

## “Allergy Profile in an Agricultural Area of Telangana (APAT)”

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### I. Introduction

Allergy ( Allos meaning “other” & ergon meaning “reaction” : Greek) is a condition of over-reaction of the immune system in certain individuals to some harmless substances coined by two pediatricians , an Austrian Clemens Peter Friherr Von Pirquet<sup>1</sup> & a Hungarian Bela Schick. About one-third of the population suffer from one or other form of allergy with children being most affected. Allergic reactions are excessive activation of certain white blood cells called mast cells & basophil by a type of antibody

called immunoglobulin E ( IgE ). These reactions are acquired , predictable and at times rapid. Over 20% of the world suffers from IgE related diseases<sup>2</sup>.

In India alone nearly 20% to 30% of population suffers from at least one allergic disease, out of this about 15% develops asthma. Urban children have higher prevalence with male predominance. About 45% of adolescents are allergic to certain food items leading to asthma, rhinitis or both. Asthma & rhinitis are the common respiratory allergies with aeroallergens playing a major role in the pathogenesis. Infectious diseases during early childhood, environmental pollution, allergen levels (substance causing Allergic reaction), dietary changes are the main reasons for the majority of allergies. The relative frequency of allergy by different allergens vary from place to place depending on the type of local plantation, allergenicity of different pollens , dust ,insects present in the atmosphere & immunological state of the patients living in that atmosphere. Epidemiological ,experimental and clinical observations have suggested a link between rhinitis and asthma leading to a definition of allergic rhinobronchitis<sup>3</sup> or united airway disease (UAD)<sup>4</sup> and the concept of “one airway one disease”.

Skin prick test (SPT) is widely used to predict the presence of allergen specific IgE. Prick test is useful to identify the offending allergen. Sangareddy is an agricultural based district of Telangana with enormous paddy , cotton ,sugarcane plantations & is a potential industrial area. These areas have high prevalence of naso-bronchial allergy & nearly 20 to 35% of the cases attending the department of pulmonary medicine in our hospital have complaints of allergy mostly to pollen & dust.

Though there has been immense research in the prevalence of allergy in the western population, there has been a lack of parallel research in the Indian population. With this background study was done to know the skin sensitivity to various allergens by skin prick test in patients of naso-bronchial allergy attending the department of pulmonary medicine ,MNR Medical College Hospital ,Sangareddy ,Telangana.

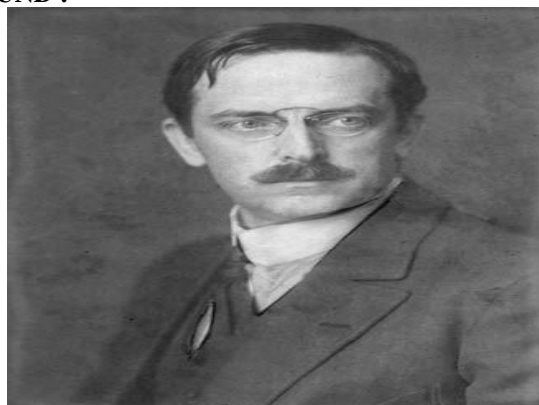
### II. Aims And Objectives

#### AIMS AND OBJECTIVES

- Skin prick testing in susceptible individuals in an agricultural area of Telangana.
- To know the skin sensitivity to various allergens in patients of nasobronchial Allergy by skin prick testing (SPT) .

### III. Review Of Literature

#### HISTORICAL BACKGROUND :



**Figure 1.** Clemens Peter Freiherr von Pirquet (May 12 ,1874 – February 28 , 1929).

The term “allergy” was coined by von Pirquet in his article which appeared in “Munchener Medizinische Wochenschrift “ in 1906 where he was attempting to reconcile two apparently contradictory phenomena which occurred when individuals were exposed to foreign agents like vaccinia and horse anti-serum and termed the local and systemic reactions of fever, arthropathy and lymph node swelling as “serum sickness”<sup>5,6</sup>. He laid down the foundation for the modern science of immunology by appreciating that a foreign substance ‘sensitizes’ the organism in a way that produces a different response on the second and subsequent administration. Porter and Richet (1902) had systematically studied and named ‘anaphylaxis’<sup>7</sup>. Others had previously described violent or fatal reactions to repeated injections of foreign proteins to various species including dogs, guinea-pigs and rabbits<sup>8</sup>.

In the 1960s Robin Coombs and Philip Gel<sup>9</sup> attempted to restore the word allergy to its original meaning after conflicting results by Doerr(1914)<sup>10</sup> and Coca(1926)<sup>11</sup>. They pointed out that hypersensitivity was, and still is, a general term to describe an adverse clinical reaction to an antigen (allergen). Such an antigen could be bacterial derived as in a classical delayed-type hypersensitivity reaction to tuberculin-protein or derived from allergen such as pollen giving rise to IgE mediated Hypersensitivity.

1). Allergen skin testing was first used by Dr. Charles Blackley to diagnose pollen as the cause of his hay fever in 1873.

2) In 1924 the current skin-prick test (SPT) method was introduced and in 1975 Prof. Jack Pepys proposed the modified skin-prick testing method<sup>12</sup>.

#### **ATOPY:**

Personal and/or familial propensity to produce IgE antibodies and sensitization in response to environmental triggers is defined as Atopy<sup>13</sup>. It is a condition for the development of allergy but is not itself allergy.

#### **ALLERGY & ALLERGENS:**

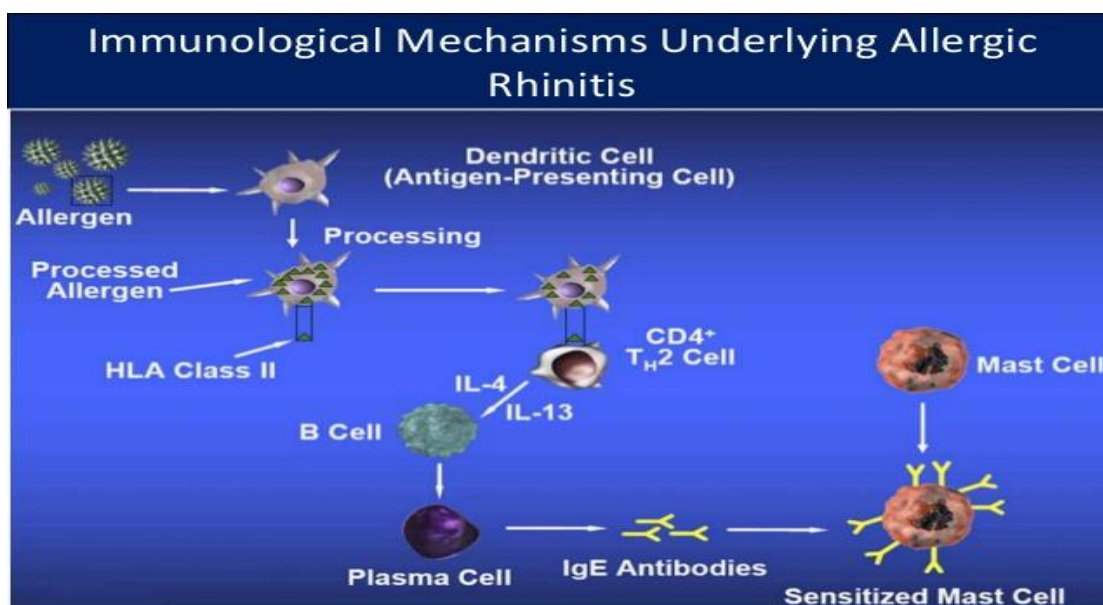
Hypersensitivity reaction initiated by immunological mechanisms resulting from antigen – induced changes in reactivity is termed as allergy. Allergens are proteins or glycoproteins with molecular masses ranging from 3 to 80 kilodaltons(kDa), but there is no single structural, functional, or chemical property that will define a protein as allergenic.<sup>14</sup>. Individual allergens are termed ‘Major allergens’, when they bind IgE antibodies from more than 50% of sera from a panel of exposed and sensitized individuals<sup>15</sup>, more than 200 allergens have so far been identified and characterized.

#### **Common Allergens & Allergic Diseases:**

ALLERGENS	ALLERGIC DISEASES
INHALANTS – pollen ,fungi ,dusts, dander , Insect debris .	ALLERGIC RHINITIS ALLERGIC ASTHMA
INGESTANTS- drugs , food .	ATOPIC DERMATITIS
CONTACTANTS – chemicals , dyes.	CONTACT DERMATITIS
INJECTANTS- drugs , vaccines , etc	ALLERGIC CONJUNCTIVITIS

	URTICARIA
	FOOD/DRUG ALLERGY
	INSECT STING/ BITE ALLERGY
	ANAPHYLAXIS

Allergic diseases result from an augmented response of the immune system to external substances. An acute reaction in response to allergen exposure is known as a type 1 hypersensitivity reaction, characterized by the excessive activation of leukocytes by IgE antibodies resulting in the induction of an extremely inflammatory response. The primary sensitization stage occurs when the allergen is presented to the immune system inducing IgE production. Allergen uptake and presentation by dendritic cells activate T-helper (Th) lymphocytes leading to the release of cytokines like IL-4, IL-5 and IL-13 which activates B lymphocytes resulting in the secretion of specific IgE antibodies. These antibodies then bind to mast cell membranes via the high affinity IgE receptor. During subsequent re-exposure to the allergen, the allergen binds to membrane bound IgE molecules on the surface of eosinophils, mast cells, basophils. This induces degranulation of pre-formed mediators and new vasoactive mediator synthesis, triggering the release of inflammatory mediators (histamine, prostaglandin) leading to the clinical symptom of allergy ranging from rash to anaphylaxis.



Allergic Rhinitis and Rhinosinusitis, Nadir Ahmad, Mark A. Zachanski, Otolaryngol Clin N Am 41 (2008) 267-281

**Figure-2: immunological mechanisms involved in allergic disease**

**Gel And Coombs Classification Of Immune Reactions:**

Type I reactions : IgE mediated immediate hypersensitivity reaction (allergy skin Test) ; time of onset is 1-20 min.

Type II reactions : result from antibody binding to membrane bound Ag leading to complement mediated cytotoxicity or opsonisation/inflammation (Hemolytic Anaemia).

Type III reactions: occur when antibody binds to soluble antigens to form Immune complexes (Arthus reaction); in 7-10 hours.

