

# Risk Factors Associated With Scabies Infestation Among Schoolchildren in a Low Socio-Economic Area in Southeast of Iran

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## Research Article

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# Abstract

**Background:** Scabies is a neglected tropical disease caused by the mite *Sarcoptes scabiei* that burrows under the skin. It is a major health problem in tropical areas, largely affecting children. Scabies is common and highly contagious and in schoolchildren spreads quite rapidly, due to overcrowding and close contact within the schools. This study aimed to determine the risk factors associated with scabies infestation among schoolchildren in Bashagard County, one of the low socio-economic areas in southeast of Iran.

**Methods:** To conduct this community-based cross-sectional study, four primary schools were randomly selected in the Bashagard County. In each school all of the students were selected and examined for scabies. Clinical examination and sociodemographic profile of students were assessed using a pre-tested structured questionnaire. Data were analyzed using SPSS.21 software.

**Results:** Out of 480 studied schoolchildren, there were 15 cases of scabies with a prevalence of 3.1%. The frequency of infestation in males was 1.6% and it was 4.7% in females. Independent factors associated with a high risk of scabies infestation in unadjusted analysis were being student of grade 5-6 (OR =13.12, 95% CI 2.92-58.89,  $p= 0.0001$ ), being older than 10 years (OR =36.07, 95% CI 7.96-163.28,  $p= 0.0001$ ), low educational level of father (OR =4.37, 95% CI 0.97-19.59,  $p= 0.036$ ), low educational level of mother (OR =4.14, 95% CI 1.92-18.57,  $p=0.045$ ), father's joblessness (OR =14.77, 95% CI 4.97-43.89,  $p=0.0001$ ), employment of mother (OR =5.28, 95% CI 1.38-20.16,  $p=0.007$ ), large family size (OR =3.34, 95% CI 1.05-10.64,  $p=0.031$ ), use of shared articles (OR =33.37, 95% CI 10.82-102.90,  $p= 0.0001$ ), and absence of bathroom in the house (OR =11.77, 95% CI 2.16-63.94,  $p= 0.0001$ ).

**Conclusion:** Results of this study confirm that scabies is still one of the most important health problem in the Primary schools of the Bashagard County. Low socioeconomic status and personal hygiene of the schoolchildren were the most important factors significantly influencing the prevalence of scabies. Improvement of socioeconomic conditions and implementation of appropriate educational programs and active surveillance system to quickly detect and treat scabies cases is necessary to reduce the prevalence of scabies in schoolchildren in this area.

## Background

Scabies is a skin infestation caused by *Sarcoptes scabiei var. hominis*, which is an obligate parasite mite that burrows in the lower stratum corneum of the skin [1].

The annual world burden of scabies is estimated to be 300 million scabies cases [2]. It is more prevalent in tropical, humid regions and was listed as a neglected tropical disease (NTD) by the WHO in 2013 [3]. The major clinical manifestations of scabies is a generalized pruritic rash, worsening at night [4]. Scabies is transmitted through close personal contact, as well as through infected clothing. Although it is associated with low morbidity, scabies can lead to dermatitis, intense itching, and secondary bacterial infections [5]. It can also cause psychological frustration and intense anxiety among the infected people

[6]. The most common sites of infestation are the wrists, buttocks, fingers, genitals, axillae, groins, and the breasts in women. In young children and infants, the soles, palms, neck, and face are involved more commonly [7].

Epidemiological studies have shown that the prevalence of scabies infestations is not influenced by race, age, or sex and the main contributing factors are poor hygiene, poverty, and overcrowded living conditions [8].

Scabies affects all social classes, however, some groups of people, such as immunocompromised individuals, the elderly, residents of care facilities, children, and populations with low socioeconomic conditions, are at higher risk of becoming infected [9].

Scabies is a common problem in schoolchildren and the infestation spreads rapidly due to close physical contact between classmates and overcrowding conditions in the schools [10, 11].

Scabies has a different epidemiological distribution among different communities [12]. In Iran, most of the epidemiological studies about scabies have been conducted among prisoners and military personnel. Results of these studies indicated that sociodemographic factors such as educational level, family size, and level of personal hygiene influence the prevalence of scabies in these populations. However, few studies have reported prevalence of scabies and its related factors in schoolchildren [13]. Therefore, it is important to recognize the factors that may influence the prevalence of scabies to provide basic information for interventions toward the prevention and control of infestation in schoolchildren. This study aimed to determine the risk factors associated with scabies infestation among schoolchildren in Bashagard County, one of the low socio-economic areas in southeast of Iran.

