

Overview of Epidemiology and Treatment Impetigo & Scabies

¹FATEN SAUD M ALJEHANI, ²MOHAMMED AYED M ALSHAMMARI,
³MOHAMMED AHMED M ALABYAD, ⁴ARWA TALAL D ALGAIDI,
⁵FAWAZ TARIQ H ALSAMDANI, ⁶ABDULLAH AHMED A ALGHAMDI

Abstract: We aimed by this review study to discuss and overview the prevalence of Impetigo and scabies worldwide, and dermatological consequences beyond that, as well as to review the treatment options for these dermatological diseases. We searched Medical databases; MEDLINE, PubMed, and Emabse, for studies that reported on the epidemiology of scabies and impetigo, and also those studies discussing the treatment approaches of same diseases, Mesh terms as following; “scabies”, “Sarcoptes scabiei”, “impetigo”, or “dermatological disease”, combined with “incidence”, “prevalence”, “epidemiology”, “diagnosis”, or “Treatment”. Restriction was applied to only English language studies with human subjects published up to January 2017. Island nations of the Pacific were the most afflicted populations, with scabies and impetigo especially common in children. Other locations where scabies frequency was particularly high consisted of Panama, parts of Brazil, and Indigenous neighborhoods of northern Australia. Scabies and impetigo were especially common in tropical developing countries. There are safe and efficacious treatments readily available for these typical skin infections, yet in lots of locations where disease burden is highest, bit has altered with regards to control. Ongoing research checking out risk factors and aetiology, improved approaches for medical diagnosis and approaches to both private and neighborhood based treatment is needed.

Keywords: Impetigo, scabies, Sarcoptes scabiei, dermatological disease, incidence, Treatment.

1. INTRODUCTION

Scabies is a skin disease caused by invasion with a small mite (*Sarcoptes scabiei*) that burrows under the skin and is transmitted through close individual contact ⁽¹⁾. The direct effect of scabies is debilitating itching, resulting in scratching, which remains in turn followed by complications due to bacterial infection of the skin, varying from impetigo, abscesses and cellulitis, through to septicaemia and even death ^(1,2). Bacterial infections secondary to scabies can likewise result in more severe sequelae connected with group A streptococcal infection such as rheumatic fever and glomerulonephritis ^(2,3,4). Scabies and its complications are considered endemic in a lot of Pacific Island nations and in many other tropical nations including in Africa mostly on the basis of anecdotal reporting. Occurrence studies of scabies have actually been conducted in localized areas of a minimal variety of nations ^(5,6,7). These research studies have actually typically validated high levels of scabies in these locations however none have actually been national that we know, and have actually not been sufficiently broad-based to provide the basis for developing and informing nationwide disease control strategies. The direct impact of scabies is incapacitating itching, leading to scratching, which can result in complications due to bacterial infection of the skin (impetigo), predominantly by *Staphylococcus aureus* and *Streptococcus pyogenes* ⁽⁸⁾. These issues vary from regional skin and soft tissue infections, consisting of skin abscesses, cellulitis, and necrotizing fasciitis, through to septicaemia, renal disease, and potentially rheumatic heart problem ⁽⁹⁾. A more serious kind of scabies called crusted or Norwegian scabies can happen in individuals who are immune-suppressed, including those with diabetes or HIV infection, and people who are mal nourished, elderly individuals, or those residing in organizations. Scabies has several efficient treatment alternatives, ⁽⁹⁾ but population control is challenging because of the high levels of re-infestation that can happen through community and household contacts. The Global Burden of Disease Study 2010, estimated the worldwide occurrence of scabies to be 100 million. Countries of the Pacific area have actually been acknowledged as having an especially high concern of scabies and its complications ^(7,8,10). Scabies was just recently contributed to the

World Health Organization's list of Neglected Tropical Diseases, but has actually generally not been recognised as a public health priority in a lot of developing countries, perhaps because of the lack of large scale studies to totally define its level and risk factors⁽³⁾.

