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Acne: An understanding of the disease and its impact on life

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Abstract

Acne is one of the most common skin diseases affecting majority of the teens and reaching its pinnacle during adulthood. In certain severe cases, it mounts to pronounced skin deformity. This appears to adversely dampen the self esteem of the affected which can eventually lead to depression and even suicides. The disease invariably diminishes in twenties but in some cases, it might even persist in thirties, forties and beyond and there is no such definite way to predict its spell. Majority of females suffer from mild to moderate acne at some stage of life. Although the pathogenesis still stands unknown, but some of the probable reasons could be: increased sebum production, ductal keratinization, bacterial colonization of the pilosebaceus ducts and inflammation. Effective approach towards the treatment of acne primarily rests on thorough understanding of its pathogenesis. An indispensable factor demanding consideration for its treatment is personal and family history. Apart from genetic makeup, food habits also affect the severity of the disease. This review will lay emphasis on a brief disease pathogenesis underlined in the very disease and its impact on life.

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Introduction

Acne vulgaris is a human skin disease characterized by areas of seborrhea (red scaly skin), comedones (blackheads and whiteheads), papules, pustules, nodules and probably scarring[1]. Acne affects the skin regions with the densest sebaceous follicles populations which include face, upper part of chest and the back. Severe acne is marked by inflammation

but it can also manifest in non-inflammatory state in moderate cases[1,2]. The disease is supposed to be associated with anxiety and depression resulting in social disunion[3]. Hair follicles can be inflamed, especially on the face, chest and back. This inflammation is called acne. Acne affects many individuals, especially in their teens, but can persist well into adulthood. Acne is marked by excess oil production by hair follicles, when the follicles are irritated and when the pores get plugged which leads to (opening of the follicle) leads to increased bacteria in the follicles.

According to W.H.O: Acne is an inflammatory disease of the pilosebaceous units in the skin of the face, neck, chest and upper back. It initially appears during the onset of puberty at the time when androgenic stimulation triggers excessive production of sebum and abnormal follicular keratinization, colonization by a Gram-positive bacterium *(Propionibacterium acnes)* and local inflammation. *P. acne* produces inflammation through the production of extracellular products such as lipases, proteases, hyaluronidases and chemotactic factors[4].

Types of Acne

- Mild acne—this includes **whiteheads** (closed clogged pores) and **blackheads** (clogged pores that are open at the skin surface and more easily noticeable).
- Moderate or severe inflammatory acne includes whiteheads and blackheads plus **papules** (reddened areas that are elevated above the skin surface) and areas of **pustules** (pimples—small bumps on the skin that contain visible fluid).
- Nodulocystic acne—**nodules** are deeply embedded solid, often painful lesions. These may develop additional infections and may eventually lead to scarring if not treated. Nodules can be greater than 5 mm in diameter.

Pathogenesis

The pathogenesis of *Acne vulgaris* is multifactorial, while the key factor is genetics[5]. If both parents had acne, 75% of children will have acne. If 1 parent had acne, then the probability becomes 25%. However, similar to other genetic conditions, not every family will have the same pattern and sometimes skipping of generations is observed.

Retention hyperkeratosis is the first identified event in the development of *acne vulgaris*[6]. The exact underlying cause of this hyperproliferation is not yet understood. Presently, 3 leading hypotheses have been proposed to explain why the follicular epithelium produces cells at a faster rate that are retained in individuals with acne.

First, androgenic hormones have been referred to as the initial trigger[7]. Comedones, result from follicular plugging. Additionally, it has been noticed that androgen hormone receptors are present in sebaceous glands. This gives the reason why individuals with malfunctioning androgen receptors do not develop acne[8].

Secondly, excess sebum production is another key factor in the development of *acne vulgaris*. Sebum production and excretion are regulated by a number of different hormones including androgens and mediators[9].

As a result, inflammation may be a primary phenomenon or a secondary phenomenon. Most of the evidence suggests a secondary inflammatory response to *P acne* infestation. Interleukin 1-alpha expression has also been identified in microcomedones, and is supposed to have a role in the development of acne[10].