Type IV reactions: delayed type hypersensitivity; cell mediated immunity(CMI)e.g. graft rejection; in 1-3 days.

**Allergic Conditions And Symptoms:**

<b>Allergic rhinitis</b>	Repeated sneezing , blocked nose,  Difficult breathing , distorted smell sense.
<b>Allergic asthma</b>	Difficulty breathing , cough and tightness of chest, shortness of breath.

<b>Atopic dermatitis</b>	Itching & excessive dryness of skin
<b>Allergic conjunctivitis</b>	Sore & swollen , watery , itchy eyes.
<b>Urticaria/hives</b>	Intensely itchy wheals on the skin.
<b>Food allergy</b>	Vary according to the severity of the reaction , but include above combination.
<b>anaphylaxis</b>	Swelling of mouth , tongue , lips, skin and eyelids progressing to vomiting , wheeze, breathing difficulties, cardiovascular collapse, death.

Allergic rhinitis is clinically defined as symptomatic disorder of the nose, caused by IgE mediated inflammation of nasal membranes, associated with ocular symptoms<sup>16</sup>. Strachman “hygiene-hypothesis” though explains the development of allergy<sup>17</sup> but no unified concept has emerged<sup>18</sup>. (cant be supported by genetic factors also<sup>19</sup> ). It affects work , sleep , school and social life<sup>20</sup> with an estimated 11.2 billion \$ for USA alone to treat allergic rhinitis in 2005<sup>21</sup>.

**Mechanisms Of Allergic Reactions:**

**The Ige Dependent Allergic Cascade:**

An IgE dependent allergic reaction is characterized by an early-phase and late-phase reaction.

**Early Phase Reaction:**

Mast cells release histamine and other preformed / proinflammatory mediators(enzymes ,hydrolases,proteoglycans,PGD<sub>2</sub>,leukotrienes,platelet activating factor ,bradykinin , cytokines like IL-4 ,IL-5, IL-6 ,IL-10, IL13)<sup>22</sup> which initiate a complex network of inflammatory phenomenon involving Th2 lymphocytes , adhesion molecules(upregulated on the surface of endothelial cells{selectins} and epithelial cells{integrins}) leading within seconds or minutes to vasodilationand increased permeability and also result in late and ongoing symptoms of nasal congestion , asthma and urticaria<sup>23</sup>.

Specific adhesion molecules favour the “roll” of inflammatory cells towards the epithelium( e.g. vascular cellular adhesion molecule-1{VCAM-1}, P-selectin, and L-selectin), the firm arrest of inflammatory cells to the epithelium(e.g. CD18Integrin , intercellular adhesion molecule-1{ICAM-1}, and VCAM-1, and diapedesis through the epithelium<sup>24</sup>.

Upregulation of ICAM-1 molecule is evident on nasal epithelium of allergic patients, even when they are asymptomatic. This also suggests a mechanism of asthma in children during upper respiratory viral infection<sup>25</sup>. The ICAM-1 is the major receptor for human rhino virus<sup>26</sup>.

**Late Phase Reaction:**

Mast cells responding to IgE and allergen also release a broad range of newly synthesized cytokines , chemokines and growth factors, but these are released more slowly than the preformed mediators<sup>27</sup>. They have the potential to recruit other immune cells either directly or indirectly(for example, TNF- $\alpha$  , LTB<sub>4</sub>, IL-8, chemokine ligand 2(CCL2) and many other chemokines), to activate innate immune cells(e.g. TNF- $\alpha$  and IL-5) and to affect many aspects of the biology of dendritic cells , T cells and B cells(e.g. IL-10 ,TNF- $\alpha$ , histamine & transforming growth factor- $\beta$ ). Late phase reactions are thought to be coordinated in part by certain long term consequences of the mediators released by activated mast cells during early phase reactions, and in part by antigen-stimulated T cells. The clinical features of late-phase reactions reflect the activities of both resident cells and circulating leukocytes that are recruited to the site. Late-phase reactions(LPR) typically develop 2-6hr after allergen exposure, and often peak after 6-9 hr.

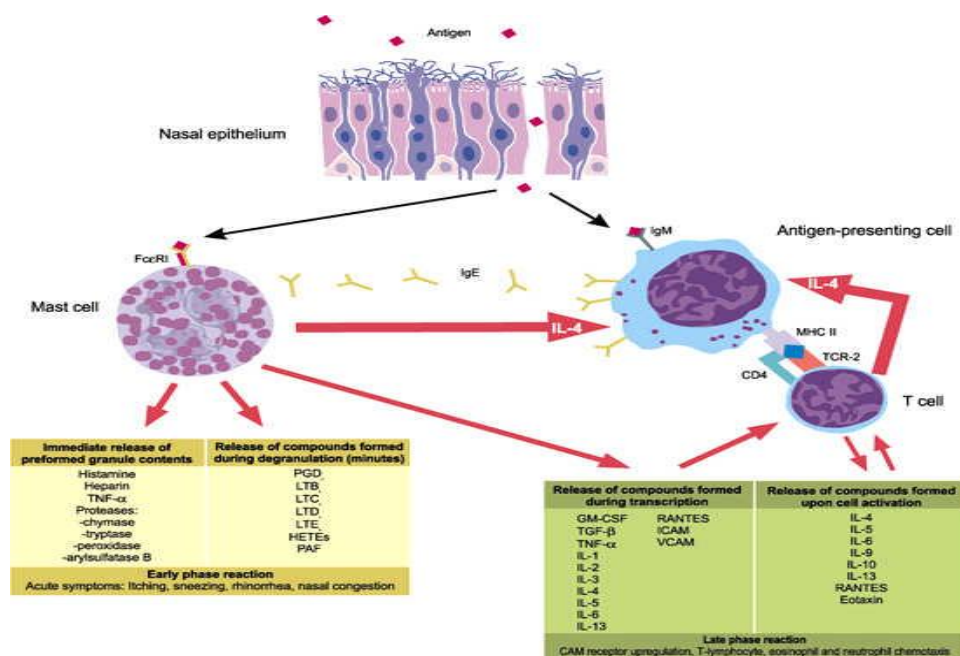


Figure 3- showing early and late phase reactions with mediators.

Table 1. MEDIATORS OF ALLERGIC REACTION(EARLY & LATE PHASE)

CELL SOURCE	RELEASED MEDIATORS
<b>INDUCTION PHASE</b>	Cytokines (IL-4 ,IL-5, IL-9, IL-13)
T cells	
<b>EARLY PHASE REACTION</b>	Histamine , proteases , proteoglycans, Prostaglandins(PGD2) , LTC <sub>4</sub> , interleukins (IL-3, IL-4, IL-5, IL-6 ,IL-8 ,IL-16 ,GM-CSF); chemokines(CCL2 ,CCL3 , CCL11)
Mast cells	Histamine , leukotriene(cys-LTs <sup>28</sup> : LTC <sub>4</sub> , LTD <sub>4</sub> , LTE <sub>4</sub> ); cytokines <sup>29</sup> (IL-4 ,IL-13),CCL11, CCL28 <sup>30</sup> ,CXCL8
Basophils	MBP (major basic protein) , eosinophils Cationic protein(ECP) , eosinophils- derived neurotoxin(EDN) and eosinophil
<b>LATE PHASE REACTIONS</b>	Peroxidase(EP) <sup>31</sup> ,LTC <sub>4</sub> ,LTD <sub>4</sub> ,IL-1, IL-2
Eosinophils	Chemokines(CXCL8 , CCL3 , CCL5). Proteases(elastase <sup>33</sup> , collagenase , gelatinase B) ,microbicidal products(lactoferrin ,lysozyme , myeloperoxidase) ,reactive oxygen
Neutrophils	intermediates ,NO , LTA <sub>4</sub> ,LTB <sub>4</sub> , PAF ,TXA <sub>2</sub> ,CXCL8 (high concentration in Asthmatics compared to controls) <sup>34</sup> .
( airway narrowing , increased mucus Secretion ) <sup>32</sup>	

<p>T cells ( Th1 cells produce CCL5 , and Th2 cells Produce CCL1 &amp; CCL22)<sup>35, 36</sup>.</p>	<p>Cytokines(IL-3 ,IL-4 , IL-5 ,IL-6, IL-9 ,IL10 ,IL-13 , GM-CSF); Chemokines(CCL1 ,CCL22).{ defective capacity of Treg cell To suppress Th2 response to allergy Leads to allergic sensitization}<sup>37</sup>. Cytokines (IL-1, IL-6) , lipids, PAF, ROS, Chemokines(CXCL8), NO. {Cytokines (IL-1, IL-6) ,lipids , PAF ,ROS, Chemokines(CXCL8) ,NO.}<sup>39</sup></p>
<p>Macrophages ( play a dual role in allergic response)<sup>38</sup>.</p>	<p>ICAM-1, ICAM-2 , PECAM-1; VCAM-1; Selectins. Chemokines(CCL5, CCL7, CCL11,</p>
<p>Dendritic cells</p>	<p>CCL13, CXCL18); Cytokines(GM-CSF ,IL-6 ) , PGE2, ECM proteins.</p>
<p>Endothelial cells</p>	<p>Cytokines(IL-6, GM-CSF); chemokines, ICAM-1.</p>
<p>Airway smooth muscle cells</p>	
<p>Bronchial epithelial cells</p>	

**Diagnostic Aspects Of Ige Mediated Allergic Diseases:**

Since many clinical manifestations of allergy are mimicked by non-allergy mechanisms, it is usually necessary to use additional diagnostic procedures to ascertain whether the person has developed an immune response to the incriminated allergen. Such procedures primarily consist of skin tests, where a small amount of allergen is applied on or injected into the skin. The blood may also be analysed for IgE and IgG antibodies by serological assays.

**In-Vivo Tests For Type I Allergy Diagnosis:**

Often diagnosed with skin-prick testing which give rapid results and good sensitivity but cannot inform the clinician about the delayed hypersensitivity. SKIN TESTS: These give quick results than other techniques in the diagnosis of respiratory allergy. Commonly followed skin tests for allergy diagnosis are:

- SKIN PRICK TEST
- INTRADERMAL TEST
- PRICK TO PRICK TEST

#### Bronchial Challenge Test:

Medical test used to assist in the diagnosis of asthma where the patient breathes in nebulised Methacholine or Histamine<sup>40</sup>. If allergic asthma is present, exposure to the allergen will cause constriction of the bronchial tubes, the degree of narrowing can then be quantified by spirometry<sup>41</sup>.

