



ACNE VULGARIS AMONG ADOLESCENT FEMALES IN ARAR CITY, NORTHERN SAUDI ARABIA

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ABSTRACT

We aimed to assess the prevalence of Acne Vulgaris, factors aggravating the appearance of acne vulgaris and its psychological impact on adolescent females in Arar city, Saudi Arabia. From May 1 to October 30, 2020, community-based cross-sectional research was steered in Arar, Northern Saudi Arabia. Adolescent females from a secondary school that was chosen at random made up the study population. The SPSS program was used to assemble and analyze the data, and the findings were examined using frequencies and the Chi-squared test if necessary.

According to our findings, 15.1% of participating females aged less than 15 and 84.9% were between 15- 18 years old. 96.9% of them were Saudi, and 3.1% were non-Saudi. Acne appeared during 13- 16 years of age in 59.3% of the cases. 45.9% of respondents had acne on their faces. Increased acne appearance due to consumption of certain types of food was reported in our study (46.7% fatty meals, 31.4% chocolate, 15.1% spicy food and 6.9% soft drinks). Here stayed non-significant connotation amid acne and age, social status, father of mother working and educational level. We established substantial connotations between smoking and the appearance of acne. Acne Vulgaris prevalence among adolescent Saudi Females is near the published figures. Acne had psychological effects on adolescent girls causing low self-confidence and depression symptoms. Awareness should be raised among this age group about the nature of the disease, appearance of acne, factors increasing and factors decreasing acne, causes of acne and treatment strategies for acne vulgaris.

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Introduction

A widespread skin condition called acne vulgaris, which disturbs 9.4% of the world's populace, is most prevalent among teens. In all ethnic groupings, it distresses more than 90% of men and 80% of women [1]. Open and closed comedones, erythematous papules and pustules, and in more serious instances, nodules, deep pustules, and pseudocysts make up the acne lesions [2]. The quality of life decreased self-esteem, and communal communication with others are all negatively impacted by reasonable to serious acne lesions, which could similarly leave overdue post-inflammatory hyperpigmentation or atrophic scars [3]. Additionally, it can cause anxiety, depression, and other emotional trauma that jeopardizes the quality of life [4]. Different nations and ethnic groups have varying rates of adult and teenage acne [5]. In Mainland, China2017, Li D, reported greater proportions of acne among primary and secondary students than undergraduate students. He also reported that men were more likely than women to have acne [6].

In a 2013 research in Yazd, Iran, teens in high school had an overall prevalence of acne of 85.9 percent. Ninety percent of women and 81.4 percent of men had acne, and the severity of the condition had a greater impact on quality of life [7].

El-Hamd (2017) conducted an Egyptian research with 994 teenage secondary school students and discovered that 333 (33.5%) of them had acne vulgaris, with girls having a greater frequency than boys (200, 60% vs. 133, 40%) [8].

In 2014, Al-Nohair and Sharaf, in their study on teenagers in the Qassim region, Saudi Arabia, found that a high percentage have acne misconceptions. The most prevailing misconception was that stress exacerbates acne by 59.9% [9].

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Abo El-Fetoh (2016) concluded that 68.2% of female teens in Riyadh, Saudi Arabia, have acne vulgaris. The average age (in years) of acne patients was 21, the average age of acne beginning was 15, and 42.5% of cases had a positive family history of acne vulgaris [10].

In Jeddah, Saudi Arabia, Zari (2017) established that acne is very common in female medical students, with a prevalence rate of 98% [11]. A study carried out in the USA by Dhabhar FS (2003) revealed that emotional strain could amend the immune roles of the skin and then aggravate the appearance of acne vulgaris [12].

A study on young adolescents in Greece (2012) stated that with mild acne, 64.6% with moderate acne, and 89.3% with severe acne, people stated feeling embarrassed and having lower self-esteem due to facial acne. Additionally, 21.3% of people described changing their wardrobe style, and 31.4% conveyed experiencing feelings of worthlessness due to acne. Teenagers' personal and academic lives were disrupted by acne in 21.4% of cases, while their interests were influenced in 19.4%. Due to their facial acne, 19.2% of people reported that their individual and communal natural life, notably the development of relationships, was impacted. (14%) of people evaded swimming and further activities out of shame. 16.6 percent of people with acne conveyed having sleep difficulties [13].

