# Massive Honeybee Envenomation: A Case Series of Simultaneous Multiple Casualties

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**ABSTRACT** **Background:** Mass honeybee envenomation (MHE) is a rare occurrence, with possible life-threatening or fatal consequences.

**Objectives:** To present the first description of multiple simultaneous casualties in a single incident of MHE.

**Methods:** Nine young men were simultaneously attacked by a large honeybee swarm. All patients were hemodynamically stable on arrival to Sheba Medical Center. One had fiberoptic evidence of laryngeal edema. Eight (89%) of the patients had leukocytosis and laboratory evidence of rhabdomyolysis. Eight patients were hospitalized in an internal medicine ward. The patient who had the most (over 300) stings removed presented with severe rhabdomyolysis and acute renal failure (ARF) and was admitted to the intensive care unit.

**Results:** Most patients had a benign clinical course and were discharged within 2 days. One patient developed severe rhabdomyolysis and was treated with fluids and urine alkalinization with significant improvement. The clinical course of another patient was complicated by ARF consistent with acute tubular necrosis. His creatinine peaked at 3.04 mg/dl and improved over several days until his discharge.

**Conclusions:** In our case series, we demonstrated the spectrum of clinical presentations associated with MHE and highlighted the importance of stings load as a prognostic factor, which may dictate early therapeutic intervention.

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**KEY WORDS:** acute renal failure, emergency medicine, massive honeybee envenomation, toxicology

Honeybee (Apis species) stings are a common occurrence; however, massive honeybee envenomation, consisting of simultaneous hundreds to thousands of stings is rare. The large cumulative amount of venom delivered to the victim causes a systemic toxic effect, which could prove fatal, even in a non-allergic individual. There have been 788 deaths due to hornet, wasp, and bee stings reported in the United States between 2011 and 2021 [1], mostly due to immunoglobulin E (IgE) mediated allergic reaction in pre-sensitized individuals [2].

Bee venom composition is similar among different Apis species [3] with minor variations in the quantities of its components. The main component, melittin, comprises 50% of venom weight. It functions as a membrane integrity altering agent, facilitating the entrance of larger molecular weight components, such as the enzyme phospholipase A2 (11% by weight), which has no toxic effect by itself; however, it is the main allergen in bee venom. The combined action of these components results in cell wall disruption and cellular death.

Hyaluronidase (1–2%) disrupts the connecting tissue matrix, facilitating venom spread, as well as being a secondary allergen. Mast cell degranulation protein (2%) causes mast cell breakdown and histamine release. Other components include apamin (3%) a neurotoxin, histamine (0.7–1.6%), and additional hydrolytic enzymes such as acid phospholipase and lysophospholipase (1% each). Various components of bee stings were demonstrated to also have an anticoagulant effect in vitro [4,5]. A case of severe envenomation demonstrated detectable levels of circulating venom in the serum for over 50 hours after the incident [6].

Presently, massive bee envenomation have been described as sporadic single case reports. According to these episodes, initial symptoms are non-specific and usually consist of fatigue, dizziness, nausea, and vomiting [7]. Endogenous histamine release often causes diarrhea. Evidence of systemic toxicity usually presents within 24 hours, although delayed onset between 2 and 6 days was also described. Systemic manifestations include hemolysis and rhabdomyolysis with creatinine phosphokinase (CPK) levels usually reaching their peak by 24 hours [8]. Acute renal failure is a common finding due to rhabdomyolysis as well as direct toxic damage to nephrons, with findings compatible with acute tubular necrosis (ATN) [9,10]. Thrombocytopenia with or without disseminated intravascular coagulopathy may occur. Other findings include acute liver failure [11], hypertensionm and central nervous system dysfunction. Death following massive envenomation has occurred from 16 hours to 12 days following the envenomation, with the cause of death usually being renal failure or cardiac arrest. The total amount of venom delivered by a single honeybee sting is estimated at 50–140 mcg [12]. The median lethal dose of honeybee venom has been estimated at 2.8–3.5 mg/kg or 19 stings per kg, which is approximately 1000–1500 stings for an average adult [13].

