

Clinico-epidemiology of Hymenoptera Stings in and around Kaski District, Nepal.

Samata Nepal,^{a,d} Alok Atreya,^{b,d} Tanuj Kanchan^{c,e}

ABSTRACT:

Introduction: In Nepal, morbidity and mortality from Hymenoptera stings is mainly from three commonly encountered insects: hornets (local: *aringal*), wasps (local: *barulo*) and honey bees (local: *mahuri*). The present study documents the incidence of hymenoptera sting in Western Region of Nepal and explores the cause behind such unprovoked attack upon human subjects. **Methods:** This hospital-based study included all the patients with history of insect sting attending the Emergency Department of Manipal Teaching Hospital, Pokhara from May 2015 till November 2015. **Results:** Of total 16 cases during the study period three were brought dead cases. The alleged insect happened to be bee in two cases, hornet in two cases, and wasp in eight cases with a case of unidentified insect sting. Severe burning pain with swelling, redness and itching were the common presenting symptom in all the admitted patients (n=13). **Conclusion:** Agricultural activity during the day was the cause of most unprovoked stings followed by deliberate destruction of the insect hive. Immediate medical attention in the nearby health care facility to the victims might decrease mortality. The health care facility also needs to have surplus lifesaving medication to counteract the life-threatening anaphylaxis reactions from such stings.

Keywords: Bees, Envenomation, Hornets, Hymenoptera, Nepal

INTRODUCTION:

Stings from insects of Hymenoptera group are common in developing countries. The venom the insects possess in their stings is capable of life threatening anaphylactic reaction associated with unanticipated mortality.[1-5] The immunoglobulin IgE present in the venom which is capable of late-phase inflammatory reaction is the reason for morbidity from the stings.[6] In Nepal, the

emergency hospital visits due to stings are mainly from three commonly encountered insect groups; hornets (local: *aringal*), wasps (local: *barulo*) and honey bees (local: *mahuri*). It is well recognized fact that these fierce insects sting only when provoked. [1] If these insects feel a threat from intruder bashing their hives, colonies or being attacked; they counter attack by the use of their powerful stings.

Though isolated cases of insect stings are reported from different regions, detailed analysis of insect stings and their outcomes are lacking in literature. The objective of the present study was to observe the incidence of insect sting and present its detailed clinico-epidemiological profile in the region, and measures for prevention and raise public awareness.

Submitted: 24 December, 2018.

Accepted: 21 November, 2019.

Published: 29 December, 2019.

a - Lecturer, Department of Community Medicine

b - Assistant Professor, Department of Forensic Medicine

c - Additional Professor, Department of Forensic Medicine & Toxicology

d - Lumbini Medical College and Teaching Hospital, Palpa, Nepal.

e - All India Institute of Medical Sciences, Jodhpur, India.

Corresponding Author:

Alok Atreya

e-mail: alokraj67@hotmail.com

ORCID: <https://orcid.org/0000-0001-6657-7871>

How to cite this article:

Nepal S, Atreya A, Kanchan T. Clinico-epidemiology of Hymenoptera Stings in and around Kaski District, Nepal.

Journal of Lumbini Medical College. 2019;7(2):50-55. DOI:

doi.org/10.22502/jlmc.v7i2.276 Epub: 2019 December 29.



METHODS:

This descriptive cross sectional study was carried out in the Emergency Department (ED) of Manipal Teaching Hospital, Pokhara, Nepal. An approval was obtained from the Institutional Research Committee (IRC) before the commencement of the study. All the patients attending the ED with a history of bee or wasp sting between May 2015 and November 2015 were included in the study. Three patients who were brought dead to the ED with an alleged history of wasp sting during the study period were also included. The study duration was chosen between May and November because venom specific IgE has seasonal variation and maximum number of casualties are reported in this period of the year.[2,3]

