**Scabies Education in Secondary Schools: A Multicenter Study**

Perpetua Uchechi Ibekwe, Eshan B. Henshaw¹, Bolaji Otike-Odibi², Nnenna U. Okoh³, Bob A. Ukonu, Thomas O. Nnaji⁴, Joseph Archibong⁵, Chinwe Onyekonwu⁵, Grace C. Okudo⁵

Department of Medicine, Dermatology Unit, University of Abuja, Abuja, ¹Department of Medicine, Dermatology Unit, University of Calabar, Calabar, Cross River State, ²Department of Medicine, Dermatology Unit, University of Port-Harcourt, Port-Harcourt, Rivers State, ³Department of Medicine, Dermatology Unit, Alex Ekwueme Federal University Teaching Hospital, Abakaliki, ⁴Department of Internal Medicine, Dermatology Unit, University of Nigeria Teaching Hospital, Ifuku, Enugu State, Nigeria

**Abstract**

**Background:** The aim of this study was to educate secondary school students on etiology, risk factors, clinical features, treatment, and prevention of scabies; to evaluate their knowledge base on scabies before and after an educational intervention; and to reassess this knowledge base and behavioral change, 6 months after, on a second visit. **Methods:** Questionnaires with standard questions on scabies, graded to a maximum score of 10, were administered to students in junior secondary Classes 1 and 2 across 4 states in Nigeria. Information obtained included subjects’ demographics, scabies symptomatology, risks, and preventive behaviors. Students with active scabies were diagnosed and treated. Data were analyzed with STATA. **Results:** The mean test scores for the pretest and posttest at first visit were 2.82 ± 1.38 and 6.30 ± 1.09, respectively. This difference was statistically significant at \( t = 3.95, P = 0.004 \). Six months later, when the same schools were re-visited, the mean test scores for the pretest and posttest were 4.63 ± 0.54 and 5.87 ± 0.25, respectively. This difference was also significant at \( t = 4.13, P = 0.003 \). The prevalence of scabies was 3.5% at first visit and 4.34% at second visit; \( t = 0.24, P = 0.41 \). **Conclusions:** Secondary school students lack basic education on scabies and exhibit high-risk behaviors for scabies transmission. Knowledge on scabies needs constant reinforcement.

**Keywords:** Education, prevalence, risk behaviors, scabies, secondary school students

**Résumé**

**Contexte:** Le but de cette étude était d’éduquer les élèves du secondaire sur l’étiologie, les facteurs de risque, les caractéristiques cliniques, le traitement et la prévention de la gale; évaluer leur base de connaissances sur la gale avant et après une intervention éducative; et de réévaluer cette base de connaissances et ce changement de comportement, six mois après, lors d’une deuxième visite. **Méthodes:** Des questionnaires contenant des questions standard sur la gale, notées à un score maximum de 10, ont été administrés aux élèves des classes 1 et 2 du premier cycle du secondaire dans 4 États du Nigéria. Les informations obtenues comprenaient la démographie des sujets, la symptomatologie de la gale, les risques et les comportements préventifs. Les étudiants atteints de gale active ont été diagnostiqués et traités. Les données ont été analysées avec STATA. **Résultats:** Les scores moyens aux tests avant et après le test lors de la première visite étaient respectivement de 2,82 ± 1,38 et 6,30 ± 1,09. Cette différence était statistiquement significative à \( t = 3,95, p = 0,004 \). Six mois plus tard, lorsque les mêmes écoles ont été revues, les scores moyens aux tests avant et après test étaient respectivement de 4,63 ± 0,54 et 5,87 ± 0,25. Cette différence était également significative à \( t = 4,13, p = 0,003 \). La prévalence de la gale était de 3,5% lors de la première visite et de 4,34% lors de la deuxième visite; \( t = 0,24, p = 0,41 \). **Conclusions:** Les élèves du secondaire manquent d’éducation de base sur la gale et présentent des comportements à haut risque de transmission de la gale. Les connaissances sur la gale nécessitent un renforcement constant.

