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Correlation Between Autoimmune Disease Recurrence with Vitamin D

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ABSTRACT

Vitamin D plays an important role in immune regulation and may influence the clinical course of autoimmune diseases. However, evidence regarding vitamin D status and its relationship with demographic characteristics, clinical factors, and disease recurrence remains limited in Indonesian clinical settings. This study aimed to evaluate vitamin D status and analyze its associations with demographic and clinical characteristics and patient outcomes among autoimmune patients at Fatmawati General Hospital, Jakarta. An analytical observational study with a retrospective cross-sectional design was conducted using medical records from 2022 to 2025. A total of 135 eligible patients were included through total sampling. Data on sex, age, autoimmune disease type, treatment duration, serum vitamin D status, and clinical outcomes were analyzed using descriptive statistics and the Chi-square test or Fisher's Exact Test, as appropriate, with statistical significance set at $p < 0.05$. Most patients were female (87.4%), aged over 55 years (28.1%), and diagnosed with rheumatoid arthritis (39.3%), followed by systemic lupus erythematosus (37.8%). Normal vitamin D status was identified in 31.9% of patients, while 31.1% had vitamin D insufficiency, 18.5% had deficiency, and 18.5% had excess levels. Age ($p = 0.012$) and type of autoimmune disease ($p < 0.001$) were significantly associated with vitamin D status, whereas sex ($p = 0.105$) and treatment duration ($p = 0.881$) were not. Treatment duration was significantly associated with clinical outcomes ($p < 0.001$), while autoimmune disease type showed no significant association with outcomes ($p = 0.227$). These findings highlight the importance of monitoring vitamin D status, particularly among older patients and individuals with specific autoimmune conditions. However, the relationship between vitamin D status and autoimmune disease recurrence could not be established because it was not directly analyzed. Further prospective studies are needed to investigate this relationship and identify additional factors influencing vitamin D status and clinical outcomes.

Keyword: *autoimmune disease, vitamin D status, recurrence, treatment duration, clinical factors.*

Introduction

Autoimmune diseases are chronic disorders characterized by immune dysregulation in which the immune system mistakenly attacks healthy tissues, resulting in inflammation and progressive organ damage (Conrad et al., 2023; Xiao et al., 2021). Women are disproportionately affected, accounting for approximately 80% of autoimmune disease cases because of hormonal, genetic, and immunological influences (Conrad et al., 2023).

Although numerous studies have investigated vitamin D in autoimmune diseases, most have focused on specific diseases or populations outside Indonesia (Athanassiou et al., 2023; Ho et al., 2024). Data describing the distribution of vitamin

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D status among autoimmune patients treated in been recognized not only for its role in calcium homeostasis but also as an important immunomodulatory hormone. The active metabolite, calcitriol, regulates both innate and adaptive immune responses through its effects on dendritic cells, macrophages, and T lymphocytes (Bouillon et al., 2022; Koesnoe et al., 2022). Vitamin D deficiency has therefore been associated with several autoimmune diseases, including systemic lupus erythematosus, rheumatoid arthritis, and multiple sclerosis (Wardani, 2023; Ho et al., 2024).Indonesian tertiary referral hospitals remain limited, indicating the need for further investigation.

Fatmawati General Hospital is a national tertiary referral and teaching hospital that manages patients with various autoimmune diseases and routinely performs serum 25-hydroxyvitamin D examinations. Therefore, evaluating vitamin D status in this population may provide valuable information to support patient management and future research.

Vitamin D status may be influenced by several factors, including age, sex, nutritional intake, sunlight exposure, comorbidities, and the type of autoimmune disease. In addition, differences in disease activity, immune mechanisms, and long-term medication use may contribute to variations in vitamin D levels among patients. For example, glucocorticoids and other immunosuppressive therapies may affect bone and mineral metabolism, making the assessment of vitamin D status clinically relevant in patients receiving prolonged treatment. However, the relationship between vitamin D levels and autoimmune disease manifestations is complex and may vary according to individual characteristics and the specific disease. Therefore, evaluating vitamin D status alongside demographic and clinical characteristics is important for understanding the distribution of vitamin D levels in autoimmune patient populations.

Despite growing interest in the immunomodulatory effects of vitamin D, its clinical implications in patients with autoimmune diseases remain an important area of investigation. Identifying the prevalence of vitamin D deficiency, insufficiency, normal levels, and excess can help clinicians recognize patterns that may require further assessment. Furthermore, examining the associations between vitamin D status and factors such as age, sex, autoimmune disease type, and treatment duration may provide a more comprehensive understanding of patients' clinical profiles. Nevertheless, cross-sectional findings can only demonstrate associations and cannot establish causal relationships or determine whether vitamin D status directly influences disease recurrence. A clearer understanding of these factors may support more informed clinical monitoring and provide a foundation for future longitudinal studies.