All the patients in the present study were initially registered either a case of bee sting or wasp sting based on the history given by the patients and/or the attendants. Although, wasp and hornets are two different insect species, there was likelihood that hornet stings too were designated as wasp stings. To be more specific in this regard, a coloured photograph each of hornet and wasp was shown to all the patients registered as a case of wasp sting for confirmation. When the patient or their caregivers, after looking at the photograph claimed it was neither wasp nor hornet, the case was categorized under unidentified insect sting. Detailed history was obtained from the patient and/or patient's caregivers after obtaining informed consent. The specific variables were noted which included age and gender of the patient, insect involved, site stung, activity prior to sting, and the presenting symptoms. The patients were followed up in the wards and data on complications, outcome of treatment and duration of hospital stay were noted. The collected data was analysed using Statistical Package for Social Sciences (SPSS™) software 16.0 and results expressed in proportions.

RESULTS:

A total of 16 cases of bee and wasp stings brought to the Emergency Department (ED) of Manipal Teaching Hospital, Pokhara were analysed in the present investigation. Of all the cases of insect stings (N=16), one patient was referred from primary health centre and three patients were brought dead to the ED with a history of wasp sting, others had directly reported to the ED. Two cases were registered as those from bee sting and other fourteen as wasp sting. The study group comprised

of ten males (62.5%) and six females (37.5%) with a mean age of 25.25±18.36 and 37.0±10.07 years respectively. On showing the picture of the alleged insect, two cases were assigned as bee stings, two cases as hornet and eight cases as wasp stings. The three brought dead cases with alleged history of wasp sting, could not be confirmed yet placed under wasp sting category. Demographic characteristics of the patients are presented in Table 1.

Table 1. Demographic characteristics of the patients. (N=16)

Variable	Frequency n (%)
Sex	
Male	10 (62.5%)
Female	06 (37.5%)
Age distribution	
≤ 10 years	03 (18.75%)
11-30 years	06 (37.5%)
≥31 years	07 (43.75%)
Mean Age (years)	
Male	25.25±18.36
Female	37.00±10.07
Insect Involved	
Bee	02(12.50%)
Wasp	11* (68.75%)
Hornet	02 (12.50%)
Unidentified	01(6.25%)
Activity during Sting	
Cutting paddy	01 (6.25%)
Rearing goat in jungle	01 (6.25%)
Playing	01 (6.25%)
Honey hunting	01 (6.25%)
Walking	01 (6.25%)
Cutting grass	03 (18.75%)
Destroying the hide	04 (25.00%)
Wasp hunting	04 (25.00%)
Time of sting	
Morning (6am to noon)	03 (18.75%)
Day (noon to 6pm)	11 (68.75%)
Evening (6pm onwards)	02 (12.5%)

* Wasps were involved in all three brought dead cases

Severe burning pain with swelling, redness and itching were the presenting symptom in all the patients who got admitted (n=13) to the hospital.

Rash over areas other than the sting site was seen in five cases (38.56%). Besides, four patients (30.77%) complained of shortness of breath. The sting was confined to head and neck region in four cases (30.77%) and one case each (7.69%) in the trunk and upper limb. In the remaining seven cases (53.85%) the sting was not confined to a particular region rather was generalised over a wide area.

History obtained from the patient and/or their caregivers revealed that day time was the most vulnerable period as 68.75% of the total casualties occurred during this period. Unprovoked sting occurred mostly during agricultural activities like cutting paddy, cutting grass, rearing goat etc. One child suffered bee sting while playing. It was observed that deliberate destruction of the insect hive was the main reason of hymenoptera sting in our study. In four cases (25%), the patients were stung while destroying the hive in their neighbourhood. There were four patients stung during wasp hunting and a case from Lamgunj district where a patient was stung by a swarm of bees while he was honey hunting. No mortality was reported for the patients admitted to the hospital (N=13). Duration of stay in the hospital varied between two days and four days with a mean hospital stay of 2.92 ± 0.86 days.

