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# Urogenital health and intimate hygiene practices among Filipino women of all ages: Key issues and insights

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## Abstract:

Routine intimate hygiene care has a major contribution in maintaining overall urogenital and perineal health in women. However, Filipino women continue to experience a major surge in vulvar and vaginal symptoms across all age groups, in a context of major changes in lifestyles and risk factors impacting their genital health. Personal beliefs, preferences, apprehensions to discuss intimate topics with health-care practitioners (HCPs), availability of cleansing products in the market, and their affordability prevent many women from discussing the role of intimate hygiene care with their HCPs. Communication difficulties and lack of robust evidence, supporting optimal hygiene recommendations are some of the challenges experienced by HCPs. Through this review, the authors discuss the following factors: (i) Differing physiological needs and pathological effects that result from changing dynamics of microflora in the vulvar, perineal, and vaginal region across all age groups of women, (ii) Importance of focusing on perianal and perineal hygiene, and bowel habits, to improve the quality of vulvar hygiene and genital health, (iii) Designing approaches for HCPs to maintain genital health in the light of intimate hygiene, (iv) Recommending improvements in HCP-patient communications to help HCPs dispel the misconceptions pertaining to intimate hygiene practices, and (v) Highlighting the antimicrobial efficacy of feminine hygiene cleansers that preserve the natural microbiome and help maintain the vaginal pH within the normal range. These strategies can fill the knowledge gaps among HCPs, women, and their caregivers' perspectives and help achieve optimal intimate hygiene.

## Keywords:

Filipino women, intimate hygiene practices, microbiome, perineal hygiene, vagina, vulva

## Introduction

Optimal vulvar, vaginal, and perineal health is the result of maintaining a biodynamic equilibrium throughout the lifespan of women, against the disrupting role of many personal and contextual factors.<sup>[1,2]</sup> Genital health is highly influenced by age, general health, lifestyle, hormonal status, sexual behavior, etc. [Figure 1].<sup>[3-12]</sup>

This review focuses on: (i) Factors contributing to maintain a dynamic vulvar,

vaginal, and perianal/perineal health in women across different age groups in the Philippines, (ii) factors preventing constructive communication between women and health-care practitioners (HCPs) on personal hygiene, and (iii) rationale and physiological background that inspire the recommendations presented in this review.

## Vulva and Vestibule: The Protective First Line of Defense

### Vulvar and vestibular anatomy

The vulva serves as an external opening for the vagina. It houses various structures

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such as mons pubis, labia (majora and minora), vestibular bulbs, vulvar vestibule, urethra, and vaginal opening. The outer fold of vulva (labia majora) is highly keratinized with hair-bearing skin along with sweat and sebaceous glands that constitute the first level of defense against the invading microbes. They block the entry of microbes and other contaminants that may invade the underlying sensitive structures.<sup>[13]</sup> The functional

characteristics of structures in the vulvar region are presented in Table 1.<sup>[9,11,14-17]</sup> Vulvar vestibular skin is nonkeratinized yet highly permeable with increased hydration, occlusion, and frictional properties.<sup>[22]</sup> The nonkeratinization makes the vestibular skin highly susceptible to extrinsic irritants (e.g., topical cleansing agents and excretory fluids) and physical forces such as heat, friction, and microbial invasion.<sup>[22]</sup>

AGE	SEXUAL BEHAVIOR	CULTURAL PRACTICES	LIFESTYLE	
<ul style="list-style-type: none"> <li>Reproductive age group women (15–49 years): Poormenstrual hygiene practices<sup>[3]</sup></li> <li>Peri- or postmenopausal women: Anti-itch product to overcome vulvar pruritus, or deodorant sprays to reduce vaginal malodor, sponge baths.<sup>[3]</sup></li> </ul>	<ul style="list-style-type: none"> <li>Noncoital sexual activities (e.g., anal sex or use of sex toys)<sup>[4]</sup></li> <li>Improper cleaning postsexual intercourse.<sup>[4,5]</sup></li> </ul>	<ul style="list-style-type: none"> <li>Weary of using water for cleaning purposes fearing stoppage of menstrual flow<sup>[6]</sup></li> <li>Abstaining from changing their menstrual pads in public places fearing “witchcraft” practices.<sup>[6]</sup></li> </ul>	<ul style="list-style-type: none"> <li>Clothing habits (synthetic and tight underpants and trousers)<sup>[7]</sup></li> <li>Toilet hygiene (incorrect cleaning postdefecation).<sup>[8]</sup></li> </ul>	
	<th>VAGINAL HEALTH AND MICROBIOME</th> <th>BOWEL HABITS AND MICROBIOME</th> <th>DIAGNOSTIC OMISSIONS</th>	VAGINAL HEALTH AND MICROBIOME	BOWEL HABITS AND MICROBIOME	DIAGNOSTIC OMISSIONS
	<ul style="list-style-type: none"> <li>Vaginal deliveries with minimal medical attention and postpartum healthcare guidance<sup>[9,10]</sup></li> <li>Short urethra in women and higher proximity between vagina and anus.<sup>[10,11]</sup></li> </ul>	<ul style="list-style-type: none"> <li>Impact of bowel disorders, e.g., irritable bowel syndrome<sup>[11]</sup></li> <li>Uropathogenic <i>Escherichia coli</i> spreading from the bowel and anus to the perineum, vagina, urethra, and urothelium.<sup>[11]</sup></li> </ul>	<ul style="list-style-type: none"> <li>Lack of awareness of conditions with common etiological denominators, e.g. recurrent vulvovaginal candidiasis, recurrent <i>Escherichia coli</i> cystitis, and consequent limited therapeutic approach<sup>[11,12]</sup></li> </ul>	

Figure 1: Schematic representation of multifactorial nature of genital health. Vulvar and vestibular pain, sexual pain, and recurrent cystitis shared common etiological denominator such as recurrent vulvovaginal candidiasis, hyperactive pelvic floor, and recurrent *Escherichia coli* cystitis<sup>[3-12]</sup>

Table 1: The functional characteristics of structures in the vulvar region

Physiological and functional characteristics of structures in the vulvar region	
Vulvar Region	Characteristics
Mons pubis	
Fatty tissues covered with pubic hair <sup>[18,19]</sup>	Provides cushioning during sexual intercourse <sup>[18]</sup>
Labia majora	
Fleshy and cutaneous skin folds and rich of sweat gland	Protects underlying tissues
Vulvar skin is covered by hair, desquamated epithelial cells, a complex microbiota, sebum, water (“perspiratio insensibilis”), pheromones <sup>[20]</sup>	Undergoes engorgement during sexual arousal
	Together they behave as a dynamic “bioshield” against dehydration and dryness by producing lubricating secretions, reduce the vulnerability to chemical and bacterial insults, and contribute to erotic attractions, through the vulvar shape, appearance, and engorgement at arousal and scent <sup>[18,21]</sup>
Labia minora	
Smaller, hairless, cutaneous skin folds; abundant in sebaceous glands <sup>[18]</sup>	Undergoes engorgement during sexual arousal, thrilled by the underlying corpora cavernosa congestion, and induces pleasant erotic sensation <sup>[18]</sup>
Vulvar vestibule	
Hairless; houses the vestibular bulbs, vaginal and urethral orifice <sup>[9]</sup>	Undergoes engorgement during sexual arousal and induces pleasant sensation <sup>[9]</sup>
Urethra	
From sexual perspective, the lower third of portion of the urethra is surrounded by specialized network of vessels (urethral corpus spongiosum) equivalent to male urethral corpus spongiosum <sup>[9]</sup>	Gets congested during sexual arousal and acts as a dynamic “bio-airbag” to protect the urethra from the “bio-mechanical” trauma in case of prolonged intercourse, or intercourse with a hyperactive pelvic floor that increases the urethral vulnerability when pressed against the symphysis during thrusting
	Protects the urethra from undergoing mechanical trauma that may result from repeated sexual thrusting during intercourse <sup>[11]</sup>

## Vulvar microbiome and impacting factors

A healthy vulvar microbiome is characterized by a diverse ecology, compared to the vaginal microbiome. It is predominantly composed of *Segniliparus* spp., *Fusobacterium*, *Lactobacilli*, other organisms such as *Staphylococcus*, *Micrococci*, *Diphtheroids*, *Corynebacterium*, *Propionibacterium*, *Malassezia*, and *Prevotella* spp. along with other viruses and fungi.<sup>[23,24]</sup> Together, they continuously influence the vulvar health by eliciting immune response against the invading pathogens and ensure the microbial equilibrium is dynamically maintained.<sup>[18]</sup> The vulvar pH remains stable at approximately 5–5.5 except during heavy menstrual bleeding when the pH rises owing to lightly alkaline blood.

