

Determinants of Scabies among Primary School Children in Habru District: a Case-Control Study

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Abstract

Background: Human scabies is a parasitic infection caused by *Sarcoptes scabiei* var *hominis*. Although affects all age groups; children are more vulnerable. In primary schools, scabies affects children's school regularity and performance. There is a gap of information on the determinants of scabies among primary school children in Ethiopia. The aim of the current study was to identify factors that determine scabies among primary school children in Habru district, North Wollo Zone, Amhara region, Ethiopia.

Methods: Institution-based unmatched case-control study was conducted among primary school children. Three hundred (100 cases and 200 healthy controls) study participants were enrolled. Skin examination of scabies was done by trained health professionals. Data were collected using a structured questionnaire and analyzed by SPSS version 20 statistical software. Bivariate and multivariable analyses were used to identify factors that determine the dependent variable and statistical significance was declared at P value less than 0.05.

Results: Sex, age, family size, family history of scabies, sharing of clothes with an infected person, previous history of scabies and number of sleeping rooms were found to be independent determinants of scabies. Male were more likely to have scabies (AOR= 7.5; 95% CI: 3.2, 24.4). Younger children were more prone to scabies. Children between 10-12 years of age (AOR= 8; 95%CI: 2.7, 24.2) were found to be the most affected age group followed by 13-15 years of age (AOR= 7.7; 95%CI: 2.6, 23.1). Other factors like family size ≥ 5 (AOR= 3.4; 95% CI: 1.5, 7.7), family history of scabies (AOR= 9.8; 95% CI: 3.9, 24.4), were also independent factors of having scabies.

Conclusion: Being male, younger age group, family history of scabies, having more than five family members, having a smaller number of rooms, children's previous history of scabies, and sharing of clothes were determinants of scabies among primary school children. Thus, the district health and education offices and the school community should work together to equip students and their families with scabies prevention and control strategies. **Keywords:** Ethiopia; Family Characteristics; Scabies; *Sarcoptes scabiei*; Primary School

Background

Scabies is a neglected parasitic disease which is a public health problem worldwide (1). The transmission is through close body contact and the incubation period is 3–6 weeks for primary infestation, however, it may be as short as 1–3 days in cases of re-infestation (2) (3)(4). Diagnosis is made clinically, based on patient history and physical examination. It is confirmed by the demonstration of mites, eggs on microscopic examination (5). Scabies incidence is frequently reported in developing countries among poor peoples who live in rural and crowded areas (6). It is particularly a problem where there is social disruption, overcrowding and where personal hygiene is poor (7).

Globally, scabies affects more than 130 million people at any time (8). However, the prevalence varies in recent literature and ranging from 0.3–46% (9). In the developed world, outbreaks contribute to the

significant economic cost in national health services. However, in tropical settings, the shared burden of scabies infestation, as well as their complications, imposes a major cost on health-care systems (10). Young children and the elderly in resource-poor communities are more susceptible to scabies as well as to the secondary complications of infestation. School children, immunocompromised, elderly, disabled and debilitated persons are at risk of a severe form of scabies (11). The transmission of human scabies infestations in school settings is a major public health problem. The problem is more aggravated among school children in rural areas due to poor living conditions and low levels of parent's education (12). The infection spreads rapidly in school children due to different driving forces such as close contact, sharing of utensils and overcrowding within the class. The infection affects the academic performance of students (13).

In Ethiopia, scabies is common public health problem, especially during natural and man made disasters, such as flooding, drought, conflict, poor water supply and poor sanitation, and overcrowded living conditions. According to the public health emergency measures surveillance report of the Federal Ministry of Health, scabies is becoming a public health concern, affecting wider geographic areas and population groups in Ethiopia (14)(15). It is a major problem among Ethiopian primary school children (16). Epidemiological data about scabies infestation in schoolchildren provide valuable information about its risk factors and suggest a basis for methods of prevention and therapy (17). To the best of our knowledge, the determinants of scabies among school children are not well studied in Ethiopia. Besides, there is a scarcity of epidemiological information about scabies available in the current study area, Habru district (18). In addition to that Scabies, outbreak has been reporting in Habru district frequently (19). Therefore, the aim of this study is to determine factors associated with scabies among primary school children in Habru district.