## Methods

### Study areas

The study was conducted in Bashagard County in the Hormozgan Province, southeast of Iran. This County has an area of 16,000 km<sup>2</sup> and is placed between longitudes 57°23'-59°02' E and latitudes 26°04'-26°58' N, with 43000 populations according to 2016 census from which 51% were males and 49% females. The area is mountainous with low precipitation. It has hot and dry climate. In this county, the average annual rainfall is 262 mm and the averages of maximum and minimum relative humidity are respectively 47% in February and 17% in May. The climate in this region is tropical with a mean annual temperature of 26.7°C, ranging from 15.3 to 36.4°C (Fig. 1).

### Study design and sample size

This community-based cross-sectional study was conducted from October to December 2018 in Bashagard County. To calculate the sample size, the maximum variability was assumed to be 7% [14], With 95% confidence level and  $\pm 2.3\%$  precision, the minimum number of dust samples was determined

using the formula ( $n = z^2pq/d^2$ ) to be 472. A multi-stage stratified random sampling method was used to select the primary schoolchildren. In this regard, two urban schools in Gouharan and Sardasht cities and two rural schools in Ahven and Kooch-e-heydar villages were randomly selected and considered as the clusters (Fig. 2).

All of the schoolchildren in the clusters were examined for scabies. Clinical examinations were performed in a private room for all of the students in each school by a trained physician to detect the presence of scabies. Scabies infestation was diagnosed by the presence of burrows or erythematous papular, vesicular, and pustular lesions with itching and positive family history. A sampling of borrows of the patient by scraping test methods was used only in suspected cases [10]. After the examination, all of the schoolchildren were interviewed by a pre-tested structured questionnaire. The questionnaires were directed by trained interviewers and supervised by the principal investigator. The questionnaire included items such as demographic characteristics, presence of health teacher in the schools, parent's educational level, parent's job, family size, bathroom availability in the home, and living houses' construction materials and water supply.

## Statistical analysis

To analyze the data, SPSS ver.21 software was used. Descriptive statistics were used to show averages, percentages, and relative frequencies. The t-test, chi-square test, binary logistic regression, and One-way ANOVA were used to analyze the data.

Odds ratio (OR) with 95% confidence interval (CI) was used to analyze the factors predisposing the subjects to scabies infestation. The results were considered significant at 5% level ( $p$ -value < 0.05).

## Results

A total of 480 students including 257(53.3%) males and 223(46.5%) females were examined. The average of students' age was  $9.6 \pm 1.77$  years, ranging from 6 to 13 years. The mean family size was  $5.4 \pm 2.2$  people, ranging from 2 to 13 people. Nearly 88% of the schoolchildren were living in houses constructed using cement blocks. Majority of the schoolchildren had access to sanitary tap water (94.2%), and all of them had electricity in their houses. In addition, 98.3% of them had bathroom in their houses (Table 1).

Majority of the children's fathers (60.6%) were either illiterate or had a primary level of education, also, 93.1% of the children's fathers were employed. In addition, most of the children's mothers (61.9%) were either illiterate or had only received a primary education, and 95% were housewives (Table 2).

In this study *Sarcoptes scabiei* was detected on the skin lesions of 15 out of 480 schoolchildren. Accordingly, the prevalence of scabies among schoolchildren was 3.1%. The frequency of infestation in male and female students were 1.5% and 4.9%, respectively, and females were more likely than males to be infected by scabies (OR =3.28, 95% CI 1.03-10.45,  $p= 0.034$ ; Table 2).

Itching was the most prevalent symptom (84.6%), with 64% presenting severe itching and 49% complained of itching-related sleep disturbance. Moreover, Erythematous nodules were the most common skin lesions in the students (Fig. 3).

As figure 4 indicates, lesions were observed on the web space between the fingers (33.3%), wrists (20%), abdomen (13.3%), forearms and arms (13.3%), thighs (6.7%), anterior axillary folds (6.7%), and legs (6.7%).

The study showed that the prevalence of scabies was significantly higher in the grade 5-6 students and the students in these grades were more likely to develop scabies than grade 1-4 students (OR =13.12, 95% CI 2.92-58.89,  $p= 0.0001$ ; Table 2). Furthermore, according to the results, being older than ten years was found to be associated with higher risk of scabies infestation in the schoolchildren (OR =36.07, 95% CI 7.96-163.28,  $p= 0.0001$ ).

