**Original article**

# Factors affecting the prognosis of Honey Bee sting reaction

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**Abstract:**

Insects of the order Hymenoptera, which include honey bees, wasps, ants and hornets, are frequently involved in accidental stings to human beings. Bee venom consists of a mixture of biologically active substances which cause localized and systemic reactions which may be fatal. Present study was conducted to study the clinical features of Honey bee sting reaction & to evaluate various factors affecting its prognosis. Total 50 patients (37 males & 13 females) were included in this study from different age groups. All patients were given conservative treatment with antihistaminics & were observed till discharge from the hospital. In this study we conclude that in Honey bee sting patients the incidence of systemic anaphylaxis is more in old age patients with history of previous allergy & severe previous sting reactions, in patients having multiple stings and late presentation to the hospital.

**Key words:** Honey bee sting, antihistaminics, systemic anaphylaxis

**Introduction:**

Anaphylactic shock is an unexpected, sudden and deadly event that affects the 75% of the cases without pre-existent history of allergy. According to the recent concept most common causes of Anaphylactic shock are drugs, hymenopteric poisons and nutrients. [1] Insects of the order Hymenoptera, which include honey bees, wasps, ants and hornets, are frequently involved in accidental stings to human beings. Hymenoptera venom consists of a mixture of biologically active substances which cause localized and systemic reactions which may be fatal. The severity and duration of reaction to bee venom can differ from one person to another.

**Entomology:**

Hymenoptera order members are particularly important because of being nearly ubiquitous in the nature. Their stings may lead to fatal allergic reactions. The members of the Hymenoptera order are bees, wasps, hornets, yellowjackets and ants.Many of these animals have poison glands and stinging apparatus. Two distinct families exist, the Apidae and the Vespidae. The genus Apis contains only the honeybee (Apis mellifera), while the genus Polistes and the genus Vespula contain wasp, yellow jacket and hornet. The various subspecies occur with different frequencies in different parts of the world .

**Pathogenesis:**

During a sting approximately 50 µg of venom is injected into the skin. The sting is normally left in situ, resulting in evisceration and death of the bee. Bees venom contains three main allergens: Phospholipase A, hyaluronidase and mellitin. Hymenoptera venom consists of a mixture of biologically active substances including enzymes (phospholi-pases, hyaluronidases), peptides (melitin, apamin, bombolitins) and other low molecular weight compounds (biog-enic amines, acetylcholine, lipids and free amino acids) .

The non-allergic local reaction is a toxic response to venom constituents, while the large local reaction appears to be caused by an allergic reaction to venom proteins. The IgE mediated late-phase reaction is probably responsible for most of these reactions; however, a cell-mediated mechanism, or a combination of the two, is possible. Mellitin, a peptide component of bee venom, hydrolyses cell membranes, changes cell permeability, causes histamine and cate-cholamine release and is responsible for local pain. It acts with phospholipase-A2 to trigger the release of arachido-nic acid, which causes cell membrane breakdown, damage of the vascular endothelium, and activation of the inflammatory response. Peptide 401 (mast cell degranulating peptide), triggers mast cells to degranulate, releasing hista-mine and other vasoactive peptides. Vasoactive amines, including histamine, dopamine and noradrenaline can pro-voke ischemia and even myocardial infarction through profound hypotension and arrhythmia, or by increasing oxy-gen demands through direct inotropic and chronotropic effects in the presence of preexisting ischemic heart Disease[ 2]. The "allergic angina syndrome" which could progress to acute myocardial infarction ("allergic myocardial infarction") was first described in 1991 by Kounis and Zavras. Allergic angina and allergic myocardial infarction are no-w referred to as "Kounis syndrome" this syndrome is associated with mast cell degranulation[3-5].Jae Woo Jung et al reported a fatal case of a 65-year-old woman with DIC (Disseminated intravascular Coagulation), following ana-phylactic shock after bee sting acupuncture[6]. Mesothelium damage, thrombocyte and macrophage activation, cyt-okine, leukotriene release vascular coagulation, bradykinin and Platelet activating factor (PAF) and sometimes eve-n the deposition of immune complexes in the basement membrane of small blood vessels and activation of the complement system may contribute to the pathogenesis of DIC[7].