The everyday eating of chocolate, sweetmeats, and smoking was shown to be autonomously and strongly related to an intensification in the occurrence of acne in research to evaluate the impact of food and smoking on acne [14].

In the Northern Borders region of Saudi Arabia, no previous research has been available on acne vulgaris amongst feminine secondary school scholars. So, to ascertain the prevalence and psychological effects of acne vulgaris, our study was carried out.

Study Objectives

To measure the prevalence of Acne Vulgaris, factors aggravating the appearance of acne vulgaris and its psychological impact on adolescent females in Arar city, Saudi Arabia

Materials and Methods

Study Design, Setting and Period

The cross-sectional study was conducted in Arar city, Northern Saudi Arabia, from June 1 to October 31, 2020.

Study Sample

The sample size was calculated by Raosoft. The target population is 382, adding 20% non-response, and the minimum sample was 458. The cluster sampling technique was used. Three female secondary schools in Arar city were selected by simple random sampling. From each school, we included students from 3 classes.

Study Tool

Data were gathered using a pre-designed questionnaire. The questionnaire was administered to the class for completion. Age, gender, age of onset, location of acne and its relationship to skin cleansing, smoking, a particular kind of diet, seasonality fluctuation, histories of therapy and its consistency, and histories of cosmetic procedures were among the characteristics covered in the survey.

Ethical Considerations

Permission to conduct the study was obtained from the Research Ethics Committee of the Northern Border University, Arar, Saudi Arabia. Data collectors gave a brief introduction to the students by explaining the aims and benefits of the study. Informed written consent was obtained from all participants. Anonymity and confidentiality of data was maintained throughout the study.

Statistical Analysis

We utilized the statistical package for social sciences, version 16 (SPSS Inc., Chicago, Illinois, USA), to analyze the study data. The results were displayed as counts and percentages. The chi-square (X²) will be used as a significance test, and $P < 0.05$ indicates significance.

Results and Discussion

Table 1 demonstrates the socio-demographic features of participants in addition to the prevalence of acne vulgaris among the studied sample. 15.1% of participating females were aged less than 15 years old, and 84.9% were between 15- 18 years old. 96.9% of them were Saudi, and 3.1% were non-Saudi. Only 53.3% and 43% of participants' fathers and mothers went to university, respectively. 61.3% of mothers were housewives, and only 9.6% of fathers did not work. Prevalence of acne vulgaris was found to be 62.9% among studied female adolescents.

As shown in **Table 2**, acne appeared during 13- 16 years of age among 59.3% of the cases, 45.9% of respondents had acne on the face, 48.9% on the face and back and only 5.2% on the back. Increased acne appearance due to consumption of certain types of food was reported in our study (46.7% fatty meals, 31.4% chocolate, 15.1% spicy food and 6.9% soft drinks).

Regarding the psychosomatic influence of acne on adolescents, the present study established low self-confidence in 33.3% of participants, 18.5% signs of depression, and 6.9 decreased social relations. 34.3% of participants take treatment for acne vulgaris (94.9% take medications regularly). Topical agents were used in 72.6% of treated cases, 15.8% used antibiotics, and 11.5% used Roaccutane. Brown spots were reported in 66.6% of our sample, scars in 54.5% and redness in place of pimples in 36.2%.

Sources of information about the causes and treatment of acne were school peers in 3.5% of the sample, parents in 4.9%, doctors and pharmacists in 41.7%, internet in 43% and newspapers and television in 6.9% of participants.