Overzealous cleaning of the vulvar skin using chemical irritants such as harsh soaps or use of talcum powder, antiperspirants, and deodorants can induce vulvar dryness, allergies, and cause pruritus and irritation.<sup>[25]</sup> Moreover, vulvar depilatory practices (shaving and waxing) lead to microabrasions and repeated immunoallergic hyperactivation, thereby contributing to vulvar pain/vulvodynia. In fact, studies suggest that more than 80% women suffer from vulvovaginitis and 60% women experience epidermal abrasion or ingrown hairs.<sup>[19]</sup>

It is worth noting that human papilloma virus (HPV), which is transmitted through sexual contact, gains access to the basal layer of epithelium through cuts, breaks, or microabrasions in the ectocervix, vulva, and vagina to establish infection. HPV is linked to various clinical conditions, ranging from harmless warts and lesions to cancer. Poor or inadequate personal hygiene is known to be one of the risk factors associated with HPV infection. Thus, emphasizing the significance of personal hygiene in reducing the risk of cervical cancer in addition to infection by other uropathogens.<sup>[20,21]</sup>

Furthermore, chronic conditions such as type 2 diabetes mellitus or a family history of this condition increases the vulnerability to recurrent vulvovaginitis and vulvar vestibulitis.<sup>[26]</sup> Vulvar vestibulitis may also exacerbate due to scents, dyes, body wash, and abrasive activities such as long biking hours.<sup>[14]</sup>

It becomes imperative to ensure the following: (i) Timely diagnosis of predisposing, precipitating, or maintaining factors that increase women's vulnerability to vulvar and vaginal infections, by general practitioners and gynaecologists, (ii) Close scrutiny of the vulvar cleansing practices, and (iii) Adoption of appropriate practices for adequate vulvar care to maintain the integrity of the vulvar skin and underlying tissues.

## Perineum and Perianal Region: An Overlooked Space

### Perineal body anatomy

The perineal and perianal regions play a major role in maintaining vaginal health as they are in close proximity to the vulvar area. The perineal body in women extends from the posterior vulvar orifice to the anal canal.<sup>[27]</sup> Overall, the entire perineal area can be divided into the anterior urogenital triangle, defining the area from the clitoris to the line ideally traced between the two ischiatic tuberosities and including the vulva and the vestibule, i.e., the perivaginal/periurethral region, extending from the medial face of labia minora until the vaginal orifice and including the urethral orifice, and the posterior anal triangle, from the line between the two ischiatic tuberosities to the coccyx, that includes the perianal region, i.e., the skin surrounding the anal orifice extending to the skin overlying the coccygeal area.<sup>[15]</sup> The midline structure of perineum referred to as perineal body varies in length among women (ranging from 1.5 to 5.5 cm).<sup>[16]</sup>

### Perineal ecosystem and microbiome

The perineal ecosystem is highly dynamic with constant shifts in the composition right from infancy through adulthood. Although longitudinal studies examining this phenomenon are still underway, a pilot study reveals intense remodeling of the perineal microbiome as the woman ages.<sup>[15]</sup> The perineal microbiome in infants and toddlers shows high loads of uropathogens, namely *Escherichia coli*, *Clostridium* spp., *Gardnerella* spp., *Staphylococcal* spp., *Bacterioides fragilis*, which gradually decrease as they reach puberty. In addition, the perineal microbiome thrives with *Lactobacilli* and *Bifidobacterium* spp. that continually migrate from and into the vaginal milieu, forming the “protective flora” and providing genitourinary protection.<sup>[17]</sup> However, the perineal microenvironment is constantly subjected to internal and external transitions throughout the life period, for example, changing bowel movements (arising from shift from liquid to solid food in infant girls), toilet training, pubertal hormonal shifts (primarily increased levels of estrogen), personal hygiene postdefecation and during menstruation, perspiration due to tight clothing, or moisture from urine or fecal leaks due to incontinence. These factors can disrupt the microbial flora, particularly affecting *Lactobacilli* and *Bifidobacterium* colonies. This disruption can result in an increased susceptibility to dysbiosis, which may lead to genitourinary infections such as urinary tract infections (UTIs).<sup>[23,24]</sup>

### Bowel habits and perineal health: Powerful influencers of vulvar and vaginal health

The microbial ecosystem of the anterior urogenital triangle and posterior anal triangle regularly interact with each other because of close anatomical proximity

of the vagina, bladder, and gut.<sup>[17]</sup> The *Lactobacillus* species, *Lactobacillus crispatus*, *Lactobacillus jensenii*, *Lactobacillus gasseri*, and *Lactobacillus iners* are the predominant microbiota found in the vaginal region. In the event of alterations in local vaginal *Lactobacilli* concentrations following sexual activities or douching, the rectum within the anal canal acts a back-up reservoir for *Lactobacilli*. The *Lactobacilli* then migrate from the posterior anal triangle into anterior urogenital triangle of the perineum toward the vagina, recolonize the vaginal milieu, and maintain the ecological balance while keeping the bacterial vaginosis (BV) risk at bay.<sup>[28]</sup>

Pelvic floor dysfunction, namely hyperactive pelvic floor can contribute to the “biomechanical” component of the comorbidity between obstructive constipation, sexual pain (superficial dyspareunia), and vestibular pain. It predisposes to vestibular and urethral trauma during coitus. This provoked “biomechanical” trauma with microabrasions can facilitate the ingress of uropathogenic *E. coli* coming either from the bowel and/or from pathogenic biofilms inside the urothelium and in the urine. This acts as a precipitating factor in the postcoital cystitis and recurrent cystitis (24–72 h after intercourse). In parallel, concomitant frequent vaginitis caused by *E. coli* is reported up to 2 weeks before overt cystitis.<sup>[29]</sup> Moreover, the vaginal microflora is highly susceptible to alterations in microbiota composition, in parallel with pH variations, leading to dysbiosis with increased risk of developing BV by approximately four times.<sup>[30,31]</sup> In addition, *Candida* spp. which is a native flora within the intestinal milieu can outgrow in number and cross the intestinal wall when the function of the colonic wall as a “dynamic selective frontier” is impaired by bowel dysbiosis and/or inflammatory conditions such as the irritable bowel syndrome (IBS). This leads to the so called “leaky gut syndrome” if bowel disorders such as IBS persists over time. Antibiotics can further aggress the bowel microbiota causing *Candida* spp. to proliferate. This contributes to candida vaginitis as the microbiota of bowels and the vagina can have a microbiological crosstalk due to anatomical proximity.<sup>[32]</sup> More than 45% and 36% of women with bowel disorders have complaints of BV and vulvar and vaginal discomfort, respectively.<sup>[33,34]</sup> Further, overgrowth of *E. coli* within the gut of women with bowel disorders causes the organism to seep into urethra through the anal-urogenital pathway of the perineum leading to recurrent UTIs.<sup>[35,36]</sup> The constant anal-periurethral interaction throughout the lifecycle of women with the resulting impact on genital infections makes this interaction the main driver of overall vulvar and vaginal health.

### Critical role of perineal hygiene in women’s health

Perineal hygiene is one of the most neglected aspects of intimate health across all age groups of women. It is

generally cleaned in an incorrect fashion or sometimes totally ignored.<sup>[37]</sup> Incorrect cleansing practices, for example, back-to-front washing or wiping of the perineal area, can compromise perineal hygiene by transferring the pathogenic microbes from the posterior region of the perineum into the vulvar, vaginal, and urethral region. Around 38%–75% of women indulging in posteroanterior cleaning postdefecation experience vaginal symptoms such as discharge, malodor, pruritus, dysuria, or dyspareunia.<sup>[19,38]</sup> The choice between toilet paper and water for perianal cleansing varies based on personal preference and toilet design, with toilet paper being more common in Western countries and water being preferred in Asia, the Middle East, and some parts of Europe.<sup>[39]</sup> Although there are no studies comparing perineal cleansing through washing versus using toilet paper, clinical practitioners often recommend front-to-back washing of the perianal region without soap to prevent recurring UTIs and maintain vulvovaginal health.<sup>[40,41]</sup> Conversely, the use of scented and moist toilet paper has been linked to vulvar dermatitis and vulvovaginitis.<sup>[42,43]</sup>

Perineal hygiene is often challenged by the use of synthetic and tight underpants and trousers. Panty liners can prevent the escape of moisture arising from sweat and vaginal secretions, which in turn increases the humidity in perineal area that favors the proliferation of microbes.<sup>[37]</sup> Poor menstrual hygiene practices, like using reusable cloth to absorb menstrual blood or infrequent changing of pads can trap moisture in the vulvo-perineal area. This can create an environment conducive to *Candidal* or *Trichomonal* infections, which can then spread to the vaginal area and increase the risk of vulvovaginal candidiasis (VVC) and BV.<sup>[44-46]</sup> Almost 37%–42% of women experience unpleasant vaginal symptoms due to poor menstrual hygiene practices. During pregnancy, some women douche their vagina, or even use deodorant sprays to manage increased vaginal secretions which can irritate the perineal skin.<sup>[47]</sup> In worse situations, improper practices that can lead to UTIs, such as back-to-front cleaning of the perineal region and vaginal douching, can cause dysbiosis, resulting in bacterial ascension up the genital tract that can even infect the fetal membranes, amniotic fluid, placenta, and/or uterus. The resulting immunological aberrations cause an increase in inflammatory cytokines level resulting in premature rupture of membrane and ultimately increase the risk of preterm labor.<sup>[48]</sup> In postpartum women with perineal trauma, lack of adequate attention toward perineal care can result in symptoms such as perineal pain, sexual dysfunction, sexual pain at intercourse, fecal and urinary incontinence, and purulent vaginal discharge along with recurrent VVC.<sup>[46,49]</sup> Applying talcum powder to the underwear as a part of perineal hygiene, especially in menopausal women can increase the risk of endometrial cancer by 21%.<sup>[50]</sup> Moreover,

there is ample evidence supporting the increased risk of ovarian cancer (31%–65%) related to the frequent perineal exposure to talcum powder, both in infancy during diapering and in adulthood.<sup>[51,52]</sup> These vast arrays of hygiene behavior point toward ignorance and neglect across women of different age groups [Table 2].