#### Rhinomanometry/Nasal Challenge Test:

Standard diagnostic tool aiming to objectively evaluate the respiratory function of nose. Useful to confirm an allergic reaction, when there is a discrepancy between skin & blood tests or in preparation of immunotherapy. Increased pressure during respiration is a result of increased resistance to airflow through nasal passages (nasal blockage). While increased flow, which means the speed of airstream, is related to better patency<sup>42</sup>.

#### In-Vitro Tests For Type 1 Allergy Diagnosis:

Convenience, no danger of anaphylaxis, lack of interference by antihistaminics or skin condition, good reproducibility, allowing the use of parallel controls with each run are the advantages of in-vitro tests. These tests can even reveal food allergies which could manifest symptomatically in the future.

- I. RADIO ALLERGO SORBENT TEST (RAST)
- II. ENZYME LINKED IMMUNOSORBENT ASSAY (ELISA)
- III. MICRO ARRAY

RAST: Radioimmunoassay test to detect specific IgE antibodies to suspected or known allergens for the purpose of guiding a diagnosis about allergy. The suspected allergen is bound to an insoluble material & the patient's serum is added. If the serum contains antibodies to the allergen, these antibodies will bind to the allergen. Radiolabelled anti-human IgE antibody is added where it binds to those antibodies already bound to the insoluble material. The unbound anti-human IgE antibodies are washed away<sup>43</sup>. The amount of radioactivity is proportional to the serum IgE for the allergen. Scores more than 100.00 Ku/L IgE suggest extremely high level of allergen specific IgE.

ELISA: This test measures the amount of specific IgE, circulating in the blood that the immune system has produced against a suspected allergen. This test is carried out on a small sample of blood (sera) causing minimal discomfort to the patients<sup>44</sup>. This test is particularly useful in patient with risk of anaphylaxis, eczema, when anti-histaminics cannot be stopped due to severe symptoms.

#### Micro Array Technique:

This technique offers advantages in diagnostic applications such as allergy testing because of little amount of reagents required, and thus the cost per assay is greatly reduced. Because of the extremely small volumes (0.5-5nL) of sample used to make spots on the micro array technique, this approach has been difficult to introduce. This method also requires purified antigens for adequate diagnosis of allergy.

#### Skin-Prick Testing:

- Allergen skin testing was first used by Dr. Charles Blackley to diagnose pollen as the cause of his hay fever in 1873.
- In 1924 the current skin prick test (SPT) method was introduced & in 1975

Prof. Jack Pepys proposed the modified skin-prick testing method.

There are three types of skin testing used in allergy diagnosis:

**1. Skin prick testing (SPT)**- widely practiced primary mode of skin testing for Immediate IgE-mediated allergy. It provides very low risk of serious side-effects to patients and provides high quality information when performed optimally and interpreted correctly. Also called prick skin testing or PST.

**2. Intradermal testing (IDT)** – relevant to both Immediate IgE-mediated allergy and Delayed-type hypersensitivity. When used in the diagnosis of immediate allergy, it carries a higher risk of adverse reactions and requires high levels of technical and interpretive expertise.

**3.Patch testing** – relevant to contact hypersensitivity and some other forms of delayed-type hypersensitivity. It is conducted mainly by dermatologists and some immunologists, and is not relevant to immediate or IgE-mediated allergy, and will not be further discussed.

Skin prick testing provides information about the presence of specific IgE to protein and peptide antigens (allergens). Small amounts of allergen are introduced into the epidermis and non-vascular superficial dermis and interact with specific IgE bound to cutaneous mast cells, histamine and other mediators are released, leading to a visible “Wheal-and-Flare” reaction peaking after about 15 minutes.

The value of this test depends on a number of factors like relevance of the test allergen to the condition under investigation, correct introduction of a sufficient amount of allergen in its native form, functional status of cutaneous mast cell and the interpretation of the reaction in the context of positive and negative controls. Correctly used, the skin prick test has good sensitivity and specificity for the presence of allergen specific IgE with small discomfort and minimal systemic reactions<sup>45</sup>. Ultimately the integration of skin prick test results, knowledge of the biology of the various allergens and the exposure of the patient, and the nature and timing of symptoms enable the construction of a diagnosis and an appropriate management plan for the patient. Allergy testing has been shown to increase the accuracy of the diagnosis when added to history and clinical exam<sup>46</sup>.

**Indications Of Skin Prick Testing:**

- Rhinitis / rhinoconjunctivitis / rhinosinusitis /allergic conjunctivitis.
- Asthma.
- Atopic dermatitis.
- Food reactions.
- Suspected latex allergy.
- Conditions in which specific IgE is considered likely to play a pathogenic role (e.g. selected cases of chronic urticaria if the history suggests an exogenous allergic cause).
- Rarer diseases such as allergic bronchopulmonary aspergillosis ,eosinophilic oesophagitis or eosinophilic gastroenteritis.

**Contraindications for skin prick test:-**

ABSOLUTE	RELATIVE
Diffuse dermatological conditions	Persistent severe/unstable asthma
Severe dermographism	Pregnancy
Poor subject cooperation	Babies and infants
Subject unable to cease anti-histaminics	Patients on beta-blockers
Known anaphylaxis to test allergen	Patients with ongoing food allergic symptoms.

**Drugs Contraindicated In Skin Prick Testing:**

ACE inhibitors and beta-blockers are contraindicated as these drugs interfere with normal compensatory mechanisms in anaphylaxis (beta-blockers interfere with the effect of adrenaline). In general the risk of systemic anaphylaxis from skin testing is low and the drugs need not be withheld except where certain high- risk features exist.

**Drugs That Interfere With Skin Test Response :**

First generation antihistaminics usually have a short duration of action whereas second generation act for longer. Antidepressants like doxepin, other tricyclics, and tetracyclins having antihistamine activity may need to be withheld for 1-2 weeks or more<sup>47</sup>. Oral corticosteroids probably do not significantly diminish the skin test reaction even after prolonged use<sup>48</sup> but prolonged topical corticosteroids have been showed to reduce skin reactivity<sup>49</sup>. Topical moisturizers and pimecromilus do not reduce prick test reactions<sup>50</sup>.

**Common Drugs Interfering With Spt & Their Withholding Period :**

ANTIHISTAMINICS	DRUGS WITH HOLDING PERIOD(DAYS)
Azatidine	2
Brompheniramine	5
Cetirizine	4
Chlorpheniramine	4
Cyproheptadine	4
Desloratidine	4
Dexchlorpheniramine	4
Diphenhydramine	2
Fexofenadine	4
Loratidine	10



Pheniramine	4
Promethazine Hcl	4
Trimeprazine	2

H2 ANTAGONISTS	DRUG WITHHOLD PERIOD(DAYS)
Cimetidine/ranitidine/famotidine	1

ANTI-DEPRESSANTS	DRUG WITHHOLD PERIOD(DAYS)
Amitriptyline	Not established(variable)
Clomipramine	Not established(variable)
Dothiepin	Not established(variable)
Doxepin	7
Imipramine	Not established(variable)
Mianserin	Not established(variable)
Mirtazapine	Not established(variable)
Nortriptyline	Not established(variable)
Trimipramine	Not established(variable)

Skin prick testing is not routinely indicated in the investigation of nonspecific skin rash without allergic features, chronic urticaria in the absence of allergic features on history, assessment of the effectiveness of allergen immunotherapy, migraine, chronic fatigue, reactions to respiratory irritants(smoke, fumes, perfumes).Intradermal test is appropriate for insect venom hypersensitivity and immediate hypersensitivity to some vaccines or beta-lactam drugs.

Allergy testing may lead to allergen avoidance strategies, improved use of medications and for some patients, desensitization treatment(immunotherapy).skin Prick tests also used for epidemiological purposes or to define atopy in an individual without specific disease diagnosis considerations.

**Patient Factors Leading To Variability In Skin Prick Testing:**

Menstrual phase , race , circadian rhythm , seasonal variation , atopic dermatitis.

The following conditions can reduce skin test reactivity:

- 1).Chronic renal failure
- 2).CVA
- 3).Cancer(some cases)
- 4).Spinal cord injury
- 5).Diabetic neuropathy
- 6).Recent anaphylaxis.

Skin prick testing should not be carried out on limbs affected by lymphedema,paralysis or neurogenic abnormalities. A very recent report demonstrates that RSVaffected individuals show increased histamine wheal size and false positive allergenskin test wheals<sup>51</sup>.

**Methods Of Skin Prick Testing**

**Requirements For Skin Test Procedure :**

- 1).Allergen extracts
- 2).Positive and negative control solutions
- 3).Sterile lancets for skin pricking
- 4).Marker pen for the skin
- 5).Ruler for measuring reactions and recording sheets
- 6).Tissues for wiping solutions
- 7).Epinephrine ( to treat anaphylaxis)
- 8).Gloves( latex and latex free)
- 9). Emergency equipment( ambu bag , et tubes ,oxygen etc..)

**Allergen Extracts & Composition Of Skin Testing Extracts:**

These are aqueous solutions of proteins (viscous), combined with a preservative 50% glycerol and supplied in a multiuse dropper bottles.Allergy extracts should be free of cross-contamination with allergenic proteins of other substances. Some extracts contain defined mixtures of related allergenic substances, some standardized for allergic patency, while other are prepared basedon weight of allergenic material used for elution of allergens. Allergenic proteins canbe separated by electrophoresis and may vary in their content and proportion with different manufacturers preparations(due to difference in source material and preparation.Cross-reactivity (IgE reactive to particular allergen also reacts to other similar allergens) of pollen and other allergens often relates to phylogeny but there are sometimes patterns of cross-reactivity that would not have been predicted bybiologic relatedness, due to proteins that have conserved structure across diverspecies.

### **Maintainance Of Allergen Extracts:**

Clearly labeled allergen extract bottles should be stored in a temperature- monitoredrefrigerator and left out for as short a time as necessary to conduct the test. Expirydates should be checked to check the potency of extracts and precautions must be used to prevent bacterial contamination and cross-contamination between allergens.

