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Case report
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# Septic Shock and Multi-Organ Dysfunction Syndrome in A Patient with Extensive Tophaceous Gout, Diagnostic and Management Challenges in South Papua, Indonesia: A Case Report

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## ABSTRACT

**Background:** Septic shock and multiple organ dysfunction syndrome (MODS) are interrelated medical conditions arising from the body's response to severe infection. Extensive tophaceous gout is recognized for its potential to worsen kidney failure, thereby negatively impacting the prognosis of patients suffering from septic shock and MODS.
**Case Presentation:** This case report describes a male patient in his 40s who presented to the emergency department in an unresponsive state and was diagnosed with septic shock, likely secondary to pneumonia, which progressed to MODS. The patient also had uncontrolled hyperuricemia, resulting in extensive tophaceous gout that may have contributed to renal failure. Despite receiving appropriate fluid resuscitation, vasopressors, and antibiotics, the patient succumbed to severe complications. Key challenges in managing this case included limited diagnostic resources, low health awareness, and unclear health insurance coverage, particularly in the context of medical care in South Papua, Indonesia.
**Results:** The case illustrates the interplay between chronic gout and acute infection. Hyperuricemia may contribute to renal impairment, weaken immune defenses, and worsen outcomes in septic patients—challenges in health access, diagnostics, and patient awareness further complicated management.
**Conclusion:** Our case report emphasizes the possible contribution of unmanaged gout to the deterioration of septic shock, leading to MODS. This study is important as it highlights the interplay between septic shock, MODS and extensive tophaceous gout, particularly in resource-limited settings. Understanding how unmanaged gout exacerbates renal failure in septic-prone patients can inform clinical practices and improve patient outcomes.

**Keywords:** gout, septic shock

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## BACKGROUND

Septic shock and multiple organ dysfunction syndrome (MODS) are interrelated medical conditions arising from the body's response to infection. A thorough understanding of these conditions is crucial for timely

diagnosis and treatment, as they can result in significant morbidity and mortality (Sun et al., 2021).

Sepsis is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection. It typically arises from bacterial infections but can also be triggered by fungi or viruses. The clinical presentation of sepsis includes symptoms such as fever, increased heart rate, rapid breathing, and changes in white blood cell counts (Srzić et al., 2022). Septic shock is a severe subset of sepsis, characterised by persistent hypotension despite adequate fluid resuscitation. This condition signifies a critical failure in circulatory and cellular metabolism, leading to insufficient blood flow to vital organs (Basodan et al., 2022). Patients with septic shock often exhibit signs of organ dysfunction and require immediate medical intervention to prevent progression to MODS (Hotchkiss et al., 2016). MODS occurs when septic shock results in the failure of multiple organ systems due to inadequate perfusion and oxygenation (Sun et al., 2021). This condition is marked by dysfunction in two or more organ systems, such as the lungs, kidneys, liver, and cardiovascular system (Sun et al., 2021). The pathophysiology involves complex interactions between pro-inflammatory and anti-inflammatory responses triggered by infection.

Recent estimates indicate that in 2017, there were approximately 49 million cases of sepsis worldwide, resulting in 11 million sepsis-related deaths, accounting for about 20% of all global deaths (Guarino et al., 2023). The incidence of sepsis is estimated to range from 276 to 678 cases per 100,000 persons annually, with a higher concentration in low- and middle-income countries (LMICs), where the burden is often underreported due to limited data (Fleischmann et al., 2023). In developed countries, sepsis occurs in 2% of all hospitalizations and affects between 6% to 30% of intensive care unit patients (Martin, 2012).

This report presents a case of septic shock and multi-organ failure in a patient with extensive tophaceous gout. This case underscores the need for early management of risk factors, especially uncontrolled hyperuricemia in septic patients. The aim is to underscore the challenges faced by regions with limited healthcare resources, particularly in South Papua, Indonesia, in diagnosing and managing such complex medical cases.

## CASE PRESENTATION

A male patient in his 40s was admitted to the emergency department in an unresponsive state, as discovered by his wife in the morning. Upon examination, the patient exhibited hyperthermia (39.7°C), hypotension (87/56 mmHg), tachycardia (140 beats per minute), and deep, rapid breathing (35 breaths per minute). Hypoxemia was noted, with oxygen saturation at 87% on room air and 95% with a non-rebreathing mask at 15 L/min. The patient's medical history included chronic, uncontrolled hyperuricemia with extensive tophi on both feet and hands (Figure 1).

These were managed with piroxicam and dexamethasone during episodes of pain. The patient's genetic history was unavailable, and there was no prior history of organ failure or autoimmune diseases. The patient was overweight (BMI: 27.8, weight: 90 kg, height: 180 cm), led a sedentary lifestyle, and was neither a smoker nor an alcohol consumer.