The main and the third underlying cause of acne is a genetic predisposition. The condition is inherited in an autosomal dominant pattern with incomplete penetrance.

Acne lesions: As already discussed, acne lesions mark the onset of the disease. Table 1 discusses various types of acne lesions which are associated in low or high frequency.

Table 1: Types of acne lesions

Type	Indication
Comedo	A plug of keratin and sebum within the dilated orifice of hair follicle, invariably containing *P. acne*, *Staphylococcusalbus* and *Pityrosporon ovale*
Microcomedo	The first acne lesion, often followed by inflammatory lesions
Open comedo	Comedo with a widely dilated orifice in which the pigmented impingement is invariably visible, seen as a *blackhead*
Closed comedo	A comedo devoid of a widely dilated orifice which may rupture and cause inflammatory lesion in the dermis
Fistulated (polyporous) comedo	An assemblage of open comedos from interconnected hair follicles
Pustule	An inflammatory lesion (a small, elevated, circumscribed lesion) evolving from the microcomedo that displays a visible cap of pus.
Papule	A firm and more deep-engraved lesion than a pustule. Its emergence reflects a more severe form of acne than the pustule and often results in scarring
Nodule	A larger and still deeper inflammatory lesion that invariably produces a deep scar. It can also be painful. Nodules may suppurate and contain a core of purulent material.
Conglobate lesion	Severely inflamed lesions joined by *sinus tracts* seen in the most disfiguring forms of acne. *Draining sinuses,* chronic fistulae arising in conglobate lesions, also may develop
Hidradenitis suppurativa/*acne inversa*	A chronic inflammatory scarring process of the axilla and groin that may accompany severe acne or stand alone

Affected Age Group

During adolescence, *acne vulgaris* is more common in males than in females. In adulthood, *acne vulgaris* is more common in women than in men.

Acne vulgaris may be present in the first few weeks and months of life, when a newborn is still under the influence of maternal hormones and when the androgen-producing portion of the adrenal gland is disproportionately large. This neonatal acne tends to resolve spontaneously. However, the neonate should be treated with a mild retinoid to clear out the impacted follicles. Adolescent acne usually begins with the onset of puberty, when the gonads begin to produce and release more androgens.

Acne is not limited to adolescence. Twelve percent of women and 5% of men at age 25 years have acne. By age 45 years, 5% of both men and women still have acne[11]. Table 2 represents age-wise prevalence of acne.

Table 2: Age-wise comparison of acnes

Age (years)	Body-location	Morphology	Gender
Below 12	Centro-facial	Comedonal	Both
12 to 20	Face, trunk	Mixed	Both
Above 20	Perioral, jawline, chin	Inflammatory	Women

Socioeconomic Factors and Acne

The spell of acne is not as widespread in the rural society as it is in the industrialized and modern society. Substantial attempts are being made to find concrete evidence of the relationship between diet and acne. However, alarming glycemic indices have seemed to play a pivotal role in the development of acne. The prevalence of acne in Inuit people (Eskimo) increased with their transition towards the western living (acculturation) has been reported by Schaefer and Bendiner. Surveys of disease in some rural African villages in Kenya, Zambia, and the Bantu in South Africa reported far less cases of acne than is found in the descendants of these communities now residing in UK or the United States. It has been reported by Necropsies and others that in a location where there was little use of modern facilities and vegetarian food habits, the rates of incidence of acne were found to be rare. In a report, two populations, i.e., Kitavan Islanders of Papua New Guinea and Ache hunter gatherers of Paraguay have been observed. These two communities have not shown even a single case of acne. It has been hypothesized that the populations in the urban area are more affected with acne than in non-urban stretches. Glycemic index has been proposed for the same, which is lower in non-western

diets. Higher glycemic index are reported to cause hyperinsulinemia, which most probably, initiates sequence of endocrine events which affect the sebaceous glands and follicular keratinization. A cross-sectional study of 2214 healthy adolescents of Arequipa and Peru, reported a low prevalence of acne of moderate-to-severe type, i.e., significantly less in Indians (28%) than in Mestizos (43%) or whites (45%). It was hypothesized that ethnic differences are responsible for this difference rather than distinct socioeconomic situation or alimentary or hygienic habits. In another study on 9955 school children (age 6-16 years) in a rural region in Brazil, only 2.7% were found to suffer from *acne vulgaris*[12].