**Mots clés:** Gale; éducation; comportements à risque; élèves du secondaire; prévalence
INTRODUCTION

Scabies is a skin infestation caused by the arthropod *Sarcoptes scabiei* var. hominis. This mite was accurately described for the first time by an Italian physician, Giovan Bonomo, in the 15th century. S. scabiei is known to burrow into the skin epidermis of humans and many other mammals. Thus, close contact with infected host is the primary means of transmission. Studies by Mellanby et al. and Arlian et al. have shown that scabies can also be transmitted through fomites (clothes, beddings, furniture, and toys) though the risk is small. The ability of scabies mites to survive and remain infective while off the host is approximately 48 h in a warm environment with atmospheric temperature above 25°C and relative humidity of 75%. Basically, the mites actively seek the host closest to it once it perceives some stimuli from the host. These stimuli are postulated to include body odor, body temperature, and exhaled breath.

Once it penetrates the skin, the female mites can produce 40–50 eggs over a life span of 7–21 days. Three diagnostic criteria have been proposed by the Delphi study on consensus criteria for the diagnosis of scabies, namely confirmed scabies, clinical scabies, and suspected scabies. These criteria have been recommended as a reliable tool for epidemiological studies.

Epidemiological studies of scabies are quite limited in Nigeria. Prevalence studies among school children in Nigeria have been reported to range from 4.7% to 25%. A recent community-based study by Ugboro et al. in Nasarawa, an area known to have several armed and violent communal disturbances, revealed a prevalence of 65%, the highest ever reported in Nigeria, and children were most susceptible. Other factors that contribute to outbreaks of scabies include poverty, overcrowding, institutionalization, stigmatization (since persons with scabies are shamed as being dirty, infected persons may prefer not to present themselves for prompt treatment), poor physical hygiene, and restricted access to health care, poor compliance to treatment and decrease in health education and literacy.

Control of scabies is based on clinical identification and treatment of cases and household contacts. Studies on the effectiveness of this strategy are limited and difficult. Clinical identification requires presentation at health facility and knowledgeable health personnel. This is often hampered by the absence of health facilities in these locations, poor knowledge in the diagnosis and treatment among health care providers and lack of funds for treatment by those affected. Health education has proven to be an essential element in health promotion and disease prevention. This module has been used in different studies to show a reduction in scabies prevalence in communities.

The primary endpoint of this study involves the use of education to create awareness and increase the knowledge base of scabies among secondary school students. The ultimate goal was to reduce the prevalence of scabies in Nigeria. Education is pivotal in maintaining good health and should be employed as a veritable behavioral change communication strategy to reduce the high incidence of scabies in institutions.

The objectives of this study were to determine the prevalence of scabies in selected secondary schools; to educate the students on etiology, risk factors, clinical features, treatment, and prevention of scabies; to evaluate their knowledge base on scabies before and after an educational intervention; and to reassess this knowledge base and impact on behavior 6 months after, at a second visit. Students who were diagnosed were treated at the time of diagnosis.

METHODS

Ethical statement

Before the commencement of this study, institutional authorization was obtained from the Directorate in charge of Federal Government Secondary Education in Nigeria and the administrative authorities of each school. Furthermore, ethical approval was obtained from the National Health Research Ethics Committee of Nigeria. Consent forms and informational leaflets were given to each student. The study did not interfere with normal lessons, and participation was voluntary.

This study was designed as an action research with focus on scabies education in order to improve knowledge of its clinical characteristics and treatment among secondary school students. The target population was boarding school students in junior secondary (JS) classes of the Federal Government Colleges (FGC); Bwar, Calabar, Okposi, and Port-Harcourt. Since this was a pilot study, the schools were purposively selected. FGC Okposi and Port-Harcourt were coeducational while FGC Bwar and Calabar were girls only. All boarding students in JS Classes 1 and 2 were included in the study. JS Class 3 students were excluded because they would have proceeded on vacation after completing their JS school certificate examinations which coincided with the time scheduled by the study for the second visit.

