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# HUMAN SCABIES IN KIRKUK, IRAQ : PREVALENCE AND RELATION TO SECONDARY BACTERIAL INFECTIONS

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## Abstract

Various species of disease agents infect human skin, including the most common chancedsk in parasites and subcutaneous tissues; *Sarcoptesscabiei*, *Demodex* sp., *Tungapenetrans* and myiasis. The objective of this study was to detect the incidence of scabies and other skin infections among Kirkuk population and to determine their relationship to secondary bacterial infections. A survey of scabies and some other skin diseases among Kirkuk population was conducted in the years 2017 and 2018. Where skin scrap samples from patients attending the Allergy Centre, Azadi Teaching Hospital and Kirkuk General Hospital were tested. The overall prevalence rate for *Scabies* was 30.2 percent in Kirkuk Region. There was a major shift in *Sarcoptes* incidence between 2017 (36.4 percent) and 2018 (63.6 percent). Nearly equivalent proportions occurred in the two years (55.8, 44.2 percent) and without noticeable disparity between male and female. The age of most infected patients was between 11-30 years in 2017, while the age group most affected was between 1-10 years in 2018. Allergies were one of the most prevalent skin diseases affecting individuals in the two years with levels of 51, 65 percent for each year respectively, females were found to be more allergy-infecting. Urticaria was the second prevalent skin disease with a prevalence of 18, 23 percent followed by leishmaniasis of 19, 12 percent and fungal infection of 7, 5 percent over the span of two years respectively. Most of the percentages of male infected *Scabies* were among police and soldiers followed by workers.

***Key words:*** Sarcoptes scabies, Skin infections, Kirkukcity.

## Introduction

Scabies is a human skin disease caused by *Sarcoptes scabiei varhominis*, a form of the mite (Micali *et al*., 2016), an ectoparasite infecting the cutaneous tissue causes itching. Following the invasion of adult female scabies into the skin's corneum layer and the oviposit made into the tunnels, a very severe skin itch may result, which may get worse at night (Swe *et al*., 2017). Itching of the skin can cause hyper sensitivity, eruptions and inflammation. Its wide spread presence in poorer crowded communities (Sara *et al*., 2018). Scabies dispersal typically occurs during some disasters, such as wars, emigration and earthquakes (Sara *et al*., 2018; Nurie, 2018). Scabies is more common in developing countries (Anderson and Strowd, 2017) and its distress in resource-poor environments is exacerbated by group A *Streptococci* and *Staphylococci* (Swe *et al*., 2017; Hay *et al*., 2012; Romani *et al*., 2015). Secondary bacterial infection in patients with scabies is usual in the infected corer areas with lesions of the pustules and crusted scales. The seles ions can appear as impetigo and are typically infected with *Streptococci* and *Staphylococcus aureus* (Swe *et al*., 2017; Hay *et al*., 2012; Romani *et al*., 2015). An estimated 100 million cases of scabies (Hay *et al*., 2014) and 300 millioncases were reported as an annual worldwide distribution in 2010. Swe *et al*., 2017; Anderson and Strowd, 2017). Scabies were prevalent in many cities in Iraq, with cases reported at 3.3 percent in Basra. At 1.2 percent in Tikrit, 2.7 percent in Kirkuk and 1.9 percent in Samara (Al Rubaiy, 2001; Alaa 2002; Al Samarai 1995; Murtada, 2001). This research aimed to diagnose the occurrence of scabies and other skin infections among Kirkuk population and to establish the relationship between scabies and secondary bacterial infection.

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## Materials and Methods

**Study design:** This research was conceived to determine the extent of scabies among the Kirkuk Governorate population and to compare prevalence levels between 2017 and 2018, after a large number of refugees spread to the region. The association between scabies and secondary bacterial infection is also to be identified. To this end, the Allergy Center and Dermatology Units have been visited in a number of hospitals. Samples were randomly taken from the attendance. The cases of skin injuries were sorted with the assistance of the specialist physician to take skin samples from suspected cases of scabies.

