



Odynophagia is Suspected to Be Due to Esophageal Stricture Caused by Low Volume Glyphosate-Surfactant Consumption

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ABSTRACT

Introduction: Glyphosate-surfactant is a non-selective, broad-spectrum systemic herbicide widely used in agriculture, forestry, and industry. It is frequently ingested in suicide attempt and depending on the ingested dose, may cause local caustic injury, systemic toxicity, or even death. **Case:** A 32-year-old man presented to the emergency department (ED) with throat pain and difficulty swallowing food for 2 days after ingesting approximately 5 mL of glyphosate-surfactant. Examination found hyperemic pharyngeal arch and oropharynx edema (Mallampati III). Laboratory results revealed leukocytosis, renal function, and electrolyte abnormalities. After gastric lavage, antibiotics, NSAIDs, and a liquid diet, the patient improved and was able to eat independently. **Discussion:** Even in small volumes (5 mL), glyphosate-surfactant, a caustic substance, can cause irritation and inflammation of the esophageal tract and progress to esophageal stricture. **Conclusion:** Small amounts of glyphosate-surfactant compound ingestion caused esophageal strictures, affecting the patient's ability to eat and causing discomfort, despite no kidney or respiratory damage.

Keywords: Case report, esophageal stricture, glyphosate-surfactant, herbicide.

ABSTRAK

Pendahuluan: Surfaktan *glyphosate* merupakan herbisida non-selektif berspektrum luas yang banyak digunakan di bidang pertanian, kehutanan, dan industri. Senyawa ini sering digunakan dalam percobaan bunuh diri dan bergantung pada jumlah yang tertelan, senyawa ini dapat menyebabkan cedera kaustik lokal, toksisitas sistemik, hingga kematian. **Kasus:** Laki-laki berusia 32 tahun datang ke Instalasi Gawat Darurat (IGD) dengan keluhan sakit tenggorokan dan sulit menelan selama 2 hari setelah mengonsumsi sekitar 5 mL surfaktan *glyphosate*. Pada pemeriksaan ditemukan lengkung faring hiperemis dan edema orofaring (Mallampati III). Hasil laboratorium menunjukkan leukositosis, kelainan fungsi ginjal dan elektrolit. Setelah bilas lambung, antibiotik, NSAID, dan diet cair, pasien membaik dan dapat makan secara mandiri. **Pembahasan:** Bahkan dalam volume kecil (5 mL), surfaktan *glyphosate* yang merupakan zat kaustik dapat menyebabkan iritasi dan radang saluran esofagus dan berkembang menjadi striktur esofagus. **Simpulan:** Konsumsi senyawa glifosat-surfaktan dalam jumlah kecil dapat menyebabkan penyempitan esofagus, memengaruhi kemampuan menelan dan menyebabkan ketidaknyamanan, meskipun tanpa kerusakan ginjal atau pernapasan. **Arya Marganda Simanjuntak, Harianto, Ibrahim Irsan Nasution. Odinofagi Diduga karena Striktur Esofagus yang Disebabkan oleh Konsumsi Surfaktan Glyphosate dalam Volume Rendah.**

Kata Kunci: Laporan kasus, striktur esofagus, surfaktan *glyphosate*, herbisida.



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INTRODUCTION

Glyphosate, N-(phosphonomethyl) glycine, is a non-selective and broad-spectrum systemic herbicide, widely used in agriculture, forestry, and industries for the last 40 years.¹⁻³ There are many misuses of glyphosate to

self-injure or commit suicide by consuming it directly. The health effects of ingesting these compounds are both physical, due to their caustic nature, and systemic when absorbed. Mahendrakar, et al., in 2014, reported a 35-year-old man who consumed 200 mL of

glyphosate-surfactant, suffered from kidney damage with hypokalemia (6.5 mEq/dL). The patient progressed to respiratory distress and hypotension, needing intubation.¹

Many other effects, such as kidney

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CASE REPORT



failure,^{1,3} gastrointestinal bleeding,⁴ aspiration pneumonia,⁴ metabolic acidosis,⁴ cardiopulmonary failure,⁵ shock,⁵ and even death⁴ were reported. A retrospective study by Liu, *et al.*, in 2024 showed a bad prognosis (low Glasgow coma scale, requiring intensive treatment) in 32.1% cases, and 5.5% died even after proper treatment.⁴ Some reported consumption amounted to about 200 mL. This case report shows that even a small volume can have a severe impact.

CASE

A 32-year-old male came to our emergency department with throat pain and swallowing pain for 2 days. The patient consumed a small bottle cap (± 5 mL) of glyphosate-surfactant 2 days earlier for an unknown reason. The patient began to complain of throat pain 1 day after consumption, but there were no open healthcare facilities in his area at that time. Two days after consumption, the patient was brought to the nearest health center and was referred directly to the nearest hospital. The patient did not receive gastric lavage therapy, and the family only gave coconut water and milk as an attempt to neutralize the glyphosate-surfactant. On the family's advice, the patient was brought to the ENT clinic in Pekanbaru. Endoscopic evaluation found an esophageal stricture. His complaints included pain and difficulty swallowing regular food such as rice and side dishes, and he could only consume liquids. Chest pain, shortness of breath, and vomiting were denied.

