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Association of acne with impaired dermatologic quality of life among Young People in Nigeria: A cross-sectional survey

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Abstract
Objective: Acne, particularly severe forms, may impair quality of life. This study aimed to determine the prevalence of acne, its severity, and its impact on the quality of life among young people in Nigeria.
Methods: We conducted a cross-sectional survey of 1017 systematically selected undergraduates in a Nigerian University using a 24-item self-administered questionnaire. We derived the proportions and means of participants' characteristics and computed the crude and specific (age, sex, and location of residence) prevalence. We then conducted bivariate analysis and used binary logistic regression analysis to evaluate the relationship between the report of acne and the dermatologic quality of life. The level of significance was set at 5%.
Results: About half (539; 53.0%) of the respondents were females, while 478 (47.0%) were males with mean ages of 16.6 (±1.2) and 16.8 (±1.4) (p = 0.004) respectively. The prevalence of self-reported acne was 61.3% (58.2-64.3). Participants reporting acne were four times more likely to perceive an impairment in dermatologic quality of life (AOR: 4.18 [2.77-6.33]). The perceived severity of acne was statistically related to the dermatologic quality of life. Participants with moderate (AOR: 3.05 [2.19-4.25]) and severe (AOR: 7.96 [3.12-20.16]) acne were at increased odds of impairment of dermatologic quality of life compared to those with no or mild acne.
Conclusion: The self-report of acne and its severity are associated with diminished quality of life independent of age and sex. The management of acne among young people should include strategies to improve their perceived quality of life.

Keywords: Adolescents, Acne, Dermatologic quality of life, Nigeria, Young people

Plain English Summary
Acne popularly known as pimples is a disease that is seen in young people. It is seen on the most visible parts of the skin, especially the face, therefore it affects appearance an important determinant of a young person's self-esteem and feeling of acceptance among peers. If the youths are bothered about their appearances, then pimples can affect how they can comfortably participate in and enjoy life events.
Our study used a reliable questionnaire to determine if pimples have an impact on the quality of life of new students in a private university in Nigeria.

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Introduction

Acne vulgaris is a chronic disease of the pilosebaceous gland. It can be classified as mild, moderate, or severe based on the presence of inflammation, nodules, scarring, and duration of symptoms despite treatment (1). Although closely related to sebum production following elevations in the productions of androgens and testosterone hormone seen with puberty and sexual maturation, it is not a 'natural' developmental occurrence as it involves the colonisation of the gland by Propionibacterium acne and activation of the immune system with consequent production of inflammatory markers (1, 2, 3). It is the most common dermatological disorder in adolescents (3). The global disease burden is thought to be dynamic with an increase in prevalence among male adolescents and female adults (4, 5, 6). Worldwide, the prevalence of acne is estimated to be about 9.4% (7), in a review done on the prevalence of acne in medical students worldwide, the prevalence of acne was estimated to be 34.38% to 97.9% (8). In the Nigerian population, a higher prevalence of acne was found in the Southwestern region (9, 10, 11) than in studies done in Northcentral and South southern Nigeria (12, 13). Also, among undergraduate students in Ogun state, acne was observed to have a prevalence above 80% among young adults with a mean age of 19 years ± 2.25 years (14).

Although not life-threatening and transient, acne continues to significantly impact the physical, social, and emotional well-being of adolescents. The period of adolescence is an important stage of identity formation and sexual maturation (15), therefore acne vulgaris which affects the largest and most visible organ of the human body influencing appearance remains a strong determinant of self-esteem and peer acceptance, which may predict the quality-of-life index in this age group (16, 17).

The World Health Organisation defines the quality of life as "perception by the entity's position in life, in the context of culture and value systems in which they live and the relation to its objectives, expectations, standards and interests" (18). In simple terms, the quality-of-life index can be defined as the degree to which an individual is healthy, comfortable, and able to participate in or enjoy life events (19). The dermatologic quality of life can be defined as the health-related quality of life of patients suffering from a skin disease (20). Among adolescents, the quality of life is closely tied to appearance and acceptance by close family relationships and peers (21). There may be more to the impact of acne than the physical scars in adolescents, where the perception of others is an important index of self-esteem. More than the physical scars, acne may also be responsible for deep-seated psychological scars which may affect participation and enjoyment of life events.