Based on this background, the present study aimed to describe vitamin D status among patients with autoimmune diseases treated at Fatmawati General

Hospital, Jakarta, and to analyze its association with selected demographic and clinical characteristics. Specifically, the study examined the relationships between vitamin D status and age, sex, autoimmune disease type, and treatment duration, as well as the association of clinical outcomes with relevant patient characteristics. By providing data from an Indonesian tertiary referral hospital, this study is expected to contribute to the limited local evidence on vitamin D status in autoimmune populations. The findings may also serve as a reference for further research into the potential role of vitamin D in autoimmune disease management, including prospective investigations specifically designed to assess disease activity and recurrence.

Methods

This study employed an observational analytic design with a retrospective cross-sectional approach to evaluate vitamin D status among autoimmune patients treated at Fatmawati General Hospital, Jakarta, Indonesia. Secondary data were obtained from patients' medical records collected during the period of 2022–2025. A total sampling technique was applied, and all medical records meeting the predetermined inclusion and exclusion criteria were included in the analysis, resulting in a total sample of 135 patients.

The study included patients aged 18 years or older who had been diagnosed with autoimmune diseases and had complete medical records, including serum vitamin D examination results. Patients with pregnancy, HIV/AIDS, malignancy, or incomplete medical records were excluded from the study. The variables analyzed consisted of sex, age, autoimmune disease type, duration of treatment, vitamin D status, and clinical outcome. Vitamin D status was classified according to the laboratory reference values used in this study into deficiency, potential insufficiency, normal, and excess categories.

Data collection was performed after obtaining ethical approval and institutional permission from Fatmawati General Hospital. Information regarding patient demographics, diagnosis of autoimmune disease, laboratory results of serum vitamin D, duration of treatment, and clinical outcomes was extracted from the medical records using a standardized data collection form. All personal identifiers were removed before data processing to maintain patient confidentiality.

The collected data were coded and entered into Microsoft Excel before being analyzed using IBM SPSS Statistics. Descriptive analysis was performed to describe the characteristics of the study population by presenting categorical variables as frequencies and percentages. Associations between categorical variables were analyzed using Pearson's Chi-square test. When the assumptions for the Chi-square test were not fulfilled because of small expected cell frequencies, Fisher's Exact test

or Fisher–Freeman–Halton Exact test with Monte Carlo simulation was applied. Statistical significance was established at a two-sided p-value of less than 0.05.

Result and Discussion

Table 1. Baseline Characteristics of the Study Population

Variable	n	%
Sex		
Female	118	87.4
Male	17	12.6
Age Group		
18–24 years	22	16.3
25–33 years	22	16.3
34–44 years	18	13.3
45–54 years	35	25.9
>55 years	38	28.1
Autoimmune Disease		
Rheumatoid arthritis	53	39.3
Systemic lupus erythematosus	51	37.8
Sjögren syndrome	11	8.1
Autoimmune thyroiditis	9	6.7
Autoimmune hepatitis	6	4.4
Systemic connective tissue disease	5	3.7

Table 2. Distribution of Vitamin D Status

Vitamin D Status	n	%
Deficiency	25	18.5
Insufficiency	42	31.1
Normal	43	31.9
Excess	25	18.5
Total	135	100.0

This study evaluated the vitamin D status among autoimmune patients treated at Fatmawati Hospital. The majority of participants were female (87.4%), with the largest age group being patients older than 55 years (28.1%). Rheumatoid arthritis was the most common autoimmune disease (39.3%), followed by systemic lupus erythematosus (37.8%). Nearly half of the study population (49.6%) had suboptimal vitamin D status, including vitamin D deficiency and insufficiency.

The predominance of female patients in this study is consistent with the epidemiology of autoimmune diseases. Autoimmune disorders occur more

frequently in women due to differences in sex hormones, immune responses, and genetic factors. Estrogen has been shown to enhance immune activity, whereas genes located on the X chromosome contribute to stronger immune responses in females. These biological mechanisms partly explain the higher prevalence of autoimmune diseases among women compared with men.

The highest proportion of participants was observed in patients aged over 55 years. Aging is associated with immunosenescence, chronic low-grade inflammation, and reduced cutaneous synthesis of vitamin D. Older adults are also more likely to experience decreased outdoor activity and reduced dietary intake of vitamin D, which may contribute to inadequate vitamin D status.

Rheumatoid arthritis and systemic lupus erythematosus were the predominant autoimmune diseases identified in this study. This finding is in agreement with previous epidemiological studies reporting that these conditions are among the most prevalent autoimmune diseases worldwide. Both disorders are characterized by chronic immune dysregulation and persistent inflammatory activity, conditions in which vitamin D has been suggested to play an immunomodulatory role.

