Iran Red Crescent Med J. 2019 August; 21(8):e92510. doi: 10.5812/ircmj.92510.

Published online 2019 August 25. **Research Article**

Scabies Among High School Students in Accra, Ghana: Risk Factors and Health Literacy

Masood Maleki Birjandi [1], Mahbobeh Oroei [2, *], Seyed Naser Emadi [3, **], Ali Asghar Peyvandi [4] and Abraham Kwabena Anang [5]

[1] Iran Clinic, Iranian Red Crescent Society, Accra, Ghana
[2] Hearing Disorders Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3] Skin Research Center, Razi Hospital, Tehran University of Medical Sciences, Tehran, Iran
[4] Hearing Disorders Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5] Department of Parasitology, Noguchi Memorial Institute for Medical Research, University of Ghana, Accra, Ghana

[*] *Corresponding author*: Community Medicine Specialist, Hearing Disorders Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: dr.oroei@gmail.com
[**] *Corresponding author*: Dermatologist, Skin Research Center, Razi Hospital, Tehran University of Medical Sciences, Tehran, Iran. Email: seyednaser_emadi@yahoo.com

Received 2019 April 22; **Revised** 2019 June 24; **Accepted** 2019 July 28.

Abstract

Background: Scabies is one of the most common itchy dermatoses in school students. The scabies incidence is dependent on personal hygiene and social factors.
Objectives: This study aimed to determine the scabies prevalence and health literacy among high school students.
Methods: This cross-sectional study was performed in 22 high schools of Accra, Ghana, from March to July 2018. School students voluntarily participated in the study. After obtaining the agreement of the relevant authorities, we gathered information regarding demographic characteristics and knowledge, attitude, and hygiene habits of 2,766 students.
Results: Overall, 2,766 students consisting of 1,171 from urban areas and 1,595 from suburban areas of Accra were enrolled in this study. The scabies prevalence was 10.3% in the high school students, ranging from 3.7% in suburban students to 19.4% in urban students. The risk of scabies was higher in females than in males (OR = 1.57; 95%CI = 1.18 - 2.07; P = 0.002) and in urban students than in suburban students (OR = 6.90; 95%CI = 5.05 - 9.43; P < 0.001). The knowledge level was good in 53.4% of the students and moderate in 44.1%. Almost 91.3% of the students had a positive attitude toward scabies prevention. There were significantly higher knowledge and attitude scores in urban areas than in suburban areas (all P < 0.001).
Conclusions: According to the high prevalence of scabies in urban students in, it is necessary to perform more educational efforts and governmental/ non-governmental supports to limit the cases. It seems that high social class and urban residence do not guarantee the occurrence of scabies; thus, comprehensive prevention programs are required for all social classes.

Keywords: Attitude, Scabies, Ghana, Habit, Health, Hygiene, Knowledge, Literacy, Schools, Social Class, Students, Pruritus

1. Background

Scabies is one of the most common itchy dermatoses worldwide. The World Health Organization recognizes scabies as one of the neglected tropical diseases. The cause of scabies is the mite *Sarcoptes scabiei*. This ectoparasite burrows into the epidermal layer of the host skin and induces debilitating itching and scratching due to allergic reactions to proteins and faces exerted by the mite. This mite can transfer from the patient's skin to other persons' skins by direct contact (1). The scabies infestation occurs mostly in young children and rarely in adults; however, it can affect anyone regardless of age, gender, and personal hygiene (1, 2). Scabies can induce complications such as local bacterial skin infection, septicemia, rheumatic fever, and post-streptococcal glomerulonephritis (3).

The scabies occurrence has been attributed to low socioeconomic level, overcrowding, poor water resource management, and poor sanitation (4). The most cases of scabies are reported from low-income countries, the majority of which are attributed to lack of knowledge of scabies and preventive health behaviors, besides other reasons such as poor facilities and resources (2, 5). Most studies report different prevalence rates of scabies in various sub-populations (6-9); for example, Nigeria and Mali as sub-Saharan countries have reported the rates of 10.5% and 4%, respectively (7, 10). However, based on our knowledge, there was no evidence of the scabies prevalence and health literacy among high school students from Ghana. There-

fore, we decided to fill this gap.

2. Objectives

The study aimed to investigate the scabies prevalence and determine the knowledge, attitude, and hygiene practice concerning scabies among high school students in Accra, Ghana.

