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ORIGINAL ARTICLE

Prevalence, Pattern of Skin Diseases and Associated Risk Factors among Students of a Public Secondary School in Ekiti State, South–West Nigeria

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Keywords

Prevalence,

Risk factors,

Skin Diseases,

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ABSTRACT

Background: Limited research exists on the frequency and patterns of dermatologic problems in adolescents and young adults. This study determined the prevalence and pattern of skin diseases and associated risk factors among students at a public secondary school in Ekiti State.

Method: A cross-sectional survey was conducted among 226 public secondary school students (Federal Teaching Hospital Staff School, Ido-Ekiti) Ekiti State, Southwestern Nigeria. The total population was used in this study using a semi-structured interviewer-administered questionnaire. Also, a general body medical examination was performed on the students to assess for skin lesions/rashes. Data collected were analysed with IBM SPSS version 25.0, while Chi-square and binary logistics regression were used to determine the predictors of skin diseases. Results with a p-value less than 0.05 were considered significant.

Result: The majority (86.5%) were 9 to 15 years old, with a male-to-female ratio of 1.03:1. The prevalence of skin diseases among the students was 50.7%. More than two-thirds (70.8%) of those with skin disease had one skin disease and the commonest skin diseases among the students were acne (26.0%), miliaria sweat rash (11.2%), and pityriasis versicolor (7.2%). The only predictor of skin disease among the children was awareness (AOR=2.236, 95% CI= 1.227 – 4.076) rather than unawareness of skin disease.

Conclusion: Over half of the students had one or more skin diseases, with acne and miliaria sweat rash being the most common forms. Awareness of skin diseases was a predictor of skin diseases among the participants. It is recommended that secondary school students may benefit from educational programs on the prevention of skin diseases.

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INTRODUCTION

The prevalence and patterns of dermatologic issues in adolescents and young adults are poorly understood and sparsely published.[1] Various pubertal changes characterize the age group attending secondary schools in Nigeria, and such changes may be reflected directly on the skin. Sebaceous and apocrine secretions rise during adolescence due to physiological and anatomical changes to the pilosebaceous unit,[2] while in a tropical environment, yeast infections and acne vulgaris are common illnesses in this age range.[2] Teenagers' quality of life is impacted by the burden of skin diseases and can also decrease school performance among the affected.[3] The Global Burden of Disease Study database analysed the prevalence rates, age and sex distributions, and fungal burden using disability-adjusted life years (DALYs) for 195 countries worldwide in 2017.[4] Sub-Sahara Africa had the highest prevalence of fungus-related skin diseases (DALY rate: 89.3 per 100,000 males, 78.42 per 100,000 females). In contrast, Mali had the highest DALY rate per capita (122). Southern Latin America, Western Europe, high-income North America, Australia, and the southern Pacific belong to the Global Burden of Disease super region with the lowest burden of fungus-related skin diseases (DALY rate: 33.12 per 100,000 men, 30.16 for females).[4] Among secondary school students and adolescents, studies have shown that various skin presentations exist, ranging from fungal skin infections, scabies, miliaria rash, common warts, pitted keratolysis, and recurrent herpes simplex labialis.[1,2] Since it is at this stage that most good hygiene health habits can be formed, there is, therefore, a need to look into the common skin diseases among this population and intervene subsequently to lower the burden and prevent the spread of identified infectious types of skin diseases subsequently among the subjects. Schools are frequently utilized as platforms for disease prevention initiatives because they offer easy access to the target population and make it possible to educate or sensitize a broader audience.[5] Unfortunately, there are limited studies on the prevalence of skin diseases among school students in Africa.[2] Since good hygiene habits can be developed during this phase, it is important to consider the common skin diseases in this age group and reduce the burden by preventing the spread of infectious skin diseases among students.

The aim of this study was to assess skin disease prevalence, patterns, and associated risk factors among public secondary school students. To the best of our knowledge, no previous study has examined the prevalence, patterns, and associated risk factors of skin diseases in the study area.