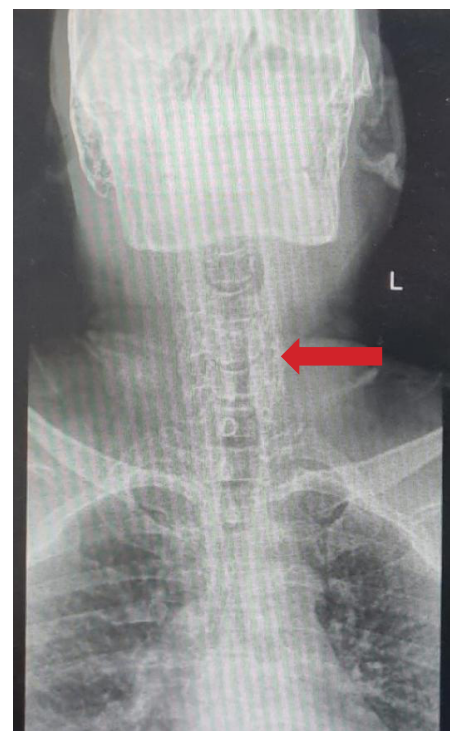
The patient's vital signs were within normal limits. Examination found a hyperemic uvula, hyperemic pharyngeal arcus, and edema covering the oropharynx with a Mallampati impression score of 3. Indirect laryngoscopic examination is difficult because of severe mouth pain. Laboratory studies only found leukocytosis (16.790 μ L). Plain neck x-ray found narrowing of the esophageal tract with the impression of esophageal stricture (**Figure**).

A nasogastric tube (NGT) was inserted to remove any residual glyphosate-surfactant in the stomach. A 0.9% NaCl infusion of 1,500 mL/24 hours was administered to preserve hydration; diet via NGT, and oral with cold liquids. The patient was also given ketorolac 30 mg IV every 8 hours, ceftriaxone 1 g every 12 hours, and ranitidine 25 mg every 8 hours. The patient was hospitalized for 4 days with improved condition; the pharyngeal arcus edema began to decrease after 4 days of hospitalization. The patient decided to go home. He was advised to have routine control at the ENT clinic.

DISCUSSION

This case ingested a small amount (5 mL) of glyphosate-surfactant with no systemic or laboratory abnormalities. Systemic harmful consumption was estimated to be > 100 mL.¹⁰ Chang, *et al.*, (2009) reported refractory respiratory failure and death in a patient who consumed as much as 400 mL.⁵ Several case reports are summarized in **Table**.

The smallest volume consumption reported was 100 mL by Wu, *et al.*,¹⁰ and caused death from septic shock. In this case, the recognized volume consumed was about 5 mL and caused throat pain and swallowing difficulties. It did not cause total esophageal stenosis, and an NGT can be inserted to ensure the intake pathway. Unlike the other cases that were treated as soon as possible (< 24 hours) after



*Photo documentation by Arya Marganda Simanjuntak.

Figure. Plain neck x-ray showed a narrow esophageal tract (red arrow).

Table. Summary of the previous case report outcome of glyphosate-surfactant consumption.

Author	Year	Age	Gender	Volume Consumed	Outcome	Mortality
Chang, <i>et al.</i> ⁵	2009	57	Female	400 mL	Refractory respiratory failure, shock	Yes
Beswick, <i>et al.</i> ⁶	2011	29	Male	300 mL	Cardiac arrhythmias, cardiac arrest, respiratory failure	Yes
Nincevic, <i>et al.</i> ⁷	2017	45	Male	500 mL	Acute renal failure, rhabdomyolysis, comatose, ARDS, hyperkalemia	Recovered
Kunapareddy, <i>et al.</i> ⁸	2021	69	Female	500 mL	Respiratory distress, hypotension, severe lactic acidosis	Recovered
Chakraborty, <i>et al.</i> ⁹	2022	36	Female	400 mL	Acute kidney injury, hyperkalemia, acute liver injury, respiratory distress	Recovered
Wu, <i>et al.</i> ¹⁰	2024	37	Female	100 mL	Septic shock, respiratory distress	Yes
Chhikara, <i>et al.</i> ¹¹	2024	28	Female	100 mL	Hyperkalemia, respiratory distress, acute kidney injury	Recovered
		46	Male	400 mL	Respiratory distress, hypotension, cardiac arrhythmia	Yes
		36	Female	350 mL	Respiratory distress, acute kidney injury, metabolic acidosis	Yes



consumption, this case presented 2 days after consumption. However, perhaps because of the small volume consumed, it did not cause any systemic damage.

Most commonly, systemic damage found after ingestion of glyphosate-surfactant is kidney damage and metabolic disturbances. Studies have shown that glyphosate, particularly in its commercial formulations containing surfactants, can induce significant renal tubular injury characterized by necrosis and apoptosis of proximal tubular cells.^{12,13} Research highlights that surfactant components in glyphosate products may exert additional cytotoxic effects, with Liu, *et al.*, reporting direct kidney toxicity from these surfactants.⁴

The mechanism of damage from ingestion of caustic or irritant substances in the esophagus

is described by Yang, *et al.*,¹⁴ in three stages. The first stage is the inflammatory phase. Injury to the esophageal lining triggers an inflammatory response that causes vasodilation, and the immune system works at the site of injury to clear residual debris and initiate healing. Stage 2 is the proliferation/granulation phase, which is the body's response to repair the injured area. Repair is achieved through the formation of new cells and the restoration of inter-tissue integrity using collagen. The proinflammatory cytokine will also activate fibroblasts to repair cells, resulting in good wound closure. However, if there is a chronic inflammatory process or cytokine mismatch, it will continue to stage 3, the fibrotic tissue formation phase. This phase will result in the formation of fibroblast tissue, followed by remodeling of the extracellular matrix.¹⁵ The tissue formed is a rigid network that strongly binds together, causing stiffness

and an esophageal stricture.¹⁴

CONCLUSION

Even the ingestion of small volumes of the glyphosate-surfactant compound (5 mL in this case) led to esophageal strictures that impaired the patient's ability to eat and caused discomfort.

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CONFLICT OF INTEREST

None to declare

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