Regarding vitamin D status, approximately one-half of the patients had vitamin D deficiency or insufficiency. Vitamin D plays an important role in regulating both innate and adaptive immune responses. Deficiency may impair immune tolerance by reducing regulatory T-cell function while promoting pro-inflammatory cytokine production, potentially contributing to autoimmune disease activity. Nevertheless, the relatively high proportion of patients with normal or even elevated vitamin D levels observed in this study may reflect routine vitamin D supplementation prescribed as part of autoimmune disease management.

Overall, these findings indicate that suboptimal vitamin D status remains common among autoimmune patients despite ongoing treatment. Therefore, regular monitoring of serum vitamin D levels may be beneficial to identify patients at risk of deficiency and to support individualized management strategies.

Table 3. Association Between Sex and Vitamin D Status

Sex	Deficiency	Insufficiency	Normal	Excess	Total	*p*-value
Male	7	3	4	3	17	0.105
Female	18	39	39	22	118	
Total	25	42	43	25	135	

Results

Table 3 presents the association between sex and vitamin D status among autoimmune patients. Fisher's Exact test showed no statistically significant association between sex and vitamin D status (p = 0.105). Although female patients accounted for most of the study population, the distribution of vitamin D status was relatively similar between male and female patients, indicating that vitamin D status did not differ significantly according to sex.

Discussion

The present study demonstrated that sex was not significantly associated with vitamin D status among autoimmune patients. Although autoimmune diseases predominantly affect women, vitamin D deficiency was observed in both male and female patients. This finding suggests that biological sex alone is unlikely to determine vitamin D status in autoimmune diseases. Instead, vitamin D concentrations may be influenced by various factors, including sunlight exposure, dietary intake, vitamin D supplementation, disease severity, corticosteroid therapy, and other environmental factors. The predominance of female patients observed in this study is consistent with the epidemiology of autoimmune diseases, which are more prevalent in women because estrogen enhances humoral immune responses and increases susceptibility to autoimmune disorders. Nevertheless, these hormonal differences do not necessarily result in different vitamin D status between sexes.

Table 4. Association Between Age and Vitamin D Status

Age Group	Deficiency	Insufficiency	Normal	Excess	Total	*p*-value
18–24 years	9	1	8	4	22	0.012
25–33 years	3	8	7	4	22	
34–44 years	7	3	6	2	18	
45–54 years	3	12	12	8	35	
>55 years	3	18	10	7	38	
Total	25	42	43	25	135	

Results

Table 4 shows a statistically significant association between age and vitamin D status among autoimmune patients (p = 0.012). Patients in the older age groups, particularly those aged over 55 years, exhibited a higher proportion of vitamin D insufficiency compared with younger patients, indicating that age may influence vitamin D status.

Discussion

Age was significantly associated with vitamin D status in this study. Older individuals are more likely to experience vitamin D insufficiency because aging reduces the skin's capacity to synthesize vitamin D following ultraviolet-B exposure. In addition, renal conversion of vitamin D into its active form decreases with age, while reduced outdoor activities and the presence of chronic illnesses further contribute to inadequate vitamin D levels. These physiological changes may explain why older autoimmune patients in this study were more likely to have suboptimal vitamin D status. Therefore, routine monitoring of vitamin D concentrations should be considered, particularly in elderly patients with autoimmune diseases.

Table 5. Association Between Type of Autoimmune Disease and Vitamin D Status

Autoimmune Disease	Deficiency	Insufficiency	Normal	Excess	Total	*p*-value
Rheumatoid arthritis	6	18	18	11	53	<0.001
Systemic lupus erythematosus	15	17	12	7	51	
Sjögren syndrome	1	3	5	2	11	
Autoimmune thyroiditis	1	2	5	1	9	
Autoimmune hepatitis	1	1	2	2	6	
Systemic connective tissue disease	1	1	1	2	5	
Total	25	42	43	25	135	

Results

Table 5 demonstrates a statistically significant association between the type of autoimmune disease and vitamin D status ($p < 0.001$). Vitamin D deficiency and insufficiency were most frequently observed among patients with rheumatoid arthritis and systemic lupus erythematosus, whereas patients with other autoimmune diseases generally exhibited a more balanced distribution of vitamin D status.

Discussion

The findings indicate that vitamin D status varies according to the type of autoimmune disease. Patients with systemic lupus erythematosus frequently presented with lower vitamin D concentrations, which may be explained by photosensitivity that limits sun exposure, chronic inflammatory processes, and prolonged corticosteroid therapy. Similarly, rheumatoid arthritis patients often exhibit vitamin D insufficiency because chronic inflammation may alter vitamin D metabolism and immune regulation. These findings suggest that vitamin D assessment may be particularly important in autoimmune diseases with persistent inflammatory activity.

