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Inpatient Case Report: Severe Malaria

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KEYWORDS
Severe Malaria, *Plasmodium falciparum*, Cerebral Malaria, Pediatric Infectious Disease, Anemia, Organ Dysfunction

ABSTRACT
Malaria is a significant global health problem caused by Plasmodium parasites transmitted through Anopheles mosquito bites, predominantly affecting tropical and subtropical regions. This case report focuses on a pediatric patient with severe malaria caused by *Plasmodium falciparum* at Prof. Dr. W.Z. Johannes Hospital, Kupang, Indonesia. The patient, a 7-year-old girl, presented with fever, vomiting, reduced appetite, and decreased consciousness. Laboratory tests revealed severe anemia, liver dysfunction, and positive malaria microscopy for *P. falciparum*. The study employed a comprehensive clinical approach, combining patient history, physical examination, and laboratory tests to diagnose and manage the condition. Treatment included intravenous fluids, antimalarial drugs, and supportive care. The results underscore the importance of prompt diagnosis and treatment in severe malaria cases to mitigate life-threatening complications like cerebral malaria, which is associated with high mortality rates. This case highlights the pressing need for tailored malaria management strategies, particularly in resource-limited settings. Conclusively, timely and targeted interventions can effectively address severe complications, ensuring better outcomes in malaria-endemic regions.

INTRODUCTION

Malaria is an acute to chronic infectious disease caused by one or more protozoan parasites of the genus Plasmodium that are transmitted to humans through the bite of the Anopheles mosquito which also functions as the host of this parasite. This disease is characterized by the discovery of an asexual form in the blood and this parasite attacks erythrocytes (Gusra et al., 2014; Indonesia, 2019). Malaria manifests as an acute or chronic disease, characterized by paroxysmal fever, chills, fatigue, sweating, anemia and splenomegaly. Clinical manifestations in children are different and non-specific than adults (Liwan, 2015).

Until now, malaria is still an important health problem in the world, especially in tropical and subtropical areas such as Brazil, all of sub-Saharan Africa and Southeast Asia because it affects the morbidity of infants, toddlers, and mothers giving birth and causes Extraordinary Events (KLB) (Hasyim et al., 2014). Globally, there was a decrease in the number of malaria cases and deaths due to malaria between 2000-2015. It is estimated that the number of malaria cases in 2000 was around 262 million cases with a death rate of 839,000 deaths, while in 2015 it was estimated to be around 214 million cases of malaria with 438,000 deaths and about 7% of deaths in Asia. Most deaths occur in children and non-immunized adults. In addition, 306,000 cases of deaths in children less than 5 years old due to malaria were also reported. For a while malaria was still the leading killer in children, where death occurred every 2 minutes

(Organization, 2015). In Indonesia, according to the WHO in 2006, more than 90 million people lived in endemic areas, with cases of about 30 million each year (Semme & Widyaningrum, 2023).

Malaria is still endemic in most parts of Indonesia (Laihad, 2021). The prevalence of malaria in the Indonesian population in 2013 was 6.0% and the incidence of malaria in NTT was around 6.8% with cases being more dominant by P. falciparum and P. vivax around 0.5% cases and cases in children most often due to P. falciparum 1.2% (Badan Penelitian dan Pengembangan Kesehatan, 2019).

Severe malaria is caused by Plasmodium falciparum or tropical malaria. The disease is rare in the first months of life, but in children who are a few years old can have severe attacks of tropical malaria. One of the most dangerous complications of this falsiparum infection is complications to the central nervous system or also known as severe malaria or cerebral malaria (Parmadi & Pratama, 2020). This type of malaria infection can cause organ dysfunction and even death (Handbook, 2012). Cerebral malaria is a complication of Plasmodium falciparum infection and is the leading cause of death (20-40% of cases), especially in children and non-immune-exempt adults. Similar to other complications, cerebral malaria is more common in patients with severe parasitemia (≥5%) (Marcdante et al., 2021). The mortality rate of cerebral malaria without other complications is quite low, which is around less than 0.1%. But when there are complications of liver organ disorders and erythrocytes infected >3%, then mortality becomes very high. Although treated, cerebral malaria has a mortality rate of 20% in adults and as much as 15% in children (Harijanto et al., 2020).