A modified Veron study educational tool introduced by White was used. The investigators first administered the scabies education prelecture questionnaires which were used to assess the students’ baseline knowledge of scabies. Then an interactive lecture on scabies was given by a dermatologist at each study site with the aid of Microsoft PowerPoint. The same lecture was used in all the schools. The lecture covered the etiology, risk factors, clinical features, treatment, and prevention of scabies, simplified to enable comprehension.

Thereafter a postlecture questionnaire was administered, same as that administered before the lecture. This was to assess their level of understanding of the topic and to determine any objective change in knowledge base. Six months later, the same process outlined above was repeated in the same schools and on the same study population. The data obtained in the second visit was compared with that of the first and used to assess the effectiveness of the educational program. Information on subjects’ demographics; scabies-related past medical and
social history; and scabies-related current medical history was obtained. A general skin examination was conducted by the two dermatologists and four resident doctors in each team to confirm the diagnosis of scabies (using the Delphi consensus criteria) among students who self-reported the presence of suspicious symptoms after having listened to the lecture. This was used to assess the prevalence of scabies among the students. Privacy of students was ensured with the use of screens and chaperons. Those confirmed to have scabies were treated with 5% permethrin or 20% benzyl benzoate topical medication. Treatment was not assigned; it was given free to the students based on availability at study center.

Data were collected from all four study sites in Microsoft Excel sheet and transferred to STATA for analysis. The difference in mean standard deviation (SD) of correct answers in the pre- and postscabies knowledge test was used to assess the level of knowledge acquired using one-tailed t-test. Prevalence of scabies was calculated from the ratio of students infected with scabies and total number of students present at the lecture. The effectiveness of the educational tool was assessed by comparing the level of knowledge at first visit with that of the second visit using a one-tailed t-test. The difference between those with risk factors for scabies transmission in the first and second visit was analyzed using Chi-square. P value was considered significant at <0.05.

**RESULTS**

**Subject demographics**

A total of 1768 JS students were evaluated at the first visit; 585 males and 1180 females; male: female ratio of 1:2, with a mean age of 11.26 ± 0.24 years. The same group of students was re-evaluated 6 months later; however, the total number of students had reduced to 1525; 454 males and 1071 females (male: female ratio 1:2.4) with a mean age of 11.85 ± 0.29 years. Table 1 displays the above information based on school location. Majority of the participants’ parents were government employees. This implies they had a steady and regular income. Also, majority of the participants’ parents had tertiary school education [Table 2]. The average household occupancy was 6.4 persons per house.

**Scabies education pretest and posttest**

During the first visit to the four schools, the mean ± SD scores for the pretest and posttest were 2.82 ± 1.38 and 6.30 ± 1.09, respectively (t = 3.95, P = 0.004). On a re-visit 6 months later, there was a significant increase in the mean test scores of correct answers on scabies at the pretest (M = 4.63 ± 0.54) compared to the posttest (M = 5.87 ± 0.25); t = 4.13, P = 0.003; although, the revisit mean posttest score was lower than the first visit posttest. The effectiveness of the educational tool used in the study was evident by the statistically significant difference between the respective mean ± SD pretest scores of the first and second visits (2.82 ± 1.38 and 4.63 ± 0.54; t = 2.44, P = 0.025). There was a reduction in the respective mean ± SD posttest scores of the first and second visit; although, it was not statistically significant (6.30 ± 1.09 and 5.87 ± 0.25; t = 0.75 P = 0.239). This is depicted in Figure 1.