3. Methods

3.1. Study Design and Participants

A cross-sectional study was conducted in 22 high schools in Accra from March to July 2018. According to the collaboration of high school officials, 11 high schools from each of urban and suburban regions were selected. Accra is the capital of Ghana with an area of 225.67 km^2. The population size was estimated at 131,482 high school students studying in public high schools in 2010. We calculated 384 students as the minimum sample size required for the accurate estimation of the proportion by considering the disease percentage of 50% and a standard deviation at 95% confidence level and the sampling error of 5% based on the formula of sample size calculation for prevalence. Overall, 2,766 students consisting of 1,171 from urban areas and 1,595 from suburban areas of Accra were enrolled in this study. The students were junior or senior high school students that were conveniently selected for the study.

The inclusion criterion included the students of the given high schools (junior and senior) who were willing to participate in this study. The exclusion criteria included the students who were unwilling to participate and those who were absent at the time of visiting.

3.2. Data Collection

We used a predesigned questionnaire developed based on a comprehensive literature review for data collection. This questionnaire was assessed by two authors for content validity. In order to check the reliability, we administered the questionnaire to 30 school students and calculated Cronbach's alpha. We found a reliability coefficient of 0.64 for the whole questionnaire. The questionnaire was modified and then checked for content validity. Finally, we found a reliability coefficient of 0.72. Cronbach's alpha is a value ranging from zero to one, and an alpha (α) value equal to or greater than 0.7 indicates acceptable reliability (11). We considered this value for our questionnaire; thus, we had to change some questions for achieving the acceptable value. Finally, we developed a questionnaire with 19 yes/no questions for knowledge. Moreover, ten questions focused on attitude. The hygiene habits of students were assessed by 19 questions that six questions were related to personal hygiene. All questions are listed in Table 1. In the knowledge section of the questionnaire, a correct answer scored one, and a wrong answer scored zero. The knowledge level was categorized into three categories: good (mean score $\geq$ 70%), moderate (40% - 69%), and poor ($<$ 40%). The attitude scores ranged from zero to 10, categorized into two classes of positive attitude (score $\geq$ 6) and negative attitude (score $<$ 6).

Clinical examinations were carried out by two experienced physicians in a private room in each school. Female students were visited by a female physician. The suspected cases were referred to the Iran clinic to be visited by a dermatologist and to confirm the diagnosis using skin scraping smear. The topical treatment of scabies was provided for scabies patients and related families. All prescribed drugs were free of charge on behalf of the Iran clinic. Moreover, required orders about how to use drugs, need for repeating after a week, and treatment of household contacts were explained by our physician team.

We used the household crowding index as an alternative measure of crowding that was calculated by the number of usual residents in a house divided by the number of rooms in the house.

During the study period, one of the authors supervised the process of interviewing and data collection. Besides, another author conducted a primary analysis of at least 5% of the data to recheck data entry.

3.3. Statistical Methods

The data were recorded in an excel spreadsheet and imported to the SPSS Statistics for Windows, version 18.0 (SPSS Inc. Chicago, IL., USA). We had no missing data. The qualitative data were expressed as the frequency and percentages and the quantitative data as mean $\pm$ SD. The chi-square test and independent t-test were applied to determine the associations between variables and the differences between subgroups. In addition, we conducted univariate and multivariate logistic regression to find risk factors predisposing to scabies. The significance level of statistical tests was set at below 0.05 and 95% confidence intervals were calculated for all odds ratios.

3.4. Ethical Statement

Before beginning the study, institutional authorizations were obtained from the administrative authorities of the high schools, the ministry of education, and the ministry of health of Ghana. The procedures of the study and questionnaires were explained to school managers and participants. Based on the Declaration of Helsinki, we considered medical ethics in this study and reassured the participants that their individual information would be kept confidentially. Informed consent was obtained from all

participants. This study was based on the humanitarian services of the Iranian Red Crescent Society as a health promotion project in Ghana. The project was confirmed by the Health and Rehabilitation Deputy of Iranian Red Crescent Society in December 2017 and then ran in the Iran clinic in Ghana.

4. Results

In this study, the overall scabies prevalence was 10.3% (286/2,766). It was 19.4% and 3.7% in urban and suburban students, respectively (P < 0.001). Female students with scabies were more frequent than male students with scabies (12.2% vs.7.9%, P < 0.001). The overall mean age of the students was 15.6 ± 3.7 years; it was 15.6 ± 1.8 in scabies patients and 15.5 ± 3.9 in healthy students (P = 0.465). Table 2 shows the demographic information of the students.

The risk of scabies was significantly associated with gender (female), urban residence, father's and mother's job. The family size of more than four persons increased the odds of scabies as 1.8 folds. In univariate analysis, having animals in the house and sharing clothes with others were significantly related to scabies incidence (OR = 1.69, 95%CI = 1.32 - 2.16 and OR = 1.49, 95%CI = 1.14 - 1.96, respectively); however, in multiple logistic regression, the effect of sharing of clothes was not significant.

