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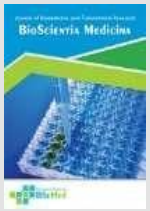

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A Retrospective Three-Year Analysis of Adult Scabies at a Tertiary Referral Center in Bali, Indonesia

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A B S T R A C T

Background: Scabies, a parasitic infestation by *Sarcoptes scabiei* var. *hominis*, is a global health challenge with significant morbidity, particularly in tropical climates. While often studied in community settings, the profile of adult patients presenting to tertiary care facilities remains under-documented. This study aimed to delineate the clinical-demographic characteristics of adult scabies patients at a major referral hospital in Bali, Indonesia, to better understand this specific patient study. **Methods:** A retrospective, descriptive study was conducted utilizing electronic medical records from the Dermatology and Venereology outpatient clinic at Prof. Dr. I.G.N.G. Ngoerah General Hospital from January 2021 to December 2023. Following a total sampling method based on strict inclusion and exclusion criteria, data from 38 adult patients with a clinical diagnosis of scabies were extracted. The analysis focused on descriptive statistics to summarize patient demographics, contact history, and prescribed therapeutic regimens. **Results:** The study of 38 patients had a mean age of 34.1 ± 2.5 years. A male predominance was noted (n=22, 57.9%). The highest frequency of cases was in the 40-49 year age bracket (n=9, 23.7%). Most patients had completed senior high school (n=17, 44.7%) and were employed in the private sector (n=20, 52.6%). A family history of scabies was prevalent (n=18, 47.4%). While indirect transmission via shared clothing was rare (reported by only 7.9%), direct contact through bed sharing with at least one other person was common (n=24, 63.2%). The standard therapeutic protocol was combination therapy, with topical 5% Permethrin and oral antihistamines being the most frequent regimen (n=24, 63.2%). **Conclusion:** Adult scabies patients at this tertiary center are typically middle-aged, educated, working males. Transmission is overwhelmingly linked to intimate household contact, highlighting the inefficiency of fomite-based spread compared to direct skin-to-skin contact. The standard use of combination therapy reflects a proactive clinical approach to managing both the parasitic infestation and the complex immunologic cascade of pruritus. These findings provide a crucial clinical baseline for this specific patient population.

1. Introduction

Scabies is a pervasive and intensely pruritic skin infestation caused by the microscopic burrowing mite, *Sarcoptes scabiei* var. *hominis*.[1] This ectoparasite orchestrates a complex interaction with its human host, transforming the skin into a habitat for its life cycle, which in turn triggers a cascade of debilitating immunological and physical consequences.[2] The gravid female mite excavates a burrow within the stratum corneum, the outermost layer of the epidermis, where she deposits eggs and fecal pellets. This parasitic activity is not merely a passive colonization; it is an active invasion that breaches the skin's critical barrier function and initiates a profound host immune response.[3] The clinical hallmark of scabies is a relentless, nocturnal pruritus. This itching

is not caused by the physical burrowing itself but is the manifestation of a delayed type-IV hypersensitivity reaction to the mite's antigens—its saliva, eggs, and feces. The constant scratching incited by this pruritus inflicts further damage on the epidermis, creating excoriations that serve as portals of entry for opportunistic bacteria. Secondary bacterial infections, most commonly with *Staphylococcus aureus* and *Streptococcus pyogenes*, are a frequent and serious complication.[4] These infections can range from localized impetigo and cellulitis to life-threatening conditions such as bacteremia and sepsis. Furthermore, streptococcal skin infections are a known trigger for devastating post-infectious syndromes, including post-streptococcal glomerulonephritis, which can lead to irreversible kidney damage, and acute rheumatic fever, which can cause permanent valvular heart disease. Recognizing this substantial morbidity, the World Health Organization (WHO) officially designated scabies as a Neglected Tropical Disease (NTD) in 2017.[5] This act highlighted the profound global burden of the disease, which is estimated to affect hundreds of millions of individuals at any given time, with a disproportionate impact on populations in tropical and resource-limited regions, including Indonesia.

The typical presentation of classical scabies involves erythematous papules, vesicles, and occasionally, the pathognomonic sinuous burrows. These lesions are characteristically distributed in areas of thin skin, such as the interdigital web spaces, the flexor aspects of the wrists, the elbows, axillary folds, and the genital and gluteal regions.[6] In a subset of individuals with compromised or altered cell-mediated immunity, the infestation can progress to a hyperkeratotic and profoundly contagious variant known as crusted (or Norwegian) scabies. This severe form is characterized by the proliferation of thousands to millions of mites, leading to the formation of thick, warty crusts and scales, and poses a significant risk for large-scale institutional or community outbreaks.[7] While the clinical picture can be highly suggestive, a definitive diagnosis relies on the microscopic identification of the mite, its eggs, or its fecal matter (scybala) from skin scrapings. In practice, particularly in a busy outpatient setting, the diagnosis is often made on clinical grounds, based on the characteristic history and morphology of the lesions. This approach, while pragmatic, relies heavily on the clinician's expertise. A vast body of epidemiological research on scabies has been conducted in settings where it is hyperendemic, such as residential schools, nursing homes, and specific rural communities.[8] These studies have been invaluable in shaping our understanding of transmission dynamics in crowded environments. However, a significant gap persists in the literature regarding the characteristics of adult scabies patients who present to tertiary referral hospitals, especially in regions where the disease is endemic in the wider community. Patients who seek consultation at a tertiary dermatology clinic often represent a distinct study. They may include individuals with diagnostically challenging presentations, cases of treatment failure from primary care physicians, patients with significant underlying medical conditions that could alter their clinical course, or those experiencing more severe or persistent symptoms.[9] Therefore, characterizing this specific population is not merely an academic exercise; it is essential for refining diagnostic algorithms, anticipating clinical challenges, and optimizing management strategies within the tertiary care system.

