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# Review of Scabies: Current Update of Patogenesis, Transmission, and Elimination

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**Abstract**
**Purpose:** Scabies is a very common dermatological condition that accounts for a large proportion of skin diseases in developing countries. The disease spreads globally, with an estimated population of 200 million and a prevalence ranging from 0.2% to 71%. According to the Indonesian Ministry of Health, the prevalence of scabies in Indonesia has decreased from 5.60% to 12.96% in 2008 to 4.9% to 12.95% in 2009. This review will provide an overview of the pathogenesis, transmission, and elimination of scabies so that scabies cases in Indonesia can be controlled properly.
**Research Methodology:** This article reviews 21 recent studies and discusses them comprehensively.
**Results:** Scabies often does not receive attention because it is not life-threatening; however, the result is itching, which can cause discomfort in sufferers. The spread of scabies has been widespread. Discussion on the pathogenesis, transmission, and elimination of scabies from various regions in Indonesia is still not comprehensive.
**Limitations:** Approximately 90% of scabies transmission is carried out by adult female mites, especially gravid ones. Mites cannot jump or fly, but move by creeping. The ability of mites to infest decreases with time, and mites are outside the host body.
**Contribution:** First, increasing awareness of scabies and advocacy of potential funding parties' eradication programmes. Second, clinical and epidemiological research should be conducted to better understand the effects of the disease. Third, we developed and implemented a strategy for effective scabies control.
**Keywords:** *Scabies, etiologi, pathogenesis, transmission, elimination.*
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## 1. Introduction

In communities that have a high risk of scabies the prevalence can reach 80% (Saleha Sungkar & ParK, 2016). At the institutional level, a significant amount of funds is spent to cope with outbreaks of scabies. Engelman et al. (2013) In Indonesia, there is no integrated and structured guide for generally accepted community-scale management of scabies. (Kemenkes, 2015) Scabies was officially included in the list of neglected tropical diseases (NTD) in 2018 by the World Health Organization (WHO) because it fulfills four WHO criteria for NTD classification, namely (A) it disproportionately affects poor and marginalized populations; (B) affecting but not limited to people living in tropical and subtropical areas, especially areas that are far from where health services are located; (C) can be prevented and controlled by public health interventions; and (D) relatively neglected by scientific research and public/private funding, compared to the magnitude of the health problem that occurs. Discussion on the patogenesis, transmission and elimination of scabies from various regions in Indonesia so far is still not comprehensive. This review will provide an overview related to patogenesis, transmission and elimination against scabies so that scabies cases in Indonesia can be controlled properly.

## 2. Literature Review

Scabies is a skin disease caused by an infestation *Sarcoptes scabiei* varieties of hominis. The parasite belongs to the arachnid class, acarina subclass, order astigmata, and sarcoptidae family. Besides varieties hominis, *S.scabiei* has varieties of animals but those varieties only causes temporary, non-contagious and non-infectious dermatitis continue its life cycle in humans (Saleha Sungkar & ParK, 2016). *S.scabiei* is host specific and these properties occur because of differences mite physiology and host variables such as odor, diet, physical factors and immune response. Arlian et al conducted an in vivo study using *S.scabiei* varieties of suis, canis and hominis. In that study *S.scabiei var canis* were successfully transferred from dogs to rabbits cannot be transferred to pigs, rodents, mice and guinea pigs. Arlian also failed to transfer *S.scabiei var suis* and *hominis* to dogs and rabbits which are the two most sensitive hosts to *S.scabiei var canis* (Valldeperes et al., 2021).

## 3. Methodology

This section is about pathogenesis. *S.scabiei* lives in the stratum corneum of the human epidermis and other mammals. All life stages of mites, namely larvae, protonimfa, tritonimfa and adult mites are permanent parasites obligate requiring the host extracellular fluid seep into the tunnel to survive. *S.scabiei* has long lived with humans and other mammals as well as evolving and adapting to various mechanisms for avoid both innate and acquired host immune responses. The host exhibits a slow type immune response to scabies. In humans, clinical symptoms of new skin inflammation appear 4-8 weeks after being infested. This slow immune response is the impact of the ability of mites to modulate various aspects of the immune response and host inflammation (Morgan, Arlian, & Markey, 2013).