**Samples collection:** A total of 5071 skin cases were obtainable from patients visiting the Allergy Center, Azadi Teaching and Kirkuk General Hospitals from January 2017 until December 2018. Information was gathered through a questionnaire form submitted to each patient including: gender, age, residential area, occupation and presence of pets.

**Microscopic examination:** Before skin scraping samples from infected areas were obtained, the areas were moisturized with mineral oil and then scraped using a clean, sterile blade. The scrapping skin was stored in a sample collection jar, adding a few drops of 10 percent KOH as a macerating agent to each glass. For each sample wet mount smear was made and identified by direct microscopic examination. Accentuate diagnosis was based on direct observations and the detection of mite, ova, or even feces taken from skin burrow in adult or immature scabies (Kandi, 2017).

**Table 1:** Prevalence of scabies according to sex in years 2017 and 2018.

| Year | Total No. examined | Total+ve *Scabies*% | Male % | Female % |
|---|---|---|---|---|
| 2017 | 2003 | 556 36.4 | 308 55.4 | 248 45 |
| 2018 | 3063 | 973 63.6 | 545 56.1 | 428 44 |
| Total | 5071 | 1529 30.2 | 853 55.8 | 676 44.2 |

$\chi 2$ value Evaluated $\chi 2$ value = 896 (significant), 0.073 (non-significant).

**Cultivation of skin samples:** From scabies positive patients suspected of having secondary bacterial infection were taken 30 swabs from inflamed or exudate skin. The swabs have been carriedin to the media for transport. Nutrient, blood and agar MacConky were used to grow samples of the skin. Smears were prepared from cultivated sample after bacterial growth, then heat was set and stained with gram stain. The identification of the bacteria was based on the characteristics of the colony, gram stain, bacterial form and some other basic methods of bacterial identification (Parks *et al*., 2012).

**Statistical analysis:** In order to identify variations according to a variety of parameters, the $\chi^2$ (chi-square) method was used manually, where possible, in the form of independent and homogeneous. A probability level of 0.01 or 0.05 was used.

## Results

A high incidence of scabies occurred among Kirkuk residents, the overall rate of infection was 30.2 percent. Between 2017 and 2018 a significant difference in the prevalence of scabies was observed. The overall prevalence rate in 2018 has been elevated to 63.6 percent, after being 36.4 percent in 2017. Almost equal proportions appeared in the two years, albeit without any disparity between male and female, as demonstrated in table 1, Fig. 1.

As illustrated in table 2, in 2017, the result of scabies based on age groups showed that the most affected age group was 11-30 years of age, with a 21-22 percentage. While the most affected age group in 2018 was 1-10 years, it was 32%.

Across the months of the year, statistical findings of scabies depending on the gender showed a higher prevalence of scabies in cold months (January, February, November and December) compared to hot or moderate

