Recurrence rate of scabies in patients 14 years or older in Saudi Arabia

Anwar E. Ahmed, PhD, *Hamdan AL-Jahdali* MD, *Hoda Jradi,* PhD, *Bashayr I. ALMuqbil,* MD, *Doaa A. AlBuraikan,* MD, *Monirah A. Albaijan,* BSC, *Yosra Z. Ali,* MBA, *Ali M. Al Shehri,* MD,

ABSTRACT

الأهداف: تقدير معدل تكرار الجرب التشخيصي وتحديد العوامل المرتبطة بالفرص العالية لتكرار الجرب المتكرر بين البالغين في المملكة العربية السعودية.

المنهجية: أجريت هذه الدراسة متعددة المراكز بأثر رجعي في المرضى البالغين الذين تم تشخيص إصابتهم بإصابد أو أكثر من الإصابات المتكررة بالجرب خلال الفترة من يناير 2016م وسبتمبر ٢٠١٨م في مستشفيات وزارة الحرس الوطني لشؤون الصحة وعيادات المملكة العربية السعودية. تم تسجيل عدد مرات تكرار الجرب خلال فترة الدراسة باستخدام نموذج Poisson.

النتائج: اشتملت الدراسة على مجموعه 468 مريض بالغ (39.8±17.8 ، المدى: 14.2–105.7 عام) في الدراسة، مما أدى إلى 645 تشخيص للجرب فيها 302 (46.8%) كانت متكرره. كشف نموذج بوسون متعدد المتغيرات أن جنس الذكور (نسب المعدل المعدلة: 1.465 ؛ 95% فترة الثقة: 1.064–2.017؛ p=0.019) ، الجزء الأول (من يناير إلى أبريل) (aRR: 3.021؛ 95% CI: 1.484 – 6.149؛ p=0.002) ، والرطوبة العالية (aRR: 1.066؛ 95% CI: 1.002 – 1.133؛ p=0.043) أدت إلى احتمالية أعلى لتكرار الجرب.

الخلاصة: كان معدل تكرار الجرب بين المرضى البالغين في المملكة العربية السعودية مرتفعًا، ويمكن مقارنته بالتقرير السابق في اليابان. تشير الدراسة إلى أن جنس الذكور، والجزء الأول، والرطوبة العالية كانت مرتبطة بشكل مستقل مع ارتفاع معدل تكرار الجرب بين البالغين. ينبغي تنفيذ برنامج علاجي لخفض معدل تكرار الجرب ومنع تفشي المرض.

Objectives: To estimate the rate of scabies diagnostic recurrence and identify factors associated with the high likelihood of frequent scabies recurrences among adults in Saudi Arabia.

Methods: This multi-center retrospective study was conducted in adult patients who were diagnosed with one or multiple recurrent infestations of scabies between January 2016 and September 2018 at the Ministry of National Guard-Health Affairs hospitals and clinics, Saudi Arabia. The number of scabies recurrences during the study period was recorded and modeled using a Poisson model.

Results: A total of 468 adult patients (39.8±17.8, range: 14.2-105.7 years) were included in the study, resulting in 645 scabies diagnoses in which 302 (46.8%) were recurrences. The multivariate Poisson model revealed that male gender (adjusted rate ratios [aRR]: 1.465; 95% CI: 1.064 - 2.017; p=0.019), first tertile (January to April) (aRR: 3.021; 95% CI: 1.484 - 6.149; p=0.002), and high humidity (aRR: 1.066; 95% CI: 1.002 - 1.133; p=0.043) had a higher likelihood of frequent scabies recurrences.

Conclusion: The rate of scabies recurrence among adult patients in Saudi Arabia was high, and is comparable with previous report in Japan. The study suggests that male gender, first tertile, and high humidity were independently associated with the high rate of scabies recurrences among adults. An interventional program to lower the rate of scabies recurrences and prevent outbreak should be undertaken.