As illustrated in **Table 3**, non-significant connotation amid acne and age, social status, father of mother working and educational level. We found a significant association between smoking and the appearance of acne

Table 1. Socio-demographic characteristics of the studied population and prevalence of acne vulgaris among the studied sample (N=644)

	Frequency	Percent
Age:		
Less than 15	97	15.1
15 – 18	547	84.9
Nationality:		
Saudi	624	96.9
Non-Saudi	20	3.1
Father's educational level:		
Uneducated	46	7.1
Primary	44	6.8
Intermediate	67	10.4
Secondary	144	22.4
University or more	343	53.3
Father working status:		
Army	50	7.8
Teacher	93	14.4
Employee	208	32.3
No Work	62	9.6
Retired	231	35.9
The mother's educational level:		
Uneducated	116	18.0
Primary	91	14.1
Intermediate	41	6.4
Secondary	119	18.5
University or more	277	43.0
Mother working status:		
Works	249	38.7
Housewife	395	61.3
Do you suffer from acne?		
Yes	405	62.9
No	239	37.1

Table 2. Characteristics of acne among studied cases (N=405)

Age when acne appears?		
Less than 13	51	12.6
13 – 16	240	59.3
More than 17	114	28.1
Site of acne		

Face	186	45.9
Back	21	5.2
Face and back	198	48.9
The psychological impact of acne		
Symptoms of depression	75	18.5
Low self-confidence	135	33.3
Decreased social relationships	28	6.9
There is no	167	41.2
Increased appearance due to lack of skin hygiene		
Yes	86	21.2
No	319	78.8
Increased appearance due to consumption of certain types of food e.g.		
Excess cola drinks	28	6.9
Fatty meals	189	46.7
Chocolate	127	31.4
spicy food	61	15.1
Increased appearance due to increased smoking:		
Yes	34	8.4
No	371	91.6
Seasonal variation in the appearance of acne:		
In summer	105	25.9
In spring	15	3.7
There is no seasonal difference	285	70.4
Taking acne treatment:		
Yes	139	34.3
No	266	65.7
Regularity in acne treatment:		
Yes	132	94.9
No	7	5.1
Type of acne treatment (N=139)		
Topical	101	72.6
Antibiotic	22	15.8
Roaccutane	16	11.5
Acne complications (there is overlapping)		
Brown spots	270	66.6
Digging and scars	221	54.5
Redness in place of pimples	147	36.2
Nothing	135	33.3
Cosmetic procedures for the effects of acne (there is overlapping):		
Laser	51	12.5
Chemical peeling	197	48.6
Lightening creams	275	67.9
Having previous plastic surgery for acne:		
Yes	20	4.9
No	385	95.1
Sources of information about the causes and treatment of acne:		
School peers	14	3.5
Parents	20	4.9

Doctors and pharmacists	169	41.7
Internet	174	43.0
Newspapers and television	28	6.9

Table 3. The relationship between socio-demographic characteristics of the studied population and the presence of acne vulgaris

		Presence of acne vulgaris		Total (N=644)	P value
		Yes (N=405)	No (N=239)		
Age:	Less than 15	63	34	97	0.649
		15.6%	14.2%	15.1%	
	15 – 18	342	205	547	
		84.4%	85.8%	84.9%	
Nationality:	Saudi	393	231	624	0.786
		97.0%	96.7%	96.9%	
	Non-Saudi	12	8	20	
		3.0%	3.3%	3.1%	
Father's educational level:	uneducated	31	15	46	0.083
		7.7%	6.3%	7.1%	
	Primary	36	8	44	
		8.9%	3.3%	6.8%	
	Intermediate	39	28	67	
		9.6%	11.7%	10.4%	
Secondary	88	56	144		
	21.7%	23.4%	22.4%		
University or more	211	132	343		
	52.1%	55.2%	53.3%		
Father working status:	Army	38	12	50	0.235
		9.4%	5.0%	7.8%	
	Teacher	54	39	93	
		13.3%	16.3%	14.4%	
	Employee	135	73	208	
		33.3%	30.5%	32.3%	
No Work	38	24	62		
	9.4%	10.0%	9.6%		
Retired	140	91	231		
	34.6%	38.1%	35.9%		
The mother's educational level:	uneducated	67	49	116	0.710
		16.5%	20.5%	18.0%	
	Primary	59	32	91	
		14.6%	13.4%	14.1%	
	Intermediate	28	13	41	
		6.9%	5.4%	6.4%	
Secondary	77	42	119		
	19.0%	17.6%	18.5%		
University or more	174	103	277		
	43.0%	43.1%	43.0%		
Mother working status:	Works	161	88	249	0.460
		39.8%	36.8%	38.7%	
	Housewife	244	151	395	