The incidence of malaria can be prevented, namely by preventing the bite of the causative vector, with prophylactic drugs and using vaccines, but there are various stages in the course of malaria that cause difficulties in making it.

Anamnesis and physical examination were carried out on November 18 and 19, 2016 in the ICU and Kenanga rooms of Prof. DR. W.Z. Johannes Kupang Hospital.

Patient Identity

Name	: An.AM
Age	: 7 years 10 months
Gender	: Woman
Address	: West Fatuleu

Anamnesis (November 18 and 19, 2016)

a) Main Complaint : Decreased consciousness since ± 2 days before admission to the hospital.
b) Current Disease History (autoanamnesis and alloanamnesis): The patient is a referral from the Regional Hospital with a decrease in consciousness that has occurred since ± 2 days before entering the hospital. The decrease in consciousness occurs suddenly when the patient is about to sleep at night. At first, the patient looked restless and looked unsettled. 1 week before the patient had a fever, the fever disappeared, fever until chills. Fever most often arises at night, the fever will usually decrease after the child sweats, but some time after sweating the patient will have a fever again. The patient has been treated at the health center and received paracetamol and malaria drugs, but there is no improvement. In addition to fever, the patient also vomited 4x, vomited after the patient ate, vomited without spraying. Since the onset of fever, the patient's appetite has decreased. According to the patient, since the beginning of the fever, the patient felt pain and nausea in the patient's body and pain in the heart area, the pain of the heart is still felt until now, the pain is like being stabbed. Cold cough is absent. The patient has not defecated since 5 days ago, BAK is still within normal limits.
c) Medical history: The patient had been treated at the health center in the previous 4 days received paracetamol and malaria medication but there was no improvement, the next

2 days the patient was taken again to the health center because he looked restless and was immediately referred to the Regional Hospital.

d) Past Disease History: Never suffered from the same disease before.
e) Family Illness History: No family member is or has ever suffered from the same illness as the patient.
f) Pregnancy and Birth History: During the pregnancy of ANC mothers at the health center 8 times, the child was born spontaneously vaginally at home with a birth weight of 3200 grams.
g) Immunization History: Unknown (since the age of 8 months the child lives with his grandmother), the scar on the right arm (+).

Physical Examination (November 18, 2016)

General conditions	: The patient appears to be seriously ill.
Awareness	: Delirium, GCS (E3V3M4).
TTV Pulse	: 135 x/min and 122x/min, regular, strong lift.
RR	: 36 x/min
Temperature	: 38.10C (axillary)
Nutritional Status BB	: 24 Kg
TB	: 124 cm
BMI/U	:Usual
Skin	: Tan, pale (+), cyanosis (-), icteric (-).
Head	: Brown hair, evenly distributed and not easy to pull out.
Eye	: Pale conjunctiva (+/+), icteric sclera (+/+), isocular pupil and direct, indirect (+/+) light reflexes.
Nose	: Septal deviation (-), secretion (-), nasal lobe breath (-), O2 nasal canul 2 lpm installed.
Ear	: Secretary (-)
Mouth	: dry lip mucosa (+), pale (+), cyanosis (-)
Neck	: Enlargement of KGB (-), mass (-)
Thorax	
Inspection	: Left and right symmetrical chest development, retraction (+)
Palpation	: Tactile fremitus left=right
Percussion	: Sonor
Auscultation	: Vesikuler (+/+), rhonkhi (-/-), wheezing (-/-)
Heart	
Inspection	: Ictus cordis invisible
Palpation	: Ictus cordis palpable di ICS V linea midclavicula sinistra
Percussion	:Dim
Auscultation	: S1S2 single, regular, murmur (-), gallop (-)
Abdominal	
Inspection	: The stomach appears flat.
Auscultation	: Intestinal noise (+) 11x/min
Palpation	: Hepar palpable 3 fingers below arcus costa (4 cm), lien scuffner 2.
Percussion	:Timpani
Limb	: Akral warm, pale (+), CRT <3 seconds, swollen (-)

Supporting Examination (17 and 18 November 2016)