Treatment of massive honeybee envenomation consists of supporting measures, including hydration and forced diuresis in cases of rhabdomyolysis. There have been several reports of plasma exchange therapy or plasmapheresis successfully used to treat cases of massive bee envenomation associated with multiple organ failure [14-16]. The chances for beneficial plasmapheresis may be related to early initiation of therapy, although supporting evidence is lacking. The efficacy of therapeutic plasma exchange (TPE) or plasmapheresis likely results from the rapid removal of large amounts of circulating venom, as well as byproducts of cellular damage and inflammatory mediators [17]. A specific antiserum for apis venom components melittin and phospholipase A2 is currently being researched as a possible therapy [18].

We describe for the first time, to the best of our knowledge, the clinical course of a simultaneous massive envenomation in a series of nine healthy males. The study was approved by an internal review board for Sheba Medical Center (Helsinki committee approval SMC-D-1305-24).

## PATIENTS AND METHODS

Nine young men were simultaneously exposed to a large swarm of honeybees. The swarm was suspected to include thousands of bees. All nine individuals were stung in exposed body areas, including hands, scalp, mouth, nose, ears, eyelids, and parts of the neck and torso. After an estimated 30–60 minutes from the beginning of the incident, they were evacuated to Sheba Medical Center. Following an initial evaluation in the emergency department, patients were undressed and inspected for visible wounds and bee stingers, which were removed. Each patient had several dozen to several hundred stingers removed with patient A having the highest number of stings removed (> 300). Laboratory tests for each individual included complete blood count, creatinine and electrolytes, liver enzymes, CPK levels, and high sensitivity troponin levels [Table 1]. All patients received initial treatment with 1 liter of intravenous (IV) crystalloid solution (NaCl 0.9% or lactated ringer's solution), with further crystalloids administered according to hemodynamic status and laboratory results. Initial treatment also consisted of 300 mg of IV hydrocortisone, except for a single patient who received 10 mg of intravenous dexamethasone due to laryngeal edema, and 10 mg of oral loratadine. Three patients with more severe symptoms were treated with intramuscular promethazine, and one patient received a single dose of intramuscular adrenaline.

Patients' initial vital signs and laboratory results are summarized in Table 1. All nine patients were hemodynamically stable, and seven were free of respiratory symptoms. Two patients who presented with respiratory distress underwent laryngeal endoscopy. One was deemed normal and the other had laryngeal edema. He remained in the emergency shock room for repeat evaluation. Several hours after the initial therapy his dyspnea abated, and repeat endoscopy demonstrated resolution of laryngeal edema. All but one patient had an increased leukocyte and neutrophil count in their initial laboratory tests. Initial creatinine levels were within normal limits for 8/9 patients. Initial CPK levels were elevated in 8/9 patients, ranging from 190–4310 U/L. Troponin I levels were elevated in three patients, ranging between 21.8–73.6 ng/L.

## RESULTS

Patient A [Table 1, Figure 1] presented with over 300 bee stings, concentrated mostly on the torso but also involving the throat and the face, with ophtalmological examination revealing a corneal abrasion resulting from a stinger that penetrated the eyelid. While his vital signs and physical examination were normal, his laboratory results demonstrated rhabdomyolysis with a CPK value of 4310 U/L, acute renal failure with a creatinine value of 1.49 mg/dl,

prolonged partial thromboplastin time (pTT) above 150 seconds with near normal prothrombin time (PT) of 72%, and electrolyte disturbances including severe hypokalemia of 2.8 meq/L and hypophosphatemia of < 1 mg/dl. Repeat bloodwork after treatment with IV crystalloid and potassium chloride demonstrated improvement with potassium level increasing to 3.7 meq/L and creatinine decreasing to 1.35 mg/dl. The pTT disturbance may have resulted from an interfering lupus anticoagulant (LAC)-like effect of the bee toxin. A plasma mixing study demonstrated a significant reduction in pTT time, so the patient was deemed not to be at risk of major bleeding.