The novelty of this research lies in its specific focus on the adult patient population with classical scabies presenting to a major tertiary referral hospital in Bali, a unique geographical and cultural setting within an endemic country. To our knowledge, this is the first study to systematically document the demographic, behavioral, and clinical profile of this particular study. By moving beyond traditional high-prevalence settings, this research provides a novel perspective on how scabies manifests and is managed in a different part of the healthcare ecosystem. It challenges preconceived notions of scabies as a disease confined to the poor or uneducated by examining its presence

in a diverse patient population, thereby contributing a crucial and previously missing piece to the epidemiological puzzle of scabies in Indonesia.[10] The primary aim of this study was to conduct a retrospective analysis to describe the key demographic profile, relevant contact and behavioral history, and therapeutic management of adult patients diagnosed with scabies at the Dermatology and Venereology outpatient clinic of Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar, over a three-year period. The objective was to create a detailed, evidence-based profile of this patient group to inform clinical practice and provide a baseline for future research.

2. Methods

A retrospective, descriptive, cross-sectional study design was employed. The study was conducted by analyzing secondary data from the electronic medical record (EMR) system of the Prof. Dr. I.G.N.G. Ngoerah General Hospital in Denpasar, Bali, Indonesia. This hospital is the principal government-owned tertiary care and referral center for the province of Bali and the surrounding Eastern Indonesian islands. The data review was performed between March and May 2024, covering patient records from January 1st, 2021, to December 31st, 2023. The study population comprised all patients who received a diagnosis of scabies at the hospital's Dermatology and Venereology outpatient clinic during the specified three-year period. A total sampling method was used, including all patient records that met the eligibility criteria to ensure the inclusion of all available cases. Records were selected based on the following criteria: Inclusion: Patients aged 18 years or older at the time of consultation; A documented clinical diagnosis of scabies (ICD-10 code: B86) by a consultant dermatologist or a dermatology resident under supervision; Complete medical records for the key variables under study. Exclusion: Patients younger than 18 years of age; Records with a primary diagnosis of crusted (Norwegian) scabies; Incomplete or ambiguous records that precluded accurate data extraction.

Cases were identified through a search of the EMR database for the ICD-10 code B86. The diagnosis in all included cases was clinical, based on a detailed history and physical examination by a dermatology specialist. Key diagnostic features documented in the records included a history of intense, nocturnally exacerbated pruritus, the presence of compatible lesions (papules, vesicles, nodules, burrows), and a characteristic anatomical distribution. A standardized data extraction form was used to collect data from the anonymized records. The following variables were extracted: Demographic Data: Age, gender, highest level of formal education, and current occupation; Behavioral and Environmental Factors: History of sharing clothing and the number of individuals sharing a bed; Contact History: Documented history of scabies in close contacts, categorized as "Family," "Relatives," or "None."; Clinical Data: History of prior scabies episodes (recurrence) and the prescribed therapeutic regimen. The collected data were analyzed using IBM SPSS Statistics for Windows, Version 26.0. The analysis was purely descriptive. Categorical variables are presented as frequencies (n) and corresponding percentages (%). The continuous variable of age is presented as the mean ± standard deviation (SD) and range. All percentages were rounded to one decimal place. The study was conducted in full compliance with the ethical principles of the Declaration of Helsinki. Formal ethical approval was granted by the Ethics Committee of the Faculty of Medicine, Universitas Udayana/Prof. Dr. I.G.N.G. Ngoerah General Hospital. All patient identifiers were removed from the dataset prior to analysis to ensure complete anonymity and confidentiality. The ethics committee waived the need for individual patient consent due to the retrospective and non-interventional nature of the research.

3. Results

Figure 1 showed a comprehensive demographic summary of the 38 adult scabies patients who sought consultation at a tertiary referral center in Bali, Indonesia, over the three-year period from 2021 to

2023. The infographic elegantly breaks down the study's characteristics into four key domains: gender distribution, age group distribution, highest education level, and occupation status. Collectively, these data points paint a detailed and nuanced portrait of the patient population, challenging certain stereotypes associated with scabies and highlighting specific socio-demographic clusters that are particularly relevant for clinical and public health considerations in this specific healthcare setting. Gender distribution reveals a slight but notable male predominance within the patient study. Males constituted 57.9% of the cases, corresponding to 22 individuals, while females accounted for the remaining 42.1%, or 16 individuals. This finding prompts a scientific inquiry beyond simple behavioral assumptions. While social or occupational factors may contribute, this distribution could also hint at subtle biological differences in host susceptibility or variations in healthcare-seeking behaviors. For instance, differences in skin physiology, such as thickness and sebum production, influenced by sex hormones, could theoretically create different microenvironments for the mite. Furthermore, patterns in seeking medical attention might differ, with one gender potentially enduring symptoms longer before consulting a specialist at a tertiary facility, leading to their overrepresentation in such a setting. This data point serves as a crucial baseline, suggesting that in this context, adult males represent a slightly larger fraction of patients presenting with scabies to a high-level dermatology clinic. Age Group Distribution panel provides one of the most compelling insights, illustrating that scabies in this adult population is not confined to a single age bracket but affects a wide spectrum of adult life, with a notable peak in middle age. The largest single group of patients was those aged 40-49 years, representing 23.7% of the study. This is closely followed by a significant cluster of younger adults, with the <20 and 20-29 age groups combined accounting for a substantial 42.2% of all cases. The distribution then tapers off in older age, with the 50-59 age group comprising 18.4% and the 60-69 group making up only 5.3% of patients. This pattern suggests that the highest burden falls on adults in their most productive years. The prevalence in the 40-49 age range may reflect their central role within multi-generational households, where they may be exposed to the mite through contact with younger children or elderly parents. For the younger adult study, increased social mixing, different living arrangements, and frequent close contact in academic or early career settings could be primary drivers of transmission. This age-specific data is critical for targeting educational and preventative campaigns, emphasizing that scabies is a relevant health concern for adults actively engaged in work and family life. Challenging the pervasive stigma that links scabies exclusively to lower socioeconomic status, the Highest Education Level panel reveals a patient study that is, on average, well-educated. The vast majority of patients had completed at least a senior high school education. Specifically, individuals with a senior high school diploma constituted the largest group at 44.7%, and another significant portion, 26.3%, held a bachelor's degree. Those with a junior high school education made up 18.4% of the study, while only a small minority of 10.5% had a primary school education as their highest level of attainment. This finding is profoundly important as it suggests that formal education does not confer automatic immunity or sufficient specific health literacy to prevent scabies. It indicates that the mechanisms of transmission—primarily close personal contact—can easily transcend educational backgrounds. The data implies that exposure risk, driven by living conditions and social behaviors, is a more powerful determinant than general educational level, highlighting the need for universally accessible and clearly communicated public health information about scabies prevention. Occupation Status panel further defines the socioeconomic context of the patients, showing that the majority were actively employed. The "Private Sector" was the most represented category, accounting for over half of the patients at 52.6%. This broad category could encompass a wide range of professions, some of which