Antihistaminic medication was the treatment given to all admitted cases whereas Injection Hydrocortisone (steroid) and Adrenaline were used only in six admitted cases. Two patients in the study had abnormal renal function and one patient had deranged liver function test reports. One patient with haematological complication had an abnormal Prothrombin Time (PT) where blood did not clot within two minutes. This was the only patient who was transfused four units of fresh frozen plasma and was also administered Vitamin K. Clinical presentation, complications and outcome of hymenoptera stings in the study are shown in Table 2.

DISCUSSION:

Reactions to insect stings are varied ranging from local irritation to systemic manifestations including anaphylaxis, organ failure and death. Small peptides, vaso-active amines and proteins are responsible for initiation of painful stimuli following the sting.[2] The triad of inflammatory responses; redness (rubor), pain (dolor) and swelling (tumor) are invariably present in hymenopteroid stings as observed in our cases. The venom consisting of

Table 2. Clinical presentation and outcome. (N=13)

Variable	Frequency N (%)
Signs and Symptoms	
Swelling	13 (100%)
Severe Pain (burning)	13 (100%)
Redness	13 (100%)
Itching	13 (100%)
Rash (other than sting site)	05 (38.46%)
Shortness of Breath	04 (30.77%)
Sting Site	
Head and neck	04 (30.77%)
Trunk	01 (7.69%)
Limbs	01 (7.69%)
Multiple sites	07 (53.85%)
Duration of hospital stay (days)	
2	05 (38.46%)
3	04 (30.77%)
4	04 (30.77%)
Mean duration (days)	2.92 ± 0.86
Complications	
Abnormal Liver Function Test	01 (7.69%)
Abnormal Renal Function Test	02 (15.38%)
Haemolysis	01 (7.69%)
Outcome	
Recovered and discharged	10 (76.93%)
Left Against Medical Advice	03 (23.07%)
Mortality	00 (--)*

* three cases of wasp stings were brought dead to the hospital

phospholipase, hyaluronidase and enzyme protein is the culprit for tissue damage and fatal anaphylaxis. The pathophysiology of IgE mediated allergic reaction provoked by the venom and its systemic manifestation is exhaustively studied previously and is not within the scope of this article.[4-9] Studies have shown that fatality from hymenoptera venom occurs mostly within one to two hours of sting.[2,4,10] If a patient is injected with epinephrine within this time then the mortality would certainly decline. Intra-dermal skin testing for venom specific IgE is usually

done to determine the severity of anaphylaxis and also to determine the patients needing treatment with venom immunotherapy (VIT). The tertiary centre where this study was conducted had no provision of skin testing for venom specific IgE and neither was treatment with VIT. It is believed that once a person stung by the insect of this group and develops anaphylaxis reaction, there is less than 5% chance that such reaction would occur in subsequent stings. [6,11-13]

The demographic and clinical findings from the previous studies on insect stings are consistent with our findings yet the previous studies did not explore much on the cause of such stings in humans. Beekeeping, formally a secondary activity for some farmers in Nepal, presently has become a business replacing sustenance crop farming.[14] The interesting and unique observation as to cause of bee sting in our study was wild honey hunting. The toxic effect of wild honey on humans especially in the areas of surplus wild nectar flower *Rhododendron* (national flower of Nepal) has already been reported,[15] yet bee sting due to wild honey hunting has not been previously reported. Honey hunting, formerly done as a small and subsidiary activity, nowadays, has become a business, as the collected honey when exported earns a handsome amount of money. Even the intoxicating mad honey is sold in the markets in Japan and Korea where it is used for its medicinal properties. Recently, honey hunting has emerged as a recreational and adventurous sport for the tourist intending to experience this event, which is also a source of income for the indigenous communities. [16] Hornets hunt on honey bees and hornet stings too cannot be denied during this activity.

