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Scabies outbreak investigation among madrasahs in Sinana district, Bale Zone, Oromia, Ethiopia, May 2019

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Abstract

Background: Scabies is neglected parasitic disease and major public health problem worldwide, particularly in resource-poor regions including Ethiopia. It has been estimated about 300 million cases reported yearly and causes more than 1.5 million Disability Adjusted Life Years for all age. The study conducted in Ethiopia, among 'Yekolo-Temari' revealed 22.5% scabies prevalence. On March 9, 2019, the Sinana district surveillance office reported a scabies outbreak in five *madrasahs*. We investigate to determine its magnitude, identify risk factors and provide intervention and recommendation.

Methods: We conducted a (1:2) unmatched case-control study. The scabies case-patient was any student of *madrasahs* in Sinana district with signs and symptoms consistent with scabies (superficial burrows, intense itching especially at night, generalized rash and secondary infection) from March 11 to April 30, 2019. We reviewed the line list and conducted active case finding. Participants were recruited from all *madrasahs* (five) proportional to the number of students in each madrasah (56 cases-patients and 111 controls) and interviewed with structured questionnaires. We use OR, P-value and 95% CI to measure the strength of association in multivariable logistic regression.

Result: We identified 815 (6 crusted) scabies cases-patients (100% male) with the attack rate 143 per 1000 population (815/5,689) and no death and the mean age was 14 years (range 8-28 years). Sharing bed with scabies case (AOR=3.9, [95% CI=1.5-10.3], travel history to scabies area (AOR=3.87, [95% CI=1.19-12.56], showering more than a week interval (AOR= 2.74, [95% CI=1.04-7.21] were statistically associated with illness.

Conclusion: Sharing bed with scabies case, travel history to scabies area and showering more than a week interval was associated with a high frequency of scabies infestation. All patients and contacts treated, additionally, at two madrasahs mass drug administration conducted with permethrin, and *cloxacillin* for secondary infection. We recommend health education about the transmission, prevention and control of scabies disease to the students.

Background

Scabies is a contagious ectoparasite of the skin caused by the mite Sarcoptes scabiei var. hominis[1]–[3]. It is a human-specific mite that is highly prevalent in some areas of the developing world. Scabies is also frequently occurring at prisons and schools in developing countries, where it is associated with overcrowding[4]. In 2017, at the 10th meeting of the Strategic and Technical Advisory Group for NTDs, the WHO added scabies to the NTD list[5].

According to neglected skin diseases illustrated that the diagnosis of scabies is made mainly on clinical signs and symptoms. The patients presented with an intensely itchy rash, often worse at night, is helpful and a history of contact with known cases is often exist. Up on examination skin lesions in a characteristic distribution, mainly the hands between the fingers, and elbows, shoulders, wrists, genital

area, including the penis, lower legs, particularly the ankles, the scrotum in males, and the breasts in women, and typical serpiginous burrows may be observable with the naked eye[7], [10].

The worldwide prevalence has been estimated to about 300 million cases yearly[5]. According to the review of scabies study show that, globally, more than 200 million people are affected, with a mainly high prevalence in low income tropical regions[7].

The prevalence of scabies in Africa is different in various regions. Although it represents the most common skin disease in Ethiopia and Nigeria[6]. According to a study conducted in primary schools of Egypt indicated that prevalence of scabies was 3.8%[8]. Additionally, study conducted in India shows that the prevalence of scabies in rural school children were 3.7%[9].

In Ethiopia according to the report by WHO in January 2016, more than 300,000 scabies cases were reported in Amhara and Tigray regions[10]. Additionally, according to the study conducted in the Amara region showed that the prevalence of scabies ranged from 2–67% with median prevalence of 33.5%[11].

Scabies has a number of important sequelae. The resultant scratching of the skin is an important cause of impetigo. Trouble of the skin barrier allows bacterial superinfection, frequently caused by Streptococcus pyogenic and Staphylococcus aureus[7]. Accordingly, bacterial superinfection occurs in 16–67% of cases[12]. This infestation predisposes to bacterial skin infections that can result in serious complications affecting the kidneys and possibly the heart[13]. Additionally, the main discomfort associated with scabies, such as sleep loss, are caused by itching and secondary infection leads to additional complications in a poor resource setting. The best predictable of these are the result of secondary infection by group A streptococcus [67]. Furthermore, this streptococci infection has been documented that causes glomerulonephritis [14].