may involve travel, close physical work with others, or high-stress environments that could potentially modulate immune responses. Housewives represented the second-largest group at 23.7%, a significant finding that underscores the importance of the household as a primary site of transmission. Unemployed individuals comprised 15.8% of the study, while a smaller group categorized as "Other" (including civil servants and the self-employed) made up the remaining 7.9%. This occupational breakdown reinforces that scabies affects a diverse cross-section of society, including those in stable employment and those managing households. Figure 1 constructs a clear profile of the typical adult scabies patient at this Balinese tertiary center: a male, likely in his 20s or 40s, who has completed at least a high school education and is actively employed. The data collectively shifts the narrative away from scabies as a disease of the uneducated or impoverished and recasts it as a condition driven by the universal factor of close human contact, affecting individuals across various stages of adult life and socioeconomic strata.

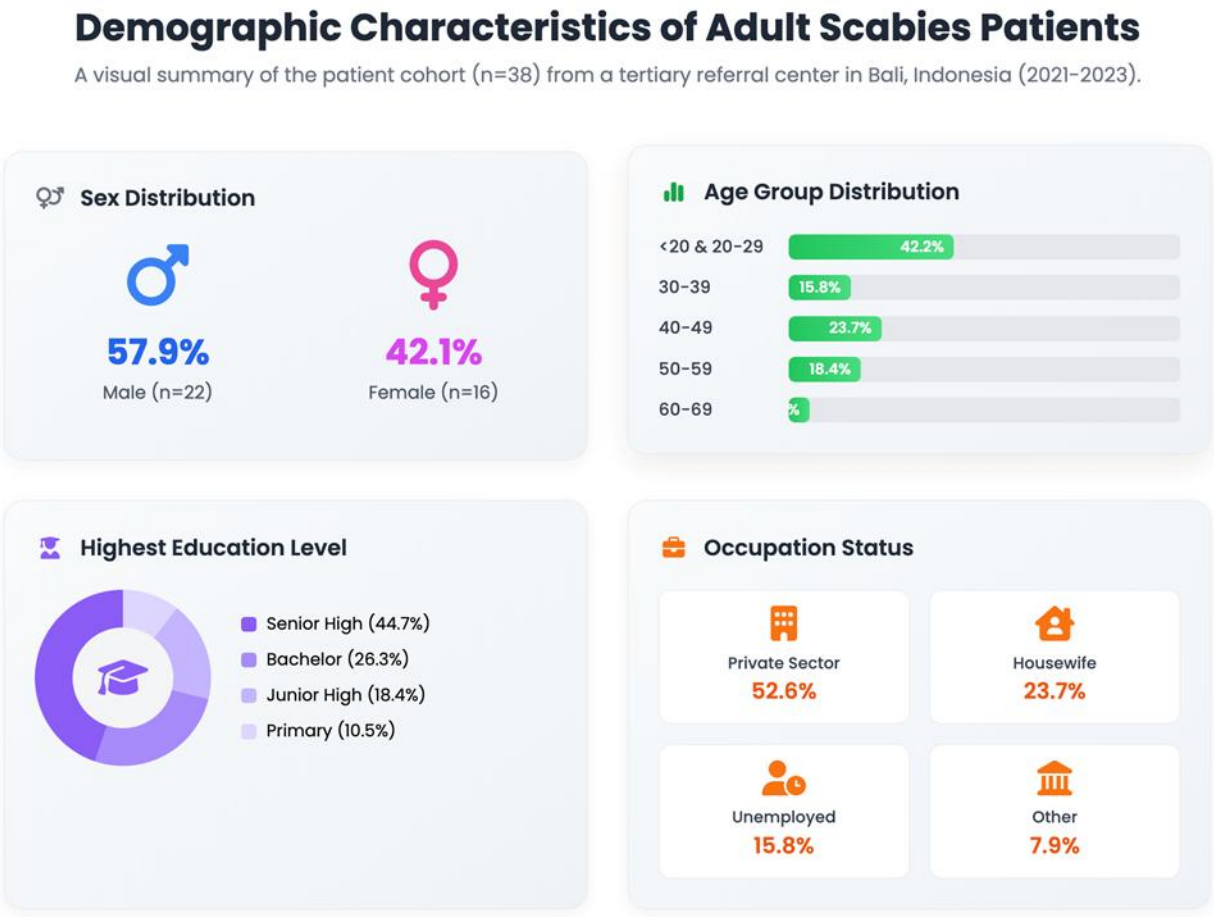

Figure 1. Demographic characteristics of adult scabies patients.

Figure 2 showed a sophisticated and informative analysis of the transmission pathways and contact history associated with adult scabies patients at the tertiary referral center, dissecting the relative contributions of indirect (fomite) transmission versus direct skin-to-skin contact. The figure is structured to create a compelling narrative about how *Sarcoptes scabiei* likely navigated through this patient study, systematically contrasting the low prevalence of fomite-related risks with the high prevalence of factors facilitating direct physical contact. This visual representation underscores the fundamental