The most common site of lesions was the wrist or the web of fingers (22.7%), followed by genitals or buttock (22.0%), armpits or upper arms (19.2%), and the breast (15.7%) (Figure 1).

Some students had other infectious skin diseases. The rates of fungal skin infection was 59.6% (n = 53), folliculitis 25.8% (n = 23), impetigo 11.2% (n = 10), and wart 3.4% (n = 3). Among the scabies patients, 46 had infectious skin diseases consisting of 22 cases with fungal infection (47.8%), 20 cases with folliculitis (43.5%), and 4 cases with impetigo (8.7%).

4.1. The Status of Knowledge, Attitude, Healthy Behaviors in High School Students

Table 2 shows the demographic specifications of the students, and Table 1 shows the rate of correct answers to the questions of knowledge and attitude. Almost 23.1% of the students recognized an insect as the cause of scabies, and 64.1% mentioned that the main route of transmission is close skin contact with patients. The mean knowledge score was 12.5 (± 2.4); 53.4% had good knowledge, 44.1% had moderate knowledge, and 2.5% had poor knowledge. The knowledge score was significantly higher in urban students than in suburban students (13.3 ± 2.1 vs. 12.0 ± 2.4, P < 0.001).

There were no significant differences in the knowledge level between males and females and between scabies patients and students without scabies (Table 3). The majority of the students (n = 2526, 91.3%) had a positive attitude toward precautions for scabies infestation. Of the students with a positive attitude, 55.5% had good knowledge, 42.4% had moderate knowledge, and 2.1% had poor knowledge. The mean score of attitudes was 7.6 (± 1.5) that was higher in females (P < 0.001). Urban students had a more positive attitude than suburban students (P < 0.001). There was no significant difference in attitude between students with and without scabies.

The mean score of hygiene habits was 9.0 ± 2.0. There were no significant differences in hygiene habits in different groups of gender, residence place, and scabies infestation (P = 0.130, P = 0.485, and P = 0.086, respectively). We also found that 92.0% (n = 2547) of the students had bathing two times a day and 70.2% (n = 1942) were to change clothes two times daily. Almost half of them were to change bed linen and pillowcase four times or more in a month (Table 4).

Overall, 64% (n = 1769) of the students had good hygiene habits while 33.7% (n = 932) and 2.3% (n = 65) had moderate and poor habits, respectively. The rate of using separate bedrooms or sleeping place was 44.3%.

5. Discussion

School students are susceptible to scabies due to close contact and high population density at schools. Based on our findings, the scabies prevalence was 10.3% in the students, which was different from the rates reported by other studies conducted in Ghana. The study by Hogewoning et al. in 2013 reported a very low prevalence in school children (12). Rosenbaum et al. in 2016 reported a prevalence rate of 5.1% in dermatology clinics (13). Kaburi et al. in 2017 reported a prevalence rate of 11.2% in primary school students and 25.1% in kindergarten children (14). Our different findings with the Kaburi study can be explained by the high education level and age of our participants, leading them to pay more attention to their personal hygiene. Research shows various prevalence rates of scabies in school students (4, 10, 15-18) ranging from 4.4% in Egypt (19) to 20% in Indonesia (5). Among African school students, there was a prevalence rate of 17.8 % in boarding school students in Cameroon (20) and 10.5% in school students in Nigeria (7). However, scabies has different prevalence rates worldwide, with more prevalence in countries with lower human development indices. The highest prevalence is in the Pacific and Latin American countries, and the lowest prevalence is in European and the Middle East countries (3).

There are contradictory findings of the role of gender in the scabies prevalence based on personal and social fac-

