., 2017; Fettweis et al., 2014). Although somewhat protective, a community dominated by *L. iners* is less stable and associated with a higher pH than one dominated by *L. crispatus* (Ravel et al., 2011; Zhou et al., 2007). As such, it is more susceptible to community disruption and opportunistic colonization, contributing to an inflammatory, higher risk milieu (Romero et al., 2014). Because an *L. iners*-dominated vaginal microbiota is less stable, it may be that African or African-American women are more susceptible to vaginal community disruption from douching or following the insertion of herbs compared to white women. This may be especially significant given our team's recent finding that decreasing SES is associated with decreased vaginal microbiota stability across pregnancy (Dunlop et al., 2019). For African women who have experienced FGM, especially genital cutting, a state of near chronic inflammation or even infection, may be present, further de-stabilizing the vaginal community and negatively influencing reproductive outcomes. For these women, exposure to non-sterile douches, herbs, or stones may further inflame the already injured tissue.

Implications for Nursing Practice and Research

Globally, nurses caring for pregnant or non-pregnant women, need to be aware of the commonality of intravaginal practices and their potential adverse health complications. With increased awareness, nurses can pro-actively advise on, treat, and perhaps reduce exposure to such practices. As social advocates, nurses may also collaborate with the United Nations, the World Health Organization, or regional groups to ban or advocate against specific practices. For nursing scientists, rigorous research on the association between the different intravaginal practices described in this report and PTB, as well as their influence on the composition of the vaginal microbiota is essential. Potential research studies could range from testing culturally-sensitive, behavioral interventions to reduce specific practices to analyzing the vaginal microbiota, inflammatory markers, and risk of preterm birth at baseline, and over the course of pregnancy among women who have or have not experienced FGM, elongation of the labia minora, or *Ifumbi* and its treatment. By conducting and disseminating rigorous research, the consequences of specific cultural practices could be identified, with implications for women and infant health worldwide.

Conclusion

The findings from the studies included in this review indicate that cultural practices related to female genitalia and reproduction are prevalent worldwide and are passed down as traditions to young women from trusted elders. This article focused on the

traditional intravaginal practices of two culturally different African countries (Rwanda and Liberia) and African-American women in the U.S. Although the potential for the identified practices to affect birth outcomes and the vaginal microbiota is clear, the extent to which most contribute to the composition or dynamics of the vaginal microbiota or contribute to PTB and other adverse outcomes remains to be investigated. The frequent infections and chronic inflammation that often accompany FGM procedures are perhaps the most obvious practices that might be expected to affect the vaginal microbiota composition, but it is unclear whether insertion of, or bathing in, herbs or labial elongation also may alter microbial composition. A better understanding of the impact of the practices identified in this manuscript is essential for clinicians caring for women who have undergone FGM or who engage in traditional practices with herbs or douches during pregnancy, in order to improve the health of women and infants world-wide.


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