Methods

Study area and design

The study was conducted in primary schools at Habru district, North Wollo, Amhara regional state. The district is administratively organized into 43 kebeles; 7 urban and 36 rural kebeles. The district has 96 primary schools (1-8 grade) of which 67 are found in the rural kebeles and 29 are found in the urban kebeles with a total of 30,925 students, 15,775 male and 15,150 female students in the 2019 academic year. An institution-based unmatched case-control study was conducted among primary school children from March to May 2019.

Sample size determination and procedure

The sample size was calculated by Epi Info™ version 7 statistical program using unmatched case-control formula by taking one of the determinates of scabies, family size greater than five (≥ 5), percent of cases exposed (85%) and percent of controls exposed (65%) with OR of 3.05. The probability of obtaining the population proportion of children among cases and controls was fall within 5% margin of error, two-sided confidence level 95% and 80% power of the test, 5% non-response rate, design effect of 1.5 and case to

control ratio of 1:2. The final sample size was 300 (100 cases and 200 controls). A multi-stage sampling technique was employed to select a representative sample of students from urban and rural primary schools. Study participants were selected from grade 4 to 8 since younger children (grades 1–3) were not able to understand and answer the questionnaire well.

Data collection and analysis

The data were collected using pre-tested interview guided structured questionnaire. The questionnaire was first prepared in English and translated to the local language (Amharic) and then back to English by language experts. The instrument was adopted from different literatures developed for similar purposes and tools designed by various organizations. Data were collected by six BSc nurses. The diagnosis of scabies was made on clinical basis.

Cases selection: A student who had clinical sign and symptoms of scabies based on WHO case definition (presence of itching with typical lesions on hands, inter-digital, and/or genitalia and/or itching and close contact with an individual who had itching or typical lesions in a typical distribution). Cases were selected by trained health professionals.

Controls selection: A student who had no clinical sign and symptoms of scabies based on WHO case definition that were selected from the same school. Two controls for each case were selected by trained health professionals.

The collected data were coded and entered into Epi Info version 7 and exported to SPSS version 20 for analysis. Descriptive and summary statistics were carried out. Variable having a p-value less than or equal to 0.25 in the bivariate analysis was further analyzed in the multivariate model with a 95% confidence interval and a 5% significant level. Variables with a p-value less than or equal to 0.05 in the multivariate analysis were considered to have a significant association with the occurrence of scabies. The logistic regression assumption test was tested and model fitness was checked by Hosmer Lemeshow goodness of fit ($p=0.87$).

Results

Three hundred study participants (100 cases and 200 controls) were included in the current study. Among the total 100 cases, 73(73%) were male and 27(24%) were female. The mean age of children was 14 ± 2.4 years for both cases and controls. The majority (79% and 75% of controls and cases respectively) of study participants were from a rural area. Sixty percent of cases and 64.5% of controls were Muslims and the rest were Orthodox Christian. One-third (72%) of cases born to mothers who can't read and write, while 18% of controls born to mothers with primary educational level. The majority, 84(42%) of controls and 43(43%) of cases born to fathers who can read and write, and few children born to fathers who have

accomplished university or college education; 11(5.5%) and 7(7%) for controls and cases respectively. As to parent's occupational status, 69% of cases and 66% of controls born to housewives; whereas 71% of cases and 66.5% of controls born to farmers regarding father's occupational status (Table 1). Among the case study participants, 96 (96%) had scabies related skin rash and 99(99%) had itching followed by secondary bacterial infection 33(33%). Of the total cases, 89 (89%) did not visit a health facility to get treatment for the infestation and few cases got medication. Almost all cases included in the study complained persistent itching during night time. Regarding the site of the rash on the body, 16(16%) had it on intergluteal area, 70 (70%) on the ulnar border of the hand space, 7 (7%) on inner aspects of thighs and 5(5%) in elbow surface. The rash was disappeared within one week among half of the cases (Table 2).

Table 1
Socio-demographic characteristics of cases and controls among primary School children in Habru district May 2019.