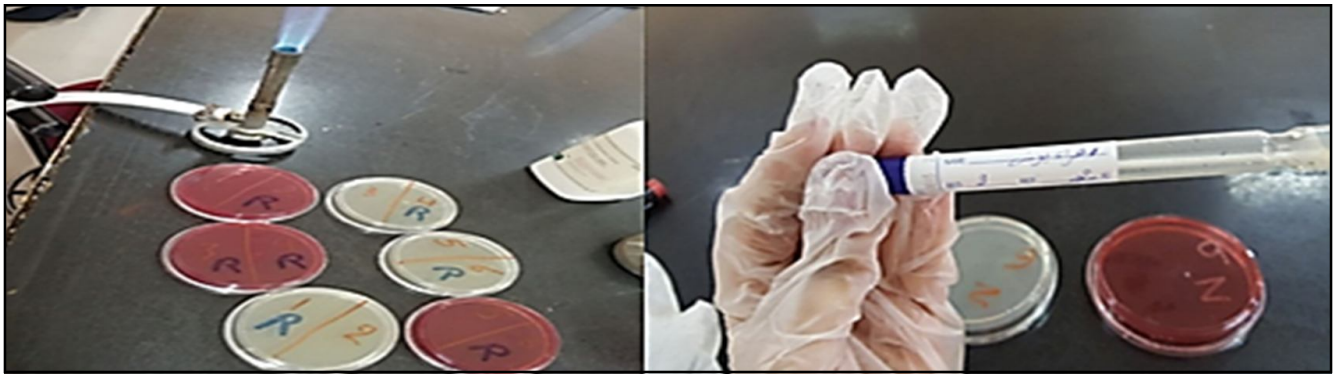

**Fig. 1:** Bacterial cultures and transport media.

**Fig. 2:** *Sarcoptesscabiei* positive patients, leftscabiespatient with secondary bacterial infection.

months in both years. There were no substantial differences between the two genera as shown in table 3.

**Table 2:** Prevalence of scabies according to the age group in 2017 and 2018.

| Ages in years | Year 2017 | | | Year 2018 | | |
|---|---|---|---|---|---|---|
| | Female % | Male % | Total % | Female % | Male % | Total % |
| 1-11 month | 7 28 | 18 72 | 25 4 | 23 38 | 37 62 | 60 6 |
| 1-10 | 33 38 | 53 62 | 86 15 | 140 45 | 174 55 | 314 32 |
| 11-20 | 52 44 | 66 56 | 118 21 | 90 50 | 90 50 | 180 18 |
| 21-30 | 54 45 | 67 55 | 121 22 | 37 30 | 87 70 | 124 13 |
| 31-40 | 32 40 | 49 60 | 81 15 | 51 47 | 57 53 | 108 12 |
| 41-50 | 37 36 | 66 64 | 103 19 | 39 45 | 47 55 | 86 10 |
| 51-60 | 19 48 | 21 53 | 40 7 | 31 49 | 32 51 | 63 6 |
| 61-70 | 11 65 | 6 35 | 17 3 | 12 50 | 12 50 | 24 2 |
| 71-80 | 3 33 | 6 67 | 9 2 | 5 36 | 9 64 | 14 1 |
| Total | 248 55 | 308 45 | 556 | 428 44 | 545 56 | 973 |

$\chi 2$ value Evaluated $\chi 2$ value = 11.5 (non-significant), 15.8 (significant).

**Table 3:** Prevalence of scabies throughout the months of the year in 2017 and 2018.

| Months | Year 2017 | | | Year 2018 | | |
|---|---|---|---|---|---|---|
| | Male % | Female % | Total % | Male % | Female % | Total % |
| January | 40 55 | 21 48 | 61 8 | 52 57 | 40 45 | 92 8 |
| February | 30 60 | 20 40 | 50 9 | 50 63 | 34 41 | 84 9 |
| March | 25 53 | 22 47 | 47 8 | 49 59 | 38 48 | 87 8 |
| April | 28 55 | 23 45 | 51 9 | 44 58 | 32 42 | 76 7 |
| May | 23 52 | 17 49 | 40 13 | 44 53 | 39 47 | 83 9 |
| June | 20 61 | 13 39 | 33 6 | 33 49 | 34 51 | 67 7 |
| July | 18 51 | 19 39 | 37 9 | 42 53 | 30 3 | 72 8 |
| August | 15 38 | 12 32 | 27 7 | 40 55 | 33 43 | 73 9 |
| September | 21 51 | 20 49 | 41 7 | 43 58 | 35 42 | 78 9 |
| October | 25 68 | 25 63 | 50 7 | 48 59 | 31 41 | 79 8 |
| November | 33 59 | 23 41 | 56 10 | 43 54 | 37 46 | 80 8 |
| December | 30 61 | 33 45 | 63 6 | 57 55 | 45 45 | 102 10 |
| Total | 308 55 | 248 45 | 556 | 545 56 | 428 44 | 973 |

$\chi 2$ value Evaluated $\chi 2$ value = 10.22 (significant).

Police and soldiers were found to be significantly more infected in cases of male positive scabies. With rats of 32.8, 57.8 percent respectively for each year of 2017 and 2018. Worker followed with rates of 38.5, 23.7 percent respectively for the two years, as seen in table 4.