| Subject demographics | First visit | Second visit |
|----------------------|-------------|--------------|
| The total number of students (n) | 1768 | 1525 |
| Average age of students (years), mean±SD | 11.26±0.24 | 11.85±0.29 |
| Father’s occupation (%) | | |
| Government employee | 53.1 | 54.9 |
| Nongovernment employee | 13.6 | 12.2 |
| Self-employed | 26.1 | 27 |
| Nonpaid student | 0.1 | 0.1 |
| Homemaker | 0.5 | 0.3 |
| Retired | 3.5 | 3.3 |
| Unemployed (able to work) | 2.9 | 2.1 |
| Unemployed (unable to work) | 0.1 | 0.1 |
| Mother’s occupation (%) | | |
| Government employee | 48.6 | 52.0 |
| Nongovernment employee | 11.7 | 9.9 |
| Self-employed | 30.7 | 31.4 |
| Nonpaid student | 12 | 0.3 |
| Homemaker | 3.6 | 2.6 |
| Retired | 0 | 1.1 |
| Unemployed (able to work) | 3.9 | 2.5 |
| Unemployed (unable to work) | 0.4 | 0.3 |
| Father’s educational status (%) | | |
| None | 3.4 | 2.1 |
| Primary | 2.3 | 1.9 |
| Secondary | 10.8 | 8.9 |
| Tertiary | 83.4 | 87.1 |
| Mother’s educational status (%) | | |
| None | 2.9 | 2.1 |
| Primary | 1.5 | 1.1 |
| Secondary | 12.6 | 10.6 |
| Tertiary | 82.9 | 86.3 |
| Average number in household of each, mean±SD | 6.44±0.53 | 6.40±0.57 |

Table 1: Participants based on school location

| School demographics | Okposi | Port-Harcourt | Calabar | Bwari |
|---------------------|--------|---------------|---------|-------|
| First visit Mean age (years) | 11.8±1.0 | 11.2±0.9 | 10.7±0.9 | 11.1±1.0 |
| Gender Male | 331 | 256 | 326 | 461 |
| Female | 188 | 206 | | |
| Total | 519 | 462 | 326 | 461 |
| Second visit Mean age (years) | 12.3±1.0 | 12.0±1.3 | 11.3±0.9 | 11.7±1.0 |
| Gender Male | 317 | 137 | 333 | 452 |
| Female | 197 | 89 | | |
| Total | 514 | 226* | 333 | 452 |

*Ongoing accreditation resulted in a low turnout of students
Scabies prevalence and medical history

A total of 62 students were diagnosed with scabies during the first visit, while 65 were diagnosed during the second visit. The prevalence of scabies was 3.50% for first visit and 4.34% for second visit. Participants with scabies were treated with 25% benzyl benzoate and 5% permethrin lotion. The commonest adverse reaction from the treatment agents among those treated was itching (6%). These complaints were similar for both first and second visits.

At the first visit, 213 participants (12%) gave a history of having ever been diagnosed and treated for scabies by healthcare providers. Only one was treated in the school clinic, while 108 (57%) received treatment in a hospital. After the first visit, only 99 students (6.5%) were diagnosed and treated for scabies by healthcare providers or through self-treatment at home. Treatment received was grouped into appropriate scabies therapy which included benzyl benzoate, permethrin, and ivermectin; inappropriate scabies therapies which included topical steroids and antifungal; other unidentifiable therapies (consisting of unnamed drugs, injections and lotions) and additional treatment. Analysis of first visit revealed that 67 of the 213 (31%) students who have previously been treated for scabies received the proper scabies treatment in which 61 used benzyl benzoate, 5 applied permethrin while one was treated with ivermectin; 10 students received improper scabies therapies with nine students being treated with highly potent steroid creams and one with antifungal cream. Twenty-five students were treated with unidentifiable drugs, injections and lotions. Additional treatments received by infected students were Tetmosol (antiseptic soap), calamine lotion, and palm kernel oil. Second visit showed 48 of 108 (44.4%) students who were later treated for scabies received proper scabies treatment (benzyl benzoate 44, permethrin 4), while 10 students were treated with unidentifiable drugs, injections, and lotions.

Scabies symptomatology, risks and prevention behaviors

Considering factors that contribute to the spread of scabies, 907 (51.3%) students did not have access to tepid water for bathing, 876 (49.5%) did not use bleach on clothes and beddings, 672 (38%) shared a bed with one other person, and 316 (17.8%) shared clothing. These parameters did not significantly differ between the two visits ($X = 5.97; P = 0.11$). The detail of the findings is shown in Figure 2.

