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The Role of Gut-Brain-Skin Axis in Guttate Psoriasis caused by *Enterobacter cloacae*

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ABSTRACT

Background: Psoriasis is a chronic inflammatory skin condition often manifesting as erythematous plaques with white scales. Guttate psoriasis (GP), a specific variant, presents as sudden-onset red, water-drop-like spots typically triggered by infections. The gut-brain-skin axis highlights the role of gut microbiota in modulating skin inflammation. **Objective**: To present a case report of guttate psoriasis and the interplay between gut-brain-skin axis in guttate psoriasis. **Case Presentation**: A 28-year-old woman presented with itchy raised red patches covered by thick white scales. Symptoms began a month earlier, with red spots first appearing on her chest and spreading. A week prior, she experienced fever, sore throat, nausea, vomiting, and diarrhea. Physical examination revealed erythematous papules and plaques with positive Auspitz and Karsvlek signs. A throat swab identified Enterobacter cloacae. Treatment included cetirizine, hydrocortisone cream, desoximetasone cream, and ketoconazole shampoo. **Discussion**: The gut-brain-skin axis suggests that gut microbiota, like Enterobacter cloacae, can affect skin inflammation through immune modulation. Dopamine produced by gut bacteria may exacerbate psoriasis by influencing T cells and keratinocytes. Stress also plays a role in psoriasis flare-ups. This patient's history of bacterial infection and stress supports this theory. **Conclusion**: This case illustrates the intricate interplay between gut microbiota, stress, and immune mechanisms in GP, emphasizing the need for holistic treatment approaches in managing psoriasis.
Keyword: Enterobacter cloacae, Gut, Guttate psoriasis, Microbiota, Skin axis

ABSTRAK

Latar Belakang: Psoriasis adalah kondisi peradangan kulit kronis yang sering bermanifestasi sebagai plak eritematosa dengan sisik putih. Psoriasis gutata (GP) adalah varian khusus yang muncul sebagai bintik merah yang menyerupai tetesan air dengan onset tiba-tiba yang biasanya dipicu oleh infeksi. **Tujuan**: Untuk mempresentasikan laporan kasus psoriasis gutata dan hubungan pola antara aksis saluran pencernaan-otak-kulit di psoriasis gutata. **Presentasi kasus**: Seorang wanita berusia 28 tahun datang dengan keluhan bercak merah gatal yang menonjol dan tertutup sisik putih tebal. Gejala muncul sejak satu bulan sebelumnya, dimulai dengan bintik merah di dada yang kemudian menyebar. Seminggu sebelum munculnya lesi, pasien mengalami demam, sakit tenggorokan, mual, muntah, dan diare. Pemeriksaan fisik menunjukkan papul dan plak eritematosa dengan tanda Auspitz dan Karsvlek yang positif. Hasil kultur usap tenggorokan mengidentifikasi Enterobacter cloacae. Pasien diberikan terapi berupa cetirizine, krim hidrokortison, krim desoximetasone, dan sampo ketokonazol. **Pembahasan**: Aksis saluran pencernaan-otak-kulit menunjukkan bahwa mikrobiota usus, seperti Enterobacter cloacae, dapat memengaruhi inflamasi kulit melalui modulasi sistem imun. Dopamin yang diproduksi oleh bakteri usus berpotensi memperburuk psoriasis dengan memengaruhi sel T dan keratinosit. Stres juga berperan dalam kekambuhan psoriasis. Riwayat infeksi bakteri dan stres pada pasien ini mendukung teori tersebut. **Kesimpulan**: Kasus ini menggambarkan hubungan antara mikrobiota

usus, stres, dan mekanisme imun dalam GP, sehingga menekankan pentingnya pendekatan terapi holistik dalam tata laksana psoriasis.
Kata Kunci: Aksis kulit, Enterobacter cloacae, Mikrobiota, Psoriasis gutata, Usus

1. Introduction

Psoriasis has various clinical types, including guttate psoriasis, psoriatic arthritis, plaque psoriasis, and pustular psoriasis.[1] Guttate psoriasis (GP) is a form of psoriasis distinguished by typical clinical features of raised red spots resembling water droplets with small diameters, usually not exceeding 1 cm, appearing suddenly and being disseminated.[2,3]