**Figure 1. Clinical Presentation of Extensive Tophaceous Deposits**

During the examination, the patient's Glasgow Coma Scale (GCS) score was 9 (E3V2M4). Pulmonary auscultation revealed rhonchi in both lungs. The insertion of a urinary catheter yielded 50 cc of gross haematuria. A chest radiograph indicated fibroinfiltration consistent with broncho-pneumonia. Laboratory evaluation showed a white blood cell count of 12.9 × $10^6$/µL, hypereosinophilia (20.8%), a platelet count of 129 × $10^3$/µL, urea levels of 156.4 mg/dL, creatinine levels of 3.23 mg/dL, albumin levels of 2.92 g/dL, AST levels of 47.9 U/L, and ALT levels of 37.4 U/L. Polymerase Chain Reaction (PCR) for Mycobacterium tuberculosis was negative. Arterial blood gas analysis revealed fully compensated metabolic acidosis (pH: 7.387, $pCO_2$: 20 mmHg, $pO_2$: 52.9 mmHg, $FIO_2$: 21%, $HCO_3$: 11.7 mmHg).

The Sequential Organ Failure Assessment (SOFA) score totaled 11 points, indicating significant organ dysfunction and an elevated risk of mortality (Hotchkiss et al., 2016). Details regarding the patient's SOFA scores are provided in Table 1.

**Table 1. Sequential Organ Failure Assessment (SOFA) Scoring System to Measure Organ Dysfunction and An Elevated Risk of Mortality**

| No. | Criteria | Result | Points |
|---|---|---|---|
| 1 | Respiratory | $PaO_2/FIO_2$ (251.9 ÷ 0.21) = 251.9 | 2 |
| 2 | Coagulation (platelet count) | 129 x $10^3$/µL | 1 |
| 3 | Hypotension | Norepinephrine dose: 0.05 mcg/kg/min | 3 |
| 4 | Glasgow Comma Scale | E3V2M4 (score: 9) | 3 |
| 5 | Creatinine | 3.23 mg/dL | 2 |
| | Total SOFA score | | 11 |

*11 points (indicates a high level of organ dysfunction and high risk of mortality)

The CURB-65 score was 4, indicating a high risk of mortality and necessitating admission to the intensive care unit (ICU) (Ilg et al., 2019). The patient was subsequently transferred to the ICU. Despite adequate fluid resuscitation, vasopressors (initial dose of norepinephrine at 0.05 mcg/kg/min) and broad-spectrum antibiotics (2 grams of intravenous ceftriaxone daily) were required. The patient was intubated and transferred to the ICU. Despite intensive care, the patient succumbed to intractable multi-organ failure later that day.

## DISCUSSION

The patient's clinical presentation and diagnostic findings collectively indicate

multiple organ dysfunction syndrome (MODS) secondary to septic shock, most likely caused by pneumonia. The presence of uncontrolled tophaceous gout further complicated renal function and the systemic inflammatory response. The patient's rapid clinical deterioration and subsequent death due to intractable multi-organ failure corroborate this diagnosis. The prognosis for patients with septic shock is notably poor. A meta-analysis by Bauer et al. reported a 30-day mortality rate of approximately 34.7% (95% CI: 32.6–36.9%) and a 90-day mortality rate of 38.5% (95% CI: 35.4–41.5%). Furthermore, each 1-point increase in the Sequential Organ Failure Assessment (SOFA) score is associated with a 1.8% to 3.3% rise in mortality (Bauer et al., 2020).

The patient's diagnosis involved several critical factors. Systemic signs of inflammation and multiple organ dysfunction—such as hyperthermia, tachycardia, tachypnea, and hypotension unresponsive to fluid resuscitation—are hallmark features of sepsis and septic shock. The chest radiograph revealing fibro infiltration indicative of broncho pneumonia suggests the pulmonary source of infection. However, the absence of blood culture data precluded definitive pathogen identification.

Elevated levels of urea (156.4 mg/dL) and creatinine (3.23 mg/dL) indicate significant renal dysfunction, consistent with impaired kidney function. Using the Cockcroft-Gault formula for a male in his 40s with a weight of 90 kg, the estimated glomerular filtration rate (eGFR) was calculated at approximately 35.5 mL/min, signifying severe renal impairment (Delgado et al., 2022). A meta-analysis by Roughley et al. demonstrated that individuals with gout are more than twice as likely to develop chronic kidney disease (CKD) at stage 3 or higher, with an odds ratio (OR) of 2.41. Additionally, these individuals are 1.77 times more likely to have a history of nephrolithiasis compared to those without gout (Roughley et al., 2015).

The progression from uncontrolled hyperuricemia to MODS and eventual death is a complex and multifactorial process. It begins with the deposition of urate crystals in the joints, causing chronic inflammation and the formation of tophi, which are deposits of monosodium urate (MSU) crystals in soft tissues. Over time, this chronic inflammation can lead to systemic complications, including hyperuricemia, a major risk factor for kidney disease.

As kidney function declines, urate levels increase, further exacerbating systemic inflammation and renal impairment (Lee et al., 2021). The kidneys' inability to effectively excrete urate leads to its deposition in renal tissues, resulting in nephrocalcinosis and obstructive nephropathy, which may progress to kidney failure and eventually end-stage renal disease (ESRD) (Mahadita and Suwitra, 2021). Hyperuricemia also activates the renin-angiotensin system (RAS), causing glomerular hypertension and impaired renal autoregulation. This condition promotes oxidative stress, leading to further damage to endothelial and mitochondrial functions within the kidneys (Mahadita and Suwitra, 2021).