We aimed by this review study to discuss and overview the prevalence of Impetigo and scabies worldwide, and dermatological consequences beyond that, as well as to review the treatment options for these dermatological diseases.

2. METHODS

We searched Medical databases; MEDLINE, PubMed, and Embase, for studies that reported on the epidemiology of scabies and impetigo, and also those studies discussing the treatment approaches of same diseases, Mesh terms as following; “scabies”, “Sarcoptes scabiei”, “impetigo”, or “dermatological disease”, combined with “incidence”, “prevalence”, “epidemiology”, “diagnosis”, or “Treatment”. Restriction was applied to only English language studies with human subjects published up to January 2017. Then we finally did a search of the references list of each selected study for more eligible citation.

3. RESULTS

➤ Prevalence of scabies and impetigo worldwide:

Almost half of the picked research studies^(11,12,13,14,15,16,17,18) were limited to children. However, just nine studies reported on occurrence by age, with five of the pediatric research studies even more reporting information by age. The occurrence of scabies was higher in children than in grownups in all 8 studies that reported on frequency across several age groups (**Figure 1**)⁽¹¹⁻¹⁸⁾. The greatest frequency of scabies reported in the basic population was in Papua New Guinea (40 [71%] of 56) followed by Panama (245 [32%] of 756) and Fiji (242 [32%] of 760)^(13,14). The greatest scabies prevalence explained in children was recorded in Panama, with scabies spotted in 78% of children younger than 2 years and in 60% of those aged between 2 years and 6 years (participant numbers not reported)⁽¹³⁾. In Fiji, prevalence of 44% (1053 of 2408) was reported in children aged 5-- 9 years (15) and scabies was present in 32% and 35% of children in two Australian Indigenous communities (numbers not reported)^(19,20). The frequency of impetigo was tape-recorded in 26 research studies and was likewise generally high, particularly in 2 Aboriginal neighborhoods in northern Australia (49%)⁽¹⁹⁾ and in the Solomon Islands (4370 [43%] of 10 224)⁽¹⁶⁾. Like scabies, the frequency of impetigo was usually greater in children than in grownups, with 69% of children younger than 16 years in the Australian research study impacted⁽¹⁹⁾. High prevalence of impetigo in children was likewise frontend in Pacific nations, specifically the Solomon Islands (2678 [52%] of 5160), Fiji (1259 [36%] of 3462), and Vanuatu (16%; numbers not reported)^(16,17,19). The occurrence of impetigo did not seem to highly associate with the occurrence of scabies across research studies, both in the general population and in children, although we did not officially assess this relation.