Scabies imposes a considerable economic problem on people, families, communities, and health systems. Families in endemic areas pay a considerable portion of financial gain on treatments, limiting offered funds for food and crucial commodities. Treatment costs, missed employment, frequent healthcare visits, and management of hospitalized patients consequence in economic burden[15].

The principle of GBD is indicated that all human being deserves to live a long life in full well-being, as described by the IHME (institute for health metric and Evaluation)[16]. Scabies is among a diminishing to that goal, predominantly in poor resource countries where this disease frequently occurs and inadequate access to effective treatment. Economically disadvantaged persons are prone to scabies more probable due to overcrowding and less likely to seek medical attention. So, treatment and control of this disease are difficult. Studies suggest that Mass Drug Administration (MDA) actions embrace the highest advantage for these affected regions [16].

Scabies among the neglected tropical diseases. Epidemiology of scabies in sub-Saharan Africa including Ethiopia no more known[16]. Scabies is an actually neglected disease but its huge burden is largely underappreciated. The complications and secondary effects of infection cause a large public health

burden. The scabies outbreak reported from madrasahs of Sinana district, Bale Zone. Therefore, this study was aimed at investigating scabies suspected outbreak and its risk factors in Sinana District madrasahs (Islamic religious school), Southeast Ethiopia.

Methods

Study area and period

The study was conducted in the Madrasahs (Islamic religious schools) of Sinana district, in Bale zone, Oromia region. Sinana district is located around Robe town at 430km from Addis Ababa and administratively divided into 24 kebele. As projected from 2007 Ethiopian population and housing census, the 2018/19 population of the district estimated to be 162,399. There are five madrasahs in the Woreda, namely, Hawusho, Qaso-shekmara, Amalama, Hamida and Basmana with 1305, 1510, 1102, 916 and 856 students respectively. Accordingly, a total of 5,689 students follow Islamic religious schools. All schools use river water for personnel hygiene except Qaso-shekmara which has pipe water. The Woreda has 24 health posts and six health centers. The study was conducted in April 30, 2019.

Study design and population

The descriptive cross sectional and unmatched case-control study design was conducted. Source population are all students attend madrasahs in Sinana district. Study population are students attend the madrasah during study period. Cases were any students of the madrasahs of Sinana district, with sign and symptoms of scabies. Controls were any students of the madrasahs of Sinana district without any signs and symptom of scabies. Diagnosis of a scabies cases (patients) is clinical, based on the presence of typical rash and symptoms of unrelenting and worsening itch, particularly at night[3]. Included cases were any students attend the madrasah of sinana district with sign and symptoms of scabies and agreed to participate during study period and included control were any students attend the madrasahs of sinana district without any signs and symptom of scabies and agreed to participate in the study. Excluded cases were any students who did not fulfill the signs and symptoms of scabies and refuse to participate in the study and excluded controls were those who refuse to participate in the study and not a member of madrasahs students.

Sample size calculation

Sample size was calculated using Epi Info 7 by considering the following assumption. The percentage of controls exposed were 26.7 [17], 95% CI, 80% power and a ratio of 1:2 rate, the total number of study participants was 167 (56 cases and 111 controls).

Sampling technique and procedure

The scabies cases were reported from all five madrasahs in Sinana district. So, the sample size was proportionally allocated to each madrasah.

Numbers of study participants were assigned to each madrasah according to proportional to their average students' size. Thus, mathematically, average number of students attended each madrasah multiplied by total sample size (N=167) divided by total number of students in entire madrasahs in selected for the study (N=5,689). Proportional allocation of the total sample size will be given to each madrasah. To select the final study units and get the required sample, we reviewed scabies line list then selected the case randomly and two controls for each case from the same madrasah (school) were interviewed (Figure 1).

