
ORIGINAL RESEARCH

PROFILE OF PSORIASIS VULGARIS PATIENTS TREATED WITH METHOTREXATE AT DR. SOETOMO HOSPITAL, SURABAYA, 2017–2018

Profil Pasien Psoriasis Vulgaris yang Mendapatkan Terapi Methotrexate di RSUD Dr. Soetomo Surabaya Periode 2017-2018

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ABSTRACT

Background: Psoriasis Vulgaris is a chronic inflammatory skin disease that affects patients' quality of life. Methotrexate is the first-line and most effective systemic therapy in psoriasis vulgaris management. **Purpose:** The aim of this study was to evaluate clinical improvement after methotrexate therapy and any adverse effects of methotrexate therapy in psoriasis vulgaris management. **Methods:** The data for this descriptive, retrospective study were retrieved from the medical records of 22 psoriasis vulgaris patients who were treated with methotrexate therapy between January 2017 and June 2018 in the Child Kemuning Ward (IRNA), Dr. Soetomo General Hospital in Surabaya, East Java. **Results:** Data for a total of 22 subjects were collected for this study. The majority of the subjects were in the age group 25–59, and the average age was 40.50±17.20. Good clinical improvement (decrease in the body surface area of the lesion) was found in all patients. The adverse effects of methotrexate were evaluated based on the elevation of liver and renal function test levels. An elevation of aspartate aminotransferase levels was found in 11 patients, and an elevation in alanine aminotransferase levels was found in 13 patients. Elevated blood urea nitrogen levels were found in eight patients, and elevated serum creatinine levels were found in four patients. **Conclusion:** Methotrexate is an effective treatment for severe psoriasis vulgaris management when administered with careful selection and regular monitoring of patients. Application of methotrexate therapy in accordance with the guidelines remains suitable for psoriasis vulgaris management with vigilance regarding methotrexate's adverse effects.

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ABSTRAK

Latar Belakang: Psoriasis Vulgaris merupakan penyakit kulit inflamasi kronik yang dapat menurunkan kualitas hidup pasien. Metotreksat merupakan terapi lini pertama yang efektif untuk psoriasis vulgaris. **Tujuan:** Penelitian ini bertujuan untuk mengevaluasi perbaikan klinis setelah terapi metotrexate dan efek samping terapi metotrexate pada psoriasis vulgaris. **Metode:** Data penelitian deskriptif retrospektif ini diambil dari data rekam medis 22 pasien psoriasis vulgaris yang mendapatkan terapi metotreksat pada Januari 2017 sampai dengan Juni 2018 di Instalasi Rawat Inap Anak (IRNA) Kemuning, Rumah Sakit Umum Daerah Dr. Soetomo Surabaya. Jawa Timur. **Hasil:** Mayoritas responden adalah kelompok usia 25 – 59 tahun, dengan rata-rata usia $40,50 \pm 17,20$ tahun. Perbaikan klinis (penurunan luas area lesi) tampak pada semua pasien. Efek samping metotrexate dievaluasi dari peningkatan level fungsi hati dan ginjal. Peningkatan kadar aspartate aminotransferase (AST) didapatkan pada 11 pasien, dan peningkatan level alanine aminotransferase (ALT) terjadi pada 13 pasien. Peningkatan level blood urea nitrogen (BUN) didapatkan pada 8 pasien, dan peningkatan level kreatinin serum didapatkan pada 4 pasien. **Kesimpulan:** Metotreksat merupakan terapi yang efektif pada psoriasis vulgaris berat, jika dilaksanakan dengan pemilihan yang cermat dan pemantauan pasien secara teratur. Penerapan terapi metotreksat harus dilakukan sesuai dengan pedoman untuk manajemen psoriasis vulgaris dengan kewaspadaan mengenai efek samping metotreksat.

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INTRODUCTION

Psoriasis is a chronic inflammatory skin disease of unknown etiology. The prevalence of psoriasis vulgaris in populations varies from 0.1%–11.80%. In the United States, 150,000 cases are diagnosed per year. Psoriasis vulgaris is significantly associated with psychological distress and impaired quality of life. The management of the condition aims not to cure the disease, but to control its clinical manifestation and to improve patients' quality of life and their level of acceptance of the disease. Based on the body surface area of the lesion, about 25% of psoriasis vulgaris cases are moderate-to-severe cases that require systemic therapy or phototherapy. Methotrexate is the first-line systemic therapy in psoriasis vulgaris management. It is an effective therapy that can reduce the severity of the disease by at least 50% in more than 75% of patients. Unfortunately, methotrexate also the potential to

cause adverse effects, so special consideration is needed when prescribing methotrexate therapy to patients (Arakawa, Arakawa, Vural, Mahajan, & Prinz, 2019; Czarnecka-Operacz & Sadowska-Przytocka, 2014; Gudjonsson & Elder, 2019; Shaikh, Sardar, Raj, & Jariwala, 2018).