This study aims at determining the quality of life of adolescents with acne. It will serve as a preliminary to a more robust study on the need for a multidisciplinary approach to the management of acne. We aimed to determine the prevalence of acne, its severity, and its impact on the quality of life of adolescents as this may be important in developing a holistic management option for acne in our environment because, in addition to pharmacologic therapy, there may be a need for counselling and psychotherapy in its management.

Materials and Methods

The study was carried out at Babcock University between July 2022 and February 2023. Babcock University (BU) is a private faith-based co-educational Nigerian university. BU is one of the first three private universities established in Nigeria. The university is owned and operated by the Seventh-day Adventist Church in Nigeria (22, 23). The University is located in Ilishan Remo, Ikenne local government, Ogun State, Nigeria. It is situated off the Lagos- Ore expressway. Overall, the student population is about 14,000 with 12,000 undergraduate and about 2,000 postgraduate students. At the time of the study, the first-year undergraduate students were 2403 and 700 on the main campus and satellite campus respectively. The institution has nine schools and one college. Most of the university's students reside in halls of residence on campus, and more than half of its student population are females.

This was a descriptive cross-sectional study among first-year undergraduate students. All first-year undergraduate students were eligible to participate in this research. We excluded individuals who had severe health conditions at the time of the study. The sample size was determined using Leslie Kish's formula for a single proportion where the study population is more than 10,000 (24) as follows.

$$n = \frac{Z^2 \times p\,(1-p)}{d^2}$$

The symbol n represents the minimum sample size, Zα is the value of alpha error at a 95% confidence interval given as 1.96, d is the precision set at 0.05, p is the estimated prevalence set at 50% (11), and q is 1-p. Substituting the

figures into the formula, a minimum sample size of 384 was obtained, 10% of this was added to account for non-response and incomplete responses. However, 1035 students were studied to further improve the external validity of the study. The research was conducted at the two campuses of BU. We then allocated the sample size to each site through proportionate allocation based on the number of students resident in them. We recruited 731 students from the main campus and 304 students from the satellite campus. Participants were selected by a systematic sampling technique. Simple random sampling by balloting was used to select the first study participant then a sampling interval of three was applied to select subsequent study participants until the sample size of 1035 was attained from a list of all first-year students in the University. The sampling interval was obtained by dividing the total population of first-year students (3107) by the sample size (1035).

We engaged and trained graduate assistants who served as research assistants in this study. They were trained on how to obtain informed consent and data collection using self-administered questionnaires. The instrument is a 24-item questionnaire with two sections. The first section assessed the socio-demographic characteristics of the participants, while the second assessed the participants' perception of the effect of acne on the quality-of-life index. There are various tools available to assess the health-related quality of life index in adolescents, however, the dermatology life quality index remains the most widely used tool to assess the quality of life in individuals with skin disorders (25) and will, therefore, ensure comparability with other studies. We used the dermatological life quality index (DLQI) (26) to assess the quality of life of adolescents. The questionnaire was hand-delivered to the selected participants by trained research assistants after obtaining written informed consent. The participants were given some privacy for 10 minutes for completion. Students were asked to fill up the DLQI questionnaire without assistance. All copies of the questionnaire were retrieved on the same day by the investigators. A maximum of three attempts were made to get selected participants to fill out the questionnaire whenever difficulties were encountered. The questionnaire was pre-tested with 60 fresh students of another privately-owned University in Ogun State which is about 15% of the minimum sample size.

The DLQI questionnaire, first introduced by Finlay and Khan, in 1994 (26) was used as the study instrument for this study. The DLQI, the first published dermatology-specific quality of life questionnaire, is a validated measure of the health-related quality of life of individuals with skin diseases. The widely used scale has been applied in over 80 countries, translated into more than 110 languages, and resulted in more than 3,000 peer-reviewed publications based on different methodologies, including randomized controlled trials. It is amenable to varied uses, including clinical decision-making, research, and evaluation. A simple tool, the DLQI requires about two minutes to complete and assesses the preceding week.