Study variables

The dependent variable was scabies infestation and the independent variables were sociodemographic (age, sex, occupation, marital status, and family size), travel history, contact history, personal hygiene, and overcrowding condition were independent variables

Data collection procedures

We used a semi-structured questionnaire, which is tailored from different literatures, to collect data including sociodemographic characteristics, clinical features for cases, and the possible risk factors. The data were collected by one nurse and one health officer through face-to face interview with cases and controls. Orientation was given for data collectors on the questionnaire. The collected data was checked for completeness and consistence before data entry. Line list of the cases was collected from district health office for further analysis.

Data quality control

To assure the quality of data, data collectors was given orientation on questionnaires. Each questionnaire will be checked on daily basis for completeness and consistency. Standard case definition was used to classify cases. The all line list and completed questionnaires checked for completeness and consistence before data entry into the computer.

Data processing and analysis

All line listed and completed questionnaires were checked for completeness before entry, coded, cleaned, and then analysis made. Data was entered into Epi data version 4.4.1 and exported to SPSS 23 statistical software for analysis and line list also entered into Microsoft Office excel 2016 then exported to SPSS for analysis. After recoding, cleaning data for inconsistencies and missing values descriptive statistics such as mean, median, frequency and percentage will be done and data was presented using charts, tables and text both for line list data and collected data. Bivariate analysis was done and all candidate variables which have association with the outcome variable with p value less than 0.25 was included in multivariate analysis. Then multivariate analysis using Back ward stepwise selection method will be employed to determine independent predictors among explanatory variables. Model fitness will be assessed by using Hosmer and Lemeshow goodness of fit test at p-value > 0.05. Explanatory variable that are significant at P value < 0.05 will be considered as a risk factors for scabies outbreak. Adjusted odds ratio with its 95% confidence interval was considered to see the association.

Standard case definition

Suspected case: Student with signs and symptoms consistent with scabies. (Scabies characterized by rash or lesions and intense itching especially at night. Lesions prominent around finger webs, wrists, elbows, axillaries, beltlines, thighs, external genitalia, nipples, abdomen, lower portion of buttocks, head, neck, palm and soles of infants could also be involved [3], [18].)

Confirmed case: Student who has a skin scraping in which mites, mite eggs or mite feces have been identified by a trained health care professional [3], [18].

Contact: A person without signs and symptoms consistent with scabies who has had direct contact (particularly prolonged, direct, skin-to-skin contact) with a suspected or confirmed case in the two months preceding the onset of scabies signs and symptoms in the case [3].

Ethical consideration

Jimma University was written the official letter by the reference number Epi/46/2011 to Bale zone Health office for us to conduct field Epidemiology resident research outputs. So, this study was among the outputs. For the response to this public health emergence the letter of permission was obtained from Bale Zone Health Office by the reference number EFGB/14773 and Sinana district Health Office by the reference number 61/47/2011 and oral permission was obtained from madrasahs administration to access the participants. Informed written consent was also obtained from all the study participants or parent or guardian for the participants of less than 16 years old. For the sake of confidentiality, the names of participants were not recorded on the questionnaire.

Results

Descriptive Epidemiology

A rumors of scabies cases were reported from madrasahs of Sinana district, Bale zone on March 7, 2019. From March 15 to 24 we identify a total of 815 scabies cases from five madrasahs of sinana district. The overall attack rate (AR) of scabies in five madrasahs was 143 per 1000 population with no case fatality rate related to scabies. Regarding sociodemographic characteristics all scabies cases were their sex, religion and ethnicity were male, Muslim and Oromo respectively. The mean age of cases was 14.5$\pm$3 years with the minimum age 8 years and maximum 28 years. The total reported scabies cases by age groups of 5-14 years, 15-19 years and >20 years were 52.6% (429), 41.6% (339), and 5.8% (47) cases respectively.

The overall prevalence of scabies in five madrasahs of sinana district was 14% (815/5689), accordingly, the prevalence in Hawusho, Qaso-shekmara, Amalama, Hamida and Basmana madrasah was 4.3%, 28.2%, 17.4%, 13.1% and 2.5% respectively.