		60.2%	63.2%	61.3%	
Smoking	Yes	34	42	76	0.001
		8.4%	17.6%	11.8%	
	No	371	197	568	
		91.6%	82.5%	88.2%	

The top three most frequent skin problems among adolescents are always acne. Different nations and ethnic groups have different rates of adult and teenage acne [10]. This research explores the psychological effects of acne vulgaris on teenage girls in Arar, Saudi Arabia, its incidence, and the variables that make it worse.

Results of our study reported 62.9% acne prevalence among studied female adolescents. Our results were comparable to those of cross-sectional research on teenagers in Hail City. It was discovered that 65% of participants had mild to moderate acne [15]. Another Saudi research study in Jeddah, Saudi Arabia, discovered that 64.5 percent of both males and females had acne [16]. This was consistent with research [17] done in Riyadh, Saudi Arabia, which demonstrated that college students had an acne incidence of 56.2%. According to Abo-Elfotouh *et al.*, 53.5% of male pupils in the Northern area of Saudi Arabia have acne vulgaris [10]. Another research stated that the prevalence rate of acne was 51.2% (mild acne was 71.2% and reasonable to serious acne was 28.8%) [18]. In Egypt, 60% of female high school students have acne, according to El-hamd *et al.* [19]. In another research, all students above 14 developed acne, which had a higher prevalence rate of 96.0% and rose with age [20]. At age 10, there was a frequency of 1.6 percent in China. As people aged, the incidence rose, reaching 46.8% at age 19 [21]. Another study reported prevalence of acne varies from 35-90% among adolescents at some stage [22]. 63.6% was reported in Turkey [23]. Another Chinese research concluded that 53.5% of all teenagers had acne, with men having 51.3% and girls having 58.6% [24]. These findings were substantially lower than those concluded in Lithuania; the prevalence rate of acne among defendants was 82.9%, with the greatest prevalence rates in the age categories of 13-15 and 16-19 years [25]. One more research for the period of adolescence revealed a 23.1% prevalence rate of acne (The rate in girls and boys was 16.1% and 29.2%, correspondingly) [26].

In our studied sample, 45.9% of respondents had acne on the face, 48.9% on the face and back and only 5.2% on the back. Another study reported the prevalence of facial acne at 89.1% and that of acne in the back at 41.3% [18]. In another study, face acne was reported in 99.3% of the cases, which was the commonest site of acne, followed by the back at 3.6% and chest at 2.1% [27]. This was in line with another study that reported the face as the furthestmost commonly subjective place at 97.5%, followed by the face and trunk at 2.3% [20].

Regarding risk factors for increased acne, 21.2% of our sample reported a lack of skin hygiene, and 8.4% reported smoking. Stress and genetic susceptibility are correlated with acne and its severity [18]. Factors associated with causes of acne in another study were food, bad skin hygiene and hormonal changes [23]. Nevertheless, another survey identified major risk indicators for acne, such as age, skin condition, poor sleep, and chemical cosmetics usage [26].

Increased acne appearance due to consumption of certain types of food was reported in our study (46.7% fatty meals, 31.4% chocolate, 15.1% spicy food and 6.9% soft drinks). The majority of another study's population reported increased acne when consuming oily food consumption (42.9%), chocolates (30.7%), ice cream (25.7%), and milk consumption (6.4%) [27]. According to another research, a high proportion of respondents had whole milk weekly, twice per week, and consumed fruits. They really consumed chocolates, processed food, fatty meals, and seafood with much the same consistency [15]. Of such replies, 37% consumed nuts relatively regularly. Patients with intermediate to serious acne are more likely to have psychological issues. Teenage females seem to be more susceptible than men to the detrimental psychological consequences of acne, even though acne seems to be more frequent in teenage boys [26].