Methotrexate can cause several adverse effects, including hepatotoxicity (can cause hepatic fibrosis when chronic), myelosuppression, pulmonary fibrosis, and severe skin reactions. The occasional adverse effects of methotrexate therapy include fever, chills, depression, and opportunistic infections. Methotrexate therapy rarely causes severe toxicity such as nephrotoxicity (Gudjonsson & Elder, 2019; Nast et al., 2015; Shaikh, Sardar, Raj, & Jariwala, 2018; West et al., 2017). The current research was carried out as a descriptive–retrospective study. The aim was to evaluate the effectiveness and adverse effects of methotrexate therapy in psoriasis vulgaris management.

METHOD

This research took the form of a descriptive–retrospective study. The data for the study were secondary data taken from patients’ medical record. All medical records of psoriasis vulgaris patients who received methotrexate therapy between January 2017 and June 2018 in the Kemuning Ward at the Dr. Soetomo General Hospital, Surabaya, were retrieved. Demographic information, anamnesis, physical examinations, laboratory examinations, and treatment were evaluated in this study. Ethical clearance for this study was approved by the Ethical Committee of Dr. Soetomo General Hospital, Surabaya (# 0465/KEPK/VIII/2018).

The samples in this study were retrieved from among 311 patients hospitalized in the Kemuning Ward at Dr. Soetomo General Hospital, Surabaya, between January 2017 and June 2018 who fulfilled the inclusion criteria of being psoriasis vulgaris patients who were given methotrexate therapy in this ward during the study period. All data are presented in a frequency table. The demographic information retrieved for this study comprised gender and age group. The age group classification in this study was based on the World Health Organization’s age classification. The anamnesis data were the trigger factors of psoriasis vulgaris, such as infection and the patient’s history of medication. Clinical manifestation was evaluated based on Psoriasis Area Severity Index (PASI) score and progression of the lesion. The laboratory examination data were liver and renal function test results. The treatment of psoriasis vulgaris patients was classified into systemic therapy and topical therapy. Methotrexate therapy in psoriasis vulgaris management was the main systemic therapy examined in this study, by evaluating the clinical improvement of the psoriatic lesion and any liver and renal function test elevation after methotrexate therapy.

RESULTS

The medical records of all psoriasis vulgaris patients who were given methotrexate therapy between January 2017 and June 2018 in the Kemuning Ward at Dr. Soetomo General Hospital, Surabaya, were retrieved, and 22 subjects were collected. Eight of the subjects were women, and the other 14 subjects were men. As Table 1 shows, the majority age group was 25–59 (63.64%), and the average age was 40.5 ± 17.2 years (Table 1).

There were six subjects who had an infection (dental infection, upper respiratory infection, ear infection) as a trigger factor. Three patients had a history of oral administration of traditional medicine. The PASI scores of all subjects were above 30%, meaning that the patients were indicated to receive systemic and topical treatment.

Table 1

Age group of psoriasis vulgaris patients who were given methotrexate therapy

Age group (years old)	Number of patients
< 14	1
14-24	4
25-29	14
> 60	3
Total	22

As shown in Table 2, all of the patients were given an antihistamine orally, and 14 patients were given folic acid orally, after receiving methotrexate therapy. All of the patients in the sample were indicated to receive methotrexate therapy because their PASI scores were above 30%. All of the patients received a topical corticosteroid, and 13 patients had moisturizer applied. The topical corticosteroids that were given to the patients were desoximethasone cream, desonide lotion, and mometasone cream. The moisturizers were urea 10% cream, oleum cocos, and Vaseline album (Table 2). Good clinical improvement, indicated by progression of the lesion, was observed in all patients (100%), with a zero mortality rate.

Table 2.