parasitology of scabies, emphasizing that the mite thrives through prolonged, intimate human interaction rather than environmental contamination. The first panel, dedicated to Fomite Transmission Risk, presents a stark illustration of the minimal role that shared personal items played in this study. An overwhelming majority, 92.1% of patients, reported that they did *not* share clothing. Conversely, only 7.9% (n=3) indicated a history of sharing clothes. This finding is critically important from a scientific perspective. While *S. scabiei* mites can survive off-host for a short period (typically 24-48 hours under ideal laboratory conditions), their ability to successfully transfer from an inanimate object, like clothing, to a new host is relatively inefficient. The mite requires the specific warmth, humidity, and microenvironment of human skin to thrive and burrow. The data presented strongly suggests that, for this adult population, transmission via clothing is a statistically minor pathway. This challenges common misconceptions that emphasize excessive environmental cleaning over treating human contacts. The visual representation, featuring a large prohibited symbol over a clothing icon, powerfully conveys that fomite risk was a negligible factor in the vast majority of these cases. Moving to the central panel, Direct Contact Risk, the figure highlights the primary mechanism of scabies transmission: prolonged, close skin-to-skin contact, analyzed here through the lens of bed sharing status. This section provides the epidemiological backbone for understanding how the infestation spreads. The data reveal that a significant majority of patients shared a bed with at least one other person. The most frequent scenario was sharing a bed with one other individual (labeled "2 Ppl"), accounting for 42.1% of cases. Furthermore, 21.1% of patients shared a bed with more than one person (labeled ">2 Ppl"). When combined, these figures demonstrate that 63.2% of the study engaged in the very behavior—sleeping in close proximity to others—that maximizes the opportunity for mite migration between hosts. Only 36.8% of patients slept alone. The segmented bar chart vividly illustrates this distribution, visually emphasizing that situations conducive to prolonged nighttime contact are prevalent among affected individuals. From a dermatological standpoint, the act of sharing a bed provides the necessary duration of contact required for the mite to successfully transfer, which is often estimated to be around 15-20 minutes of sustained contact. The final panel, infection source history, completes the transmission narrative by identifying the likely origins of the infestation, reinforcing the findings from the direct contact analysis. This section confirms that scabies is predominantly a condition acquired from known close contacts. Nearly half of all patients, 47.4%, reported a definitive history of contact with an infected family member. An additional 18.4% had contact with infected relatives outside the immediate household. Together, this means that 65.8% of patients could trace their infestation to a known close personal contact. This data strongly supports the clinical imperative to treat entire households or close contact groups simultaneously, as failing to do so almost guarantees re-infestation. The household environment, characterized by frequent and intimate contact, serves as the primary reservoir and transmission hub for *S. scabiei*. However, it is also scientifically noteworthy that a substantial minority, 34.2%, reported having no known contact with an infected individual. This finding opens several avenues of interpretation. It could suggest transmission through brief but intense contact that the patient did not recognize as a risk, or it may point to the presence of asymptomatic carriers. In scabies epidemiology, hyposensitive individuals may harbor the mite without displaying the characteristic intense pruritus, acting as silent vectors for the disease. Identifying an infection source in these cases is often challenging, yet it remains a crucial aspect of disease control. Figure 2 provides a powerful visual argument that shifts the focus from environmental factors to human interaction. The data clearly delineate a pattern where direct, prolonged physical contact, particularly through bed sharing within the family unit, is the dominant mode of transmission for adult scabies

patients in this setting. The contrast between the 92.1% who do not share clothing and the 63.2% who share a bed is a pivotal epidemiological insight. This interpretation underscores that clinical management and patient education must prioritize the identification and treatment of intimate contacts rather than focusing disproportionately on inanimate objects, aligning clinical practice with the known biological requirements of the *Sarcoptes scabiei* mite.

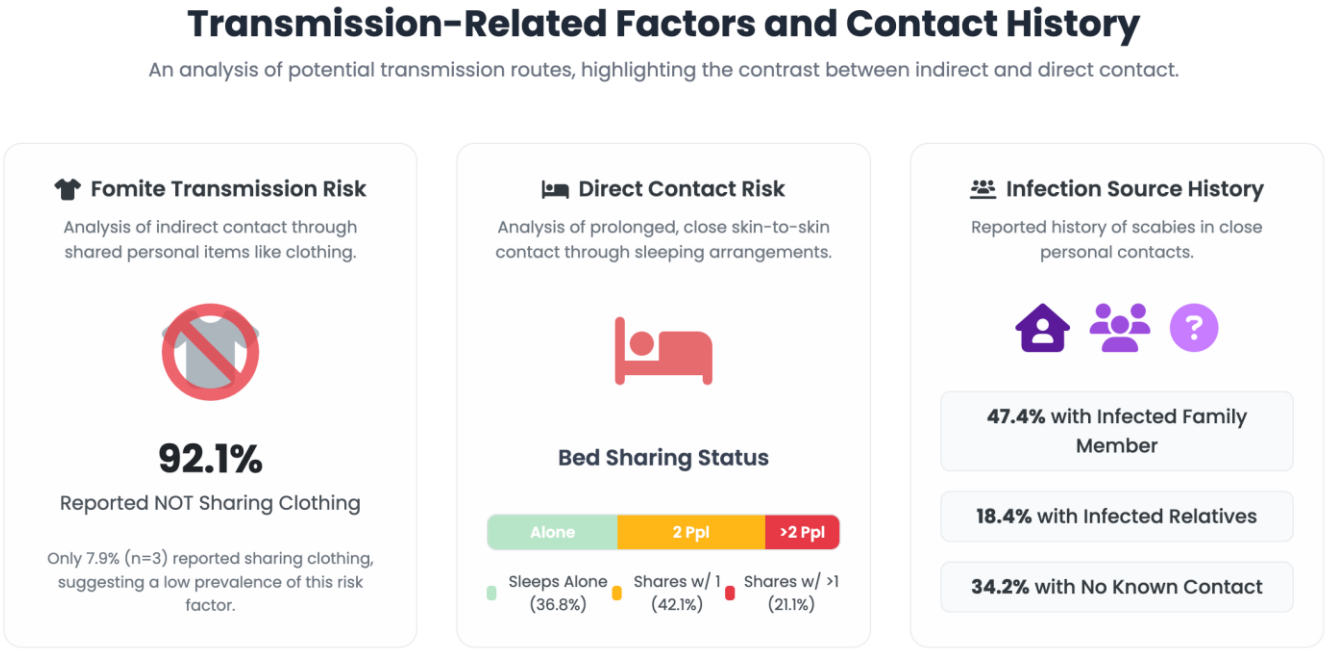

Figure 2. Transmission-related factors and contact history.