The index case of the outbreak was perceived on January 24, 2019 and the rumor was reported to district health office on March 7, 2019. Then on March 9, 2019, Sinana district health office notified the situation to Bale Zone Health department. Then investigation team was deployed to assess the situation on March 11, 2019. The index cases were two students whose come from West Arsi zone where scabies outbreak is there as reported from the affected students. The burden of cases has been started to rise then after and reached pick on March 8,2019, then decline gradually after intervention (Figure 2).

Case control analysis

A total of 167 participants (56 cases and 111 controls) were randomly selected from the students of the five madrasahs in Sinana district. All participants were male, Muslim and Oromo. The mean age was 18±3 years with minimum and maximum age was 12 and 24 years (Table 1). From cases and control 80.4% and 86.5% has previous history of scabies respectively (Table 2). River is source of water for personnel hygiene for cases and control was 78.6% and 73.9% respectively (Table 3) Regarding the distribution of rash on the body for cases, almost all case has rash on the side and webs of the fingers (92.9%), flexor aspect of the wrists (76.8%), extensor aspect of the elbows (64.3%), extensor surface of the knees (25%), and the lower half of the buttocks and adjacent thigh (17.9%).

In bivariate analysis variables with p value less than 0.25 were entered into multivariable analysis to adjust for possible confounding. Accordingly, educational status, number of students per sleeping room, sleeping together with scabies case on one bed, travel history to scabies epidemic area, showering frequency per week, heard about scabies were entered into multivariate logistic regression model.

After adjusted to possible confounding factors the result of multivariable logistic regression shows that, sharing bed with scabies case, travel to scabies area and showering more than a week interval were the final predictors significantly associated with scabies infestation. In view of that, those students share bed together with student with scabies infestation were 3.9 times more likely to develop scabies (OR=3.9, 95% CI (1.5-10.3), p value= 0.006) with compared those students not share bed with scabies case. Those students travel to scabies area were 3.87 time more likely to develop scabies (OR=3.87, 95% CI (1.19-12.56), p value= 0.024) with compared to students has no travel history to scabies epidemic area. Additionally, students showering more than week interval per week were 2.74 times more likely to develop scabies (OR= 2.74, 95% CI (1.04-7.21), p value=0.041) with compared to those students showering less than a week interval (Table 4).

Discussion

A total of 815 suspected scabies cases were identified from five madrasahs of Sinana district, Bale zone, with an overall attack rate of 143 per 1000 population. This result is higher to the finding of the study conducted in the east badewacho which reported to be 110 per 1000 population and a study conducted in Dembiya district with the overall attack rate was 20 per 1000 population[19]. The higher attack rate observed in our study may be due to our study was an institution (school) based but both studies conducted in east badewacho and Dembiya were conducted at the community-based result in the high

denominator. Inversely, the attack rate finding of our study lower than the finding of the study conducted in the Northern Ethiopia “yekolo temari” which is reported to be 225 per 1000 population[17]. This likely due to our study include more schools but a study conducted in Northern Ethiopia “Yekolo temari” include a single school. Additionally, our finding higher than a finding of the study conducted in Yirgacheffe district school which is 5.5%[20]. This likely due to the result of our finding was during the outbreak.

Regarding the distribution of scabies rash on the body parts, the side and webs of the finger were the most affected area followed by the flexor aspect of the wrists, this being consistent with the finding of study conducted in the health facilities of Cameron[21]. This is due to these areas were favorable for the typical distribution of mites[3].

Concerning the risk factors of scabies infestation, there is a statistically significant association between sharing the bed with cases of scabies and the odd of acquiring scabies infestation. Accordingly, those who had reported to slept with scabies case were three times more likely to develop scabies infestation than those not slept with scabies infested individual. This result is consistent with the study done in the east badewacho district, Ethiopia, showing that sleeping with scabies case is the risk factor for scabies infestation[19]. In addition, supported by systemic review study conducted on scabies in developing countries showing that overcrowding especially sleeping with scabies case is an important risk factor[14]. This due to the mite of scabies transmitted from infected persons through body to body contact, as well as through infected bedding and cloths[1], [3].