Psychosomatic impression of acne in adolescents in our study was established to be low self-confidence in 33.3% of participants, 18.5% signs of depression, and 6.9 decreased social relations. The alternative study's contributors' self-reported anxiety rate was 44.6%, indicating a connection between stress and acne ($p < 0.0001$) [18]. Another study confirmed that acne affects anxiety, depression and self-esteem [23].

Topical antibiotics and benzoyl peroxide are effective in treating inflamed acne. In many previous studies, topical erythromycin and clindamycin reduce inflammatory lesions by 46% to 70% [28, 29]. Systemic treatment may be retinoid (e.g., isotretinoin), systemic antibiotics (e.g., azithromycin, clindamycin, co-trimoxazole, doxycycline, erythromycin, levofloxacin, minocycline), hormonal contraceptives or diverse (e.g., clofazimine, corticosteroids, ibuprofen, zinc sulfate) [29, 30]. Oral isotretinoin medication (Roaccutane) is one of the most common medications to prevent extreme acne. The normal period of isotretinoin is 16–24 weeks, with increasing doses used as tolerated until the target dosage, usually between 120 and 150 mg/kg, is met. However, late teenage use has an increased risk of relapse, especially in women with hormonally induced acne and up to 20% of all younger patient populations [31, 32]. In our study, 34.3% of participants take treatment for acne vulgaris (94.9% take medications regularly). Topical agents were used in 72.6% of treated cases, 15.8% used antibiotics, and 11.5% used Roaccutane. A previous study reported that (71.6%) of the studied population was under topical treatment, 13.65% antibiotics, contraceptives in 1.6% and isotretinoin in 1.6% [18]. Another study reported positive treatment history in (47.9%) of patients [27-29, 33]. According to data from another research, 20.6% of people with acne had previously used topical treatments, oral drugs, or "skin washing," whether or not it was related to taking pills and oral medications [20]. El-Fotouh *et al.* found that (67.6%) of the cases received medical treatment for acne, and only (4.7%) had plastic surgery for acne [10].

Brown spots were reported in 66.6% of our sample as a complication, scars in 54.5%, and redness in place of pimples in 36.2%, comparable to Abo-Elfotouh *et al.* results about (74.9%) reported the presence of scarring and post-acne hyperpigmentation [10].

According to our result, there was a non-significant connotation among acne and age, social status, father of mother working and educational level. This disagreed with a study that reported age, job, wedding situation, household, and dealing history were associated with acne, while diet, smoking, and alcohol did not [27-29, 33]. Lasek's results found an association between acne and age [34, 35]. Furthermore, a substantial correlation involving parental educational status with acne intensity has been seen observed in other research [20]. In Arar, Saudi Arabia, we discovered a significant positive correlation between tobacco smoke and the development of acne [10]. Being overweight, smoking, under distress, having irregular menstrual cycles, and eating too many nuts could be other factors showing a strong connection for acne [36]. Compared to such findings, research from Italy revealed a link between tobacco and acne [37].

Conclusion

Acne Vulgaris prevalence among adolescent Saudi Females is near the published figures. Acne had psychological effects on adolescent girls causing low self-confidence and depression symptoms. Awareness should be raised among this age group about the nature of the disease, appearance of acne, factors increasing and factors decreasing acne, causes of acne and treatment strategies for acne vulgaris.