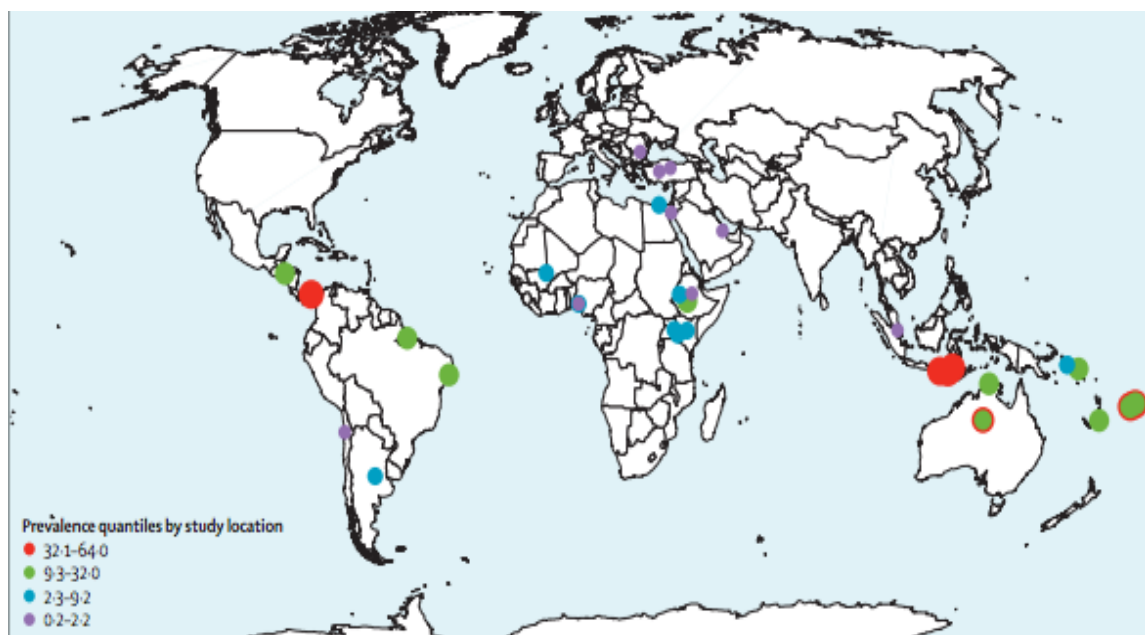


Figure1: Map of scabies prevalence in children

○ **Diagnosis, Clinical features, and complications of Impetigo:**

Impetigo can present as bullous lesions or non-bullous, papular lesions that go on to form a crust. Bullous impetigo is triggered by *S. aureus* whilst non-bullous sores are connected with both *S. pyogenes* and *S. aureus* as explained above. Ecthyma is a deep kind of impetigo where ulceration extends into the dermis. In the industrialized world impetigo is a typical factor for presentations to primary healthcare service providers but it is generally a self-limiting condition in this setting⁽²¹⁾. In resource-limited settings severe disease and complications of impetigo remain troublesome⁽²²⁾. Invasive infections such as erysipelas (including the dermis and lymphatics), cellulitis (including subcutaneous tissue), osteomyelitis, septic arthritis and bacteraemia can all complicate impetigo. *S. pyogenes* bacteraemia and streptococcal poisonous shock syndrome are frequently preceded by skin and soft tissue infection^(23,24). *S. aureus* bacteraemia brings a high mortality and skin infection is an essential risk factor in settings where impetigo is common⁽²⁵⁾. Where *S. pyogenes* is the primary pathogen, impetigo can likewise cause considerable immune-mediated complications. In endemic settings most cases of acute poststreptococcal glomerulonephritis (APSGN) are preceded by impetigo^(26,27). People with a history of APSGN in childhood are at increased risk of developing continuous albuminuria and chronic kidney disease in later life^(28,29). There is also a possible link between *S. pyogenes* skin infection and acute rheumatic fever⁽³⁰⁾. This hypothesis is supported by the existence of very high rates of rheumatic fever and rheumatic heart problem in Aboriginal populations in Australia wherein impetigo is pervasive and *S. pyogenes* throat infection is unusual⁽³¹⁾. The diagnosis of impetigo is normally made scientifically. The use of clinical algorithms might assist in the recognition and treatment of impetigo in resource-limited settings. For example, the WHO Integrated Management of Childhood Illness (IMCI) skin algorithm has been evaluated in Fiji and showed improvement in the medical recognition of impetigo. Elsewhere, flipcharts using high quality pictures and medical descriptions are utilized to train health care employees in identifying impetigo^(32,33). Gram stain and culture of skin swabs to verify the aetiological representative are often suggested⁽³³⁾ but sufficient laboratory resources are not constantly readily available in resource-limited settings and treatment of typical cases without microbiology is empiric^(33,34).