Saudi Med J 2019; Vol. 40 (12): 1267-1271
doi: 10.15537/smj.2019.12.24773

From King Saud bin Abdulaziz University for Health Sciences (Ahmed, AL-Jahdali, Jardi, AlMuqbil, AlBuraikan, Albaijan, Al Sherhri), from King Abdullah International Medical Research Center (AL-Jahdali); and from the Ministry of the National Guard-Health Affairs (Ali), Riyadh, Kingdom of Saudi Arabia.

Received 8th August 2019. Accepted 24th November 2019.

Address correspondence and reprint request to: Dr. Anwar E. Ahmed, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Kingdom of Saudi Arabia. E-mail: anwar.ahmed.ctr@usuhs.edu
ORCHID ID: https://orcid.org/0000-0001-8743-6007

Disclosure. Authors have no conflict of interests, and the work was not supported or funded by any drug company.

Worldwide, it has been estimated that 300 million cases of scabies occur annually.[1] Scabies can be transmitted by direct contact with the person's skin, or indirectly by sharing clothes, towels, bedding, and others objects used by an infected person.[2] Scabies can affect families, and particularly those living in poor conditions and with limited access to healthcare.[3] Scabies can occur in any geographical location; however, the highest global rates of scabies (71.4%) were reported in tropical regions with humid climates.[3,4] Pruritus is the most frequently diagnosed skin condition of scabies, which can progress to become bacterial infections and potentially can become a life-threatening condition.[5] Reports on indicators and prevalence of scabies in Saudi Arabia have been limited to closed communities, such as observed cases among workers residing in crowded neighborhoods;[6] however, at the start of the year 2018, there were outbreaks of this highly contagious disease in the Western region of the Kingdom, and additional outbreaks have been reported in other regions. It is unclear whether these outbreaks were imported from the Western region. Despite the continuous sporadic reports about new cases, which are generated by the Ministry of Health for different regions in Saudi Arabia, there is no official documentation of the epidemiological aspects and main determinants of scabies infestation. In addition to the lack of reports on the number and distribution of the cases of scabies, the reasons for the recurrent infestations after an initial infestation are poorly understood. Studies have reported high recurrence rate of scabies[7,8] and its most likely to happen in hospitalized patients with no significant correlation evident in community-acquired cases. This study aimed to estimate the rate of scabies diagnostic recurrences and identify factors associated with the high likelihood of frequent scabies recurrences in patients who were diagnosed with one or multiple recurrent scabies outbreaks between January 2016 and September 2018 at the Ministry of National Guard-Health Affairs (MNGHA) hospitals and clinics, Saudi Arabia.

Methods. A multi-center retrospective study was conducted on patients who were diagnosed with one or multiple scabies recurrences between January 2016 and September 2018 at the MNGHA hospitals and clinics, Saudi Arabia (Western, Central, and other regions). The study included patients from major MNGHA hospitals and clinics such as King Abdulaziz Medical City, Riyadh; King Abdulaziz Medical City, Jeddah; Imam Abdulrahman Bin Faisal Hospital, Dammam; King Abdulaziz Hospital, Al Ahsa; and, Prince Mohammad bin Abdulaziz Hospital, Madinah. The study obtained approval (# RC18/220/R) from the Ethics Committee at MNGHA. The patients' consent to review their medical records and publish research findings was not required by the Ethics Committee. Data were reported from 24 MNGHA hospitals and clinics across Saudi Arabia. The database group at King Abdullah International Medical Research Centers (KAIMRC) identified patients who were diagnosed with scabies during the period of the study, as these patients were evaluated and managed at the MNGHA hospitals and clinics across Saudi Arabia.

In 2015, the MNGHA implemented a new electronic health information system, called BestCare[9,10] and data for this study were extracted from the BestCare system. This unified database allows integration of all MNGHA hospitals and clinics across Saudi Arabia. All diagnoses and medication histories are stored in chronological order. The data included gender, age, region where a case was diagnosed, and tertiles of the year: first (January to April), second (May to August), and third (September to December). Data on climate factors (based on Google reports) were gathered by calculating the monthly average of ultraviolet index, temperature (°C), rainfall (mm), humidity (%), cloud (%), and winds (kmph). We retrieved data on the clinics where patient received scabies diagnoses: emergency room and satellite clinic.

