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Original Article

Acne and its association with modifiable factors amongst young adults of Islamabad - A cross sectional study

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Abstract

Objective Study aimed to assess the certain risk factors for acne to ultimately improve its management and quality of life by spreading awareness and modifying their behaviors.

Methods This cross-sectional study involving participants of age 16-25 years, was carried out after Institutional Ethics Committee clearance. After written informed consent, participants filled an online questionnaire including demographic data, questions related to presence of acne, grade of acne and type of skin. Along with other questions related to modifiable factors affecting acne including diet, lifestyle, personal hygiene, BMI, Smoking and Menstruation. Statistical analysis was performed with the Statistical Package for Social Sciences (SPSS version 23.0), Chi-square test was used to assess the association between proportion of participants with acne and predefined modifiable factors.

Results Out of total participants 50.36% (n=69) were females. Acne was present in 54.74% of the participants. Out of those suffering from acne, 56% were suffering from mild acne, 30.67% were suffering from moderate and 13.33% were suffering from severe acne. There was no association of frequency of occurrence of acne with diet, smoking (p-value=0.249), Body Mass Index (BMI) (p-value=0.704) or stress. However, there was significant association of frequency of Occurrence of acne with type of skin (p-value=0.032), exercise (p-value=0.015), menstruation (p-value=0.01) and use of toners (p-value=0.005) and serum (0.037).

Conclusion Our study concludes that that no exercise, menstrual cycle, use of toners and serums have statistically significant association with Acne vulgaris. Stress, BMI, diet and smoking showed statistically insignificant association in our study.

Key words
Acne vulgaris, diet, menstruation, smoking, serum and toners, BMI, skin type, exercise.

Introduction

Acne vulgaris, is a skin condition that occurs when dead skin cells and oil from the skin clog the hair follicles. It is the formation of comedones, papules, pustules, nodules, and/ or cysts as a result of obstruction and inflammation of pilosebaceous units (hair follicles and their accompanying sebaceous glands) and involves bacterial colonization by *Propionibacterium acnes.*

Typical features of the condition include blackheads or whiteheads, pimples, oily skin, and possible scarring. It primarily affects skin with a relatively high number of oil glands, including the face, upper part of the chest, and

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back. The condition usually is self-limiting and can be controlled by healthy diet, improved skin care and with a stress-free life. However, in some cases, it may exacerbate leading to possible scarring and bodily disfigurement. Severe acne affects a person mentally and psychologically, resulting in low self-esteem, poor body image, social withdrawal and depression.[1]

Acne vulgaris is recognized as the third most prevalent skin disease worldwide.[2] It shows higher prevalence in adolescents and affects approximately 80-90% of teenagers in the world.[2,3] The studies show male predominance in getting affected by this skin condition.[4]

Pathogenesis of acne vulgaris is multifactorial and includes hormonal disturbances, sebum production, bacterial colonization, and psychological stress.[4] Studies have also highlighted the importance of genetic predisposition to acne where overexpression of certain genes, affects the regulatory mechanisms, activating the proinflammatory reactions, thus, paving way to acne development.[5] Influence of premenstrual factors, diet as well as skin hygiene are also noted as main contributors to acne development.[6,7]

Investigations performed to date concluded that the most incriminated food categories include milk and dairy products, dietary fats and sweets, that comprise of high glycemic load which induces hyperinsulinemia and through a series of endocrine responses increases the acne severity.[8] The contents such as fatty food, sweets and spices were believed to aggravate acne formation.[7,9] They have also shown that populations exposed to paleolithic dietary conditions (low glycemic load, no milk and dairy consumption) are examples of acne-free populations, in comparison to the populations that have adapted western dietary lifestyle (high glycemic food, milk and dairy products) and thus are showing increasing prevalence.[3,5,10] Excessive intake of sweets, chocolates, carbonated drinks, dietary fats and white bread shows significant correlation to acne while on the contrary, food like fruits, vegetables and fish show negative association to acne and are instead rendered to be protective.[8,9,11]

According to different studies, psychological stress is considered as important culprit of acne.[6] Stress can alter the immune function of the skin and cutaneous barrier function, making the skin more prone for infections.[4] Stress also results in increased release of cortisol in the body which in turn increases the sebum production and hence, aggravates acne.[7,9]