Psoriasis is found worldwide with varying prevalence and is related to race, geography, and environment. High incidences of psoriasis have been reported in the Faroe Islands, approximately 2.8% of the population, while in the United States, it occurs in about 2.2%-2.6% of the population. Incidences in Asia are relatively low (0.4%), and psoriasis is not found in Indigenous people of South America.[4] Based on data from Kandou Manado Hospital from January 2013 to December 2015, there were 188 new cases of psoriasis out of 3,573 new dermatological visits (5.26%).[5] Guttate psoriasis accounts for less than 30% of all psoriasis cases.[6,7] The activation of various immune pathway in psoriasis, as in many other systemic inflammatory diseases, likely contributes to the rise in proinflammatory cytokines. The development of proinflammatory Th17 cells, which contribute to inflammation in conditions like inflammatory bowel disease and obesity, is thought to be influenced by the gut microbiome. The concept of the "skin-gut axis" offers fresh perspectives on exploring the connection between gut microbiota and skin health. Disruptions in gut microbial balance are associated with inflammatory skin conditions like acne vulgaris, seborrheic dermatitis, and psoriasis. Growing evidence supports the presence of this gut-skin relationship, suggesting that an imbalanced microbiome may contribute to skin inflammation.[8]

2. Case Presentation

A 28-year-old woman came with main complaint of widespread, itchy, raised red patches covered with thick white scales. The symptoms began a month earlier, initially appearing on her chest and then spreading (Figure 1). The patient had experienced fever, sore throat, nausea, vomiting, and diarrhea a week before the onset of skin symptoms but did not seek medical treatment. Neither the patient nor her family had a history of similar skin conditions. Physical examination showed multiple erythematous papules and plaques with positive Auspitz and Karsvlek tests (Figure 2). The Psoriasis Area Severity Index (PASI) score was 22.8. Laboratory tests, including a throat swab, identified *Enterobacter cloacae*, which was sensitive to several antibiotics but resistant to others. Dermoscopy result showed the presence of white scales against a pink background (Figure 3). Histopathological examination supported the diagnosis of psoriasis (Figure 4).

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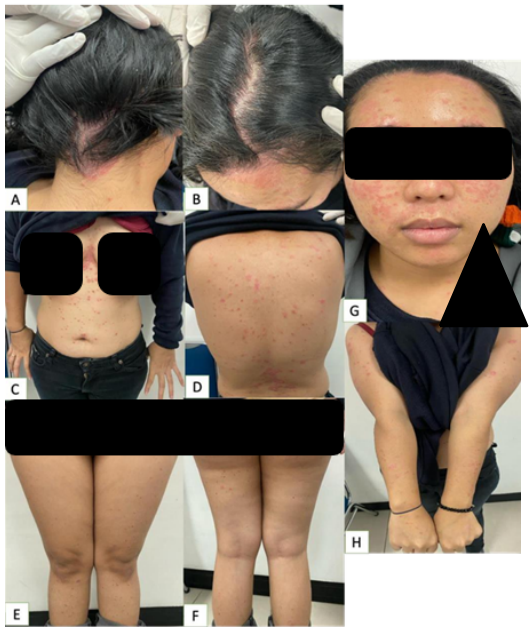

Figure 1. Dermatological examination shows multiple erythematous papules and plaques, circumscript, millimetre-lenticular-numular, discrete, covered by white scales on the scalp, facial, thoracic, abdominal, vertebral, brachial-antebrachial dextra et sinistra, and lower extremities (A-H).

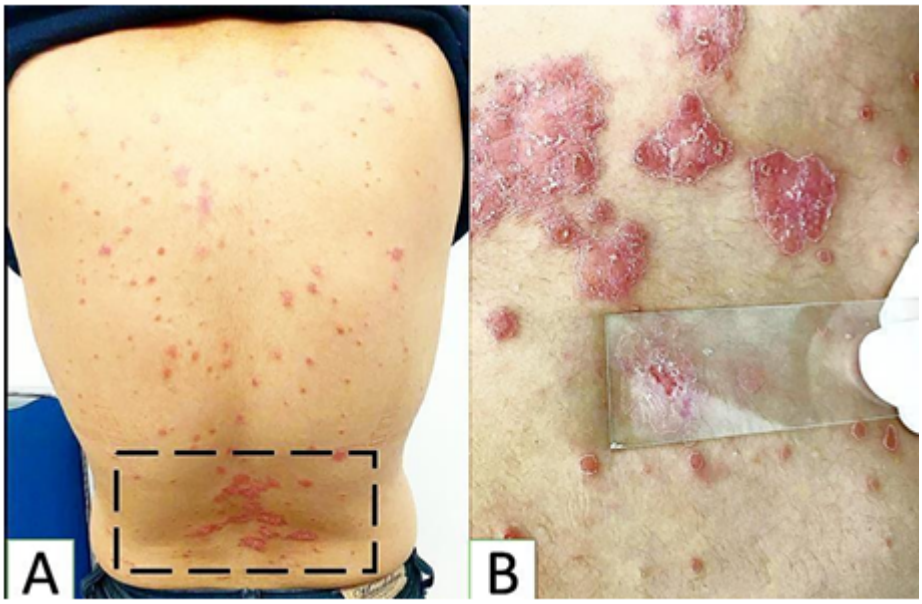

Figure 2. Auspitz sign examination on the back yielded positive results (pinpoint bleeding observed when scraping psoriasis scales). (A) whole back; (B) pinpoint bleeding

