CASE REPORT

Intisari Sains Medis 2023, Volume 14, Number 3: 1146-1151
P-ISSN: 2503-3638, E-ISSN: 2089-9084

Intisari Sains Medis

Published by Intisari Sains Medis

# Systemic lupus erythematosus and diabetic mellitus is it single or two entity(es)

Ni Made Mindawati[1], Ketut Dewi Kumara Wati[1*], I Made Arimbawa[1], Ida Bagus Ramajaya Sutawan[1], I Made Darma Yuda[1]

## ABSTRACT

**Introduction:** Systemic lupus erythematosus (SLE) is a complex and chronic autoimmune disease with varied clinical manifestations and multi-organ involvement. The disease may present with acute, severe, and life-threatening symptoms or present as a fluctuating and chronic process that impacts several systems and increases the risk of malignancy. Systemic lupus erythematosus (SLE) often coexists with other diseases. Diabetes mellitus (DM) is an example and patients with SLE-DM can present with clinical features common to both disorders. Type 2 diabetes (T2D) is characterized by insulin resistance the inability of tissues to respond to insulin, and a progressive pancreatic beta cell dysfunction in response to glucose levels. The disease is thought to be caused by environmental and inherited factors in about equal proportions. Many environmental risk factors are known, including obesity, sedentary lifestyle, stress, nutritional factors and toxins. The report aims to describe Systemic Lupus Erythematosus and Diabetes mellitus as single or two entity(es).

**Case presentation:** A 14-year-old female patient who was admitted to the hospital with complaints of weakness and drowsiness was getting worse 3 days before admitted from hospital. There have been complaints of fatigue for last 3 years accompanied by a lot of eating and drinking and urinating. Complaints of pain in both joints of the hands and both knees appeared in the last 3 months and had been getting worse. Hair loss existed in the past 4 months before being admitted to the hospital. Blurred vision in the right eye in the last 6 months has worsened in the last 1 month. Vision loss in the last 3 months. Body weight was reduced 4 kilograms within 3 months without any loss of appetite. Initial laboratory results revealed hyperglycemia, antinuclear antibodies (ANA) IF 1:100 and ANA Profile Sm (+), dyslipidemia, increase of creatinine serum with glomerular filtration rate 72.41 $m^2$/BSA (decreased 38%). Other examinations showed that C-peptide is normal and beta islet antibody is negative. Echocardiography resulted tricuspid regurgitation with normal ventricle function.

**Conclusion:** Systemic Lupus Erythematosus and Diabetes mellitus is a rare condition that warrants a thorough evaluation to both determine the diagnosis and predict the clinical course of disease.

**Keywords:** systemic lupus erythematosus, type 2 diabetes mellitus, management, outcome.

**Cite This Article:** Mindawati, N.M., Wati, K.D.K., Arimbawa, I.M., Sutawan, I.B.R., Yuda, I.M.D. 2023. Systemic lupus erythematosus and diabetic mellitus is it single or two entity(es). *Intisari Sains Medis* 14(3): 1146-1151. DOI: 10.15562/ism.v14i3.1876

[1]Department of Pediatric, Faculty of Medicine, Universitas Udayana/Prof. Dr. I.G.N.G Ngoerah General Hospital, Denpasar–Bali, Indonesia.

*Corresponding author:
Ketut Dewi Kumara Wati;
Department of Pediatric, Faculty of Medicine,Universitas Udayana/Prof. Dr. I.G.N.G Ngoerah General Hospital;
dewi_kumara@unud.ac.id

Received: 2023-09-18
Accepted: 2023-11-02
Published: 2023-12-07

## INTRODUCTION

Systemic lupus erythematosus (SLE) is a multisystem, chronic but often episodic, autoimmune disease characterized by antinuclear antibodies (ANA). Because SLE can present with several signs and symptoms, the diagnosis is usually considered in children with prolonged unexplained complaints. The most common presenting symptoms of SLE in teenagers are fever, rash, mucositis, and arthritis. Other common symptoms include constitutional symptoms such as malaise and weight loss. Such symptoms, especially when prolonged in an adolescent female, should prompt evaluation for SLE. Approximately 20% of all patients who have SLE are diagnosed in childhood. The onset of SLE is rare in those younger than 5 years of age; most pediatric patients are diagnosed in adolescence. SLE is considered a predominantly female disease, and although most affected patients are female, the ratio changes with age. Prior to puberty, the female-to-male ratio is 3:1; after puberty, the ratio becomes 9:1.[1]

