

The increased use of medicinal plants necessitates guidance on issues relating to normal flora

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ABSTRACT

The use of medicinal plants has increased tremendously and that has led to the scientific interest for testing this plant for toxicity and antimicrobial activity. The manuscript used a comprehensive literature search from databases such as PubMed, Google Scholar, and ScienceDirect to identify relevant studies published within the last five years (2018-2023) and selectively those beyond that provide the necessary background to the article. The literature analysis found a huge scientific progress made and a lot of plants have been tested for safe use and antimicrobial resistance using the different microorganisms. Nonetheless, the article also highlights the possible hormonal effect or microbiota imbalance which could be attributed to these medical plants being used without proper guidance among our population. Age wise on patients, any prolonged use of these medicinal plants may have devastating effects as such this article advocates for a thorough understanding of the normal flora when communities are treated at home by traditional healers.

Keywords: Normal flora, Human microbiome, Medicinal plants, Antibiotics impact on microbiome, Toxicity of medicinal plants

Introduction

The typical flora of the human body is a diverse range of microorganisms that coexist in a complex ecosystem. These microorganisms, which live on and within different bodily parts and have symbiotic relationships with their human hosts, include bacteria, fungi, and viruses. The natural flora starts to colonize various bodily areas as soon as the baby is born, serving important functions in promoting health, facilitating digestion, and warding off infections.

Throughout a person's lifetime, the normal flora changes in composition according to various stages that are impacted by age, nutrition, environment, and lifestyle. Infants pick up their first

microbiological colony during birth, and there are notable distinctions between vaginally delivered babies and those delivered via cesarean section [1]. The richness and diversity of an individual's microbiota increase with age, reaching a peak in maturity and finally beginning to decline with advanced age [2]. Different microbiological communities are found in different areas of the human body as shown in **Figure 1**. Numerous microbial species are supported by the skin due to its diverse habitats, which range from oily to dry [3]. Bacteria are abundant in the gastrointestinal tract, especially the colon, and are vital for both digestion and the synthesis of important vitamins [4]. The oral cavity, urogenital tract, and respiratory tract each have unique microbial communities that support the equilibrium and general health of the human microbiome [5].

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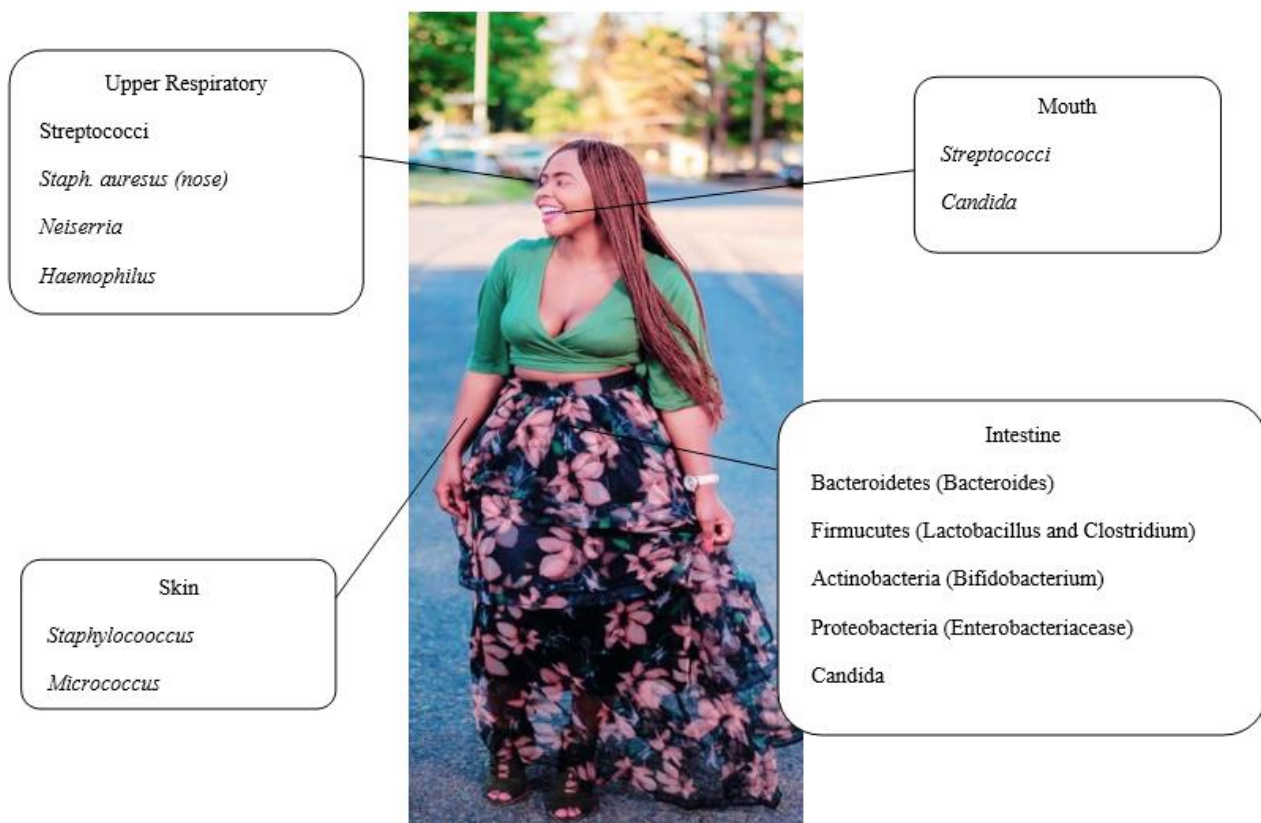