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References

1. Tan JK, Bhate K. A global perspective on the epidemiology of acne. *Br J Dermatol.* 2015;172 Suppl 1:3-12.
2. Maldonado-Colín G, Hernández-Zepeda C, Durán-McKinster C, GarcíaRomero MT. Inherited epidermolysisbullosa: A multisystem disease. *Indian J Paediatr Dermatol.* 2017;18(4):267-73.
3. Alajlan A, Al Turki YA, AlHazzani Y, Alhowaish N, AlEid N, Alhozaimi Z, et al. Prevalence, level of knowledge and lifestyle association with acne vulgaris among medical students. *J Dermatol Dermatol Surg.* 2017;21(2):58-61.
4. Al Natour S. Acne vulgaris: Perceptions and beliefs of Saudi adolescent males. *J Fam Community Med.* 2017;24(1):34.
5. Bagatin E, Timpano DL, Guadanhim LR, Nogueira VM, Terzian LR, Steiner D, et al. Acne vulgaris: prevalence and clinical forms in adolescents from São Paulo, Brazil. *An Bras Dermatol.* 2014;89:428-35.
6. Li D, Chen Q, Liu Y, Liu T, Tang W, Li S. The prevalence of acne in Mainland China: a systematic review and meta-analysis. *BMJ Open.* 2017;7(4):e015354.
7. Noorbala MT, Mozaffary B, Noorbala M. Prevalence of acne and its impact on the quality of life in high school-aged adolescents in Yazd, Iran. *J Pak Assoc Dermatol.* 2013;23(2):168-72.
8. El-Hamd MA, Nada EE, Moustafa MA, Mahboob-Allah RA. Prevalence of acne vulgaris and its impact of the quality of life among secondary school-aged adolescents in Sohag Province, Upper Egypt. *J Cosmet Dermatol.* 2017;16(3):370-3.
9. Al-Nohair SF, Sharaf FK. Acne Vulgaris: Misconceptions among Teen School Students in Qassim Region, Saudi Arabia. *Al-Jouf J Soc Sci.* 2014;1(2):14-8.
10. AboEl-Fetouh N, Alghamdi R, Albarqi W, Asiri S, Alruwaili N. Epidemiology of Acne Vulgaris in Adolescent and Young Females in Riyadh City, Kingdom of Saudi Arabia. *Int J Adv Res.* 2016;4(12):589-98.
11. Zari S, Turkistani A. Acne vulgaris in Jeddah medical students: prevalence, severity, self-report, and treatment practices. *J Cosmet, Dermatol Sci Appl.* 2017;7(01):67-76.
12. Dhabhar FS. Stress, leukocyte trafficking, and the augmentation of skin immune function. *Ann N Y Acad Sci.* 2003;992(1):205-17.
13. Tasoula E, Gregoriou S, Chalikias J, Lazarou D, Danopoulou I, Katsambas A, et al. The impact of acne vulgaris on quality of life and psychic health in young adolescents in Greece: results of a population survey. *An Bras Dermatol.* 2012;87(6):862-9.
14. Wolkenstein P, Misery L, Amici JM, Maghia R, Branchoux S, Cazeau C, et al. Smoking and dietary factors associated with moderate-to-severe acne in French adolescents and young adults: results of a survey using a representative sample. *Dermatology.* 2015;230(1):34-9.

