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STUDYING THE PREVALENCE EXTENT OF ACNE VULGARIS AMONG SECONDARY AND UNIVERSITY STUDENTS IN KIRKUK CITY

Sohaib Sabah Kasim1, Ahmed Abdulrahman2, Iman Tajer Abdullah1
[1] Department of Biology, College of Science, University of Kirkuk, Iraq
[2] Directorate of Education Kirkuk, Ministry of Education, Kirkuk, Iraq
sohaibsabah63@gmial.com ; ahmedbio727@gmial.com

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Abstract:
Acne vulgaris is considered as one of the most important chronic inflammatory disorders of pilosebaceous follicles affects approximately 90% of teenagers. Acne is commonly appeared at puberty age, but in some cases might continue beyond youth till the age of 40's. The reason of this condition is the overproduction of sebum resulted from disturbance of sebaceous glands which increases the chance of developing acne. The current study aims to study the occurrence of acne in secondary school and university students aged (12-24) years from both genders. One hundred and fifty-five skin swabs were collected from both genders in the period from April to May of 2021. The results showed that the females were more vulnerable to acne infection 88(56.8%) in compared to males 67(43.2%). The highest infection percentage was seen in the age group (12-18 years) 88(56.8%), whilst the infection rate among university students (18-24 years) age group was 67(43.2%). Bacteriological study showed that the predominant bacteria present on the skin infection was *Propionibacterium acnes* 79(51%) followed by *Staphylococcus epidermidis* 42(27.1%) and *Staphylococcus aureus* 29(18.7%). The other bacterial isolates were *Pseudomonas aeruginosa* 3(1.9%) and *Klebsiella oxytoca* 2(1.3%).

Keywords: Acne Vulgaris, Skin Infection, Teenager Infection

INTRODUCTION:

Acne is derived from a Greek word acne means teenagers, as it appears in the early ages during puberty period **[1]**. The first how used the term Acne vulgaris was German professor Conrad Heinrich Fuchs in 1840 **[2]**. Acne is one of common chronic inflammatory and recurrent skin disorders infects both genders especially those in the youth phase causing inflammation in pilosebaceous unit (hair follicle, sebaceous gland, hair, erector pili muscle). It considers as the eighth common prevalent infection, affects globally around 10% of the world's population **[3-4]**. It usually appears in the puberty age but gradually disappears after 25 years and in some cases might extend to 40 years in some individuals **[5]**. Unlikely, acne might occur in infants and disappeared at the age 5 years old as well as in adults 60-70 years **[6-7]**. Acne lesions might be mild, moderate or severe **[8]**. Although the acne is not life threating disease, but might cause social and psychological disturbance in the infected individuals. They might suffer from shame, anxiety, depression, lack of confidence and poor social communication particularly when the symptoms are severe and scarring occurs **[3,9-10]**. Four important factors are involved in the pathogenesis of acne. These factors are: overproduction of sebum, hypercornification of the pilosebaceous duct, colonisation and proliferation of follicular microflora especially *Propionibacterium acnes (P.acnes)*, and finally stimulation of immunological and inflammatory responses. Overproduction of sebum cause plugging of hair follicle and form a lesion called microcomedo. These lesions might enlarge and become visible comedones (non-inflammatory lesions) appear as (blackhead) open to air or closed by skin (whitehead comedones), or tend to cause inflammatory lesions such as nodules, papules or pustules **[3,11] as shown in Figure 1**