The study results also indicated that the prevalence of scabies was significantly related to the parents' educational level. In this regard, lower levels of education for either the father or the mother were found to increase the risk of scabies significantly (OR =4.37, 95% CI 0.97-19.59,  $p= 0.036$  for paternal education; and OR =4.14, 95% CI 1.92-18.57,  $p=0.045$  for maternal education; Table 2).

According to the results, scabies infestation was significantly related to the parents' job. The risk of scabies infestation was higher in schoolchildren whose fathers were jobless (OR =14.77, 95% CI 4.97-43.89,  $p=0.0001$ ), and the students with employed mothers had higher risk of infestation (OR =5.28, 95% CI 1.38-20.16,  $p=0.007$ ; Table 2).

In this study, infestation rate of scabies was positively associated with family size and the risk of scabies infestation was higher in the crowded families with more than four members (OR =3.34, 95% CI 1.05-10.64,  $p=0.031$ ; Table 2).

The study results also showed that the prevalence of scabies infestation was 31% among schoolchildren who used shared articles such as towel, combs, and cloth and they were more likely to be infested by scabies than students who did not use shared articles (OR =33.37, 95% CI 10.82-102.90,  $p= 0.0001$ ; Table 3). In addition, the prevalence of scabies infestation was higher among students with shared bedroom compared to those with private bedroom, but sharing the bedroom was not found to affect the risk of infestation significantly (OR =1.76, 95% CI 0.23-13.68,  $p= 0.58$ ; Table 3).

In the present study, the risk of scabies infestation was significantly higher among the students who did not have bathroom in their houses compared to those who had bathroom (OR =11.77, 95% CI 2.16-63.94,  $p= 0.0001$ ; Table 3).

## Discussion

Scabies is one of the neglected health problems in developing countries including Iran [13]. Scabies has non-uniform geographical distribution in Iran and prevalence of this infestation is nearly high and

different in various provinces owing to different climates [13, 15]. For example, compared to other areas, the prevalence of scabies is higher in the northern parts of Iran, as a result of climatic conditions and higher population density [13, 15,16].

In this study the prevalence of scabies was 3.1% in primary schoolchildren of Bashagard County. Previous studies have reported the prevalence of scabies infestation in primary schoolchildren from 2.09% to 7.22 % in different parts of Iran [13, 17, 18]. In other studies, conducted in schoolchildren of Egypt, Nigeria, Turkey, and, Kuwait, the prevalence of scabies was 4.4%, 4.8%, 2.16%, and 3%, respectively [19-22]. In addition, studies from India and Cameron have reported high infestation rate of scabies among schoolchildren with the prevalence of 39.42% and 17.8%, respectively [23, 24]. The variation of scabies infestation rate may be due to different factors such as family size, personal hygiene, and economic conditions [25-26]. Prevalence of scabies infestation in the study area may be attributed to factors such as use of shared articles, low parents' educational level, large family size, low frequency of bathing per week, and poor health facilities. Obviously, many of these factors are due to the extreme poverty.

In this study, the most common location of scabies lesions was found on the web spaces between the fingers and wrists. A similar study in the north of Iran also reported the highest number of scabies infestation on the web spaces between the fingers [17]. Scabies infections are usually localized in specific parts of the body and elbows, wrists, and hands are the most commonly infected sites [27]. Hand and wrist infections may occur due to handling mite-contaminated materials and touching infected persons. However, the distribution patterns suggest that the mites select special locations of the body and these locations may be preferred partly because of the lipid composition [27, 28].

In this study the highest prevalence of scabies infestation was observed in children aged more than 10 years. This finding is in accordance with the results of previous studies in Brazil, Nigeria, Pakistan, and Sri Lanka [7, 29-31]. This can be explained by more direct physical contact with friends at this students age group. In this regards, other studies also have reported the important role of physical contacts in transmission of scabies [30].

According to the results, scabies was more prevalent among schoolchildren with low educated parents. Similar findings have been reported from Iran [17, 18, 21, 32-35]. Parental education seems to have a major role in prevention of contagious diseases. Many studies have reported that parents with higher levels of education are more capable to apply healthcare and prevention measures for their children [21, 34, 37]. Since educational-based interventions have been reported to be efficient in reduction of insect-borne diseases in low socioeconomic areas [37], it is essential to provide appropriate educational programs for teachers, parents, and students to increase their awareness about scabies infestation risk factors and related prevention measures [4].

The results of the present study have confirmed the positive relationship between scabies infestation and the family size. This finding is supported by previous studies in Iran, Saudi Arabia, Cameroon, Ethiopia, Fiji, Mali, Malawi, and Cambodia [16-18, 24, 33, 38-40]. Larger family size leads to overcrowding. In the overcrowded homes, close contact between family members and use of shared beds and cloths,

increases the risk of scabies transmission. In addition, having more children may result in higher scabies infestation rates, because parents with more children pay less time per child to perform laundry and other personal hygiene activities.