Variable	Control		Cases n (%)		Total, n (%)
	Number	Percent	Number	Percent	
Age					
10–12	46	23%	54	54%	100(33.3%)
13–15	64	32%	36	36%	100(33.3%)
16–18	90	45%	10	10%	100(33.3%)
Family size					
< 5	132	66%	44	44%	176(58.7%)
≥ 5	68	34%	56	56%	124(41.3%)
Sex					
Female	128	64%	27	27%	155(51.7%)
Male	72	36%	73	73%	145(48.3%)
Current residence					
Urban	42	21%	25	25%	67(22.3%) %
Rural	158	79%	75	75%	233(77.7%)
Religion					
Orthodox	71	35.5%	34	34%	105(35%)
Muslim	129	64.5%	66	66%	195(65%)
Marital status of the mother					
Married	158	79%	84	84%	242(80.7%)
Divorced	42	21%	16	16%	58(19.3%)
Marital status of the father					
Married	158	79%	84	84%	240(80%)
Divorced	42	21%	16	16%	60(20%)
Mother's educational level					
Can't read and write	60	30%	72	72%	132(44%)

Variable	Control		Cases n (%)		Total, n (%)
	Number	Percent	Number	Percent	
Reading and writing	80	40%	23	23%	103(34.3%)
Primary school	36	18%	3	3%	39(13%)
Secondary school	16	8%	1	1%	17(5.7%)
University/college	8	4%	1	1%	9(3%)
Father's educational level					
Can't read and write	79	39.5%	46	46%	125(41.7%)
Reading and writing	84	42%	43	43%	127(42.3%)
Primary school	14	7%	3	3%	17(5.7%)
Secondary school	12	6%	1	1%	13(4.3%)
University/college	11	5.5%	7	7%	18(6%)
Mother's occupational status					
Housewife	132	66%	69	69%	201(67%)
Government employee	8	4%	3	3%	11(3.7%)
Daily laborer	4	2%	4	4%	8(2.7%)
Merchant	36	18%	10	10%	46(15.3%)
Others	20	10%	14	14%	34(11.3%)
Father's occupational status					
Farmer	133	66.5%	71	71%	204(68%)
Daily laborer	5	2.5%	4	4%	9(3%)
Government employee	10	5%	6	6%	16(5.3%)
Merchant	32	16%	8	8%	40(13.3%)
Others	20	10%	11	11%	31(10.3%)

Table 2
Clinical profiles of study participants (Cases)

Variable	Category	Number of Cases percentage (%) (N = 100)	
Skin rash	Yes	96	96
	No	4	4
Tiny red burrows	Yes	73	73
	No	23	23
Secondary infections	Yes	33	33
	No	67	67
Persistant itching	Yes	99	99
	No	1	1
Itching time	Day	12	12
	Night	88	88
Duration of rash	< 8 days	53	53
	≥ 8 days	47	47
Nearby clinic/health center	Yes	54	54
	No	46	46
Have you visited health facility because of the scabies	Yes	11	11
	No	89	89
Did you get medication	Yes	10	10
	No	90	90
Site of lesion	Ulnar border of the hand	70	70
	Elbow	5	5
	Inter gluteal area	16	16
	Inner aspects of thighs	7	7

In the bivariate analysis age, family size ≥ 5 , family history of scabies, mother's educational status, sleeping with person infested with scabies, previous scabies history, number of sleeping rooms, sharing of clothes with infected person, source of water for daily basis, and animal live inside the house were significantly associated with having scabies. After adjusting for possible confounders, the result of multiple logistic regression analysis showed that younger age, male sex, family size ≥ 5 , family history of scabies, a smaller number of sleeping rooms, previous infection and sharing of clothes with infected person were positively associated with scabies infestation (Table 3). Children between 10–12 years old were 8 times more likely to get scabies (AOR = 8, 95% CI: 2.7, 24.2) and age between 14–15 years of age, 7.7 times more likely to develop scabies (AOR = 7.7, 95% CI: 2.6, 23.2) compared with age between 16–18 years of age. Male children were more likely to get scabies infestation. In the multivariate analysis, being male was 7.5 times more likely to develop scabies than females (AOR = 7.5; 95% CI: 3.3, 24.4). The larger the family size was found to be independent determinants of scabies. Children with family size ≥ 5 were more likely to develop scabies infestation (AOR = 3.4, 95% CI: 1.5, 7.7). Similarly, the number of sleeping rooms was also found to be independent determinants of scabies. The smaller the number of sleeping rooms, the greater the risk to get scabies. As shown in Table 3, children from a family having ≤ 3 sleeping rooms were more likely to be infected by scabies (AOR = 8.2, 95% CI: 2.9, 23).