This study finding show that, those students bath their body more than a week interval 2.74 times more likely to develop scabies than showering less than a week interval. This result is in line with the study conducted in Dembiya district which show that those taking body baths with a frequency of more than a week more likely to develop scabies[22]. Additionally, supported by the study conducted in North Gondar “yekolo temari” showing that those taking body baths with a frequency of more than a week are at risk to develop scabies[17]. This supported by an unhygienic living condition or poor personal hygiene is favorable for scabies[5]. And rigorous personal hygiene is a preventive method [21].

The present study has shown that a statistically significant association between travel history in the past two months to scabies epidemic area and scabies infestation. The odd of scabies infestation among students who had a history of travel to scabies area were 3.87 times more than the odds of scabies infestation among the students who had no travel history. This finding is consistent with the study conducted in Northern Gondar “yekolo temari” [17]. Direct contact is necessary for the transmission of scabies to new individuals[2]. So, the result may due to those students travel to the scabies area who were in contact with the cases of scabies.

This study was not free of limitations. Hence, for the ascertainment of cases and control, our study was based on clinical signs and symptoms, while lacking laboratory confirmation. As we conducted the case-control study the problem of recall bias may take place.

Conclusion

The scabies outbreak occurred in Sinana district, Bale zone, Ethiopia. Sharing bed with scabies case, travel history to scabies area and take shower more than a week interval was a risk factor significantly associated with a scabies infestation. The district health office and cluster health center and health post workers have to increase their active surveillance since scabies diseases affect more students because of late detection and response to the outbreak. Providing health education for students on modes of transmission of scabies to circumvent or reduce contact with cases for prevention and control scabies infestation and promote personnel hygiene of the students.

Declarations

Competing interests

The authors declare that they have no competing interests

Authors contribution

MH: He was responsible for the design, data analysis, and interpretation of the result and drafting the final manuscript.

HA: He was responsible for the data analysis, and interpretation of the result and review the final manuscript.

FS: He is responsible for data analysis, and interpretation of the result and drafting the final manuscript.

All authors have read and approved the manuscript

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Availability of the data

All the data supporting our findings of this study are available from the corresponding author upon request

Consent for publication

Not applicable

Ethics approval and consent to participate

The approval of this outbreak investigation was provided by the Bale zone health office department. The permission to access the participants was obtained from sheik of the madrasahs. The written informed consent was obtained from the participant or parent or guardian for participants under 16 years old by signing or applying a thumb print. For the sake of confidentiality, the names of participants were not recorded on the questionnaire the code numbers were used.

Abbreviations

AR: Attack rate; GBD: Global Burden of Disease; MDA: Mass Drug Administration; NTD: Neglected Tropical Disease; WHO: World Health Organization

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Tables

Table 1: Sociodemographic characteristic of participants in madrasahs of Sinana district, Bale zone, Oromia region, Ethiopia, 2019.

Variables		Case(n=56)	Control(n=111)
Age	10-14	10 (17.9)	16 (14.4)
	15-19	28 (50)	55 (49.5)
	≥20	18 (32.1)	40 (36)
Marital status	Married	6 (10.7%)	14 (12.6%)
	Single	50 (89.3%)	97 (87.4)
Educational status	Read and write only	15(26.8)	12(10.8)
	Primary	35(62.5)	85(76.6)
	Secondary	6(10.7)	14(12.6)
Family size	≤ 5	39 (69.6)	70 (63.1)
	≥6	17 (30.4)	41 (36.9)

Table 2: Contact history related characteristic of participants in madrasahs of Sinana district, Bale zone, Oromia region, Ethiopia, 2019

Variables		Case(n=56)	Control(n=111)
Previous history of scabies	Yes	11(19.6)	15 (13.5)
	No	45 (80.4)	96 (86.5)
Student per sleeping room	≤ 15	33(44.9)	101(91)
	>15	23(41.1)	10(9)
Sleep together on one bed	Yes	27 (48.2)	15 (13.5)
	No	29 (51.8)	96 (86.5)
Quick hand shake	Yes	31 (55.4)	51 (45.9)
	No	25 (44.6)	60 (54.1)
Travel history to scabies area	Yes	10 (17.9)	6 (5.4)
	No	46 (82.1)	105 (94.6)

Table 3: Sanitation, hygiene and knowledge related characteristic of participants in madrasahs of Sinana district, Bale zone, Oromia region, Ethiopia, 2019