According to the results of this study, use of shared articles such as towel, combs, and cloth affects the scabies prevalence. In a similar study conducted by Karim et al in Bangladesh [35], children who had shared beds on the floor, contracted more severe scabies infections and became re-infected more frequently. It was attributed to the use of shared beds which facilitates skin-to-skin contact and transmission of scabies from infested children to healthy ones. Similar findings have been reported from Egypt, Pakistan, Brazil, Ethiopia, Argentina, and Taiwan [21, 30, 34, 41-43]. In the crowded conditions, use of shared beds, cloths, and other materials may transmit the scabies infestation [43].

The present study revealed that the prevalence of scabies was higher among schoolchildren without bathroom in their home and it had relationship with frequency of bathing. This finding is similar to the results of [Wochebo et al](#), in Ethiopia who reported the risk of scabies is significantly associated with personal hygiene and children who took bath less than two times a week were five times more likely to be infected by scabies [41]. Likewise, in previous studies conducted in Ethiopia, Nigeria, Saudi Arabia, Bangladesh, and Cameroon association between scabies infestation and frequency of bathing was reported [11, 29, 33, 35, 37]. This might be because primary school students have less control over their personal hygiene. In addition, since schoolchildren spend much of their time with their friends, they have a higher chance of physical contact which facilitates scabies transmission. Other studies also have confirmed that the prevalence of human scabies is linked with poor personal hygiene [44, 45]. Hence, the prevalence of scabies infestation in primary school children may be, to some extent, due to low awareness and practice regarding the personal hygiene.

## Conclusion

Results of this study confirm that scabies is still one of the most important health problems in the primary schools of Bashagard County.

Low parents' educational level, father's joblessness, employment of mother, large family size, use of shared articles such as towel, comb, and cloth, absence of bathroom in the house, and poor health facilities were recognized as significant sociodemographic factors associated with prevalence of scabies among schoolchildren in the study area. Implementation of appropriate health education programs for students and their parents is necessary to increase their awareness about scabies risk factors and prevention measures for successful management of scabies in schoolchildren. In addition, implementation of an active surveillance system for early case detection by medical staff and periodic clinical check-ups for schoolchildren to provide early treatment, particularly in rural areas, is necessary.

## Abbreviations

NTD: Neglected tropical disease, OR: odds ratio, CI: Confidence interval

## **Declarations**

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### **Authors' contributions**

All the authors contributed to the conception and design of the study. "MSA, and MZ drafted the manuscript. MSA and ASD participated in the data analysis. SAJ performed the data collection, and trained field researcher. All authors read and approved the final manuscript".

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### **Availability of data and materials**

The data are available from the corresponding author on reasonable request.

### **Ethics approval and consent to participate**

This study was confirmed by Ethical Committee of Hormozgan University Medical Sciences (Code No: IR.HUMS.REC.1398.273). The participation in the study was voluntary and the participants were free to withdraw from the study at any time. Students and their parents had received an adequate and understandable explanation about the intent of the study, the possible results, their meaning, and signed the informed consent form. Besides, the data were collected anonymously after obtaining informed verbal consent that approved by the ethics committee from students and their parents. In this study identification numbers were used instead of participant names and collected data were kept confidential. In this study, All methods were carried out in accordance with relevant guidelines and regulations

### **Consent for publication**

Not applicable.

### **Competing interests**

The authors declare that they have no competing interests.

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## Tables

**Table 1** House characteristics of schoolchildren in Bashagard County, southeast Iran.

Characteristics	Number	Precent
<b>Type of house</b>		
Cement- blockhouse	422	87.9
Muddy	44	9.2
Shed	14	2.9
<b>Water supply</b>		
Yes	452	94.2
No	28	5.8
<b>Electricity</b>		
Yes	480	100
No	0	0
<b>Bathroom availability in house</b>		
Yes	472	98.3
No	8	1.7