Table 3

Bivariate and multivariable logistic regression analysis of determinantes of scabies among primary school children's Habru district; Amhara region, Ethiopia

Variable	Cases (%)	Control (%)	COR (95% CI)	AOR (95% CI)
Age				
10–12	54(54)	46(23)	10.5(4.928–22.649)	8(2.786–24.244) *
13–15	36(36)	64(32)	5(2.343–10.938)	7.7(2.612– 23.194)*
16–18	10(10)	90(45)	1	1
Sex				
Female	27(27)	128(64)	1	1
Male	73(73)	72(36)	4.8(2.836–8.146)	7.5(3.293– 24.462)*
Family size				
< 5	44(44)	132(66)	1	1
≥ 5	56(44)	68(34)	2.47(1.511–4.039)	3.4(1.536–7.748)*
Number of rooms				
≤ 3	105 (52.5)	85 (85)	5.127 (2.772–9.484)	8.2(2.914– 23.145)*
> 3	95 (47.5)	15 (15)	1	1
Mothers educational status				
Can't read & write	60 (30)	72 (72)	9.6 (1.168–78.938)	2(0.205–21.142)
Read and write	80 (40)	23 (23)	0.5(0.028–9.076)	0.01(.000-0.447)*
Primary school	36 (18)	3 (3)	2.3(0.273–19.353)	0.7 (0.064–8.491)
Secondary school	16 (8)	1 (1)	0.7(0.061–7.271)	0.1 (0.005–2.402)
College/ university	8 (4)	1 (1)	1	1
Previously infected				
Yes	11 (11)	6 (3)	3.996(1.433– 11.148)	7.4(1.420– 39.196)*
No	89 (89)	194 (97)	1	1
Family history of Scabies				
Yes	70 (70)	44(22)	8.27 (4.806–14.239)	9.78(3.913–24.462)*

*Shows variables that are statistically significant after adjusted with $p < 0.05$.

Variable	Cases (%)	Control (%)	COR (95% CI)	AOR (95% CI)
No	30 (30)	156 (78)	1	1
Shared any clothes with someone with Scabies case				
Yes	34 (34)	15 (7.5)	6.354(3.253– 12.408)	7.4(2.786–24.049)*
No	66 (66)	185 (92.5)	1	1
*Shows variables that are statistically significant after adjusted with $p < 0.05$.				

Children who have been infected previously were 7.4 times more likely to be re-infected (AOR = 7.4, 95% CI: 1.4, 39.1). In addition, a family history of scabies was also an independent determinant of scabies, (AOR = 9.8, 95% CI: 3.9, 24.4). The odd of developing scabies infestation was 7.4 among children shared clothes with someone infested with scabies (AOR = 7.4, 95% CI: 2.7, 24).

Discussion

In the present study, it was found that being male, age group between 10–12 years old and 13–15 years old, sharing of clothes with scabies patients, previous scabies history, having a family history of scabies, family size ≥ 5 and numbers of sleeping rooms were positively associated with scabies infestation.

Male children were more likely to be infected compared to female. This result was in line with studies done in northwestern Ethiopian and Cameroonian children (20) (21). The possible assumption could be female had more access to water than males and are able to maintain their personal hygiene. It could be also male, particularly in the rural area, spend more time outside and can be potentially prone to infection easily since other environmental factors also play a significant role for scabies transmission. Male also have a habit to sleep with others that could contribute to acquiring the infestation (20). However, the result was in contrast with other studies in which no significant difference was observed between being male or female with scabies infestation (22)(23). This difference could be due to the socio-cultural differences or number of study participants included.

Younger children were more likely to get scabies infestation. Children between 10–12 years of age were found to be the most affected age group (AOR: 8, 95%CI: 2.7, 24.2) followed by 13–15 years of age (AOR = 7.7, 95%CI: 2.6, 23.1). The finding was in line with a similar study conducted in Cameroonian boarding schools (20). However, the result was in contrast with other studies conducted in South West Ethiopia, Quetta and Pakistan (21)(24)(25). The reason why younger children were more prone to scabies could be due to the fact that younger children, particularly those at school are at high risk of scabies infestations as the school environments may increase the susceptibility of cross-infestation and increase contacts (13). The other possibility could be younger children could not have awareness of how to prevent scabies and keep personal hygiene. In addition, younger children, are most commonly shared clothes with others (4)(2) who are potential having scabies.

