Acne Vulgaris:
Causes, Consequences and Potential Treatment

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Introduction

Acne vulgaris, also known as acne or red spots, is the most common skin disease worldwide. It is a chronic inflammatory disease involving the pilosebaceous unit of the skin, which includes a hair follicle and sebaceous gland. Acne is recognizable as spots or lesions on the skin, including both non-inflammatory (blackheads and whiteheads) and inflammatory lesions (papules, pustules, nodules and cysts).

Although acne can occur on other parts of the body, including the chest, back, shoulders and upper arms, it most commonly affects the face and neck. Scarring due to acne is very common, and the duration of acne has been shown to correlate with the scarring process, supporting the use of products that reduce the likelihood of acne and prevent new lesions from developing. Depending on the lesion type and the severity of acne, different preventative or treatment methods may be required.

There are four main factors implicated in the development of acne.

1. Sebum (grease) production by the sebaceous gland, which is mediated by androgen hormones around puberty;
2. Proliferation of skin cells within the hair follicle, which block the follicle and results in non-inflammatory lesions;
3. Clinically, proliferation of Propionibacterium acnes (P. acnes) within the pilosebaceous duct, which contributes to visible inflammation.
4. Inflammation which may be subclinical evident early in acne development prior to the presence of P. acnes or visible inflammation triggered at least to some degree by P. acnes.

Although the physical effects of acne may be limited to the skin, people who are affected can also suffer from significant emotional and psychological issues comparable to the psychosocial impact of some major chronic medical conditions such as asthma, diabetes, epilepsy and arthritis. These issues may be a result of the acne itself as well as scarring. Costs, both direct (financial) and indirect (e.g., impact of disease on employment opportunities or loss of time due to acne treatment) can also be a significant burden.

Thus, it would be ideal to identify mechanisms for affordable prevention and control. Adopting good skin care, such as skin cleansing, along with additional acne management can be beneficial during the earlier stages of acne development.

Prevalence

Acne is the most common skin disease globally. In the United States, nearly 85 percent of people will be affected by acne, and the disease represents the most frequent skin disease across all ethnic groups. In rural Yucatan, Mexico, acne was one of the most common skin diseases diagnosed in dermatology clinics. In Pakistan, 20 percent of patient visits to dermatology clinics were attributed to acne.

Pre-pubertal acne can start as early as age 8, but onset of acne usually occurs during puberty. By age 15-17, most adolescents have experienced some degree of acne. In China, acne is one of the most common adolescent health issues. In a community-based survey in Hong Kong, the prevalence of self-reported acne among those 15 to 25 years of age was 91.3 percent. In the United States, more than 40 percent of adolescents have acne or acne scarring that requires treatment by a dermatologist. In a study of female students from Pakistan, ranging in age from 16 to 24 years, acne was the most common skin disease diagnosed. Among Nigerian students, 97.1 percent of those age 17-19 years were diagnosed with acne.
Data from studies across the globe show that acne may be more prevalent among adolescent males than adolescent females. For example, in a Chinese community-based study, acne was more prevalent in males among study subjects in their late teenage years and into their 20’s. A large survey in the U.K. also showed that facial acne was more prevalent in adolescent males than in females at age 18. The severity of acne may also increase in male adolescents (see below for more on acne severity under Pathogenesis).

Acne can persist throughout adulthood and may affect adult women more than adult men. Beyond the age of 20-30 years, data from China and the U.K. show that acne appears to become more prevalent in women. The U.K. survey showed that 3 percent of men and 5 percent of women aged 40-49 years had acne, and this increased to 6 percent of men and 8 percent of women aged 50-59 years. The American Academy of Dermatology states an increasing number of women over the age of 30 have acne, but the causes are unclear.