### Emphasizing on hygiene of entire perineum: A key aspect of intimate hygiene

The efforts in maintaining the optimal dynamic equilibria of the entire perineal region against the backdrop of extrinsic hygienic, hormonal, and physiologic factors

**Table 2: Risk factors for compromised perineal hygiene**

Risk factor	Example
Clothing	Panty liners, synthetic underwear, sanitary towels, tampons, and tight trousers, close-fitting clothes used over a long period of time <sup>[53]</sup>
Toilet hygiene	Posteroanterior cleaning postdefecation, not drying perineal areas posturination, neither washing nor drying after urination, holding urine for long hours (>5 h) <sup>[19]</sup>
Menstrual hygiene	Use of reusable clothes for absorbing menstrual blood, low frequency of changing pads (>12 h), not taking a shower/bath during menstruation <sup>[38]</sup>
Coital hygiene	Unprotected sex, without condom, unless pregnancy is looked for; noncleansing of perineal area before and after sexual intercourse (this is debated), not urinating postsexual intercourse, douching the vagina postsexual intercourse <sup>[19,29]</sup>
Depilatory behaviour	Trimming or complete removal of pubic hair using razor blade, scissors, waxing or plucking either by self or in beauty salons or medical clinics <sup>[54]</sup>
Cosmetic irritants	Using antibacterial soaps, shower gel, scrubs, or bubble bath <sup>[29]</sup> Tattoos or piercing the perineal region Using talcum powders, topical anesthetics, or topical antifungals or topical steroids <sup>[55]</sup>

becomes absolutely essential to retain the skin integrity and normal flora. Hence, the HCPs and patients should consider focusing on the entire perineal area (extending from the anterior urogenital triangle until the posterior anal triangle) from diagnostic and hygiene perspectives, across all age groups of women.

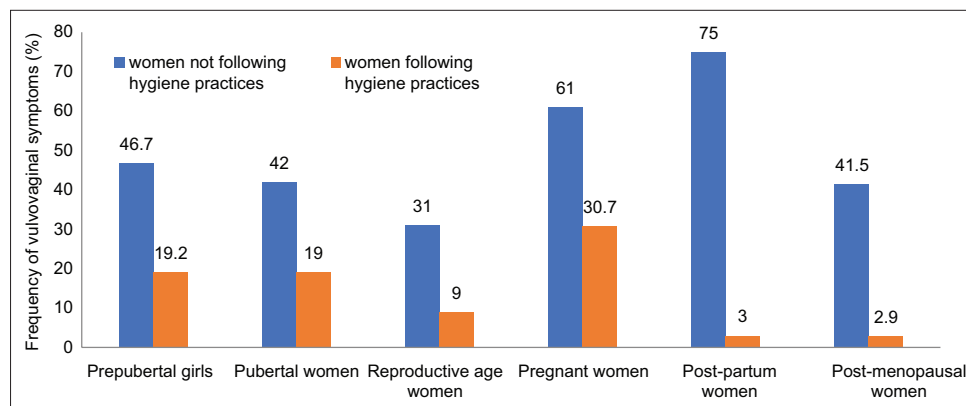
Figure 2 depicts the differences in the prevalence of vulvovaginal symptoms across different age groups along with hygiene practices adopted by each group.

### Vagina: A Critical yet Sensitive Organ

The vagina has a simple anatomy and a dynamic microbial ecosystem. It allows three main functions: the passage of the menstrual blood outflow, sexual intercourse, and childbirth.<sup>[12,56]</sup> It is extremely rich in hormone receptors. As vagina is involved in critical life events, it is highly sensitive to intrinsic factors (e.g., hormones, aging, microbiota, and their biofilms) and extrinsic factors (such as sexual behavior, sexually transmitted infections, and intimate hygiene practices). Moreover, the functional and anatomic integrity of vagina is often challenged throughout the reproductive and menopausal stages, i.e., during menstruation, sexual activities (including sexual abuse), pregnancy, obstetric-related damages, menopause, and overall hygiene practices. Such vulnerabilities give rise to unique needs of vagina during each reproductive phase, which should be respected and addressed.<sup>[56]</sup>

### Vaginal microflora: A “dynamic” ecosystem across each age group

The vaginal microflora has a dynamic ecosystem that entails a diverse array of microbes whose proportion is modulated across different reproductive stages of women through puberty, pregnancy/breastfeeding,



**Figure 2:** Percentage of women who experienced lower frequency of genitourinary infections by practicing perineal hygiene practices (marked in “orange” bar) versus those not practicing perineal hygiene practices (marked in “blue” bar).<sup>[10,19,37,38,45,48,51]</sup> Perineal hygiene practices practiced by women in the studies mentioned in Figure 2: <sup>a</sup>Prepubertal girls: (i) Bathing in standing position; (ii) practicing proper perineal hygiene post-defecation; iii. wearing well-fitted clothes rather than tight pants or jeans.<sup>[38]</sup> <sup>b</sup>Pubertal women: (i) Showering/bathing during menstrual period; ii. frequent changing of menstrual pads (every 1–6 h).<sup>[19,37]</sup> <sup>c</sup>Reproductive age: (i) Practicing coital hygiene pre- and postsexual intercourse.<sup>[38]</sup> <sup>d</sup>Pregnant women: (i) Frequent changing of underpants, (ii) wiping perineal area posturination.<sup>[45]</sup> <sup>e</sup>Postpartum women: (i) Undertaking perineal care postvaginal deliveries to manage perineal sutures (sexuality in the postpartum and intimate hygiene: the gynaecologists’ role).<sup>[10]</sup> <sup>f</sup>Postmenopausal women: (i) Using hygiene washes in the entire perineal region.<sup>[56]</sup>

and menopause.<sup>[57]</sup> Various internal factors that can impact the vaginal microflora include hormones (specifically estrogen), intracellular glycogen levels, bacterial interactions, and the pH. The external factors that have the potential to influence the vaginal flora include douching, sexual activity, particularly with a new partner, antibiotics, and spermicides.<sup>[18]</sup>

Estrogen level variation across reproductive age influences the vaginal microflora in multiple ways. The surge in estrogen levels at puberty triggers the proliferation of vaginal epithelial cells and an increase in intracellular glycogen levels within the vaginal mucosa.<sup>[58,59]</sup> Glycogen is metabolized by the *Lactobacilli* leading to the production of lactic acid consequently lowering the pH to <4.5, thus inhibiting the colonization of other bacterial species.

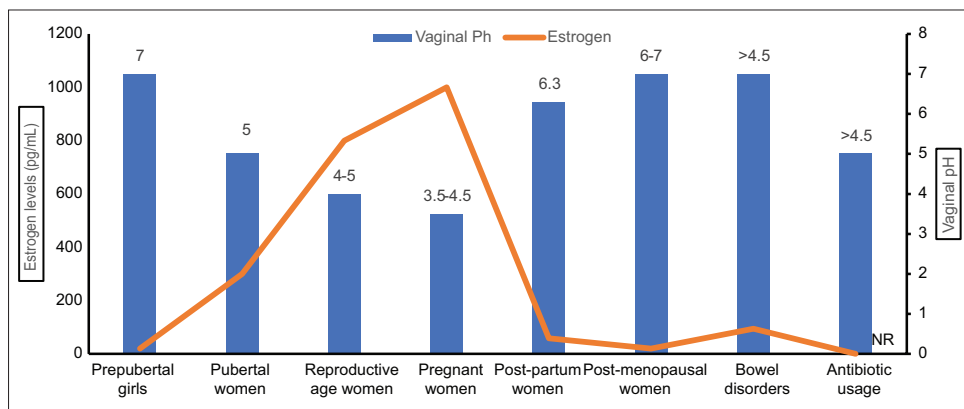
The vaginal flora is influenced by shifts in estrogen levels throughout different life stages including prepuberty, puberty, reproductive years, menstrual cycles, and the transition from peri- to postmenopause. The vaginal environment, especially in prepubertal stages (infancy and childhood) is conspicuous with the lack of estrogen with alkaline or close to neutral vaginal pH (~7), low *Lactobacilli* concentration, and increased diverse microflora.<sup>[57,60]</sup> While the onset and progression of puberty witnesses higher surges in *Lactobacilli* concentration, microbial fluctuations are observed within sub-phases of menstrual cycle, i.e., during menses, estrogenic, and luteal phase.<sup>[57,59,61]</sup> Nevertheless, the predominance of *Lactobacilli* continues throughout the reproductive age group and increases exponentially with corresponding decrease in diverse microflora throughout the three trimesters of pregnancy.<sup>[58]</sup> The hypoestrogenic state encountered during postpartum including breastfeeding causes a fall in *Lactobacilli* concentration which rises once again as the women resumes her menstrual cycle.<sup>[62]</sup> Finally, with the decline