Figure 1. Locations of the normal flora [6]

The natural flora is not merely a passive inhabitant; rather, it actively contributes to both health and illness. The composition of the microbiota can be greatly impacted by the use of drugs, especially antibiotics, sometimes with unforeseen consequences. Antibiotics can cause problems like antibiotic-associated diarrhoea or an overgrowth of opportunistic infections like *Clostridium difficile* by upsetting the delicate balance of the natural flora [7]. It is crucial to comprehend the intricate relationships that exist between pharmaceutical medicines and the normal flora while creating plans to reduce side effects and advance ideal wellness.

Understanding the normal flora distinctions between men and women is important as some organisms protect the inhabitant differently from both genders. Age, nutrition, environment, and sex are some of the variables that affect an individual's typical microbiota, or flora, in the human body. The microbial communities of men and women differ, especially in places where hormonal and structural variations are present. An outline of the typical flora in men and women, both common and unique, is provided below.

For example, a typical Common flora in men and women based on **Figure 1** will be as follows: Skin mostly includes the following organisms *Corynebacterium* species; *Micrococcus* species; *Propionibacterium acnes* (*Cutibacterium acnes*); and *Staphylococcus epidermidis*. The oral cavity is mostly predominated by the following bacteria, *Streptococcus* species, such as *Streptococcus salivarius* and *Streptococcus mutans*, *Veillonella* species; *Neisseria* species; *Lactobacillus* species. The gastrointestinal tract is a natural inhabitant of Firmicutes (e.g., *Lactobacillus*,

Clostridium species), *Bacteroides* species, and certain types of *Bifidobacterium* and *Escherichia coli*.