SLE is a multigenic disease. A patient who has SLE is more likely to have a relative who has either SLE or another autoimmune condition, such as thyroiditis or insulin-dependent diabetes. Epidemiologic, twin, and human leukocyte antigen data suggest a strong genetic contribution to the etiology of SLE, but the exact cause is unknown. Multiple factors confer risk, including abnormalities in the metabolism of sex hormones, particular foods that have been found to be immunostimulatory in animals, and infectious agents. Overall, it has been suggested that an environmental trigger is necessary in a genetically predisposed individual to result in the disease.[1]

Type 2 diabetes (T2D) is characterized by insulin resistance which inability of tissues to respond to insulin, and a progressive pancreatic beta cell dysfunction in response to glucose levels. The disease is thought to be caused by environmental and inherited factors in about equal proportions. Many environmental risk factors are known, including obesity, sedentary lifestyle, stress, nutritional factors and toxins. Family history is an important risk factor that has been shown in twins and singleton siblings. The prevalence of T2D varies in populations, and the rate has increased in many global populations. Solid epidemiological data indicate that families of T2D patients show an excess of type 1 diabetes (T1D) which is an autoimmune disease (AId). Recent data confirm some shared genetic predispositions for both types of diabetes, and the classification has become difficult, particularly in obese adolescents. Furthermore, T2D has been found to express autoimmune characteristics, including the presence of autoantibodies against pancreatic beta cells and self-reactive T-cells. Glucose-lowering effects of some immune modulatory therapies in T2D patients have been related to the role of inflammasome pathways in T2D, shared by AIds with an inflammatory component.[2]

Patients with SLE are at an increased risk of cardiovascular disease, which is a major cause of mortality. This higher risk is multifactorial, including traditional cardiovascular risk factors, SLE disease activity, SLE-related immunological factors, and SLE-related medications. Diabetes is one of the modifiable cardiovascular risk factors for cardiovascular disease. Data on the risk of developing diabetes in patients with systemic lupus erythematosus (SLE) are limited and have yielded mixed results.[3]

We present a case of systemic lupus erythematosus and Type 2 diabetes mellitus as single or two entity(es). The pancreas can be affected by remodeling in Type 2 diabetes associated with SLE. The diagnostic process of two distinctive diseases SLE and DM in determining whether both of diseases are associated or independent to each other.

## CASE PRESENTATION

A 14-year-old female patient who was admitted to the hospital with complaints of weakness and drowsiness was getting worse since 4/11/22 (3 days before admitted to hospital). There have been complaints of fatigue for 3 years accompanied by a lot of eating and drinking. Currently eating and drinking is said to have decreased for 5 days. Complaints of pain in both joints of the hands and both knees appeared in the last 3 months and had been getting worse for 2 days (5/11/22). Swelling and redness of the joints are denied. Complaints of chest pain and shortness of breath were denied. Hair loss complaints existed in the last 4 months before being admitted to the hospital. Blurred vision in the right eye in the last 6 months ago has worsened in the last 1 month. Vision loss in left eye in the last 3 months. Reddish rash or discoloration of the skin and sudden reddish of the skin following sunlight exposure were denied. Body weight was reduced 4 kilograms within 3 months without any loss of appetite. Denied complaints of oral trash, fever, nausea, vomiting, liquid bowel movements and seizure, decreased consciousness, paralysis of half of the body, pain in the muscles, abdominal pain, dark urine, pain or movement disorders were denied. The patient was generally active and healthy child before the appearance of these symptoms with no remarkable medical history. The parent said the patient ever have history of obesity but never really getting examined in public health service. There was no family history of type I or type 2 DM. The patient was diagnosed with systemic lupus erythematosus in previous month (October 2022) and had been taking methylprednisolone 16 mg twice daily for at least 18 days before admission.