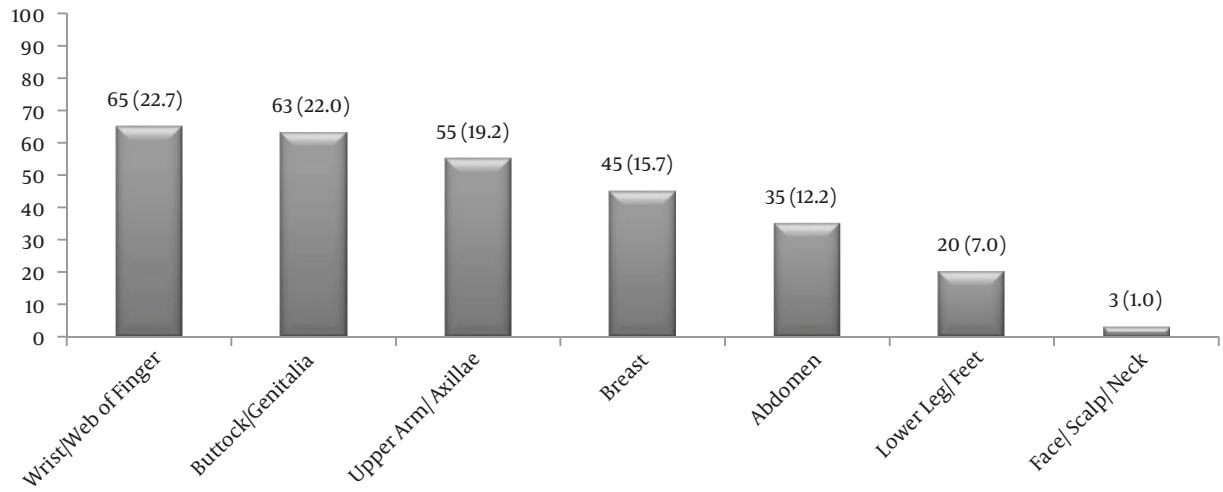

Figure 1. The site of lesions in scabies disease. Data labels are numbers (%).

tors in different populations (18, 19, 21). We found more prevalence in females so that the odds of scabies was 57% higher in female students than in male students. It can be related to the following reasons found in our study: (a) females had less frequent bathing and changing clothes daily than males (33.9% vs. 66.1% bathing at least three times a day, $P<0.001$; 2.3% vs. 9.5% changing clothes at least three times a day, $P< 0.001$), (b) female students had more sleeping on the floor (60.2% vs. 39.8%; $P = 0.01$), and (c) female students had less sleeping alone than male students (40.5% vs. 59.5%; $P< 0.001$).

We observed an increased risk of scabies in students with a history of itchy rashes in their families similar to other studies (19), in urban residence, a relation with the paternal occupation and education, and the maternal job. The high prevalence of scabies among students whose fathers were from a high social class is not compatible with previous studies, and we have no justification. Housemakers were found to predispose the students to scabies, in that was in line with other studies (19, 22). Chaudhry (6) and Heukelbach et al. (23) showed that living in urban areas could increase the risk of scabies. The residents of villages and suburban areas usually live in more open spaces while people in urban areas live densely, which increases the risk of disease transmission through close skin contact. Besides, overcrowding, migration, and displacement in urban areas are the challenges that add to the reasons possibly explaining the higher prevalence of scabies in urban areas. Some studies challenge this viewpoint and suggest that living in rural societies with poor socioeconomic condition and the lack of access to health facilities can increase the scabies incidence (6, 17, 20).

There was a significant positive relationship between the risk of scabies and the number of households, but the crowding index had a negative relationship with predisposing to scabies. It can be explained by the cultural and traditional differences, making this population to use separate bedrooms less frequently. Hegab et al. (19) and Raza et al. (8) reported that the crowding index had no association with the risk of scabies. However, it seems that this index is not suitable for determining the risk of scabies in various communities.

In the present study, the overall health literacy of high school students in Accra was acceptable. Most students had good knowledge and positive attitudes toward scabies and precautions against it. Personal hygiene of the students in our study was better than that reported from some developing countries (4, 17, 24). Al-Zahrani et al. (24) showed a low-knowledge of the Saudi Arabia- Family Physicians regarding the Scabies. Binti Mohd Yusof et al. (5) in Indonesia reported a moderate to good level of knowledge, attitude, and health behaviors for scabies prevention. Dawoodzada reported that more than 50% of Afghan students had poor knowledge about scabies (4).

However, our results showed that living in urban areas, having more social and welfare facilities, and having good knowledge and attitude in health issues did not guarantee to have high personal health behaviors, but they may even lead to a false pride in preventing infectious diseases. We found a higher prevalence of scabies in urban students than in suburban students; however, the issue needs more investigation in other populations. The early diagnosis and treatment of patients have important roles in reducing scabies; thus, periodic screening in sub-populations