It is also important to know there exists microbiota between Men and Women. Looking at the skin even though the core microbiota are similar, hormonal differences can influence the abundance and distribution of skin microbes. For example, higher levels of androgens in men can increase sebaceous gland activity, influencing the prevalence of *Propionibacterium acnes* [3]. With obvious urogenital tract, when looking at the men, the urethra is inhabited by *Corynebacterium* species, *Staphylococcus* species (e.g., *Staphylococcus epidermidis*), *Streptococcus* species and *Mycoplasma* species (less common, if found predominant in a specimen it can be pathogenic) [5]. While in women the vagina is colonized by *Lactobacillus* species (dominant, crucial for maintaining acidic pH), *Gardnerella vaginalis* (can be part of normal flora but associated with bacterial vaginosis if overgrown), *Candida* species (part of normal flora, but overgrowth can cause yeast infections), *Streptococcus agalactiae* (Group B *Streptococcus*) and *Prevotella* species [4, 5]. The urinary tract which is also obvious between the two genders needs a better understanding regarding the normal flora. The urinary microbiota in both men and women is less well-characterized compared to other body sites but is known to include a diverse array of bacteria, with some differences due to anatomical variations. For example, women are more prone to urinary tract infections due to the shorter urethra and closer proximity to the anus, which may influence the microbial populations [1].

The purpose of this article research is to encourage a clear scientific understanding of when medicinal plants are tested and

reported. While many microbial species are common across both sexes, significant differences exist, particularly in areas influenced by hormonal and anatomical variations such as the skin and urogenital tract. These differences underscore the importance of considering sex-specific factors in studies of the human microbiome and its implications for health and disease. Medicinal plants are being employed more and more in addition to medications because of their impact on the natural flora and therapeutic benefits. Depending on how they are used, certain plant chemicals with antibacterial qualities may change the microbiome and present either advantages or disadvantages [8]. Herbal medicines like garlic and turmeric, for instance, can affect the microbial makeup and either promote or inhibit the growth of good bacteria [9].

Materials and Methods

In this article, we utilized a comprehensive literature review approach to examine the normal flora of the human body, the normal flora of different body parts, and the implications of drug use, including medicinal plants, on these microbial communities. The methodology comprised the following steps:

Article search and selection

We conducted extensive searches using academic databases such as PubMed, Google Scholar, and ScienceDirect to identify relevant studies published within the last five years (2018-2023), and a proper background was found in articles published in the early 2000s. Keywords used included "normal flora," "human microbiome," "medicinal plants," "antibiotics impact on microbiome," and "toxicity of medicinal plants." Articles were selected based on their relevance to the topics of normal flora composition, stages of microbiota development, regional microbial communities in the human body, and the impact of drugs and medicinal plants on the microbiome. Priority was given to peer-reviewed journal articles, systematic reviews, and meta-analyses to ensure the inclusion of high-quality and reliable data.

Data extraction and analysis

Information was extracted from the selected articles concerning the diversity of microbial communities in different body parts, and the impact of pharmacological agents and medicinal plants on these communities. Specific attention was paid to studies that investigated the antimicrobial properties of medicinal plants and their effects on both pathogenic and beneficial bacteria known to be part of the normal flora.

Synthesis of findings

The extracted data were synthesized to provide a coherent narrative on the normal flora, highlighting the dynamic nature of microbial colonization on both sexes. We analyzed and discussed the dual impact of medicinal plants, noting their beneficial

antimicrobial properties as well as their potential toxicity to normal flora organisms.

Results and Discussion

The effect of therapeutic plants on natural flora could be a potential hazard if administered without a better understanding of the normal flora. Because of their natural origins and therapeutic benefits, the usage of medicinal plants has increased dramatically. It's important to realize, though, that these plants might affect the typical flora in different ways. Some studies have shown that these plants can be harmful to beneficial microbes that are a part of the human microbiome.

Studies have indicated that specific plant extracts possess antibacterial characteristics that have the potential to upset the natural flora's equilibrium. For example, *Allium sativum* (garlic) extracts were examined for their effects on several bacterial species, such as *Lactobacillus acidophilus* and *Bifidobacterium bifidum*, which are significant members of the gut microbiota, in a study conducted [10]. In greater quantities, garlic showed inhibitory activity against these beneficial gut bacteria, even while it had robust antibacterial activities against pathogenic bacteria [10].