As for residential areas, the highest two positive cases of scabies were recorded in Yahyawa emigrants camp and Wastiregions, each with a rate of 34, 18 percent compared to the other regions, as shown in table 5.

Large numbers (50.01 percent) of people with scabies have the infection in their whole body sites, as seen in table 6. Followed by the abdomen, with a rate of 19.9% compared to other sites of the body.

The presence of animals in or near housing areas influences the incidence of scabies, aproportion of 70percent of infected persons had lived in areas where there are stray or pet animals, different from 30percent of the infected in the areas where there were no animals, and this is demonstrated in table 7.

Other skin disease findings in both 2017 and 2018 years revealed that, for both years, the allergy is slightly more common than other skin infections at 51 percent and 65 percent. As shown in table 8, Fig. 3, the lowest percentage was for fungal infections.

Scabies and its relationship to secondary bacterial infections indicated that *Staphylococcus* sp. is present in 40 percent of positive scabies cases. As demonstrated in table 9 Fig. 4.

## Discussion

The epidemiological studies on skin diseases are limited by many factors. The most significant factors are genetic background, season, climate, socioeconomic status, geographic area, living conditions and medical resources (Chen *et al*., 2008; Sardana *et al*., 2009). The current study indicated a high-level of scabies indecision in patients attending the dermatology clinic. The overall

prevalence in 2018 was raised to 63.6 percent, after being 36.4 percent in 2017. This may have come to the city because ofthe high number of emigrants, which creates a semi-outbreak situation. In the two years studied, nearly equal rates were recorded at both male and female. Evidence from gender showed an equal distribution between males and females in most regions of the world. In the current report, the number of infected males in Kirkuk city population was 55 percent in 2017 and 56 percent in 2018. And the shape of the female (45, 44 percent) in both years was different. This result was similar to that of other studies such as: in 2018, patients attended Salahaldeen hospital in Tikrit-Iraq, Scabies was more male indecision (63.1%) than female (36.9%) (Nisreen, 2018). Additional study conducted in Diyala by (Al-Zobydy, 2018) who found 62.2 percent of men infected with scabies, during the period from March 2017 to February 2018 in Iraq, Al-Najaf Governorate, of 1103 samples of positive scabies, 602 patients (54.1 percent) were males and 501 patients (45.9 percent) were females (Ali *et al*., 2018). Although (Sharquie *et al*., 2012) found 58 (59.8 percent) males and 39 (40.2 percent) females in his study in Baghdad, Iraq, out of a total of 97 patients infected with scabies. Scabies infection does not appear to be affected by genders but the high percentages of males recorded in some studies may be due to the fact that many of them were soldiers, prisoners or students living in dormitories. In this analysis, in 2017, indecision was higher (22 percent) in the category of younger adults than in older ages and in 2018 among Kirkuk studied population was higher (32 percent) in the category of children than in other categories. The results were agreed with a study conducted in India which found that the categories of children were the most affected age group because they were sitting closely in their school seats (Steer *et al*., 2009), also agreed with a study conducted in Diyala in 2017 which found that scabies were more prevalent in the adult category than in other age groups (Alzobydy, 2018).

In the current study among 853 male positive participants, 416 (48.8 percent) of them were soldiers, This agreed with Tikrit research where they observed that scabies were found more among soldiers (36.9 percent) (Nisreen, 2018) and it was also observed in an Iranian research that scabies were more prevalent among soldiers (Mohammad *et al*., 2012). Interpersonal close contact or sharing the same bedding of blanket clothplays a critical role in transmitting the mites from one to another. The current study found that the scabies

**Table 4:** Prevalence of scabies according to patientsoccupation.

| Years | Total +ve No. | Male + ve samples | Student % | Police and soldier % | Worker % | Others % |
|---|---|---|---|---|---|---|
| 2017 | 556 | 308 | 69 12.4 | 101 32.8 | 97 38.5 | 289 51.9 |
| 2018 | 973 | 545 | 88 9.1 | 315 57.8 | 129 23.7 | 441 45.3 |
| Total | 1529 | 853 | 157 10.3 | 416 48.8 | 226 26.5 | 730 47.7 |