Table 1. Knowledge and Attitude of High School Students About Scabies

Variables	Correct (%)
Items of knowledge	
The cause of scabies disease	639 (23.1)
Easy transmission of scabies disease	2264 (81.9)
The main route of transmission	1773 (64.1)
The transmission through wearing the patient's clothing	2263 (81.8)
The transmission through handshaking and hugging with the patient	1839 (66.5)
The transmission through sleeping beside the patient	1830 (66.2)
Playing with animals can cause skin disease	2292 (82.9)
Children are more vulnerable to scabies disease	2153 (77.8)
No difference in scabies infestation between boys and girls	1465 (53.0)
If anyone of your family members is affected by scabies disease, it is necessary to maintain personal hygiene	2354 (85.1)
The spraying of your living area decreases the scabies disease	1496 (54.1)
The scabies disease is harmful to the body	2146 (77.6)
There is no need to isolate scabies patients	1041 (37.6)
Disinfecting clothes and bed linen and treatment of the patient are the most important preventive measures	1377 (49.8)
Using drugs for the treatment of scabies disease	2094 (75.7)
Itching at night and feeling of the heat are the symptoms of scabies	1805 (65.3)
The sites of involvement include the web of fingers, armpits, waist, genitals, elbows, and wrists	1630 (58.9)
All age groups, especially teenagers, may suffer from scabies	1913 (69.2)
Exchanging clothes with an infected person	2352 (85.1)
Knowledge level, No. (%)	
Good	1478 (53.4%)
Moderate	1219 (44.1%)
Poor	69 (2.5%)
Items of Attitude	
Scabies is a curable disease	2416 (87.3)
No exchange of clothes, towels, and bedding with others	389 (14.1)
Scabies patients do not need to be avoided	1493 (54.0)
Personal hygiene is very necessary to keep the body free from scabies	2506 (90.6)
If scabies disease is not treated, it may cause serious health problems for the infected person	2479 (89.6)
Clothes of the infected person must be washed with boiled water and dried in sunlight	2290 (82.8)
If any case of scabies is found in the family, treatment should be started quickly to prevent the disease transmission	2597 (93.9)
For prevention of scabies, besides personal hygiene, the home environment must be sprayed	2122 (76.7)
Contamination with this parasite is more in overcrowded areas	2109 (76.2)
No need to quarantine scabies sufferers	937 (33.9)
Attitude level, No. (%)	
Positive	2526 (91.3%)
Negative	240 (8.7%)

such as students and their families can be effective to prevent scabies and poor school performance.

Our study can be representative of the prevalence of scabies in the school student population in Accra due to

Table 2. Sociodemographic Characteristics of High School Students with and Without Scabies

Variables	Total, No. (%)	With Scabies, No. (%)	Without Scabies, No. (%)	OR (95%CI)	P Value	aOR (95%CI)	P Value[a]
Gender							
Male	1191 (43.1)	94 (7.9)	1097 (92.1)	-	-	-	-
Female	1575 (56.9)	192 (12.2)	1383 (87.8)	1.62 (1.25 - 2.09)	< 0.001	1.57 (1.18 - 2.07)	0.002
Residence							
Urban	1171 (42.3)	227 (19.4)	944 (80.6)	6.26 (4.65 - 8.43)	< 0.001	6.90 (5.05 - 9.43)	< 0.001
Suburban	1595 (57.6)	59 (3.7)	1536 (96.3)	-	-	-	-
Paternal education							
Illiterate/primary	727 (26.3)	50 (6.9)	677 (93.1)	-	-	-	-
Secondary or higher	2039 (73.7)	236 (11.6)	1803 (88.4)	1.77 (1.29 - 2.43)	< 0.001	1.28 (1.65 - 2.93)	0.181
Maternal education							
Illiterate/primary	1058 (38.3)	100 (9.5)	958 (90.5)	-	-	-	-
Secondary or higher	1708 (61.7)	186 (10.9)	1522 (89.1)	1.17 (0.90 - 1.51)	0.228	1.19 (0.87 - 1.62)	0.259
Paternal job							
Unemployed/worker	704 (25.5)	34 (4.8)	670 (95.2)	-	-	-	-
Employee/professional	2062 (74.5)	252 (12.2)	1810 (87.8)	2.74 (1.89 - 3.97)	< 0.001	2.87 (1.89 - 4.35)	< 0.001
Maternal job							
Housewife	922 (33.3)	106 (11.5)	816 (88.5)	1.20 (0.93 - 1.55)	0.158	1.73 (1.28 - 2.34)	< 0.001
Employee	1844 (66.7)	180 (9.8)	1664 (90.2)	-	-	-	-
Crowding index							
$\leq$ 1.5	660 (23.9)	93 (14.1)	567 (85.9)	1.62 (1.25 - 2.11)	< 0.001	1.63 (1.21 - 2.18)	0.001
> 1.5	2105 (76.1)	193 (9.2)	1912 (90.8)	-	-	-	-
Family size							
$\leq$ 4	432 (15.6)	37 (8.6)	395 (91.4)	-	-	-	-
> 4	2334 (84.4)	249 (10.7)	2085 (89.3)	1.27 (0.88 - 1.83)	0.188	1.82 (1.23 - 2.70)	0.003
History of scabies							
No	1944 (70.3)	181 (63.3)	1763 (71.1)	-	-	-	-
Yes	822 (29.7)	105 (36.7)	717 (28.9)	1.43 (1.10 - 1.84)	0.006	2.19 (1.65 - 2.93)	< 0.001
Sleeping index							
Alone	2058 (74.4)	217 (10.5)	1841 (89.5)	-	-	-	-
With others	708 (25.6)	69 (9.7)	639 (90.3)	1.09 (0.82 - 1,45)	0.547	1.07 (0.78 - 1.47)	0.663
Sharing clothes							
No	2127 (76.9)	200 (9.4)	1927 (90.6)	-	-	-	-
Yes	639 (23.1)	86 (13.5)	553 (86.5)	1.49 (1.14 - 1.96)	0.003	1.21 (0.89 - 1.62)	0.213
Having an animal in house							
No	994 (35.9)	135 (13.6)	859 (86.4)	-	-	-	-
Yes	1772 (64.1)	151 (8.5)	1621 (91.5)	1.69 (1.32 - 2.16)	< 0.001	1.43 (1.09 - 1.87)	0.009