Systemic and Topical Treatment

Treatment	Number of patients	
	n	%
Systemic treatment		
Methotrexate	22	100.00
Folic acid	14	63.64
Antihistamine	22	100.00
Topical treatment		
Corticosteroid	22	100.00
Moisturizer	13	59.10

* Patients may have received more than one treatment.

Methotrexate was given at 0.1–0.3 mg/kg body weight/week. Each of the 21 adult subjects (95.5%) was given 15 mg/week, and one child subject was given 7.5 mg/week. As shown in Table 3, the majority of the patients were given

methotrexate per-orally (90.90%), and only two subjects were given methotrexate parenterally, due to availability of preparations. A total of 13 subjects (59.10%) showed a good clinical response after one cycle of methotrexate (Table 3).

Table 3
Methotrexate Dose

Methotrexate	Number of patients	
	n	%
Dose (mg/week)		
15 mg/ week	21	95.50
7.50 mg/ week	1	4.50
Route of administration		
Per-oral	20	90.90
Parenteral	2	9.10
Number of cycle		
1 cycle	13	59.10
2 cycle	8	36.40
3 cycle	0	0.00
4 cycle	0	0.00
5 cycle	1	4.50

The adverse effects of methotrexate in this study were evaluated based on the elevation of liver and renal function test levels. The liver function test was evaluated based on aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels, and the renal function test was evaluated from blood urea nitrogen (BUN) and serum creatinine levels (Table 4).

Elevation of AST levels was found in 11 patients (50%). Among these, the level increased by less than 25% in four patients, by 25%–50% in two patients, by 51%–75% in three patients, and by more than 76% in two patients. Elevation to an abnormal AST level was found in 5 of these 11 patients, and the average elevation was 49.40% (Table 4).

Table 4
Elevation of AST Level of Psoriasis Patients who Received Methotrexate Therapy

Elevation of AST level	Number of patients	
	n	%
Increased < 25%	4	18.18
Increased 25-50%	2	9.09
Increased 51-75%	3	13.64
Increased > 75%	2	9.09

Elevation of ALT levels was found in 13 patients (59.09%). The ALT level increased by

less than 25% in five patients, by 25%–50% in three patients, by 51%–75% in one patient, and by more than 76% in four patients. Elevation to an abnormal ALT level was found in 7 of these 13 patients, and the average elevation was 58.90% (Table 5).

Elevation of BUN levels was found in eight patients (36.36%), but all of the values were still in the normal BUN level range. The BUN level increased by less than 25% in one patient, by 25%–50% in one patient, by 51%–75% in three patients, and by more than 76% in three patients. The average elevation of BUN level was $68.10 \pm 30.80\%$ (Table 5).

Elevation of serum creatinine levels was found in four patients (18.18%), and two of them were still in the normal range. The serum creatinine level increased by 25%–50% in three patients and by 51%–75% in one patient. The average elevation of serum creatinine level was $44.8 \pm 18.8\%$ (Table 5).

Table 5
ALT Level Elevation in Psoriasis Patients who Received Methotrexate Therapy

Elevation of ALT level	Number of patients	
	n	%
Increased less than 25%	5	22.73
Increased 25-50%	3	13.64
Increased 51-75%	1	4.55
Increased more 75%	4	18.18

DISCUSSION

Psoriasis vulgaris is a chronic inflammatory skin disease that considerably decreases patients' quality of life, especially in moderate to severe cases. A severe case is defined by the Food and Drug Administration as extensive or disabling psoriasis vulgaris (Arakawa, Arakawa, Vural, Mahajan, & Prinz, 2019; Elango et al., 2017).

There are three main histopathology features of psoriasis vulgaris. The first is hyperplasia of the epidermal layer or acanthosis. Acanthosis is characterized by abnormality of keratinocyte differentiation and a decrease of keratinocyte apoptosis in the epidermal layer. The second feature is dilatation and prominence of blood vessels in the dermal layer, and the third feature is infiltration of leukocytes, especially in the dermal layer (Elango et al., 2017; Gudjonsson & Elder, 2019; West, Ogston, & Foerster, 2016).

The basic clinical manifestation of psoriasis vulgaris is a sharply marginated, erythematous

plaque, covered with white scale. The size of the lesion can vary from pinpoint papule to plaque. The Auspitz sign is the pathognomonic sign in psoriasis vulgaris. It appears when the thick white scale is removed, and it traumatizes the dilated capillaries below the scale. The Koebner phenomenon or the isomorphic response is the traumatic induction of psoriasis vulgaris on nonlesional skin. The Koebner reaction typically occurs 7–14 days after the trauma of the nonlesional skin. The Koebner phenomenon does not always exist in psoriasis vulgaris cases, but it can be valuable in confirming a diagnosis when present (Gudjonsson & Elder, 2019).