➤ **Treatment approaches of impetigo:**

When deciding impetigo treatment option, there are numerous crucial factors including the level of disease, community wide occurrence, most likely adherence to treatment and known antimicrobial resistance. Most of the scientific trials for impetigo treatment associate with restricted or straightforward impetigo, specified as fewer than 5 sores. Where, impetigo is substantial (greater than 5 lesions) or community occurrence is high, refer to the treatment area on substantial impetigo. Uncomplicated or limited impetigo A Cochrane organized evaluation⁽³⁵⁾ concluded that topical prescription antibiotics are the most effective treatment for minimal impetigo. This evaluation included 68 randomised control trials representing 5578 participants,⁽³⁵⁾ finding that mupirocin, fusidic acid and retapamulin were all superior to placebo and there was no difference demonstrated in between the most commonly studied topical representatives: mupirocin and fusidic acid. In addition, there was no substantial distinction discovered in 7-day treatment rates between topical and oral antibiotics (leaving out erythromycin which is inferior to topical mupirocin) and topical antibiotic use was connected with fewer unfavorable occasions. The evaluation also mentioned an absence of encouraging evidence for making use of disinfectant services in the treatment of impetigo⁽³⁵⁾. When selecting a topical antibiotic, there are several factors to think about. Resistance to mupirocin and fusidic acid amongst *S. aureus* isolates is increasing in association with increased use of these representatives⁽³⁶⁾. Although retapamulin has actually shown great in vitro activity against methicillin resistant *S. aureus* (MRSA), its efficacy in scientific trials versus MRSA infections has actually varied^(37,38) and it is not approved for the treatment of MRSA infections. *S. aureus* isolates with elevated minimum inhibitory concentrations (MICs) to retapamulin have been described, although the clinical significance of this is unsure⁽³⁹⁾. There are calls to restrict the use of topical fusidic acid in order to protect the oral formulation as an useful agent, in combination with rifampicin, for difficult-to-treat MRSA infections⁽³⁶⁾. Topical fusidic acid is not offered for usage in the USA and this is shown in the Infectious Diseases Society of America (IDSA) guidelines for skin and soft tissue infection which recommend topical retapamulin or mupirocin for straightforward impetigo⁽³⁴⁾. The offered systemic treatment alternatives for impetigo have some restrictions. Benzathine penicillin G (BPG) has actually been widely utilized nevertheless it is improperly accepted in some settings due to its intramuscular (IM) path of administration and its effectiveness has been questioned with the emergence of *S. aureus* as a pathogen in impetigo. Empiric therapy with *S. aureus* cover is recommended for extensive impetigo however oxacillins and first generation cephalosporins do not have activity versus MRSA and may not be appropriate in settings where methicillin-resistance is common⁽³⁴⁾. Among oral representatives with activity against

MRSA, tetracyclines are contraindicated for use in children and liquid formulations of lincosamides are unpalatable for this age group. Co-trimoxazole (TMPeSMX) is an appealing choice in that it is cheap, licenced for usage in children and is readily available in a tasty liquid formulation. Although the conventional wisdom is that TMPeSMX does not have activity against *S. pyogenes* there are both in vitro and in vivo⁽⁴⁰⁾ data to challenge this understanding⁽⁴¹⁾.

➤ **Overview of diagnosis and complication of scabies:**

In the period of primary infection, the look of signs is postponed until 4 weeks following initial contact⁽⁴²⁾. Patients present with a papular or vesicular eruption which is extremely pruritic, typically even worse in the evening. The mites are frequently discovered in web areas of the fingers, on the wrists, in the axillae, around the umbilicus and in the popliteal or the groin fossa. Other member of the family might likewise have pruritus. The distribution of problem is different in infants with participation of the palms, soles and scalp⁽⁴³⁾. Scabies problem is associated with considerable problems associated with secondary infection with germs. Bacterial infection, especially with *S. pyogenes* and *S. aureus*, is a well-recognised problem of scabies infestation^(1,5). The presence of scabies is associated with issues of impetigo consisting of intrusive bacterial infection and post-streptococcal glomerulonephritis^(23,27). Crusted scabies is a severe form of scabies where the host immune system cannot manage the variety of termites⁽⁴⁴⁾. It is characterised by crusted, hyperkeratotic sores with mite numbers reaching millions in some patients. Cases classically happen in immunosuppressed patients and those in institutional care although, in particular communities, patients with no underlying risk factors are also affected⁽⁴⁴⁾. Contacts of patients with crusted scabies are at high risk of problem themselves and this might own community outbreaks⁽⁴⁵⁾ since of the high mite concern. Medical diagnosis of scabies is predominantly based on the medical findings of extreme pruritus and a typical circulation of papules. Skin scrapings sometimes reveal mites, ova or faeces, however microscopy is time consuming, of low-yield and might be unwise in resource-limited settings^(42,46). While dermatoscopy is a potentially useful diagnostic tool, the expense of equipment and the reliance on appropriate training are restrictions⁽⁴⁶⁾.