$\chi 2$ value Evaluated $\chi 2$ value = 37.73 (significant)

**Table 5:** Prevalence of scabies according to the residential area.

| Total +ve No. | residential area | | | | | | |
|---|---|---|---|---|---|---|---|
| | Haial-naser | Wa-sti | Yahyawa camp | 1 huz-airan | Tariq Baghdad | Es-kan | Oth-ers |
| 5071 | 811 | 914 | 1725 | 521 | 306 | 407 | 387 |
| Percentage | 16 | 18 | 34 | 10 | 6 | 8 | 7.1 |

**Table 6:** Prevalence of scabies according to the places of infection in the body.

| Site of infection in the body | Number of patient | Percentage |
|---|---|---|
| Infection of Hands | 507 | 10 |
| Infection of legs | 609 | 12 |
| Infection of chest | 405 | 7.9 |
| Infection of abdomen | 1014 | 19.9 |
| Infection of the whole body | 2536 | 50.01 |
| Total | 5071 | 100 |

**Table 7:** Prevalence of scabiesaccording topresence or absence of pet animals in houses.

| Total examined No. | pets present | petsabsents |
|---|---|---|
| 5071 | 3549 | 1522 |
| Percentage | 70 | 30 |

**Table 8:** Prevalence of other skin infection in 2017, 2018.

| Type of skin infection | Year 2017 | | | Year 2018 | | |
|---|---|---|---|---|---|---|
| | Female % | Male % | Total % | Female % | Male % | Total % |
| Urticaria | 210 63 | 122 37 | 332 23 | 257 67 | 129 33 | 386 18 |
| Fungus | 38 39 | 59 61 | 97 7 | 41 40 | 62 60 | 103 5 |
| Allergy | 584 78 | 565 76 | 745 51 | 719 53 | 644 47 | 1363 65 |
| *leishmania* | 112 41 | 161 59 | 273 19 | 102 42 | 141 58 | 243 12 |
| Total | 994 69 | 907 63 | 1447 | 1118 53 | 976 47 | 2095 |
| $\chi 2$ value | Evaluated $\chi 2$ value = 113.1 (significant) | | | Evaluated $\chi 2$ value = 49.19 (significant) | | |

**Table 9:** The relation between scabiesand secondary bacterial infection.

| Total cultured samples | +ve bacteria linfection | -ve bacterial infection |
|---|---|---|
| 30 | 12 | 18 |
| Percentage | 40% | 60% |