in estrogen levels that starts right from peri-menopausal stage through menopausal and postmenopausal stages, *Lactobacilli* colonies continually diminish and is rapidly replaced by diverse microflora.<sup>[63]</sup> Alternatively, some diseases such as bowel disorders can disturb the microbial equilibria within the gut that leaks into vaginal microbiota and increases the vaginal pH (>4.5) by overproducing short chain fatty acids in the vagina.<sup>[32]</sup> This situation is further exacerbated with the use of antibiotic or steroid as treatment for these conditions, that further alters the already disturbed microbial ecosystem.<sup>[64]</sup> The presence of intracellular and extracellular pathogenic biofilms in the bladder and vagina further complicates the microbiological scenario.

Evidently, this sequential orchestration of estrogen levels and other external factors can influence the vaginal pH, *Lactobacilli* colonization, and vaginal mucosal proliferation [Figure 3]. This, in turn, governs the extent of immune protection against vaginal infections.<sup>[57,65]</sup> Owing to physiological changes, risk of BV, sexually transmitted infections as well as fertility-related complications may arise in certain age groups when compared with other age groups that is often mitigated with self-protective defense mechanisms contained within vulvar, perineal, and vaginal regions.

### Vulvar, Perineal, and Vaginal Immune System: Focusing on the Self-protective Defense Mechanisms

The self-protective defense or the immune response within vulvar, perineal, and vaginal region is a trifecta between healthy microbiota, immune cells such as neutrophils, macrophages, and monocytes, and proteins such as  $\alpha$  and  $\beta$  defensins lysozyme lactoferrin among many others.<sup>[66]</sup> As female genital tract, including the vulva, perineum, and vagina is predominantly colonized by *Lactobacilli* colonies, they form the core in maintaining



**Figure 3:** Fluctuations observed in vaginal pH along with corresponding estrogen levels (pg/mL) as the women progresses through various reproductive stages (prepubertal, pubertal, reproductive, pregnancy, postpartum, and postmenopausal stage) and in conditions such as bowel disorders and during antibiotic usage. The values expressed do not represent the exact values of vaginal pH and estrogen but are denoted as a range in the graph and have been plotted using median values. The fluctuations in estrogen levels after antibiotic usage are not reported in the literature<sup>[29,66,67]</sup>

the overall genital health. However, their survival and persistence are governed by biofilm formation.<sup>[67]</sup>

### Biofilms: An invisible yet powerful protective shield

“Biofilms” are a well-defined consortium encasing the microbes (in this case, *Lactobacilli*) in an extracellular gelatinous matrix that is secreted by the microbe itself.<sup>[68]</sup> Biofilms not only confer protection for *Lactobacilli* against biological, chemical, or physical stressors but also help in genetic exchange through cross-feeding and horizontal gene among the organisms. Biofilms transfer the immunomodulatory functions across the *Lactobacilli* colonies, which are then established strongly as microcolonies (within the persister cells) in a protective niche provided by the biofilm. As biofilms mature, some *Lactobacilli* spp. disperse and form several niches protected by biofilms, thus resulting in the proliferation of *Lactobacilli* colonies.<sup>[69]</sup> To reiterate in terms of an analogy, a woman’s body is a welcoming house for trillions of invisible, yet essential biofilms acting as cities, protecting essential gentle tenants (*Lactobacilli*) who work tirelessly to maintain optimal vulvar, perineal, and vaginal health.

### Biofilms: A friend turned into a foe, if disrespected

In the event of stressors such as hormonal shifts, diseased states such as bowel disorders, noncoital sexual practices, depilation of vulvar and perineal region coupled with improper intimate hygiene practices, alter the presence of physiologic biofilms significantly.<sup>[29,69]</sup> The resulting dysbiosis shifts the microbial balance from commensals (also known as “normal microflora”) toward opportunistic microbes that use reduced immunity as an “opportunity” to cause infections or pathogenic microbes.

Owing to its ubiquitous nature, biofilms are produced by all microbes including the opportunistic and pathogenic ones, which in a similar way, can enhance their proliferation through formation of persister cells.<sup>[69]</sup> Hence, biofilms produced by opportunistic microbes can enhance their colonization and confer protection against the self-protective immune response induced by the host. More importantly, through gene plasmids, biofilms can facilitate antibiotic or antifungal resistance, making their eradication difficult.<sup>[69]</sup> Moreover, an overgrowth of anaerobes *Gardnerella vaginalis*, *Atopobium* spp., *Prevotella* spp. during BV can produce dense biofilms that co-exist intracellularly and extracellularly within the bladder and vagina, which further complicates the microbiological scenario.<sup>[70,71]</sup>

During this period, some microbes dispersed from biofilms cause secondary increase of the amines (putrescine and cadaverin) that volatilize in the vaginal milieu upon elevation in pH resulting from menses or sexual intercourse.<sup>[72]</sup> These amines are responsible for

the malodor that leads to a major embarrassment and disgust among women, can hamper arousal in their sexual partners, and impact their sexual life.<sup>[73]</sup> The malodor also induces women to wash their external genitalia too often, thus causing further damage to the biodynamic vulvar microbiota and cutaneous vulvar “shield,” impairing their protective role.

Indeed, the powerful shields of biofilms are a “double-edged sword” that can be considered either physiologic or pathologic depending on two factors: (i) Consideration of subtleties of biofilms and (ii) Understanding the microbe type producing and residing in the biofilms.

### The Role of Feminine Hygiene Cleansers on Vaginal Health and Microbiome

Clearly, women’s genitourinary health is governed by subtle physiological and lifestyle nuances. Intimate hygiene practices are an important aspect in maintaining vulvar, perineal, and vaginal health. Keeping this in mind, there has been a growing interest in the use of cleansing agents that not only provide cleanliness and prevent malodor but also moisturize the epithelial layer and have hypoallergenic properties.<sup>[12,29]</sup> Table 3 summarizes the evidence pertaining to the efficacy and safety of a few feminine hygiene cleansers in managing vulvovaginal symptoms and maintaining normal vaginal pH and vulvar microbiome.<sup>[74-77]</sup> Cleansers with natural ingredients, such as thymol, are emerging as an important component of the therapeutic strategy in managing vulvovaginal conditions, especially due to availability of recent evidence-based research pertaining to its mechanism of action, pharmacological efficacy coupled with positive in-clinic experiences.<sup>[74,77]</sup> A recent pilot randomized controlled trial on healthy Japanese women demonstrated the efficacy of *Lactobacillus* containing hygiene products in reducing the pathogenic flora and genitourinary symptoms while maintaining the vaginal pH in the normal range.<sup>[75]</sup> The findings from another 4-week clinical study showed that daily use of a lactic acid-containing intimate gel wash did not impact the vulvar skin pH or the natural vulvar microbiome.<sup>[76]</sup>

### Recommendations for Health-care Practitioners and Women

Notably, the specific physiological changes and resulting needs in women across age groups warrants a tailor-made, age-appropriate approach toward achieving optimal genitourinary health. Usually, HCPs from primary care are the first point of contact, bridging patients and specialty care through referrals and back referrals. Hence, by adopting an individualized approach, HCPs can offer both pharmacological

