# INFLUENCE OF AIR TEMPERATURE AND HUMIDITY ON THE ADDRESSABILITY OF PATIENT WITH INSECT STINGS AT THE DERMATOLOGY CABINET

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***Abstract***

*The attempt to identify correlation between temperature and humidity levels and prevalence of patients with insect strings who request diagnostic for different form of urticaria. Moreover, to identify patterns related to sudden or slight changes with respect to above mentioned factors and their impact on insect presence and aggressiveness as well. Also distribution among patients gender and their location, have been considered as potential factor for this prevalence.*

*As a general results, it seems that flatness of temperature and humidity evolution from month to month are the most powerful cause of insect stings development, while sudden and / or higher degree of monthly differences, rather leads to a decrese of the urticaria symptom based on insect strings.*

*Patients home location is also a differentiator for prevalence. Urban area seems to be more afectted by the way in each temperature and humidity are changing, polution beeing just an assumption in this view. More input factors such as accessibility to the medical cabinet, income level, education and / or level of awarenesse related to the potential impact of insect stings upon personal health, should be taken into consideration.*

*As far as gender is concerned, there is no reason to be considered as a factor for this prevalence at least from statistical point of view.*

**Key words:** insect sting, temperature and humidity, flatness, urban, rural.

## INTRODUCTION

In Central Europe, the insect stings cause most commonly local reaction, and in a few causes systemic reactions, to human beings. They can be caused by blood-sucking and by venomous insect stings (Bernhard, Rueff, 2012). The insects that most frecvent cause such reactions are: honeybees, wasps, mosquitoes, flies, spiders and ticks.

Insect venom induced a toxic reaction at the site of the sting. Reactions can be either local or else systemic and independent of the site of contact. Large local reactions are due to an immunological reactions and occur in up to 25% of the population (Bernhard, Rueff, 2012). They are followed by a systemic reaction in not a negligible proportion of patients (10-15%) (Paul, Greilich, 1991) 3,5% developed IgE- mediated life-threatening anaphylaxis. Mastocytosis is found in 3-5% of patiens with sting anaphylaxis, rendering these patiens prone to very severe reactions. Blood-sucking by hematophagous insects can elicit a local immune reaction, presenting as a wheal or papule, in at least 75% of the population. Large

local reactions may ensue, but other diseases are rare. Patients who have had a systemic reaction must take permanent measures to avoid further allergen contact and to make sure they can treat themselves adequately if stung again.

The patients with systemic anaphylactic reactions to bee or wasp sting need specific immunotherapy (Bernhard, Rueff, 2012)

Human disease can result from toxic or allergic reactions to insect venom and saliva, as well as to other insect-derived substances or body parts (Bernhard, Rueff, 2012).

The most common type of reaction to an insect sting is a local reaction to the bite of a mosquito. The reaction reflects an immune response to proteins in the insect`s saliva, leading in about three-quarters of all persons to an immediate reaction (wheal) and in about one-half to a delayed reaction (papule). The bite of mosquitoes and other blood-sucking insects only rarely cause serious disease (Bernhard, Rueff, 2012).

The insects stings can be also port of entry for microbials leading in cutaneous superinfections. IgE-mediated systemic allergic reactions are of far greater clinical significance, especially for Hymenoptera. They are associated with an immediate anaphylactic response that can have fatal consequences (Bernhard, Rueff, 2012). They are most commonly caused by honeybees and wasps, very rarely by ants.

Hymenoptera stings.

Local reactions to bee and wasp sting are: pain, redness and swelling that are generally less the 10 cm in diameter and improve markedly within 24 hours. A severe local reaction large than 10 cm in diameter that persists several days may induce noninfectious lymphangitis, and mild systemic symptoms.The prevalence of such reactions may be as high as one person in four. Although presumably of allergic origin, they are not necessarily mediated by IgE. In multiple stings the toxin can cause severe or even fatal illness (Bernhard, Rueff, 2012).