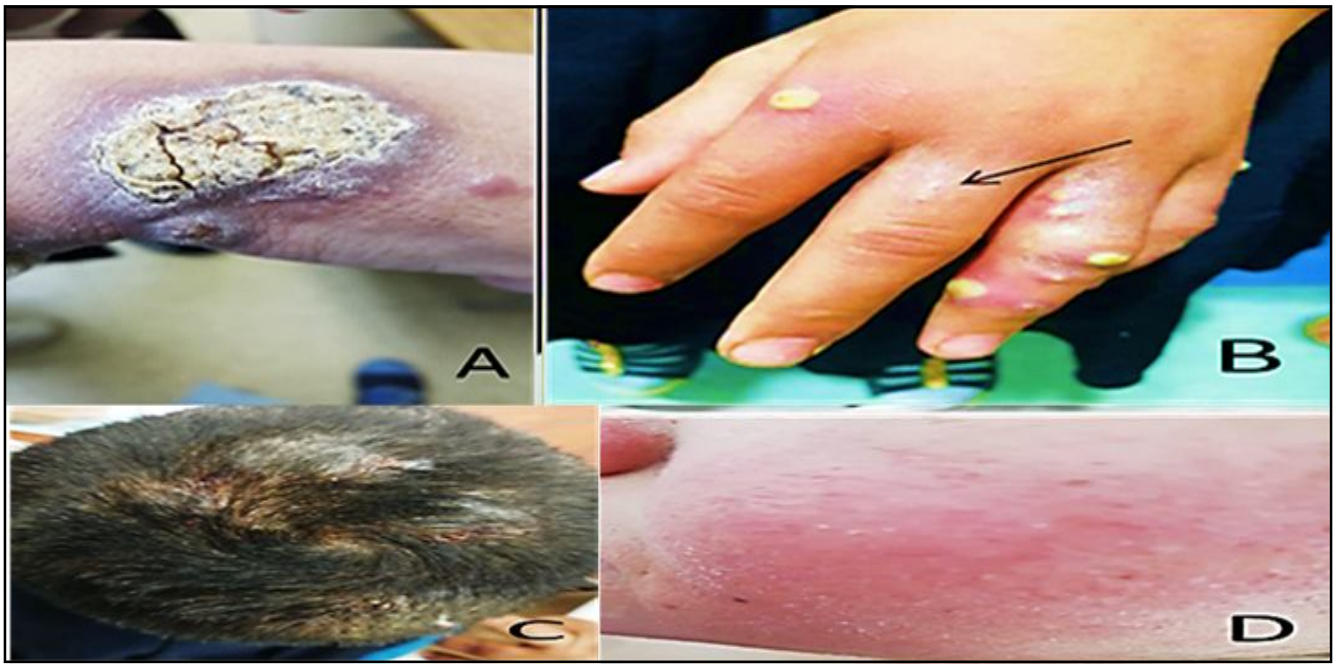


**Fig. 3:** *Other skin infection,* A *(cutaneous leishmaniasis*), B (cutaneous leishmaniasis and scabies), C (fungus infection in a young patient), D (eczema in young patient), the arrow refer to scabies tunnel.