Epidermal cells such as keratinocytes and Langerhans cells are the first cells to confront the scabies mite and its products. The innate and acquired inflammatory response of the host skin plays a role as a first line defense against invasion, continuity life and reproduction of mites in the skin. Mites stimulate keratinocytes and dendritic cells via the molecules present in in eggs, feces, excreta, saliva, and other secretions such as enzymes and hormones, as well as the activity of organs such as chelicerae, pedipalps and feet during the tunnel excavation process. Body dead, rotting mites also stimulate an immune response (Morgan et al., 2013).

*S.scabiei* produces a lot of saliva when forming tunnel and is a source of molecules that can be modulate inflammation or host immune response. Mite products that penetrate the dermis stimulate cells such as fibroblasts, microvascular endothelial cells as well as immune cells such as Langerhans cells, macrophages, mast cells and lymphocytes. Suspected of Langerhans cells and cells other dendritics process the mite antigen and carry the antigen to the regional lymph nodes where the immune response is obtained initiated through activation of T lymphocytes and B lymphocytes (Morgan et al., 2013).

## 4. Result and Discussion

### *4.1 Transmission*

Scabies can be transmitted by transferring eggs, larvae, nymphs, or adult mites from the skin of the sufferer to the skin of others but from all these infective forms the most common are adult mites cause transmission. About 90% of scabies transmission is carried out by adult female mites especially the gravid ones. Mites cannot jump or fly but move by creeping. The mites' ability to infest will decrease with time length of time the mites are outside the host body. Scabies can be transmitted directly or indirectly however, the most common mode of transmission of scabies is through contact directly between individuals when mites are walking on the surface of the skin. Direct contact is skin to skin contact for a long time, for example at the time of sleeping together. For example, short-term direct contact shaking hands and brief hugs do not transmit mites. Scabies is more easily transmitted by direct person-to-person contact people who live in crowded, close-knit neighborhoods such as in a home elderly people, orphanages, pesantren and other institutions where residents are located stay for a long time. Mites move from people with scabies to a new host because of aroma stimuli and thermotaxis from the new host. For transmitting scabies, both stimuli must be adequate and sufficient duration which is about 15-20 minutes of direct skin-to-skin contact on when people sleep on the same mattress as a person with scabies orduring sexual intercourse (Golant & Levitt, 2012).

In adults, mode of transmission most often is through sexual contact, whereas in children transmission is obtained from parents or friends. Children have the opportunity more likely to transmit scabies due to high interpersonal contact especially with his brothers who live in that place the same and with his parents during normal physical contact as when cuddle or sleep together (Saleha Sungkar & ParK, 2016). The female mite makes tunnels in the stratum corneum and lay about 4-5 eggs daily for up to 6 weeks before die. Development of the life cycle of *S.scabiei* from egg-larva-nymph to adulthood takes two weeks. Orkin, Maibach, Parish, and Schwartzman (1977) made it demonstrated that direct skin-to-skin contact is the way the most frequent transmission of scabies. Mellanby et al conducted a study of 300 subjects for know the relationship between the number of mites and the risk of transmission. On research, subjects were asked to lie down without using clothes on the mattress were warm and had previously been used by <20 mites infested with scabies. The results show 4 subjects (1.3%) experienced scabies infestation after sleeping in bed the. The number of infected patients increased to 15% when contact with a scabies sufferer who has> 50 mites (3 out of 20 infested subject). Based on this research concluded the number scabies mites are directly related proportionally to risk of transmission (Orkin et al., 1977).