November 17, 2016

Hemoglobin : 5.2 g/dL (L)
Number of Erythrocytes: 3.09x10^6/uL (L)
Hematocrit : 15.1 % (L)
MCV : 49.7 fL (L)
MCH : 17.1 pg (L)
MCHC : 34.4 g/L
Leukocyte : 14,45 10^3/ul
Eusinophyll : 0.1 % (L)
Basophils : 0,5 %
Neutrophils : 48,4 %
Lymphocytes : 37,0 %
Monocytes : 14.0 % (H)
Platelets : 82x10^3/ul (L)
Malaria Mik. :(+2) Plasmodium falciparum
SGPT : 62 U/L (H)
SGOT : 225 U/L (H)
GDS : 118 mg/dL
Urea : 51.10 mg/dL (H)
Creatinine : 0.79 mg/dL
Sodium : 138 mmol/L
Potassium : 4.6 mmol/L (H)
Chloride : 105 mmol/L
CRP : Positive (24 mg/L)

November 18, 2016

Hemoglobin : 5.1 g/dL (L)
Number of Erythrocytes: 2.93x10^6/uL (L)
Hematocrit : 14.6 % (L)
MCV : 49.8 fL (L)
MCH : 17.4 pg (L)
MCHC : 34 g/L
Leukocyte : 10.61 10^3/ul
Eusinophyll : 0.4 % (L)
Basophils : 0,8 %
Neutrophils : 52,9 %
Lymphocytes : 33,3 %
Monocytes : 12.6 % (H)
Platelets : 21x10^3/ul (L)
LED : 8 mm/h
Malaria Mik. :(+2)Plasmodium falciparum

Resume

ANAMNESIS

Decrease in consciousness 2 days SMRS.1 week before fever, fever disappears, fever to chills. The patient has been treated at the health center and received paracetamol and malaria drugs, but there is no improvement. Vomiting 4x. The patient's appetite decreases. According to the patient, since the beginning of the fever, the patient feels pain and tingling in the patient's body.

PHYSICAL EXAMINATION

General conditions : Tamapak is seriously ill
Awareness : Delirium, GCS (E3V3M4)
TTV Pulse : 135x/min, regular, strong lifting
RR : 36x/min
S : 38.10C (axillary)
Nutritional Status
TB : 128 cm
BB : 24 Kg
BMI/U :Usual
Skin : Pale (+)
Eye : Pale conjunctiva (+), icteric sclera (+)
Mouth : Dry and pale lip mucosa.
Thorax : Within normal limits
Heart : Within normal limits
Abdominal : Distension (+), palpable hepatic 3 fingers below arcus costa, lien scuffner 2.

Limb : Pale (+)

LABORATORY RESULTS

Hemoglobin : 5.2 g/dL (L)
Number of Erythrocytes: 3.09x10^6/uL (L)
Hematocrit : 15.1 % (L)
MCV : 49.7 fL (L)
MCH : 17.1 pg (L)
MCHC : 34.4 g/L
Leukocyte : 14,45 10^3/ul
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Chloride : 105 mmol/L
CRP : + (24 mg/L)

Work Diagnosis

Severe Malaria
Anemia
Dyspepsia

Differential Diagnosis

Typhoid encephalopathy
Sebsis
Severe leptospirosis/Weil's disease.

PRC Transfusion 200 cc/24 hours

Lasix 1x25 mg iv

Therapy

- IVFD D5% 1500 cc/24 hours
- Darplex 2x11/2 tabs.
- Ranitidin 2x1/2 amp.
- PCT 1/2 tab every 6 hours

Previous studies have emphasized the clinical and epidemiological aspects of severe malaria caused by *P. falciparum*. For instance, Harijanto et al. (2020) explored the complications associated with severe malaria, including organ dysfunction and high mortality rates. Similarly, Das and Pani (2016) discussed the symptomatology and progression of cerebral malaria in pediatric patients, highlighting the role of early diagnosis in reducing morbidity and mortality. However, the majority of these studies focus on general population data, leaving gaps in understanding specific pediatric presentations and outcomes, particularly in Indonesian contexts.

Severe malaria remains a leading cause of mortality among children in malaria-endemic regions. The disease's complexity and potential to cause severe organ dysfunction necessitate immediate attention to improving diagnostic and treatment protocols, particularly in areas with limited healthcare infrastructure.

While extensive research exists on malaria epidemiology and general management, there is limited data on severe pediatric cases involving *P. falciparum* in Indonesia. The lack of targeted studies on clinical management strategies for severe malaria in children, especially in resource-constrained settings, presents a critical research gap.