**Emotional and psychological effects**

Although acne is a skin disease, it can lead to far-reaching emotional and psychological issues. Studies have demonstrated that acne can affect a person’s quality of life, self-esteem and mood. These issues may be exacerbated by facial scarring, which affects many acne patients. Scarring from all lesion types can occur early in the course of the disease and can lead to long-term self-esteem issues. In the first study to investigate psychological issues associated with acne, the authors noted, “There is probably no single disease which causes more psychic trauma, more maladjustment between parents and children, more general insecurity and feeling of inferiority and greater sums of psychic suffering than does acne vulgaris.”

Rates of depression appear to be higher among those with acne than those without. According to a survey of students in New Zealand, adolescents with acne were at increased risk of anxiety and depression, as well as suicide attempts. In fact, a retrospective study in the United States showed that people with acne were diagnosed with clinical depression two to three times more frequently than the general population, with a reported prevalence of 8.8 percent. A study of dermatology patients in Iran indicated a clinical depression rate of 47.4 percent among those with acne.

The overall psychological impact resulting from acne can be similar to those resulting from other chronic diseases, including diabetes, cancer, epilepsy, asthma and arthritis. Studies of adolescents in Turkey, Pakistan and the United States found that acne is correlated with anxiety, depression, lower body satisfaction and lower self-esteem. Acne may affect men and women differently. For example, in a U.K. study acne was found to be correlated with a higher degree of self-consciousness and more negative self-concept in women than in men. However, a U.S. study found acne to be correlated to poorer social outcomes and quality of life for both genders, particularly in severe cases.

Two studies, from Canada and Pakistan, showed that acne coinciding with puberty can exacerbate body image, self-esteem and other emotional issues. Emotional and psychological effects reported in these studies included the following:

- Social withdrawal
- Decreased self-esteem
- Reduced self-confidence
- Poor body image
- Embarrassment
- Depression
- Feelings of depression
- Anger
- Preoccupation
- Frustration
Similarly, a large survey conducted in the U.K. revealed that acne has a negative effect on the lives of teenagers and young adults, affecting both their confidence and self-esteem. Nearly half of the adolescents surveyed indicated that acne was the most difficult aspect of puberty. This perception by adolescents was supported by findings from the same survey that adolescents without acne were most often perceived by other adolescents and adults as confident and intelligent, whereas photos of the same adolescents with acne were labeled shy, nerdy and lonely. These results indicate that acne may potentially impact an adolescent’s social and academic opportunities. Illustrating these emotional and psychological effects, below are quotes from the U.K. survey:

- “I just want to be accepted at school, but I have really bad spots and get teased all the time.”
- “I spent six years being bullied at school because I had spots.”
- “At school, my mates made jokes about my spots and pockmarks. I thought it would go away when I got to work, but people still look at me as if I’m dirty.”
- “I want to hide away as my acne is so vile.”
- “My acne makes me feel disgusting.”
- “When my acne is bad, I can’t face anything.”
- “I blame my acne for everything.”

### Pathogenesis

Bacteria appear to play a critical role in the pathogenesis of acne, as described above. Formation of acne occurs in a stepwise fashion, beginning with sebum production by the sebaceous gland in response to androgen hormones, leading to proliferation of skin cells and, finally, accumulation of *P. acnes* within the pilosebaceous duct. *P. acnes* are normally present on the surface of the skin, however, the combination of dead skin cells and excess sebum creates an ideal environment for *P. acnes* to proliferate. As a result of a number of inflammatory events, the pore becomes inflamed and appears red and swollen.

Much remains to be learned about the exact role of *P. acnes* in the development of acne, but it is clearly implicated in the disease process. This is supported by the fact that treatment with antibiotics that reduce *P. acnes* result in acne improvement and the fact that presence of antibiotic resistant *P. acnes* may be associated with reduced efficacy to antibiotics.

There are several classic lesion types observed in people with acne, both non-inflammatory and inflammatory. These lesions correlate with the pathophysiology of acne.