Upon presentation, the patient was alert and able to communicate. Vital signs were as follows: blood pressure 90/60 mmHg, heart rate 90 beats per minute, respiratory rate was regular 30 times per minute, temperature 36.5°C with oxygen saturation 99% room air. Mild dehydration signs were noticed such as sunken eyes and dry oral mucous but with normal skin turgor and capillary refill time. No signs of infection were found in physical examination. Anthropometric evaluation revealed well nourished (weight 55 kg, height 158 cm, Body mass index 0-1 SD, mid-parental height 175.5 cm and genetic potential height 167-184 cm) and waist circumference 96 (> P90). His current height was within genetic potential. Puberty status was Tanner stage 2.

Initial laboratory examination revealed leucocytes 17.00 $x10^3$/µL (neutrophils $14.2x10^3$ / µL (83.5%); lymphocytes $2.24x10^3$/µL (13,2 %), hemoglobin 14 mg/dL; mean corpuscular volume (MCV) 80.6 fL; mean corpuscular hemoglobin (MCH) 80.6 pg, platelet $220.4x10^3$/µL, random plasma glucose 618 mg/dL, fasting plasma glucose 404 mg/dL, aspartate transferase (AST) 20,1 U/L, alanine transaminase (ALT) 23.6 U/L, total bilirubin 2 mg/dL, direct bilirubin 0.72 mg/dL, indirect bilirubin 1.28 mg/dL. Urinalysis revealed Glucose +4, no protein, no blood or calcium oxalate or uric acid. A blood smear shows leukocytosis. Blood Urea Nitrogen is 27.7 mg/dL and creatinine 1.2 mg/dL with glomerular filtration rate 72.41 $m^2$/BSA (decreased 38%). Total cholesterol 184 mg/dL, low-density lipoprotein cholesterol (LDL-C) 149 mg/dL, high-density lipoprotein cholesterol (HDL-C) 25 mg/dL, Triglycerides 15.6 mg/dL. Immunologic screening test revealed ANA IF 1:100, C3 108.3 mg/dL and ANA Profile Sm (+), Plain chest x-ray was normal. Echocardiography with tricuspid regurgitation with normal ventricle ejection.

Periodic arterial blood gas analysis and electrolyte count are shown in Table 1. The patient was then diagnosed with hyperglycemic hyperosmolar syndrome with mild dehydration caused by diabetes mellitus type II differential diagnosis diabetes mellitus type I and acute kidney injury risk injury due to prerenal cause with differential diagnosis renal caused, well nourished.

Upon the 5th day of admission, she had reduced symptoms with little improvement of pain, reduction of blurred vision. The management of hyperglycemia and blood sugar stable with insulin and then we continued management plan including Mycophenolate sodium titration with 200-400 mg/body surface area (BSA).

A follow-up laboratory panel

**Table 1. Arterial blood gas analysis and electrolyte count**

| Parameter | Sept 7nd 22 22.36 am | Sept 8th 22 09.21 am | Sept 8th 22 15.49 am | Sept 9th 22 07.26 am | Sept 9th 22 14.34 am | Unit | Reference range |
|---|---|---|---|---|---|---|---|
| Potassium | 3.7 | 4.07 | 3.49 | 3.64 | 3.71 | mmol/L | 3.50-5.10 |
| Soium | 139 | 135 | 144 | 152 | 152 | mmol/L | 136 - 145 |
| Chloride | 104.9 | 103.8 | 112.9 | 113.9 | 118.9 | mmol/L | 94 - 110 |
| Calcium | 8.4 | 8.9 | 8.4 | 8.4 | 8.5 | mg/dL | 9.20 - 11.00 |
| pH | 7.51 | 7.48 | 7.45 | | 7.4 | | 7.35 - 7.45 |
| pCO2 | 32.0 | 33.0 | 38 | 40.0 | 44 | mmHg | 80.00 - 100.00 |
| pO2 | 129.00 | 170.00 | 80 | 100.00 | 30 | mmHg | -2 - 2 |
| BEecf | 2.5 | 1.1 | 2.4 | -1.4 | 2.5 | mmol/L | 22.00 - 26.00 |
| HCO3- | 25.5 | 24.6 | 26.4 | 23.70 | 27.3 | mmol/L | 22.00 - 26.00 |
| SO2c | 99.0 | 100 | 96.0 | 98.0 | 57 | % | 95% - 100% |
| TCO2 | 26.50 | 25.6 | 27.6 | 24.90 | 28.7 | mmol/L | 24.00 - 20.00 |