This study uniquely examines a pediatric case of severe malaria with cerebral involvement in Indonesia, providing insights into clinical presentation, diagnostic challenges, and management outcomes. It emphasizes the integration of supportive care with standard antimalarial treatments tailored to resource-limited settings.

The research aims to document the clinical course, diagnostic approach, and management of severe pediatric malaria caused by *P. falciparum*, highlighting effective treatment protocols and challenges in endemic regions.

The findings contribute to improving clinical guidelines for pediatric malaria management in Indonesia and similar endemic regions. It provides healthcare practitioners with

actionable insights to enhance early diagnosis and reduce complications associated with severe malaria.

Strengthening diagnostic and treatment protocols based on case studies like this can reduce mortality rates and improve healthcare outcomes in endemic regions. The study reinforces the need for capacity building in healthcare systems to address severe malaria cases effectively.

RESEARCH METHOD

The method used in the clinical case presented involves a combination of anamnesis (patient history) and physical examination, followed by laboratory testing to establish a diagnosis and treatment plan for a patient with severe malaria. The process began with a thorough collection of the patient's medical history, which included details about the onset and progression of symptoms, previous treatments, and relevant past medical and family history. This was complemented by a physical examination that assessed the patient's general condition, consciousness level, vital signs, and specific signs of malaria, such as pallor and hepatomegaly.

Subsequently, laboratory tests were performed to obtain quantitative values for hemoglobin, erythrocytes, and other blood parameters, confirming the diagnosis of severe malaria caused by Plasmodium falciparum, as indicated by the presence of the parasite in the blood smear. This comprehensive approach ensured accurate diagnosis and treatment of the patient's condition, which included severe anemia and potential complications associated with malaria. The therapy administered was tailored to address the identified issues, utilizing intravenous fluids, antimalarial medications, and supportive care to manage symptoms and improve the patient's overall condition.

RESULTS AND DISCUSSION

Malaria is an acute to chronic infectious disease caused by one or more species of Plasmodium, characterized by intermittent high fever, anemia and hepato-splenomegaly.[1] Malaria is caused by protozoa of the genus Plasmodium. In humans, plasmodium consists of 4 species, namely *Plasmodium falciparum* which causes severe infections and can even cause death, *Plasmodium vivax* causes tertiana malaria, *Plasmodium malariae* causes quartana malaria, *Plasmodium ovale* which causes malaria ovale and *Plasmodium knowlesi* (Rampengan, 2017).

Until recently malaria is still a worldwide problem with the main transmission areas being Asia, Africa and South America. In Indonesia, malaria is spread throughout the island with varying degrees of endemicity. The most common species are *Plasmodium falciparum* and *Plasmodium vivax*. Malaria can be transmitted in two ways, namely through natural *infection*, namely through anopheles mosquito bites and non-natural transmission such as congenital or congenital malaria, mechanical transmission occurs through blood transfusions.[8]

In its life cycle, plasmodiums need two hosts, namely humans and female anopheles mosquitoes.