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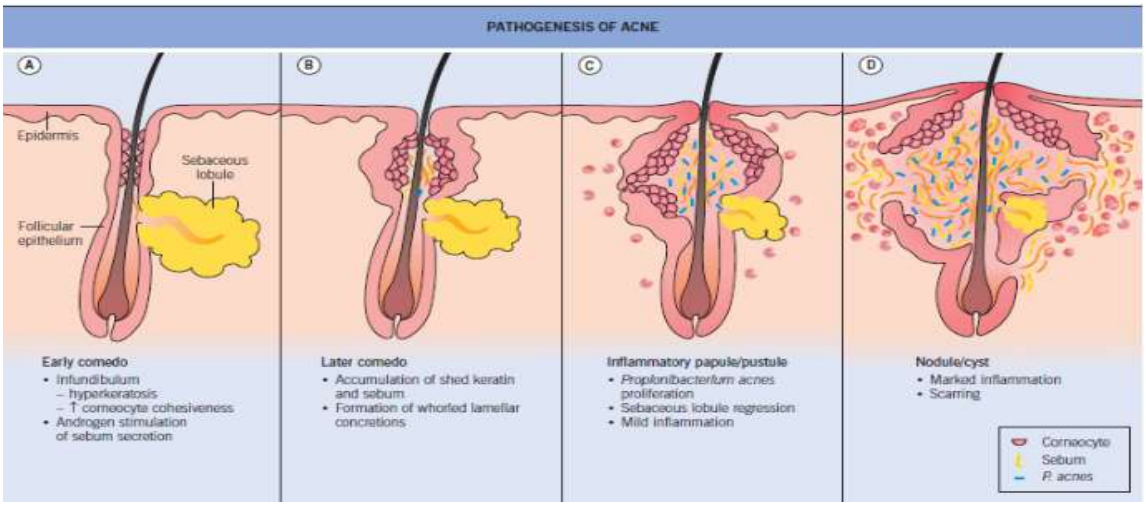

Figure 1: Diagram showing stages of acne development [12].

Several factors involve in the occurrence and development of acne: hormones, stress, air pollution and high humidity, smoking, diet, occupation, sweating, ultra violet radiation, genetics, some medications and cosmetics personal care products **[11-12] as depicted in Figure 2**.

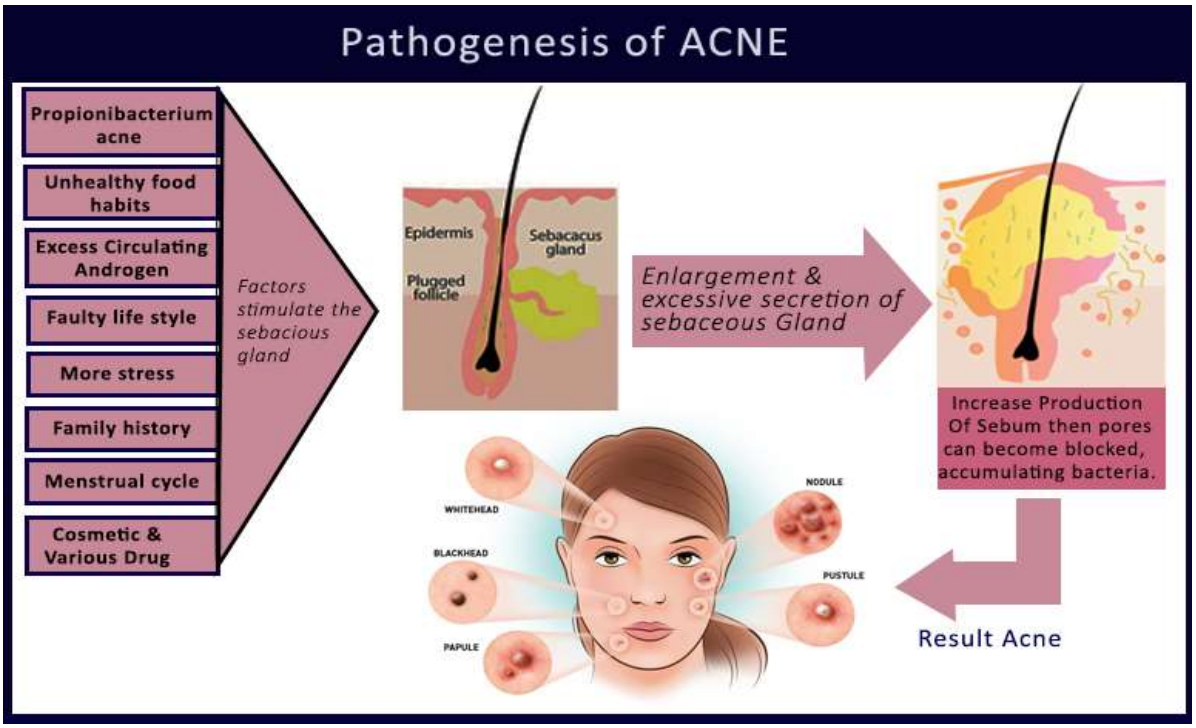

Figure 2: Risk factors associated with acne vulgaris infection [13].