The diagnosis was based on clinical signs with the presence of the following: "scabies burrows," "typical lesions affecting male genitalia," or "typical lesions in a typical distribution and 2 history features,"[11] and physicians often considered microscopy to confirm some cases. The study included all patients 14 years of age or older who were treated from one or multiple recurrences of scabies. We excluded patients who had follow-up treatment for scabies. More description of the methods can be found in our previous report on children.[12]

We defined the study outcome to be the number of scabies recurrences after an initial diagnosis during the study period. The number of scabies recurrences was found to be clustered (from 0 to 7), where "0" indicates a single diagnosis or no recurrence, and 1 to 7 indicate the number of recurrences. A total of 468 adult patients were included in the study, resulting in 645 scabies diagnoses during the study period.

Statistical analyses. Data analysis was performed by the Statistical Package for Social Sciences, version 20.0 (IBM Corp, Armonk, NY, USA). A descriptive of the sample is presented in **Table 1**. The study outcome was treated as discrete counts, which is the number of scabies recurrences, and was analyzed by Poisson model. We compared the goodness-of-fit of negative binomial and Poisson models using deviance values. We assessed bivariate unadjusted and multivariate adjusted rate ratios (RR and aRR) of scabies recurrences and a 95% confidence interval (CI), which were calculated and presented in **Table 2**. A 2-tailed *p* value of <0.05 was regarded as a significant association with a greater frequency of scabies recurrences.

Results. A total of 468 adult patients were included in the study, resulting in 645 scabies diagnoses in which 302 (46.8%) were recurrences with a CI between 42.9% and 50.8%. **Figure 1** shows frequency of scabies recurrences. The sample of 468 adult patients comprised 57.7% males, and 61.1% were diagnosed in the Western region of Saudi Arabia. The mean age was 39.8 years (±SD 17.8) with an age range between 14.2 and 105.7 years. More descriptive of the sample can be found in **Table 1**.

Table 1 - Patient's characteristics and monthly climate data (N=468).

Factor	n (%)
Gender	
Male	270 (57.7)
Female	198 (42.3)
Region	
Western	286 (61.1)
Central	116 (24.8)
Other	66 (14.1)
Tertile	
1st	169 (36.1)
2nd	174 (37.2)
3rd	125 (26.7)
Emergency room	
Yes	31 (6.6)
No	437 (93.4)
Satellite clinic	
Yes	23 (4.9)
No	445 (95.1)
Age (14.2-105.7 years)	39.8±17.8
Ultraviolet index (3.0-9.0)	7.2±1.6
Temperature (14.0 °C -38.0 °C)	27.9±7.4
Rainfall (0.0-17.1 mm)	3.5±4.6
Humidity (9% - 38%)	19.9±8.4
Cloud (0.0% -24%)	8.8±6.3
Winds (7.6-17.1 kmph)	13.6±2.5

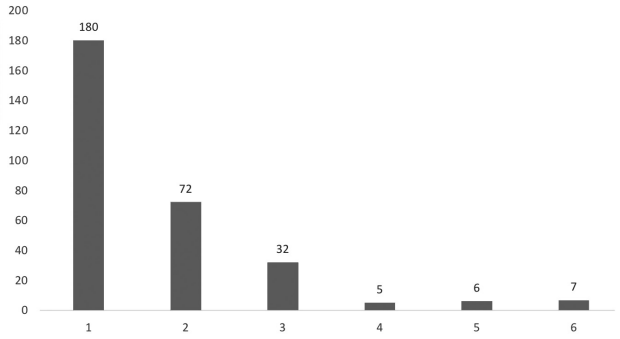

Figure 1 - Frequency of recurrence of scabies.

The bivariate Poisson models (**Table 2**) identified male gender (RR: 1.505; 95% CI: 1.099-2.059; *p*=0.011), and high humidity (RR: 1.020; 95% CI: 1.002-1.037; *p*=0.028) to be significantly associated with a greater rate of scabies recurrences. Low ultraviolet (RR: 0.889; 95% CI: 0.812-0.974; *p*=0.011) and low temperature (RR: 0.977; 95% CI: 0.959-0.997; *p*=0.021) were associated with a lower rate of scabies recurrences.