Table 1: Association between socio-demographic variables and skin diseases

| Variable | Presence of skin disease (n= 223) | | | χ^2 | *p* value |
	Yes n (%)	No n (%)	Total N		
Age group (years)					
≤15	96 (49.7)	97 (50.3)	193	0.498	0.480
≥16	17 (56.7)	13 (43.3)	30		
Sex					
Male	60 (53.1)	53 (46.9)	113	0.539	0.463
Female	53 (48.2)	57 (51.8)	110		
Class					
(Junior)					
JSS1	22 (50.0)	22 (50.0)	44	1.546	0.908
JSS2	20 (50.0)	20 (50.0)	40		
JSS3	23 (48.9)	24 (51.1)	47		
(Senior)					
SS1	15 (46.9)	17 (53.1)	32		
SS2	21 (60.0)	14 (40.0)	35		
SS3	12 (48.0)	13 (52.0)	25		
Tribe					
Yoruba	95 (49.0)	99 (51.0)	194	1.732	0.188
Others	18 (62.1)	11 (37.9)	29		
Nationality					
Nigerian	113 (51.1)	108 (48.9)	221	2.073	0.150
Non-Nigerian	0 (0)	2 (100.0)	2		
Religion					
Christianity	109 (50.7)	106 (49.3)	215	0.002	0.969
Islam	4 (50.0)	4 (50.0)	8		
Family Type					
Monogamy	104 (51.7)	97 (48.3)	201	0.931	0.335
Polygamy	9 (40.9)	13 (59.1)	22		
Family Housing Type					
1 Bedroom	8 (50.0)	8 (50.0)	16	1.217	0.749
2 Bedrooms	15 (44.1)	19 (55.9)	34		
3 Bedrooms	77 (51.0	74 (49.0)	151		
> 3 bedrooms	13 (59.1)	9(40.9)	22		

χ^2: **Chi-square test;** *p value*<0.05

METHODS

This was a cross-sectional study carried out among students of the Federal Teaching Hospital (FETHI) Staff School Ido-Ekiti. The FETHI staff school is a public secondary school located within the Federal Teaching Hospital, Ido-Ekiti complex in Ekiti State, Nigeria. It has a capacity of 245 students and an average of 24 students per class.

Table 2: Association between hygiene as well as other risk factors and skin disease

| Variable | Presence of skin disease (n= 223) | | | | |
	Yes n (%)	No n (%)	Total N	χ^2	*p* value
Source of Bathing water					
River	3 (42.9)	4 (57.1)	7	0.325	0.850
Well	38 (52.8)	34 (47.2)	72		
Tap	72 (50.0)	72 (50.0)	144		
Number of bathing times					
1	36 (61.0)	23 (39.0)	59	3.754	0.153
2	71 (47.7)	78 (52.3)	149		
>2	6 (40.0)	9 (60.0)	15		
Use of soap for bathing					
Yes	110 (50.9)	106 (49.1)	216	0.177	0.674
No	3 (42.9)	4 (57.1)	7		
Number of people living in the room with respondent					
None	5 (50.0)	5 (50.0)	10	3.563	0.614
1	59 (49.2)	61 (50.8)	120		
2	29 (46.8)	33 (53.2)	62		
3	14 (70.0)	6 (30.0)	20		
4	5 (55.6)	4 (44.4)	9		
≥ 5	1 (50.0)	1 (50.0)	2		
Respondent Sweat excessively					
Yes	34 (42.5)	46 (57.5)	80	3.334	0.068
No	79 (55.2)	64 (44.8)	143		
Method of face cleaning					
Face Towel	74 (48.4)	79 (51.6)	153	2.808	0.422
Hand Wipe	23 (51.1)	22 (48.9)	45		
T-Shirt	10 (71.4)	4 (28.6)	14		
Do not clean routinely	6 (54.5)	5 (45.5)	5		
Share personal items					
Yes	47 (59.5)	32 (40.5)	79	3.808	0.051
No	66 (45.8)	78(54.2)	144		
Use of skin lightening cream					
Yes	22 (44.9)	27 (55.1)	49	3.838	0.360
No	91 (52.3)	83 (47.7)	174		
Aware of skin diseases					
Yes	90 (56.3)	70 (43.8)	160	7.048	**0.008**
No	23 (36.5)	40 (63.5)	63		
Takes measures to prevent skin disease					
Yes	73 (49.0)	76 (51.0)	149	0.507	0.477
No	40 (54.1)	34 (45.9	74		
History of food or drug allergy					
Yes	27 (48.2)	29 (51.8)	56	0.181	0.671
No	86 (51.5)	81 (48.5)	167		
Ever been treated for any skin condition					
Yes	34 (52.3)	31 (47.7)	65	0.098	0.754
No	79 (50.0)	79 (50.0)	158		
Family history of skin disease					
Yes	13 (59.1)	9 (40.9)	22	0.692	0.405
No	100 (49.8)	101 (50.2)	201		

