

Paralytic Complications of Puffer Fish (Tetrodotoxin) Poisoning

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ABSTRACT

Introduction: Puffer fish is available in Bangladesh and is occasionally eaten by some people. Ignorance regarding its proper cooking process may lead to serious health hazards, including fatality.

Methods: An unusual catastrophic event happened recently in Khulna, Bangladesh that drew nationwide attention. Eight families were affected.

Results: Thirty-seven patients were admitted with a history of consumption of puffer fish. Peri-oral paraesthesia (24), weakness of both lower limbs (22), paraesthesia all over the body (18), headache (15), difficulty in respiration (14), nausea and vomiting (8), blurring of vision (7), and vertigo (6) were common clinical presentations. Twenty-two patients developed ascending paralysis of limbs and involved the respiratory muscles in 17 patients. Eight patients died due to respiratory failure while the rest improved.

Conclusion: Health personnel should have sufficient knowledge regarding the clinical manifestations, complications and management of puffer fish poisoning. During its preparation, organs that contain the highest level of tetrodotoxin should be removed. Since there is no specific treatment, people should be made aware of the potential risk of eating puffer fish, about the warning symptoms and signs of puffer fish poisoning, and when to seek medical help.

Keywords: paralytic complications, poisoning, puffer fish, respiratory failure, tetrodotoxin

Singapore Med J 2004 Vol 45(2):73-74

INTRODUCTION

Puffer fish poisoning is probably the most common fish poisoning along the coasts of Asia⁽¹⁾. It is variously known as blowfish, toadfish, globefish, balloonfish, Patkafish and Fugu^(2,3). They all belong to the order Tetraodontiformes. In spite of the toxic nature of the puffer fish and its recognised ill effects, it is a delicacy

in Japan that is prepared by licensed puffer fish cooks^(2,3). Despite careful preparation, the number of annual deaths in Japan from puffer fish poisoning is around 50^(3,4). Deaths have also been reported in Singapore⁽¹⁾, Hong Kong^(4,5) and Australia⁽⁶⁾. Puffer fish poison is tetrodotoxin. Ingestion of the flesh, viscera or skin of toxic tetraodontiform fishes causes poisoning. As there is a distinct relationship between gonadal activity and toxicity, the fishes are most dangerous to eat immediately prior to and during their reproductive season. The highest concentration of the toxin is found in the viscera (gonads, especially the ovaries; liver; intestines) and skin. The body musculature is usually free of poison⁽¹⁾. Though puffer fish is available in Bangladesh, puffer fish poisoning is sporadic in our country^(7,8). Since it is an uncommon poisoning and happened to occur on a large scale, we are prompted to report this case series.

METHODS

On 18 April 2002, 37 patients belonging to eight families were admitted to Khulna Medical College Hospital, Khulna, Bangladesh with a history of consumption of puffer fish. The fishes were bought from a nearby village market and those eight families had no past experience in preparing, cooking and eating Puffer fishes. A presumptive diagnosis of puffer fish poisoning was made on the basis of classical clinical presentations following consumption of puffer fishes. Other members of those eight families who did not ingest the fishes were free of symptoms. All patients were treated with gastric lavage, symptomatic treatment, and injection of Neostigmine in some cases. Routine investigations were done in all cases and they were clinically reviewed periodically. Some cases died within a few hours. Symptoms gradually resolved in others without any residual effects and were discharged.

RESULTS

A total of 37 (male 19, female 18) patients with manifestations of puffer fish poisoning were admitted to our hospital. The amount of fish taken during a meal varied from approximately 40 to 400 grams. Important

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Table I. Clinical presentations in patients with puffer fish poisoning (n=37).

Clinical manifestations	No. of patients
Perioral paraesthesia	24
Weakness of both lower limbs	22
Paraesthesia all over the body	18
Headache	15
Difficulty in respiration	14
Nausea and vomiting	8
Blurring of vision Vertigo	7
Vertigo	6
Dizziness	5
Cramping pain in the lower limbs	4

Table II. Onset of symptoms in patients with puffer fish poisoning (n=37).

Time (in minutes)	Number of patients
<30	14
31 - 60	3
61 - 90	1
91 - 120	13
≥121	6

Table III. Relation of clinical outcome with amount of fish ingested (n=37).

Amount of fish ingested (in g)	Total patients	No. of patients who improved	No. of patients who died
Less than 50	21	20	1
51 - 100	10	6	4
101 - 151	2	1	1
151 - 200	2	1	1
201 - 500	2	1	1

symptoms observed were peri-oral paraesthesia (24), weakness of both lower limbs (22), paraesthesia all over the body (18), headache (15), difficulty in respiration (14), nausea and vomiting (8), blurring of vision (7), and vertigo (6). Twenty-two patients developed ascending paralysis of the limbs, and the respiratory muscle were involved in 17 patients (Table I). Fourteen patients had manifestations within 30 minutes of ingestion (Table II). Out of these 37 cases, eight patients died within five hours post-ingestion. The cause of death in all these patients was respiratory muscle paralysis leading to respiratory failure (Table III).

DISCUSSION

Puffer fish poisoning is the best known among all types of fish poisoning and has been recognised from ancient times⁽¹⁾. The flesh of puffer fish,

prepared by a licensed puffer cook, is considered a delicacy in Japan. Puffer fish is also available in Bangladesh and is occasionally ingested by some people, mostly rural villagers. Thus, cases of puffer fish poisoning is not unusual in our country. Moreover, there is no restriction or supervision of puffer fish culture, sale and cooking. A rapid ascending paralysis was the most common paralytic complication⁽¹⁻³⁾ as happened in 22 of our patients. Patients with severe poisoning may fall into a coma and death may occur within four to six hours of ingestion^(3,4). Typically it is due to respiratory muscle paralysis.

The liver, gonads and skin of puffer fish contain tetrodotoxin, a powerful neurotoxin that can cause death in approximately 50% to 60% of persons who ingest it. Tetrodotoxin is heat-stable, water-soluble and a non-protein quinazoline derivative⁽⁶⁾. It blocks sodium conductance and neuronal transmission in skeletal muscles⁽⁷⁾. Thus, all of the observed toxicity is secondary to the blockade of action potential⁽⁶⁾. Tetrodotoxin acts on the central and the peripheral nervous systems (i.e. autonomic, motor, sensory nerves). Tetrodotoxin also stimulates the chemoreceptor trigger zone in the medulla oblongata and depresses the respiratory and vasomotor centres in that area.

Puffer fish is available in many Asian countries, including Bangladesh, and it is said to be a very delicious food. Its cooking process needs a special technique about which most people are ignorant. Since puffer fish poisoning has no specific treatment⁽⁹⁾, people should be made aware of the potential risk of eating puffer fish. During its preparation, the liver, gonads, intestines and skin which contain the highest level of Tetrodotoxin should be removed. People should be made aware of the potential risk of eating puffer fish, about the warning symptoms and signs, and when to seek medical advice. Simultaneously, health personnel should be trained and remain always prepared to deal with such medical emergencies.

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