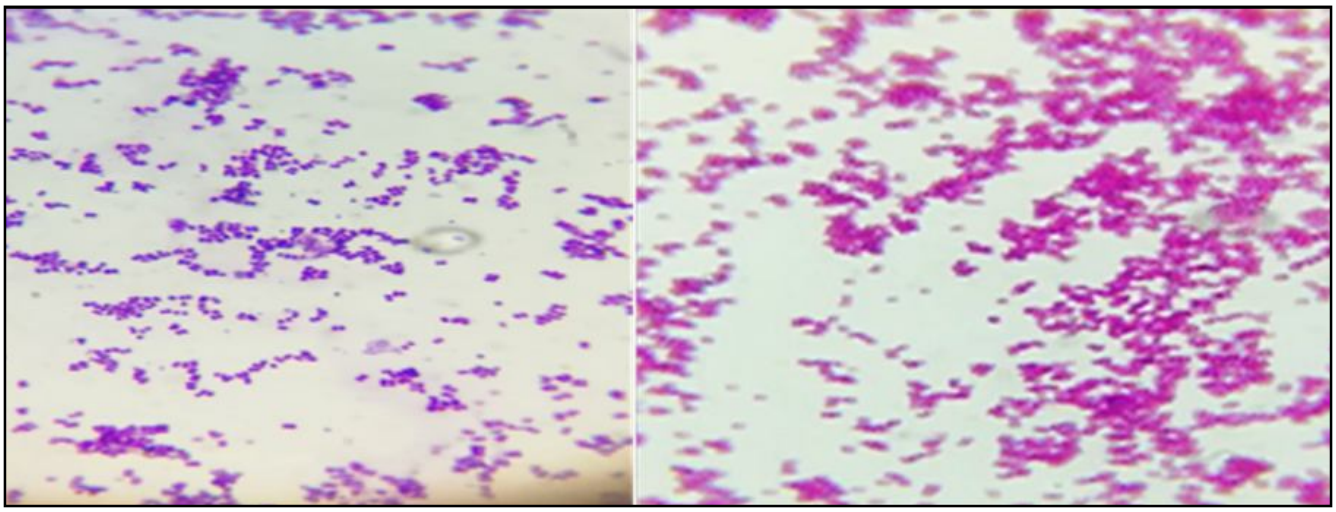

**Fig. 4:** *Gram positive bacteria typeStaphylococcus in skin smear from Sarcoptesscabiei patients.*

can be present in all months of the years but concentrated more in cold months, this finding disagreed with other studies such as in Tikri-Iraq the findings revealed that more than half (52.6 percent) of cases were in summer (Nisreen, 2018). The scabies were prevalent in various regions of Kirkuk City in our study but the infection rate was highest (36 percent) in Yahyawa Camp. Strong percentage of Kirkuk hospitals attendance in 2017-2018 were low socioeconomic emigrants, due to unemployment, insecurity and the crowding of inhabitants, in particular camps, In addition to these factors, disadvantaged societies had poor personal hygiene, shared clothing, pillows and bedding. Studies in Egypt (Hegab *et al*., 2015) and Brazil (Feldmeier *et al*., 2009), Sierra, Leone, Mali, Thailand and India (Uade *et al*., 2018) also find the scabies in low economic and social levels of families.

In the present report, 70% of infected people had animals in their residents versus 30% who did not have animals in their homes. Infection of scabies increases due to the presence or touch of infected domestic and wild animals, including dogs (*S. scabieivarcanis*), swine, horses and camels. This research also observed other skin diseases, such as leishmaniasis, fungus, urticaria and allergy. The allergy was most common than other skin infections, 51 percent in 2017 and 65 percent in 2018 followed by urticaria and *Leishmania*. Allergy happens when a person is responding to chemicals that are harmless to most people in the environment. These substances are known as allergens, people can have

allergies to various materials found in foods, dust mites, ticks, pollen, animals, mounds, insects and certain medicines. In 2017, leishmaniasis was higher (19 percent) than in 2018 (12 percent). In both tropical and subtropical areas of the world, cutaneous leishmaniasisis endemic. The spread of this disease is closely related to geography. In Iraq, during the attack by the Islamic State of Iraq and the Levant in 2013-2016 there seems to be an rise in the cutaneous leishmaniasis disease due to migrants. The prevalence in Kirkuk City in 2015 was 64.6 percent (Obaid and Shareef, 2018). In both current years studied, cases of skin fungal infection had low incidence compared to the other reported skin diseases, it was 7% in 2017 and 5% in 2018. In India, nearly the same rate (4.65 percent) was reported (Sardana *et al*., 2009). Equally low rates in Kuwait were 3.28 percent (Nanda *et al*., 2009), in Turkey 3 percent (Tamer *et al*., 2008), in Switzerland 2.07 percent (WenkandItin, 2007). In reverse, however, higher fungal infection incidence (20.6, 15.8 percent) was reported in other areas (Ogunbiyi *et al*., 2005; Yasmeen and Khan, 2005). The reason for these differences between different reports may be due to variations in species detected, techniques and tests used for identification, sample size, climate and environmental factors in each area.

The current research indicates that scabies are associated with secondary bacterial infection, with secondary bacterial infections in 40 percent of infected patients. *Staphylococcuaureus* and *Streptococcus* were the most prevalent bacterium whilst others appear negative. (Lee and Tay, 2012) listed *S. aureus* in Singapore as the most common organism causing secondary skin lesion infection and accounted for 67%, 43.5% and 45% of all positive cultures. Similar findings showed that aerobic and anaerobic bacteria were produced from specimens collected from 30 children with scabies lesions (Brook, 2002). Likewise, (Ochsendorf *et al*., 2000) had isolated bacteria fromscabies lesions in Germany, (Brook, 2002) in USA. Bacterial culture of secondary contaminated skin disease specimens should be performed to confirm bacterial etiology and administer proper care, restrict the abuse of antimicrobials to prevent resistant bacterial strains from forming. The recommendation is that the overcrowding and level of education and family income should be improved to overcome such diseases especially in schools. Parental education is critical particularly for mothers. For their children, educated mothers can appreciate and use health promotion and disease prevention services. Daily visits to rural areas and camps by medical personnel would provide care, adequatediagnosis and health awareness about the most common skin diseases that could affect these conditions.

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