There are also unusual types of sting reaction, for example : serum sickness, vasculitis, thrombocytopenic purpura and neurological, renal or cardiovascular disease. These reactions have an immune mechanism (Bernhard, Rueff, 2012)

Diptera stings.

Blood-sucking Diptera, mosquitoes and horseflies are the most common inducers of local, allergic bite reactions, usually seen as wheals, papules or a biphasic response (wheals and papules). Allergens in mosquito saliva induce an immune response in which IgE, IgG and T lymphocytes may all be involved (Bernhard, Rueff, 2012). They could be: severe local swelling or necrosis, fever, anaphylaxis, serum sickness, hematological disease.

Spider stings.

Spider bite is common, but most species cause minimal effects like local irritation, skin ulceration and rare systemic symptoms (Braitberg, Segal, 2009)

Tick stings.

Most tick stings are uncomplicated, with a cutaneous inflammatory reactions, rarely may develop a granuloma. Tick-borne illness occur in distinctive geographic areas and they are increasing in prevalence, perhaps because people are undertaking more outdoor activities. The most common diseases are caused by Rickettsia, Borrelia and Ehrichia (Flicek, 2007).

Lime disease is a bacterial infection caused by Borrelia burgdorferi, which is transmitted by infected ticks. The cutaneous first manifestation is the erytema migrans (Patey, 2007).

Management of insects stings.

Local sting reactions are treated symptomatically with topical glucocorticoid, moist and cold compress and H1-blocker per os. For large local reactions in adition 0,5-1 mg/kg body weight predisolone p.o., rapid dose reduction to zero in 3 to 5 days. In case of anaphylaxis the patient should always carry an emergency kit with epinephrine in an autoinjector for intramuscular injection too.5. Specific immunotherapy is the treatment recomanded for patients who have a systemic immediate IgE reaction to Hymenoptera sting.

The best methods are preventive: avoid tick-infested areas, wearing of long trousers that are tucked into boots, topical repellents and treatment of clothing with permethrin 3,4 checking and removal of ticks after a journey and in case of tick bite, regular examination of the bite site during the following weeks in order to initiate an early curative treatment if erytema migrans is diagnosed (Patey, 2007)

There are no data to indicate that antimicrobial prophylaxsis is beneficial to the tick-bitten patient to prevent disease (Flicek, 2007).

Reducing and controlling insects is difficult. It is necessary to change the habitat, including vegetation management by cutting, burning and herbicide treatment, drainage of wet areas, use of mosquito netting, window screens.

**AIM**

This study has the following aims. First, to prove ar reject the assumption that gender is one of the main differentiator factor with respect to prevalence of insect stings as a cause for urticaria. Second, to check if there are differences between urban and rural are related to the same issue.

The last but not the least, to verify how the temperature and humidity level and evolution as well, might effect the county population sensibility to

insect stings and if possible to setup a correlation between this factors and the prevalence of urticaria caused by those sources.

## MATERIAL AND METHOD

All patients included in this survey have visited one dermatology office that is located in Oradea. Futher conclusions should be carefully considered as an extention for rural area. On the same line of analysis, temperature and humidity data have been collected for Oradea area, yet differences are not significant for other sites among Bihor county (source: https://rp5.ru/docs/about/ro ).

The total number of patient that have been taken into consideration was 44, 13 of them being identified with insect stings in 2017 and 31 in 2018 with monthly distribution as into Figure 1.

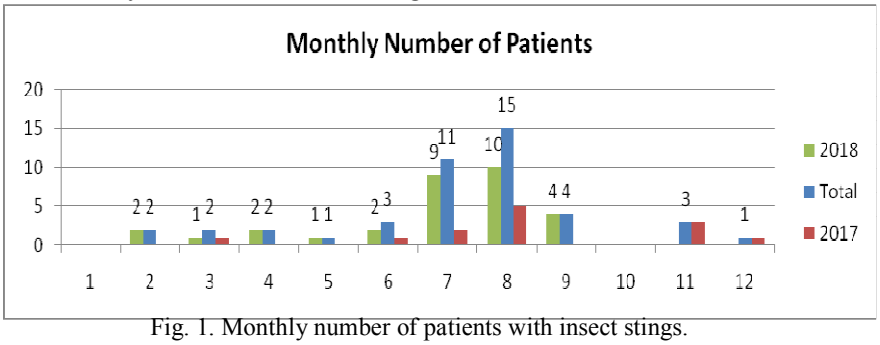


Fig. 1. Monthly number of patients with insect stings.