Variables		Case(n=56)	Control(n=111)
Source water for personal hygiene	Stand pipe	12 (21.4)	29(26.1)
	River	44 (78.6)	82 (73.9)
Shower frequency	More than a week interval	49 (87.5)	75 (67.6)
	Less than a week interval	7 (12.5)	36 (32.4)
Use soap for shower	Some_times	6(10.7)	9(8.1)
	Always	50(89.3)	102(91.9)
Participants heard about scabies	Yes	38 (67.9)	85 (76.6)
	No	18 (32.1)	26 (23.4)
Know any symptoms of scabies	Yes	32 (57.1)	68 (61.3)
	No	24 (42.9)	43 (38.7)
Know any transmission ways	Yes	6 (10.7)	18 (16.2)
	No	50 (89.3)	93 (83.8)

Table 4: Determinants of scabies outbreak, madrasahs of sinana district, Bale zone, Oromia, Ethiopia, 2019.

Variables	Category	Case (n=56)	Control (n=111)	COR (95%CI)	AOR	P value
Educational status	Read and write only	15(26.8)	12(10.8)	2.9(0.9-9.9)	2.85(0.73-11.11)	0.13
	Primary	35(62.5)	85(76.6)	0.96(0.3-2.7)	1.23(0.37-3.91)	0.72
	Secondary	6(10.7)	14(12.6)	Ref		
Overcrowding	≤15studen/sleeping room	33(44.9)	101(91)	Ref		
	>15studend/sleeping room	23(41.1)	10(9)	7.04(3.1-16.3)	2.767(0.96-7.99	0.06
Sharing bed with scabies case	Yes	27 (48.2)	15 (13.5)	5.96(2.8-12.7)	**3.9(1.47-10.33)**	0.006
	No	29 (51.8)	96 (86.5)	Ref		
Travel history	Yes	10 (17.9)	6 (5.4)	3.8(1.3-11.1)	**3.87(1.2-12.6)**	0.024
	No	46 (82.1)	105 (94.6)	Ref		
Shower frequency	≤ 1 time	49 (87.5)	75 (67.6)	3.4(1.4-8.2)	**2.74(1.04-7.21)**	0.041
	≥2 times	7 (12.5)	36 (32.4)	Ref		
Participant heard about scabies	Yes	38 (67.9)	85 (76.6)	0.65(0.32-1.32)	0.70(0.30-1.63)	0.41
	No	18 (32.1)	26 (23.4)	Ref		