➤ **Treatment options of scabies:**

There are various topical treatments utilised in the treatment of scabies. In a Cochrane evaluation of randomised control trials comparing scabies treatments, permethrin was discovered to be the most reliable topical therapy (superior to lindane and crotamiton)⁽⁴³⁾. Benzyl benzoate is another reliable topical therapy that is chosen in some resource-limited settings due to the reasonably high cost of permethrin, however is less well endured⁽⁴²⁾. The application of topical scabies therapies can result in skin reactions and tolerability may be additional minimized in damp tropical environments⁽⁴³⁾. Ivermectin is an oral scabicide which was previously booked for cases of scabies refractory to topical therapy however is increasingly seen as a beneficial agent for both individual and neighborhood based treatment. As ivermectin is not ovicidal a 2nd dose is suggested 8e15 days following the initial dose to prevent recrudescence. The effectiveness of oral ivermectin is superior to placebo and topical lindane whilst trials comparing oral ivermectin to topical benzyl benzoate have actually shown combined outcomes⁽⁴³⁾. In the Cochrane review of scabies treatments, topical permethrin was found to be superior to oral ivermectin although the length of subsequent in consisted of trials varied from 1 to 2 weeks only⁽⁴³⁾. Ivermectin is a efficient and well-tolerated representative in the treatment of scabies there stay some limitations to its usage. Resistance is a prospective issue particularly in endemic neighborhoods⁽⁴⁷⁾. There are restricted information showing security and tolerability of ivermectin in infants and it is not yet accredited for the treatment of straightforward scabies in numerous regions. Neighborhood treatment and prevention⁽⁴⁸⁾. The treatment of the close contacts of patients with scabies is recommended in order to avoid re-infection and further transmission although there is an absence of information supporting this method. Topical permethrin is thought about first-line therapy, nevertheless bad compliance among contacts has actually been determined as a barrier to the efficacy of this method⁽⁴⁹⁾. Oral ivermectin is an alternative agent for the treatment of contacts which might show effective and more acceptable than topical therapies however this has yet to be assessed in comparative trials⁽⁴²⁾. There is a clear requirement for more research study in this area with a current Cochrane evaluation failing to identify any properly designed randomised trials assessing prophylactic steps to prevent the transmission of scabies⁽⁵⁰⁾.

4. CONCLUSION

Island nations of the Pacific were the most afflicted populations, with scabies and impetigo especially common in children. Other locations where scabies frequency was particularly high consisted of Panama, parts of Brazil, and Indigenous neighborhoods of northern Australia. Scabies and impetigo were especially common in tropical developing

countries. The high frequency in these nations might be due to low socioeconomic status, with resulting domestic crowding, but it might also be because scabies is inherently more matched to a tropical environment. Future studies must be undertaken to evaluate risk factors for scabies in more information. There are safe and efficacious treatments readily available for these typical skin infections, yet in lots of locations where disease burden is highest, but has altered with regards to control. Ongoing research checking out risk factors and aetiology, improved approaches for medical diagnosis and approaches to both private and neighborhood based treatment is needed. Probably, resolving the environmental and socioeconomic factors which serve to perpetuate the high rates of skin disease in specific neighborhoods is of chief significance. Whilst in the industrialised world scabies and impetigo are typically thought about insignificant, ongoing efforts to deal with the major impact of these infections in the developing world remain exceptionally essential.