**Table 2. Diagnostic criteria for systemic lupus erythematosus based on the Systemic Lupus International Collaborating Clinics and American College Of Rheumatology**

| SLICC Criteria 2015 | |
|---|---|
| Acute/subacute cutaneous lupus rash | Up to 2 points |
| • Malar rash | 2 point |
| • Subacute cutaneous Lupus erythematosus (SCLE) rash | 1 point |
| • Palpable purpura or urticarial vasculitis | 1 point |
| • Photosensitivity | 1 point |
| Discoid lupus erythematosus (DLE) rash or hypertrophic Lupus rash | 1 point |
| Non-scarring frank alopecia | 1 point |
| Oral/nasal ulcers | 1 point |
| Joint disease | 1 point |
| Pleurisy and/or pericarditis | 1 point |
| Psychosis and/or seizure and/or acute confusion | 1 point |
| Kidney involvement | Up to 2 points |
| • Proteinuria ≥ 3+ or ≥ 500 mg/day or urinary casts | 1 point |
| • Biopsy-proven nephritis compatible with SLE | 1 point |
| Hematologic | Up to 3 points |
| • WBC count < 4000/mm$^3$ or lymphocyte count < 1500/mm$^3$ on ≥ 2 occasions or WBC count < 4000/mm$^3$ along with lymphocyte count < 1500/mm$^3$ in one occasion | 1 point |
| • Thrombocytopenia < 100,000/mm$^3$ | 1 point |
| • Hemolytic anemia | 1 point |
| Serologic Test | Up to 3 points |
| • Low titer positive ANA | 1 point |
| • High titer FANA with homogenous or rim pattern | 2 point |
| • Positive anti-ds DNA | 2 point |
| • Positive anti-Sm | 2 point |
| • Anti-phospholipid antibodies (aPLs) | 1 point |
| • Low serum complement (C3 and/or C4 and/or CH50) | 1 point |

was performed after, which showed leucocytes 10.76 x 10$^3$/µL, neutrophils 4.91 x 10$^3$/µL (45.50%), lymphocyte 5.02 x 10$^3$/µL (46.7%), hemoglobin 13.80 g/dL, hematocrit 42.2%, platelet 192 x 10$^3$/µL, AST 45.1 U/L, ALT 34.4 U/L, BUN 6.7 mg/dL, creatinine 0.93 mg/dL. Other examinations showed HbA1C 7.1%, C-Peptide 3.25 ng/dL (0.78-5.19) and Beta islet antibody is negative. Discharge was executed and a plan for regular follow-up visit at the outpatient department with mycophenolate sodium.

## DISCUSSION

Autoimmune inflammatory rheumatic diseases are the group of illnesses arising from a combination of loss of tolerance to self-antigens and shifting of the immune system into becoming self-destructive.[2] The vast data on clinical spectrum and antibodies have led to the classification of these systemic autoimmune diseases under six mutually exclusive diseases which include: (1) systemic lupus erythematosus (SLE), (2) systemic sclerosis (SSc), (3)

dermatomyositis (DM), (4) polymyositis (PM), (5) rheumatoid arthritis (RA), and (6) primary Sjögren syndrome. These diseases are labeled as definitive connective tissue diseases (DCTD). Systemic lupus erythematosus has always been a challenge for the diagnosis and follow-up due to the heterogenicity in clinical presentation, laboratory features, and disease progression. Patients with SLE are at an increased risk of cardiovascular disease, which is a major cause of mortality. This higher risk is multifactorial, including traditional cardiovascular risk factors, SLE disease activity, SLE-related immunological factors, and SLE-related medications. Diabetes is one of the modifiable cardiovascular risk factors for cardiovascular disease.[3]