Hormones are chemicals that are the main regulators and coordinators of all body processes. Any disturbance or imbalance in them can cause drastic changes to the normal body functions. Androgens are involved with sebum production leading to acne. Acne flares are common in females during their pubertal period, premenstrual period and perimenopausal period owning to higher androgen levels leading to excessive sebaceous gland stimulation in the body.[9,12] Hence the association between irregular periods, PCOS and acne is also attributed to hormonal imbalance in the body.[9]

There is a common misconception about face washing and skin hygiene. People normally believe that frequent face washing and use of face cleansers helps to eliminate acne, however, there is no scientific evidence to support this idea.[2,9] A stigma of cleanliness is still associated with acne among the people, regardless of the fact that it develops due to influence of the hormonal imbalances in the body as part of the psychological stress caused to the affected to cope up with and improve their condition, however, on the contrary, frequent washing and

use of cosmetical products for face hygiene is shown to exacerbate the condition instead of ameliorating it.[1,7,9] Nevertheless, facial cleansing twice daily is still an appropriate way of acne clearance without irritation.[2]

Acne is a long-term disease that significantly influences the lives of those affected. The disease creates cosmetic, physical, and psychological scarring in them, fueling anxiety, depression, and other emotional trauma that threatens their quality of life. Despite it being a very common dermatological condition, only a few studies have been conducted regarding the knowledge, beliefs, and perceptions about the causative factors of acne, particularly in Pakistan.

The study was conducted to find the association between different modifiable factors in young adults and development of acne. It aimed to assess the certain risk factors for acne to ultimately improve its management and quality of life of the affected by spreading awareness and modifying their behaviors.

Methods

This was an Analytical Cross-sectional study conducted in Air University, Islamabad. A total of 137 participants were enrolled in this study through convenient sampling. The sample size was calculated using WHO Sample size calculator All students at Air University, Islamabad between ages 16-25 years were included in the study and those who were receiving hormonal therapy or using oral contraceptive pills were excluded from our research to avoid their confounding effects.

A Self- developed questionnaire was developed via Google form and its link was shared online with the participants to be filled by themselves. The questionnaire inquired about demographic characteristics, acne status and the questions related to certain modifiable factors under study comprised of dietary intake, stress levels, personal hygiene, menstrual factors for females, BMI and smoking. The questionnaire was based on content from a Lahore based research on lifestyle done in 2019,[16] a Community-Based study on diet, smoking and family history as potential risk factors in acne vulgaris conducted in Romania[8] and perimenstrual flare of adult acne in New York.[17] In diet, we compared the differences in glycemic index by assessing the dietary intakes of dietary fats, sweets, dairy products, carbonated drinks, fruits, vegetables among acne and non-acne people in the population. The standardized high glycemic value for each category is as follows;[8]

i. Dairy products: 3-4 times per week.
ii. Sweets: More than 100 g per day (100g sugar is 8 Tbsp).
iii. Carbonated drink: More than 150ml per day.
iv. Dietary fats: More than 3 times per week.
v. Fruits: 2-3 times per week.
vi. Vegetables: 2-3 times per week.

Stress was evaluated by self-perception of participants.

In Personal hygiene, the difference in skin care routines and hygiene among people was assessed through questionnaire.

Knowledge about any irregularity about menstrual periods from female students only was evaluated an all the participants were inquired about their weight and height at the time of interview, on basis of which BMI were computed at the time of analysis.

The data collected was analyzed using SPSS version 23.0. with a 5% margin of error (α=0.05%). Proportion was calculated for

categorical data while, mean and standard deviation for quantitative data. On the basis of acne status, the proportion of participants with and without acne problems were calculated and then they were cross tabulated with each of the modifying factors under study separately. Chi Square Test was used to assess the association between proportion of participants with acne and predefined modifiable factors.

Results

The mean age of our study population was calculated out to be age 21±1.5 years, of those halves (50.36%) were females and 56% students were medical students and the rest were non-medical students. Out of the total participants, 54.74% (n=75) had acne. Out of those having acne, 13.33% (n=10) were having severe type acne, 30.67% (n=23) were having moderate type of acne and 56.00% (n=42) were suffering from mild type of acne.

Majority of participants had their acne on their face that is 64% (n=48), while remaining 36% had acne on multiple areas of the body especially neck, chest and back.

Participants taking high Glycemic Index food showed no significant association with the frequency of occurrence of acne. As all the dietary variables showed P-value > 0.05 **(Table 1)**.