- 1). Label the test solution bottles with numbers and place in order in a rack.
- 2). Only open one bottle at a time with its specific stopper to avoid contamination .
- 3).Clean the patients skin prior to testing to prevent contamination of the dropper tip.
- 4).When depositing the allergen solution drop on the patient’s skin , it is acceptable to touch the drop against the skin but not the glass tip of the dropper.

### **Positive & Negative Controls:**

Some patients develop dermatographism or develop a small flare or wheal from the pin prick alone leading to an apparent reaction to extracts to which the patient is not actually sensitized. The negative control would be expected to show a similar reaction . If this occurs then either the test must be rejected as uninterpretable, orinterpreted by comparison with reaction to the negative control(eg. If the negative control produces a wheal of 3mm, only wheals of >6mm will be considered positive).The positive control should produce a wheal of 6mm, and if there is no wheal or onlya tiny one, this may indicate either that the patient has taken an antihistamine or thatthey have nonreactive skin ,in which case SPT will not be possible. It’s recommended that a wheal of >4mm to the Positive control is acceptable(or 4mm greater than the Negative control) and if it is <4mm the test should be considered uninterpretable.

The positive control can be a solution of histamine (histamine phosphate 10mg/dl)or codeine (usually 9% solution) while the negative control is the same solution as the allergens are made up in. e.g. saline buffer/50% glycerol, without any allergen.

### **The Lancet :**

A special lancet with 1mm pointed tip and blunt shoulder to prevent skin trauma is used. The lancet is pressed through the drop of allergen at 90 degrees to the skin and replaced after each allergen pricked , or thoroughly wiped with alcohol to prevent cross-contamination of allergens.a conventional hypodermic needle will cause varying skin penetration and the puncture depth will be difficult to control.

### **Procedure Of Skin Prick Testing:**

After explaining the procedure with reassurance and enquiring medication history,the subject should be seated in a comfortable position with the forearms or back at a convenient height for the practitioner to do the test in a private room at a comforttemperature. The area to be tested should be exposed with no risk of clothing brushing across the test area and wiping the test solutions.

### **Method & The Site Of Application:**

The most frequently used sites are either the volar surface of the forearm or outer upper arm ,and the back with reactions to the allergen are larger on back(lower part)and on the upper forearm compared to the wrist<sup>52</sup>. Generally it is advisable to site tests more than 5cm from the wrist and 3cm from the antecubital fossa<sup>53</sup>.After cleaning the skin site with alcohol prior to testing, the positions for skin pricks should be marked by numbers on the skin to identify the allergen with atleast 2cm apart to avoid false positive results. Allergen will be applied from the dropper bottlewhere the drop on the tip of the dropper can be touched on the skin but actual tip ofthe dropper should not touch the skin. Either all drops can be deposited before the prick or can deposit each drop and prick each drop straight away. The test solution can be blotted from the skin after 1 minute without compromising the eventual result.

### **Time Of Reading Results:**

The reaction to the histamine positive control is at its maximum size at 10 minutesand should be read at 10-15minutes after the skin prick, whereas the allergic reaction reaches its maximum at around 15 minutes and should be read at 15-20 minutes. If the test is left for longer than 20 minutes the histamine and allergen response may diminish or be lost.

### **Measurement Of Wheal And Flare:**

The drops must always be carefully blotted from each test site with a transparent ruler prior to taking measurements. If the result is a circular wheal, one measurement of the diameter (in mm) is sufficient; if ovoid or irregular, it should be measured on the longest and shortest perpendicular axis and the numbers are added and divided by 2 (mean diameter).the flare may also be recorded by the same method.

GRADE	DIAMETER OF WHEEL	ERYTHEMA
NEGATIVE	No wheal or same as negative control	Nil
1+	2mm or more than negative control	More than twice the size of wheal
2+	4mm or more than negative control	More than twice the size of wheal
3+	6mm or more than negative control	More than twice the size of wheal
4+	8mm or more than negative control	More than twice the size of wheal

**Method Of Recording Skin Prick Test Results:**

A chart should be kept and the wheal ( and flare) size in mm recorded next to each allergen name. It is now considered an essential part of good clinical practice to record atleast the wheal diameter in numerical form and to not use a qualitativemarking(e.g. +,++) as the primary reported result.

**Patient After Care:**

Numbers should be removed from the skin, by cleaning with an alcohol solution.Itching from prick test usually subside within 15 minutes for which topical creams canbe used. Topical corticosteroids have been shown not to be useful<sup>54</sup>. Patients should be warned about the possibility of a late-phase reaction (LPR).

**Post-Test Holding Time:**

In the general setting, where there have been multiple positive results and there is a history of asthma or anaphylaxis, the patient should remain under observation for 20 minutes after the completion of the test in view of a small risk of systemic reaction<sup>55</sup>.

**Skin Prick Test Reporting:**

Skin prick test result should contain the name/address/contact information of thepractitioner, date of test, region tested, name and date of birth of patient, name of each allergen tested with dilute standard concentrations.

Negative and positive controls should be listed with the size of the resultant wheal foreach allergen.

Reporting of skin prick testing by qualitative measures(ie,0,+,++) alone is not satisfactory. If a qualitative scale is used then the scale should be printed on the form. Qualitative scales quoted in the literature are highly variable and hence mayconfound communication and interpretation of results.

**Interpretation Of Skin Prick Test Results:**

The decision of whether a patient is truly allergic to the substance in question depends on the careful interpretation of the SPT results as well as other factors.A wheal of 3mm or greater is taken to indicate the presence of specific IgE to the allergens tested. Though prick test is a highly sensitive and specific test for thepresence of allergen specific IgE antibody, it does not prove that the patient is clinically relevant to the allergen. The 3mm lower cutoff was determined becauseof reproducibility of measurement rather than the clinical relevance. Studies haveindicated that for many allergens, a wheal size(lower cutoff) set at a larger size than3mm would correlate better with clinical allergen reactivity.

**Precaution To Be Taken In Spt Interpretation:**

- 1).Positive tests indicate that IgE is present and may occur without clinical symptomswhich may be referred to as “clinical false positive” test result.
- 2).The size of the skin prick test reaction may correlate with the likelihood that thepatient is clinically relevant to that allergen.
- 3).In general the size of the skin prick test reaction does not correlate with severityof the allergic manifestations.
- 4).A positive skin prick test does not predict the nature of the allergic symptoms;different individuals with a positive test to the same substance may react in very different ways on exposure to the allergen.

**The Role Of Medical Practitioner In Skin Prick Testing:**

- Ensure that an appropriate environment for skin prick testing is in place and that trained staff, equipment, reagents and facilities are available.
- Assess the patient , history and examination, formulate a differential diagnosis, assess the likelihood of allergic disease, consider indicationsfor skin prick testing , whether additional information is likely to beprovided by skin prick testing and whether management will be alteredby the results of skin prick testing.
- Carefully consider any contraindications or factors which might interferewith skin prick testing.
- Advise the patient of the procedure including risks and benefits.

- Decide on which allergens or panels of allergens should be tested, based on the symptom pattern, patient exposure, and using information about allergens in the local environment.
- Consider location to be tested, for example back, arms.
- In some cases the medical practitioner personally carry out all steps of the skin prick test.
- If not carried out by the medical practitioner personally:
  - ✓ Advise paramedical staff of the test panel required and any patient characteristics that will need to be known to complete the
  - ✓ Be present and available in case of any adverse symptoms experienced by the patient.
  - ✓ Inspect the test site at the conclusion of the test to verify measurements taken by the person who carried out the test and determine whether there are any factors that might affect the interpretation of the results.
- Interpret the meaning of the measured results in the context of the clinical assessment.
- Consider whether technically positive skin test results are clinically important and whether negative test results are potentially false negative.
- Determine final diagnosis and management plan.
- Counsel the patient on the meaning of the results and their diagnosis and management.

#### **Safety And Risks Of Skin-Prick Testing:**

It is an extremely safe procedure with minimal discomfort and rare adverse events which can be classified into allergic, test related non allergic, and nonspecific. Vasovagal syncope, transmission of infection (theoretical but never documented), Delayed local skin swelling (the late phase response) which does not last more than 36 hours are few systemic allergic reactions. Systemic anaphylaxis is rare (0.033%) according to a recent survey<sup>56,57</sup>. <6m age, history of food anaphylaxis, asthma and atopic dermatitis are risk factors for anaphylaxis in skin prick testing.

#### **Treatment Of Allergic Diseases:**

##### **Specific Immunotherapy (SIT):**

Practice of gradually increasing doses of allergens in order to reduce allergic symptoms resulting from exposure to a specific allergen and the need for medication restoring the Th1/Th2 imbalance (shift to Th1 from Th2), reduced recruitment of Effector cells, induction of IgG (blocking) antibodies, T-cell anergy, induction of regulatory T cells, reduction in specific IgE levels are the possible mechanisms<sup>58-59</sup>. Typically patients receive a course of injections, starting with a very low dose of allergen and building up gradually until a plateau or maintenance dose is achieved.

##### **Administration Of Immunotherapy:**

Maintenance injections are then given at 4- to 6-week intervals for 3 to 5 years. The up dosing phase is generally given as a series of weekly injections, some giving several doses on each day and then waiting a week before giving a further series of injections (cluster protocol), whereas others give the whole series of incremental injections in a single day (rush protocol). Subcutaneous immunotherapy (SCIT) was introduced into clinical practice at the beginning of the 20<sup>th</sup> century, but double blinded placebo controlled trial (DBPC) of efficacy commenced in the 1960s<sup>60</sup> and DBPC trials on sublingual immunotherapy (SLIT) started in the 1990s. SIT has additional benefits like long-lasting efficacy following cessation of SIT<sup>61</sup>, the prevention of new sensitizations and the reduction of the risk for Asthma onset in children with allergic rhinitis<sup>62,63</sup>.

Allergen-specific IgE levels increase temporarily during the initial phase of SIT but fall back to pretreatment levels during maintenance therapy<sup>64</sup>. The immediate wheal and flare response to skin sensitivity usually reduces during the initial phases of SIT, but this effect is relatively small compared with the degree of clinical benefit. In contrast, the late-phase response to skin test

is virtually abolished after successful SIT. Similar patterns are observed for late-phase responses in the nose and airways<sup>65</sup>.