Systemic lupus erythematosus (SLE) is an autoimmune rheumatic disease characterized by widespread inflammation and presenting autoantibodies affecting multiorgan system. The disease is associated with deposition of autoantibodies and immune complexes, resulting in tissue damage. Three mechanisms of SLE include a deficiency of complement, overproduction of interferon-α (IFN-α) and damage mechanisms several factors influence the risk and severity of the diseases such as genetics, hormonal and environmental exposures.[3,4]

In this case, A 14-year-old female patient was admitted to the hospital with complaints of weakness and drowsiness that had been getting worse since 3 days before admitted at hospital. There have been complaints of fatigue since last 3 years ago accompanied by a lot of eating, drinking and urinating. Currently eating and drinking is said to have decreased for 5 days ago. Complaints of pain in both joints of the hands and both knees appeared in the last 3 months and had been worsening since 2 days ago (5/11/22). Hair loss complaints existed in the last 4 months before being admitted to the hospital. Blurred vision in the right eye in the last 6 months has worsened in the last 1 month. Vision loss in the last 3 months ago on the left eye. Body weight was reduced 4 kilograms within 3 months without any loss of appetite. Four points from SLICC criteria 2015 are joint disease, acute confusion, alopecia and laboratory findings that met the ACR/SLICC 2015 criteria for SLE was a positive anti Sm is definitive SLE.

Systemic lupus erythematosus (SLE) often coexists with other diseases. Diabetes mellitus (DM) is an example and patients with SLE-DM can present with clinical features common to both disorders. Immunological data show that type 2 diabetes manifests (T2D) autoimmune features. This association is explained epidemiologically by assessing subsequent diagnoses of T2D following diagnosis of autoimmune disease (AId) and subsequent AId after T2D in the same individuals. We will describe the patients with SLE-DM, focussing on the clinical features common to both diseases that these patients can present that explain this condition is co-incident or as causation to each other disease.[5,6]

Type 2 diabetes (T2D) is characterized by insulin resistance which inability of tissues to respond to insulin, and a progressive pancreatic beta cell dysfunction in response to glucose levels. The disease is thought to be caused by environmental and inherited factors in about equal proportions. Many environmental risk factors are known, including obesity, sedentary lifestyle, stress, nutritional factors and toxins. Family history is an important risk factor which has been shown in twins and singleton siblings.[2]

Diagnosis of T2D is symptom of hyperglycemia and one of the following laboratory value and negative islet autoantibodies:

1. Fasting Plasma Glucose (FPF) ≥ 126 mg/dl (7.0 mmol/L)
2. 2-h plasma glucose on an oral glucose tolerance test (OGTT) ≥ 200 ml/dl (11.2 mmol/L). OGTT: 1.75 g/kg (max 75 g) anhydrous glucose dissolved in water
3. Random plasma glucose ≥ 200 mg/dl (11.1 mmol/L)
4. HbA1C ≥ 6.5 % (48 mmol/mol) by NGSP-certified device, standardized to the DCCT assay.

In this case was found patient fatigued for 3 years accompanied by a lot of eating and drinking. Currently eating and drinking is said to have decreased for 5 days. Blurred vision in the right eye in the last 6 months ago has worsened in the last 1 month. Vision loss in left eye in the last 3 months. Body weight was reduced 4 kilograms within 3 months without any loss of appetite. The parent said patient ever have history of obesity but never really getting examined in public health services. There was no family history of type I or type 2 DM. Examination showed Random Plasma Glucose 618 mg/dL, Fasting plasma glucose 404 mg/dL, HbA1C 7.1%, C- Peptide 3.25 ng/dL (0.78- 5.19) and Beta islet antibody is negative. In this case patient met diagnosis criteria of Type 2 Diabetes Mellitus.