χ^2: Chi square test; *p value*: <0.05

All the students of FETHI Staff School, irrespective of age, sex, or class, were included in the study. However, students who were absent from school during the study period and those who were unwilling to participate were excluded from the study. Participants aged 18 to 20 years were required to give informed verbal consent before participating in the study. In comparison, those aged 9 to 17 years were allowed based on verbal informed consent from their parents or guardians. Also, individual child assent was adequately obtained before research instrument administration. The total student population was used in this study. Total population is a form of sampling where the whole population of interest is sampled, and it is most practical when the total population is of manageable size.[6] The students were well-defined from Junior Secondary School (JSS) Class 1 to Senior Secondary School (SSS) Class 3. The total number of students in the school during the study period was 235. The remaining nine students were not available during the days of school visits for the study probably due to sickness or other absenteeism-related reasons. The study took place from 15th August 2021 to 30th August 2021.

Data collection was done using a semi-structured interviewer-administered questionnaire by 13 trained final-year medical students over 2 days. The study instrument was designed by the researcher and had three sections. The general body medical examination was conducted by the final year medical students who received adequate clinical training in dermatology and identification of skin diseases in Primary Care settings. The examination was done in an enclosed room with a chaperone, and it involved a systematic check for skin lesion(s)/rash(es) by the trained research assistants. The recruited final-year medical students (research assistants) have all completed a medical posting of 6 weeks in clinical dermatology and had a 2-day refresher training specifically for this study. The refresher training involved a brief overview of the clinical identification of skin lesions involving infectious and inflammatory types.

Data was analysed using descriptive and inferential statistics with IBM SPSS (Statistical Package for the Social Sciences) version 25.0. The data were represented in charts, frequency, percentages, and cross-tabulation. Chi-square was used to assess significance in cross-tabulations, while binary logistics regression was used to determine the predictors of skin diseases. $P<0.05$ was taken as significant. There were a few limitations during this research, especially a limited sample size, which warranted a total population method, and a few absent students that reduced the coverage to 94%.

Ethical Consideration

Ethical approval (Protocol number: ERC/2021/08/09/619B) was sought and obtained from the Federal Teaching Hospitals' Health Research and Ethical Committee (HREC) before the respondents and their parents were approached for the study. The school authorities informed the parents and guardians about the study and its benefits two weeks prior to the

study. Subsequently, informed written consent was granted by the parents and guardians of the minors through a dispatched letter in which their signatures were appended to participate in the study. The school Vice-Principal and the teachers appropriately facilitated such written consent among the minors. Also, individual child assent was adequately obtained. All the students were subsequently given bathing soaps and face towels after the 2-day survey; two sessions of health talk on the prevention of skin diseases via general body hygiene were also carried out in the public school during the morning assembly period after the survey to avoid selection bias and stigmatization.

Table 3: Binary logistic regression of associated factors and prevalence of skin diseases

Variable	B	AOR	95% CI		p value
			Lower	Upper	
Number of bathing times					
1	0.430	1.538	0.451	5.244	0.492
2	-0.018	0.983	0.318	3.039	0.983
>2[Ref]		1			
Sweats excessively					
Yes	-0.424	0.369	0.655	0.369	1.163
No [Ref]		1			
Do you share personal items?					
Yes	0.432	0.857	1.540	0.857	2.765
No [Ref]		1			
Aware of skin diseases					
Yes	0.774	2.169	1.175	4.005	**0.013**
No [Ref]		1			