The effectiveness of SIT in patients with intermittent (seasonal) allergic rhinitis has been confirmed in many trials with grass, ragweed and bird pollen extracts<sup>66</sup>. Importantly, SIT has been shown to be effective even in patients with severe seasonal rhinitis caused by grass pollen that is resistant to conventional drug therapy<sup>67</sup>. The benefits of 1 year's treatment wear off quickly<sup>68</sup>, but there are good data showing that 3 year's therapy provides lasting benefit<sup>69</sup>. Less well-controlled data show that the effects of SIT can persist for many years after discontinuing therapy<sup>70</sup>. SIT remains a common indication for asthma in many parts of North America and continental Europe<sup>71</sup>. A body of evidence has accumulated from well-conducted clinical trials indicating that SLIT can be effective, with up to

30 -40% reductions in symptom scores and rescue medication use in patients with seasonal allergic rhinitis<sup>72</sup>.

**Future Directions In Specific Immunotherapy:**

There is a scope to improve conventional SIT. Possible avenues include those of recombinant allergens, which would improve standardization of allergen vaccines and might allow fine tuning of vaccines for patients with unusual patterns of reactivity. Thus far, clinical trials have confirmed the efficacy of recombinant allergen cocktails but have not yet shown superiority to conventional vaccines<sup>73</sup>.

**Alternate Forms Of Immunotherapy:**

- 1). Topical immunotherapy
- 2). Enzyme-Potentiated Desensitization (EPD)
- 3). Homeopathic Desensitization

**Possible New Technologies For Immunotherapy**

- 1). Anti IgE .
- 2). Recombinant allergens.
- 3). Hypoallergenic allergens (bioengineered recombinant molecules).
- 4). T-cell peptide vaccines.
- 5). Th1 immunostimulants (eg, mycobacteria and CpG).
- 6). Allergen- immunostimulant complexes.

**IV. Materials And Methods**

**Materials:**

This study was conducted in patients who attended the outpatient Department of pulmonology, MNR Medical College and Hospital, Sangareddy. A total of 206 patients were evaluated on the basis of complete clinical grounds (patients with symptoms of recurrent rhinorrhea, sneezing, itching of eyes by evaluating history, clinical examination, TLC, DC, X-ray PNS and detailed ENT Examination) and area of residence (in and around areas of Sangareddy) and out of these 100 (n=100) patients were included in the study and were subjected to skin prick testing with 30 standard antigens.

The study was conducted over a period of 36 months from July 2015 to August 2017 after being approved by institutional Ethics Committee.

**Inclusion Criteria:**

- ✓ Patients in the age group between 15 to 60 years .
- ✓ Male and female patients with history of atopy/allergy and or family h/o allergy.
- ✓ Symptomatic of rhinitis and bronchial asthma not responding to usual therapy.

**Exclusion Criteria:**

- ✓ Pregnant women.
- ✓ Patients with active dermatological symptoms (dermographism).
- ✓ Children below the age of 15 years.
- ✓ Adults above 60 years.
- ✓ Patients who could not stop taking antihistamines.
- ✓ Patients with co-morbid conditions (diabetes/immune compromised).
- ✓ Patients with active smoking history.
- ✓ Patients with acute asthma.

**Methods:**

An informed consent was taken from all patients. General data regarding age, sex, weight, history of allergic rhinitis, Bronchial asthma, atopy, family h/o allergy, home environment, animal contacts, severity of symptoms, history of treatment, family history are noted. The antigens were supplied by Kerala based pharma company. The antigens included House Dust Mite, 15 types of Pollens, 3 types of fungi, 6 types of Insects, 5 types of dust. (a total of 30 allergens).

**Mnr Allergy Kit:**

This was a special kit made by us for our study in which the vial capseals of the mother vials provided by the company are not broken. Sterile micropipettes are applied to the rubber caps of the mother vials. The antigens are siphoned in to the pipettes tip which is intern capped with syringe needle caps. This differs from the usual practice of testing with the company provided tips which are cumbersome and have tendency for cross contamination. This also makes the patient comfortable and is portable. Antibiotics / antidepressants / antihistamines / H-1 receptor blockers were withdrawn for 3-7 days depending upon the type of drug. An informed consent was taken from the patient after explaining the procedure to the patient.

**Procedure:**

Medial aspect of the arm and flexor aspect of the forearm are selected. The site selected is sterilized with alcohol swab and then allowed to dry. Mapping of antigens (H-histamine, S-saline etc) is done with delible ink and distance between each antigen of 2cm is maintained. Histaminic acid phosphate and buffer saline (1mg/ml) are taken as positive and negative controls respectively. Charging of the allergen extract is done with a pre-loaded micro-pipette by placing a drop of antigen next to the corresponding number given for that antigen. Prick is done with a hypodermic needle (26G) by passing it through the drop and inserted in to the epidermal surface at a low angle with the bevel facing up. The needle tip is then gently lifted upward to elevate a small portion of the epidermis without inducing bleeding. The needle is then gently withdrawn. Excess of the antigen is wiped out with a blotting paper to avoid contamination. Reading is done after 15-20 minutes.

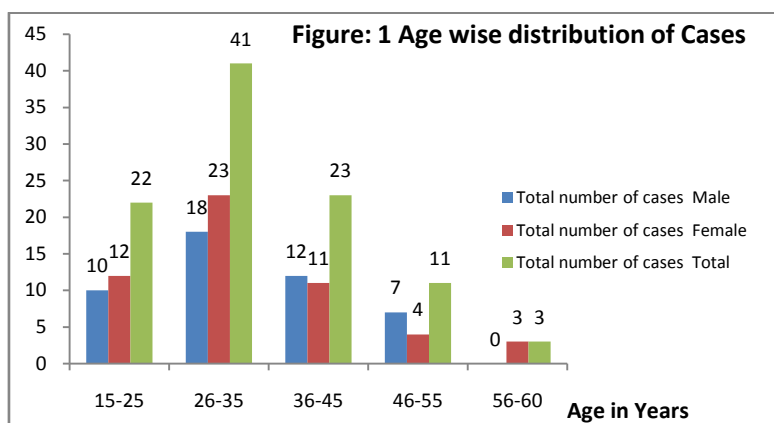
**V. Results**

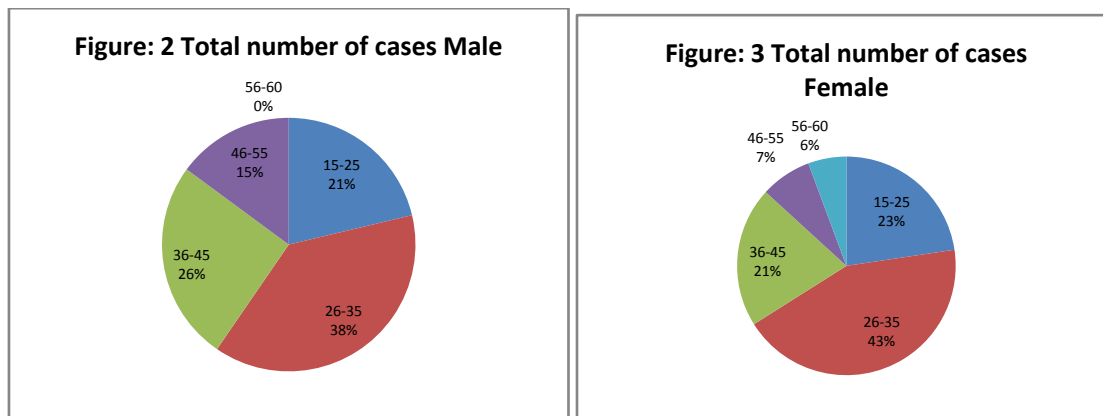
**AGE DISTRIBUTION**

In the present study majority of patients suffering from allergic symptoms Belonged to age group of 26-35 years (41%), followed by 36-45 years (23%) and 15 -25 years (22%).

**TABLE -1** age distribution of cases among the study

Age distribution	Total cases (n=100)	Total cases (n=100)	Total cases(n=100)
	Male	Female	Total
15 – 25 years	10	12	22
26 - 35 years	18	23	41
36 - 45 years	12	11	23
46 - 55 years	7	4	11
56 - 60 years	0	3	3



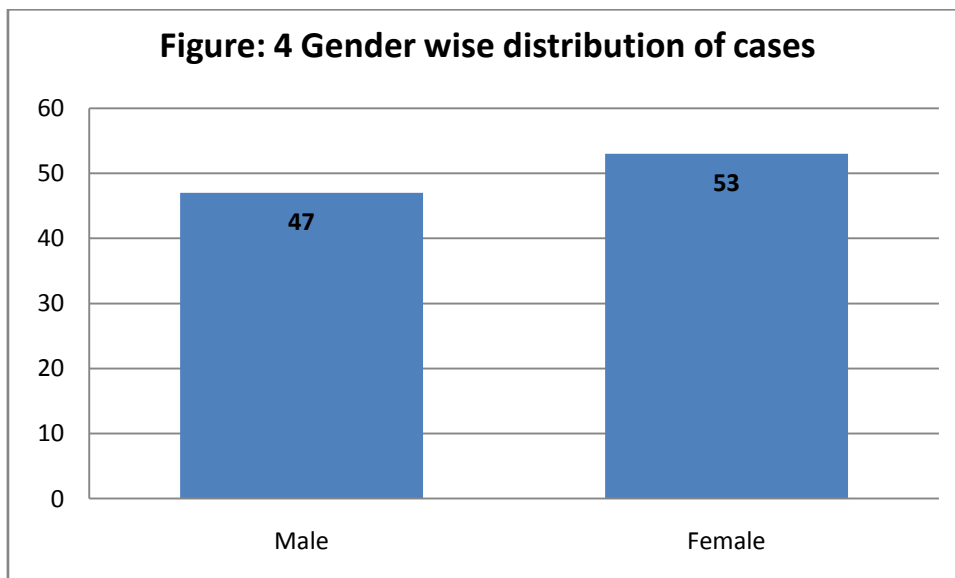


**Gender Distribution :**

In the present study , among 100 patients seeking medical advice for Allergic symptoms, Females (n=53) were more compared to males (n=47) .In the study group, females were present in all age groups, most of them were in the age group of 26-35 years (n=23) followed by 12 patients in The age group of 15-25 years.