Hymenopterans do not attack human unless provoked. Humans fear hymenopterans because of the painful stingers they possess. The hive or colony near the residential area is usually destroyed fearing such an attack. In the present study, four cases of wasp sting resulted while trying to destroy the colony in their neighbourhood. The commonest way of destruction of hive is by making a thick smoke below the hive so that the insects are repelled and the hive is destroyed by a long bamboo stick. The authors during interview of the patients in the study found out that three cases were stung by the insect when they were trying to hunt the wasp larvae. It is a popular belief among the local people that the larva of the wasp/hornet is an energy food and also

an aphrodisiac.

The number of cases and the number of mortality in the present study may seem low but the findings reveal bitter reality. Out of 16 cases in the present study only three cases were from Kaski district where the study centre is located. There were only two cases who sought treatment at rural health-post before reaching the study centre. The authors want to highlight the fact that fourteen cases didn't seek treatment at the rural health posts in their locality and travelled two to four hours to reach the tertiary care centre. The two cases who visited the health post were also referred to tertiary centre without epinephrine injections. This point to the fact that the rural health workers in Nepal are not familiar with epinephrine injections/ auto-injectors or it is unavailable. As a consequence people do not trust the care given at the primary health care centres by incompetent care givers.

The authors want to highlight a case where a lady stung by hymenoptera was successfully treated and recovered in a primary health care centre when the nervous health assistant consulted and sought help from a doctor at tertiary centre by telephone.[17] Telemedicine in the form of telephone consultation is not only cost effective but also a life-saving in the remote areas of Nepal. Sometimes unavailability of vehicle, difficult geographical terrain, bumpy roads delay the transport of the patient to the tertiary centre and the patient may collapse and die even before reaching the hospital. Government of Nepal states there are 208 primary health care centres (PHCCs), 1559 health-posts (HPs) and 2247 sub health-posts (SHPs).[18]

The authors recommend the government should conduct awareness programs for the public and also should provide emergency life saving drugs (e.g.epinephrine injections) invariably to all the rural health posts of the country. All the PHCCs, HPs and SHPs should necessarily have a telephone line so that in case of emergency telephone consultation could be made. There should be training and workshops for the care givers from time to time to refresh their knowledge and skills. The locals who live near wild and those who indulge in hymenoptera hunting activity should be made aware that in case of stings they should visit the nearby health post so that life threatening allergic reactions is prevented and human lives are saved in time.

CONCLUSION:

Usually insect stings cause minor and self-limited reactions, but the insects of Hymenoptera group are infamous for causing severe systemic reactions and fatality in some cases. Therefore, patients who are stung by hymenopteroid insects require timely and aggressive therapy. The early use of epinephrine, immediately after sting or at the onset of systemic symptoms are proved life-saving. There should be surplus supply of life saving drugs at the primary health care centre in the rural areas and there should be awareness amongst the public to seek treatment at nearest accessible health care provider that would save time and dime.

Acknowledgement:

The findings of this study were presented at 12th Annual National Conference of Indian Society of Toxicology (Toxocon-12), held on 6th and 7th April 2018 at Sikkim Manipal Institute of Medical Sciences, Gangtok, Sikkim, India.

Conflict of interest: Authors declare that no competing interest exists.

Funding: No funds were available for the study.

REFERENCES:

1. Reisman RE. Insect stings. *N Eng J Med*. 1994;331:523-7. PMID: 8041420 DOI: <https://doi.org/10.1056/NEJM199408253310808>
2. Warpinski JR, Bush RK. Stinging insect allergy. *Wilderness Environ Med*. 1990;1:249-7. DOI: <https://doi.org/10.1580/0953-9859-1.4.249>
3. Paudel B, Paudel K. A study of wasp bites in a tertiary hospital of western Nepal. *Nepal Med Coll J*. 2009;11:52-6. PMID: 19769240
4. Golden DB. Anaphylaxis to Insect Stings. *Immunol Allergy Clin North Am*. 2015;35:287–302. PMID: 25841552 DOI: <https://doi.org/10.1016/j.iac.2015.01.007>
5. Turner PJ, Gowland MH, Sharma V, Ierodiakonou D, Harper N, Gracez T et al. Increase in anaphylaxis-related hospitalizations but no increase in fatalities: An analysis of United Kingdom national anaphylaxis data, 1992-2012. *J Allergy Clin Immunol*. 2015;135:956-63. PMID: 25468198 DOI: <https://doi.org/10.1016/j.jaci.2014.10.021>
6. Umemoto L, Poothullil J, Dolovich J, Hargreave FE. Factors which influence late cutaneous allergic responses. *J Allergy Clin Immunol*. 1976;58:60-8. PMID: 947978 DOI: [https://doi.org/10.1016/0091-6749\(76\)90107-x](https://doi.org/10.1016/0091-6749(76)90107-x)
7. Golden DB. Large Local Reactions to Insect Stings. *J Allergy Clin Immunol Pract*. 2015;3:331-4. PMID: 25819508 DOI: <https://doi.org/10.1016/j.jaip.2015.01.020>
8. Castells MC, Hornick JL, Akin C. Anaphylaxis after hymenoptera sting: is it venom allergy, a clonal disorder, or both? *J Allergy Clin Immunol Pract*. 2015;3:350-5. PMID: 25858055 DOI: <https://doi.org/10.1016/j.jaip.2015.03.015>
9. Ewan PW. Venom allergy. *BMJ*. 1998;316:1365-8. PMID: 9563993 DOI: <https://doi.org/10.1136/bmj.316.7141.1365>
10. Barnard JH. Studies of 400 Hymenoptera sting deaths in the United States. *J Allergy Clin Immunol*. 1973;52:259-64. PMID: 4746790 DOI: [https://doi.org/10.1016/0091-6749\(73\)90044-4](https://doi.org/10.1016/0091-6749(73)90044-4)
11. Sigdel MR, Raut KB. Wasp Bite in a Referral Hospital in Nepal. *J Nepal Health Res Council*. 2013;11:244-50. PMID: 24908524
12. Kumar MK, Thakur SN. Acute Renal Failure and Seizure following Multiple Wasp Stings: A case Report. *Journal of Nepal Paediatric Society*. 2012;32:65-8. DOI: <http://dx.doi.org/10.3126/jnps.v32i1.5238>
13. Wijerathne BT, Rathnayake GK, Agampodi SB. Hornet Stings Presenting to a Primary Care Hospital in Anuradhapura District, Sri Lanka. *Wilderness Environ Med*. 2014;25:122-6. PMID: 24411975 DOI: <https://doi.org/10.1016/j.wem.2013.09.012>
14. Pokhrel S. Comparative benefits of beekeeping enterprise in Chitwan, Nepal. *Journal of Agriculture & Environment*. 2009;10:39-50. DOI: <http://dx.doi.org/10.3126/aej.v10i0.2129>
15. Kurdziel M, Sutherland T. Wild Honey Intoxication in the remote Himalaya. *Wilderness Environ Med*. 2013;24:473-4. PMID: 23958230 DOI: <https://doi.org/10.1016/j.wem.2013.05.008>
16. Indigenous Honeybees and Honey Hunters of Himalayas: A case of *Apis laboriosa* in Kaski District of Nepal. Available from: <http://www.icimod.org/?q=1511> (Accessed 24 August 2015)
17. Lama T, Karmacharya B, Chandler C, Patterson V. Telephone management of severe wasp stings in rural Nepal: a case report. *J Telemedicine Telecare*. 2011;17:105-8. PMID: 21139015 DOI: <https://doi.org/10.1258/jtt.2010.100606>
18. Annual Report 2070/71(2013/2014). Department of Health Services. Ministry of Health and Population. Government of Nepal. Available from: https://dohs.gov.np/wp-content/uploads/2014/04/Annual_Report_2070_71.pdf (Accessed 28 February 2016)