Figure 3 showed a detailed schematic overview of the clinical management strategies employed for the adult scabies study and the corresponding clinical outcomes regarding the history of recurrence. This visualization effectively bifurcates the clinical journey into two critical components: the intervention (Therapeutic Regimens) and the result (Recurrence History), painting a picture of robust, multimodal therapeutic approaches yielding highly favorable outcomes within this tertiary care setting. The data presented underscore a clinical paradigm that prioritizes combination therapy, addressing both the parasitic infestation and its symptomatic sequelae simultaneously. The left panel, dedicated to Therapeutic Regimens, reveals a near-universal adoption of combination therapies. It is immediately apparent that monotherapy was not the standard of care in this study. Instead, the clinical strategy heavily favored integrated treatment plans. The most prevalent approach, utilized in 63.2% of cases, was the "Standard Combination Therapy". As visualized by the icons, this regimen involved a topical agent (likely a scabicide such as Permethrin 5%) combined with an oral medication. This dual approach is grounded in a sophisticated understanding of scabies pathophysiology. The topical scabicide acts directly on the *Sarcoptes scabiei* mites, disrupting their neurological function and leading to parasitic death. However, the profound pruritus associated with scabies is immunologically mediated—a hypersensitivity reaction to mite antigens remaining in the stratum corneum. This itching often persists even after successful eradication of the live mites. Therefore, the inclusion of oral medication, typically

antihistamines, is critical. It serves to mitigate the intense pruritus, break the itch-scratch cycle, reduce the risk of secondary bacterial infection from excoriations, and significantly improve the patient's quality of life during treatment. The predominance of this regimen highlights a commitment to comprehensive patient care that extends beyond mere parasite eradication. The second most common strategy, accounting for 34.2% of patients, was the "Enhanced Combination Therapy". This regimen involved three components: a primary topical agent, a secondary topical agent, and an oral medication. This enhanced approach suggests a tailoring of treatment for potentially more complex or severe presentations, which are often encountered in a tertiary referral hospital. The addition of a secondary topical agent might include mild-to-moderate potency topical corticosteroids to rapidly reduce severe inflammation and eczema induced by the infestation, or perhaps topical antibiotics if signs of secondary impetiginization were present. This enhanced strategy reflects a nuanced clinical response, indicating that dermatologists are proactively managing complications and severe symptoms alongside the primary infestation. Only a marginal 2.6% of cases were managed with "Other Regimens," indicating rare deviations from the established combination protocols. Collectively, these data demonstrate that 97.4% of the patients received a combination of topical and oral medications. This overwhelmingly standardized approach signifies a high level of consensus in clinical management within this institution, prioritizing aggressive, multifaceted treatment to ensure efficacy. The right panel of Figure 3 presents the Recurrence History, offering a powerful testament to the effectiveness of the clinical management strategies employed. The data show that an overwhelming 94.7% of patients had "No Recurrence". This figure is visually emphasized by a large green shield icon, symbolizing successful defense against re-infestation or treatment failure. The figure further clarifies that "the vast majority of patients presented with a primary infestation and did not have a documented history of recurrence". This remarkably low rate of recurrence is a critical clinical indicator. In the context of scabies, which is notorious for high rates of re-infestation in endemic settings, a success rate nearing 95% is commendable. Scientifically, this success can likely be attributed to several factors implied by the therapeutic regimens. Firstly, the effectiveness of the chosen scabicides. Secondly, the use of oral medications to manage pruritus likely improves patient compliance with topical treatments by reducing discomfort, thereby ensuring the topical agents are used correctly and for the appropriate duration. Thirdly, it may suggest effective patient education regarding the necessity of treating household contacts and decontaminating bedding and clothing, although this is inferred rather than explicitly stated in the figure. Conversely, only a very small minority, 5.3% (n=2), had a history of prior scabies episodes. While low, recurrence in scabies, when it occurs, is rarely due to true drug resistance. More commonly, it results from re-infestation by untreated close contacts, improper application of topical therapy, or inadequate environmental decontamination.

4. Discussion

The observation of a slight male predominance (57.9%) in our study invites a more profound analysis than simple behavioral speculation. While occupational and social factors undoubtedly play a role, it is crucial to consider the underlying biological differences between sexes that may influence host susceptibility to ectoparasitic infestations.[11] The human skin is not a passive barrier; it is a complex, hormonally-responsive organ with its own immune system. Sex hormones, particularly estrogens and androgens, are known to modulate cutaneous biology and local immune responses. Estrogen, for instance, has been shown to enhance skin barrier function and promote wound healing, potentially offering a more robust defense against the initial burrowing of the mite.[12] Conversely, androgens can increase sebum production, which, while not directly related to mite

survival, alters the cutaneous microenvironment. Furthermore, the cutaneous immune response itself may exhibit sex-based dimorphism. The initial host response to *S. scabiei* involves both innate and adaptive immunity. Langerhans cells in the epidermis capture mite antigens and migrate to lymph nodes to present them to T-cells, initiating a type-IV hypersensitivity reaction. There is growing evidence that female immune systems often mount stronger Th2-type responses, which are crucial for combating extracellular parasites.[13] A more vigorous initial immune reaction in females could potentially limit the mite burden or lead to earlier symptom presentation, prompting treatment before a visit to a tertiary center is required. While our study cannot prove such a mechanism, it is a biologically plausible hypothesis that moves the discussion beyond simplistic behavioral tropes and towards a more scientific inquiry into host-parasite interactions.

Figure 3. Clinical management and recurrence.

The age distribution, with its peak in the 40-49 year group and significant representation in younger adults, provides a fascinating window into the relationship between age, immune function, and social structure. Scabies is fundamentally a disease of immune recognition.[14] The intense pruritus is not caused by the mite itself but by the host's inflammatory response to it. In younger adults (20-39 years), the immune system is typically at its peak reactivity. Upon initial infestation, these individuals are likely to mount a very robust, and therefore highly symptomatic, inflammatory response. The intense itching and visible skin reaction may drive them to seek medical care promptly. Their social structures—

often involving shared living spaces, new partnerships, and active social lives—also increase their potential exposure. The peak in the 40-49 year age group is particularly compelling. This demographic often represents the "sandwich generation," simultaneously caring for children and aging parents. This central role in the family unit places them at the nexus of potential transmission chains. A child may acquire scabies at school and transmit it to the parent, who may then unknowingly transmit it to an elderly grandparent.[15] From a pathophysiological standpoint, individuals in this age group have a mature but not yet senescent immune system. Their response is strong enough to be highly symptomatic but may lack the rapid, overwhelming vigor of a younger adult, perhaps allowing the infestation to become more established before consultation. In the older patients (50-69 years), the concept of immunosenescence becomes relevant. With age, there is a decline in the efficacy of cell-mediated immunity. This can lead to a less intense inflammatory response to the mite. While this might sound beneficial, it can be a double-edged sword: a blunted immune response may result in less severe itching initially, but it also allows for a higher mite burden to accumulate before the condition becomes clinically apparent. This is the same principle that, in its extreme form, leads to crusted scabies in the immunocompromised.