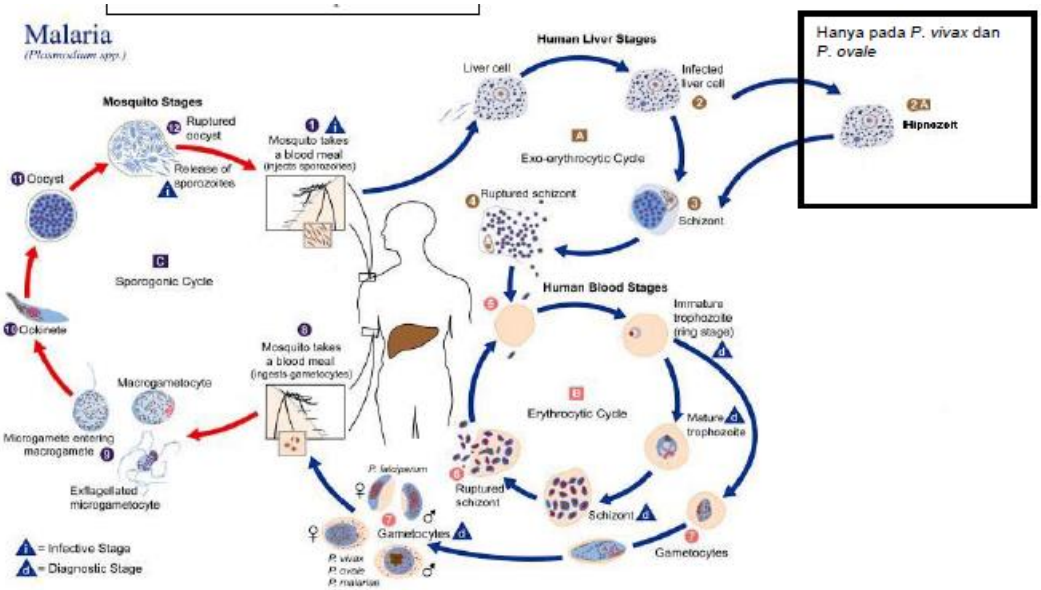

Figure 1 Plasmodium Life Cycle.

The asexual cycle occurs in the human body whereas the sexual cycle occurs in the body of mosquitoes. The incubation period varies depending on the plasmodium species. Clinically, the symptoms of non-immune-infected single-infection malaria consist of several febrile attacks at specific intervals interspersed by a fever-free period (latent period). Before fever the patient usually feels weak, headache, no appetite, nausea and vomiting. The parochism period usually consists of three consecutive stages, namely the cold stage, the fever stage and the sweaty stage (Siregar, 2015).

In this case, the patient was brought by his family due to a decrease in consciousness since 2 days earlier, the patient had been treated and diagnosed with falsiparum malaria. In theory, it is said that falsiparum malaria is the cause of severe malaria or cerebral malaria. This is in line with the theory that malaria accompanied by one or more disorders as listed below is severe malaria, including: cerebral malaria with decreased consciousness (delirium, stupor, coma). Cerebral malaria in children is often characterized by seizures, but keep in mind that seizures in children have many causes. The most important neurological sign of cerebral malaria is the disorder *upper motor neuron* which is symmetrical and brainstem. Delirium, hallucinations or tantrums are very rare in children. In addition, malaria is also known to have three clinical stages that are often found, including the cold period, fever stage and sweating stage. According to the patient's parents, the fever went up and down and until they shivered and sweated. After sweating, the heat experienced will go down, and after a while the patient will be hot again, this is experienced by the patient for ± 5 days before the patient experiences a decrease in consciousness. Fever in malaria arises due to the rupture of blood schizon which secretes various antigens that stimulate magrophage cells, monocytes or lymphocytes to secrete various kinds of cytokines, including TNF and Il-6 which will be carried by the bloodstream to the hypothalamus as a center for regulating body temperature and fever occurs. Clinical symptoms in malaria are febrile (47%), usually followed by gastroenteritis (38.1%) (Das & Pani, 2016). In addition, other symptoms that are also found in malaria are weakness, nausea vomiting, back pain, myalgia, back pain and the patient looks pale.(1) According to the patient's parents, since the beginning of the fever, the patient's appetite has decreased and the patient has vomited 4 times. Vomiting occurs after eating. The patient also admitted that before experiencing a decrease in consciousness, the patient felt pain all over the body and pain in the uluhati area. In addition, on the physical examination, anemia, jaundice and hepato-splenomegaly were found. Physical examination and laboratory examination results found

anemia, paleness, jaundice in the sclera, hepatomegaly (2 fingers below arcus costa) and splenomegaly (Schuffner 2).

This patient was diagnosed with severe malaria where severe malaria is caused by *P. Falciparum* accompanied by other additional symptoms such as hyperparasitemia, when >5% of erythrocytes are infested with parasites, decreased consciousness in cerebral malaria, severe anemia with hemoglobin levels of <7 g/dl, bleeding, jaundice with serum bilirubin levels >50 mg/dl, hypoglycemic (<40 mg/dl), pulmonary edema as evidenced by thorax photographs, shock with systol blood pressure <80 mmHg in adults and < 50 mmHg in children, Hyperpirexia, thrombocytopenia (<100,000 platelets/µl) or in some cases very extreme platelet levels (<20,000/µl), abnormal bleeding and acute kidney failure. Renal function is an indicator of prognosis in adults infected with falsiparum malaria in Southeast Asia. There are studies that prove that in cases of severe falsiparum accompanied by impaired kidney function>50% are found in children.[1][8][9][14] The results of blood tests proved that the patient had anemia with hemoglobin levels of 5.2 g/dL, falsiparum malaria (+2), liver function disorders with SGPT values (62 U/L), SGOT (225 U/L), and kidney function disorders with urea levels (51.10 mg/dL) and creatinine (0.79 mg/dL).