The prevalence of T2D varies in populations and the rate has been increasing in many global populations. There are solid epidemiological data indicating that families of T2D patients show an excess of type 1 diabetes (T1D) which is an autoimmune disease (AId). Recent data confirm some shared genetic predispositions for both types of diabetes and the classification has become difficult particularly in obese adolescents. Furthermore, T2D has been found to express autoimmune characteristics, including the presence of autoantibodies against pancreatic beta cells and self-reactive T-cells. Glucose-lowering effects of some immune modulatory therapies in T2D patients have been related to the role of inflammasome pathways in T2D, shared by AIds with an inflammatory component.[2]

Comorbidities in SLE children most frequently involved cardiovascular diseases (28.54%), musculoskeletal diseases (16.7%), ocular diseases (10.73%), metabolic diseases (7.63%), and renal diseases (6.75%). Any underlying damage may result from the nature of SLE or could result from the medical intervention.[6]

Cardiac manifestations often complicate patients with systemic lupus erythematosus, both in adults and in the pediatric population. However, compared to adult-onset SLE, child-onset disease confers a greater potential for cumulative damage. All the cardiac structures can be involved: pericardium, endocardium, myocardium, coronary arteries, and the conduction tissue. The vast majority of acute cardiac manifestations occur within 6 months of SLE diagnosis.[7,8] Cardiovascular involvement is among the

most common causes of mortality, along with the central nervous system and renal disorder. Even if the risk of cardiovascular involvement in SLE cannot be explained only with traditional vascular risk factors, metabolic syndrome has an important role in its prediction and is seen more frequently in SLE than healthy populations with prevalence of 18 to 30%.[9]

In this patient was found with waist circumference 86 (> P90) with laboratory result kolesterol total 184 mg/dL, LDL 149 mg/dL, HDL 25 mg/dL, Triglyceride 150.6 mg/dL. According to IDAI (Indonesian Pediatric Association) is abdominal obesity (> P80) with at least 2 parameters (hypertension, HDL< 40, Triglyceride >100 or Blood sugar > 100/ type 2 Diabetes mellitus). This patient has metabolic syndrome which is abdominal obesity (> P 80) with HDL 25 mg/dL, Triglyceride 150.6 mg/dL and patient with type 2 Diabetes mellitus). This could happen because of sedentary life that one of the factors for systemic lupus erythematosus and metabolic syndrome that can lead to diabetes.

Insulin resistance (IR) is the most widely hypothesized mechanism and the key component of metabolic syndrome, several molecular mechanisms have been proposed to elucidate the pathogenesis of metabolic syndrome and its link with SLE. In the presence of nutritional excess, the adipose tissue undergoes hyperplasia and hypertrophy, resulting in a hypoxic environment when it outgrows the blood supply. Hypoxia of adipocytes causes the production of proinflammatory mediators, such as tumor necrosis factor alpha (TNF a), plasminogen activator inhibitor-1 (PAI-1), interleukin 6 (IL-6), C-reactive protein (CRP) and leptin. Along the pathway, IL-6 and TNF alpha are both known to cause IR by inhibiting insulin receptor function and also have been shown to increase in SLE, especially during active disease. Another suggested mechanism in SLE is reduce nitric oxide synthesis associated with vascular endothelial dysfunction and reduce insulin sensitivity. Asymmetric dimethylarginine (ADMA), as inhibitor of nitric oxide synthesis, has been shown to be elevated in SLE, and this may also contribute to pathogenesis of IR in SLE. Also long term therapy with glucocorticoid may also aggravate the IR.[10]

The Systemic Lupus International Collaborating Clinics/American College of Rheumatology (SLICC/ACR) damage index score (SDI) was the primary outcome measure of the accumulated and irreversible damage resulting from disease activity and the adverse effects of medications. The definition of damage index includes specific disease severity and duration. The damage can caused by complex immune that could deposit in every organ. Ocular manifestation in SLE often happens mostly in the anterior eye segment. In this patient found with blurred vision and continued with blindness in left eye. This condition can occur in patients with diabetes as well. Papil atrophic Ocular dextra et sinistra was found diagnosed with systemic lupus retinopathy or could be caused by diabetic retinopathy.