REFERENCES

- [1] Heukelbach J, Feldmeier H (2006) Scabies. *Lancet* 367: 1767–1774.
- [2] Negus RM (1971) Rheumatic fever in Western Fini: the female preponderance. *Med J Aust* 2: 251–254.
- [3] Engelman D, Kiang K, Chosidow O, McCarthy J, Fuller C, et al. (2013) Toward the global control of human scabies: introducing the International Alliance for the Control of Scabies. *PLoS Negl Trop Dis* 7: e2167.
- [4] Carapetis JR, Steer AC, Mulholland EK, Weber M (2005) The global burden of group A streptococcal diseases. *Lancet Infect Dis* 5: 685–694.
- [5] Harris M, Nako D, Hopkins T, Powell DM, Kenny C, et al. (1992) Skin infections in Tanna, Vanuatu in 1989. *Papua New Guinea Medical Journal* 35: 137–143.
- [6] Steer AC, Jenney AW, Kado J, Batzloff MR, La Vincente S, et al. (2009) High burden of impetigo and scabies in a tropical country. *PLoS Negl Trop Dis* 3: e467.
- [7] World Health Organization (2005) Epidemiology and management of common skin diseases in children in developing countries.
- [8] Steer AC, Jenney AW, Kado J, et al. High burden of impetigo and scabies in a tropical country. *PLoS Negl Trop Dis* 2009; 3: e467.
- [9] Engelman D, Kiang K, Chosidow O, et al. Toward the global control of human scabies: introducing the International Alliance for the Control of Scabies. *PLoS Negl Trop Dis* 2013; 7: 1–4.
- [10] Steer AC, Tikoduadua LV, Manalac EM, Colquhoun S, Carapetis JR, MacLennan C. Validation of an Integrated Management of Childhood Illness algorithm for managing common skin conditions in Fiji. *Bull World Health Organ* 2009; 87: 173–79.
- [11] Feldmeier H, Jackson A, Ariza L, et al. The epidemiology of scabies in an impoverished community in rural Brazil: presence and severity of disease are associated with poor living conditions and illiteracy. *J Am Acad Dermatol* 2009; 60: 436–43.
- [12] Jackson A, Heukelbach J, Filho AFdS, Junior EdB, Feldmeier H. Clinical features and associated morbidity of scabies in a rural community in Alagoas, Brazil. *Trop Med Int Health* 2007; 12: 493–502.
- [13] Taplin D, Porcelain SL, Meinking TL, et al. Community control of scabies: a model based on use of permethrin cream. *Lancet* 1991; 337: 1016–18.
- [14] Haar K, Romani R, Filimone R, et al. Scabies community prevalence and mass drug administration in two Fijian villages. *Int J Dermatol* 2014; 53: 739–45.
- [15] Romani L, Koroivueta J, Steer AC, Kama M, Kaldor J, Whitfield M. Scabies and impetigo prevalence and risk factors in Fiji: a national survey. *PLoS Negl Trop Dis* 2015; 9: e0003452.
- [16] Eason RJ, Tasman-Jones T. Resurgent yaws and other skin diseases in the Western Province of the Solomon Islands. *P N G Med J* 1985; 28: 247–50.
- [17] dos Santos MM, Amaral S, Harmen SP, Joseph HM, Fernandes JL, Counahan ML. The prevalence of common skin infections in four districts in Timor-Leste: a cross sectional survey. *BMC Infect Dis* 2010; 10: 61.