Dietary Role in Acne

A lot has been written on this subject over the past few years. The role of diet in acne is gradually being ascertained. Molecular mechanisms postulated as responsible for the stimulation of the pilosebaceous unit are logical and scientific. Reports are available to establish the relationship between dietary manipulation and the acne associated with biochemical and endocrine parameters. Also, the statistical association between acne and dairy is strong[13].

Milk and dairy products

Excessive milk and dairy products intake has been reported to induce acne either depending upon fats or due to hormones. Today 75% to 90% of marketed milk and milk products are being derived from pregnant cows. Hence, milk contains hormones like placenta-derived progesterone, dihydrotestosterone (DHT) precursors, including 5α-pregnanedione and 5 α -androstanedione. These compounds can be easily converted to DHT (the accepted prime acnegen) in a few enzymatic steps. The enzymes required to mediate the change are present in the human pilobaceous unit. It has been proposed that 5 α -reductase inhibitors might block the final conversion to DHT. But, blockade of 5 α -reductase cannot serve the purpose of acne management as the chemicals have already undergone 5 α -reduction—in the bovine mammary gland. These precursors arrive at the pilosebaceous unit with no need for further 5 α -reduction, a situation that exposes humans to potent agonists for which we are unprepared by any evolutionary defense mechanism.

Just the steroid hormones in milk are not of primary concern. It contains also prolactin, somatostatin, growth hormone releasing factor-like activity, gonadotropin- releasing hormone, luteinizing hormone, thyroid- stimulating and thyrotropin-releasing hormones, numerous steroid hormones, insulin, epidermal growth factor (EGF), nerve growth factor (NGF), IGF-1 and -2, transforming growth factors (TGFs), vitamin D, transferrin, lactoferrin, many prostaglandins including F2α, erythropoietin, bombesin, neurotensin, vasoactive intestinal peptide, various nucleotides, cyclic adenosine monophosphate and guanosine monophosphate, B-casomorphins, and even relaxin. The concentrations of above listed compounds vary among species and the lacta and pregnancy stage. Most of these are growth enhancers and increase sebum production. Milk is, after all, specifically designed to make things grow.

Intake of milk during adolescence is generally associated with history of teenage acne. There are evidences that these associations are not a result of fat content of milk. Instant breakfast drink, cream cheese and cottage cheese are also reported to be associated with acne. These associations may be because of the milk content of these foods [13-19].

Fibrous diet

Inclusion of fibres in the food is a good food habit and 30% dietary fibre per day is reported to decrease the acne instances. This effect would be a result of low glycemic load. High fibre and low fat diet is known to decrease the sebum production in adults and such diet has been reported by Smith *et al.*,[20].

Fish and sea foods

Fish and sea foods are rich in omega-3–fatty acids and intake of such foods is correlated with lower

rates of incidence of acne episodes. Omega-3-fatty acids is a proved leukotriene B4–inhibitor. Inhibition of latter reduces the sebum production and improves the inflammatory condition of acne.

Apart from omega-3- fatty acids, fish and sea- foods are rich in polyunsaturated fats. Both omega-3- fatty acids and polyunsaturated fats are known to decrease the androgen levels. Hence, larger intake of sea-foods may decrease the incidences of acne [13-20].

Chocolate

Fulton *et al.* [21] proved that the intake of about ten times of chocolate that is found in chocolate bars did not affect the cause of *acne vulgaris* and sebum production. The age old idea of co- relation of chocolate intake with acne was proved wrong.