The scale is amenable to use among adolescents. DLQI assesses six domains, namely (a) physical symptoms and feelings (questions 1 and 2), (b) daily activities (questions 3 and 4), (c) leisure (questions 5 and 6), (d) work/school (questions 7), (e) personal relationships (questions 8 and 9), and (f) treatment (question 10). Each item on the scale is scored from zero to three as follows; "very much" (score 3), "a lot" (score 2), "a little" (score 1), and "not at all" (score 0). The minimum and maximum overall scores are 0 and 30, respectively. The higher the score, the more the likelihood of impairment in the dermatologic quality of life. Less than two is regarded as having no effect, two to five is said to have a small effect, while six to ten is interpreted as having a moderate effect. Scores of 11 to 20 are interpreted to mean there was a large effect, while 21 and above are regarded as extremely large effects. A score of ten or higher indicates severe impairment of the quality of life by skin disease (26, 27). The severity of acne was self-reported based on the degree of inflammation (painful swelling) and if it was present in single or multiple sites- face, upper trunk, and/or neck (11).

The investigators routinely assessed the collected data for accuracy and completeness. The researchers did a full review of 10% (selected by systematic sampling method) of the data tool for errors. The research assistants coded and entered the data obtained into Microsoft Excel software in CSV format. The researchers then cleaned the data and exported it into the SPSS version 22 statistical software for analysis.

We derived the proportions and means of sociodemographic characteristics and computed the crude and specific (age, sex, and location of residence) prevalence (and 95% confidence intervals of acne). The researchers used appropriate bivariate analysis (chi-square and t-tests) to assess the association between acne and other sociodemographic characteristics and the quality of life. We then ran a binary logistic

regression analysis to evaluate the relationship between the report of acne and the dermatologic quality of life while controlling for the indicated participant characteristics, which were selected based on literature, biological plausibility, and statistical significance on bivariate analysis ($p < 0.25$). For the bivariate and logistic regression analyses, the DLQI categories were dichotomized into no effect (0 to 1) and some effect (>1) We tested the variables at the 5% level of significance and used the Hosmer-Lemeshow chi-square test to test the fit of our final model to the underlying data.

Results

Of 1035 recruited and surveyed, 1017 students participated fully in the study and returned quality responses, giving a response rate of 98.3%.

Table 1: Participant characteristics

Participants' characteristics	n (%)	Female n (%) 539 (53.0%)	Male n (%) 478 (47.0%)	χ2 (p-value)
Age*	16.7 (±1.3)	16.6 (±1.2)	16.8 (±1.4)	-2.87 (0.004)
< 15	4 (0.4)	1 (0.2)	3 (0.6)	
15-19	968 (95.2)	521 (96.7)	447 (93.5)	0.056
20-24	45 (4.4)	17 (3.2)	28 (5.9)	
Ethnicity				
Yoruba	484 (47.6)	281(52.1)	203 (42.5)	
Igbo	346 (34.0)	164 (30.4)	182 (38.1)	9.89 (0.020)
Hausa	14 (1.4)	7 (1.3)	7 (1.5)	
Others	173 (17.0)	87 (16.1)	86 (18.0)	
Religion				
Christianity	955 (93.9)	500 (92.8)	455 (95.2)	2.60 (0.107)
Islam	62 (6.1)	39 (7.2)	23 (4.8)	
Frequency of attendance to a religious activity				
Daily	63 (6.2)	40 (7.4)	23 (4.8)	
Twice weekly	364 (35.8)	202 (37.5)	162 (33.9)	
Weekly	543 (53.4)	275 (51.0)	268 (56.1)	6.56 (0.161)
Monthly	27 (2.7)	16 (3.3)	11 (2.0)	
Annually	20 (2.0)	11 (2.0)	9 (1.9)	
Family type				
Nuclear	966 (95.0)	513 (95.2)	453 (94.8)	
Single Parent	35 (3.4)	19 (3.5)	16 (3.3)	0.74 (0.864)
Polygamous	13 (1.3)	6 (1.1)	7 (1.5)	
Foster	3 (0.3)	1 (0.2)	2 (0.4)	
Location of residence				
Rural	52 (5.1)	37 (6.9)	15 (3.1)	7.25 (0.007)
Urban	965 (94.9)	502 (93.1)	463 (96.9)	
Severity of acne				
Mild or none	685 (67.4)	366 (67.9)	319 (66.7)	
Moderate	308 (30.3)	159 (29.5)	149 (31.2)	0.56 (0.756)
Severe	24 (2.4)	14 (2.6)	10 (2.1)	