**Table 2** Sociodemographic characteristics associated with scabies infestation in schoolchildren of Bashagard County, southeast Iran

p-value	Crude OR (95% CI)	Positive cases		Total examined cases		Characteristics
		%	No.	%	No.	
<b>Sex</b>						
0.034	1	1.5	4	53.5	257	Males
	3.28 (1.03-10.45)	4.9	11	45.5	223	Females
<b>Age</b>						
0.0001	1	0.5	2	82.5	396	7-10
	36.07 (7.96-163.28)	15.5	13	17.5	84	>10
<b>School grade</b>						
0.0001	1	0.6	2	65.2	313	1-4
	13.12 (2.92-58.89)	7.78	13	34.8	167	5-6
<b>Father's education</b>						
0.036	1	4.4	13	60.6	291	Illiterate/ Primary
	4.37 (0.97-19.59)	1	2	39.4	189	Secondary/ High school/ University
<b>Mother's education</b>						
0.045	4.14 (1.92-18.57)	4.4	13	61.9	297	Illiterate/ Primary
	1	1.1	2	38.1	183	Secondary/ High school/ University
<b>Father's Job</b>						
0.0001	1	1.8	8	93.1	447	Employee/ Farmer/ Self-employment
	14.77 (4.97-43.89)	21.2	7	6.9	33	Jobless
<b>Mother's Job</b>						
0.007	5.28(1.38-20.16)	12.5	3	5	24	Employee
	1	2.6	12	95	456	Housewife
<b>Family size</b>						
0.031	1	1.5	4	53.9	259	2-4

3.34(1.05-10.64)	4.8	11	46.1	221	>4
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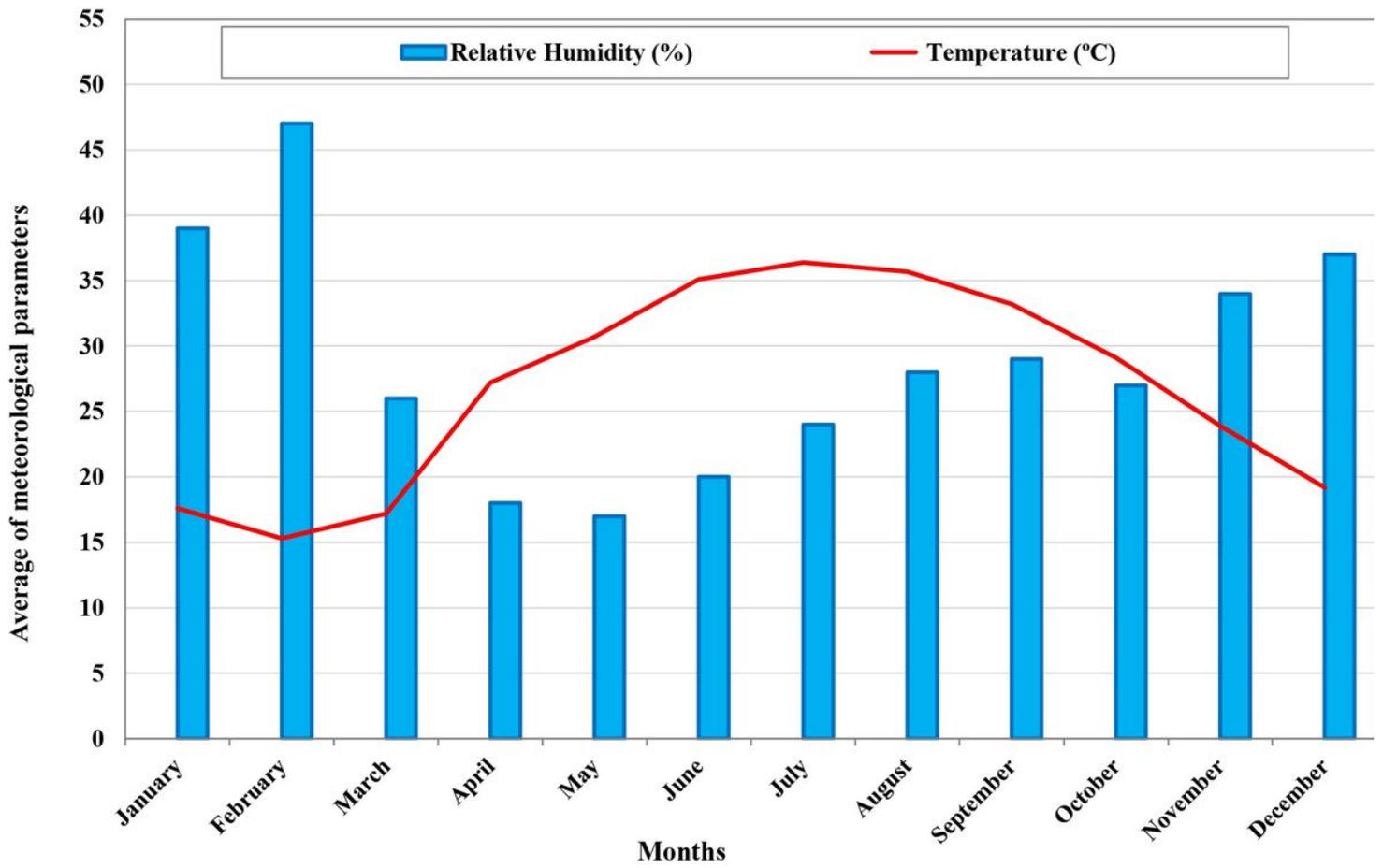
OR: Odds ratio, CI: Confidence interval