B: Coefficient of Binary regression; OR: Adjusted Odds ratio; 95% CI: 95% Confidence Interval; Ref: Reference Category; Cut-off = p<0.2

RESULTS

A total of two hundred and twenty-three (223) students participated in the study, resulting in a response rate of 94.89%. The majority (86.5%) were aged 9 to 15 years, with a male-female ratio of 1.03:1. Figure 1 shows that the prevalence of skin diseases among the students was 50.7%. Figure 2 shows that 70.8% of those with skin disease had one skin disease, 28.3% had two and 0.9% had three skin diseases. Figure 3 shows the pattern of skin diseases among the students. The broad picture of skin diseases among the students shows that 26.0% had acne, 11.2% had miliaria sweat rash, 7.2% had pityriasis versicolor, 5.4% had acne vulgaris, 4.5% had keloids/hypertrophic scars, 3.1% had tinea capitis, 2.7% had allergic dermatitis, 1.3% had tinea versicolor, 0.9% each had seborrhea, contact dermatitis and scabies. In comparison, 0.4% each had tinea corporis, tinea pedis, cabunculosis and alopecia. Table 1 shows no significant associations between the socio-demographic characteristics and the prevalence of skin diseases among the students (p>0.05). Table 2 shows the association between risk

factors and the prevalence of skin diseases. Awareness was significantly associated with the prevalence of skin diseases among the students (p=0.008). More than half (56.3%) of those aware of skin diseases had skin diseases. Other risk factors were not statistically significant. In Table 3, it was found that being 'aware of skin disease' (AOR=2.236, 95% CI= 1.227 – 4.076) was a significant predictor of skin disease. Specifically, those who were aware of skin diseases were two times more likely to have skin diseases.
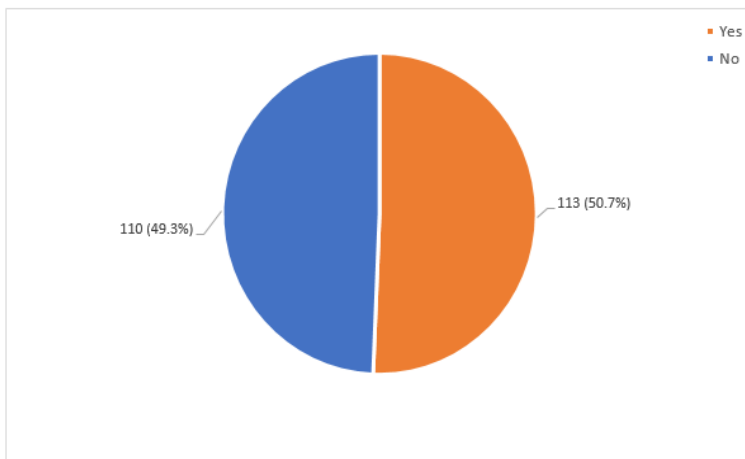
Figure 1: Prevalence of skin diseases among the students
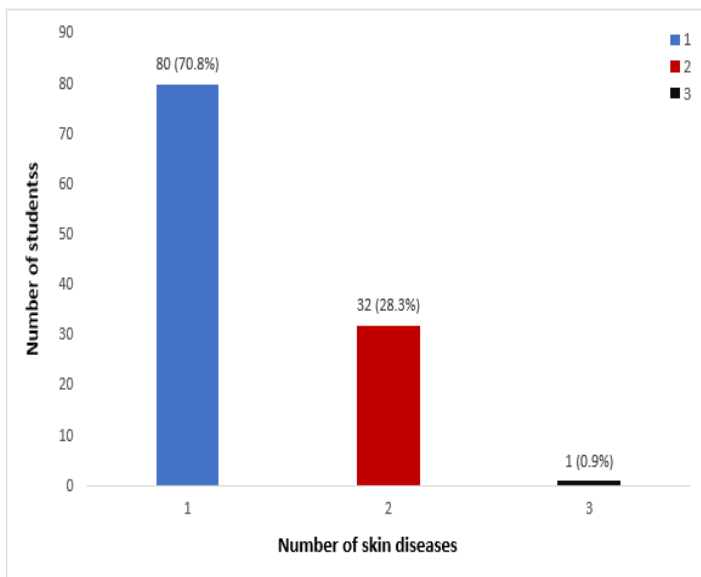
Figure 2. Number of skin diseases among students with skin diseases (n = 113)