The treatment given is radical malaria treatment by killing all stages of the parasite in the human body. Malaria treatment in Indonesia uses a combination of Anti-malarial Drugs (OAM). What is meant by combination malaria treatment is the use of two or more anti-malarial drugs whose pharmacodynamics and pharmacokinetics are appropriate, synergistic and different ways of resistance. The goal of this combination therapy is to better treat and prevent the development of Plasmodium resistance to anti-malarial drugs. The first option for the treatment of malaria is artemisinin derivatives. The first line of falsiparum malaria uses a combination of ACT and primaquin. First-line therapy of malaria falsiparum by body weight with DHP and primaquinin is listed in the table below.

Table 1 First-Line Treatment of Malaria falsiparum by weight body with DHP and Primaquine.

Day	Drug Type	Number of tablets per day by body weight						
		≤5 kg	6-10 kg	11-17 kg	18-30 kg	31-40 kg	41-59 kg	≥60 kg
		0-1 Month	2-11 Month	1-4 Years	5-9 Years	10-14 Years	≥15 Years	≥15 Years
1-3	DHP	¼	½	1	1½	2	3	4
1	Primaquine	-	-	¾	1½	2	2	3

If a patient *with P. falsiparum* with a BB of >80 kg comes back within 2 months after the administration of the drug and the blood sample test is still positive *for P. falsiparum*, then DHP is given with an increased dose to 5 tablets/day for 3 days. And second-line therapy for falsiparum malaria with a combination of quinine + doxycycline or tetracycline + primaquine, second-line treatment is given if first-line treatment is ineffective. And supportive therapy that can be given is the provision of adequate fluids, nutrition, blood transfusions. PRC blood transfusion 10 ml/kgbb or wb 20 ml/kgbb if anemia with Hb <7.1 g/dl. In addition, symptomatic therapy can also be given, namely by giving anti-pyretic drugs to children with fever to prevent hyperthermia with a dose of paracetamol 15 mg/kgbb/dose every 4-6 hours.[1][3][13] In this case, IVFD therapy D5% 1500 cc/24 hours, darplex 2x11/2 tabs, ranitidine 2x1/2 amp, PCT 1/2 tabs every 6 hours, and PRC transfusion 200 cc/24 hours and pre-transfusion pre-transfusion lasix 1x25 mg iv was given.

CONCLUSION

Malaria is one of the most important parasitic infectious diseases in the world, this disease is a problem especially in developing and tropical and subtropical regions such as Brazil, all of sub-Saharan Africa and Southeast Asia because it affects the morbidity of infants, toddlers, and mothers giving birth and causes Extraordinary Events (KLB).(4) Malaria is an infection that can be acute to chronic caused by one or more species of Plasmodium, characterized by intermittent high fever, anemia and hepato-splenomegaly. Malaria is caused by protozoa of the genus Plasmodium.(1) Malaria manifests as an acute or chronic disease, characterized by paroxysmal fever, chills, fatigue, sweating, anemia and hepato-splenomegaly. In addition, symptoms of gastroenteritis, weakness, nausea, no appetite, back pain, paleness and in severe malaria are found to be decreased consciousness, severe anemia, jaundice, kidney failure, hyperpiraxis, pulmonary edema and even shock.(9)(3)(13) In the case of children with a diagnosis of severe malaria with clinical symptoms found are fever that has occurred ± 1 week, sweating, vomiting 4 times containing food, decreased appetite, and paleness. In addition, the patient also experienced a decrease in consciousness and on the results of the microscopic examination was found the malaria parasite falsiparum (+2), in addition to anemia with a hemoglobin level of 5.2 mg/dl, liver function disorders with SGPT values (62 U/L), SGOT (225 U/L), and kidney function disorders with urea levels (51.10 mg/dL) and creatinine (0.79 mg/dL).

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