Out of total 137 participants, 64.23% (n=88) feel stressed in their daily life, who do not feel stressed were 20.44% (n=28) and 15.33% (n=21) did not comment. Chi-square test was performed to see the association of frequency of acne with self-perception of stress. P-value was 0.220. There was no significant association of stress with acne **(Table 2).**

About 16% (n=22) of the participants smoked cigarettes. Out of those only 10% (n=14) were suffering from Chi-square test gave P-value of 0.24 which makes the results insignificant. About 49.64% individuals (n=37) who had specialized skin type i.e. dry, oily and sensitive skin) were suffering from acne when we applied the Chi Square test, P-value was 0.03. So, there was a significant association of frequency of acne with specialized skin type.

In lifestyle variables, participants who did at least 30 minutes of exercise daily and were not suffering from acne were 35.04% (n=21).

While those who were suffering from acne were 28.47% (n=21). As compared to those who did not do any exercise and were suffering from acne were 26.28% (n=19) and those not suffering from acne were 10.22% (n=6). Chi-square test showed P-value= 0.01. There was a significant association of acne with sedentary

Table 1 Association of occurrence of acne with high glycemic dietary intake.

High glycemic index for dietary variables	*Do you have acne (%)*		*P value*
	Yes	*No*	
Dairy	31.39	27.01	0.782
Sweet	40.88	32.12	0.627
Carbonated drinks	30.66	21.17	0.282
Dietary Fats	10.22	4.38	0.138
Fruits	30.66	29.20	0.311
Vegetables	18.25	16.79	0.646
Sugars	20.44	10.95	0.099

Table 2 Association of frequency of acne with self perception of stress in daily life.

Do you feel stressed in daily life	*Do you have acne (%)*	
	Yes	*No*
Yes	33.96	24.53
No	24.53	13.21
No comments	15.09	5.66

Table 3 Association of frequency of acne with daily exercise.

Do you Exercise Daily for 30 minutes	*Do you have acne (%)*	
	Yes	*No*
Yes	28.47	35.01
No	26.28	10.22

Table 4 Frequency of acne flare up with menstruation.

When does your acne flare up?	*Percentage*
Pre-menstruation phase	32.31
Menstruation phase	18.46
Throughout cycle	7.69
No Effect	41.54

Table 5 Association of frequency of acne with daily use of toners and serums.

Do you use		*Do you have acne? (%)*	
		yes	*no*
Serum	yes	13.87	5.11
	no	40.88	40.15
Toner	yes	13.14	2.92
	no	41.61	42.34

lifestyle **(Table 3)**.

About 78 participants were females, out of these participants 58.46% (n=46) participants said that their acne flares up during the pre-menstrual and menstrual phase. While remaining 42% did not show any association for flare up of acne with menstruation. Chi- square test gave P-value= 0.01 showing significant association of occurrence of acne with menstruation in females **(Table 4)**.

Out of 137 participants, more than 58% students washed their face more than 2 times a day among them 89% used face wash/ soap. Only 44.5% used moisturizer, 16% used toner while serum was used by 18.9%. Among these students 59% used towels to wipe their faces. Frequency of acne was higher in the group who did not use toners 41.46% (n=31) or serums 40.88% (n=30) while those who did use toners 13.14% (n=7) and serums 13.87% (n=7) had a lower frequency of acne in them. Chi-square test was performed which gave p-values=0.005 and 0.037, respectively. Showing significant negative association of acne with use of toners **(Table 5)**.

Out of the total participants, 71% (n=97) were having normal BMI (18.5-24.9), while 16.07% (n=22) were under weight (<18.5) and remaining were overweight (>24.9) 13% (n=18). Chi square test was performed it gave P-value of 0.704 which shows that the results were insignificant.

Discussion

Diet The study did not show any significant relation between diet and acne flare ups. The acne affected population showed similar glycemic index intake of sweets, carbonated drinks, dietary fats and dairy as non-acne and no significant difference in dietary practices was observed.

According to a study conducted in Romania, a statistically significant difference was found between the two groups (58.7%) concerning their excessive intake of sweets, carbonated drinks, dietary fats and white bread. These dietary factors have been considered as risk factors for acne occurrence.[13] Acne was implicated to be worsened by certain foods mainly chocolate, followed by fatty food and chili. Less commonly nuts, fizzy drinks and other food items were involved.[7] Evidence suggests that components of Western diets, particularly dairy products, may be associated with acne.