**Table 2:** Gender distribution among cases

SEX	TOTAL NO. OF CASES
MALE	47
FEMALE	53

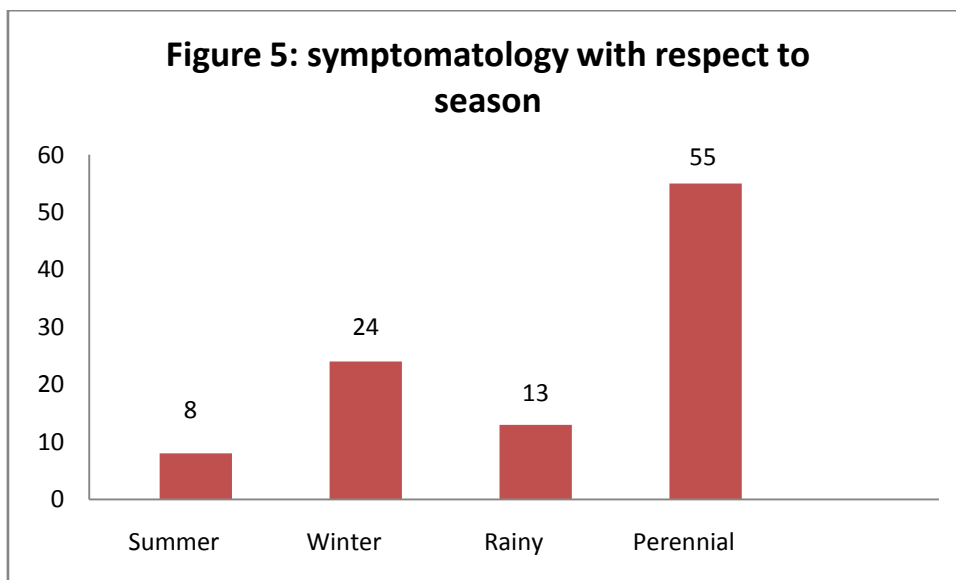


**Symptomatology With Respect To The Season**

Based on the history of the patients , majority had symptoms perennial in nature (55%) among the study patients and the allergic symptoms were less in summer season.

**Table 3:** Symptomatology with respect to Season:

Season	Summer	Winter	Rainy	Perennial
No. of cases	8	24	13	55

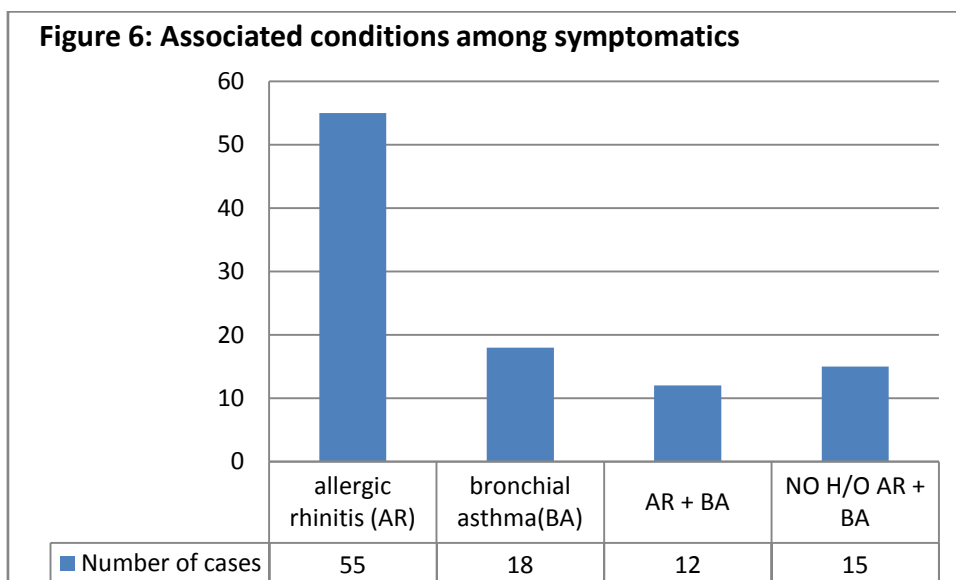


**Associated Conditions Among Symptomatics :**

In the study population 85% had either allergic rhinitis , bronchial asthma or Both from their history compared to 15% who had neither Allergic Rhinitis orBronchial Asthma in their previous medical history.

**Table 5 : Associated Conditions Among Symptomatics**

Symptom	Number of cases(n)
Allergic rhinitis	55
Bronchial asthma	18
AR + BA	12
No H/O AR +BA	15



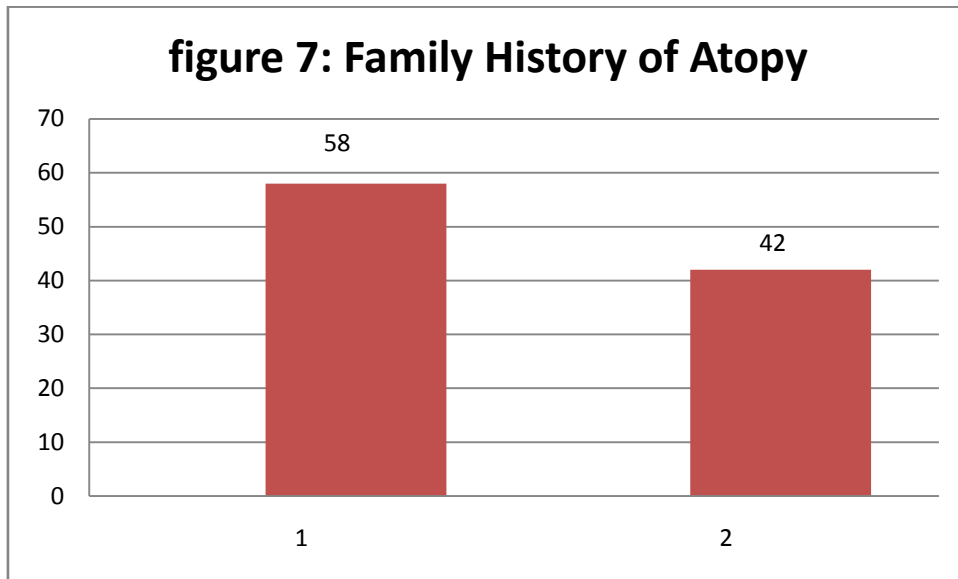
**Family History**

Based on the family history –  
 Around 58 patients(58%) had family history of atopy.  
 Around 42 patients (42%) had family history of atopy.



**Table 5: Family history of Atopy**

Atopy	Positive family history	Negative family history
No. of cases	58	42

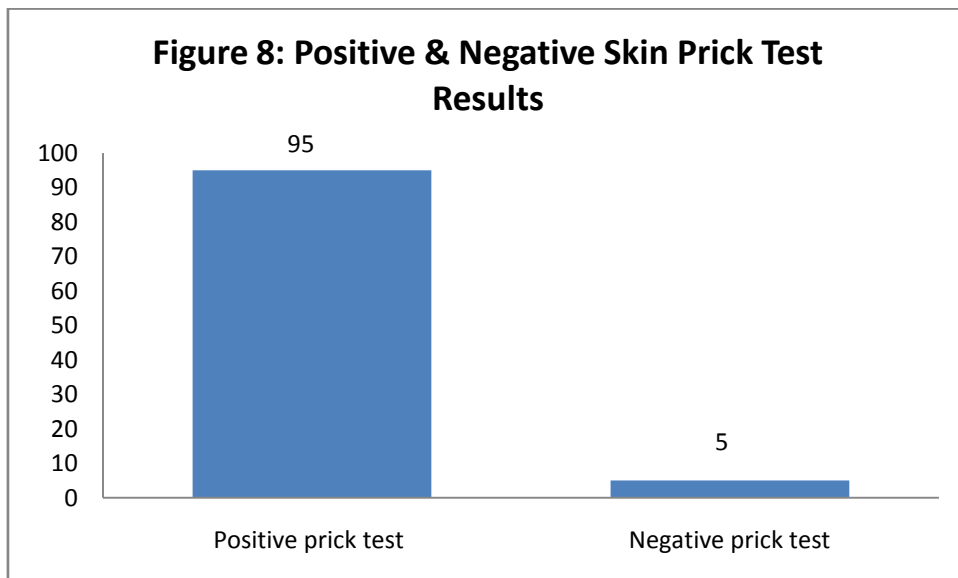


**Positive And Negative Results:**

Among the 100 population in whom Skin Prick Test was done 95% had Positive Skin prick test result to atleast one antigen compared to 5% with Negative Reaction to the test.

**Table 6: Positive and Negative Skin Prick Test Results:**

Skin prick test results	Positive( to atleast 1 antigen)	Negative
Total no. of cases	95	5

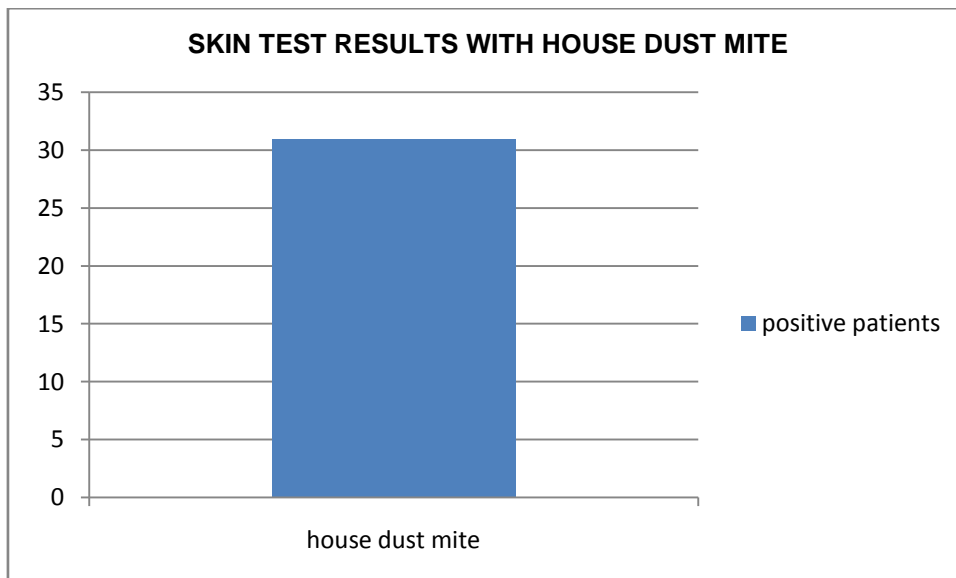


**Skin Prick Test Sensitivity To House Dust Mite**

Table 7 : SPT sensitivity to House Dust Mite

Positive skin test sensitivity to House Dust Mite was seen in 31% of patients among the study population.