DISCUSSION

All the socio-demographic variables were statistically insignificant using the Chi-square test at p-value < 0.05; this does not mean the variables may not be clinically significant among the research subjects. The prevalence of skin disease among the subjects was 50.7%, revealing over half of the total respondents had skin diseases, and more than one quarter (28%) had more than one skin disease. This is a great burden among secondary school students despite the presence of a teaching hospital within less than a 2-kilometer radius of the school compound. The students may not be paying prompt attention to their skin health. They may also not be aware of such pathologies that can be easily transferred from one student to another via skin-to-skin contact or sharing personal items like hair combs, brushes, and towels. The prevalence of infectious skin illnesses among post-adolescent boarding school students in Turkey was found to be as high as 52.05%,[1] with tinea pedis, onychomycosis, common warts, pitted keratolysis, and recurrent herpes simplex labialis being the most prevalent. However, similarity exists regarding the prevalence of 50.7% found in this present study, where acne, miliaria, and pityriasis vesicolor ranked highest in ascending order. Such disparity in the pattern may be because the subjects in Turkey were boarding students with a greater possibility of sharing various personal items, unlike those in this study who were day students. One or more skin disorders were present in 31.3% of secondary and primary school students in a study carried out in Hong Kong, with the most prevalent conditions being acne vulgaris (9.9%), eczema (6.8%), café au lait spots (4.4%), congenital melanocytic nevus (3.6%), superficial

fungal infections (2.2%), keratosis pilaris (1.3%), and pityriasis alba (1.0%), [7] also acne vulgaris and tinea cruris were significantly more prevalent in secondary school pupils, [7] acne vulgaris ranked fourth and is similarly high (5.4%) in this research among the students though lower overall prevalence among the Hong Kong students. In a study conducted in rural Nepal, India, the extremely high point prevalence of observable skin abnormalities was 62.2%, with a wide spectrum of dermatoses in the general population.[8] This finding in India is higher than the findings in this research probably because the Indian students belonged to a lower socio-economic class and their parents may not be as literate as the students in this study. Dermatophyte infections (11.4%), pityriasis versicolor (8.9%), acne (7.7%), melasma (6.8%), eczema (5.6%), and pityriasis alba (5.2%) were the six most common skin problems in the Nepal study, and most skin problems were curable. The Nepal study was carried out in rural settings similar to this present study, where acne ranked first in our study (28%) among the adolescent respondents, unlike third position (7.7%) in the general population study in India. Rural living may be associated with the proliferation of dermatophytes among the Indians, as the risk of having contact with soil microbes may be higher among rural people due to their farming activities.

A study conducted in rural Ethiopia found 140 cases of skin disorders among school children, representing an 80.4% prevalence rate.[9] Out of these illnesses, 98% of the children were thought to be curable, 81.2% of skin pathologies were infestations, and 13.4% of infections were caused by fungi.[9] The Ethiopian study showed a very high prevalence and variability in patterns of skin diseases among school subjects of lower age groups compared to this study. The diseases commonest among the Ethiopian school children were curable; that is, they were more infectious diseases than the inflammatory acne vulgaris and miliaria skin rash (inflammatory skin diseases) seen in this study. Acne vulgaris and pityriasis versicolor were found to be the most prevalent skin problems in teenagers in a study carried out among school children in Ibadan Southwest Nigeria[2]; also, in the Ibadan study, consequences from the use of skin-lightening agents were observed in a small number of students.[2] These findings are similar to those in this study, where acne, miliaria, and pityriasis vesicolor ranked highest. Both studies were carried out in Southwest Nigeria, characteristically domiciled within the tropical climate region, having similar weather and environmental conditions that must have been influenced by similar weather effects on the skin of secondary school students. Similarly, a study among participants aged 18 years and under in Lagos, Nigeria, revealed that adolescents were more likely than younger children to experience acneiform eruptions.[10] This Lagos finding supports the predominant skin condition discovered in this study (acne) and can be related to the same climatic exposures experienced by adolescents in Ekiti and Lagos.