A study in Washington DC showed the hormonal effects of dietary components, such as glycemic index levels or fat or fiber intake, may mediate the effect of diet on acne risk.[14] Food is a conditioning environment that shapes the activity of the human genome whereas acne is obviously the visible outcome of imbalanced nutrigenomics induced by Western diet, the maximized form of Neolithic nutrition.[15] A close association was found between moderate to severe acne and a high intake of milk, other dairy products, cakes/sweets and chocolate. Obesity and low intake of fish were also linked

with the presence of moderate to severe acne.[13]

In another study, the most reported consumables were the following, in decreasing order: dietary change, sweets, increased water consumption, fatty foods, soft drinks, and dairy products. Sweets, fatty foods, and change in dietary habits towards healthier food were statistically more frequently reported by girls compared to boys in a study conducted in Serbia.[6]

Similarly, the association between fruits and vegetables as protective factors towards acne was not significant in our research contradictory to previous research, probably due to small sample size and specified age groups. Whereas a significant negative correlation between a normal or higher intake of fish, vegetables, fruits and acne prevalence was observed.

According to statistical analysis, the results obtained in the study in Romania showed a protective effect of these foodstuffs on acne vulgaris development.[13] The ideal "antiacne diet" will be a paleolithic-like nutrition with accentuated intake of vegetables and fruits with low glycemic index and sea fish enriched in anti-inflammatory ω3-fatty acids. Art 5 High intake of fish (1 day/ week or more), high intake of fruit and vegetables are associated with limited or no acne.

Stress Our study showed no relation of daily life stress with acne. 32.12 % people believed that stress leads to acne flares whereas a similar percentage of people i.e. 31.39% did not relate acne flares to stress. Of the respondents facing stress in daily life, 38.69% had acne and 25.55% did not have acne.

However, a study by Amal A. Kokandi reported stress as an aggravating factor for acne in females.[7] A Singapore-based study demonstrated similar results and showed a statistically significant relation between self-perceived stress and severity of acne.[11]

In large study of adolescents self-reported stress was higher in males. It is possible that more severe forms of acne might demonstrate stronger correlation with psychological stress where mediators associated with stress play a role in acne development and flares. Different research conducted deduced stress to be a cause or more commonly an aggravating factor for acne development.[3,5,6,9,10,12] Higher perceived stress was positive predictor of acne among university students, there was a confirmed association between acne prevalence and degree of stress in students who are continuously subjected to stress, an increased rate of acne was observed. Male students living with families, however, had decreased prevalence of acne due to less psychological and emotional stress.[5]

The adolescents surveyed in a study in Serbia believed that stress is one of exacerbating factors of acne.[6] The study revealed that nearly half of female respondents and slightly more than 1/3rd of all participants believed that emotional stress triggers their acne. A bidirectional relationship was evidenced, and it was stated that stress might be a consequence of acne, but it may aggravate acne as well. There was substantial evidence about stress related neuroendocrine regulations and gland activities eventually leading to acne flares. Stress related worsening of acne was found to be a common complaint in medical practice especially in adult female patients treated by dermatologists in New York stated a study,[4] however the role leading to acne flares were not yet understood. Data shows acne's association with stress, daily stress triggers acne in 1/3rd female respondents but it was considered a less decisive research.

The data collected and results of our study say otherwise and can be contributed to small

sample size, difference in lifestyles and cultures in Pakistan. Strong family bonding is important in minimizing the daily emotional and psychological stress and might be a factor in less stress induced acne flare ups in our study.

Smoking There was no association between acne and smoking in our research (p-value: 0.249) but according to research around the world, smoking is both significant and insignificant, according to some authors even has a protective effect.

One of the reasons for insignificance could be that the sample size in our research is smaller as compared to other researches. We could not evaluate if the participants had started smoking before acne onset or after acne.[1] Another limitation was age group of the persons enrolled, that was 16-25 yrs. Some authors have taken all age groups into consideration and not a specific age group like we did which made it difficult to study the effect of age and role of smoking.[2]

It was also difficult to differentiate between ex-smokers and the people who had never smoked before because a previous history of smoking could also play a role in development of acne. A study was conducted in Italy that consisted exclusively of males or females only while we did not specify gender.[3]

Personal Hygiene Sometimes the stigma of bad hygiene is feared by some acne patients.[7] A study was published by Oxford University Press and it stated that there is poor evidence for lack of facial hygiene on acne and for face cleansing in acne management furthermore frequent face washing increases chances of acne. Soaps and shampoos play a comedogenic role.[8] Similarly, our study showed no significant association between frequency of face washing, usage of soap/ face wash, usage of moisturizer or usage of separate towels for wiping of face and acne however there is a positive correlation between usage of toners (p-value=0.005) and serums (p-value=0.037) with acne.