Acne vulgaris in teenagers is commonly associated with alteration in hormonal level in the body particularly hormone androgen which drives bacterial colonisation and invasion **[14-15]**. Most females have flare-ups before menstruation, and this is related to hormonal changes **[16]**. Testosterone plays an important role in acne, as it turns into 5α – dihydrotestosterone during puberty and hyperandrogenic states, by the aid of 5α- reductase enzyme. This active molecule stimulates sebocytes present on the skin to differentiate and produce more sebum **[17-18]**. Accumulation of sebum in the hair follicle enhances bacterial colonisation in particular anaerobic bacteria *P. acne* **[12, 19] as indicated in Figure 3.**

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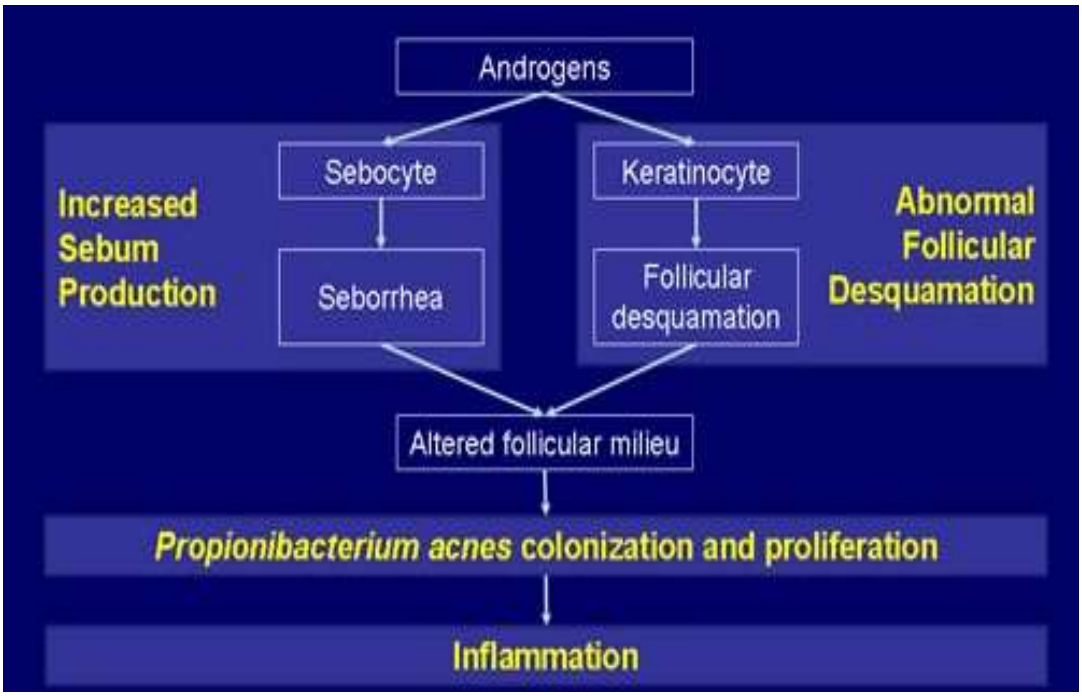

Figure 3: Contribution of androgen hormones in stimulation bacterial colonisation and proliferation in acne vulgaris infection [20].

