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The pattern of skin disorders in federal prison population

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ABSTRACT
Relevance. Skin disorder cases in prisoners are caused by poor access to medical care, late detection, limitation in isolation rooms, and concerning health funding.
Objective. This study aims to investigate the profile of skin diseases among prisoners in a regional penitentiary.
Material and methods. This cross-sectional study was held in one regional penitentiary in South Kalimantan, Indonesia, using sociodemographic and clinical data. The consultation requests were submitted by the registered prisoner with the dermatological disease. Then, doctors wrote the descriptions, diagnoses, and treatments. All data were collected from the inmate's medical records that six dermatologists filled during medical consultation. All data analysis was carried out descriptively using the SPSS 23 program.
Results. A total of 243 prisoners participated in this study. The major diagnoses were 119 cases (49%) of scabies, 31 cases (12.7%) of pyoderma, 14 cases (5.8%) of tinea cruris, 14 cases (5.8%) of tinea corporis, 9 cases (3.7%) of dermatitis and eczema, 8 cases (3.3%) of neurodermatitis, 5 cases (2.1%) of seborrheic dermatitis, 5 cases (2.1%) of allergic contact dermatitis, and 38 cases (15.6%) of other diagnoses.
Conclusion. We found that 188 participants (77%) had infectious skin diseases, and 55 (23%) had non-infectious skin diseases. Scabies, pyoderma, and tinea (cruris and capitis) were the most common skin diseases among prisoners in a regional penitentiary in South Kalimantan, Indonesia.

Keywords: *dermatology, federal prison, venereology disease, vulnerable population.*

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Структура кожных заболеваний у заключенных федеральных тюрем

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РЕЗЮМЕ
Актуальность. Случаи кожных заболеваний у заключенных обусловлены плохим доступом к медицинской помощи, поздним выявлением, ограничениями в изоляторах, а также недостаточным финансированием здравоохранения.
Цель исследования. Изучить профиль кожных заболеваний среди заключенных в региональном пенитенциарном учреждении.
Материал и методы. Это перекрестное исследование проводилось в одном региональном пенитенциарном учреждении Южного Калимантана (Индонезия) с использованием социально-демографических и клинических данных. Зарегистрированные заключенные с дерматологическим заболеванием подавали запросы на консультацию. Затем врачи вносили в документацию описания, диагнозы и методы лечения. Все данные собирали из медицинских карт заключенных, которые заполняли шесть дерматологов во время врачебных консультаций. Анализ всех данных проводили описательно с использованием программного обеспечения SPSS 23.
Результаты. В исследовании приняли участие 243 заключенных. Основные диагнозы: чесотка (119 случаев, 49%), пиодермия (31 случай, 12,7%), паховая дерматофития (14 случаев, 5,8%), дерматофития гладкой кожи (14 случаев, 5,8%), дерматит и экзема (9 случаев, 3,7%), нейродермит (8 случаев, 3,3%), себорейный дерматит (5 случаев, 2,1%), аллергический контактный дерматит (5 случаев, 2,1%), другие диагнозы (38 случаев, 15,6%).
Заключение. Обнаружены инфекционные заболевания кожи у 188 (77%) участников исследования, у 55 (23%) имелись неинфекционные заболевания кожи. Чесотка, пиодермия и дерматофития (промежности и гладкой кожи) были наиболее распространенными кожными заболеваниями среди заключенных в региональной пенитенциарной системе Южного Калимантана (Индонезия).

Ключевые слова: *дерматология, федеральная тюрьма, венерологическое заболевание, уязвимые группы населения.*

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Introduction

The number of prisoners is continuing to increase worldwide [1]. The world's prisoner population was 20% in 2000. It was above 2% of the world population growth [2, 3]. More than 11 million people are detained in penal institutions globally, either as remand (pretrial detainees) or sentenced prisoners. Currently, 17 countries have a confinement rate of more than 400 per 100,000 of their population. With an incarceration rate of 655 per 100,000 population, the USA has become the largest incarcerator globally. As of February 14, 2021, the data showed 252,384 correctional inmates, even though the maximum prisoner capacity is 135,704 people. According to the community database of South Kalimantan, there are 9,982 correctional residents as of July 09, 2021, while the maximum capacity is only 3,653, or exceeding the maximum capacity by 173% [4]. The soaring prisoner population with no comparable expansion in the penal institutions' infrastructure has raised health concerns in many countries regarding overcrowded prisons. These conditions urgently need to be a public health concern [5].