A study at King Abdul Aziz University, KSA should that only 17.6% patients thought bad hygiene played a role in causing acne.[7] According to a survey held in Serbia, inappropriate hygiene increases chances of acne but on the other hand there is poor evidence for role of improper facial hygiene in acne. It also says that bad hygiene is the second most common aggravating factor for acne but at the same times mentions that washing face with cleanser twice daily is an appropriate measure for better acne clearance without irritation.[6]

In a study held at University of Dammam, misconceptions in young adults is the key point. It is believed that poor hygiene and insufficient cleansing causes acne (83.9%) and at the same time people also believe that the use of cleansers had a therapeutic role.[9] This is contradictory to our research according to which effect of poor hygiene and cleansers was insignificant, the reasons for contradiction could be the difference of sample size, difference of location, gender specified.

In Karnataka India, a study showed that most patients preferred toners as treatment which is in support of our study which shows significance in results that use of toner helps in prevention of acne.

Menstruation According to the research we have conducted there is relevance between menstrual cycle and acne flare up and more than 58% women with regular or irregular menstrual cycle had acne around menstruation, but there was no association between an irregular menstrual cycle and acne(p-value=0.185).

According to a study conducted at University of

California, menstrual cycle plays a key role in acne flare up, the reasons mentioned are hormonal fluctuations and hormonal abnormalities which supports our findings.[4]

According to a study conducted in Syria, menstruation was associated with increasing acne in 80% students, hyper-androgenicity during menstrual cycle may contribute to acne formation[5] and a similar study was conducted in Serbia which proved premenstrual phase is an acne risk factor and caused acne in 84.6% women.[6]

The fact that our sample size was small and women in our setup usually do not get their irregular menstrual cycles evaluated could be a contributing factor for no association between acne flare ups and irregular menstrual cycle.

Body Mass Index (BMI) Anthropometric data analysis showed that 72% of acne subjects were normal weight respondents, 13.3% overweight and 14.7% were under weight.

There was no significance of developing acne with BMI in this study however, it was found to be a potential risk factor for acne vulgaris in previous studies[6,13] and another study gave an evidence that acne prevalence significantly increased steadily (18.5%, 36.6%, 47.5%, 60%) and (8.1%, 35.8%, 10.5%, 60%) with the increased body mass index for BMI < 20, 20–24, 25–29 and >30 kg/m^2; ($\chi 2 = 8.74$, $P = 0.05$) and ($\chi 2 = 22.6$, $P < 0.0001$) in both males and females respectively.

The relation between acne formation and BMI has been studied by many authors. They found that acne was more prevalent among obese persons in women and detected those obese students of both sexes to have higher acne rate. Several explanations could explain the reasons and few of them are the excess androgens caused by obesity and psychological stress that could have resulted from being overweight which in turn cause surge of stress hormones that will worsen the acne.[5]

The difference in the results in this study can be attributed to specified age groups considered in this study, different lifestyles and diets in this part of world. We have taken a small sample size and hence, it is an indecisive result.

Conclusion

Acne is a health and psychological problem among university and college students and more attention should be paid to the factors that might be contributing to it. There was a clear association between menstruation, toners, serums and acne in our study and although other factors did not show a significant result. There is a lot of evidence between acne and these factors in other studies. So, more studies should be conducted so that there is better understanding of the pathogenesis of acne which will help in providing better remedies. Based on the available evidence, dermatologists should recognize the possible link between diet and acne when providing medical care. They should also be aware of the complex interconnection between individual dietetic items informing eating behavior. Further efforts in whole region are needed to build a solid framework of investigative studies in students with acne in Pakistan.

Limitations

Our study has several limitations. Firstly, only a specified age group was selected as sample population for the study. Secondly, majority had mild to moderate acne and severe acne might give more significant correlations if studied separately. In addition, lifestyle differences exist among the different studies conducted. In

Pakistan, the dietary patterns are different and so are the living conditions, thus accounting for differences in results.

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