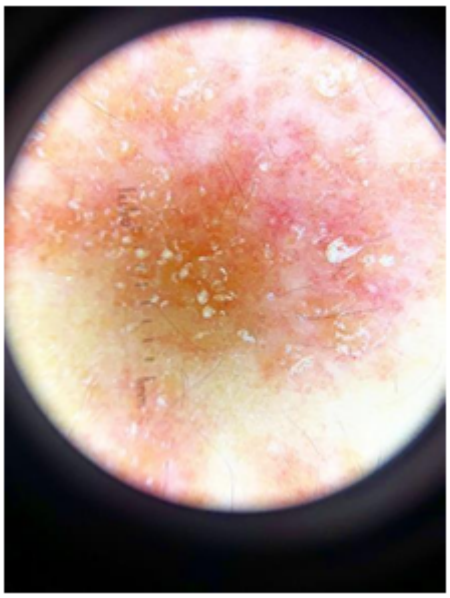

Figure 3. Dermoscopic examination shows the presence of white scales against a pink background

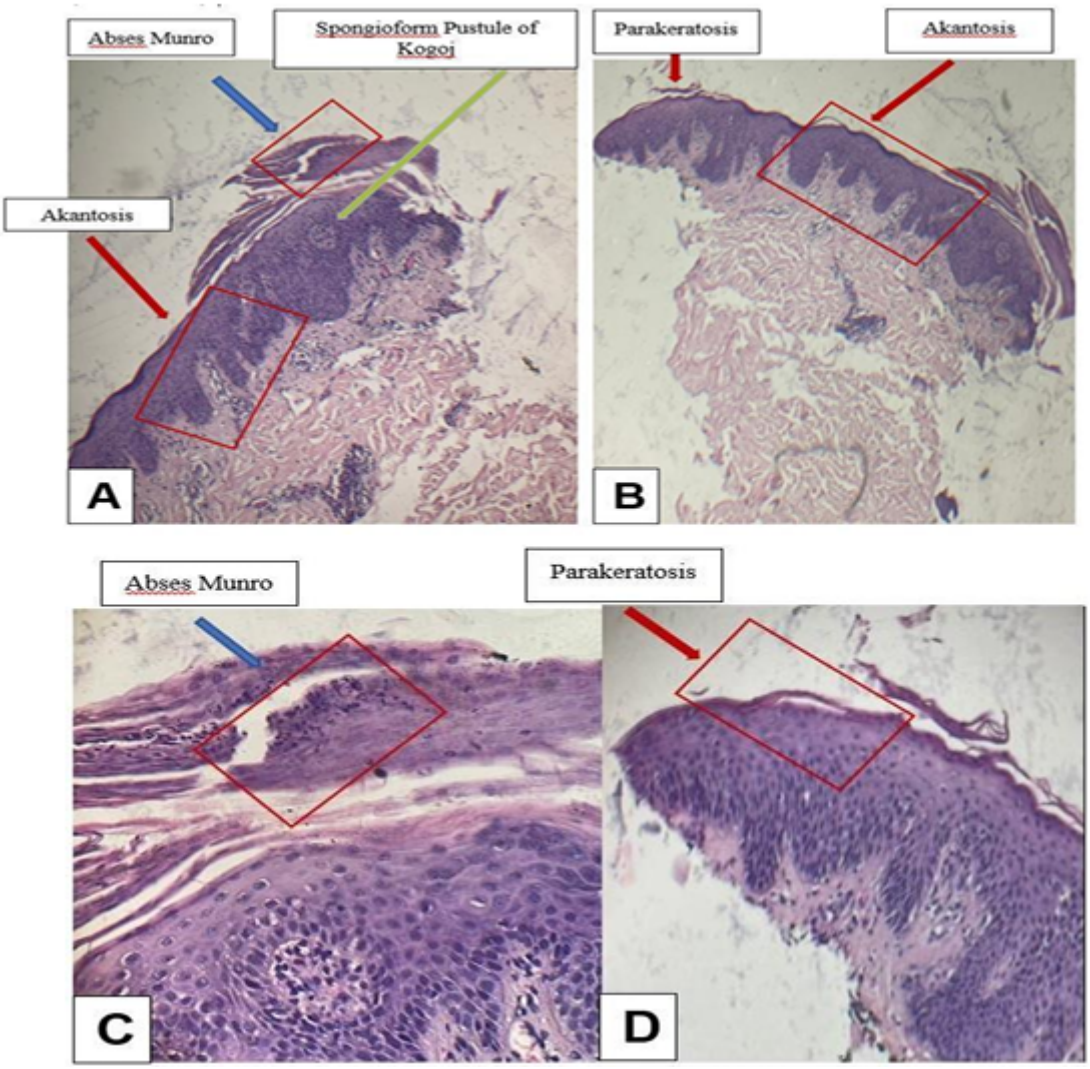

Figure 4. Histopathology of guttate psoriasis at 40x magnification

The patient was treated with cetirizine, hydrocortisone cream, desoximetasone cream, and ketoconazole shampoo. Follow-up showed improved erythema and scaling, with a reduced PASI score of 0.4 after four weeks.