Jang-lin et al. cohort study in Taiwan used a national database to examine the risk of developing type 2 diabetes in newly diagnosed SLE patients. In this study showed that patients with SLE had a 22% higher risk of type 2 diabetes within 3 years compared with matched controls.[11,12]

The higher risk of type 2 diabetes in patients with SLE might be due to increased insulin resistance caused by SLE itself and medications used to treat SLE. Insulin resistance plays a major role in the development of glucose intolerance and type 2 diabetes. In a study of 44 nondiabetic women with SLE, the incidence of insulin resistance was higher in patients with SLE than in age-matched controls. Although patients using steroids had lower insulin sensitivity, insulin sensitivity was still significantly reduced in those who did not use steroids compared with controls.[13] A cross-sectional study in Spain reported higher insulin resistance rates in SLE patients than controls.[14] This difference remained statistically significant after adjustment for classical cardiovascular risk factors and prednisone use.[14] These findings suggested that SLE independently increases insulin resistance, which over time progresses to type 2 diabetes.

Medications used to treat SLE, including glucocorticoids and calcineurin inhibitors, are associated with an increased risk of diabetes. Glucocorticoids are frequently used to treat SLE owing to their potent anti-inflammatory and immunosuppressive effects. Glucocorticoids are known to cause hyperglycemia through a variety of mechanisms, including inducing or worsening preexisting insulin resistance, increasing hepatic gluconeogenesis, causing islet cell dysfunction, and, in the long term, stimulating appetite and weight gain.[15] A United Kingdom (UK) study reported that glucocorticoid use was associated with a strong dose-dependent increase in the incidence of type 2 diabetes in SLE patients, regardless of body mass index, family history of diabetes, or disease duration, even after adjustment for systemic inflammatory activity.[16]

This patient was first diagnosed with DM type 2 from the C peptide result. and later for further examination use Beta islet antibody that was found negative. The difference in the mean years of presentation between autoimmune and no-autoimmune diabetes is almost 6 years indicating that the latter probably are type 2 DM at a very early age of onset. Childhood obesity has been claimed to be one of the important causes of early onset of type 2 DM in pediatric population.

Islet $\beta$ cells activity and reserve for insulin can be assessed by analyzing circulating levels of connecting peptide (C-Peptide) in blood. C-peptide is the part of proinsulin which is cleaved prior to co-secretion with insulin from pancreatic beta cells. It being metabolically inert, is widely used to measure pancreatic $\beta$ cell function. The role of C-peptide in the diagnosis of diabetes is currently limited to unusual or ambiguous cases of Type 1 or type 2 DM. Classification of DM is often difficult in younger adults and more so in children.[17,18]

Because of the increased risk of developing type 2 diabetes in patients with SLE, effective screening and monitoring strategies should be employed for prevention and timely detection. Guidelines for the management of SLE recommend screening for diabetes at baseline and at least annually after that. Fasting plasma glucose and glycated hemoglobin levels should be tested regularly to screen for prediabetes or diabetes. Studies have shown that lifestyle interventions such as a healthy diet, regular exercise, and weight control in

high-risk individuals effectively prevent type 2 diabetes and are considered first-line preventive therapies. Furthermore, it is well known that glucocorticoid use increases the risk of diabetes; therefore, in patients with SLE, it is strongly recommended to reduce steroid exposure and use steroid-sparing agents to minimize adverse effects.[11]

A sedentary life can affect both the occurrence of disturbances in the immune system (systemic lupus erythematosus) and also hormones (type 2 diabetes mellitus). Difficulty in determining cause and effect in this case means there is a possibility that both diseases occur simultaneously at the same time. The limitation in this case was that most of the symptoms were obtained simultaneously. Hence, it is difficult to determine whether systemic lupus erythematosus or diabetes are a risk factor or which is a manifestation.

## CONCLUSION

Systemic Lupus Erythematosus and Diabetes mellitus is a rare condition that warrants a thorough evaluation to both determine the diagnosis and predict the clinical course of disease.

## CONFLICT OF INTEREST

None declared.

## FUNDING ACKNOWLEDGEMENTS

The authors received no specific grants from any funding agency in the public, commercial, or not-for-profit sectors.

## ETHICAL CONSIDERATION

Patient/legal guardian had received signed written informed consent regarding publication of medical data in scientific medical journals with confidentiality regarding personal information.