In a similar vein, the antibacterial qualities of *Curcuma longa*, or turmeric, have been the subject of much research. Although curcumin, an ingredient in turmeric, has anti-inflammatory and antibacterial properties, studies have shown that it may be harmful to some members of the natural flora. According to Villa-Rodríguez *et al.* (2018), the growth of beneficial microbes like *Lactobacillus rhamnosus* and common gut bacteria *Escherichia coli* can be inhibited by turmeric essential oil [9]. According to Villa-Rodríguez *et al.* (2018), these results emphasize the importance of carefully weighing dosage and delivery strategies to prevent upsetting the beneficial microbial communities [9]. Moreover, *Moringa oleifera* leaf extracts' antibacterial activity was examined in a study conducted [11]. The extracts were effective against pathogenic strains like *Staphylococcus aureus* and *Pseudomonas aeruginosa*, but they also showed toxicity towards typical flora bacteria like *Staphylococcus epidermidis*, a common resident of the skin microbiome. Concerns over the unexpected effects of utilizing such plant extracts carelessly are raised by this dual action [11].

The significance of comprehending the wider ramifications of employing therapeutic plants is highlighted by these investigations. Their impact on regular flora can have unforeseen repercussions and can upset the delicate microbial balance that is essential for preserving human health, even if they offer valuable antibacterial qualities. Subsequent investigations ought to concentrate on maximizing the application of therapeutic plants to maximize their advantages and minimize any negative impacts on the native flora.

The use of medicinal plants continued to increase globally due to the deteriorating global economy which favoured recessions and unemployment. More than 80% of the world population resorted to herbal medicine as primary health care and home

remedies for various health challenges [12-15]. The use of medicinal plants is also encouraged by the ethical freedom of choice where patients can utilize any form of treatment and herbal medicine is easily accessible, culture-driven, and informal trust from relatives or friends on plant referral [16].

COVID-19 also contributed to the interest in the use of herbal medicine because the majority of people responded to curfew rules and regulations imposed at that time and with fear of contracting the diseases the doctors all resorted to the quick and accessible medicinal plants. Some factors attributed to these resurgences include trust in the herbalists, denial of the Western diagnosis outcomes, the wrong belief that traditional medicine is superior to alternative agents, and high costs and possible side effects associated with them [17].

Even though most countries are starting to introduce these products made from herbal medicine manufactured from portions of plants or plant extracts not pure containing several elements that are often commonly thought to work together synergistically some might contain toxins [18]. The Scientific methods and reports from various studies have shown efficacy, toxicity, cytotoxicity, and genotoxicity which cannot be proven while following home remedies [18, 19]. Studies have shown the importance of herbal medicine as an antimicrobial agent against both gram-negative and gram-positive [20-22]. However, one needs to understand what the antimicrobial results say about the issue of the normal flora. Normal flora are essential components of protection and survival due to their territorial protection against other invading organisms.

The organisms tested and reported by the different studies may be organisms that are classified as normal flora. For example, the inhibitory effect of herbal medicine against *Staphylococcus epidermidis* and *Enterococcus faecalis* may have negative benefits if the reported plants are used without proper knowledge which could destroy the normal flora.

Unless the patient could be immune-compromised such that the normal flora turned out to be an opportunistic infection and that also necessitates the laboratory diagnosis to establish the extent of the infection to avoid the development of drug resistance species. The increases in the use of medicinal plants should be practiced with precaution and the identification of antimicrobial agents from a medicinal plant through scientific research should not be misused by herbalists without understanding the normal flora [12, 23].

In combating this vigorously growing herbal practice mostly done at home unregulated, all countries need to contribute to the development of international standard guidelines for herbal medicine to be incorporated in the national drug regulatory framework to know the dose and to safeguard against inhibiting the normal flora [23].

Conclusion

Based on the reviewed literature, conclusions can be drawn regarding the delicate balance of the normal flora and the need for cautious use of medicinal plants to avoid unintended

disruptions to beneficial microbial communities. It is recommended that future research optimize the use of medicinal plants while preserving the integrity of the normal flora. The chosen methodology ensured that the conclusions drawn in this article are based on a thorough analysis of existing scientific literature, reflecting current understanding and research findings rather than original experimental data.

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