The pitting nail lesion is a characteristic type of lesion for chronic psoriasis vulgaris. Psoriasis vulgaris lesions usually tend to become symmetrical, and psoriasis vulgaris can spread to become erythematous lesions across more than 90% of the body surface area, known as erythroderma (Gudjonsson & Elder, 2019).

In this study, there were six subjects who had infection as trigger factors. Human Leukocyte Antigen-C (HLA-C) is the major risk factor for psoriasis vulgaris, based on fine mapping, genetic linkage, and association studies. HLA-Cw6 presents antigens to CD8+ T cells and is a good candidate for functional involvement in psoriasis. One cohort study has reported that streptococcal pharyngitis is the only infection that acts as a trigger factor for psoriasis. At least 80% of T cells in the epidermis of psoriatic lesion are CD8+ T cell. In the epidermal layer, CD8+ T cells play a role in the binding of peptides to HLA-Cw6 on the surface of dendritic cells or keratinocytes. Meanwhile, CD4+ T cells play a role in the processing and the presentation of intracellular viral components and tumor antigens in the cross-priming process. CD4+ and CD8+ memory T cells can across the skin, lymph nodes, and blood. This explains the distribution of psoriatic lesions, which tend to recur in the same place after clinical improvement (Gudjonsson & Elder, 2019; West et al., 2017).

The management of psoriasis vulgaris is divided into three categories based on the percentage of the body surface area (BSA) affected: systemic therapy, topical therapy, and phototherapy. Patients with lesion areas of less than 10% of their BSA are recommended for topical therapy. The first-line topical therapies are emollients, corticosteroids, and vitamin D3 analogs, and the second-line topical therapies are salicylic acid, dithranol, tazarotene, and tar. Phototherapy is indicated for patients with lesion

areas of more than 10% of their BSA. Systemic therapy is indicated for patients with lesion areas of more than 30% of their BSA. First-line systemic therapies are methotrexate, acitretin, and biologic agents, and the second-line systemic therapy is cyclosporin. Combination therapy is applied in order to decrease the adverse effects and toxicity of the drugs (Gudjonsson & Elder, 2019).

Patients with HLA-Cw6 show more severe psoriasis and an earlier age of lesion onset. A cohort study of patients with HLA-Cw6 who received methotrexate therapy showed that the therapeutic effect of this treatment in patients with HLA-Cw6 was significantly higher than in patients who were HLA-Cw6 negative, and that this effect was more pronounced in a sub-group without psoriasis arthritis (West et al., 2017). A study conducted by Elango et al (2017) showed that methotrexate therapy induced an intrinsic apoptotic pathway and achieved a good therapeutic response in psoriasis vulgaris by controlling the acanthosis.

All patients in the current study showed good clinical improvement (determined from progression of the lesion) after receiving methotrexate treatment, with a zero mortality rate. Methotrexate remains an essential agent for psoriasis treatment and is associated with low costs, low incidence of toxicity, and easy availability, especially in developing countries (Cheng & Rademaker, 2018).

Methotrexate, as a first-line systemic therapy in psoriasis vulgaris management, is given systemically. It can be given via the oral or parenteral (intramuscular injection or subcutaneous injection) routes. The dose of methotrexate is increased gradually. The first dose is a test dose from 2.50 mg, and the dose is then gradually increased until a therapeutic level is achieved. The average therapeutic range level is 10–15 mg weekly, with a maximum weekly dose of 25–30 mg. Methotrexate (MTX) (C₂₀H₂₂N₈O₅) is a derivative of aminopterin, an analog and antimetabolite of folic acid. Methotrexate has anti-inflammatory, antimetabolite, and antiproliferative effects. It enters the cell through the reduced folate carrier and is modified by the addition of six glutamates, forming active MTX-Gln. The mechanism of action of methotrexate in psoriasis vulgaris is inhibiting epidermal hyperproliferation by blocking dihydrofolate reductase, leading to inhibition of purine and pyrimidine synthesis. It also blocks accumulation of anti-inflammatory adenosine (Ahmadzadeh, Zamani, Hassanian-

Moghaddam, Hadeiy, & Parhizgar, 2019; Czarnecka-Operacz & Sadowska-Przytocka, 2014; Gudjonsson & Elder, 2019; Nast et al., 2015; Warren et al., 2016).