Patient A was admitted to the intensive care unit for further management. During his stay he complained of headaches, with blood pressure measurements exceeding 220/120 mmHg. He was treated with several boluses of labetalol resulting in gradual improvement in his blood pressure measurements and symptoms. Due to the finding of acute renal failure and hypertensive crisis, a renal ultrasound was performed to rule out renal arterial thrombosis, which demonstrated normal kidneys, arterial renal flow, and collecting system. Further bloodwork demonstrated an improvement in creatinine values, which decreased to 1 mg/dl, as well as worsening rhabdomyolysis,

**Table 1.** Clinical and laboratory characteristics of victims of massive bee envenomation at presentation

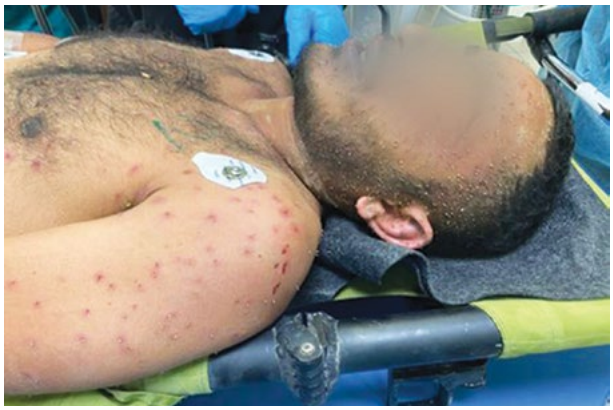
| Patient | Age in years | HR | BP | WBC (k/ml) | Cr (mg/dl) | UA (mg/dl) | CPK (U/L)* | Tr (ng/L)** | IV fluids (ml) | Other treatments |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 27 | 85 | 120/67 | 28.91 | 1.49 | 9.5 | 4310 | 73.6 | NaCL 0.9% 1000 | loratadine 10 mg<br>hydrocortisone 300 mg<br>metoclopramide 10 mg<br>fentanyl 50 mg |
| B | 23 | 101 | 139/64 | 20.51 | 1.15 | 21.5 | 334 | 22.3 | NaCl 0.9% 2000 | loratadine 10 mg<br>granisetron 3 mg<br>adrenaline 0.5 mg<br>hydrocortisone 300 mg<br>paracetamol 1000 mg<br>metoclopramide 10 mg<br>ENT endoscopy |
| C | 29 | 93 | 128/67 | 15.36 | 1.21 | 8.6 | 683 | 12.2 | LR 1000 | loratadine 10 mg<br>hydrocortisone 300 mg |
| D | 23 | 130 | 115/57 | 20.11 | 1.02 | 8.7 | 417 | 65.2 | LR 1000 | loratadine 10 mg<br>hydrocortisone 300 mg<br>metamizole 1000 mg |
| E | 31 | 110 | 137/80 | 13.25 | 1.13 | 6.5 | 551 | 7.1 | LR 1000 | loratadine 10 mg<br>hydrocortisone 300 mg<br>metoclopramide 10 mg |
| F | 24 | 81 | 122/72 | 4.78 | 0.75 | 6.5 | 427 | 3.5 | LR 1000 | loratadine 10 mg<br>hydrocortisone 300 mg<br>promethazine 25 mg |
| G | 19 | 91 | 146/81 | 28.09 | 1.12 | 12.4 | 190 | 6.3 | LR 1000 | loratadine 10 mg<br>hydrocortisone 300 mg<br>promethazine 25 mg<br>adrenaline 0.5 mg |
| H | 23 | 92 | 117/69 | 11.47 | 0.99 | 7 | 150 | 13.9 | NaCl 0.9% 2000 | loratadine 10 mg<br>tramadol 100 mg<br>dexamethasone 10 mg<br>fentanyl 50 mcg<br>promethazine 12.5 mg<br>endoscopy |
| I | 20 | 93 | 138/82 | 16.65 | 1.23 | 10.1 | 303 | 26 | LR 1000 | paracetamol 1000 mg<br>loratadine 10 mg<br>hydrocortisone 300 mg<br>metamizole 1000 mg |

*Normal range 0–170 U/L

**Normal range 0–20 ng/L (men), 0–12 ng/L (women)

BP = blood pressure, CPK = creatine phosphokinase, Cr = serum creatinine, HB = hemoglobin, HR = heart rate, IV = intravenous, LR = lactated ringer, Neu = absolute neutrophile count, P = serum phosphor, UA = uric acid, Tr = troponin I, WBC = white blood cells count

**Figure 1.** Patient A at presentation



with CPK levels peaking above the upper limit of 40,000 U/L, and troponin I levels increased to 4000 ng/L. The addition of 300 ml/hr of balanced crystalloid solution and sodium bicarbonate for urine alkalinization resulted in a decrease in troponin levels and a decrease in CPK. He was transferred to an internal medicine ward, where he continued treatment with IV crystalloids and sodium bicarbonate with gradual decrease of CPK values in repeat bloodwork. He was discharged from the hospital in good condition after a total length of stay of 6 days.

