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Case Report

# Acute kidney injury due to multiple wasp stings: a case report

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Wasp stings are a well-known form of envenomation in tropical as well as subtropical countries like Bangladesh. Wasps and bees are venomous arthropods belonging to the order Hymenoptera. The order consists of three families: *Apidae* (bees), *Vespidae* (wasps), and *Formicidae* (ants).[1] In most of cases, wasp or bee sting victims develop minor, self-limiting, and localized symptoms. Pain, tissue necrosis, and anaphylactic reactions are well-recognized, common features.[2] The skin is the most commonly affected organ. Wasp venom causes both local and systemic reactions, but acute kidney injury (AKI) is the most serious complication, with a 20% mortality rate. More serious complications like intravascular hemolysis, rhabdomyolysis, thrombocytopenia, acute kidney injury, liver function impairment, and myocardial infarction are less common but life-threatening conditions.[3-5] Acute kidney injury due to wasp stings involves several mechanisms that include intravascular hemolysis, rhabdomyolysis, shock, and the direct toxic effects of the venom. Some patients may have been stung multiple times.[6] The usual underlying lesion is acute tubular necrosis (ATN), and the course is characterized by complete recovery. Here we present a case of a girl, aged 4 years and 6 months who presented with AKI due to multiple wasp stings. **[Paediatr Indones. 2021;61:115-8 ; DOI: 10.14238/pi61.2.2021.115-8 ].**

***Keywords:*** *acute kidney injury; wasp venom; wasp stings*

## The Case

A 4 year 6 month-old girl (the 2nd child of her non-consanguineous parents, immunized per expanded program of immunization/EPI schedule, hailing from Lakshmipur) had been stung by wasps multiple times all over the body 7 days prior to admission at *Bangabandhu Sheikh Mujib Medical University* (BSMMU). She had experienced oliguria and generalized edema starting from periorbital region for 5 days prior to admission at BSMMU. She was treated conservatively in a local hospital and was not responded well. At local hospital, she developed respiratory distress on day 6. For this reason, she was referred to BSMMU. There was no history of fever, bleeding from sting sites, muscle pain, jaundice, hematuria, nausea, vomiting, headache, convulsion, rash, or joint pain. On examination, she was drowsy,

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afebrile, puffy, and had anasarca. All the vital signs were stable except for tachypnea (respiratory rate of 46 breaths/min) and acidotic breathing. Skin survey revealed about 30 wasp sting sites of different sizes (0.5x0.5 to 1x1 cm) over the whole body, mostly on back and buttock and focally on both limbs and head. Some lesions were ulcerated, while some were blackish and healed **(Figure 1).**

Bedside urine albumin (BSUA) was nil. Anthropometrically she was well-nourished. Other systemic examinations revealed normal findings. The patient did not have any other significant illness in the past. She did not have hypertension, or any history of nephrotoxic drug intake or renal disease.

Initial investigation reports revealed anemia with neutrophilic leukocytosis without any evidence of intravascular hemolysis, blood urea 279 mg/dL, serum creatinine 9.59 mg/dL, and eGFR 4.52 mL/min/1.73m$^2$. Serum electrolytes showed metabolic acidosis and hyperkalemia. Her circulating eosinophil count, urine routine examination, coagulation profiles, and liver function tests were normal. Echocardiography and chest X-ray were normal; ultrasonogram of kidney, ureter, and urinary bladder revealed no abnormalities. On the basis of history, clinical manifestations, and laboratory investigations, the patient was diagnosed with AKI due to wasp stings.

After resuscitation and supportive measures, intermittent peritoneal dialysis was given for 96 hours. Following peritoneal dialysis, her clinical and biochemical picture started to improve. Urine output gradually increased, and urine color became lighter. Serum creatinine and blood urea decreased and eGFR gradually improve d to normal levels on the 7$^{th}$ day post-admission (**Tables 1** and **2**). The patient was discharged on the 8$^{th}$ day with no residual complications.