Scabies transmission can indirectly occur through prolonged contact with sheets, pillowcases and bolsters, clothes, blankets, towels and other household furniture who are infested with *S.scabiei*. Indirect transmission of mites depending on the length of time the mites can survive outside the host body which varies depending on temperature and humidity. On infested items, *S.scabiei* can last 2-3 days on room temperature with a humidity of 30%. The higher the humidity, the longer the mites last. On dry surfaces, clothes, or sheets, mites can only be survive for several hours. At ideal temperature and humidity (21$^{o}$C and 40-80% relative humidity), the life span of mites can increase up to 3-4 days. Life span of mites can longer at low temperature and high humidity. Below temperature 20 ° C most of the mites are immobile. In the tropics with ambient temperature 30 ° C and humidity 75%, female mites can survive live 55-67 hours outside the host body. The eggs of mites can survive at low temperature for up to 10 days outside the host body. Someone is said to be infectious from the time they are infested with mites treatment is complete. Sheets and clothes are said to be infectious successful management or up to two weeks from last exposure. Reinfestation can occur through direct contact with sufferers scabies or contact with objects infested with mites. Indirect transmission of scabies plays only a minor role in transmission of typical scabies but in crustous scabies indirect transmission plays an important role because of the number a lot of mites (Sinta, Sulistyani, Ratnasari, & Milyarona, 2023).

### *4.2 Elimination*

In 2018, the International Alliance for the Control of Scabies (IACS) proposes three steps to control scabies globaly. First, increasing awareness of scabies and conduct advocacy to potential funding parties scabies eradication program. Second, increase research clinical and epidemiological to understand the effects of disease more well. Third, develop and implement a strategy effective scabies control. Scabies is a disease that is often found in various parts of the world but is one of the most neglected diseases. It is said to have been neglected because scabies is generally endemic in the regions in developing countries with limited financial resources and prioritize other diseases that are mortality and morbidity is more pronounced. Estimates of global load because scabies is still inaccurate and research is needed with a standardized method to determine the global load, namely individual to regional impacts range from health burden to the economy (Saleha Sungkar & ParK, 2016).

WHO makes a special program to deal with disease neglected in the tropics or so-called programs neglected tropical disease. In 2018 the WHO listed scabies into the list of neglected tropical disease. In Indonesia, there is no integrated and structured guide for generally accepted community-scale management of scabies, although the cases of scabies that afflict closed communities, such as pesantren or certain endemic areas have often been encountered () (Trasia, 2022).

In adapting community scabies management guidelines, need to pay attention to the similarity of targets and facilities that can be support the course of therapy properly and effectively. One of an adaptable guide is scabies management in Australian Aboriginal community. In general the community management program that applies in Australia has succeeded in reducing the prevalence of using

scabies ivermectin and permethrin cream but sustainability of the program is difficult achieved because of the high mobility of residents in the community. In addition, not every endemic area has achieved success with the programs that have been implemented. For example, program skin health has been implemented in remote Aboriginal communities in the East Arnhem area, northern Australia since 2004.

In the program permethrin cream is distributed per year, screening routine scabies, therapy in the clinic and at home but after the program running for five years, the prevalence of scabies in children at the area is not down. Based on that experience, it is necessary studies to assess the effectiveness and efficiency of management programs community in eradicating scabies before it was enforced on other region. {Nurfaizah, 2021 #2344} evaluated a skin-based health program communities in two Aboriginal communities that are endemic to scabies Northern Australia. There are 40 households participating in this program and each household has at least one a child with scabies. The program implements permethrin therapy for all household members when at the time home visits found scabies sufferers. Apart from that described how to correct drug application and decontamination surrounding environment. The home visit was made the following day to assess therapy adherence and at week two and 4 post-therapy to assess the incidence of scabies in family members especially in those who are prone to scabies infestation. (CDC, 2014)