Abbreviations: aOR, adjusted odds ratio; CI, Confidence interval; OR, Odds ratio
[a] P value < 0.05

the large sample size. However, there were some limitations as follows. There was a possible bias in the information obtained from students about hygiene habits. The period of our study was limited from March to July, whereas the prevalence of scabies is affected by month, with a higher prevalence in the winter months. Our results are not generalizable to elementary school students and kindergarten children that are more susceptible than adolescents.

According to the high prevalence of infectious skin

Table 3. Comparison of Knowledge, Attitude, and Hygiene Habits Based on Some Variables

Variables	Knowledge	Attitude	Habit
Gender			
Male	12.6 ± 2.4	7.5 ± 1.5	8.9 ± 2.0
Female	12.5 ± 2.4	7.7 ± 1.4	9.0 ± 2.0
P value	0.071	< 0.001	0.130
Region of residence			
Suburban	12.0 ± 2.4	7.5 ± 1.5	9.0 ± 1.9
Urban	13.3 ± 2.1	7.9 ± 1.5	9.0 ± 2.2
P value	< 0.001	< 0.001	0.485
Scabies			
No	12.6 ± 2.4	7.7 ± 1.5	9.0 ± 2.0
Yes	12.5 ± 2.2	7.5 ± 1.6	9.2 ± 2.0
P value	0.723	0.077	0.086

Table 4. Hygiene Habits and Personal Hygiene in High School Students

Variables	Correct (%)
Hygiene habits	
Use of clean clothes after showing	2620 (94.7)
Use of soap/shampoo in body washing	2519 (92.1)
Use of separate towels	2188 (79.0)
Never lending the personal towel to others	2327 (84.1)
Never sharing clothes with family members	2134 (77.2)
Never borrowing a friend's/family member's clothes	1765 (67.5)
Never sleeping next to family members	708 (25.6)
Never using clothes/towel of an affected person with itching skin	2585 (93.5)
Sleeping in separate bed/sleeping place	1225 (44.3)
Never sleeping on the floor	1755 (63.4)
Never sleeping beside companion animals	2565 (92.7)
Never keeping animals at home	1135 (41.0)
Never playing with animals	1192 (43.0)
Hygiene habits level, No. (%)	
Good	1769 (64.0%)
Moderate	932 (33.7%)
Poor	65 (2.3%)
Personal Hygiene	
Bathing (times in a day)	
3	54 (1.9)
2	2547 (92.2)
1	165 (5.9)
Changing clothes (times in a day)	
3	675 (24.4)
2	1942 (70.2)
1	149 (5.4)
Trimming/cleaning nails (times in a week)	
< 2	583 (21.1)
≥ 2	2183 (78.9)
Changing pillowcase (times in a month)	
< 4	1264 (45.7)
≥ 4	1502 (54.3)
Changing bed linen (times in a month)	
< 4	1178 (42.4)
≥ 4	1588 (57.6)

diseases and various dermatoses in HIV patients in Africa (25, 26), the epidemiologic studies and surveillance reports should be considered as health system priorities in this continent. The collaboration of international organizations as the WHO and Non-Governmental Organizations (NGOs) such as Red Crescent or Red Cross societies can be effective in surveillance programs and control of neglected tropical diseases for which the WHO has addressed actions to improve preventive efforts.

5.1. Conclusions

The high prevalence of scabies among high school students, especially in urban students, indicates the poor status of the community. Therefore, it is necessary to conduct more epidemiologic studies to explain these findings. Moreover, health policymakers should pay more attention to the issue and use community-based health promotion plans for the Ghanaian population.

Acknowledgments

The authors sincerely acknowledge the corporation of the Ministry of Education, the Ministry of Health, the officials of schools, the office of the World Health Organization, and the International Federation of Red Cross and Red Crescent Societies in Ghana.