**Lethal dose and fatal period:**

The estimated lethal dose is approximately 20 stings/kg in most mammals. Onset of life-threatening, anaphylactic signs typically occur within 10 minutes of the stings. Massive honey bee envenomation is defined as more than 50 stings at a time.

**Clinical Features:**

Honey bee sting results in a number of clinical presentations :

(i) Non-allergic, local reactions (pain, edema, redness at the sting site)

(ii) Allergic, large local reactions (extensive swelling >10 cm persisting more than 24hrs)

(iii) Anaphylaxis (generalized urticaria, angioedema, bronchospasm, hypotension, cardiovascular collapse and loss of consciousness)

(iv) Systemic toxic reactions (nausea, vomiting, diarrhea, headache, seizures and altered sensorium)

(v) Unusual reactions (cardiac ischemia, encephalomyelitis and cerebral infarctions)[8,9].

**Aims & objectives:**

(i) To study the clinical features of Honey bee sting reaction.

(ii) To study the factors affecting the prognosis of the Honey bee sting reaction.

**Material & Methods:**

This study was carried out in one year period at Government Medical College, Akola after taking permission from the Institute's ethical committee. Total 50 cases (37 males & 13 females) were included in this study. All the patients agreed to take part in the present study. Patients from all age groups and of both sexes were studied. Blood investigations including hemogram, liver function tests, kidney



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function tests, blood sugar level, serum proteins and urine examination were done. In all 50 patients antihistaminics were given & all patients were observed till discharge from the hospital.In all patients, first step in the treatment following a bee sting i. e. removal of the stinger was done. Cool compresses were applied to reduce local pain & swelling. Topical anaesthetic agent benzocaine was applied to reduce pain and menthol to reduce itching.In uncomplicated patients, conservative therapy with antihistaminics was done. Epinephrine is the only effective drug in cases of severe systemic anaphylaxis having respiratory (bronchial asthma, laryngeal edema) or cardiovascular (hypotension, arrhythmias, hypovolemic shock) manifestations. It was administered in cases of severe systemic anaphylaxis.

Patients having previous history of non allergic local reactions were considered as having "less severe" previous reactions & those having previous history of allergic large local reactions or anaphylaxis or required hospitalizat-ion in the past were considered as having "more severe" previous reactions.

**Observations:**

In the present study following observations were made.

**Table I: Clinical features observed in the present study.**

| S. N. | Clinical features observed | No. of patients | Percentage |
|---|---|---|---|
| 1 | Non-allergic, local reactions | 40 | 80 |
| 2 | Allergic, large local reactions | 8 | 16 |
| 3 | Anaphylaxis | 2 | 4 |
| 4 | Systemic toxic reactions | 0 | 0 |
| 5 | Unusual reactions | 0 | 0 |

The above observation table shows that in the present study, majority of the patients (80%) developed local anaphylaxis.

**Table II: Incidence of systemic anaphylaxis in relation with age of patients.**

| Age in years | No. of patients | Patients developing severe systemic anaphylaxis | % |
|---|---|---|---|
| 0-20 | 8 | 0 | 0 |
| 21-30 | 4 | 0 | 0 |
| 31-40 | 7 | 0 | 0 |
| 41-50 | 16 | 0 | 0 |
| >50 | 15 | 2 | 13.33 |

The above observation table shows that the incidence of systemic anaphylaxis was more ( 13.33% ) in patients more than 50 years of age i.e. old age patients.

**Table III: Incidence of systemic anaphylaxis in relation with history of previous allergy.**

| History of previous allergy | No. of patients | Patients developing severe systemic anaphylaxis | % |
|---|---|---|---|
| Present | 10 | 2 | 20 |
| Absent | 40 | 0 | 0 |

The above observation table shows that the incidence of systemic anaphylaxis was more ( 20% ) in patients having history of previous allergy.

**Table IV: Incidence of systemic anaphylaxis in relation with severity of previous sting reactions.**

| Severity of previous sting reactions | No. of patients | Patients developing severe systemic anaphylaxis | % |
|---|---|---|---|
| More severe | 6 | 2 | 33.33 |
| Less severe | 4 | 0 | 0 |



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The above observation table shows that the incidence of systemic anaphylaxis was more ( 33.33% ) in patients having more severe previous sting reactions.