**Table 3** Behavioral characteristics associated with scabies infestation in schoolchildren of Bashagard County, southeast Iran.

p-value	Crude OR (95% CI)	Positive cases		Total examined cases		Characteristics
		%	No.	%	No.	
<b>Use of shared articles</b>						
<b>0.0001</b>	33.37(10.82-102.90)	31.0	9	6.1	29	Yes
	1	1.3	6	93.9	451	No
<b>Sharing bedroom</b>						
<b>0.583</b>	1.76(0.23-13.68)	3.3	14	89.2	427	Yes
	1	1.9	1	10.8	53	No
<b>Bathroom availability in house</b>						
<b>0.0001</b>	1	2.7	13	98.3	472	Yes
	11.77(2.16-63.94)	25	2	1.7	8	No

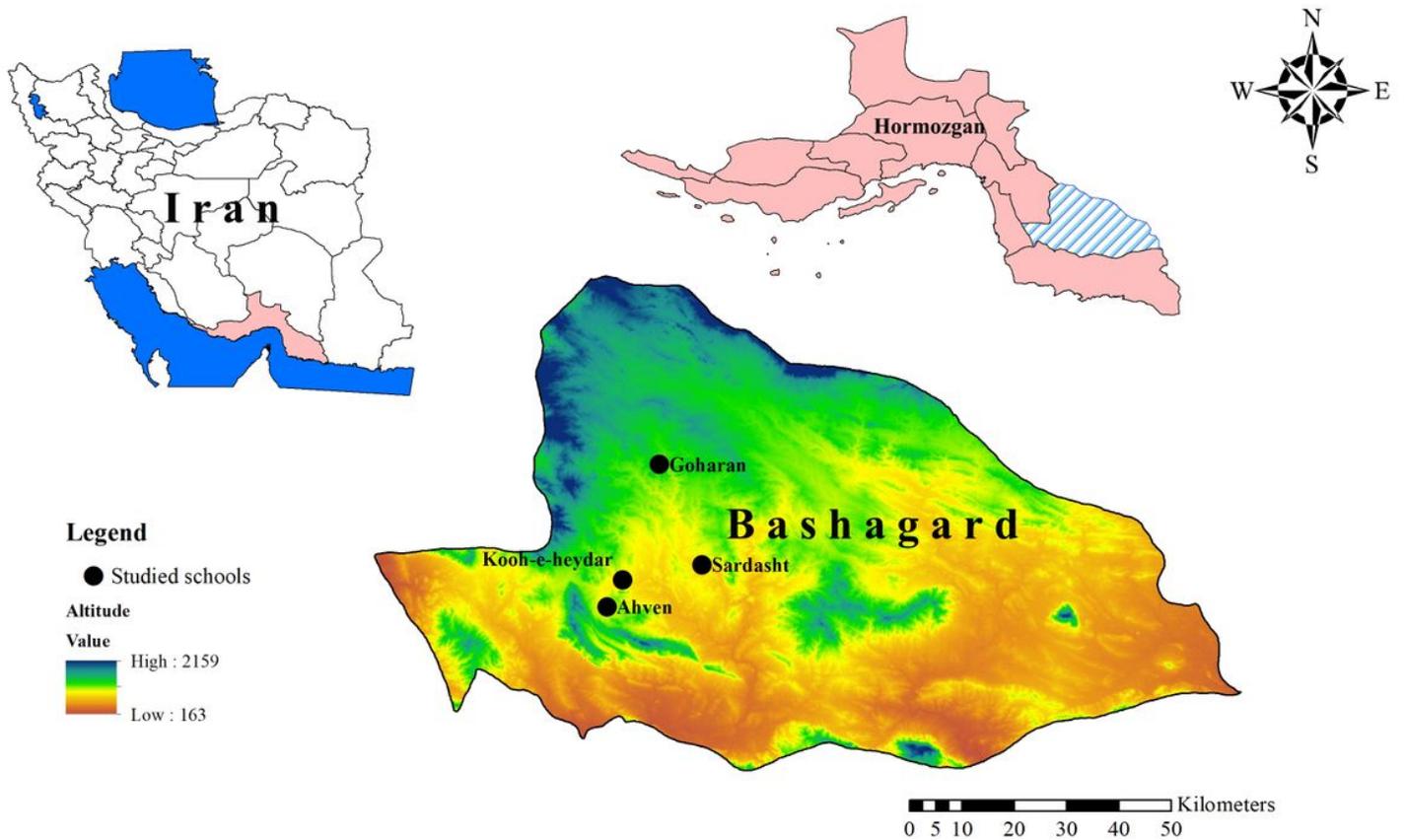
OR: Odds ratio, CI: Confidence interval

## Figures



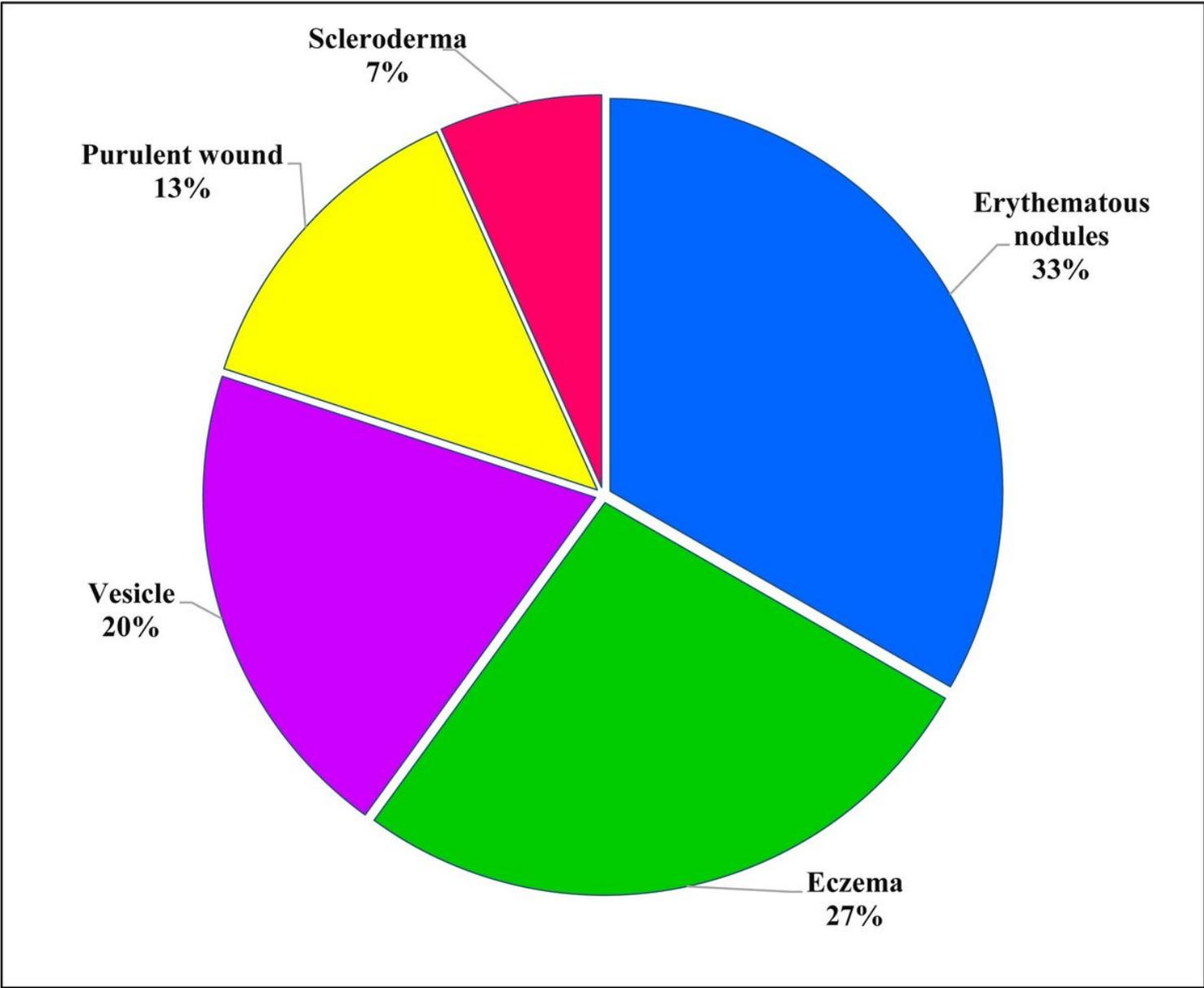
**Figure 1**

Average of meteorological parameters in Bashagard County, southeast Iran, 2018.