Footnotes

Authors' Contribution: Masood Maleki Birjandi contributed to study conception, data acquisition, critical review of the manuscript, and the final editing of the manuscript. Mahbobeh Oroei contributed to study conception, data acquisition, drafting of the manuscript. Seyed Naser Emadi contributed to study conception, data acquisition, critical review of the manuscript, and the final

editing of the manuscript. Ali Asghar Peyvandi supervised the whole study and made the final corrections before submission. Abraham Kwabena Anang assisted in study conception, data acquisition, and manuscript writing. All authors read and approved the final manuscript.

Conflict of Interests: None declared.

Ethical Approval: The project was confirmed by the Health and Rehabilitation Deputy of Iranian Red Crescent Society in December 2017 and then ran in the Iran clinic in Ghana.

Funding/Support: This study was funded by the Iran clinic in Accra (the Deputy of Health and Rehabilitation of the Red Crescent Society of the Islamic Republic of Iran).

References

1. Walton SF, Currie BJ. Problems in diagnosing scabies, a global disease in human and animal populations. *Clin Microbiol Rev*. 2007;**20**(2):268–79. doi: 10.1128/CMR.00042-06. [PubMed: 17428886]. [PubMed Central: PMC1865595].
2. FitzGerald D, Grainger RJ, Reid A. Interventions for preventing the spread of infestation in close contacts of people with scabies. *Cochrane Database Syst Rev*. 2014;(2). CD009943. doi: 10.1002/14651858.CD009943.pub2. [PubMed: 24566946].
3. Romani L, Steer AC, Whitfeld MJ, Kaldor JM. Prevalence of scabies and impetigo worldwide: A systematic review. *Lancet Infect Dis*. 2015;**15**(8):960–7. doi: 10.1016/S1473-3099(15)00132-2. [PubMed: 26088526].
4. Dawoodzada U. Knowledge, attitute and practices on scabies among religious scshool (madrasa) hostel students of Helmand province Afghanistan. *Int J Adv Res*. 2017;**5**(7):1506–14. doi: 10.21474/ijar01/4864.
5. Binti Mohd Yusof M, Fitri S, Damopolii Y. A study on knowledge, attitude and practice in preventing transmission of scabies in Pesantren Darul Fatwa, Jatinangor. *Althea Med J*. 2015;**2**(1):131–7. doi: 10.15850/amj.v2n1.448.
6. Chaudhry FR. Scabies prevalence and risk factors in Pakistan: A hospital based survey. *Biomed J Sci Tech Res*. 2018;**2**(2). doi: 10.26717/bjstr.2018.02.000726.
7. Kalu EI, Wagbatsoma V, Ogbaini-Emovon E, Nwadike VU, Ojide CK. Age and sex prevalence of infectious dermatoses among primary school children in a rural South-Eastern Nigerian community. *Pan Afr Med J*. 2015;**20**:182. doi: 10.11604/pamj.2015.20.182.6069. [PubMed: 26430479]. [PubMed Central: PMC4577624].
8. Raza N, Qadir SN, Agha H. Risk factors for scabies among male soldiers in Pakistan: Case-control study. *East Mediterr Health J*. 2009;**15**(5):1105–10. [PubMed: 20214123].
9. Ugbomoiko US, Oyedeji SA, Babamale OA, Heukelbach J. Scabies in resource-poor communities in Nasarawa state, Nigeria: Epidemiology, clinical features and factors associated with infestation. *Trop Med Infect Dis*. 2018;**3**(2). doi: 10.3390/tropicalmed3020059. [PubMed: 30274455]. [PubMed Central: PMC6073861].
10. Yap FB, Elena EM, Pubalan M. Prevalence of scabies and head lice among students of secondary boarding schools in Kuching, Sarawak, Malaysia. *Pediatr Infect Dis J*. 2010;**29**(7):682–3. doi: 10.1097/INF.0b013e3181df61dd. [PubMed: 20574407].
11. Nunnally J, Bernstein I. *Psychometric theory*. 3rd ed. MacGraw-Hill, New York; 1994.
12. Hogewoning A, Amoah A, Bavinck JN, Boakye D, Yazdanbakhsh M, Adegnika A, et al. Skin diseases among schoolchildren in Ghana, Gabon, and Rwanda. *Int J Dermatol*. 2013;**52**(5):589–600. doi: 10.1111/j.1365-4632.2012.05822.x. [PubMed: 23557028].