*Quantitative variable, t-test

Table 1 summarised participant characteristics; 539 (53.0%) of the respondents were females and 478 (47.0%) were males. The mean age of participants was statistically significant, the males had a mean age of 16.8 (±1.4) and the females were younger with a mean age of 16.6 (±1.2) (p = 0.004). The majority of the participants were Yoruba (48.7%). More of the females 37(6.9%) resided in rural areas than males 15 (3.1%) (p = 0.007).

Table 2: Prevalence of Acne

Characteristics	Prevalence (%)	95% Confidence Interval	p-value
Crude prevalence	61.3	58.2 - 64.3	
Sex-specific			
Female	62.9	58.7 – 67.0	0.256
Male	59.4	54.9 – 63.9	
Age-specific			
< 15 years	50.0	68.0 - 93.2	
15-19 years	61.4	58.2 – 64.4	0.886
20-24 years	60.0	44.3 – 74.3	
Location of residence			
Rural	57.7	43.2 – 71.3	0.588
Urban	61.5	58.3 – 64.5	

Table 2 highlights the crude and specific prevalence of acne in our study population. The prevalence of acne was 61.3% (58.2-64.3). The female and male-specific prevalences were 62.9% (58.7-67.0) and 59.4% (54.9-64.3).

Table 3: Participants' responses to DLQI

DLQI items	Not at all n (%)	A little n (%)	A lot n (%)	Very much n (%)
Over the last week, how sore or painful has your pimple been?	728 (71.6)	242 (23.8)	37 (3.6)	10 (1.0)
Over the last week, how embarrassed/ self-conscious/ upset/ sad have you been because of your facial skin?	704 (69.2)	210 (20.6)	70 (6.9)	33 (3.2)
Over the last week, how much have pimples affected your friendships?	994 (97.7)	19 (1.9)	2 (0.2)	2 (0.2)
Over the last week, how much have you changed or worn different or special clothes (hats, dark shades, hoods, others) because of your pimples?	958 (94.2)	43 (4.2)	10 (1.0)	6 (0.6)
Over the last week, how much have pimples affected going out, playing, or doing hobbies?	958 (94.2)	46 (4.5)	8 (0.8)	5 (0.5)
Over the last week, how much have you avoided swimming or other sports because of your skin trouble?	983 (96.7)	19 (1.9)	8 (0.8)	7 (0.7)
How much over the last week, has your skin problem interfered with your enjoyment of the holiday?	960 (94.4)	43 (4.2)	9 (0.0)	5 (0.5)
Over the last week, how much trouble have you had because of your pimple? With other people calling you names, teasing, bullying, asking questions, or avoiding you?	966 (95.0)	41 (4.0)	5 (0.5)	5 (0.5)
Over the last week, how much have pimples (or their effect) affected your sleep?	980 (96.4)	27 (2.7)	7 (0.7)	3 (0.3)

Over the last week, how much of a problem has the treatment for your pimples been?	854 (84.0)	106 (10.4)	45 (4.4)	12 (1.2)

Table 3 summarizes the participant's responses to each of the ten items of the Dermatologic Life Quality Index (DLQI). While acne did not affect friendship, clothing, outdoor activities, and sports involvement among the majority of the participants, many of them reported experiencing pain, embarrassment/self-consciousness/being upset, and sadness in the preceding week due to pimples.