It is challenging to choose a suitable and acceptable treatment for psoriasis vulgaris that has a good safety profile and is effective (Czarnecka-Operacz & Sadowska-Przytocka, 2014). Methotrexate is the first-line and most effective systemic therapy in psoriasis vulgaris management, but it has the potential to cause some adverse effects. Although it has been used for decades to treat psoriasis vulgaris, limited research regarding its use in treating the condition has been carried out. The incidence of adverse effects associated with methotrexate treatment is approximately 78% (Conway & Carey, 2017; Czarnecka-Operacz & Sadowska-Przytocka, 2014; Gudjonsson & Elder, 2019).

Methotrexate therapy rarely causes severe toxicity (e.g., renal toxicity, liver fibrosis, and cirrhosis), and it very rarely causes interstitial pneumonia and alveolitis, but it may be life-threatening (Gudjonsson & Elder, 2019; Madke & Singh, 2015; Nast et al., 2015; Shaikh, Sardar, Raj, & Jariwala, 2018; West et al., 2016).

The low-dose methotrexate regimen has become a mainstay treatment for a variety of immune-mediated diseases, including psoriasis vulgaris, because of its efficacy and acceptable safety profile (West et al., 2016). A study by Kivity et al (2014) showed that the most common adverse effects of low-dose methotrexate were gastrointestinal problems. Methotrexate can also, however, cause severe toxicity that may lead to mortality in patients receiving this type of therapy.

Discontinuation of methotrexate therapy caused by the adverse events occurs in one-third of psoriasis vulgaris and psoriasis arthritis patients. Most of these patients discontinue methotrexate therapy due to gastrointestinal symptoms. The adverse events of methotrexate therapy on the liver and bone marrow are potentially life threatening; therefore, it is recommended to monitor blood counts and liver function test results regularly (Vollenbroek, Doggen, Janssens, & Moens, 2018).

There are several risk factors for methotrexate-induced hepatotoxicity. A history of moderate to severe alcohol consumption, persistently abnormal liver function tests, a history of liver disease (including hepatitis), and family history of liver disease are some of these factors. Patients with diabetes, obesity, and hyperlipidemia also have greater risk of this complication (Labadie & Jain, 2019).

The rates of liver blood elevation reported during methotrexate treatment vary. Cumulative incidences of 48.90% for elevated transaminases and 16.80% for transaminases elevated to more than twice the upper limit of the normal range have been reported, however, the risk of serious adverse liver events still appears extremely low with an appropriate methotrexate treatment monitoring protocol. Long-term follow-up needs to be carried out for patients showing elevation in their liver function tests. A large increase in liver function test results associated with methotrexate is rare, and the medication should be stopped in such cases (Conway & Carey, 2017).

Pharmaco-economic considerations related to using methotrexate in psoriasis vulgaris management are very important when deciding on therapy. Methotrexate is the first-line therapy for psoriasis vulgaris. It is inexpensive, easily available, and presents a low incidence of toxicity with regular monitoring. Methotrexate is only to be replaced by a more costly biologic agent if it is found to be ineffective, poorly tolerated, or contraindicated (Cheng & Rademaker, 2018; West et al., 2016).

In this study, the adverse effects of methotrexate were evaluated based on the elevation of liver and renal function test levels. Elevation of AST levels was found in 11 patients (50%), and elevation of ALT levels was found in 13 patients (59.09%). Elevation of the BUN level was found in eight patients (36.36%), and elevation of the serum creatinine level was found in four patients (18.18%). Methotrexate has a very long half-life. The relationship between renal elimination and the different durations of plasma and intracellular methotrexate half-life plays an important role in methotrexate toxicity. The elimination of methotrexate occurs primarily through renal clearance, involving glomerular filtration and active tubular secretion. The plasma half-life of methotrexate for low-dose treatment is 8–10 hours. All conditions that impair the elimination of methotrexate may increase the uptake and accumulation of the drug, and thus prolong its elimination (Czarnecka-Operacz & Sadowska-Przytocka, 2014; Gudjonsson & Elder, 2019; Nast et al., 2015; Weidmann, Foulkes, Kirkham, & Reynolds, 2014).