Antigen	House dust mite
Total no. of cases (n)	31

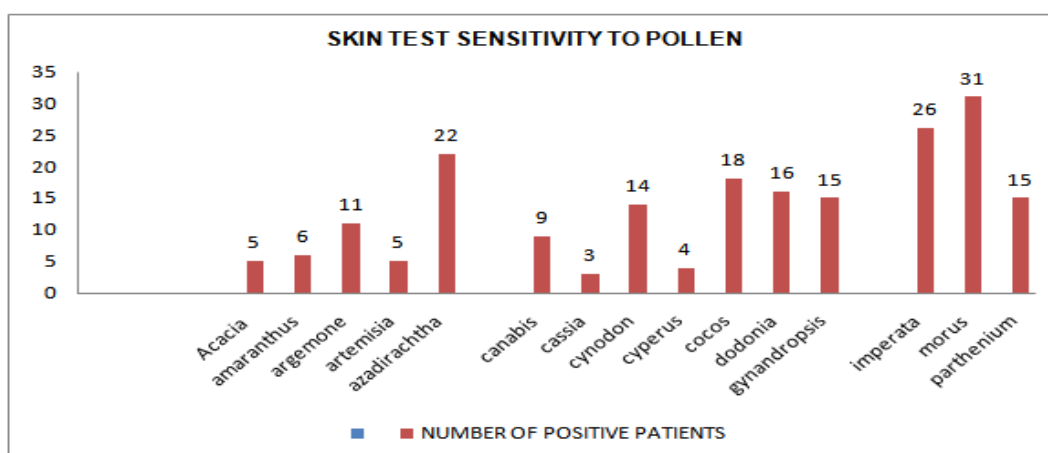


**Skin Prick Test Sensitivity To Pollens:**

**TABLE .8 Skin Prick Test sensitivity to pollens:**

S.no.	Pollen allergen	No. of positive patients
1.	Acacia arabica	5
2.	Amaranthus spinosus	6
3.	Argemone mexicana	11
4.	Artemisia scoparia	5
5.	Azadirachta indica	22
6.	Cannabis sativa	9
7.	Cassia occidentalis	3
8.	Cynodon dactylon	14
9.	Cyperus rotendus	4
10.	Cocos nucifera	18
11.	Dodonea viscosa	16
12.	Gynandropsis gynandra	15
13.	Imperata cylindrica	26
14.	Morus alba	31
15.	Parthenium hysterophorus	15

Among the 15 pollen allergens tested , morus alba (31%) , Imperata cylindrica (26%) , azadirachta indica (22%) , cocos(18%) , dodonea , parthenium were the Major allergens causing skin prick test positivity.



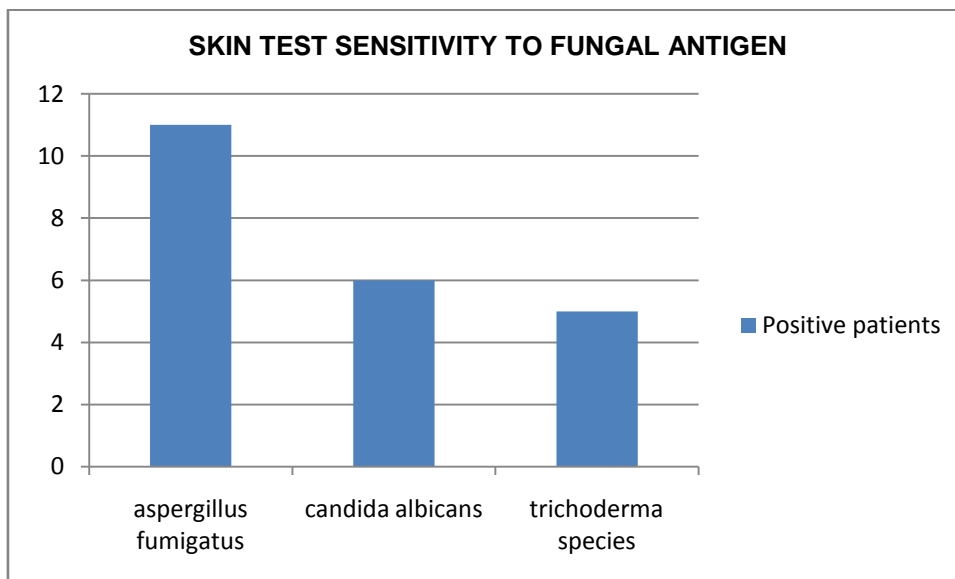
**Skin Prick Test Sensitivity To Fungal Antigens**

Among the 3 fungal antigens tested , sensitivity to fungal antigens was more With aspergillus followed by candida albicans and trichoderma species.

**Table 9 : Skin Prick Test Results to Fungal antigens**

+ SPT to	No. of Positive Cases
Aspergillus fumigatus	11
Candida albicans	6
Trichoderma sp.	5

+ = Positive SPT = skin prick test



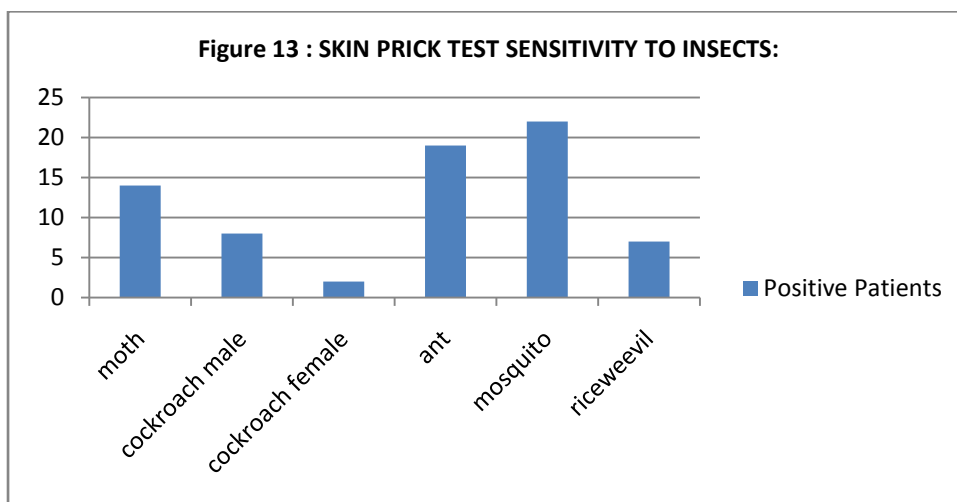
**Skin Prick Test Sensitivity To Insects**

Among the insects most of the patients had positive skin prick test sensitivity to mosquito (22%) followed by ant, moth, cockroach male, rice weevil followed by cockroach female.

**Table 10: SPT Sensitivity to insects**

+VE SPT	NO. OF CASES(n)
MOTH	14
COCKROACH MALE	8
COCKROACH FEMALE	2
ANT	19
MOSQUITO	22
RICE WEEVIL	7

+ve POSITIVE SPT – skin prick test



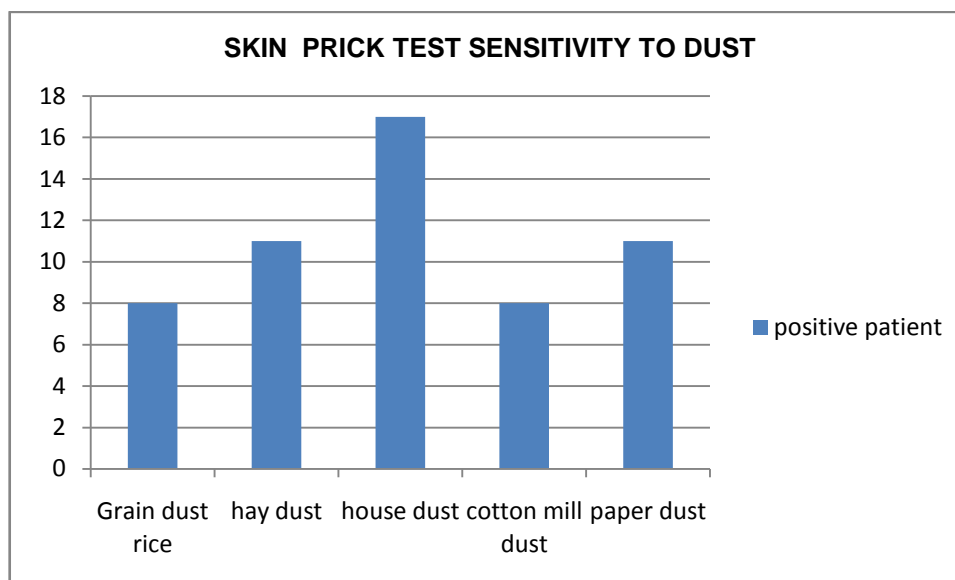
**Skin Prick Test Sensitivity To Dust**

Among the 5 dust antigens tested , majority (17%) of the patients were found Sensitive to house dust , followed by hay dust , paper dust , cotton mill dust , Grain dust rice.

**Table 11 : SPT sensitivity to dusts:**

ANTIGEN	No . of positive patients
Grain dust rice	8
Hay dust	11
House dust	17
Cotton mill dust	8
Paper dust	11

+ve – positive                      SPT – skin prick test



**VI. Discussion**

There is a huge variation in the predominance of allergens from region to region in allergic disorders with the fact that there are topographical variations in the nature. The use of Skin Prick Testing as a diagnostic tool in nasobronchial allergy dates to the studies on hay fever since 1860s. Most investigators have found the prick test to be the most satisfactory of the epicutaneous tests commonly employed. In comparison especially with the scratch test , prick test has been reported to be more sensitive , less variable and better correlated with intradermal testing<sup>74-77</sup>.

Therefore the present study was done to know the allergy profile of the Patients visiting to our hospital from in and around the region of sangareddy Which is primarily an agricultural based area with various industries, Vegetations and environmental pollutants.