The finding that most patients were educated and employed challenges the stigma of scabies as a disease of poverty. Instead of viewing education as a direct measure of hygiene knowledge, it is more scientifically sound to consider it as a proxy for socioeconomic status, which in turn influences a host of factors that can modulate health. Occupation, particularly in the "private sector," is not just a label but a descriptor of a person's daily environment and potential exposures. More importantly, chronic stress, which can be associated with certain demanding occupations, is a powerful modulator of the immune system. High levels of cortisol, the primary stress hormone, can suppress the Th1-type immune response and shift the body towards a more anti-inflammatory Th2 state.[16] While a Th2 response is needed to fight parasites, an imbalanced or dysregulated response can be less effective. Therefore, the physiological state of a stressed, working adult may create a more permissive environment for the mite to establish itself. This provides a pathophysiological link between a person's life circumstances and their susceptibility to an infectious disease, moving beyond simple correlations.

The results of this study—showing a high prevalence of bed sharing (63.2%) and a very low prevalence of clothing sharing (7.9%)—provide a powerful real-world illustration of the biological requirements for *S. scabiei* transmission. The mite is an obligate human parasite, exquisitely adapted to its host but vulnerable when removed from it. Transmission is not an instantaneous event.[17] It requires the physical transfer of at least one gravid female mite from one person to another. This transfer is facilitated by direct, prolonged, skin-to-skin contact. The warmth and moisture of skin contact provide the ideal conditions for the mite to move from one host to the next. The act of sleeping in the same bed provides the two most critical elements for successful transmission: duration and proximity.[16] Hours of sustained skin contact create an extended window of opportunity for the mite to migrate. In contrast, fomite transmission is a far less efficient process. When a mite is dislodged from the skin onto an inanimate object like clothing or bedding, it is immediately subjected to a hostile environment. It begins to desiccate and cool, and its motility decreases rapidly. While it can survive for 24-48 hours under optimal conditions, its ability to re-infest a new host diminishes with each passing hour. For fomite transmission to occur, a new host must come into contact with the specific part of the fabric where the mite is located, and the mite must have sufficient viability and motility to grasp onto the new host's skin. The probability of this sequence of events occurring is vastly lower than that of direct transfer during close contact. This is why our data so clearly shows that sharing a bed is a major factor, while sharing clothes

is not. This finding is a direct reflection of the mite's biological limitations when outside its ideal human habitat.[18]

The choice of 5% Permethrin as the first-line topical therapy is grounded in its specific neurotoxic mechanism of action against the mite. Permethrin is a synthetic pyrethroid that acts on the sodium channels in the nerve cell membranes of arthropods. It binds to these channels, delaying their closure and disrupting the normal sodium ion flow. This leads to a state of prolonged neuronal excitation, resulting in spastic paralysis and, ultimately, the death of the mite. Human sodium channels are significantly less sensitive to Permethrin, and the drug is poorly absorbed through the skin and rapidly metabolized, which accounts for its excellent safety profile in humans.[19] The universal use of this agent in our study reflects an evidence-based approach to eradicating the causative parasite. The most profound insight from the treatment data is the routine use of combination therapy, specifically the addition of oral antihistamines. This practice demonstrates a sophisticated understanding of the pathophysiology of scabietic pruritus. Killing the mites with Permethrin is only the first step. The itching in scabies is not caused by live, moving mites but by the host's sustained type-IV hypersensitivity reaction to the antigens left behind in the skin—the mite bodies, eggs, and feces.[19] Even after all live mites are eradicated, these antigens persist in the epidermis for weeks. They continue to be processed by Langerhans cells and presented to T-cells, perpetuating the inflammatory cascade. This process involves the release of a host of inflammatory mediators, including histamine from mast cells, which is a primary driver of itching. Therefore, the pruritus of scabies is an "immunological echo" that continues long after the parasitic trigger is gone. Treating with a scabicide alone addresses the cause but not the ongoing symptomatic effect. The addition of an oral antihistamine directly targets this effect. First-generation antihistamines, which were likely used in this study, not only block the H1 histamine receptor to reduce itching but also have sedative properties due to their ability to cross the blood-brain barrier. This sedation is clinically beneficial, as it helps to break the nocturnal itch-scratch cycle, allowing the patient to sleep and the skin barrier to begin healing. The use of combination therapy is therefore not just for comfort; it is a rational, pathophysiologically-driven strategy to manage a complex immunological symptom and prevent secondary complications.[20]

Figure 4 showed a masterfully constructed schematic model that provides a deep pathophysiological interpretation of the study's key findings. It moves beyond mere data presentation to create a cohesive scientific narrative, illustrating the intricate interplay between host factors, the core biological processes of scabies infestation, and the mechanisms of transmission and clinical management. The figure is logically structured into three interconnected columns, guiding the observer through the entire disease process from predisposing factors to therapeutic intervention. At the heart of the figure lies the central column, which delineates the Core Pathophysiological Cascade in three critical steps. This cascade begins with Step 1: Infestation & Antigen Release. This initial event is visually depicted with the *Sarcoptes scabiei* mite burrowing into the stratum corneum, the outermost protective layer of the skin. It is here that the mite establishes its niche, releasing a variety of antigenic materials, including eggs, saliva, and fecal matter, which serve as the primary triggers for the host's subsequent immune response. This leads directly to Step 2: Immune System Activation. The schematic explains that specialized immune cells within the epidermis, known as Langerhans cells, recognize these foreign mite antigens. They then process and present them to T-lymphocytes, initiating a classic Type-IV delayed hypersensitivity reaction. This cellular immune response is the fundamental driver of the disease's inflammatory nature. Concurrently, mast cells are activated to release histamine and other inflammatory mediators, which are key players in generating the sensation of itch. The culmination of this immune activation is Step 3: Clinical Manifestation.