**Table 3: Evidence-based summarization of the efficacy and safety of a few feminine hygiene cleansers**

Study (first author and year of publication)	Study design	Study participants	Treatment	Main findings
Leo DV <i>et al.</i> , 2015 <sup>[73]</sup>	Open, observational, prospective	Women with confirmed diagnosis of BV or candidiasis stratified into subgroups Adolescent ( <i>n</i> =241) Fertile ( <i>n</i> =861) Pregnant ( <i>n</i> =484) Breastfeeding ( <i>n</i> =335) Premenopausal ( <i>n</i> =252) Menopausal ( <i>n</i> =418)	Three different plant-based cleansers were recommended to each subgroup based on age and physiopathological status Adolescent, fertile, premenopausal: Cleanser with sage extract at pH 3.5 Pregnant and breastfeeding: Cleanser with <i>T. vulgaris</i> extract at pH 3.5 Menopausal: Cleanser with chamomile and <i>T. vulgaris</i> extract pH 7	Reduction in symptoms of BV and VVC after 4 weeks versus baseline across all subgroups Improvement observed in leucorrhea, vaginal micro-flora, and reduction in itching, burning, vaginal dryness, and erythema after 4 weeks of treatment No new safety events reported
Bruning E <i>et al.</i> , 2020 <sup>[74]</sup>	Clinical study	36 healthy women Age 18–29 years: 12 Age 30–44 years: 13 Age 45–55 years: 11	Gel wash containing 2% lactic acid (pH 4.2) for external daily use	Daily use of the gel wash did not significantly change vulvar skin pH or affect the natural vulvar microbiome's bacterial or fungal species richness and diversity Five adverse events reported; none were product related. One woman, who used the product more often than normal routine, reported moderate drying of vulvar area
Yoshikata R <i>et al.</i> , 2022 <sup>[75]</sup>	A pilot randomized controlled trial	70 healthy Japanese women (age: 20–75 years) Premenopausal ( <i>n</i> =35; age: 20–49 years) Postmenopausal ( <i>n</i> =35; age: 50–75 years)	Treatment duration: 4 weeks Control group (6 premenopausal + 5 postmenopausal) Group 1: <i>Lactobacillus</i> -containing soap and cream (14 premenopausal + 16 postmenopausal) Group 2: <i>Lactobacillus</i> -containing soap, cream, and gel (15 premenopausal + 14 postmenopausal)	Vaginal pH and pathogenic flora decreased in both treatment groups, especially in postmenopausal women in Group 2 Genitourinary symptoms improved in 60% of premenopausal women in Group 1 and 81.3% in Group 2, compared to 0% in the control group ( <i>P</i> <0.01) No adverse or allergic reactions were reported
Murina F <i>et al.</i> , 2023 <sup>[76]</sup>	Multicentre, observational, controlled open label	200 women (age: 18–45 years) with confirmed moderate severe VVC	Group 1 ( <i>n</i> =100): Clotrimazole 2% vaginal cream (for 6 days) + thymol containing cleanser (twice daily for 15 days) Group 2 ( <i>n</i> =100): Clotrimazole 2% vaginal cream alone (for 6 days)	Pruritus and burning VAS score found to be significantly lower in group 1 versus group 2 on day 10 and 15 No serious AEs required discontinuation of treatment. Two women in group 2 reported mild burning sensation that resolved in 2–3 days

BV: Bacterial vaginosis, VVC: Vulvovaginal candidiasis, VAS: Visual Analog Score, AEs: Adverse events, *T. vulgaris*: *Thymus vulgaris*

and psychological (age-specific counseling and guidance) therapy to women/their caregivers on vulvar and perineal care. An individualized approach of hygiene practices for cleansing vulva and perineum can in turn benefit the vaginal microbiota and help minimize the risk of vaginal infections. The detailed recommendations (both individualized and generalized) regarding optimal intimate hygiene approach to be prescribed by the HCPs and followed by women across age groups is compiled by all the authors by mutual consensus and is presented in Tables 4, 5 and Figure 4.

## Conclusion

Regular incorporation of intimate hygiene practices can facilitate optimal protection to vulvar and perineal

region and ensure beneficial effects on vaginal health and overall physical and emotional well-being of women in their lifespan. However, wide disparities have been noted among women regarding their perceptions and preferences toward adopting appropriate hygiene practices on the daily basis. Moreover, diseased states continually modify the microbiome niches that can compromise the vulvar and vaginal health and augment the risk of pathologies. In addition, Filipino women are apprehensive to engage in proactive sexual discussions with the HCPs or find difficulty in articulation of symptoms such as vaginal discharge, vulvar or perineal itching, and intentionally underplay them. Therefore, the responsibility of overcoming HCP patient communication barriers lies primarily with the HCPs. Having a comprehensive outlook with cultural sensitivity, updated knowledge regarding



**Table 4: Recommendations for optimal intimate hygiene in women - an individualized approach stratified by age group and genital region**

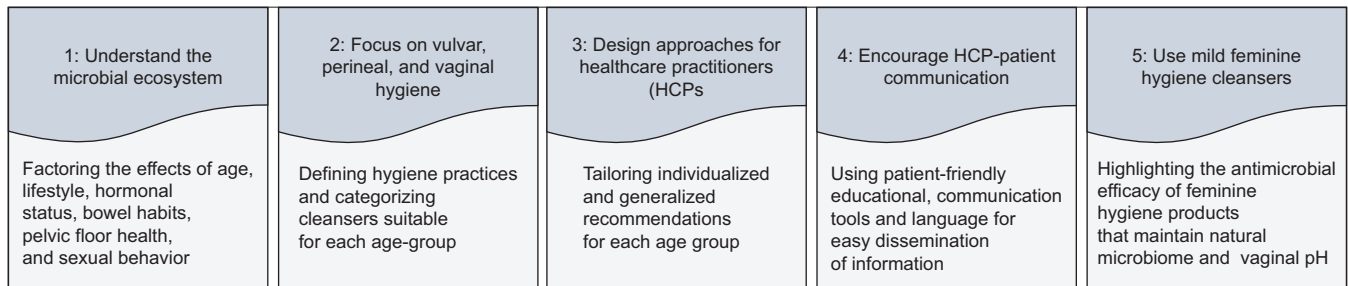
Age group	Recommendations	
	Healthcare practitioners	Women/caregivers
Prepubertal girls	<p>Counseling children regarding good toilet habits and hand hygiene before handling the perineal area<sup>[78,79]</sup></p> <p>Managing constipation (if present) in children<sup>[79]</sup></p> <p>Advising the use of barrier creams such as nappy creams and emollients for protection against irritation<sup>[78]</sup></p> <p>Advising the use of unperfumed vulvar cleanser for preventing risk of nonspecific vulvovaginitis</p>	<p>Teaching children to adopt appropriate cleansing practices (from front-to-back). Checking whether cleansing has been carried out properly by children</p> <p>Educating children not to squat on dirty floors or directly on the soil</p> <p>Avoiding usage of toilet paper</p> <p>Avoiding vulvar exposure to sand and soil</p> <p>Cleaning anal area with plain water or gentle cleanser<sup>[78]</sup></p> <p>Washing vulvar and perineum twice or more during diarrhea</p> <p>Treating pinworms/threadworms which may cause secondary vaginal infections</p> <p>Teaching children to keep legs wide apart while urinating<sup>[78]</sup></p> <p>Wearing cotton underpants and regularly changing them (&gt;once/day), avoiding tight jeans, encouraging wearing of skirts</p> <p>Avoiding perfumed bubble baths<sup>[78]</sup></p>
Pubertal women/ reproductive age group	<p>Counseling women regarding appropriate menstrual hygiene (proper usage of washrooms, bathing, and cleaning perineal area during menstruation, using new sanitary napkins each time, and changing frequently)<sup>[38]</sup></p> <p>Dispelling myths and misconceptions surrounding menstruation<sup>[80]</sup></p> <p>Counseling regarding coital hygiene. Emphasizing on the importance of coital sexual behavior from the viewpoint of hygiene. Advising usage of condom for better self-protection against STIs, unless pregnancy is welcomed</p> <p>Considering the acceptability/preference of husband or sexual partner while prescribing vulvar cleanser</p> <p>Being cognizant about the cultural norms and cultural expectations can help in encouraging women to initiate sexual health discussions during routine consultations<sup>[81]</sup></p> <p>Advising use of nonperfumed or noncolored vulvar cleansers with acidic pH (~4.2)</p>	<p>Providing timely and adequate information regarding menstruation to fill knowledge gaps and misconceptions among young girls (especially mothers, sisters, or female teachers)<sup>[80]</sup></p> <p>Cleansing vulvar folds and clitoris from front to back postsexual intercourse<sup>[15]</sup></p> <p>Refraining from buying vulvar cleansers OTC without consulting HCPs</p> <p>Avoiding vulvar irritants such as soaps, gels, bath oils, bubble bath, perfumes, deodorants, spermicides, condoms, and diaphragms<sup>[15]</sup></p> <p>Refraining from depilation of vulvar and perineal hair, abstaining from tattooing, or piercing of perineum<sup>[81]</sup></p>
Pregnant women	<p>Counseling pregnant women using standardized guidelines regarding prevention of UTIs through hygiene practices<sup>[82]</sup></p> <p>Encouraging women to use hygiene behavior targeting a specific issue. Assuring women of the controllability of UTIs or other vaginal infections can lead to avoidance of antibiotic usage available as OTC to protect vaginal flora<sup>[82,83]</sup></p> <p>Prescribing vulvar cleansers with an acidic pH (~4.2) capable of managing leucorrhoea</p>	<p>Washing vulvar and perineal region before and after-sexual intercourse, postdefecation, and urination<sup>[44]</sup></p> <p>Urinating postsexual intercourse to flush out uropathogens and prevent alteration of vaginal flora due to seminal fluid<sup>[44]</sup></p> <p>Drinking plenty of liquids; avoiding holding of urine for long hours; drying of perineal area after urination<sup>[44]</sup></p>
Postpartum women with perineal tears	<p>Prescribing cleansers capable of facilitating the following:</p> <ul style="list-style-type: none"> <li>Healing of microabrasions and episiorrhaphy</li> <li>Reducing perineal and vulvar pain and introital dyspareunia</li> <li>Contributing to accelerate and improving the quality of genital healing after vaginal delivery</li> </ul> <p>Advising adequate and careful perineal washing in patients who have undergone episiotomy during vaginal delivery or patients with third degree laceration resulting from vaginal delivery</p> <p>May use mild cleansers in the postpartum period</p> <p>Encouraging thorough full body bath to reduce the risk of infection</p>	<p>Practicing hand hygiene before handling the perineal region<sup>[10]</sup></p> <p>Washing perineal area from front (beneath pubis symphysis)-to-back (around the anal region) with warm water or with a mild feminine wash drying the perineal area postwashing<sup>[10]</sup></p> <p>Frequent change of perineal pads<sup>[10]</sup></p> <p>Flushing the toilet only in the standing position and performing perineal care postdefecation or posturination<sup>[10]</sup></p>

Contd...