15. Alshammrie FF, Alshammari R, Alharbi RM, Khan FH, Alshammari SK. Epidemiology of acne vulgaris and its association with lifestyle among adolescents and young adults in Hail, Kingdom of Saudi Arabia: a community-based study. *Cureus*. 2020;12(7):e9277. doi:10.7759/cureus.9277
16. Al Mashat S, Al Sharif N, Zimmo S. Acne awareness and perception among population in Jeddah, Saudi Arabia. *J Saudi Soc Dermatol Dermatol Surg*. 2013;17(2):47-9.
17. Al Robae AA. Prevalence, knowledge, beliefs and psychosocial impact of acne in University students in Central Saudi Arabia. *Saudi Med J*. 2005;26(12):1958-61. Available from: <https://pubmed.ncbi.nlm.nih.gov/16380781/>
18. Tasoula E, Gregoriou S, Chalikias J, Lazarou D, Danopoulou I, Katsambas A, et al. The impact of acne vulgaris on quality of life and psychic health in young adolescents in Greece: results of a population survey. *An Bras Dermatol*. 2012;87:862-9. doi:10.1590/s0365-05962012000600007
19. El-Hamd MA, Nada EE, Moustafa MA, Mahboob-Allah RA. Prevalence of acne vulgaris and its impact of the quality of life among secondary school-aged adolescents in Sohag Province, Upper Egypt. *J Cosmet Dermatol*. 2017;16(3):370-3. doi:10.1111/jocd.12328
20. Bagatin E, Timpano DL, Guadanhim LR, Nogueira VM, Terzian LR, Steiner D, et al. Acne vulgaris: prevalence and clinical forms in adolescents from São Paulo, Brazil. *An Bras Dermatol*. 2014;89:428-35. doi:10.1590/abd1806-4841.20142100
21. Shen Y, Wang T, Zhou C, Wang X, Ding X, Tian S, et al. Prevalence of acne vulgaris in Chinese adolescents and adults: a community-based study of 17,345 subjects in six cities. *Acta Derm Venereol*. 2012;92(1):40-4.
22. Stathakis V, Kilkenny M, Marks R. Descriptive epidemiology of acne vulgaris in the community. *Australas J Dermatol*. 1997;38(3):115-23. doi:10.1111/j.1440-0960.1997.tb01126.x
23. Uslu G, Şendur N, Uslu M, Şavk E, Karaman G, Eskin M. Acne: prevalence, perceptions and effects on psychological health among adolescents in Aydin, Turkey. *J Eur Acad Dermatol Venereol*. 2008;22(4):462-9. doi:10.1111/j.1468-3083.2007.02497.x
24. Wu TQ, Mei SQ, Zhang JX, Gong LF, Wu FJ, Wu WH, et al. Prevalence and risk factors of facial acne vulgaris among Chinese adolescents. *Int J Adolesc Med Health*. 2007;19(4):407-12. doi:10.1515/ijamh.2007.19.4.407
25. Karčiauskienė J, Valiukeviciene S, Gollnick H, Stang A. The prevalence and risk factors of adolescent acne among schoolchildren in Lithuania: a cross-sectional study. *J Eur Acad Dermatol Venereol*. 2014;28(6):733-40. doi:10.1111/jdv.12160
26. Aktan S, Özmen E, Sanli B. Anxiety, depression, and nature of acne vulgaris in adolescents. *Int J Dermatol*. 2000;39(5):354-7. doi:10.1046/j.1365-4362.2000.00907.x
27. Durai PC, Nair DG. Acne vulgaris and quality of life among young adults in South India. *Indian J Dermatol*. 2015;60(1):33-40. doi:10.4103/0019-5154.147784
28. Haider A, Shaw JC. Treatment of acne vulgaris. *JAMA*. 2004;292(6):726-35.
29. Ogé LK, Broussard A, Marshall MD. Acne vulgaris: diagnosis and treatment. *Am Fam Physician*. 2019;100(8):475-84.
30. Fox L, Csongradi C, Aucamp M, Du Plessis J, Gerber M. Treatment modalities for acne. *Molecules*. 2016;21(8):1063. doi:10.3390/molecules21081063
31. Kurokawa I, Layton AM, Ogawa R. Updated treatment for acne: targeted therapy based on pathogenesis. *Dermatol Ther*. 2021;11(4):1129-39.
32. DiGiovanna JJ. Systemic retinoid therapy. *Dermatol Clin*. 2001;19(1):161-7.
33. Jaber RM, Alnshash BM, Mousa SN, Fayoumi HS, Al-Qaderi LM, Zant AM. The epidemiology of acne vulgaris among adolescents and young adults in Jordan University Hospital. *Open J Nurs*. 2020;10(4):353-66. doi:10.4236/ojn.2020.104024
34. Lasek RJ, Chren MM. Acne vulgaris and the quality of life of adult dermatology patients. *Arch Dermatol*. 1998;134(4):454-8.
35. Sawsan Kh Elsayed MD, Mohamad NE, Morad W, Laila AR. Impact of Acne Vulgaris on Patients' Quality of Life. *Med J Cairo Univ*. 2019;87(December):5193-9. doi:10.21608/mjcu.2019.88821
36. Capitanio B, Sinagra JL, Ottaviani M, Bordignon V, Amantea A, Picardo M. Acne and smoking. *Dermatoendocrinol*. 2009;1(3):129-35. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835905/>
37. Santos Z, Velho M, Zan F, Rech V, Ourique AF. Review of Clinical Factors That Cause Acne Vulgaris. *Int J Innov Educ Res*. 2020;8(9):434-47. doi:10.31686/ijer.vol8.iss9.2659