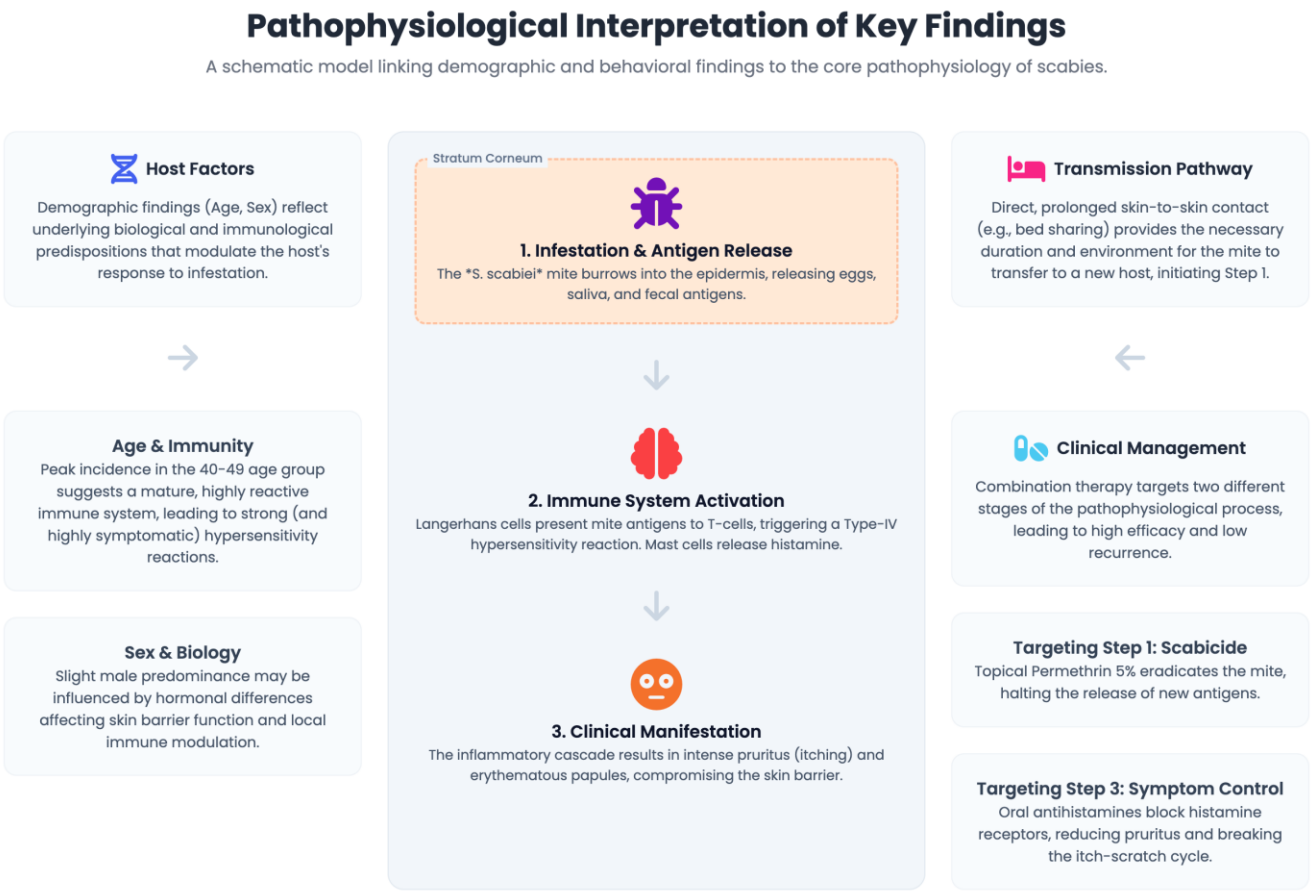

Figure 4. Pathophysiological interpretation of key findings.

The figure illustrates that the intense inflammatory cascade results in the hallmark symptoms of scabies: severe pruritus (itching) and the development of erythematous papules. This inflammatory response and the associated scratching physically compromise the skin barrier, creating a vulnerable state that can lead to secondary bacterial infections. The elegance of Figure 4 lies in how it connects the study's empirical findings, presented in the flanking columns, to this central biological process. The left column, focusing on Host Factors, explains who is affected and why their response might be modulated. It posits that demographic findings are not random but reflect underlying biological predispositions. The peak incidence in the 40-49 age group is interpreted through the lens of Age & Immunity, suggesting that individuals in this life stage possess a mature and highly reactive immune system. This leads to a particularly strong and, therefore, highly symptomatic hypersensitivity reaction, which may drive them to seek specialist care at a tertiary facility. Similarly, the slight male predominance is linked to Sex & Biology, hypothesizing that hormonal differences could affect skin barrier integrity or local immune modulation, potentially influencing susceptibility or the clinical expression of the disease. The right column provides the context for how the pathophysiological cycle begins and how it is effectively terminated. The Transmission Pathway panel directly links to Step 1, explaining that direct and prolonged skin-to-skin contact, such as bed sharing, provides the necessary environment and duration for the mite to transfer to a new host, thereby initiating the infestation. This connects the behavioral data from the study directly

to the initial biological event. Finally, the Clinical Management section illustrates a scientifically sound, dual-pronged therapeutic strategy that targets different stages of the pathophysiological cascade, explaining the high efficacy and low recurrence rates observed in the study. The first therapeutic goal is Targeting Step 1: Scabicide, where topical Permethrin 5% is used to eradicate the mite. This intervention halts the continuous release of new antigens, effectively stopping the problem at its source. The second goal is Targeting Step 3: Symptom Control, where oral antihistamines are used to block histamine receptors. This directly mitigates the pruritus, providing patient relief and breaking the debilitating itch-scratch cycle, which allows the compromised skin barrier to heal.