## Discussion

Hymenopteran stings usually occur when the insects are disturbed while searching for food. Wasps will sting in defense if they are accidentally stepped on, swatted, or otherwise disturbed. In contrast, mass envenomation occurs when stinging insects attack a human deemed as a threat to their colony, whereupon hundreds of insects may be involved. In our case, many wasps attack the child while she was playing near wasp colony. In temperate climates, stings may occur during warmer seasons, but their numbers peak in August.[7] A spectrum of clinical manifestations ranging from non-specific skin lesions to anaphylactic shock can occur in a previously sensitized person, following even a single sting. About 500 stings may be fatal to an adult due to direct toxicity; however, as few as 30-50 stings

**Figure 1**. Multiple lesions of different sizes present on the skin of the whole body, including limbs, forehead, back and buttock

**Table 1**. Improvement of renal function following peritoneal dialysis

| Variables | On admission | Day 1 | Day 4 | Day 7/before discharge |
|---|---|---|---|---|
| Urine output, mL/kg/hr | 0.13 (scanty micturition) | 500 | 750 | 1,250 |
| Blood urea, mg/dL | 279 | 120.7 | 79.2 | 55 |
| Serum creatinine, mg/dL | 9.59 | 4.8 | 2.03 | 0.9 |
| eGFR, mL/min/1.73m$^2$ | 4.52 | 9.03 | 21.36 | 48.1 |

**Table 2**. Electrolytes trend during hospitalization

| Variables | On admission | Day1 | Day 2 | Day 3 | Day 5 | Day 7/before discharge |
|---|---|---|---|---|---|---|
| $Na^+$, mmol/L | 135 | 134 | 132 | 137 | 139 | 137 |
| $K^+$, mmol/L | 6.3 | 4 | 3.6 | 3.9 | 4.2 | 4.1 |
| $Cl^-$, mmol/L | 107 | 104 | 104 | 105 | 106 | 109 |
| $TCO_2$, mmol/L | 7.1 | 15.3 | 15.3 | 18.1 | 20.4 | 21.2 |

led to fatalities in children.[8] Our patient had around 30 sting marks all over her body.

Wasp venom contains various biogenic substances such as toxic surface-active polypeptides (melittin and apamin), enzymes (phospholipase A2 and hyaluronidase), and low molecular weight agents (histamine and amino acids). Melittin and phospholipase cause rhabdomyolysis, following a toxic action on striated muscle which also acts on RBC to induce hemolysis.[9] It has been postulated that myoglobin released from muscles induces AKI by toxic effects on tubular epithelial cells through intralobular cast formation, or pigment nephropathy. In addition, myoglobin is a potent inhibitor of nitric oxide bioactivity and may trigger intrarenal vasoconstriction and ischemia in patients with borderline renal hypoperfusion. Another possible cause of renal insufficiency is acute interstitial nephritis, which is thought to occur by a direct venom effect.[10]

Fatalities following multiple wasp stings are often the result of renal failure due to myolysis and hemolysis. In a review of twelve cases of wasp stings, 7 out of the 12 cases had rhabdomyolysis.[11] In India, five out of nine cases of rhabdomyolysis were associated with wasp stings.[12] In our case, we found no evidence of rhabdomyolyis or hemolysis. Immune-mediated acute interstitial nephritis due to toxins may be another mechanism of kidney injury, according to a case report.[13] Acute kidney injury without evidence of shock, hemolysis, or rhabdomyolysis, were found to be due to acute interstitial nephritis on renal biopsy, in two case series.[14-15] The exact cause of AKI could not be established in our patient, as renal biopsy was not performed due to rapid improvement of renal function following peritoneal dialysis. Renal biopsy is recommended when renal function deteriorates or does not improve, in order to determine the renal lesion, as that specifies drug treatment.[16] Acute interstitial nephritis can be treated with steroids.[17] Steroids reduce interstitial fibrosis in acute interstitial nephritis, leading to early renal recovery and ultimately preventing irreversible kidney damage.[16]

Prognosis depends on the time interval between getting stung and hospital admission. Immediate management is essential, and starts with removal of the stingers, along with recognition of toxin-related complications, as well as treatment for anaphylaxis with injectable antihistamines, steroids, and epinephrine.[17-19] The primary therapeutic goal is to prevent volume depletion, tubular obstruction, and aciduria, which can cause AKI. Copious saline hydration for IV volume replacement and $NaHCO_3$ for urine alkalization should be administered. Once overt renal failure has developed, the only treatment is dialysis. In our case, intermittent peritoneal dialysis was given and the response was excellent.

Wasp stings are common in Bangladesh, especially in rural areas. Although most cases develop minor, self-limiting, and localized symptoms, a few cases may present with AKI. Early recognition and prompt treatment are crucial to the successful management of these patients. In case of renal failure, early dialysis may be lifesaving in many situations.

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