3. Discussion

This Guttate psoriasis can occur in males and females, with no difference in incidence rates between genders. Generally, psoriasis has its onset peak between the ages of 20-30 and 50-60 years. [2,9]

During the anamnesis, the patient complained of sore throat, nausea, vomiting, and diarrhea. A throat swab examination was performed to identify the bacteria causing the infection, and *Enterobacter cloacae* bacteria were found. *Enterobacter cloacae* is a gram-negative bacillus that is a normal gut bacterium. However, it can become a pathogen and cause multiple organ infections.[10] Gut microbiota acts as a link between the immune system and the nervous system, known as the "gut-brain-skin axis," and is associated with the modulation of neurotransmitters by the microbiota. Gut microbiota neurotransmitters, such as dopamine, serotonin, or γ-aminobutyric acid (GABA), can be produced and/or consumed by various types of bacteria. The relationship between dopamine and psoriasis is related to 3 mechanisms. The first mechanism is associated with the immune system and the nervous system, through neurotransmitters such as dopamine. Dopamine modulates immune responses by affecting the local tissue environment, and for example, affecting the activation and migration of T cells. Immune cells utilize neurotransmitters to interact with each other, playing a role in regulating the inflammation process in psoriasis. The second mechanism involves stress, which as a trigger for psoriasis in 31-88% of cases. Additionally, psoriasis itself can lead to stress, making stress hormones, including dopamine, key regulators of the disease. During the patient's history-taking, she reported experiencing stress due to household issues. The third link between dopamine and psoriasis is its ability to enhance keratinocyte activity, contributing to the release of cytokines and chemokines.[11]

The diagnosis of guttate psoriasis is typically made through anamnesis and a dermatological examination, with supportive tests potentially assisting in the diagnosis. Dermatological examination of this patient, including the Auspitz sign, yielded positive results. Auspitz sign is the presence of pinpoint bleeding from the capillaries of the papillae beneath the psoriasis plaque scales, which are easily detached.[12]

The patient also underwent a dermoscopy examination, which showed the characteristic appearance of white scales against a pink background (Figure 3). White scales are distinct manifestations of psoriasis, and the histopathological appearance is orthokeratosis and parakeratosis. The presence of white scales in psoriasis has a diagnostic specificity of 83.8%, and they are present in 64.7-88.3% of psoriasis patients. Scaliness on the scalp (85%-100%) and palmar-plantar (84.6%- 100%) are the most prevalent sites, while scaling on the face (54.4%), intertriginous areas (13.2%-77.8%) and genitalia (0.0%) are relatively rare.[13]

Histopathological findings that can be found in psoriasis include regular elongation of rete ridges, dermal papillae elongation, dermal papillae oedema, blood vessel dilation, supra papillary thinning, absence of granular layer, intermittent parakeratosis, perivascular and dermal lymphocyte infiltrate, Kogoj abscess, and sometimes neutrophil aggregates in the stratum corneum (Munro microabscess).[14]

The patient was treated with systemic and topical therapy. Systemic therapy consisted of cetirizine 10 mg once daily to reduce pruritus. Topical therapy included 1% hydrocortisone cream for facial lesions, 0.25% desoximetasone cream combined with 10% urea cream for non-facial lesions, and ketoconazole shampoo for scalp involvement. Topical corticosteroids were selected as first-line therapy, with potency adjusted according to lesion location and severity. Ketoconazole shampoo was administered to manage scalp involvement and reduce potential inflammatory triggers.[15] Clinical follow-up demonstrated significant improvement, with marked reduction of erythema and scaling. The prognosis in this patient was favorable (quo ad vitam et functionam bonam), although psoriasis remains a chronic relapsing condition. Patient education regarding treatment adherence, regular follow-up, and avoidance of triggering factors, particularly psychological stress, was emphasized to reduce the risk of recurrence.[16]

4. Conclusion

This case demonstrates the intricate interplay between gut microbiota, stress, and skin inflammation in GP. Understanding the gut-brain-skin axis can provide new insights into psoriasis management and highlight the importance of addressing gut health and psychological well-being in treating skin diseases.

5. Conflict of Interest

All authors declare there are no conflicts of interest.

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