Table 6. Association Between Treatment Duration and Vitamin D Status

Treatment Duration	Deficiency	Insufficiency	Normal	Excess	Total	*p*-value
3–7 days	13	22	21	15	71	
8–14 days	8	14	16	8	46	
15–30 days	2	3	3	2	10	0.881
>30 days	2	3	3	0	8	
Total	25	42	43	25	135	

Results

As presented in Table 6, treatment duration was not significantly associated with vitamin D status among autoimmune patients ($p = 0.897$). Similar distributions of vitamin D status were observed across all treatment-duration categories.

Discussion

The absence of a significant association suggests that treatment duration alone does not determine vitamin D status in autoimmune patients. Vitamin D concentrations are influenced by numerous factors beyond the duration of treatment, including dietary habits, sunlight exposure, supplementation, renal and hepatic function, medication use, and disease activity. Consequently, patients receiving longer treatment may still experience vitamin D deficiency if these factors are not adequately addressed. These findings highlight the importance of directly monitoring vitamin D status rather than assuming improvement with prolonged treatment.

Table 7. Association Between Treatment Duration and Clinical Outcome

Treatment Duration	Recurrence	No Recurrence	Total	*p*-value
3–7 days	46	25	71	<0.001
8–14 days	18	28	46	
15–30 days	4	6	10	
>30 days	2	6	8	
Total	70	65	135	

Results

Table 7 shows a statistically significant association between treatment duration and clinical outcome ($p < 0.001$). Patients receiving longer treatment tended to experience better clinical outcomes and lower recurrence rates than those receiving shorter treatment durations.

Discussion

Treatment duration was significantly associated with clinical outcomes in autoimmune patients. Longer treatment may contribute to sustained suppression of autoimmune activity, thereby reducing disease recurrence and improving clinical stability. Appropriate treatment duration also allows sufficient time for immunosuppressive or immunomodulatory therapies to achieve optimal therapeutic effects. Nevertheless, because this study employed a retrospective cross-sectional design, the observed association should not be interpreted as evidence of causality. Other clinical factors, including disease severity, treatment adherence, and medication regimen, may also influence patient outcomes.

Table 8. Association Between Type of Autoimmune Disease and Clinical Outcome

Autoimmune Disease	Recurrence	No Recurrence	Total	*p*-value
Rheumatoid arthritis	27	26	53	0.227
Systemic lupus erythematosus	32	19	51	
Sjögren syndrome	5	6	11	
Autoimmune thyroiditis	2	7	9	
Autoimmune hepatitis	2	4	6	
Systemic connective tissue disease	2	3	5	
Total	70	65	135	

Results

Table 8 presents the association between the type of autoimmune disease and clinical outcome. Statistical analysis demonstrated no significant association between disease type and patient outcome ($p = 0.227$). Clinical outcomes were relatively similar across the different autoimmune disease categories.

Discussion

Although recurrence rates differed numerically among autoimmune diseases, these differences were not statistically significant. Clinical outcomes in autoimmune disorders are influenced by multiple factors, including disease severity, treatment adherence, immunosuppressive therapy, comorbidities, and individual patient characteristics. Therefore, the type of autoimmune disease alone may not adequately predict clinical outcomes. The present findings suggest that comprehensive clinical management is likely to have a greater impact on patient outcomes than disease classification alone.

Conclusion

This study evaluated vitamin D status among autoimmune patients treated at Fatmawati Hospital and analyzed its association with demographic and clinical characteristics. Most patients were female, aged over 55 years, and diagnosed with rheumatoid arthritis. Approximately one-third of the patients had normal vitamin D levels, while the remaining patients exhibited vitamin D deficiency, insufficiency, or excess levels.

Age and the type of autoimmune disease were significantly associated with vitamin D status, whereas sex and treatment duration were not. Treatment duration was significantly associated with clinical outcomes, while the type of autoimmune disease showed no significant association with patient outcomes. These findings suggest that routine monitoring of vitamin D status, particularly among older adults and patients with specific autoimmune diseases, may support comprehensive patient management. However, this study did not directly evaluate the relationship between vitamin D status and autoimmune disease recurrence; therefore, future prospective studies are needed to investigate this association more thoroughly.

Reccomendations

Future research is recommended to use a cohort or prospective design to further evaluate the relationship between vitamin D status and the course of autoimmune diseases. Further studies should also consider other factors that may influence vitamin D status, including body mass index (BMI), sun exposure, dietary intake, physical activity, vitamin D supplementation, corticosteroid dosage, biologic therapy, and disease activity. For hospitals and healthcare professionals,

monitoring vitamin D status and providing education regarding healthy lifestyles, adequate vitamin D intake, and adherence to treatment should be improved according to the patient's clinical condition

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