5. Conclusion

This detailed retrospective analysis has successfully painted a comprehensive and scientifically-grounded portrait of the adult scabies patient at a tertiary referral center in Bali. The study reveals a study of educated, working individuals, primarily middle-aged men, challenging outdated stigmas associated with the disease. The findings unequivocally underscore that the engine of transmission is prolonged, direct skin-to-skin contact within the household, a direct consequence of the mite's biological need for a warm, stable host environment. The inefficiency of fomite-based spread was clearly demonstrated. From a pathophysiological perspective, the demographic patterns reflect a complex interplay between the host's age-dependent immune status, potential gender-based differences in cutaneous immunity, and the modulatory effects of life stressors. The standard clinical practice of employing combination therapy—a potent topical scabicide paired with a systemic antihistamine—is shown to be a highly rational strategy. It addresses both the parasitic cause and the persistent, immunologically-driven symptom of pruritus, which is crucial for preventing secondary complications and ensuring patient recovery. This research provides a critical, evidence-based foundation that deepens our understanding of scabies not just as a simple infestation, but as a complex host-parasite interaction with distinct characteristics in the tertiary care setting.

6. References

1. Akunzirwe R, Agaba B, Kizito SN, Bulage L, Kwesiga B, Migisha R, et al. An outbreak of scabies in a fishing community in Hoima District, Uganda, February - June, 2022. BMC Infect Dis. 2025; 25(1): 846.
2. Imran SB. Scabies: a catastrophe that befalls Bangladesh amidst floods. Am J Trop Med Hyg. 2025; 113(1): 13–4.
3. Michelucci A, Fidanzi C, Dini V. Massive facial involvement in crusted (Norwegian) scabies. Actas Dermosifiliogr. 2025.
4. Fraser TA, Shao R, Fountain-Jones NM, Charleston M, Martin A, Whiteley P, et al. Mitochondrial genome sequencing reveals potential origins of the scabies mite *Sarcoptes scabiei* infesting two iconic Australian marsupials. BMC Evol Biol. 2017; 17(1): 233.
5. Naz S, Desclozeaux M, Mounsey KE, Chaudhry FR, Walton SF. Characterization of *Sarcoptes scabiei* tropomyosin and paramyosin: immunoreactive allergens in scabies. Am J Trop Med Hyg. 2017; 97(3): 851–60.
6. Hahm JE, Kim CW, Kim SS. The efficacy of a nested polymerase chain reaction in detecting the cytochrome c oxidase subunit 1 gene of *Sarcoptes scabiei* var. *hominis* for diagnosing scabies. Br J Dermatol. 2018; 179(4): 889–95.
7. Kim JK, Chun EJ, Yang SY, Kim KS, Kim SS, Kim CW. Development and efficacy of a nested real-time quantitative polymerase chain reaction to identify the cytochrome c oxidase subunit 1 gene of *Sarcoptes scabiei* var. *hominis* for diagnosis and monitoring of ordinary scabies. Br J Dermatol. 2020; 183(6): 1116–7.

8. Stingeni L, Tramontana M, Principato M, Moretta I, Principato S, Bianchi L, et al. Nosocomial outbreak of crusted scabies in immunosuppressed patients caused by *Sarcoptes scabiei* var. *canis*. Br J Dermatol. 2020; 182(2): 498–500.
9. Bae M, Kim JY, Jung J, Cha HH, Jeon N-Y, Lee H-J, et al. Diagnostic value of the molecular detection of *Sarcoptes scabiei* from a skin scraping in patients with suspected scabies. PLoS Negl Trop Dis. 2020; 14(4): e0008229.
10. Chng L, Holt DC, Field M, Francis JR, Tilakaratne D, Dekkers MH, et al. Molecular diagnosis of scabies using a novel probe-based polymerase chain reaction assay targeting high-copy number repetitive sequences in the *Sarcoptes scabiei* genome. PLoS Negl Trop Dis. 2021; 15(2): e0009149.
11. Akuta T, Minegishi D, Kido N, Imaizumi K, Nakaoka S, Tachibana S-I, et al. Development of a rapid scabies immunodiagnostic assay based on transcriptomic analysis of *Sarcoptes scabiei* var. *nyctereutis*. Sci Rep. 2021; 11(1): 6455.
12. Ventura-Flores R. *Sarcoptes scabiei*: Ectoparasite of scabies. Rev Chilena Infectol. 2021; 38(2): 279–80.
13. Rifqoh R, Norsiah W, Oktiyani N. Comparison of clinical assessment and adhesive-tape laboratory microscopic of *Sarcoptes scabiei* for scabies diagnostic. Med Lab Technol J. 2021; 7(1): 73.
14. Yücel A, Yılmaz M. Prevalence of *Sarcoptes scabiei* in patients with suspected scabies. Turkiye Parazitol Derg. 2021; 45(2): 133–6.
15. Soni RK, Kachhawa JP, Gupta SR, Ram J, Gautam S, Choudhary S. Crusted scabies in rabbits due to *Sarcoptes scabiei* infestation. J Vet Parasitol. 2022; 36(1): 75–7.
16. Yürekli A. Adjunctive agent for treating scabies: In vitro killing activity of permethrin and tea tree oil on *Sarcoptes scabiei* collected from patients. Turkiye Parazitol Derg. 2022; 46(4): 334–8.
17. Yürekli A. Is there a really resistance to scabies treatment with permethrin? In vitro killing activity of permethrin on *Sarcoptes scabiei* from patients with resistant scabies. Dermatol Ther. 2022; 35(3): e15260.
18. Mumcuoğlu KY, Şenel E, Taylan Özkan A. Scientometric evaluation of the itch mite, *Sarcoptes scabiei* (Acari: Sarcoptidae): The last four decades of global academic output on scabies. Turkiye Parazitol Derg. 2023; 47(3): 171–8.
19. Zhong Y, Xia X-J, Liu Z-H. Ultrastructure of *Sarcoptes scabiei* in crusted scabies. Am J Trop Med Hyg. 2024; 111(4): 705–6.
20. Izmailovich M, Skvortsova A, Mendibay S, Tanriverdiev K, Erlanova K, Kemelbekova N, et al. Case report: Vesicular toxicodermia induced by the scabies mite *Sarcoptes scabiei*. J Clin Med Kazakhstan. 2024; 21(4): 78.