Skin disease has become one of the public health concerns in Indonesia. Skin disease can be caused by fungi, viruses, bacteria, parasites, etc. Based on Indonesia's health profile in 2015, the number of skin diseases has risen annually. Skin and subcutaneous tissue diseases rank third out of ten of the most common diseases in hospitals' outpatients across Indonesia, based on a total of 192,414 doctor visits, i.e., 122,076 new visits and 70,338 recurring visits [6]. The predominance of skin diseases was 8.46% and increased by 9% in 2013 based on the Ministry of Health, the Republic of Indonesia in 2012. The prevalence of scabies in Indonesia is 4.60-12.95%. This disease ranks third of the 12 most frequent skin diseases [7].

Skin disease occurs in a variety of populations, including the prison population. Prisons have been considered as a commonplace of contagious diseases [8, 9]. Skin infection is typical in a prison environment because of the high population density and promiscuity [10-12]. In addition, a prison is a place with a broader society that triggers infectious diseases [13-14]. Prisoners have a higher prevalence of skin infections than the general population due to several factors, including risky behavior, overcrowding, delay or lack of diagnosis and treatment, limited access to clean water, inadequate sanitation, and the lack of prevention measures such as condoms, sterile tattooing equipment, and syringes, and drug treatment [15].

All prisoners have the right to proper healthcare as it must be available to the general population in every country [16]. Meanwhile, a bad environment has been considered a risk factor for dermatology problems [8, 17]. However, the studies about vulnerable populations, particularly prisoners, and regarding skin diseases, are limited. The specialized management of skin diseases in the prison population has been recently perceived by the World Health Organization (WHO) in 2007, especially in scabies and pediculosis [18, 19]. Furthermore, dermatological problems become increasingly important in the correctional environment [8, 9]. Skin disorder cases in prisoners were caused by the lack of attention, poor access to medical care, late detection, the limitations in isolation rooms, and the concern in health funding. Stress associated with living in a penitentiary environment has an important role in the pathogenesis of dermatological diseases. Furthermore, psychiatric conditions, such as the burden of mental illness, substance use disorders, and cognitive disabilities, are greater in prison than in general, leading to the additional costs associated with comorbid skin disorders [20]. There is an association between stress level, the intensity of acne, and the onset of psoriasis or atopic nonspecific dermatitis [20-23].

Psychotropic drugs are also associated with dermatological diseases [24]. Dermatitis, acne, mycosis, scabies, pityriasis versicolor, pediculosis, seborrheic dermatitis, alopecia, and psoriasis are the types of dermatological diseases commonly found among prisoners [25, 26]. However, in some studies conducted in Indonesia, there is no sufficient information regarding skin diseases in prison, i.e., whether the general population has a similar pattern or not. Therefore, the objective of this study was to investigate the profile and pattern of skin diseases among prisoners in a regional penitentiary, especially in South Kalimantan, Indonesia.

Material and methods

Study design

This study was a cross-sectional study in a regional penitentiary in South Kalimantan, Indonesia. The prisoners with dermatological symptoms and needing medical treatment were enrolled in this study. The sample size formula was provided below:

$$n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2 N}} \quad (1)$$

Where as

z is the z score = 1.96

ε is the margin of error = 0.05

N is population size = 252.384

$\hat{p}$ is the population proportion = 15%

Based on the formula, the minimum sample was 183 subjects. The inclusion criteria were the registered prisoner with a dermatological disease and those willing to participate in this study. There were no exclusion criteria. This study was approved by the Regional Penitentiary Authority (No.060/KEPK-FK UNLAM/EC/II/2020).