In that study, 32 out of 40 children had scabies (80%) were treated with permethrin cream. Therapy adherence by members households are very low at only 193 out of 440 (44%) members households who carry out therapy. Of these 193 people, only 76% had complete and recommended therapy. As many as 20% of 40 households did not receive treatment at all. Family members who had scabies from the start home visits willing to follow therapy but not sick not adhering to the treatment program. Study results also show that men and individuals who come from home with burdens high scabies refuse to undergo therapy. This may be because many people suffer from scabies, the disease has become parts of life and citizens generally have experienced frequent failures treatment. Of the 185 individuals susceptible to scabies, there were 17 cases new scabies in 4 weeks (9.2%). Opportunity to stay free scabies was nearly six times greater for individuals of origin from households where each member is running therapy (Djamaludin, Hartati, & Trismiyana, 2022).

Willingness to carry out therapy for household members that doesn't hurt low enough. The inhibiting factors are awareness to prioritize therapy is still low, no feel sick, or don't feel comfortable with using the drug. The effectiveness and sustainability of the scabies program is not yet optimal due to the low number of household members who undergo it therapy and the high rate of disease transmission is needed a more practical scabies endemic community management program and easy to do. (Sunderkotter, 2021)

### *4.3 Scabies Prevention and Control Program*

People living together in an institution are encouraged to participate in the scabies prevention program including examination skin, hair, and nails have since started living together in institutions. All abnormalities found must be documented and followed up. According to the Nevada State Health Division, 45 are six essential elements for a successful scabies prevention program. First, there are written rules and procedures for prevention and control of scabies obtained from the institution of residence. Second, it needs staff who are trained to detect scabies to residents or yourself and to report to supervisors they. Third, there are regulations for early detection of scabies to new citizens when that person enters the institution and residents suspected of having scabies were isolated until it was carried out examination. Fourth, there are regulations that require it new employees, especially those working in more than one institution for was checked for scabies as part of the examination early pre-hiring. Fifth, there is access to a dermatologist to diagnose difficult and unusual cases or for them who has an unusual response to treatment. Sixth, there is support for evaluation and treatment for employees, residents and former residents in special circumstances such as the plague (Trasia, 2021).

The main purpose of an outbreak investigation is to identify risk factors that contribute to the onset outbreaks and take appropriate steps to prevent infection scabies even further. In general, an outbreak is defined as an increase in the incidence of scabies above the baseline in a certain time period and

geographic location (example: an inpatient unit, one floor, one department, or the entire hospital). There is no baseline standard cases of scabies for institutions so that the definition of the outbreak will be different in every health facility. Need to define definitions to determine whether an outbreak has occurred or to measure the extent of the outbreak the. The following is an example of the definition of an outbreak in a health facility according to guidelines: (1) Two or more cases confirmed with positive results identified skin scrapings from the patient, exertion health, or visitors in a two week period, or (2) one positive confirmed cases of skin scraping and at least two suspected cases identified from sufferers, health professionals, or visitors within a two week period, or (3) at least two suspected cases identified from sufferers, health workers, or visitors inside a two week period. Apart from that, nosocomial transmission is also possible occurs and needs to be considered if a case of scabies is confirmed found in two or more health workers who work in the same area in a health facility over a six week period and have no other possible exposure. (CDC, 2014)

After identifying the cases and risk factors, the next steps are in outbreak management is defining the definition of contact. On cases of typical (non-crustous) scabies, contact was defined as a person who have had direct (skin-to-skin) contact with the sufferer scabies; in contact with clothing, sheets, or other similar objects infested; or sleeping in the same place as the person with scabies during the period of exposure (Thomas et al, 2020). In the case of crustous or atypical scabies, the definition of contact is also includes all individuals residing in that ward or area same as with scabies during the period of exposure. As an example is a working health or cleaning worker in the same inpatient unit as a person with scabies crustosa, although never directly in contact with the sufferer, but still needs to be checked. If a person with scabies has been placed in some units before eradication management begins, then each of these units is considered exposed (Trasia, 2020).