**Table 4: Contd...**

Age group	Recommendations	
	Healthcare practitioners	Women/caregivers
Breast feeding women	Prescribing mild cleansers capable of attenuating following Vulvar and vaginal dryness during hypoestrogenic state induced by delivery, secondary to lactation Introital/superficial dyspareunia (sexual pain)	
Menopausal and postmenopausal women	Counseling women regarding pathological manifestations of the postmenopausal period and helping them overcome embarrassment to discuss sexual health <sup>[84]</sup> Initiation of proactive discussion with women pertaining to urogenital symptoms <sup>[84]</sup> Prescribing vulvar cleanser with pH (4.2–5.6) capable of hydrating the vulvar and vaginal mucosa to manage dryness <sup>[84]</sup> Re-emphasizing intimate hygiene practices especially in women with T2DM and on SGLT2i (besides having a very low-sugar diet) <sup>[50]</sup>	Washing vulvar region with hands and unscented soaps without using loofahs, puffs and patting dry postwashing or using soft, white unscented toilet paper <sup>[85]</sup> Shampooing hair over basin <sup>[85]</sup> Avoiding use of wet wipes to wipe off urine leaks due to stress incontinence. Addressing the issue of incontinence <sup>[85]</sup> Wearing cotton underpants, skirts, and loose garments <sup>[85]</sup>

HCPs: Healthcare practitioners, OTC: Over the counter, UTIs: Urinary tract infections, T2DM: Type 2 diabetes mellitus, SGLT2i: Sodium-glucose cotransporter-2 inhibitors, STIs: Sexually transmitted infections



**Figure 4:** Managing and maintaining optimal vulvar and vaginal health. HCP: Health-care practitioner

pathophysiology, treatment recommendations and providing supportive care to women can enable improved HCP patient dialog.

Gentle cleansing of vulvar and perineal region using mild agents having an appropriate pH is extremely important and plays a pivotal role in maintaining the overall vulvar and vaginal health. However, women across each age group have varying lifestyle and vaginal pH may be exposed to varying pathophysiological conditions. Therefore, designing recommendations that are tailor-made for each age group to adopt optimal intimate hygiene practices would help women achieve homeostasis of the microbial flora and assist in alleviating vulvar and vaginal pathologies. Having such customized interventions may finally fulfill the long-neglected expectations of women’s genital health.

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**Table 5: Recommendations for health-care practitioners and women/caregivers: A generalized approach**

<b>Recommendations to HCPs</b>	
For prescribing vulvar cleansers	<p>Clustering patients based on common denominators (e.g., presence of vaginal microbiota, vulvar pH 5) that can help HCPs to tailor the treatment using an algorithm flowchart</p> <p>Comprehensive usage of vulvar cleansers in patients of all age groups</p> <p>Prescribing mild vulvar cleansers for women without symptoms</p> <p>Detailed recording of patient history to determine irritation or allergic tendencies</p> <p>Patient considerations in terms of vaginal microbiota profile, symptom resolution, affordability, partner's preferences</p> <p>Using "all-natural" cleansers that has following properties</p> <ul style="list-style-type: none"> <li>Safeguards the microbial flora and the cleansers</li> <li>Equipped with robust evidence-based research data pertaining to its mechanism of action, pharmacological efficacy against pathogenic microbes</li> <li>Availability of in-clinic experiences, even in patients with hemorrhoids</li> <li>Possesses selective anti-bacterial activity with neutral effect on <i>Lactobacilli</i></li> </ul>
For appropriate communication and counselling	<p>Calling out exact anatomical terms (vulva, labia majora, labia minora, perineal area, and vagina) instead of using generalized description as "genital organs" and using local Filipino language to address the "vulva" and "vagina"</p> <p>Avoiding vague references to specific hygiene practices (e.g., douching and washing)</p> <p>Using lay terms and visual displays and models to explain medical concepts (e.g., biofilms) and indicate the problem area</p> <p>Facilitating proactive discussion with patients to understand their needs and expectations from the treatment</p> <p>Dispelling falsehoods "fakes" pertaining to women intimate hygiene by educating them regarding</p> <p>Hazards of depilation of vulvar and perineal hair</p> <p>Frequent vaginal douching</p> <p>Knowledge about vulvar cleansers being used by women</p>
For educating HCPs and addressing knowledge gaps	<p>Training programs focusing on the latest advances in vulvar and vaginal ecosystem, evidence-based research on the concept of biofilms</p> <p>Strengthening patient-centred counseling approach with training curricula and on-the-job coaching for HCPs, nurses, midwives, and pharmacists</p> <p>Documenting real-world evidence pertaining to the use of vulvar cleansers in women with varying age sub-sets with regard to AEs and safety</p> <p>Developing treatment algorithms for personalized treatment approach</p>
<b>Recommendations for women and caregivers</b>	
For educating women and caregivers and addressing knowledge gaps	<p>Designing interactive and engaging educational materials for empowering women and their caregivers, improving their awareness on intimate hygiene and dispelling misconceptions regarding some hygiene practices</p> <p>Interactive educational materials include</p> <ul style="list-style-type: none"> <li>Short videos and interactive lectures explaining menstrual cycle and vulvar itchiness</li> <li>Interactive educational materials include <ul style="list-style-type: none"> <li>Short videos and interactive lectures explaining menstrual cycle and vulvar itchiness</li> <li>Snippets on gynecological issues, designing cartoons and comic strips, and composing folk songs describing pubertal changes in women</li> <li>Using social media and designing dedicated webpages for directly addressing questions by women, designing interactive websites (designed by HCPs)</li> </ul> </li> </ul>

AEs: Adverse events, HCPs: Health-care practitioners

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### References

- Graziottin A, Murina F, Gambini D, Taraborrelli S, Gardella B, Campo M, *et al.* Vulvar pain: The revealing scenario of leading comorbidities in 1183 cases. *Eur J Obstet Gynecol Reprod Biol* 2020;252:50-5.
- Boeri L, Capogrosso P, Ventimiglia E, Scano R, Graziottin A, Dehò F, *et al.* Six out of ten women with recurrent urinary tract