**Table V: Incidence of systemic anaphylaxis in relation with history of multiple stings to patients.**

| History of multiple stings to patients. | No. of patients | Patients developing severe systemic anaphylaxis | % |
|---|---|---|---|
| Present | 14 | 2 | 14.28 |
| Absent | 36 | 0 | 0 |

The above observation table shows that the incidence of systemic anaphylaxis was more ( 14.28% ) in patients having history of multiple stings.

**Table VI: Incidence of systemic anaphylaxis in relation with late presentation of Honey bee sting patients.**

| Duration from Honey bee sting to Hospitalization (hours) | No. of patients | Patients developing severe systemic anaphylaxis | % |
|---|---|---|---|
| <6 hours | 35 | 0 | 0% |
| >6 hours | 15 | 2 | 13.33% |

The above observation table shows that the incidence of systemic anaphylaxis was more ( 13.33% ) in patients with late presentation to the hospital.

In all 50 patients antihistaminics were given but 2 patients having old age with history of previous allergy, history of more severe previous sting reactions, having multiple stings & late presentation to the hospital developed severe systemic anaphylaxis & expired.

**Discussion:**

Systemic (generalized) allergic sting reactions result in cutaneous, vascular or respiratory symptoms and signs, eit-her singly or in any combination, with possible involvement of other less common target tissues. Cardiac anaphyl-axis can also cause bradycardia, arrhythmias, angina or myocardial infarction. Golden DB et al (16 ) in their study observed that the chance of systemic reaction to a sting was low (5-10%) in children & varies between 25% & 70% which was more in adults depending on the severity of previous sting reactions . In the present study also, the inc-idence of systemic anaphylaxis was more ( 13.33% ) in patients more than 50 years of age i.e. old age patients.

There may be a greater chance of systemic reaction if there are multiple stings at one time, or if there are repeated stings in the same summer. In two retrospective surveys by Lockey RF et al & Golden DBK et al (10,15), there were a larger number of subjects who described worsening of the reaction with subsequent stings. In the present study, the incidence of systemic anaphylaxis was more ( 14.28% ) in patients having history of multiple honey bee stings. In the present study, majority of the patients (80%) developed local anaphylaxis which was also observed by Schuberth KC et al (11). In their study they observed that cutaneous symptoms are most common overall, affecting 80%; they are the sole manifestation in 15% of adults but in more than 60% of affected children. Almost 50% of reactions in both children and adults included respiratory complaints.Systemic allergic reactions are reported by Golden DBK et al (17) & Settipane GA et al (18) in 3% of adults, and almost in 1% of children having a medical history of severe previous sting reactions. In prospective sting challenge studies by Golden DBK et al & vanderLinden PG et al (13,14), less than 1% of the patients had reactions more severe than their past reactions. In the present study also, the incidence of systemic anaphylaxis was more ( 33.33% ) in patients having history of more severe

previous sting reactions. In the studies by Golden DBK, Marsh DG et al (17), over 30% of adults stung in the previous 3 months showed venom-specific IgE by skin test or RAST, and over 20% of all adults tested positive to yellow jacket or honeybee venom, even though most had no history of allergic sting reactions. Golden DBK et al (12) in their study observed that, of the subjects with initial positive skin tests, 30–60% became negative after 3–6 years & those who remained positive showed a 17% frequency of a systemic reaction to a sting. In the present study the incidence of systemic anaphylaxis was more (20%) in patients having history of previous allergy. Golden DBK et al (17) observed that the patients usually fail to admit sting reactions without specific inquiry, often do not seek medical attention, and believe the reaction was a chance occurrence which could not happen again. In the present study, the incidence of systemic anaphylaxis was more (13.33%) in patients with late presentation to the hospital. So the history should include all previous stings, the time course of the reactions, and all associated symptoms and treatments.

**Conclusion:**

In the present study 80% patients developed local anaphylaxis. In this study we conclude that in Honey bee sting pa-tients the incidence of systemic anaphylaxis is more in old age patients with history of previous allergy & severe p-revious sting reactions, in patients having multiple stings and late presentation to the hospital.

For individuals with a specific allergy to Hymenoptera venom, immunotherapy may be a relatively safe and effect-ive treatment option.The efficacy of venom immunotherapy is well documented but this treatment is expensive. It is therefore mainly indicated in patients with a history of severe systemic reactions and a high degree of exposure.

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