Any community's pattern of skin disorders is impacted by its genetic makeup, climate, social standing, employment, education, sanitary practices, customs, and level of medical treatment.[3] Therefore, climatic and weather conditions may have a direct role in skin pathology.
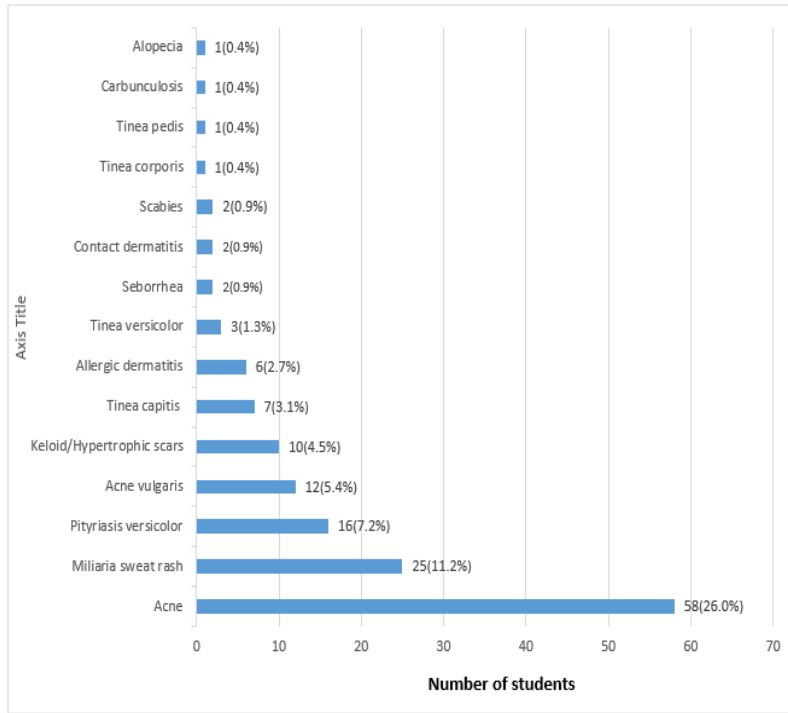

Figure 3: Pattern of skin diseases among the students

In a Romanian study, the total point prevalence of children with one or more skin illnesses was lower (22.8%) compared to 50.7% found in the current study; infectious dermatoses such as viral warts and insect bites (6.3%), dermatitis/eczema (5.1%), pityriasis alba (5.1%), keratosis pilaris (4.0%), and urticaria (1.9%) were the most prevalent illnesses.[11] Despite the lower prevalence, infectious skin conditions ranked highest among Romanian subjects than Nigerians; such may be because of cultural differences, behavioural differences, and dissimilar weather conditions. There was no sex-specific variation in a study among the general population attending a dermatology clinic in Jeddah, Saudi Arabia. However, there were significant differences among age groups, and dermatitis was more common in adults.[12] Younger subjects were considered in this study, but the prevalence of skin diseases was higher in subjects younger than fifteen years, though age and sex were not significant in this study. Hence, efforts must be harnessed irrespective of age to

ensure optimal skin health and well-being among different age groups.

In this study, only awareness of skin disease was the main significant risk factor (p< 0.2) as students who were aware of skin diseases were twice as likely to develop skin disease, and more than half (56%) of our respondents who were aware of skin diseases had 1 or 2 skin diseases. Probably because awareness can enhance prompt reporting or prompt hospital visits and un-delayed diagnoses. Following rising incidence and delayed diagnosis of skin cancer in the expanding Hispanic population in the United States, a study conducted in Miami, Florida, among secondary school students[13] showed that non-Hispanic students were more likely than Hispanic students to wear sun-protective clothing and sunscreen with a sun protection factor of 15 or higher.[13] The Hispanic students were less aware of skin self-examination, and they perceived themselves to be at lower risk for skin cancer.[13] They were also less likely to wear sun-protective clothing and sunscreen, while 6% of non-Hispanics always wore sunscreen, and 18% always wore apparel that protected them from the sun.[13] Another survey among Maltese secondary students showed a high degree of solar awareness among students; high scores were recorded on knowledge of the effects of the sun on the skin, knowledge of skin cancer, and knowledge of sun protection.[14] Girls were considerably more informed than boys; of all the students polled, 55% believed that a suntan improved their appearance, and 70% said that their classmates would also seek a tan.[14] Awareness of skin diseases, including skin cancer, is the key to promoting healthy lifestyles like wearing appropriate clothing, using sunglasses, and exhibiting good personal hygiene measures that protect the skin against potential pathologies across cultures.