- [18] Harris M, Nako D, Hopkins T, et al. Skin infections in Tanna, Vanuatu in 1989. *P N G Med J* 1992; 35: 137–43.
- [19] Carapetis JR, Connors C, Yarmirr D, Krause V, Currie BJ. Success of a scabies control program in an Australian aboriginal community. *Pediatr Infect Dis J* 1997; 16: 494–99.
- [20] Wong LC, Amega B, Barker R, et al. Factors supporting sustainability of a community-based scabies control program. *Australas J Dermatol* 2002; 43: 274–77.
- [21] Koning S, Mohammedamin RS, van der Wouden JC, van Suijlekom-Smit LW, Schellevis FG, Thomas S. Impetigo: incidence and treatment in Dutch general practice in 1987 and 2001 e results from two national surveys. *Br J Dermatol* 2006; 154(2):239e43.
- [22] Bowen AC, Tong SY, Andrews RM, O’Meara IM, McDonald MI, Chatfield MD, et al. Short-course oral cotrimoxazole versus intramuscular benzathine benzylpenicillin for impetigo in a highly endemic region: an open-label, randomised, controlled, non-inferiority trial. *Lancet* 2014;384(9960):2132e40.
- [23] Gear RJ, Carter JC, Carapetis JR, Baird R, Davis JS. Changes in the clinical and epidemiological features of group A streptococcal bacteraemia in Australia’s Northern Territory. *Trop Med Int Health TM IH* 2015;20(1):40e7.
- [24] Boyd R, Patel M, Currie BJ, Holt DC, Harris T, Krause V. High burden of invasive group A streptococcal disease in the Northern Territory of Australia. *Epidemiol Infect* 2016;144(5): 1018e27.
- [25] Skull SA, Krause V, Coombs G, Pearman JW, Roberts LA. Investigation of a cluster of *Staphylococcus aureus* invasive infection in the top end of the Northern Territory. *Aust N Z J Med* 1999;29(1):66e72.
- [26] Currie BJ, Carapetis JR. Skin infections and infestations in Aboriginal communities in northern Australia. *Australas J Dermatol* 2000;41(3):139e43. quiz 44e5.
- [27] Marshall CS, Cheng AC, Markey PG, Towers RJ, Richardson LJ, Fagan PK, et al. Acute post-streptococcal glomerulonephritis in the Northern Territory of Australia: a review of 16 years data and comparison with the literature. *Am J Trop Med Hyg* 2011;85(4):703e10.
- [28] Hoy WE, White AV, Tipiloura B, Singh G, Sharma SK, Bloomfield H, et al. The multideterminant model of renal disease in a remote Australian Aboriginal population in the context of early life risk factors: lower birth weight, childhood post-streptococcal glomerulonephritis, and current body mass index influence levels of albumi. *Clin Nephrol* 2015;83(7 Suppl. 1):75e81.
- [29] Hoy WE, White AV, Dowling A, Sharma SK, Bloomfield H, Tipiloura BT, et al. Post-streptococcal glomerulonephritis is a strong risk factor for chronic kidney disease in later life. *Kidney Int* 2012;81(10):1026e32.
- [30] McDonald M, Currie BJ, Carapetis JR. Acute rheumatic fever: a chink in the chain that links the heart to the throat? *Lancet Infect Dis* 2004;4(4):240e5.
- [31] McDonald MI, Towers RJ, Andrews RM, Bengner N, Currie BJ, Carapetis JR. Low rates of streptococcal pharyngitis and high rates of pyoderma in Australian aboriginal communities where acute rheumatic fever is hyperendemic. *Clin Infect Dis e Off Publ Infect Dis Soc Am* 2006;43(6):683e9.
- [32] Steer AC, Tikoduadua LV, Manalac EM, Colquhoun S, Carapetis JR, Maclennan C. Validation of an Integrated Management of Childhood Illness algorithm for managing common skin conditions in Fiji. *Bull World Health Organ* 2009;87(3): 173e9.
- [33] Project. East Arnhem regional healthy skin project e recognising and treating skin conditions. 2009.
- [34] Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJ, Gorbach SL, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. *Clin Infect Dis e Off Publ Infect Dis Soc Am* 2014;59(2): e10e52.
- [35] Koning S, van der Sande R, Verhagen AP, van SuijlekomSmit LW, Morris AD, Butler CC, et al. Interventions for impetigo. *Cochrane Database Syst Rev* 2012;1:CD003261.
- [36] Howden BP, Grayson ML. Dumb and dumber e the potential waste of a useful antistaphylococcal agent: emerging fusidic acid resistance in *Staphylococcus aureus*. *Clin Infect Dis e Off Publ Infect Dis Soc Am* 2006;42(3):394e400.