The other eight patients [Table 1] were admitted to an internal medicine ward. All eight were hemodynamically stable and without respiratory distress throughout their stay. Their blood work demonstrated leukocytosis with neutrophilia and mild rhabdomyolysis. They were treated with IV crystalloid solution and oral prednisone and antihistamines. Most were discharged after 2 days of observation with recommendations for further treatment with oral glucocorticoids and antihistamines for a few additional days. They were followed for at least 2 weeks for a late occurrence of symptoms. Patient B's clinical course was complicated by peripheral edema, oliguria, and acute renal failure, presumably due to ATN, with creatinine levels that increased to a maximum of 3.04 mg/dl. After treatment with a single dose of 5 mg furosemide, his urine output was greatly increased and edema rapidly resolved with a gradual lowering of serum creatinine. He was discharged from the hospital after 6 days in good clinical condition and with a creatinine value of 1.34 mg/dl. Further ambulatory follow-up for 9 months of patients A and B demonstrated no long-term sequela, with normal values of creatinine, CPK and liver enzymes.

## DISCUSSION

Our case series, to the best of our knowledge, is the first to report multiple simultaneous casualties in a single incident of massive bee envenomation. While there have been reports of incidents of massive bee envenomation, all of them contained a single target. Our series enabled us to describe the range of symptoms, severity, and clinical course of several individuals all exposed to mass bee envenomation. Previous incidents of hundreds or thousands of bee stings have resulted in severe outcomes, including severe rhabdomyolysis, renal failure, and cardiogenic shock, resulting in many fatalities. A former study showed that death in massive bee envenomation incidents is associated with age and the number of stings [7].

Our patients demonstrated a relatively benign outcome. Because the bee swarm in our case attacked several adults at once, each of them might have received a relatively smaller venom load than they would have received had they been the sole target, which likely contributed to their relatively benign clinical course. Patient A, who demonstrated the most severe rhabdomyolysis with resultant renal failure, seemed to have the highest sting count in our cohort, estimated at over 300 stings. This finding further highlights the importance of the actual exposure to bee stings as an important prognostic factor that should be assessed as accurately as possible upon admission, which may also dictate early intervention.

Our patients demonstrated several known effects of massive bee envenomation. Most presented with some degree of rhabdomyolysis. Patient A demonstrated an episode of severe hypertension [7,9], and patient B presented with acute renal failure with urine sediment findings compatible with ATN, which is a known complication of bee venom exposure [7-10].

The anticoagulant effect of honeybee venom was described mainly in vitro and involves prothrombin time prolongation. Patient A demonstrated prolonged pTT that was corrected via plasma-mixing, similar to the effect of LAC antibodies. These findings may suggest a LAC-like effect of honeybee venom not previously described. Considering an elevated troponin I levels up to 4000 ng/L, we considered a possible diagnosis of Kounis syndrome [19]–acute coronary syndrome caused by an extreme immune reaction. However, this analysis was quickly ruled out due to a lack of symptoms associated with acute myo-

cardial ischemia and a lack of an increased eosinophils count. Given the parallel course of concentration versus the time levels of CPK and troponin I, we surmised that the elevated troponin originated from the extreme rhabdomyolysis.

We initially considered TPE for patient A, who demonstrated the most severe laboratory abnormalities. However, the evidence supporting TPE in massive honeybee envenomation is anecdotal and was used in extremely severe cases of envenomation with evidence of early organ failure. Our patients (including patient A) exhibited a milder presentation, resulting in decision against TPE.

## LIMITATIONS

The major limitation of our study is our inability to quantify the number of stings and the exposure for each patient. Previous cases of single patients generally had better estimates of the number of stings received. However, in our cohort, as all nine patients arrived at the hospital at the same time, emergency department staff focused on quickly removing the stingers rather than counting them. Using photos taken on arrival to the emergency department, we estimated the sting count as several dozen to a maximum of several hundred per patient, with only patient A having a confirmed count of over 300 stingers removed.

## CONCLUSIONS

Massive bee envenomation is a rare occurrence and can result in life-threatening and potentially fatal consequences. However, our cohort demonstrated that with a relatively low load of bee stings one should expect benign clinical course that can resolve with supporting treatment alone. It is important to recognize early patients with large venom loads who are at risk for organ damage and to consider TPE at an early stage.