On the other hand, a study among school children in Egypt revealed a high prevalence of skin diseases, particularly trauma-related disorders and infections, which may be primarily attributable to a lack of appropriate health awareness and care.[15] As a result, the population tends to adapt without complaining or seeking medical assistance, leading to a growing community of 'silent and suffering patients.'[15] Contrary to the finding in this study, over half of the students were aware of skin diseases; awareness will also help the students concerned to seek help on time, prevent any future damage to the skin outlook, and enhance their general well-being. This notion is supported by researchers in Indonesia and Malaysia where machine learning and deep learning techniques were used to enhance awareness of skin diseases among students in Islamic boarding schools to reduce skin disease burden and promote prompt diagnosis.[16,17] Another study in Ethiopia found that when young subjects are on health insurance, the prevalence of skin disease reduces and such subjects are positioned to live healthier lives now and yonder.[18] Students in this study had parents who were enrolled in National Health Insurance because they are under the federal government

employment scheme; such enrolment covers any of the children under the age of 18 years in Nigeria. Parents must be encouraged to ensure early enrolment of their wards in health insurance to protect against skin diseases and other negative health conditions.

CONCLUSION

This study showed that more than half of the students had one or more skin diseases, with acne and miliaria sweat rash being the most common. The identified positive predictor of skin diseases among the students was awareness of skin diseases; the more aware the students are of skin diseases, the better the outcome is regarding their skin health and well-being. It is recommended that secondary school students be made aware of skin diseases at a younger age and appropriately tutored on basic preventive skin hygiene practices from junior secondary class. Future research can target a larger population size and use laboratory/ microscopic diagnosis of skin diseases rather than clinical diagnosis facilitated by general body examination. There is a need for policymakers and gatekeepers of education to put in place appropriate facilities like adequate water supply to public schools and continuous sensitization on skin diseases to promote awareness among secondary school students targeted at reducing the burden of skin diseases.

REFERENCES

1.   Tuncel AA, Erbagci Z. Prevalence of Skin Diseases Among Male Adolescent and Post-Adolescent Boarding School Students in Turkey. The Journal of Dermatology. 2014;32(7):557-64. https://doi.org/10.1111/j.1346-8138.2005.tb00798.x

2.   Ogunbiyi AO, Omigbodun Y, Owoaje E. Prevalence of Skin Disorders in School Children in Southwest Nigeria. International Journal of Adolescent Medicine and Health. 2009;21(2):235-42. https://doi.org/10.1515/IJAMH.2009.21.2.235

3.   Kawshar T, Rajesh J. Socio-Demographic Factors and their Association to Prevalence of Skin Diseases Among Adolescents. Our Dermatology Online/Nasza Dermatologia Online. 2013;4(3). DOI: 10.7241/ourd.20133.68

4.   Urban K, Chu S, Scheufele C, Giesey RL, Mehrmal S, Uppal P, Delost GR. The Global, Regional, and National Burden of Fungal Skin Diseases in 195 Countries and Territories: A Cross-Sectional Analysis from The Global Burden of Disease Study. JAAD international. 2017;   2:22 https://doi.org/10.1016/j.jdin.2020.10.003

5.   Yotsu RR, Kouadio K, Vagamon B, N'guessan K, Akpa AJ, Yao A, Aké J, Abbet Abbet R, Tchamba Agbor Agbor B, Bedimo R, Ishii N. Skin Disease Prevalence Study in School Children in Rural Cote d'Ivoire: Implications For Integration of Neglected Skin Diseases (skin NTDs). PLoS Neglected Tropical Diseases.