- infections complain of distressful sexual dysfunction – A case-control study. *Sci Rep* 2017;7:44380.
3. Czerwinski BS. Variation in feminine hygiene practices as a function of age. *J Obstet Gynecol Neonatal Nurs* 2000;29:625-33.
  4. Bardin MG, Giraldo PC, Benet ti-Pinto CL, Sanches JM, Araujo CC, Amaral RL. Habits of genital hygiene and sexual activity among women with bacterial vaginosis and/or vulvovaginal candidiasis. *Rev Bras Ginecol Obstet* 2022;44:169-77.
  5. Donders GG, Ruban K, Donders F, Reybrouck R. Lab-based retrospective 10-year analysis shows seasonal variation of vaginal candida infection rates in Belgium. *J Clin Med* 2022;11:574.
  6. Ellis A, Haver J, Villasenor J, Parawan A, Venkatesh M, Freeman MC, et al. WASH Challenges to Girls' Menstrual Hygiene Management in Metro Manila, Masbate, and South-Central Mindanao, Philippines. Practical Action Publishing; 2016. Available from: <https://www.practicalactionpublishing.org>. [Last accessed on 2022 Jun 24].
  7. Navarro A, Sison JM, Puno R, Quizon T, Manio LJ, Gopez J, et al. Reducing the incidence of pregnancy-related urinary tract infection by improving the knowledge and preventive practices of pregnant women. *Eur J Obstet Gynecol Reprod Biol* 2019;241:88-93.
  8. Potokoué Mpia NS, Sékangué Obili G, Ossibi Ibara BR, Djendja Ingoba I, Buambo G, Gackosso G, et al. Vaginal candidiasis in women of childbearing age at the University Hospital of Brazzaville: Prevalence and associated factors. *Microbiol Infect Dis* 2021;5:1-5.
  9. Graziottin A, Gambini D. Evaluation of genito-pelvic pain/penetration disorder. In: IsHak WW, editor. *The Textbook of Clinical Sexual Medicine*. Cham: Springer International Publishing; 2017. p. 289-304.
  10. Mohamed HA, El-Nagger NS. Effect of self-perineal care instructions on episiotomy pain and wound healing of postpartum women. *J Am Sci* 2012;8:640-50.
  11. Graziottin A, Maseroli E. Sexual Pain Disorders, Vestibulodynia, and Recurrent Cystitis: The Evil Trio: A Clinical Conversation on the Uroandrological Perspective. In *Practical Clinical Andrology*. Cham: Springer International Publishing; 2022; p. 319-40.
  12. Graziottin A, Murina F, Gambini D, Boero E. The role of recurrent vulvovaginal candidiasis and comorbidities in the etiology of vestibulodynia: Data from the VuNet study. *J Gynecol Womens Health* 2021;22:556087.
  13. Nguyen JD, Duong H. Anatomy, abdomen and pelvis, female external genitalia. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2022. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK547703/>. [Last updated on 2021 Jul 31].
  14. Rapkin AJ, Lee M. Vulvar and Vaginal Pain, Dyspareunia, and Abnormal Vaginal Discharge. In *Female Urology*. WB Saunders; 2008; p. 857-876.
  15. Lucas EJ, Ching CB, Saraswat S, Dabdoub SM, Kumar PP, Justice SS. Acquisition, divergence, and personalization of the female perineal microbiomes are driven by developmental milestones and disrupted by urinary tract infection: A pilot study. *Front Pediatr* 2020;8:542413.
  16. Mboua Batoum V, Ngo Um Meka A, Essiben F, Robinson ME. Perineal body length and prevention of perineal lacerations during delivery in Cameroonian primigravid patients. *Int J Gynaecol Obstet* 2021;154:481-4.
  17. Vásquez A, Ahrn S, Jeppsson B, Molin G. Oral administration of *Lactobacillus* and bifidobacterium strains of intestinal and vaginal origin to healthy human females: Re-isolation from faeces and vagina. *Microb Ecol Health Dis* 2005;17:15-20.
  18. Chen Y, Bruning E, Rubino J, Eder SE. Role of female intimate hygiene in vulvovaginal health: Global hygiene practices and product usage. *Womens Health (Lond)* 2017;13:58-67.
  19. Pagan L, Ederveen RA, Huisman BW, Schoones JW, Zwittink RD, Schuren FH, et al. The human vulvar microbiome: A systematic review. *Microorganisms* 2021;9:2568.
  20. Hickey RJ, Zhou X, Settles ML, Erb J, Malone K, Hansmann MA, et al. Vaginal microbiota of adolescent girls prior to the onset of menarche resemble those of reproductive-age women. *mBio* 2015;6:e00097-15.
  21. Liu X, Zhuo Y, Zhou Y, Hu J, Wen H, Xiao C. Analysis of the vulvar skin microbiota in asymptomatic women and patients with vulvar lichen sclerosus based on 16S rRNA sequencing. *Front Cell Dev Biol* 2022;10:842031.
  22. Gupte P, Patil S, Pawaskar R. Vulvovaginal hygiene and care. *Indian J Sex Transm Dis* 2009;30:130-3.
  23. Felix TC, de Araújo LB, Röder DV, Pedroso RD. Evaluation of vulvovaginitis and hygiene habits of women attended in primary health care units of the family. *Int J Womens Health* 2020;12:49-57.
  24. Bhat D. The 'why and how' of cervical cancers and genital HPV infection. *Cytojournal* 2022;19:22.
  25. Abulizi G, Li H, Mijiti P, Abulimiti T, Cai J, Gao J, et al. Risk factors for human papillomavirus infection prevalent among Uyghur women from Xinjiang, China. *Oncotarget* 2017;8:97955-64.
  26. Graziottin A, Boero E. *Staphylococcus aureus* vulvitis: An insidious infection that stresses the importance of appropriate intimate hygiene. *Riv Ital Ostet Ginecol* 2021;1:99-106. Available from: <https://www.alessandragraziottin.it>. [Last accessed on 2022 Jun 24].
  27. Siccardi MA, Bordoni B. Anatomy, abdomen and pelvis, perineal body. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2022. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537345/>. [Last updated on 2021 Jul 26].
  28. Meštrović T, Matijašić M, Perić M, Čipčić Paljetak H, Barešić A, Verbanac D. The role of gut, vaginal, and urinary microbiome in urinary tract infections: From bench to bedside. *Diagnostics (Basel)* 2020;11:7.
  29. Graziottin A, Gambini D. Anatomy and physiology of genital organs – Women. *Handb Clin Neurol* 2015;130:39-60.
  30. Antonio MA, Rabe LK, Hillier SL. Colonization of the rectum by *Lactobacillus* species and decreased risk of bacterial vaginosis. *J Infect Dis* 2005;192:394-8.
  31. Zhang M, Liu B, Zhang Y, Wei H, Lei Y, Zhao L. Structural shifts of mucosa-associated *Lactobacilli* and *Clostridium leptum* subgroup in patients with ulcerative colitis. *J Clin Microbiol* 2007;45:496-500.
  32. Pereira LC, Correia AF, da Silva ZD, de Resende CN, Brandão F, Almeida RM, et al. Vulvovaginal candidiasis and current perspectives: New risk factors and laboratory diagnosis by using MALDI TOF for identifying species in primary infection and recurrence. *Eur J Clin Microbiol Infect Dis* 2021;40:1681-93.
  33. Ona S, James K, Ananthakrishnan A, Long M, Martin C, Chen W, et al. Prevalence of vulvovaginal discomfort in a cohort of women with inflammatory bowel disease. *Am J Obstet Gynecol* 2017;217:740.
  34. Schilling J, Loening-Baucke V, Dörffel Y. Increased *Gardnerella vaginalis* urogenital biofilm in inflammatory bowel disease. *J Crohns Colitis* 2014;8:543-9.
  35. Martinez-Medina M, Garcia-Gil LJ. *Escherichia coli* in chronic inflammatory bowel diseases: An update on adherent invasive *Escherichia coli* pathogenicity. *World J Gastrointest Pathophysiol* 2014;5:213-27.
  36. Josephs-Spaulding J, Krogh TJ, Rettig HC, Lyng M, Chkonia M, Waschina S, et al. Recurrent urinary tract infections: Unraveling the complicated environment of uncomplicated rUTIs. *Front Cell Infect Microbiol* 2021;11:562525.
  37. Sevil S, Kevser O, Aleattin U, Dilek A, Tijen N. An evaluation of the relationship between genital hygiene practices, genital infection. *Gynecol Obstet* 2013;3:1-5.
  38. Hamed AG. The impact of genital hygiene practices on the occurrence of vaginal infection and the development of a nursing fact sheet as prevention massage for vulnerable women. *IOSR J Nurs Health Sci* 2015;4:55-64.
  39. Othman Z, Buys L. Towards more culturally inclusive domestic toilet facilities in Australia. *Front Architec Res* 2016;5:383-91.