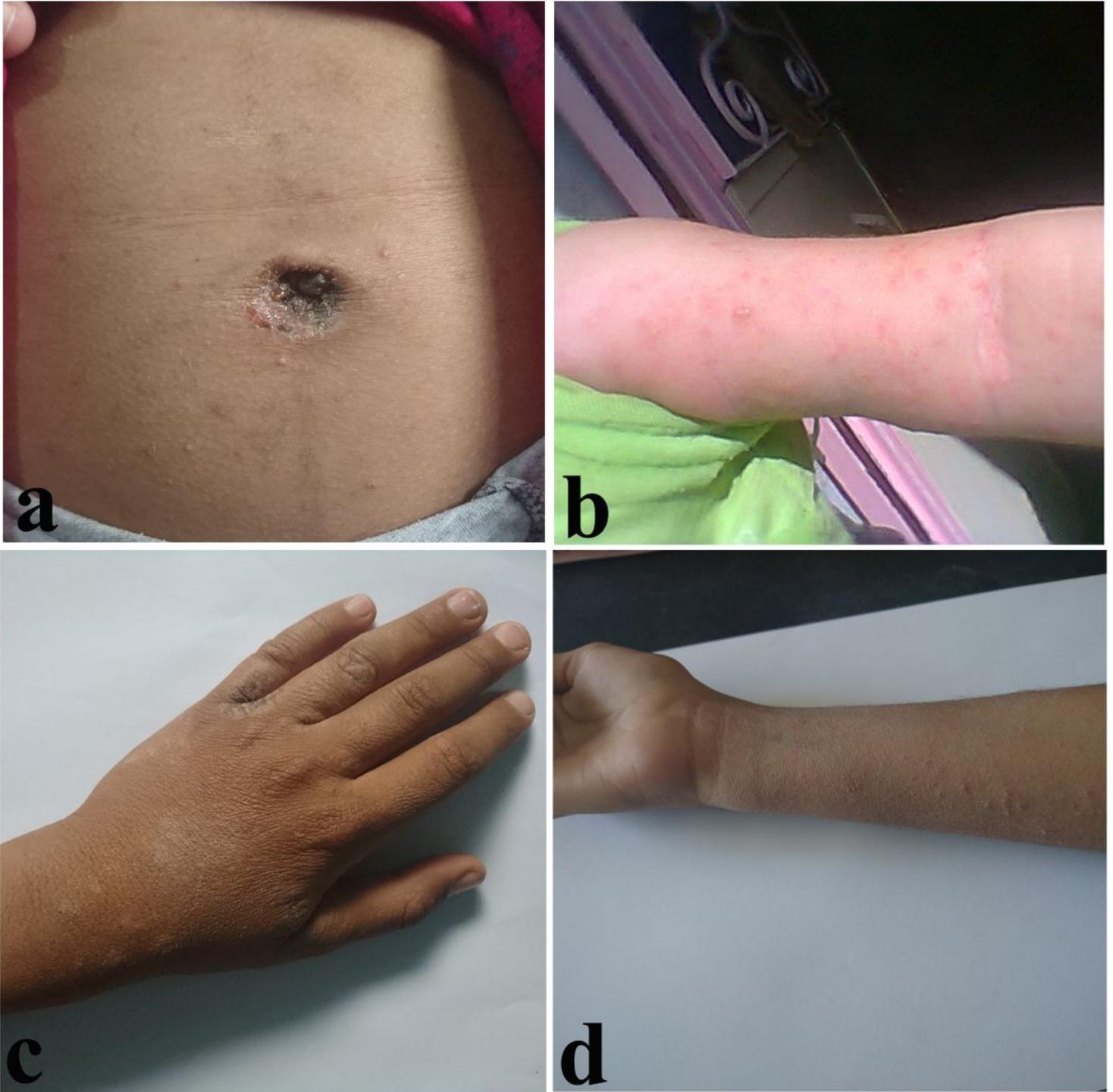
**Figure 2**

Map showing the location of study schools in Bashagard County, Hormozgan province, southeast Iran. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.



**Figure 3**

Various forms of scabies lesions in schoolchildren of Bashagard County, southeast Iran.



**Figure 4**

Locations of scabies infestation in schoolchildren of Bashagard County, southeast Iran. abdominal area(a), arm(b), web spaces between the fingers(c), and forearm(d)