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## References

1. QuickStats: Number of Deaths from Hornet, Wasp, and Bee Stings* Among Males and Females - National Vital Statistics System, United States, 2011-2021. *MMWR Morb Mortal Wkly Rep* 2023; 72 (27): 756.
2. Sherman RA. What physicians should know about Africanized honeybees. *West J Med* 1995; 163 (6): 541-6.
3. Banks BEC, Shipolini, RA. Chemistry and pharmacology of honeybee venom. In Piek T (Ed). Venoms of the Hymenoptera: Biochemical, Pharmacological and Behavioural Aspects. Orlando, FL: Academic Press, 1986: 329-416.
4. Zolfagharian H, Mohajeri M, Babaie M. Honey bee venom (Apis mellifera) contains anticoagulation factors and increases the blood-clotting time. *J Pharmacopuncture* 2015; 18 (4): 7-11.
5. Yaacoub C, Wehbe R, Salma Y, et al. *Apis mellifera syriaca* Venom: evaluation of its anticoagulant effect, proteolytic activity, and cytotoxicity along with its two main compounds-MEL and PLA2-On HeLa cancer cells. *Molecules* 2022; 27 (5): 1653.
6. França FO, Benvenuti LA, Fan HW, et al. Severe and fatal mass attacks by 'killer' bees (Africanized honey bees--Apis mellifera scutellata) in Brazil: clinicopathological studies with measurement of serum venom concentrations. *Q J Med* 1994; 87 (5): 269-82.
7. Vetter RS, Visscher PK, Camazine S. Mass envenomations by honey bees and wasps. *West J Med* 1999; 170 (4): 223-7.
8. Humblet Y, Sonnet J, van Ypersele de Strihou C. Bee stings and acute tubular necrosis. *Nephron* 1982; 31 (2): 187-8.
9. Cavalcante JS, Riciopo PM, Pereira AFM, et al. Clinical complications in envenoming by Apis honeybee stings: insights into mechanisms, diagnosis, and pharmacological interventions. *Front Immunol* 2024; 15: 1437413.
10. Veena V, Mehta H, Dhingra P, Ballani A. Multiple bee stings and acute kidney injury: a case report. *Cureus* 2024; 16 (8): e66488.
11. Osman UMA, Turfan S, Mohamud MFY. Multi-organ dysfunction due to envenoming syndrome following a massive bee attack: a fatal case study and comprehensive literature review. *Int Med Case Rep J* 2024; 17: 353-7.
12. Gajski G, Leonova E, Sjakste N. Bee venom: composition and anticancer properties. *Toxins (Basel)* 2024; 16 (3): 117.
13. Pucca MB, Cerni FA, Oliveira IS, et al. Bee updated: current knowledge on bee venom and bee envenoming therapy. *Front Immunol* 2019; 10: 2090.
14. Sunny JM, Abrencillo R. Massive bee envenomation treated by therapeutic plasma exchange. *J Clin Apher* 2021; 36 (4): 654-7.
15. McKenna WR, Hess B.Massive honeybee envenomation and plasmapheresis. *J Allergy Clin Immunol* 2003; 111 (2): S332.
16. Díaz-Sánchez CL, Lifshitz-Guinzberg A, Ignacio-Ibarra G, Halabe-Cherem J, Quinones-Galvan A. Survival after massive (>2000) Africanized honeybee stings. *Arch Intern Med* 1998; 158 (8): 925-7.
17. Schutt RC, Ronco C, Rosner MH. The role of therapeutic plasma exchange in poisonings and intoxications. *Semin Dial* 2012; 25 (2): 201-6.
18. Barbosa AN, Ferreira RS Jr, de Carvalho FCT, et al. Single-arm, multicenter phase i/ii clinical trial for the treatment of envenomings by massive Africanized honey bee stings using the unique apilic antivenom. *Front Immunol* 2021; 12: 653151.
19. Memon S, Chhabra L, Masrur S, Parker MW. Allergic acute coronary syndrome (Kounis syndrome). *Proc (Bayl Univ Med Cent)* 2015; 28 (3): 358-62.

**A misery is not to be measured from the nature of the evil, but from the temper of the sufferer.**
Joseph Addison (1672–1719), English essayist, poet, playwright, and politician