- [37] Tanus T, Scangarella-Oman NE, Dalessandro M, Li G, Breton JJ, Tomayko JF. A randomized, double-blind, comparative study to assess the safety and efficacy of topical retapamulin ointment 1% versus oral linezolid in the treatment of secondarily infected traumatic lesions and impetigo due to methicillin-resistant *Staphylococcus aureus*. *Adv Skin Wound Care* 2014;27(12):548e59.
- [38] Yang LP, Keam SJ. Retapamulin: a review of its use in the management of impetigo and other uncomplicated superficial skin infections. *Drugs* 2008;68(6):855e73.
- [39] McNeil JC, Hulten KG, Kaplan SL, Mason EO. Decreased susceptibilities to Retapamulin, Mupirocin, and Chlorhexidine among *Staphylococcus aureus* isolates causing skin and soft tissue infections in otherwise healthy children. *Antimicrob Agents Chemother* 2014;58(5):2878e83.
- [40] Miller LG, Daum RS, Creech CB, Young D, Downing MD, Eells SJ, et al. Clindamycin versus trimethoprim-sulfamethoxazole for uncomplicated skin infections. *N Engl J Med* 2015;372(12):1093e103.
- [41] Bowen AC, Lilliebridge RA, Tong SY, Baird RW, Ward P, McDonald MI, et al. Is *Streptococcus pyogenes* resistant or susceptible to trimethoprim-sulfamethoxazole? *J Clin Microbiol* 2012;50(12):4067e72.
- [42] Hay RJ, Steer AC, Engelman D, Walton S. Scabies in the developing world: its prevalence, complications, and management. *Clin Microbiol Infect* 2012;18(4):313e23.
- [43] Strong M, Johnstone P. Interventions for treating scabies. *Cochrane Database Syst Rev* 2007;(3):CD000320.
- [44] Roberts LJ, Huffam SE, Walton SF, Currie BJ. Crusted scabies: clinical and immunological findings in seventy-eight patients and a review of the literature. *J Infect* 2005;50(5):375e81.
- [45] Lokuge B, Kopczynski A, Woltmann A, Alvoen F, Connors C, Guyula T, et al. Crusted scabies in remote Australia, a new way forward: lessons and outcomes from the East Arnhem Scabies Control Program. *Med J Aust* 2014;200(11):644e8.
- [46] Walton SF, Currie BJ. Problems in diagnosing scabies, a global disease in human and animal populations. *Clin Microbiol Rev* 2007;20(2):268e79.
- [47] Mounsey KE, Holt DC, McCarthy JS, Currie BJ, Walton SF. Longitudinal evidence of increasing in vitro tolerance of scabies mites to ivermectin in scabies-endemic communities. *Arch Dermatol* 2009;145(7):840e1.
- [48] Becourt C, Marguet C, Balguerie X, Joly P. Treatment of scabies with oral ivermectin in 15 infants: a retrospective study on tolerance and efficacy. *Br J Dermatol* 2013;169(4):931e3.
- [49] La Vincente S, Kearns T, Connors C, Cameron S, Carapetis J, Andrews R. Community management of endemic scabies in remote aboriginal communities of northern Australia: low treatment uptake and high ongoing acquisition. *PLoS Negl Trop Dis* 2009;3(5):e444.
- [50] FitzGerald D, Grainger RJ, Reid A. Interventions for preventing the spread of infestation in close contacts of people with scabies. *Cochrane Database Syst Rev* 2014;2:CD009943.