The multivariate Poisson model (**Table 2**) revealed that male gender (aRR: 1.465; 95% CI: 1.064-2.017; *p*=0.019) had a higher rate of scabies recurrences. The first tertile (January to April) had a higher rate of scabies recurrences (aRR: 3.021; 95% CI: 1.484-6.149; *p*=0.002) as compared to the third tertile (September to December). There was an increased rate of scabies recurrence as humidity increases (aRR: 1.066; 95% CI: 1.002-1.133; *p*=0.043).

Goodness of fit shows that the Poisson model is a suitable approach for this data when compared to the negative binomial regression model: (deviance value: 1.069 versus 0.761).

Discussion. This is a retrospective study of the largest cohort of patients with scabies reported in Saudi Arabia. Over the past few years, a number of ineptly documented scabies outbreaks have occurred in Saudi Arabia, with greater effect in a school setting and crowded residential area,[6] and which is probably attributed to the cluster infections,[11] Causes of scabies outbreaks remain unclear in Saudi Arabia.[12]

No data exists on scabies recurrence in Saudi Arabia or the Gulf region and it has not been widely reported worldwide. The rate of scabies recurrence was 46.8% which is high in our population, consistent with previous report in Japan 44.3%[8] (Chi-squared=0.930, *p*=0.335). These high recurrence rates may require routine patient therapy compliance and close monitoring, which can be effective in reducing the burden of scabies. A large

Table 2 - Predictors of high rate of scabies recurrence.

Variables	Bivariate analysis					Multivariate analysis				
				95% CI for RR					95% CI for aRR	
	B	P	RR	Lower	Upper	B	P	aRR	Lower	Upper
Age	0.003	0.533	1.003	0.994	1.011	0.003	0.496	1.003	0.995	1.011
Gender (male vs. female)	0.409	0.011*	1.505	1.099	2.059	0.382	0.019*	1.465	1.064	2.017
Western region vs. others	0.334	0.177	1.397	0.860	2.269	0.309	0.220	1.363	0.832	2.233
Central region vs. others	0.253	0.359	1.288	0.750	2.209	0.357	0.214	1.430	0.813	2.513
Family Medicine (yes vs. no)	-0.177	0.240	0.838	0.624	1.126	-0.282	0.400	0.754	0.391	1.455
Satellite (yes vs. no)	-0.575	0.205	0.562	0.231	1.368	-0.809	0.094	0.445	0.173	1.149
First tertile vs. third tertile	0.321	0.086	1.378	0.956	1.988	1.106	0.002*	3.021	1.484	6.149
Second tertile vs. third tertile	-0.183	0.374	0.833	0.556	1.246	0.303	0.413	1.354	0.656	2.793
Ultraviolet index	-0.117	0.011*	0.889	0.812	0.974	0.013	0.939	1.013	0.721	1.425
Temperature (°C)	-0.023	0.021*	0.977	0.959	0.997	0.067	0.157	1.070	0.974	1.174
Rainfall (mm)	0.003	0.832	1.003	0.972	1.036	-0.019	0.501	0.981	0.927	1.038
Humidity (%)	0.019	0.028*	1.020	1.002	1.037	0.064	0.043*	1.066	1.002	1.133
Cloud (%)	0.008	0.477	1.008	0.985	1.032	-0.031	0.197	0.969	0.924	1.016
Winds (kmph)	-0.022	0.447	0.978	0.924	1.036	-0.120	0.057	0.887	0.784	1.004

*significant at α=0.05, RR - relative risk, aRR - adjusted rate ratio, vs - versus, B - bivariate correlation, P - Pearson analysis

prospective study is needed to assess whether scabies recurrence is the result of certain treatments. We observed a significantly higher scabies recurrence rate in the first tertile (January to April) as compared to the third tertile (September to December). In March and April 2018, several outbreaks of scabies occurred involving multiple schools and crowded residential areas. Scabies recurrence may be attributed to the effect of climate factors. The study has showed that as relative humidity has increased by 1%, the rate of scabies recurrence tends to increase by 6.6%. This is similar to a nationwide study in Taiwan where the incidence was positively correlated with relative humidity.[13] We observed a higher rate of scabies recurrence in male gender, inconsistent with report from Japan where gender was insignificantly associated with scabies recurrence.[8] This conflicting finding could be due to the variation in study populations as patients in our sample were younger (mean of 39.8 years) than the study in Japan (mean of 82.5 year).