Statistically, a significant association was observed between family size and scabies infestation that the odd of acquiring scabies was 3.4 in those having more than five family members (AOR = 3.4; 95%CI: 1.5, 7.7). Majority of cases in the current study were live in a household having five or more family members. This finding was consistent with the study done in Pakistan indicating households with six to ten persons per household were more likely to acquire scabies (24). In addition, our finding was also supported by other similar study conducted in west of Iran which revealed that scabies had been directly associated with family size (26). It is well known that scabies can spread easily under crowded conditions where close body and skin contact is common (16)(23). In general, communicable diseases are more frequent and the transmission is easy when the population density is high (27). Crowded living conditions led to overcrowding sleeping space and thus increase scabies transmission among family members. Another scholar also reported a similar finding on the epidemiological study of scabies in primary schools, Fayoum Governorate- Egypt (28). The study conducted on scabies outbreak investigation among religious students "Yekolo Temari" in Gonder town, Ethiopia also revealed living in crowded conditions was a risk for having scabies (29). The increased risk of scabies as the family size is increasing could be due to overcrowding among larger families, which increases the sharing of clothes, beds and other utensils potentially abiotic hosts for the mite. The other justification could be that larger family size may leads to poor personal hygiene due to giving care for all family members is challenging due to shortage of materials for personal hygiene (21)(28).

The number of sleeping rooms ≤ 3 was significantly associated with developing scabies (AOR = 8.2; 95%CI: 2.9, 23.1). Fewer rooms and many people sharing the same bed can lead to the predisposition to scabies infestation, mainly due to contact transmission of the disease. An increased number of family members with small sleeping rooms typically lead to poor living conditions and unhealthy practices (9). Our finding was in line with the study conducted in Fayoum Egypt (22). It was found that family history of scabies was 9.8 times more prone to having scabies (AOR = 9.8; 95%CI: 3.9, 24.4). This result is supported by other similar study conducted in Egypt (23). The reason could be probably that awareness of family members about the spread of the disease between family members is less and leads to reduced preventive measure to be taken (20).

The current study demonstrated that children who have been sharing clothes with scabies infected persons were more likely prone to having scabies (AOR = 7.4; 95%CI: 2.7, 24.0) and became infected in greater proportions. The result is in line with the study conducted in Pakistan and Egypt (24)(23). Since Scabies mites could stay alive on cloth for prolonged time unless complete removal made such as bedding and clothing laundered properly, children who are sharing clothes could get the disease easily even after medication. Previous scabies infestation was found to be independent factors of scabies reinfestation (AOR = 7.4, 95%CI: 1.4, 39.1). Re-infestation of scabies are more likely to occur due to incorrectly applied treatment, treatment failure or inadequate treatment of the environment or close contacts that are ineffective for the eradication of mites on physical bodies (30). Inappropriate medication could be contributing to reinfection as we noted only a few children have gotten medication for the infestation in the current study. This might allow the scabies mites to persist in the environment including cloths and other potential sources.

Sleeping with scabies infected person, taking shower frequencies, parent's education, resident, number of students per classroom, animal living inside the house, sources of water for domestic purpose, home affected by flooding, animals living inside the house and frequency of cloth washing were not significantly associated with scabies in the current study. It is in contrast with other previous studies in Bedwecho district, Pakistan and Egypt (21)(24)(23). The possible reasons for this discrepancy could be sociocultural, socioeconomical status and environmental factors differences.

Conclusion

Scabies remains a significant public health problem among primary school children's in Habru district and the burden can be determined by different potential factors such as sex, age, family history of scabies, family size, number of rooms, previous history of scabies and sharing clothes with a person with scabies. Therefore, district health office, Woreda education office and primary school leaders should collaborate to create awareness on the possible scabies prevention and control strategies among students and their parents. Moreover, school health program should be established to build stakeholders' healthy behavior.

Abbreviations

WHO

World Health Organization

Declarations

Strengths and limitations of the study

As to the data quality, the use of a standardized and pretested questionnaire, and intensive training for data collectors.

Diagnosis was carried out only on the clinical basis; not confirmed by microscopic examination.

Ethics approval and consent to participate

Ethical clearance was obtained from the Debre Berhan University, College of Health Sciences Research Ethics Committee. The ethics committee approved a consent from student's teacher on behalf of children parents and guardians. Permission obtained from district health and education offices and a support letter was written to the selected schools. Signed consent was obtained from student's teachers. In collaboration with health centers, medication is given to confirmed scabies cases.

Consent for publication

Not applicable

Availability of data and Materials

Data are available with the corresponding author upon reasonable request.

Competing Interests

The authors declare no conflict of interest.

Funding

No funding was obtained for this study

Author's Contribution

MW lead the project, performed data analysis and drafted the manuscript. BT supervise the project. BT and BY involved in data analysis and critically review of the manuscript. All authors read and approved the final manuscript.

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