There were 164 (9.3%) students with at least one other household member having similar symptoms of pruritus and itchy rash at baseline. There were 285 (16.1%) students with at least one other school roommate with similar symptoms of pruritus and itchy rash. This percentage reduced significantly 6 months later to 105 (6.9%) and 108 (7.1%) respectively ($P = 0.005$).

Discussion

At first visit, the mean score of correctly answered pretest questions regarding the knowledge of scabies was below average. This illustrates a general deficiency in the basic knowledge of scabies among the students. Posttest values following a lecture revealed a significant improvement in the knowledge, treatment, and prevention of scabies. This improvement was sustained 6 months later, showing an overall improvement in health literacy by the study population. Education of patients and members of an institution has been recognized as key to optimizing the effectiveness of treatment and control measures for scabies.$^{[14]}$ We believe this educational intervention carried out in this study will eventually reduce scabies prevalence. The study by Talukder $et$ $al.$ in Islamic religious schools in Bangladesh showed that a 4 weekly 10-min health education class on scabies over a 4-month period, in addition to other measures reduced the prevalence of scabies from 61% to 5%. Their mean test scores for scabies knowledge improved from 40% before the intervention to 99% after the intervention.$^{[12]}$ A study on the effect of health education on knowledge, attitude and practices of personal hygiene among secondary school students in rural Sokoto, North West, Nigeria, revealed that health education had a significant impact on the students.$^{[15]}$ In Ghana, school children are recognized as health messengers for disease control, especially malaria.$^{[16]}$ Including widely prevalent and highly contagious diseases such as scabies into school health curriculum will go a long way in reducing its prevalence across the country.
Prevalence of scabies in our study remained within the rates reported in some studies.\textsuperscript{[5,7]} The slight increase observed in second visit can be attributed to the timing of the visit. It has been observed that the incidence of scabies correlates negatively with temperature and positively with humidity.\textsuperscript{[17]} The first visit was in January, which in Nigeria is among the driest months of the year, while the second was in July, which usually records marked humidity. In addition, our diagnosis of scabies was based on the examination of students who self-reported symptoms, thus a limitation to our study. Furthermore, there is a stigma associated with scabies diagnosis which is viewed by most to be due to poor personal hygiene. This study provided more accurate information on scabies than previously held, and thus probably reduced the apprehension experienced following a diagnosis of scabies. This could have made more students to accept to be examined and treated. An analysis of the prevalence of students who had subjectively been diagnosed of scabies revealed a decrease from 12% at first visit to 6.5% at second visit. More importantly, the use of inappropriate treatment measures for scabies was significantly reduced among the students. This result is similar to the finding by Reid and Thorne\textsuperscript{[13]} where the prevalence of scabies in an infested village was reduced on second visit after the residents were educated on self-treatment and prevention. It is worthy of note that benzyl benzoate was the commonest treatment of choice for scabies in this study. This is because it is considered a first-line scabies treatment in developing countries.\textsuperscript{[14]} This is probably due to its affordability and is more commonly available.

This study showed that a large number of students exhibited risk factors associated with scabies transmission and infection. A study by Kouotou et al.\textsuperscript{[10]} on prevalence and drivers of human scabies among boarding school children and adolescents in Cameroon revealed that younger persons (≤15 years old) were more likely to share their beddings or clothes and sleep on the same bed with others. There was no significant behavior change in the students who exhibited these risk factors in our study despite the education given. This is probably because the scabies education was given only once in the 6-month interval between the first and second visit. This is in contrast to the study by Talukder et al., where 4 health education lessons on scabies were given every 4 weeks over a 16-week period.\textsuperscript{[12]}

Data collection in this study was cross-sectional and may contain biased information, especially with answers to questions regarding risk factors for transmission of scabies, subjective scabies diagnosis, and treatment as well as the number of students who presented themselves for clinical examination. The students in this study were quite young and many would have needed the assistance of their parents to fill the questionnaire, especially with regards to questions on previous diagnosis and treatment of scabies. Another important limitation is the fact that the study duration was short. A minimum of 18 months would have been more appropriate to determine a change in incidence, with 4 visits – 2 each occurring in the months of January and July of two consecutive years. It would have afforded seasonal comparison.