Fluctuation in cutaneous microbiota might also contribute in emergence of acne. Several microbial flora have been isolated from acne lesions like *P. acnes, S. epidermis, Staphylococcus aureus, K. pneumoniae, Streptococcus and Enterobacter*. It is commonly believed that the interaction between skin microbes and host immunity plays a significant role in the disease progression, as perturbed in microbial composition and activity found in acne patients **[21-22]**. Bacterial species found on the skin are commonly belong to four phyla: Actinobacteria, Proteobacteria, Bacteroidetes and Firmicutes. More than 60% of the bacterial species belong to three genera: Staphylococcus, Corynebacterium and Propionibacterium **[21]**. These bacterial species can block skin pores in particular the bacterium *Propionibacterium acnes*, which mainly grows inside the blocked ducts and use sebum as food under a low concentration of oxygen **[23]**. The second common bacteria which causes acne is *Staphylococcus epidermis*. These microorganisms characterise by secretion of several virulence factors including lipase enzymes, important for breaking down of sebum substance and converting into free fatty acids **[24]**. The resulted free fatty acids might penetrate deep tissues (dermis of the skin) and cause damage to the skin and the tissues beneath it. This disruption occurs due to bacterial enzymes which increases cell permeability and change follicular epithelium. In addition, these microbes also produce chemotactic substances stimulate immune response and attract inflammatory cells (neutrophiles) to the infected area. This causes what called inflammatory acne (papules, pustules, nodules and cysts might be form) **[25]**. In server cases, these inflammatory lesions might progress and cause scarring, dyschromia and formation of sinus tract **[26]**. The bacterial enzymes like (proteases, hyaluronidases, phosphatases), and the biofilms formed within follicles might also involve in acne pathogenicity **[8,12]**. The most common symptoms associated within inflammatory acne are redness (erythema), itching, swelling and painful blemishes **[12, 19]**.

Acne prevalence is also affected by the gender **[8]**. Recent studies showed that the occurrence of acne is higher in females than males because of the earlier onset of puberty in females than males **[12, 27-28]**. Females with oily skin are more susceptible to acne vulgaris than dried skin people. This is more likely due to high activity of sebaceous gland which produces more sebum, and increases the keratinisation of sebum transporting ducts **[12, 29]**. Recent studies also showed that an increase in sebum secretion is associated with alteration in its chemical composition, which renders the skin more vulnerable to bacterial infections **[17]**. Acne might affect any part of the body specially those have in abundance of sebaceous glands (face, upper parts of chest, neck and back), as

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the number of glands reaches 400-900 sebaceous glands per square centromere, while in other areas the density of glands is less than 100 glands/cm^2 **[12, 30]**.

Therefore, the present study aimed to assess the prevalence of acne vulgaris among secondary and university students in Kirkuk city, and determine the impact of some demographic factors like age and gender on acne development. Finally, identify the bacterial species associated with acne occurrence.

MATERIALS AND METHODS:

One hundred and fifty-five skin swabs were collected from secondary school and university students suffering from Acne with age range from (12-24) years. The samples were collected in the period from April to May 2021. Sterilised swabs were used for collection of the samples after disinfecting the lesion surface with a cotton soaked in 75% alcohol. The collected samples were transferred to Science College Laboratories in Kirkuk University for bacteriological analysis. Each sample was inoculated into blood and nutrient agar plates. These plates were then incubated aerobically and anaerobically at 37◦C for 24 hr. After incubation, all the plates were checked for presence of bacterial growth. The growing microorganisms were identified using colonial morphology, Gram staining and standard biochemical tests **[31]**.

RESULTS AND DISCUSSION:

Based on our results, females were more prone to acne than males, as the results showed that 88 (56.8%) of females suffering from acne compared with males with percentage of 43.2% **as depicted in Table 1**. These findings agree with previous study performed by Al-Husseini, 2005 who found that 53.1% of acne patients were females and 46.9% were males **[32]**. A study conducted in Saudi Arabia exhibited the high prevalence of acne among adolescents and young females **[28]**. Azad and his colleagues also demonstrated that the acne is more predominant in the females (62.5% females vs 37.5% males) **[33]**. These results might be due to hormonal disturbance in the females, which plays a major role in changing and hydration of oily skin before menstruation or due to over usage of cosmetics by females which aggravates acne formation **[12, 34-35]**.

Table 1: Showing the prevalence rate of acne vulgaris based on the gender

Sex	No (%)
Male	67 (43.2)
Female	88 (56.8)
Total	155 (100)

The results of current study also indicated that the distribution of acne vulgaris among the age groups is different, **as shown in Table 2**. The infection was 39 (25.2%) in the 12-15 years age group (secondary stage), 17 (11%) were males and 22 (14.2%) females, while 49 (31.6%) was in the 15-18years age group, 23 (14.8%) was males and 26 (16.8%) females. While in the 18-21years age group, i.e., in the university stage, the infection was 42 (27.1%),18 (11.6%) males and 24 (15.5%) females. Finally, 25 (16.1%) of acne patients was in the age group of 21-24 years, 9 (5.8%) males and 16 (10.3%) females.