Figures

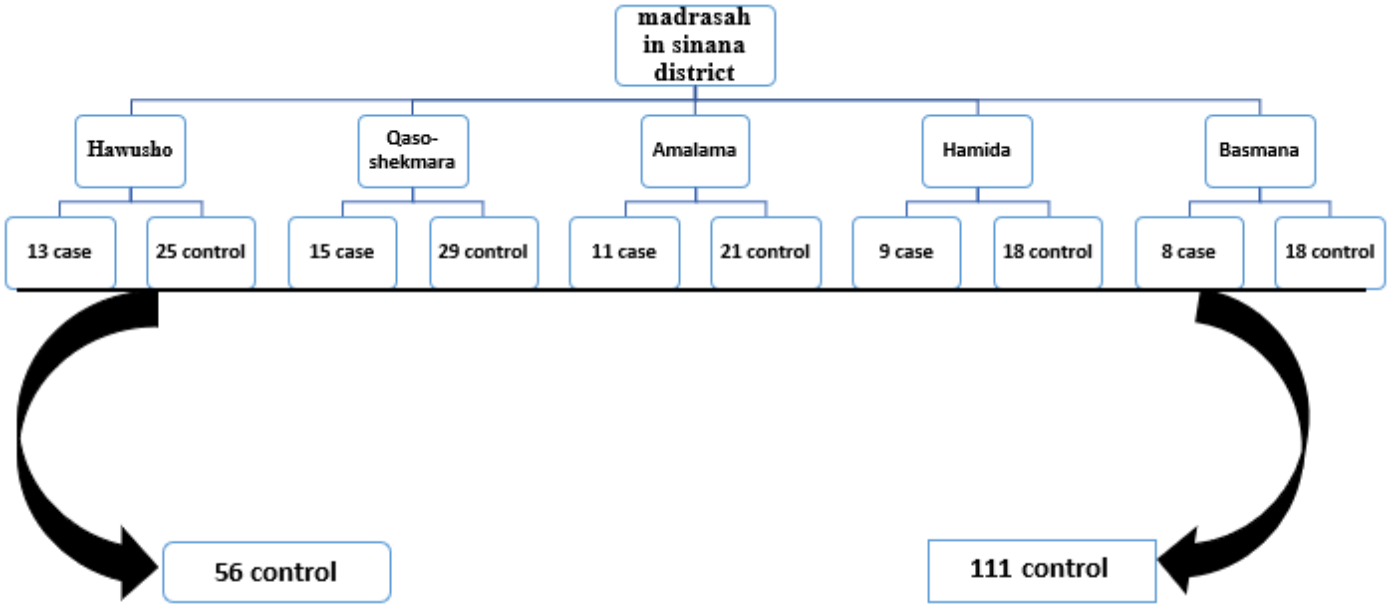


Figure 1

Schematic presentation of sampling procedure for the scabies outbreak investigation in madrasahs of Sinana district, Bale zone, Oromia, Ethiopia, 2019

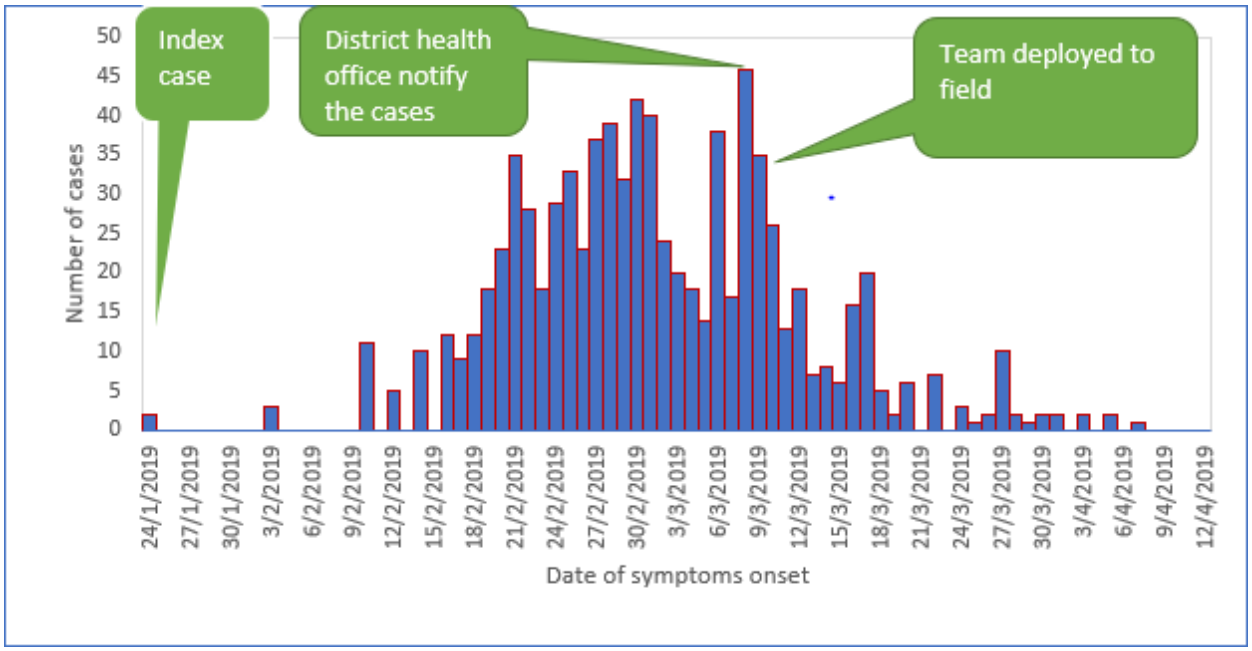


Figure 2

Epi-curve of scabies by disease of onset in madrasahs of Sinana district, Bale zone, Oromia, Ethiopia, 2019.