Data collection

This study was descriptive with the following variables: (i) sociodemographic data and (ii) clinical data. All data were collected from the prisoner's medical records that the six dermatologists filled during a medical consultation.

Data and statistical analysis

The data analysis was done using the SPSS 23 program (IBM, USA). The descriptive analysis was the frequency for categorical data (i.e., gender, disease category, the spectrum of diagnosis, and distribution diagnosis) and median for age data.

Results

A total of 243 prisoners was screened for this study; 197 were males, and six were females. The median age was 35 (11-80) years old. The respondent's characteristics are shown in **table 1**.

188 participants with infectious skin diseases, while the rest (55) had non-infectious ones. The most specific diagnoses were scabies (*n*=119), pyoderma (*n*=31), tinea cruris (*n*=14), tinea corporis (*n*=14), dermatitis and eczema (*n*=9), neurodermatitis (*n*=8), seborrheic dermatitis (*n*=5), and allergic contact dermatitis (*n*=5). Other diagnoses comprised of nummular dermatitis (*n*=4), urticaria (*n*=4), candidiasis (*n*=4), miliaria (*n*=4), pompholyx (*n*=3), erythema (*n*=3), pityriasis versicolor (*n*=3), post-inflammatory hyperpigmentation (*n*=3), keloid (*n*=3), genital ulcer (*n*=2), insect bite (*n*=2), acneiform eruptions (*n*=2), and paronychia (*n*=1).

Among 243 prisoners, 119 prisoners had zoonosis, 50 had allergic skin diseases, 35 had mycosis, 31 had pyoderma, and one had sexually transmitted disease. Lastly, seven prisoners had "others", which refers to the diagnoses that cannot be classified to the spectrums above.

Discussion

In the present study, scabies is the most common skin disease. It is highly contagious, both directly and indirectly. This skin disease affects more than 300 million people annually worldwide, leading to a considerable morbidity rate, especially in emerging countries. The disease is endemic with a medium to a long duration of infection [27]. *Sarcoptes scabiei var. hominis* and its products can live in human's stratum corneum and personal belonging (couch, bedroom, chair, towel, etc.).

The significant risk factors for scabies among prisoners are the frequent contact with those with scabies, prominent family members (>5 people), personal hygiene (bath frequency, the use of soap, and sharing personal belongings), overage, and gender [18]. Another study showed that males have a higher risk of scabies due to their higher dynamic activity than females [28]. Previous studies found that the most common skin problems in prisons in the tropics and subtropics were scabies and superficial fungi infections. These infective dermatoses were found to significantly affect the duration of stay in prison. Another study showed that scabies is a prevalent skin disease in prisons in the west region of Cameroon, with a prevalence of 32% [27]. Low academic background, sharing clothes or bedding, and more than ten detainees per cell are the independent determinants that increase a prisoner's likelihood of having scabies [25]. Those exposed to overcrowding in a hot and humid environment are most likely to get infected [16, 18, 29].

Pyoderma is the second most common disease found among prisoners in this study. Pyoderma has been well observed to be caused by *Streptococcus pyogenes* and *Streptococcus aureus*, while *S. aureus* infections usually cause broiled furuncles and carbuncles. Their relationship with skin disorder is highly related to the environment that supports bacterial infection [16, 30].

Pyoderma and scabies were connected and can worsen the condition of each other. Pyoderma, frequently associated with scabies and impetiginized scabies as secondary infection, is usually caused by gram-positive bacteria.