Table 2: Frequency distribution of Acne vulgaris cases regarding their age groups

Gender	Age groups No (%)				
	12-15 Years	15-18 Years	18-21 Years	21-24 Years	Total
Male	17 (11%)	23 (14.8 %)	18 (11.6 %)	9 (5.8%)	67 (43.2 %)
Female	22 (14.2 %)	26 (16.8 %)	24 (15.5 %)	16 (10.3 %)	88 (56.8 %)
Total	39 (25.2 %)	49 (31.6 %)	42 (27.1 %)	25 (16.1 %)	155 (100%)

As it is clear from **Table 3** that the highest number of infections was seen in the age group 12-18 years (secondary stage) 88 (56.8%), 40 (25.8%) in males and 48 (31%) in females which is higher than the infection rate (43.2%) in the 18-24 years age group (university stage) (17.4% in males and 25.8% in females). This finding is in contrast to a previous study done by Sundaram *et al.*, in which was demonstrated the highly prevalence of acne among patients in the age group over 18 years (51%) (64.40% males and 31.70% females) **[36]**. However, our results are close to the results performed by Abo El-Fetoh and his group, found that the acne begins in adolescence, reach peak at the ages of 14 to 19 years and gradually disappears by mid-twenties **[28]**. Recent studies also stated that the severity of infection is at its peak in the age group 14-18 years **[37]**. The high prevalence of acne in the age group 12-18 years might be related to the beginning of adolescence period in this age group and fluctuation in hormonal levels which lead to emergence of severe and acute acne cases

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Table 3: Showing the prevalence of acne vulgaris among secondary and university students

Gender	Age groups No (%)		
	12-18 Years	18-24 Years	Total
Male	40 (25.8%)	27 (17.4%)	67 (43.2%)
Female	48 (31%)	40 (25.8%)	88 (56.8%)
Total	88 (56.8%)	67 (43.2%)	155 (100%)

As regards to the prevalence of the microorganisms isolated, it was found that all swabs taken from the site of infection were mixed from several types of bacteria **as shown in Table 4**, and *Propionibacterium acnes*, was the predominant with an infection rate of 79 (51%), followed by *Staphylococcus epidermidis*, which accounted 42 (27.1%) and *Staphylococcus aureus* was 29 (18.7%). Three isolates belonging to the bacterial type *pseudomonas aeruginosa* (1.9%) and two strains of the bacteria *Klebisella oxytoca* (1.3%) were also isolated. Our results agree with Nishijima *et al*. results who found that *P. acnes* is the predominant microorganisms isolated from acne patients with a prevalence rate of 79% **[38]**. While studies performed by Murugesh and Chitrika (2013), and Mansy showed the highly prevalence of *S. epidermidis* among acne patients **[12, 39]**. Asima *et al.* (2011) and Silas *et al.* showed that *S. aureus* is the most prevalent microorganisms **[40]**. This discrepancy in the prevalence of bacterial species among acne patients might be due to variation in geographical regions, environmental factors and genetic factors **[38, 41]**. The reason for dominance of *P. acnes* in the acne infections is due to the low oxygen pressure found in the depth of the skin which provide appropriate conditions for survival, growth and well reproduction of this bacteria **[42]**.

Table 4: Frequency of microorganism species isolated from acne vulgaris lesions

Name of bacteria	No (%)
Propionibacterium acnes	79 (51%)
Staphylococcus epidermidis	42(27.1%)
Staphylococcus aureus	29 (18.7%)
Pseudomonas aeruginosa	3 (1.9%)
Klebsiella oxytoca	2 (1.3%)
Total	155 (100%)

We can conclude from our study, that several microbes like *P. acnes, S. epidermidis, S. aureus* and other Gram-negative bacteria have been isolated from acne lesions. These bacteria are naturally resident microbes but under certain circumstances they become opportunistic pathogens and might invade skin tissues causing skin disorders like acne. *P. acnes* is the dominant microorganism among acne patients. Age and gender play a significant role in acne development.

Further studies are required to understand the pathophysiology of these microbes and virulence factors involved in their pathogenicity. In addition, the role of immune system in aggravation the acne lesions should also be addressed. All of these would assist in producing therapeutic agents for treating acne patients.

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