As far as rural versus urban location are concerned, the distribution is splited between 11 patient coming from rural environment and 33 from urban. The gender grups are splited between 24 male and 20 female.

## RESULTS AND DISSCUSION

As a results, between January-September 2017 and 2018, 44 patients have been recorded, among of them 24 were male and 20 female. The statistical analysis shows that there is no differences between 2017 and 2018 (see Table 1), even that the average temperature and humidity have been changed.

Table 1

ANOVA

| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Rows (between months) | 116,33 | 11,00 | 10,58 | 11,26 | 0,000 | 2,82 |
| Columns (male versus female) | 0,67 | 1,00 | 0,67 | 0,71 | **0,417** | 4,84 |
| Error | 10,33 | 11,00 | 0,94 | | | |

The figures looks slightly different (see Table 2) if we take into consideration the prevalence between urban and rural areas during the analysed period of time.

*Table 2*

ANOVA

| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Urban and Rural | 20,167 | 1,000 | 20,167 | 3,056 | **0,094** | 4,301 |
| Within Urban and Rural | 145,167 | 22,000 | 6,598 | | | |
| Total | 165,333 | 23 | | | | |

A P-Value of 0,094 %, even that is not less than 0,05, might be considered as a significant level through which urban and rural patients location are so called ”input factors” related to patients prevalence magnitude for insect stings. If we take a closer look on how the P-value evolved from 2017 to 2018 (0,283 in 2017 and 0,094 in 2018), might lead us into conclusion which assumes that higher temperature and humidity as well, will affect more stronger the urban area instead of rural one.

Now let have a look on how the temperature and humidity have both evolved in 2017 and 2018. Because we’ve noticed that the most differences between 2017 and 2018 with respect to insect stings prevalence have took place within June and September, we’ll considere the same periode of time for analyze. Here underneath (see Table 3) you have the results.

*Table 3*

t-Test: Two-Sample Assuming Equal Variances

| *t-Test: Two-Sample Assuming Equal Variances for* ***Humidity*** | ***2017*** | ***2018*** |
|---|---|---|
| Mean | 65,525 | 69,35 |
| Variance | **53,84** | **25,87** |
| P(T<=t) one-tail | **0,212** | |
| *t-Test: Two-Sample Assuming Equal Variances for* ***Temperature*** | ***2017*** | ***2018*** |
| Mean | 21,275 | 21,3 |
| Variance | **9,943** | **6,073** |
| P(T<=t) one-tail | **0,495** | |

Even both the temperature and humidity averages within the analysed period of time are not significantly different year to year from statistical point of view, there is a higher closeness to 0,05 limit as far as humidity is concerned.

What is truly notable, is the differences between variances in 2017 comparing with 2018 for both temperature and humidity. In 2108, the monthly values were much closer from one month to the next.

**CONCLUSIONS**

1. The distribution of patients between male and female is having the same structure (quite close to 50% / 50%) in 2017 comparing with 2018. That means that there is no differences of insect stings prevalence from gender point of view.
2. The distribution between urban and rural areas indicates a difference very close critical leval of P-value (0,05). Even that this result might leads to the conclusion that higher level of polution favors the number of insects and their aggressiveness, other potential input factors such as accessibility to the medical cabinet, income level, education and / or level of awarenesse related to the potential impact of insect stings upon personal health, should be taken into consideration.
3. The most suprising result is the impact of flatness of temperture and humidity level evolution from month to month, that seems increase the number of cases of insect stings. In other words, high temperature and humidity differences from one month to another seem to decrease either the number of insects or their aggressiveness.

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