40. Lelie-van der Zande R, Koster ES, Teichert M, Bouvy ML. Womens' self-management skills for prevention and treatment of recurring urinary tract infection. *Int J Clin Pract* 2021;75:e14289.
41. Murina PF, Graziottin A, Bagot O, Panay N, Thamkhantho M, Shaw SW. Real-world practices and attitudes towards intimate self-care: Results from an international women's survey. *J Gynecol Obstet Hum Reprod* 2021;50:102192.
42. Majerovich JA, Canty A, Miedema B. Chronic vulvar irritation: Could toilet paper be the culprit? *Can Fam Physician* 2010;56:350-2.
43. Foote CA, Brady SP, Brady KL, Clark NS, Mercurio MG. Vulvar dermatitis from allergy to moist flushable wipes. *J Low Genit Tract Dis* 2014;18:E16-8.
44. Amiri FN, Rooshan MH, Ahmady MH, Soliamani MJ. Hygiene practices and sexual activity associated with urinary tract infection in pregnant women. *East Mediterr Health J* 2009;15:104-10.
45. Sustr V, Foesselitner P, Kiss H, Farr A. Vulvovaginal candidosis: Current concepts, challenges and perspectives. *J Fungi (Basel)* 2020;6:267.
46. Guzel AB, Ilkit M, Akar T, Burgut R, Demir SC. Evaluation of risk factors in patients with vulvovaginal candidiasis and the value of chromID candida agar versus CHROMagar candida for recovery and presumptive identification of vaginal yeast species. *Med Mycol* 2011;49:16-25.
47. Personal Hygiene During Pregnancy. *Obstetric and Newborn Care I*. Available from: [https://www.brooksidepress.org/ob\\_newborn\\_care\\_1/?page\\_id=395](https://www.brooksidepress.org/ob_newborn_care_1/?page_id=395). [Last accessed on 2022 Jun 24].
48. Hastings-Tolsma M, Bernard R, Brody MG, Hensley J, Koschorek K, Patterson E. Chorioamnionitis: Prevention and management. *MCN Am J Matern Child Nurs* 2013;38:206-12.
49. Roper JC, Amber N, Wan OY, Sultan AH, Thakar R. Review of available national guidelines for obstetric anal sphincter injury. *Int Urogynecol J* 2020;31:2247-59.
50. Karageorgi S, Gates MA, Hankinson SE, De Vivo I. Perineal use of talcum powder and endometrial cancer risk. *Cancer Epidemiol Biomarkers Prev* 2010;19:1269-75.
51. Steffen JE, Tran T, Yimam M, Clancy KM, Bird TB, Rigler M, et al. Serous ovarian cancer caused by exposure to asbestos and fibrous talc in cosmetic talc powders-a case series. *J Occup Environ Med* 2020;62:e65-77.
52. Woolen SA, Lazar AA, Smith-Bindman R. Association between the frequent use of perineal talcum powder products and ovarian cancer: A systematic review and meta-analysis. *J Gen Intern Med* 2022;37:2526-32.
53. Rouzi AA, Berg RC, Turkistani J, Alamoudi R, Alsinani N, Alkafy S, et al. Practices and complications of pubic hair removal among Saudi women. *BMC Womens Health* 2018;18:172.
54. Gentile S, Guarino G, Della Corte T, Satta E, Picicelli AM, Romano C, et al. Genital infection risk profile in post-menopausal women with type 2 diabetes mellitus on sodium-glucose cotransporter-2 (SGLT2) inhibitors. *Acta Sci Med Sci* 2022;6:292-313.
55. Graziottin A. The vagina: Clinical questions and unmet therapeutic needs. *Italian Rev Obstet Gynecol* 2021;2:7-10. Available from: [https://www.alessandragraziottin.it/en/a\\_scientific\\_update.php/The-vagina-clinical-questions-and-unfulfilled-therapeutic-needs?ID=31377](https://www.alessandragraziottin.it/en/a_scientific_update.php/The-vagina-clinical-questions-and-unfulfilled-therapeutic-needs?ID=31377). [Last accessed on 2022 Jun 24].
56. Auriemma RS, Sciarati R, Del Vecchio G, Liccardi A, Verde N, Pirchio R, et al. The vaginal microbiome: A long urogenital colonization throughout woman life. *Front Cell Infect Microbiol* 2021;11:686167.
57. MacIntyre DA, Chandiramani M, Lee YS, Kindinger L, Smith A, Angelopoulos N, et al. The vaginal microbiome during pregnancy and the postpartum period in a European population. *Sci Rep* 2015;5:8988.
58. Kaur H, Merchant M, Haque MM, Mande SS. Crosstalk between female gonadal hormones and vaginal microbiota across various phases of women's gynecological lifecycle. *Front Microbiol* 2020;11:551.
59. Agana MG, Ryali B, Patel DR. Vulvovaginitis in adolescents. *Pediatr Med* 2019;2:53.
60. Krog MC, Hugerth LW, Fransson E, Bashir Z, Nyboe Andersen A, Edfeldt G, et al. The healthy female microbiome across body sites: Effect of hormonal contraceptives and the menstrual cycle. *Hum Reprod* 2022;37:1525-43.
61. Nunn KL, Witkin SS, Schneider GM, Boester A, Nasioudis D, Minis E, et al. Changes in the vaginal microbiome during the pregnancy to postpartum transition. *Reprod Sci* 2021;28:1996-2005.
62. Kwak YK, Daroczy K, Colque P, Kühn I, Möllby R, Kopp Kallner H. Persistence of *Lactobacilli* in postmenopausal women – A double-blind, randomized, pilot study. *Gynecol Obstet Invest* 2017;82:144-50.
63. Drummond J, Ford D, Daniel S, Meyerink T. Vulvodynia and irritable bowel syndrome treated with an elimination diet: A case report. *Integr Med (Encinitas)* 2016;15:42-7.
64. Riedewald S, Kreutzmann IM, Heinze T, Saling E. Vaginal and cervical pH in normal pregnancy and pregnancy complicated by preterm labor. *J Perinat Med* 1990;18:181-6.
65. Valenti P, Rosa L, Capobianco D, Lepanto MS, Schiavi E, Cutone A, et al. Role of *Lactobacilli* and lactoferrin in the mucosal cervicovaginal defense. *Front Immunol* 2018;9:376.
66. Cribby S, Taylor M, Reid G. Vaginal microbiota and the use of probiotics. *Interdiscip Perspect Infect Dis* 2008;2008:256490.
67. Leccese Terraf MC, Juárez Tomás MS, Rault L, Le Loir Y, Even S, Nader-Macías ME. Biofilms of vaginal *Lactobacillus reuteri* CRL 1324 and *Lactobacillus rhamnosus* CRL 1332: Kinetics of formation and matrix characterization. *Arch Microbiol* 2016;198:689-700.
68. Tytgat HL, Nobrega FL, van der Oost J, de Vos WM. Bowel biofilms: Tipping points between a healthy and compromised gut? *Trends Microbiol* 2019;27:17-25.
69. Graziottin A, Zanello PP. Pathogenic biofilms: Their role in recurrent cystitis and vaginitis (with focus on D-mannose as a new prophylactic strategy) In: Studd J, Seang LT, Chervenak FA, editors. *Current Progress in Obstetrics and Gynaecology*. 2<sup>nd</sup> ed., Vol. 3. Mumbai: Kothari Medical; 2015. p. 218-38.
70. Rodríguez-Cerdeira C, Gregorio MC, Molares-Vila A, López-Barcenas A, Fabbrocini G, Bardhi B, et al. Biofilms and vulvovaginal candidiasis. *Colloids Surf B Biointerfaces* 2019;174:110-25.
71. Srinivasan S, Morgan MT, Fiedler TL, Djukovic D, Hoffman NG, Raftery D, et al. Metabolic signatures of bacterial vaginosis. *mBio* 2015;6:e00204-15.
72. Adolfsson A, Hagander A, Mahjoubipour F, Larsson PG. How vaginal infections impact women's everyday life – Women's lived experiences of bacterial vaginosis and recurrent vulvovaginal candidiasis. *Adv Sex Med* 2017;7:1-19.
73. Leo DV, Benvenuti C. Pharmacological, microbiological and clinical activity of feminine intimate cleansers based on plant extracts active principles (Saugella line). *J Womens Health Care* 2015;4:4.
74. Bruning E, Chen Y, McCue KA, Rubino JR, Wilkinson JE, Brown AD. A 28 day clinical assessment of a lactic acid-containing antimicrobial intimate gel wash formulation on skin tolerance and impact on the vulvar microbiome. *Antibiotics (Basel)* 2020;9:55.
75. Yoshikata R, Yamaguchi M, Mase Y, Tatsuyuki A, Myint KZ, Ohta H. Evaluation of the efficacy of *Lactobacillus*-containing feminine hygiene products on vaginal microbiome and genitourinary symptoms in pre- and postmenopausal women: A pilot randomized controlled trial. *PLoS One* 2022;17:e0270242.
76. Murina F, Lubrano C, Cappelli E, Campo M, Taraborrelli S. The role of female intimate hygiene practices in the management of vulvovaginal candidiasis: A randomized, controlled open-label trial. *Health Care Women Int* 2023;44:689-700.
77. Hayes L. Prepubertal vaginal discharge. *Obstetrician Gynaecologist* 2007;9:159-63.

78. Durnin S. IAEM Clinical Guideline Vulvovaginitis: Diagnosis and Management in Prepubertal Girls. Available from: <https://www.iaem.ie/wp-content/uploads/2019/04/IAEM-CG-Vulvovaginitis.pdf>. [Last accessed on 2022 Jun 20].
79. Chandra-Mouli V, Patel SV. Mapping the knowledge and understanding of menarche, menstrual hygiene and menstrual health among adolescent girls in low- and middle-income countries. *Reprod Health* 2017;14:30.
80. Mengesha ZB, Perz J, Dune T, Ussher J. Preparedness of health care professionals for delivering sexual and reproductive health care to refugee and migrant women: A mixed methods study. *Int J Environ Res Public Health* 2018;15:174.
81. Ghouri F, Hollywood A, Ryan K. Urinary tract infections and antibiotic use in pregnancy – Qualitative analysis of online forum content. *BMC Pregnancy Childbirth* 2019;19:289.
82. Abdul-Aziz M, Mahdy MA, Abdul-Ghani R, Alhilali NA, Al-Mujahed LK, Alabsi SA, *et al.* Bacterial vaginosis, vulvovaginal candidiasis and trichomonal vaginitis among reproductive-aged women seeking primary healthcare in Sana'a city, Yemen. *BMC Infect Dis* 2019;19:879.
83. Naumova I, Castelo-Branco C. Current treatment options for postmenopausal vaginal atrophy. *Int J Womens Health* 2018;10:387-95.
84. Kingston A. The postmenopausal vulva. *Obstetrician Gynaecologist* 2009;11:253-59.
85. Gandhi AB, Madnani N, Thobbi V, Vora P, Seth S, Shah P. Intimate hygiene for women: expert practice points. *Int J Reprod Contracept Obstet Gynecol* 2022;11:2315.