This study used a multi-center to address the recurrence rate of scabies and its factors among adult patients in Saudi Arabia. Given the rarity of the topicin Saudi population, this report in adult patients highlights the fact that scabies recurrence exists and is frequently common, thus, intervention is needed to prevent reinfestation.[12]

Study limitations. There are several limitations to the study. The study used retrospective design to evaluate associations rather than causations, thus interpretation must be drawn carefully. The study design also resulted in a lack of available data on clinical signs, proscribed treatment, and comorbidities. The study population is restricted to scabies diagnoses made in MNGHA hospitals and clinics.

In conclusion, the rate of scabies recurrence among adult patients in Saudi Arabia was high, and is comparable with previous report in Japan. The study suggests that male gender, first tertile, and high humidity were independently associated with the high rate of scabies recurrences among adults. An interventional program to lower the rate of scabies recurrences and prevent outbreak should be undertaken.

References

1. Chosidow O. Scabies. ***N Engl J Med*** 200; 354: 1718-1727.
2. Dupuy A, Dehen L, Bourrat E, Lacroix C, Benderdouche M, Dubertret L, et al. Accuracy of standard dermoscopy for diagnosing scabies. ***J Am Acad Dermatol*** 2007; 56: 53-62.
3. Hay RJ, Steer AC, Engelman D, Walton S. Scabies in the developing world. Its prevalence, complications, and management. ***Clin Microbiol Infect*** 2012; 18: 313-323.
4. Romani L, Steer AC, Whitfeld MJ, Kaldor JM. Prevalence of scabies and impetigo worldwide: a systematic review. ***Lancet Infect Dis*** 2015; 15: 960-967.
5. Walton SF, Currie BJ. Problems in diagnosing scabies, a global disease in human and animal populations. ***Clin Microbiol Rev*** 2007; 20: 268-279.
6. Abou NZ. Scabies in some workers living in crowded area, Jeddah, Saudi Arabia. ***J Egypt Soc Parasitol*** 2000; 30: 325-328.
7. Schmidt-Guerre AR, Aranda-Hulin B, Maumy-Bertrand M, Aubin F. Diagnosis and treatment of scabies by general practitioners: A survey of practices in France. ***Ann Dermatol Venereol*** 2018; 145: 89-94.
8. Makigami K, Ohtaki N, Ishii N, Tamashiro T, Yoshida S, Yasumura S. Risk factors for recurrence of scabies: A retrospective study of scabies patients in a long-term care hospital. ***J Dermatol*** 2011; 38: 874-879.

9. Ahmed AE, ALMuqbil BI, Alrajhi MN, Almazroa HR, AlBuraikan DA, Albaijan MA, et al. Emergency department 72-hour revisits among children with chronic diseases: a Saudi Arabian study. ***BMC Pediatr*** 2018; 18: 205.
10. Ahmed AE, AlBuraikan DA, Almazroa HR, Alrajhi MN, ALMuqbil BI, Albaijan MA, et al. Seventy-two-hour emergency department revisits among adults with chronic diseases: a Saudi Arabian study. ***Ther Clin Risk Manag*** 2018; 14: 1423.
11. Wick JY, Zanni GR. Outbreak: 10 tips to make scabies scamper. ***Consult Pharm*** 2006; 21: 512-514.
12. Ahmed AE, Jradi H, AlBuraikan DA, ALMuqbil BI, Albaijan MA, Al-Shehri AM, et al. Rate and factors for scabies recurrence in children in Saudi Arabia: a retrospective study. ***BMC Pediatr*** 2019; 19: 187.
13. Liu 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.