13. Rosenbaum BE, Klein R, Hagan PG, Seadey MY, Quarcoo NL, Hoffmann R, et al. Dermatology in Ghana: A retrospective review of skin disease at the Korle Bu Teaching Hospital Dermatology Clinic. *Pan Afr Med J*. 2017;**26**:125. doi: 10.11604/pamj.2017.26.125.10954. [PubMed: 28533848]. [PubMed Central: PMC5429409].
14. Kaburi BB, Ameme DK, Adu-Asumah G, Dadzie D, Tender EK, Addeh SV, et al. Outbreak of scabies among preschool children, Accra, Ghana, 2017. *BMC Public Health*. 2019;**19**(1):746. doi: 10.1186/s12889-019-7085-6. [PubMed: 31196056]. [PubMed Central: PMC6567626].
15. Lonc E, Okulewicz A. Scabies and head-lice infestations in different environmental conditions of Lower Silesia, Poland. *J Parasitol*. 2000;**86**(1):170–1. doi: 10.1645/0022-3395(2000)086[0170:SAHLII]2.0.CO;2. [PubMed: 10701586].
16. Mason DS, Marks M, Sokana O, Solomon AW, Mabey DC, Romani L, et al. The prevalence of scabies and impetigo in the Solomon Islands: A population-based survey. *PLoS Negl Trop Dis*. 2016;**10**(6). e0004803. doi: 10.1371/journal.pntd.0004803. [PubMed: 27348119]. [PubMed Central: PMC4922659].
17. Romani L, Koroivueta J, Steer AC, Kama M, Kaldor JM, Wand H, et al. Scabies and impetigo prevalence and risk factors in Fiji: A national survey. *PLoS Negl Trop Dis*. 2015;**9**(3). e0003452. doi: 10.1371/journal.pntd.0003452. [PubMed: 25738499]. [PubMed Central: PMC4349858].
18. Sambo MN, Umar AA, Idris SH, Olorukooba AA. Prevalence of scabies among school-aged children in Katanga rural community in Kaduna state, Northwestern Nigeria. *An Nigerian Med*. 2012;**6**(1):26. doi: 10.4103/0331-3131.100208.
19. Hegab DS, Kato AM, Kabbash IA, Dabish GM. Scabies among primary schoolchildren in Egypt: Sociomedical environmental study in Kafr El-Sheikh administrative area. *Clin Cosmet Investig Dermatol*. 2015;**8**:105–11. doi: 10.2147/CCID.S78287. [PubMed: 25759594]. [PubMed Central: PMC4345923].
20. Kouotou EA, Nansseu JR, Kouawa MK, Zoung-Kanyi Bissek AC. Prevalence and drivers of human scabies among children and adolescents living and studying in Cameroonian boarding schools. *Parasit Vectors*. 2016;**9**(1):400. doi: 10.1186/s13071-016-1690-3. [PubMed: 27430556]. [PubMed Central: PMC4950090].
21. Hassan I, Yaseen U. Prevalence of various skin disorders in school going children of Kashmir valley of North India: A cross-sectional study. *Indian J Paediatr Dermatol*. 2013;**14**(3):67. doi: 10.4103/2319-7250.122166.
22. Karim SA, Anwar KS, Khan MA, Mollah MA, Nahar N, Rahman HE, et al. Socio-demographic characteristics of children infested with scabies in densely populated communities of residential madrashas (Islamic education institutes) in Dhaka, Bangladesh. *Public Health*. 2007;**121**(12):923–34. doi: 10.1016/j.puhe.2006.10.019. [PubMed: 17884117].
23. Heukelbach J, Wilcke T, Winter B, Feldmeier H. Epidemiology and morbidity of scabies and pediculosis capitis in resource-poor communities in Brazil. *Br J Dermatol*. 2005;**153**(1):150–6. doi: 10.1111/j.1365-2133.2005.06591.x. [PubMed: 16029341].
24. Al-Zahrani MA, Nahar S, Al-Zahrani SA, Al-Zahrni RA. Knowledge, attitude, and practice of primary care physicians regarding common dermatological disorders in Abha City, Kingdom of Saudi Arabia. *IOSR J Pharm*. 2017;**7**(2):89–110. doi: 10.9790/3013-07020189110.
25. Emadi SN, Akhavan-Mogaddam J, Yousefi M, Sobhani B, Moshkforoush A, Emadi SE. Extensive hypertrophic lichen planus in an HIV positive patient. *Dermatol Online J*. 2010;**16**(6):8. [PubMed: 20579463].
26. Emadi SN, Izadi M, Poursaleh Z, Akhavan-Moghaddam J, Barikbin B, Emadi SE. Darier disease associated with HIV infection: A case report. *HIV Clin Trials*. 2011;**12**(1):48–53. doi: 10.1310/hct1201-48. [PubMed: 21388940].