Table 1. **Subjects' characteristics and diagnosis pattern**
Таблица 1. **Характеристики пациентов и диагнозов**

Age (*n*=243)	Frequency	
	Median 35 (11-80) years	Percentage (%)
Sex (*n*=243)		
Male	197	97.1
Female	6	2.9
Category (*n*=243)		
Infectious diseases	188	77.3
Non-infectious diseases	55	22.7
Diagnosis spectrum (*n*=243)		
Zoonosis (scabies)	119	49
Allergic skin diseases	50	20.6
Mycosis	35	14.4
Pyoderma	31	12.8
Sexually transmitted diseases	1	4
Others	7	2.9
Diagnosis distribution (*n*=243)		
Scabies	119	49
Pyoderma	31	12.7
Tinea cruris	14	5.8
Tinea corporis	14	5.8
Dermatitis and eczema	9	3.7
Neurodermatitis	8	3.3
Seborrheic dermatitis	5	2.1
Allergic contact dermatitis	5	2.1
Nummular dermatitis	4	1,6
Urticaria	4	1,6
Candidiasis	4	1,6
Miliaria	4	1,6
Pompholyx	3	1,2
Erythema	3	1,2
Pityriasis versicolor	3	1,2
Post-inflammatory hyperpigmentation	3	1,2
Keloid	3	1,2
Genital ulcer	2	0,8
Insect bite	2	0,8
Acneiform eruptions	2	0,8
Paronychia	1	0,4

The risk factors are poor hygiene, being immunocompromised, and the barrier problems of the skin. *Sarcoptes scabiei* builds tunnels in the skin's stratum corneum, and its secretion will induce an immune response, papule, rash, and canaliculi manifestations. Besides the mite's activity during bedtime, this condition is indicated by itchiness. This will make a never-ending itch-scratch cycle. In addition, it will worsen the barrier impairment, and then the commensal bacteria on the skin can exist as secondary infection (superinfection) in the form of abscess, cellulitis, and impetigo. Without good treatment, pyoderma may lead to serious complications, including sepsis [16, 18, 30].

Tinea corporis and *Tinea cruris* are caused by similar microorganisms (*T. rubrum*, *T. mentagrophytes*, and *M. gypseum*) and are categorized as dermatomycosis. Fungal infections are known to thrive in hot and humid environments. They are caused by overcrowding, hot weather conditions, lack of soap, and poor personal hygiene. These conditions can also predispose to other types of infections [16, 18, 30].

The increased fungal growth in the prison causes a high rate of dermatophytes among prisoners. However, the persistence or recurrence of these infections is also possible, as prisoners can have a long stay with continued favorable-predisposing conditions and complement by inadequate treatment. In an Indian prison study, the predisposing factors to the high prevalence of dermatophytes were the high humidity and hot weather and overpopulation [18, 29].

The present study found that infectious skin disease was more predominant than non-infectious skin diseases. This finding supports the association of several organism growths in prisons. As a contagious disease, infection was influenced by three major factors: agent, environment, and host [18, 29].

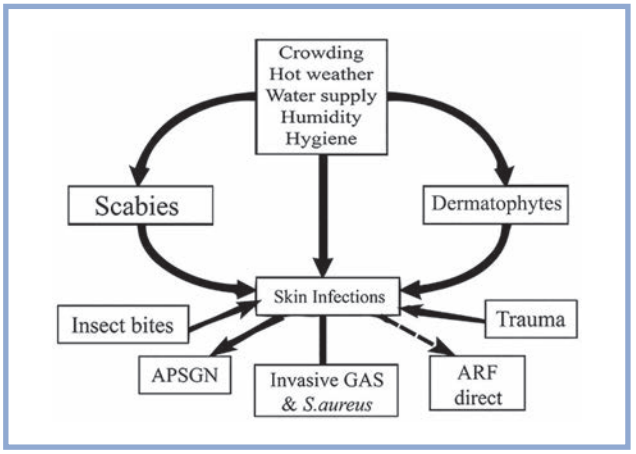
Prisoners as hosts have several predisposition factors, such as behavior, immunity, nutrition, and stress. The cause of the behavior that underpins the poor health level is the social and economic conditions in which many people in prison were born and raised. The social determinants of crime are broadly similar to the social determinants of health; most people in prison come from an economically deprived community, experience poor housing conditions, and have low levels of education and poor employment prior to entering prison. Adverse childhood experiences (ACEs), which are associated with a range of negative outcomes in adulthood, including physical and mental health disorders and aggressive behavior, have also been shown to be directly associated with adult offending behavior and associated with poor health outcomes. The prison environment itself is often not conducive to healthy behaviors, with the access to nutrition, physical activity, and sleep being controlled to a varying degree by the prison regime. This requires public health advocacy at an organizational level for a healthy prison approach and creative intervention designs to take into account the limitations of the environment (e.g., physical activity that can be done in-cell). These lifestyle factors, influenced by the environment, amongst other things, are being shown to have a detrimental effect [31].