Based on the above definition, it is important to equalize perceptions regarding the period of exposure at the health facility. Period of exposure an outbreak is the period between the dates of a person with scabies crustosa start of hospitalization until the date of confirmed cases and eradication management is applied. If the patient is treated long-term hospitalization or if the patient cannot be identified, then the period was extended to six weeks before appearing onset of symptoms. The next step in outbreak management is planning for personal protective equipment and drug supplies. Amenities health and pharmacy need to provide a minimum of 5% permethrin or ivermectin sufficient for all individuals will receive both curative and prophylactic therapy (Trasia, 2020).

Guidelines for the management of scabies control in hospitals or health services issued by the health department the South Australian government covers the following specifics. First, employees who come into contact with sufferers, clothes or sheets, must wear a long-sleeved disposable dress and handschoon. This action is carried out since the diagnosis was established for up to 24 hours after treatment is complete. If possible people with scabies need to be isolated until they recover. If sufferers have to transferred to another health facility, then the receiving institution and the transportation used must be informed of the status scabies infestation. Another thing to note is detection disease is very important so that the spread of scabies can be prevented by identifying sources and early treatment. Furthermore, suspected employees and occupants of health care facilities having skin-to-skin contact with the primary patient should be examined to detect scabies (Trasia, 2020).

Sufferers and people with proven contact with her should take a shower using warm water and soap later dry the body before treatment. Sufferers need to replace clothing, towels and bed linen immediately before and after treatment as well as applying topical medication from the neck down over the entire area skin folds, between the fingers, between the toes, the buttocks, genitalia externa, center, armpits and soles of the feet. Avoid application of drugs around the eyes and mucous membranes. If the medicine is removed from the skin during treatment, for example when washing hands, the drug needs to be applied topically again where it was erased. In the group of children and the elderly, if the scabies lesion is in the area higher than the neck, the drug can be applied at that location (Trasia, 2020).

Because mites can stick under the nails when sufferers scratching the itchy skin, the patient's fingernails need attention. Nails have to be cut short enough for the medication to get applied to the skin under the

nail. Because scabies lesions often become infected by bacteria and causes complications hence the presence of infection secondary bacteria need to be treated and monitored. Scabies treatment must be done simultaneously so that employees need to be assigned to check drug stocks regularly in order for scabies cases increase in number do not run out of drugs. Underwear, clothes, towels, bed sheets and other personal items used by patients 4 days before treatment should be washed clean using hot water and or dried using drying machine with hot temperature for 10 minutes for kill all mites so that transmission can be prevented. For items that cannot be washed, the item is put on in a plastic bag for 4 days and aerated before reused (Trasia, 2021).

The floor must be carefully mopped every day of use detergent. Shared toilet area and shared sofa or sitting area others should be cleaned using detergent. Keep in mind that contacts are those who have a skin-to-skin relationship the old with the sufferer and the environment in the future maximum incubation. Other sufferers, family, friends, volunteers, health care workers, cleaners can be contacts. Laundry attendants and cleaners should be considered contact. Handling contacts carried out simultaneously and It is very important to look for cases of scabies between contacts. For explain the situation to staff and people at risk of infestation scabies needs to be conducted a staff meeting (Trasia, 2022).

## 5. Conclusion

Scabies is a skin disease caused by an infestation *Sarcoptes scabiei* varieties of hominis. *S.scabiei* lives in the stratum corneum of the human epidermis and other mammals. It can be transmitted by transferring eggs, larvae, nymphs, or adult mites from the skin of the sufferer to the skin of others, but from all these infective forms the most common are adult mites cause transmission. In summary, there are three steps to control scabies globaly. First, increasing awareness of scabies and conduct advocacy to potential funding parties scabies eradication program. Second, increase research clinical and epidemiological to understand the effects of disease more well. Third, develop and implement a strategy effective scabies control.

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