2018;12(5):e0006489. https://doi.org/10.1371/journal.pntd.0006489

6. Stephanie G. Total Population Sampling - Statistics How To. [Cited: April 26, 2023] Available from: https://www.statisticsshowto.com/total-population-sampling/

7. Fung WK, Lo KK. Prevalence of Skin Disease Among School Children And Adolescents in a Student Health Service Center in Hong Kong. Pediatric dermatology. 2000 (6):440-6. https://doi.org/10.1046/j.1525-1470.2000.01841.x

8. Walker SL, Shah M, Hubbard VG, Pradhan HM, Ghimire M. Skin Dsease is Common in Rural Nepal: Results of a Point Prevalence Study. British Journal of Dermatology. 2001;158(2):334-8. https://doi.org/10.1111/j.1365-2133.2007.08107.x

9. Figueroa JL, Fuller LC, Abraha A, Hay RJ. The Prevalence of Skin Disease among School Children in Rural Ethiopia— A Preliminary Assessment of Dermatologic Needs. Pediatric dermatology. 1996;13(5):378-81. https://doi.org/10.1111/j.1525-1470.1996.tb00704.x

10. Ayanlowo O, Puddicombe O, Gold-Olufadi S. Pattern of Skin Diseases amongst Children Attending a Dermatology Clinic in Lagos, Nigeria. Pan African Medical Journal. 2018;29(1):1-0 doi:10.11604/pamj.2018.29.162.14503

11. Popescu R, Popescu CM, Williams HC, Forsea D. The Prevalence of Skin Conditions in Romanian School Children. British journal of dermatology. 1999;140(5):891-6. https://doi.org/10.1046/j.1365-2133.1999.02821.x

12. Alshamrani HM, Alsolami MA, Alshehri AM, Salman AK, Alharbi MW, Alzuhayri AJ, Mleeh NT. Pattern of Skin Diseases in a University Hospital in Jeddah, Saudi Arabia: Age and Sex Distribution. Annals of Saudi Medicine. 2019;39(1):22-8. https://doi.org/10.5144/0256-4947.2019.22

13. Ma F, Collado-Mesa F, Hu S, Kirsner RS. Skin Cancer Awareness and Sun Protection Behaviors in White Hispanic and White Non-Hispanic High School Students in Miami, Florida. Archives of dermatology. 2007;143(8):983-8. doi:10.1001/archderm.143.8.983

14. Aquilina S, Gauci AA, Ellul M, Scerri L. Sun Awareness in Maltese Secondary School Students. Journal of the European Academy of Dermatology And Venereology. 2004;18(6):670-5. https://doi.org/10.1111/j.1468-3083.2004.01046.x

15. El-Khateeb EA, Lotfi RA, Abdel-Aziz KM, El-Shiekh SE. Prevalences of Skin Diseases among Primary School Children in Damietta, Egypt. International Journal of Dermatology. 2014;53(5):609-16. https://doi.org/10.1111/ijd.12335.

16. Agustin IR, Putra MB. Prediction of Skin Diseases Using Convolutional Neural Networks as an Effort to Prevent their Spread in Islamic

Boarding School Environments. Khazanah Journal of Religion and Technology. 2023;1(2):49-53. https://doi.org/10.15575/kjrt.v1i2.296.

17. Bandyopadhyay SK, Bose P, Bhaumik A, Poddar S. Machine Learning and Deep Learning Integration for Skin Diseases Prediction. Int. J. Eng. Trends Technol. 2022;70(3):13-21. doi:10.14445/22315381/IJETT-V70I2P202.

18. Mengist Dessie A, Fenta Feleke S, Getaye Workie S, Getinet Abebe T, Mossu Chanie Y, Kassa Yalew A. Prevalence of Skin Disease and its Associated Factors among Primary School Children: A Cross-Sectional Study from a Northern Ethiopian Town. Clinical, Cosmetic and Investigational Dermatology. 2022:791-801. https://doi.org/10.2147/CCID.S361051.