Table 4: The Effect of Acne on Dermatologic Quality of Life

Participants' characteristics	Effect on DQL		χ2 (p-value)	AOR (95%CI)
	None **n (%)**	Some **n (%)**		
Acne				
No	359 (91.1)	35 (8.9)	108.40 (<0.001)	Reference
Yes	382 (61.3)	241 (38.7)		4.18 (2.77-6.33)[a]
Severity of acne				
Mild or none	574 (83.8)	111 (16.2)		Reference
Moderate	160 (51.9)	148 (48.1)	132.72 (<0.001)	3.05 (2.19-4.25)[a]
Severe	7 (29.2)	17 (70.8)		7.96 (3.12-20.16)[a]
Age*	16.7 (1.2)	16.9 (1.5)	-2.27 (0.023)	1.17 (1.05-1.32)[a]
Sex				
Female	378 (70.1)	161 (29.9)	4.33 (0.038)	1.39 (1.01-1.91) [a]
Male	363 (75.9)	115 (24.1)		Reference
Ethnicity				
Yoruba	336 (69.4)	148 (30.6)		1.71 (1.07-2.75) [a]
Igbo	260 (75.1)	86 (24.9)	11.68 (0.009)	3.234 (0.93-11.23)
Hausa	7 (50.0)	7 (50.0)		1.15 (0.70-1.879)
Others	138 (79.8)	35 (20.2)		Reference
Religion				
Christianity	702 (73.5)	253 (26.5)	3.31 (0.069)	Reference
Islam	39 (62.9)	23 (37.1)		1.371 (0.71-2.65)
Frequency of attendance to a religious activity				
Daily	52 (82.5)	11 (17.5)		Reference
Twice weekly	273 (75.0)	91 (25.0)		1.60 (1.07-2.75) [a]
Weekly	379 (69.8)	164 (30.2)	10.54 (0.032)	2.26 (1.04-4.91) [a]
Monthly	24 (88.9)	3 (11.1)		0.56 (0.13-2.38)
Annually	13 (65.0)	7 (35.0)		2.50 (0.69-8.97)
Family type				
Nuclear	708 (73.3)	258 (26.7)		
Single Parent	22 (62.9)	13 (37.1)	2.01 (0.571)	
Polygamous	9 (69.2)	4 (30.8)		
Foster	2 (66.7)	1 (33.3)		
Location of residence				
Rural	33 (63.5)	19 (36.5)	2.45 (0.118)	1.47 (0.74-2.90)

Urban	708 (73.4)	257 (26.6)	Reference

*Quantitative variable, t-test; [a]statistically significant at p < 0.05); DQL: Dermatologic Quality of Life; AOR: Adjusted Odds Ratio

Table 4 shows the result of bivariate and binary logistic regression analyses to assess the relationship between the self-reported presence of acne and dermatologic quality of life among our study participants. In the regression analysis, we controlled for the severity of acne, age, sex, ethnicity, religion, religiosity, and the location of participants' residences. The binary logistic regression model had a good fit to the underlying data set as evidenced by the Hosmer-Lemeshow chi-square of 8.403, df of 8, and p-value of 0.395. The presence of acne had a statistically significant relationship with the participants' dermatologic quality of life (p-value <0.001). Participants who reported the presence of acne were four times more likely to report impairment in their dermatologic quality of life compared to those who reported the absence of acne (AOR: 4.18 [2.77-6.33]). Also, the perceived severity of acne was statistically related to the dermatologic quality of life. Participants with moderate (AOR: 3.05 [2.19-4.25]) and severe (AOR: 7.96 [3.12-20.16]) acne were at increased odds of impairment of dermatologic quality of life compared to those with no or mild acne. Also, the female participants were slightly more likely to report impaired dermatologic quality of life than the men (AOR: 1.39 [1.01-1.91]). Furthermore, the report of impaired dermatologic quality of life increased with increasing age among our study participants (AOR: 1.17 [1.05-1.32). However, family type and location of residence had no statistically significant effect on the participants' dermatologic quality of life.

Discussion

The crude prevalence of acne in our study was comparatively higher than findings in other geopolitical regions of Nigeria (12, 13) but similar to studies by Anaba et al. and Okoro et al., (9, 28), and lower than those done by Ilesanmi et al. and Ayanlowo et al., (10, 14) conducted in the southwest of Nigeria. The variation in the prevalence of acne across different regions in Nigeria may reflect the diverse socio-cultural settings of the Nigerian people. Nigeria is a multi-ethnic and multicultural country with wide variations in culture, habits, diets, and probably genetic makeup. These factors and others are relevant to the development of acne (9, 10, 11, 12, 13, 14).