## AUTHOR CONTRIBUTION

All authors had contributed in manuscript writing and agreed for the final version of manuscript for publication.

## REFERENCE

1. Twilt M, Feldman BM. An update in the diagnosis and management of juvenile dermatomyositis. Int. J. Rheumatol.2021;7(3):1-7.
2. Hemminki K, Liu X, Försti A, Sundquist J, Sundquist K, Ji J. Subsequent Type 2 Diabetes in Patients with Autoimmune Disease. Sci Rep. 2015;5:13871.
3. Rebecca ES, Stacy PA, and Laura ES. Systemic Lupus Erythematosus. In: Kliegman RM, Bonita FS, Joseph WS, Nina FS, editor. Nelson Textbook of Pediatrics. 20nd ed. Philadelphia: Elsevier; 2016. h.1176-80.
4. Abari IS. ACR/SLICC revised criteria for diagnosis of systemic lupus erythematosus. Autoimmune Dis Ther Approaches. 2015;2:1-5.
5. Wu JQ, Lu MP, Reed AM. Juvenile dermatomyositis: advances in clinical presentation, myositis-specific antibodies and treatment. World J Pediatr. 2020;16:31-43.
6. Cortes S, Chambers S, Jerónimo A, Isenberg D. Diabetes mellitus complicating systemic lupus erythematosus - analysis of the UCL lupus cohort and review of the literature. Lupus. 2008. Nov;17(11):977-80.
7. Doria A, Iaccarino L, Sarzi-Puttini P, Atzeni F, Turriel M, Petri M. Cardiac involvement in systemic lupus erythematosus. Lupus. 2005;14:583-6.
8. Chan JC, Knight AM, Xiao R, Mercer-Rosa LM, Weiss PF. Use of echocardiography at diagnosis and detection of acute cardiac disease in youth with systemic lupus erythematosus. Lupus. 2018;27(8):1348-57.
9. Dayal Na, Isenberg DA. SLE/myositis overlap: are the manifestations of SLE different in overlap disease? Lupus. 2002;11:293-8.
10. Roberts CK, Hevener AL, Barnard RJ. Metabolic syndrome and insulin resistance: underlying causes and modification by exercise training. Compr Physiol. 2013;3(1):1-58.
11. Gottlieb BS. Systemic Lupus Erythematosus in Children and Adolescents. Pediatric in Review. Pubmed. 2021;27(9):323-30.
12. Lin YJ, Chien CC, Ho CH, Chen HA, Chen CY. Increased risk of type 2 diabetes in patients with systemic lupus erythematosus: A nationwide cohort study in Taiwan. Medicine (Baltimore). 2022 Dec 23;101(51):e32520.
13. El Magadmi M, Ahmad Y, Turkie W, et al.. Hyperinsulinemia, insulin resistance, and circulating oxidized low density lipoprotein in women with systemic lupus erythematosus. J Rheumatol. 2006;33:50–6.
14. Sánchez PH, Tejera SB, de Vera GA, et al.. Insulin resistance in systemic lupus erythematosus patients: contributing factors and relationship with subclinical atherosclerosis. Clin Exp Rheumatol. 2017;35:885–92.
15. Suh S, Park MK. Glucocorticoid-induced diabetes mellitus: an important but overlooked problem. Endocrinol Metab (Seoul). 2017;32:180–9.
16. Wu J, Mackie SL, Pujades RM. Glucocorticoid dose-dependent risk of type 2 diabetes in six immune-mediated inflammatory diseases: a population-based cohort analysis. BMJ Open Diabetes Res Care. 2020;8:e001220.
17. Leighton E, Sainsbury CAR, Jones GCA. Practical Review of Peptide Testing in Diabetes. Diabetes Therapy J. 2017;8:475-87.
18. Putranto TA, Wibisono D, Astoro NW, Yana ML, Prabowo ET, Irwansyah D, Nurhadiyanta N, Rantung Y, Ikrar T, Fandrich F. Introducing the tolerogenic macrophage therapy as an alternative approach to manage systemic lupus erythematosus: a case series. Bali Med J. 2019;8(3):726-32.