- Comedones (non-inflammatory lesions): Comedones can be either blackheads or whiteheads. Blackheads are pores filled with sebum, dead skin cells and bacteria and are open at the surface. Whiteheads are similar, except they are closed at the surface.
- Papules and pustules (inflammatory lesions): Papules are small raised bumps on the skin that are less than 5 mm in diameter and indicate inflammation within the pore. Pustules are similar to papules but contain a visible white center of pus reflecting an inflammatory response.
- Nodules (inflammatory lesions): Nodules are solid and painful lumps that are greater than 5 mm in diameter.
Acne can also be classified based on severity. One classification describes acne as mild, moderate or severe, depending on the number and type of lesions.5

- Mild acne: Lesion count is fewer than 20 comedones, 15 inflammatory lesions or 30 total;
- Moderate acne: Lesion count is between 20-100 comedones, 15-50 inflammatory lesions or 30-125 total lesions;
- Severe acne: Lesion count is more than five nodules, 50 inflammatory lesions or 125 total lesions.

Although facial acne is most common, acne can also occur on the back and chest, which is referred to as truncal acne. In a study of dermatology patients in the United States, half of those with facial acne also had truncal acne.46 Nearly a quarter of the patients in the study (22.4 percent) complained only of facial acne but were found to also have truncal acne when examined by the dermatologist, indicating a substantial proportion of patients may not be aware of truncal acne.46
Development of acne may be triggered by hormonal changes that increase sebum production. The changes can be related to puberty, menstruation, pregnancy, birth control pills or stress. For adolescent acne, increase in androgen hormone secretion is considered to be the major trigger.

Genetic factors may also play a role. A study in the U.K. of more than 1500 pairs of twins showed a strong genetic basis for the development of acne. Furthermore, a study in China involving nearly 5000 people showed that the risk of acne was significantly greater in a first-degree relative of a person with acne than it was for a first-degree relative of a person who was not affected by acne.

External factors are important contributors to the pathogenesis of acne. Greasy or oily cosmetic products, high humidity and sweating may all trigger the development of acne. Certain drugs, such as steroids, testosterone, and phenytoin may also act as triggers. The role of diet remains under debate, and potential dietary factors that may contribute to acne pathogenesis are currently being investigated.

Role of good skin care and antimicrobial ingredients

Good skin care can play an important role as part of a complete acne regimen and may contribute to reducing acne lesions. Examples of beneficial measures include using non-comedogenic skin products and avoiding irritation of the skin or picking at acne. Regular cleansing of the skin can help maintain clear pores and prevent the accumulation of dead skin cells and excess surface sebum.

Regular face washing may help remove surface bacteria from the skin, and facial soap with antimicrobial ingredients may provide some benefit. Safeguard DermaSense bar soap, contains an antimicrobial ingredient that may reduce the levels of skin bacteria, as well as inhibit the re-growth of bacteria up to 24 hours. In a study of adolescents age 9-18 years with mild to moderate facial acne, regular face washing twice a day for 8 weeks with Safeguard DermaSense bar soap was said to reduce acne in 89 percent. The soap is available without a prescription and could potentially be added to a person’s daily skin care routine. Further investigations will clarify the mechanism by which soap supports an effective acne regimen. Suffice it to say that the regular use of a well-tolerated antimicrobial soap is an accessible and affordable means of approaching acne care.

If acne appears or worsens, cleansing with soap may help as part of a complete acne regimen but may not prevent or resolve the acne. In these cases, a person may need to use over-the-counter treatments or consult a dermatologist for prescription medication. However, costs of these treatments, as well as the time taken to apply the treatments and visit a dermatologist, can add up. Thus, optimizing a cleansing regimen with regular use of an antimicrobial soap may be considered as a starting point. In 2004, the cost associated with acne treatment exceeded USD 2.2 billion, including substantial costs for over-the-counter and prescription treatments.

Conclusion

Given the potential long-term physical (e.g., scarring), emotional and psychological effects of acne, as well as the immediate financial and time costs, it is desirable to limit acne to its earlier stages and aim to treat it during those stages. A well-tolerated antimicrobial soap may reduce levels of skin bacteria and could have a role to play as part of an overall acne management strategy.
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References