In our study, among the 100 patients , in whom Skin Prick Test was done, 95% had positive skin prick test result to at least one antigen (allergen). Among the patients who showed positive reaction to allergens, Bronchial Asthma and Allergic Rhinitis were quite evident. 85% had allergic rhinitis , Bronchial asthma or both from their history. This points towards the association of atopy and allergy with asthma and allergic rhinitis. In this study, temporal Association between asthma and allergic rhinitis have been found (12%) , Though not significant as compared to other studies , Pawankar (2006)<sup>78</sup> where there is 70% association.

Family history of asthma is present in 58% of the patients in the study population. Chhabra et al also reported a strong association between a family history of atopic disorders and prevalence of asthma<sup>79</sup>.

Nasobronchial allergy has predilection for certain age groups. In the present study majority of patients suffering from allergic symptoms belonged to age group of 26 – 35 years (41%), followed by 36 -45 years (23%) , and then 15 -25 years (22%) { 15 – 60 years age group was the inclusion criteria}. This is also supported by a study conducted by Rajendra Prasad et al (2000). More than 80% were between 18 – 40 years of age<sup>80</sup>. In another study by Chaubey et al (1973) maximum number of patients ranged between 13-48 years<sup>81</sup>. This confirms the fact that nasobronchial allergy is more common in children and young adults. Studies done in the year 2003 and 2012 at VPC also showed a maximum number of

patients in age groups of 20-30 years(120; 35.19%) and (261; 28.43%), respectively, and this group was the most commonly affected with significant skin positive patients<sup>82,83</sup>.

**Comparison With Representative Studies In India**

	Rajendra Prasad et al (2000)	Chaubey et al (1973)	Present study
Majority age group	<b>18-40</b>	<b>13-48</b>	<b>26 – 45</b>
percentage	<b>80%</b>	<b>&gt;50%</b>	<b>64%</b>

in the present study, among 100 patients seeking medical advice for allergic symptoms. Females(53%) were more compared to males (47%). In both the regions female preponderance was observed. In the present study, majority had symptoms perennial (throughout the year) {55%} and allergic symptoms were less in summer compared to other seasons. This can be explained may be due to the fact that fungal species are omnipresent in nature. However the concentration of fungal spores in air changes with temperature, humidity, rainfall, wind velocity and the vegetation of the area. As far as pollen allergen is concerned, during rains they may get settled down in the atmosphere due to mugginess, it may be one of the reasons for less number of patients suffering in summer with symptoms. However, it strongly depends on the type of pollen and vegetation of the plant.

In the present study Positive skin test sensitivity to House Dust Mite was seen in 31%. House Dust sensitivity is seen among the majority of the patients (taking into consideration all the 30 allergens). Ghaffari et al in 2010 showed that most common SPT reaction was with HDM, i.e.,

Dermatophagoides Pteronyssinus (25.3%) and Dermatophagoides Farina(24.8%), followed by cockroach and feather<sup>84</sup>. Similar studies were done in Jamaican studies done by Madden KJ, which showed that most common significant SPT was due to Dermatophagoides Pteronyssinus (33%) followed by Dermatophagoides Farina (32%)<sup>85</sup>. A study done by Almorgen et al, revealed that most frequently reacting indoor allergen was HDM(77.8%)<sup>86</sup>. In the present study, among the 15 pollen antigens tested, morus alba(31%), imperata cylindrica (26%), azadirachta indica (22%) followed by cocos(15%), dodonea(16%), gynandropsis(15%), parthenium hysterophorus(15%), Cynodon and Artemisia were the major allergens causing positive skin prick test. Considering the study region (sangareddy) under south india, previous studies by Acharya (1980)<sup>87</sup>, Agashe (1982)<sup>88</sup>, Subbarao et al.<sup>89</sup>, studying the Predominant pollens causing nasobronchial allergy, Cassia, Ageratum Conyzoides, Salvadora, Ricinus, Albizzia lebeck and Artemisia, Parthenium Hysterophorus were predominant. In a study conducted at vishakapatnam (Raju et. Al. 1990)<sup>90</sup> Artemisia was predominantly positive.

Comparing pollen sensitivity with various other south Indian studies:

Study	Area where study was done	Major pollen isolated
Acharya (1980)	Andhra Pradesh	Cassia, Ageratum, Salvadora
Subbarao et. al (1985)	Bengaluru	Parthenium hysterophorus
Suhasini et. al (2011)	Hyderabad	Lawsonia enermi
Raju et al, 1990	Vishakapatnam	Artemisia.
<b>Present study</b>	Sanga reddy (telangana)	Morus alba, imperata cylindrica, azadirachta indica, dodonea, parthenium, gynandropsis, cocos.

From the above studies, it is clear that variations are present in allergens causing nasobronchial allergies depending upon the region. This can be due to the climatic variations, industrialization, environmental pollution and also depends on the flora of the particular region. So, it is better to know the prevalent pollens in the area so that patients quality of life can be improved by avoiding certain pollens. For this, pollen calendars are very much useful.

In the present study, among the 3 fungal antigens tested, sensitivity to Fungal antigens was more for Aspergillus followed by Candida albicans and Trichoderma species. Comparison with others work with respect to fungal allergens in naso-bronchial allergy, allergens such as Aspergillus, Flavus, Curvaria and Alternaria were found to be common allergens<sup>91</sup>. Among the air borne fungi that spread air spores, important allergens of the world are Aspergillus, Cladosporium, Alternaria, Penicillium, Dechslera. They have been reported as the predominant organisms in warm, humid and dry climates<sup>92</sup>.

Aerobiological survey done in the city of Bangalore(South India) by Aghaseand Vidya(1997) showed predominance of Cladosporium , Alternaria , Aspergillus, Penicillium , Nigrospora , Helminthosporium , Cercospora , Curvularia<sup>93</sup>.

Comparing the present study with the various studies performed in South India , there is correlation with other studies with regard to Aspergillus Fumigates being a predominant allergen causing skin prick test positivity in patients with allergic manifestations.

Among the insect group of allergens we tested ,most of the patients had Positive skin prick test sensitivity to mosquito (22%) followed by ant (19%) , moth (14%) , cockroach male (8%) , rice weevil (7%) and cockroach female (2%).

The next allergen group was dusts , among the six dust antigens tested , Majority of the patients were found sensitive to House Dust(17%) , followed by hay dust (11%) , paper dust(11%) , cotton mill dust (8%) and grain dust rice(8%).

Acharya et al reported among dust allergens in nasobronchial allergy. House Dust followed by wheat dust , cotton dust and paper dust were common in Andhra Pradesh( including present Telangana)<sup>94</sup>.

It was also found by various studies that House dust , wheat dust , paper dust, cotton dust act as predominant allergens in respiratory diseases(Duc J et al 1986)<sup>95</sup>. From the studies one can clearly observe the variations in allergens causing nasobronchial allergies. The main basis for this may be due to the climatic variations, industrialization , environmental pollution and change in life style.

SPT- positive patients were more likely to have earlier age of onset of the disease . they also had severe symptoms on presentation . it is well documented that allergic rhinitis is closely related to Asthma; both conditions are together often considered to be single disease affecting the whole respiratory tract. SPT – negative patients can be regarded as having either low level IgE mediated (below reaction threshold of the SPT) or due to non-IgE mediated pathophysiological causes. Such patients had weaker IgE mediated skin reactions than SPT- positive patients. The extent of reaction in the skin also reflected the degree of IgE mediated allergic reactivity in other body organs including the eyes , nose and lungs which might account for difference in symptom severity between SPT positive and negative patients.

## **VII. Summary**

- This study was conducted over a period of 36 months from August 2015 to July 2017.
- A total of 100 patients with symptoms of allergy , asthma, rhinitis were enrolled and were subjected to skin prick testing with 30 allergens on all these patients and the results were compared with other previous studies.
- Among the 100 patients , in whom Skin Prick Test was done, 95% showed significant positive reaction to at least one antigen.
- Bronchial asthma and Allergic rhinitis were quite evident among the patients seeking medical advice for allergic manifestations. 85% had Allergic rhinitis , bronchial asthma or both from their history.
- Family history of atopy is present (positive) in 58% of the patients.
- Majority of the patients were in the age range of 26-35 years (41%) followed by 23% of cases in the age group 36-45 years and 22% cases in 15-25 years age group.
- Majority of the patients had symptoms throughout the year (55%) and symptoms were least in the summer group (8%).
- Among the 15 pollen allergens tested Morus alba (31%), Imperata cylindrica, Azadirachta indica (22%) , Cocos nucifera , Dodonea , Parthenium were the major allergens causing skin prick test positivity.
- Among the fungal antigens tested , Aspergillus fumigatus (11%) was the major one causing positive skin prick test followed by Candida albicans & Trichoderma species.
- Among the insect antigens tested major insect allergen causing significant positive skin test was mosquito (22%) followed by ant (19%) and moth (14%).
- Among the dust group of antigens house dust followed by paper dust and hay dust (11% each) had high skin prick test sensitivity.
- Positive skin test sensitivity to house dust mite was seen in 31% of patients among the study population.

### VIII. Conclusion

- The common inhalant allergens in an agricultural area of telanganawere assessed and compared with the other studies.
- This study unravels the fact that age range 26-35 years is most Susceptible for patients being nasobronchial allergic.
- It is also found that seasonal variations of allergy were found to be minimal as the symptoms were persistent throughout the year in majority of the patients.
- The association between Asthma, Allergic rhinitis and positive skin prick test was highly evident.
- Family history plays an important factor in prevalence of allergic diseases which is quite evident in our study.
- Among pollens *morus alba* was the predominant allergen found to be positive among the study group, while among other groups house dust mite was positive.
- A positive skin test does not imply clinical disease, correlation of positive skin prick test with clinical symptoms and seasonal variation helps in diagnosis and could be attempted to facilitate preparation of antigen for hyposensitization of patients with nasobronchial allergies.
- Due to difference in prevalent allergens from place to place, it is strongly recommended to carry out further studies time to time for better outcome.
- Aerobiological studies and control of environmental factors can reduce the burden of allergy in human beings.
- More such studies from India may help in better understanding of the condition which can lead to proper diagnosis and treatment.
- This is the first study done in the state of Telangana for determining the various susceptible aeroallergens. Based on this, AR and asthmatics should be offered an effective education about the disease, avoidance of relevant allergens, and importance of compliance with the treatment. SPT should be considered to be the treatment of choice in clinical practice after correlating with the history. Sometimes, when the patients are unable to give specific history, we must test the most common locally prevalent allergens too for which this study is helpful.

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