General Measures for Acne Skin

- **Patience**– Acne is reported to increase the stress. Therefore, it becomes essential to be patient and not to expect miracles [22]. Outburst of acne can be accompanied with an increase in anxiety levels and a decrease in confidence levels of those affected, mostly the teens, which might even end up into depression or suicidal tendencies. Stress management, therefore, needs to be kept into consideration for effective acne treatment [3].
- **Face washing–** It is believed that overwashing of acne afflicted area and scrubbing can exacerbate the condition. But studies recommend washing the face twice daily with a mild cleanser. This practice can increase convenience of the patient the anti-acne efficacy also [23]. Soaps should not be used to clean the acne-prone skin rather cleansers with a pH of 5.5 should be preferred [24].
- **Picking on the lesions–** Acne scars are reported to be one of the results of self-manipulations or picking of the comedos [25]. Hence, it is advised not to try picking on them which shall only render the condition worse.
- **Cosmetics–** Selection of over-the-counter cosmetics should be judicious as many ingredients can be allergic to the acne skin and can worsen the condition[26]. Skin care products containing nicotinamide, lactic acid, triethyl acetate/ethyllineolate, and certain plant extracts like Mahonia, tea tree oil and *Saccharomyces* may contribute to a decrease in acne lesions [24, 27].
- **Acne inducing medication–** No medication should be taken prior to consultation from a physician. Corticosteroids, neuropsychotherapeutic drugs, antituberculosis drugs and immunomodulating molecules are the classes of drugs known to induce acne [28].
- **Regular follow-up visits–** Regular follow-ups and appointment with the physician is recommended so as to keep the condition under control and to take care of any cases of allergy or adverse reactions without any delay. Online follow-ups have also been reported equivalent to the official visits [29].

It is worth noting that the primary goal of acne treatment is to minimize permanent skin damage and diminish the probability of recurrence of the same. Although, acne can't be cured but it can kept under reasonable control adhering to proper guidelines [30]. Acne-care advice preferably should be individualized, and both clinician and patient aware of the limitations. Despite of sufficient evidence, the clinicians cannot issue strict recommendations in relation to diet, hygiene and face-washing and sunlight to patients with acne [31].

Conclusion:

Acne, a non-mortality disease, affects the overall performance of the affected person. Despite the established underlying pathogenesis reasons, food habits and the life-style of the person have also been recognized to affect the disease state. Foods rich in omega-3-fatty acids, polyunsaturated fats, and total fibre content and with low glycemic content are reported to significantly decrease the incidences of acne. Foods rich in milk and dairy products are known to increase the incidences of acne. Apart from

these, fast food and the stressful life style have also been reported to increase the acne instances in a few literature reports. Against the common perception of increase of acne with chocolate intake, the review points out a study against this belief. There are strong recommendations for the face-wash schedule and incorporation of agents in cosmetics which decrease the acne. However, there can not be a complete diet chart for the acne patients and set guidelines for the day-to-day life style, but the review has pointed the habits and precautions which have been established to be strongly correlated with acne.

References:

1) Adityan B, Kumari R, Thappa DM. Scoring systems in acne vulgaris. Indian J Dermatol Venereol Leprol 2009;75:323-326.
2) Arora MK, Yadav A, Saini V. Role of hormones in acne vulgaris. Clin Biochem. 2011;44:1035-1040.
3) Webster, GF. Acne vulgaris and rosacea: Evaluation and management. Clin Cornerstone 2001;4:15-22.
4) Acne vulgaris, In: Drugs used in Skin Diseases: WHO Model Prescribing Information, World Health Organization 1997;Geneva. pp. 65.
5) Goulden V, McGeown CH, Cunliffe WJ. The familial risk of adult acne: a comparison between first-degree relatives of affected and unaffected individuals. Br J Dermatol. 1999;141:297-300.
6) Norris JF, Cunliffe WJ. A histological and immunocytochemical study of early acne lesions. Br J Dermatol. 1988;118:651-659.
7) Thiboutot D, Gilliland K, Light J, Lookingbill D. Androgen metabolism in sebaceous glands from subjects with and without acne. Arch Dermatol. 1999;135:1041-1045.
8) Holland DB, Cunliffe WJ, Norris JF. Differential response of sebaceous glands to exogenous testosterone. Br J Dermatol. 1998;139:102-103.
9) Pochi PE, Strauss JS. Sebaceous gland activity in black skin. Dermatol Clin. 1988;6:349-351.
10) Ingham E, Eady EA, Goodwin CE, Cove JH, Cunliffe WJ. Pro-inflammatory levels of interleukin-1 alpha-like bioactivity are present in the majority of open comedones in acne vulgaris. J Invest Dermatol. 1992;98:895-901.
11) Kligman AM. Postadolescent acne in women. Cutis. 1991;48:75-77.
12) Wolf R, Matz H, Orion E. Acne and diet. Clin Dermatol. 2004;22;387-393.
13) Danby FW. Diet and acne. Clin Dermatol. 2008;26:93-96.
14) Logan AC. Dietary fat, fiber, and acne vulgaris. J Am Acad Dermatol. 2007;57: 1092-1093.
15) Katzman M, Logan AC. Acne vulgaris: nutritional factors may be influencing psychological sequelae. Med Hypotheses.2007;69:1080-1084.
16) Cordain L. Implications for the role of diet in acne. Semin Cutan Med Surg. 2005;24: 84-91.
17) Danby FW. Acne and milk, the diet myth, and beyond. J Am Acad Dermatol. 2005;52:360-362.
18) Adebamowo CA. et al. High school dietary dairy intake and teenage acne. J Am Acad Dermatol. 2005;52:207-214.
19) Kaufman WH. The diet and acne. Arch Dermatol. 1983;119:276.
20) Smith RN et al. The effect of a high-protein, low glycemic-load diet versus a conventional, high glycemic-load diet on biochemical parameters associated with acne vulgaris: a randomized, investigator-masked, controlled trial. J Am Acad Dermatol. 2007;57:247-256.
21) Fulton J, Plewig G, Kligman A. Effect of chocolate on acne vulgaris. JAMA 1969; 210:2071-2074.
22) Do JE, Cho SM, In SI, Lim KY, Lee S, Lee ES. Psychosocial Aspects of Acne Vulgaris: A Community-based Study with Korean Adolescents. Ann Dermatol. 2009;21:125-129.
23) Choi JM, Lew VK, Kimball AB. A single-blinded, randomized, controlled clinical trial evaluating the effect of face washing on acne vulgaris. Pediatr Dermatol. 2006;23:421-427.
24) Korting HC, Borelli C, Schöllmann C. Acne vulgaris. Role of cosmetics. Hautarzt. 2010;61:126-131.
25) Basta-Juzbašić A. Current therapeutic approach to acne scars. Acta Dermatovenerol Croat. 2010;18:171-175.

26) Cole PD, Hatef DA, Taylor S, Bullocks JM. Skin care in ethnic populations. Semin Plast Surg. 2009;23:168-172.
27) Reuter J, Merfort I, Schempp CM. Botanicals in dermatology: an evidence-based review. Am J Clin Dermatol. 2010;11:247-267.
28) Du-Thanh A, Kluger N, Bensalleh H, Guillot B. Drug-induced acneiform eruption. Am J Clin Dermatol. 2011;12:233-245.
29) Watson AJ, Bergman H, Williams CM, Kvedar JC. A randomized trial to evaluate the efficacy of online follow-up visits in the management of acne. Arch Dermatol. 2010;146:406-411.
30) Ramos-e-Silva M, Carneiro SC. Acne vulgaris: review and guidelines. Dermatol Nurs. 2009;21:63-68.
31) Magin P, Pond D, Smith W, Watson A. A systematic review of the evidence for 'myths and misconceptions' in acne management: diet, face-washing and sunlight. Fam Pract. 2005;22:62-70.