Our study demonstrated no statistical difference in acne prevalence between male and female adolescents. This is contrary to findings from many studies, which showed sex differences in acne prevalence. Most of the previous publications showed that acne was more prevalent among females (27, 29, 30, 31) but a Chinese study demonstrated the opposite; a higher prevalence among males (32). These differences may be due to the variation in settings from Asia and Northern Africa to our study setting; sub-Saharan Africa. There is a need for further studies to confirm this finding and identify the possible reasons. Although the prevalence of acne did not differ with age in our study population among mid and late adolescents another study showed an increased prevalence with increasing age among adolescents (9). A rising acne prevalence with age is plausible considering the roles of hormones responsible for puberty and the onset and progress of acne with increasing age (1).

In our study, many participants reported that acne was painful, but it did not affect most participants' appearance, dress sense, interpersonal relationships, or involvement in outdoor recreational activities. Like another study in Greece (16), our study participants also stated that acne was associated with psychological and emotional disturbance, and embarrassment that heightens self-consciousness, and results in upset or sadness.

Most of the participants reported that acne had mild symptoms. This finding supports previous community-based studies that found that the commonest form of acne was the mild type (28, 29, 30, 33). On the other hand, moderate and severe forms of acne were commoner in hospital-based studies (9, 34). It is unlikely that individuals will present in health facilities for symptoms related to mild acne. Therefore, as we found, mild acne is more likely to be reported in settings outside of health institutions. In our study, the self-report of acne was statistically significantly associated with a negative effect on the participants' quality of life. Participants reporting acne were four times more likely to report impaired health-related quality of life than those who did not have acne. Other studies have suggested that acne has a comparable impact as severe acute and chronic illnesses, including asthma, coronary heart diseases, arthritis and back pain. These

diseases are also known to have a significant negative impact on patient's quality of life (29, 35). Furthermore, we found that the impairment of participants' health-related quality of life worsened with increasing severity of acne. Participants with severe acne and moderate acne were eight times and three times more likely to have impaired health-related quality of life than those with no or mild acne, respectively. Similar findings were seen in a hospital (9, 36) and several community-based studies (30, 31, 37). The dose-response pattern in acne reports and impaired health-related quality of life suggests causality but our cross-sectional data does not affirm temporality. Therefore, future studies should focus on using longitudinal data collection to provide better evidence for acne as a cause of impaired health-related quality among adolescents and young people.

Apart from the report of acne, increasing age and being female were associated with impairment in the quality of life, while frequent attendance of religious activity was protective. These factors are critical to intervention design for promoting adolescent health-related quality of life.

Conclusion

The self-report of acne and its severity among young people is associated with diminished quality of life independent of age and sex, further evidence from more research in this area is essential. There is a need for the government, policymakers and stakeholders to design and implement evidence-based personalized health education and psychological interventions that would help improve self-esteem and general well-being of young people despite having acne.

Limitations of the study

The study depended on the self-report of acne and its severity by the participants. This is subjective and could be prone to report and social desirability bias, especially because young people are quite sensitive when divulging personal information. The cross-sectional nature of our data limits the causal linkage between acne reports and impaired quality of life.

List of Abbreviations

Declarations

Ethics approval and consent to participate

The researchers obtained ethics approval from the Babcock University Health Research and Ethics Committee (BUHREC/172/23). All the respondents gave written consent after they were given comprehensive information on the aims and processes of the study by trained research assistants. Participation in the research was fully voluntary and the respondents were able to decline or withdraw participation at any stage of the interview without untoward consequences. The investigators ensured confidentiality by de-identifying study data. The respondents were not given any inducement for participation, but they received group obesity counselling after data collection.

Consent for publication

All the authors gave consent for the publication of the work under the Creative Commons Attribution-Non-Commercial 4.0 license.

Availability of data and materials

The data sets used and analyzed during the current study are available from the corresponding author on request

Competing interests.

The authors declare that they have no competing interests

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Nil.

Authors' contributions

Conceptualization:	BOT, AC
Data acquisition:	BOT, AC, OO
Data analysis:	BOT, AC
Article writing:	BOT, AC
Manuscript review:	BOT, AC, OO
Supervision:	AC
Final approval:	BOT, AC, OO

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