Furthermore, the stress during incarceration is related to homesickness, abandonment, the possibility of harassment, and interpersonal conflicts. Some researchers in Turkey found that the high level of stress among prisoners during incarcerations is significantly related to the length of stay [32]. The nutrition status of an individual is a common topic, but it relates to appetite, food quality, and the frequency of eating. We found that prison staff gave prisoners food three times a day. However, the flat variation in the menu brings down the appetite of prisoners. Therefore, they ignore the meals, and that causes malnutrition. Hence, we have to consider that the appetite of prisoners has a significant impact on their nutritional condition and health status. Behavior is a modifiable risk factor and hard to persuade, similar to personal hygiene [16, 30].

Humidity, poor sanitary conditions, sources of water, and climate are the most influential factors for harmful entities such as viruses, bacteria, and fungi. The WHO has highlighted an estimated link between peculiar skin disease and the main suspected risk factors in growing countries [16, 18] **(table 2)**.

The inter-relationship between these skin disorders, the environment, health conditions, and the potential sequelae of infestations have been described **(figure)**. The WHO portrayed the variation of the relative contribution of the proposed risk factors according to the particular skin condition [32].

The data portray that predisposing conditions made this infection more common in older prisoners than in the healthy population. This theory can support finding two or more skin disorders in a person. Regarding



Factors affecting skin disease [32].
APSGN — acute post-streptococcal glomerulonephritis; Invasive GAS — invasive Group A Streptococcal; ARF — acute rheumatic fever.

Факторы, влияющие на кожные заболевания [32].
APSGN — острый постстрептококковый гломерулонефрит; Invasive GAS — инвазивный стрептококк группы А; ARF — острая ревматическая лихорадка.

Table 2. **The relationship between peculiar skin disease and the main suspected risk factors [29]**

Таблица 2. **Связь между определенным кожным заболеванием и основными предполагаемыми факторами риска [29]**

Disorder	Climate	Poor hygiene	Low water use	Overcrowding	Comorbidity with another skin disorder
Pyoderma	+ + +[a]	+ + +	+ +	+ +	+ +[b]
Scabies	+[c]	±[d]	—	+ + +	—
Tinea capitis	?[e]	±[d]	—	+ +	—

the relationship between a proper environment and good health, it is necessary to evaluate the effects of prison facilities against the relationship between the environmental condition and the prevalent diseases among prisoners [33, 34].

Dermatitis is the most predominant non-infectious skin disease. It is caused by several uncertain factors, including primary skin lesions, stress, humidity, and infection. These possibilities are still related to the prison's social living environment. The burden in the prison environment and smoking may lead to a high number of seborrheic dermatitis, psoriasis, and pilosebaceous disorders. It associates with disease pathogenesis [18, 32].

For scabies treatment, sulfur-containing prescriptions are applied on neck-to-toe to all those who are affected or may have been exposed. In addition, all bedding, towels, and clothing that may have been exposed are autoclaved, boiled, or dry-cleaned [35]. Prisons condition supports the development of skin diseases. Persistence or recurrence of this infection is also possible, as close friends stay longer with the continued exposure to the favorable predisposing conditions and inadequate treatment.

Conclusion

Scabies, pyoderma, and tinea (cruris and capitis) were the most common skin diseases among prisoners in a regional penitentiary in South Kalimantan, Indonesia.

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