Three major conditions that may prolong the elimination and the half-life of methotrexate are pre-existing renal impairment, nephrotoxicity of the methotrexate itself, and drug–drug interactions interfering with renal secretion of the methotrexate. Renal impairment may increase time

exposure and cellular uptake of methotrexate, thereby increasing intracellular concentration. This condition increases intracellular accumulation of methotrexate, which can increase the risk of myelosuppression and other adverse effects. Methotrexate is secreted through the renal and urinary tracts; therefore, it should not be given to patients with renal function impairment. The toxicity of methotrexate is dose-related. It is a slow-acting drug that may take several weeks to achieve complete clinical response for any given dose. A key cause of toxicity is concurrent treatment with interacting agents, such as proton-pump inhibitors, that can decrease protein binding or reduce renal clearance (Arakawa, Arakawa, Vural, Mahajan, & Prinz, 2019; Gudjonsson & Elder, 2019; Nast et al., 2015; Weidmann, Foulkes, Kirkham, & Reynolds, 2014).

Gisoni, Pezzolo, & Girolomoni (2019) conducted a study in 51 cases of chronic plaque psoriasis treated with methotrexate and 49 patients treated with cyclosporine. After six months of therapy, they determined that methotrexate was less nephrotoxic than cyclosporine. The glomerular filtration rate did not show any significant reduction in those receiving six months' continuous treatment with methotrexate. Special consideration should be taken when methotrexate is given to geriatric patients, for whom the doses should usually be lower and regular monitoring of kidney function should be carried out (Conway & Carey, 2017; Nast et al., 2015).

Patients receiving methotrexate therapy should be divided into two categories based on their risk factors for liver injury, according to the American College of Rheumatology. The risk factors include current or past alcohol consumption, persistent abnormality of liver function test levels, personal or family history of liver disease, exposure to hepatotoxic drugs, diabetes mellitus, obesity, and hyperlipidemia. Patients without these risk factors are not asked to undergo liver biopsy until they have reached a cumulative dose 3.5–4 gr, but patients with one or more risk factors are asked to undergo liver biopsy before treatment or at 2–6 months of treatment, and at each cumulative dose of 1–1.50 gr (Gudjonsson & Elder, 2019).

The assessment of the risk of severe liver damage from methotrexate and the recommendations for screening range from regular serum liver function tests to liver biopsy, according to time and dose intervals. Treatment for

long durations with low doses of methotrexate appears to be safe in selected patients who have no risk factors for cumulative liver toxicity, and liver biopsy has become the standard for liver fibrosis and cirrhosis detection. Nevertheless, recent studies have suggested that liver fibrosis is not related to any threshold cumulative methotrexate dose, and it would be more likely to occur in patients with concomitant risk factors (Arakawa, Arakawa, Vural, Mahajan, & Prinz, 2019; Nast et al., 2015; Yélamos & Puig, 2015).

It is recommended to perform clinical, physical, and laboratory examinations to rule out the risk factors that may increase the likelihood of adverse effects, such as hepatotoxic risk factors, renal insufficiency, serious infection, or pregnancy. Renal function tests, liver function tests, and complete blood counts should be performed two weeks after the initial treatment with methotrexate and every three months thereafter. Liver function tests should be performed with three to five days before and after initial treatment because methotrexate can cause transient elevation of ALT and AST levels (Gudjonsson & Elder, 2019; Nast et al., 2017; Shaikh, Sardar, Raj, & Jariwala, 2018; Weidmann, Foulkes, Kirkham, & Reynolds, 2014).

Research Limitations

As this was a retrospective study, the limited number of subjects in this research was the major limitation. The study only included psoriasis vulgaris patients who were hospitalized and received methotrexate treatment during the study period. Another limitation of the study was that some patients' medical records only reported the progression of the lesion after treatment and did not provide the PASI score. In the future, a prospective study should be carried out to elucidate the effectivity and adverse effects of methotrexate treatment in psoriasis vulgaris management.

CONCLUSION

Methotrexate is an effective treatment for severe psoriasis vulgaris management when administered with careful selection and regular monitoring of patients. Administration of methotrexate according to the guidelines still has a place in the management of psoriasis vulgaris, as long as there is consideration of the adverse effects, especially in the elevation of renal and liver function test levels.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

AUTHOR CONTRIBUTION

DD: conceptualization, methodology, writing. KDP: data curation, original draft preparation. WTN: software.

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