Uric acid additionally stimulates the proliferation of vascular smooth muscle cells, contributing to vasculopathy and chronic ischemia, which collectively exacerbate kidney injury. Pro-inflammatory pathways and the transition of renal epithelial cells into a mesenchymal state further contribute to fibrosis and progressive renal dysfunction (Mahadita and Suwitra, 2021). Kidney failure heightens the risk of infections, such as pneumonia, due to com-

promised immune function and reduced renal clearance of pathogens (Pant et al., 2021). The inflammatory response triggered by these infections can progress to sepsis and septic shock, ultimately resulting in multi-organ failure (Pant et al., 2021). In a similar case, an elderly woman with chronic gout developed ulcerations caused by tophi, leading to secondary infections, including septic arthritis and osteomyelitis, which progressed to sepsis (Gheit et al., 2023).

Healthcare systems in resource-limited regions, such as South Papua, Indonesia, face significant challenges in managing complex cases. A major limitation is the lack of advanced diagnostic capabilities. Patients often present with multifaceted conditions requiring detailed evaluations; however, limited resources result in incomplete assessments. For example, advanced imaging technologies, such as computed tomography (CT) scans and magnetic resonance imaging (MRI), essential for accurately diagnosing bronchopneumonia and multi-organ failure, are often unavailable (Franquet, 2018).

This lack of diagnostic technology delays and complicates accurate disease identification and treatment. Additionally, the integration of advanced diagnostic tools, particularly blood culture methods, was inadequate in this case. Blood cultures are critical for detecting microorganisms in the bloodstream, essential for diagnosing sepsis, and identifying causative pathogens. Modern blood culture systems, such as continuous monitoring systems and rapid organism identification methods, can significantly reduce the time to positive results and facilitate targeted antimicrobial therapy (Fulton et al., 2025). However, these advanced methods were not accessible, further complicating diagnosis and management in this case.

In South Papua, another significant issue has been the low level of self-awareness regarding health. The patient's lack of self-awareness regarding their health, particularly their uncontrolled hyperuricemia, significantly contributed to the worsening of their condition. The patient's failure to recognize the severity of their gout and their refusal to adhere to anti-gout medication led to chronic inflammation and renal impairment. Non-adherence to anti-gout medications can cause surges in uric acid levels upon restarting treatment, increasing the risk of kidney damage and compromising the therapy's overall safety and effectiveness (Hill-McManus et al., 2018).

Additionally, the patient in this case often misuses pain medication and corticosteroids, taking them nearly every day, which leads to further harm to their organs. Based on a systematic review, chronic corticosteroid use increases susceptibility to infections by significantly weakening the immune system. These medications suppress the body's natural inflammatory response, which is critical for combating infections, and impair the function of key immune cells like T-cells and macrophages (Rice et al., 2017). Therefore, the patient's lack of self-awareness and non-adherence to treatment played a crucial role in the progression of their disease, underscoring the importance of patient education and adherence to medical regimens in managing chronic conditions effectively.

Another issue is that people without national health insurance frequently encounter substantial obstacles in obtaining timely and quality medical care. This financial constraint leads to delayed medical interventions, as patients may not seek healthcare until their conditions have worsened. A different study finds that patients facing greater financial difficulties

tend to postpone their clinic visits (Zhuang *et al.*, 2021). Additionally, many people in South Papua still rely on traditional medicine and shamanism to cure various diseases, deeply ingrained in the country's cultural heritage. The combination of financial limitations and cultural beliefs in traditional medicine and shamanism thus contributes to late diagnosis and management of diseases, ultimately exacerbating health disparities and compromising patient outcomes.

In conclusion, this case report describes a male patient in his 40s who presented to the emergency department in an unresponsive state. Clinical and laboratory findings revealed septic shock accompanied by multiple organ dysfunction. A pulmonary infection was identified as the likely source of sepsis. The patient also had uncontrolled hyperuricemia, which contributed to extensive tophaceous gout and may have exacerbated renal failure.

Despite appropriate fluid resuscitation, vasopressor support, and antibiotic therapy, the patient succumbed to intractable multi-organ failure. This case underscores the critical challenges posed by insufficient diagnostic resources, low health awareness, and unclear health insurance coverage in resource-constrained settings such as South Papua, Indonesia. Our case report highlights how uncontrolled gout may contribute to the worsening of septic shock, resulting in MODS. The implications for public health are significant; with sepsis being a leading cause of mortality and morbidity worldwide, identifying modifiable risk factors such as uncontrolled hyperuricemia could lead to targeted interventions. By emphasizing early recognition and management of gout, healthcare system can potentially reduce the incidence of MODS and improve survival rates among septic patients.

## AUTHORS CONTRIBUTION

All authors contributed equally to the conception, design, writing, and revision of this manuscript. All authors have read and approved the final version of the article.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ETHICAL CLEARANCE

Ethical approval for this research was obtained from the Ethics Committee of Merauke Regional Hospital, South Papua. Written informed consent for publication was provided by the patient's next of kin.

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