**Conclusions**

The introduction of frequent health talks on scabies in school curriculum can increase awareness and knowledge of scabies transmission and prevention in secondary schools. This is an inexpensive way of reducing scabies incidence in endemic countries.

**Acknowledgment**

We wish to appreciate the Resident Doctors, Interns, and Nurses who participated in this project. We also acknowledge the Principals and staff of the various federal government schools visited in the course of this study. This project would not have been possible without the cooperation of the students. Thank you for your participation. Finally, we wish to acknowledge our sponsors, International Foundation for Dermatology and International League of Dermatological Societies (Dermalink) and the Nigerian Association of Dermatologists for giving us the opportunity to be part of this research.

**Financial support and sponsorship**

This work was supported by International Foundation for Dermatology, a foundation of the International League of Dermatological Societies, and was conducted on behalf of the Nigerian Association of Dermatologists.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Arlian LG, Morgan MS. A review of Sarcoptes scabiei: Past, present and future. Parasit Vectors 2017;10:297.
2. Mellanby K, Johnson CG, Bartley WC, Brown P. Experiments on the survival and behavior of the itch mite Sarcoptes scabiei DeG var. hominis. Bull Entomol Res 1942;33:267-71.
3. Arlian LG, Runyan RA, Sorlie LB, Estes SA. Host-seeking behavior of Sarcoptes scabiei. J Am Acad Dermatol 1984;11:594-8.
4. Engelman D, Fuller LC, Steer AC. For the International Alliance for the Control of Scabies Delphi panel consensus criteria for the diagnosis of scabies: A Delphi study of international experts. PLoS Negl Trop Dis 2018;12:e0006549.
5. Kalu EI, Wogbutsona V, Ogbaini-Emoven O, Nwa dike UV, 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.
6. Okoronkwo MO. Scabies among children in Police and Army barracks and at Mado village of Jos, Plateau state of Nigeria. Highland Med Res J 2003;1:1-4.
7. Ogunbiyi AO, Owoaje E, Ndah A. Prevalence of skin disorders in school children in Ibadan, Nigeria. Pediatr Dermatol 2005;22:6-10.
8. Ugbomoiko US, Oyedele 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;3:59.
9. Hığab D, Kato A, Kabbash I, Dabish G. Scabies among primary school children in Egypt: Sociomedical environmental study in Kafr El-Sheikh administrative area. Clin Cos Invest Dermatol 2015:8:105-11.
10. Kouotou EA, Nansseu JR, Kouawa MK, Bissek AC. Prevalence and drivers of human scabies among children and adolescents living and studying in Cameroonian boarding schools. Parasit Vectors 2016;9:400.
11. White JJ. The Veron Community Scabies Education Program. Ph.D. Thesis, Faculty of Virginia Polytechnic Institute and State University, 2009. Available from: https://vtechworks.lib.vt.edu. [Last accessed on...
12. Talukder K, Talukder MQ, Farooque MG, Khairul M, Sharmin F, Jerin I, et al. Controlling scabies in madrasahs (Islamic religious schools) in Bangladesh. Public Health 2013;127:83-91.
13. Reid HF, Thorne CD. Scabies infestation: The effect of intervention by public health education. Epidemiol Infect 1990;105:595-602.
14. Chandler DJ, Fuller LC. A review of scabies: An infestation more than skin deep. Dermatology 2019;235:79-90.
15. Abiola AO, Nwogu EE, Ibrahim MT, Hassan R. Effect of health education on knowledge, attitude and practices of personal hygiene among secondary school students in rural Sokoto, North West, Nigeria. Nig Q J Hosp Med 2012;22:181-90.
16. Ayi I, Nonaka D, Adjovu JK, Hanafusa S, Jimba M, Bosompem KM, et al. School-based participatory health education for malaria control in Ghana: Engaging children as health messengers. Malar J 2010;9:98.
17. Lui JM, Wang HW, Chang FW, Liu YP, Chiu FH, Lin YC, et al. The effects of climate factors on scabies. A 14-year population-based study in Taiwan. Parasite 2016;23:54-60.