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**RESEARCH ARTICLE**

# Effect of different factors on Atopic Allergy In Mosul Community

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## *Abstract*

The work presented in this paper involves studying the effects of different components on atopic allergy in the community of Mosul according to information taken from patients and the skin test to which they were subjected**.**

The cases of 263 allergic patients were studied who were randomly distributed over the city of Mosul , among those patients were (142 females and 121 males) whose ages ranged from (1 – 65) years at the Allergy Section of AL-Zahrawy Teaching Hospital in Mosul from the date of 12/9/2012 to 14/3/2013.

An intradermal skin test was performed using Iraqi allergens with the help of the hospital staff. The data gathered were statistically treated and analyzed to see the effects of marital status , residence , blood group , chronic disease , mode of delivery (birth) , smoking , family history, type of allergy , occupation and weight.

The results yielded that urban residents are more likely to have allergy than rural residents. Also atopic patients with blood group A+are the most likely to have allergy in both sexes. Furthermore,there was no clearcut effect of chronic diseases,mode of delivery, smoking, marital status and weight on developing atopic allergy. However, family history and type of job people exercise have a clear effect on atopic allergy in both sexes.



## Introduction

Allergy is considered as one of the disturbing diseases and confusing regarding medication since some patients respond to treatment while others do not (Dey, 2001).

Hypersensitivity reactions are inappropriate responses of the body to environmental antigens triggered via immunologic or non-immunologic mechanisms. So allergy is defined as a "hypersensitivity reaction initiated by immunologic mechanisms" and it can be mediated by specific antibodies and cells of the immune system (Roitt*et al*, 2001).

Atopy is one of four types of allergy. It is a tendency to produce IgE antibodies in response to low doses of allergens usually proteins and as a consequence to develop typical symptoms of asthma, rhinoconjunctivitis or allergic skin disease (Palosuo, 2003).

In atopy, antigens able to induce the immune system to produce IgE antibodies and to elicit an allergic reaction (*i.e.*, to trigger symptoms in a sensitized individual) are called allergens. Typical allergens are proteins or glycoproteins, but there is no single structural, functional, or chemical property that will define a protein as allergenic. 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. More than 200 allergens have so far been identified and characterized (Giangrieco*et al*, 2012).

Symptoms of allergic diseases can certainly give strong hints that a person is indeed suffering from allergies. However, in most cases, various tests are required to confirm a diagnosis. Testing depends on the type of allergic disease being investigated so,diagnosisofallergyincludes clinical examinations and screening tests. The clinical

examination involves noting the symptoms in the head, neck, skin and other symptoms. The screening tests include one or more of the skin tests (prick, Intradermal and atopy patch test), eosinophils count and IgE level in serum (Levy*et al*, 2010).

The aim of this work was to examine the effect of various factors on atopic allergy in Mosul community

## Materials and methods

Information were taken from 263 allergic patients who were randomly distributed over the city of Mosul , among those patients were (142 females and 121 males) whose ages ranged from (1 – 65) years at the Allergy Section of AL-Zahrawy Teaching Hospital in Mosul from the date of 12/9/2012 to 14/3/2013. The patients were already diagnosed as having asthma, eczema, conjunctivitis, pharangitis, laryngitis and rhinitis by exposing them to the intradermal skin test using two allergens (namely mite and pollen) of Iraqi origin. The test was carried out by injecting 0.2 $cm^3$ of the allergens solutions, which were diluted by 1:10000 with phenol, on the patient's forearm after cleaning the place with 70% ethylalcohol. The results of the test were detected after 15 – 20 minutes , where the positive results were noticed by formation of weal and flare of 3 -5 mm diameter.

## Results and Discussion

The intradermal skin test was done on the 263 patients at the Allergy Section of AL-Zahrawy Teaching Hospital. Their personal information was recorded in a specially designed form. Their positive results showed a variation of response to mite , pollen and mite – pollen together which are the allergens available at the hospitallaboratory. The results are shown in table (1) being classified according to marital status , residence , blood group , chronic diseases , birth ( mode of delivery :vaginal or cesarean ), smoking habit , family history , type of allergy , occupation and weight**.**

**Table 1: Number and percentage of all allergic patients (male and female) according to the skin test.**

| Sex | | Female 142 (54%) | | | | | | Male 121 (46%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allergens | | Mite | | Pollen | | M – P | | Mite | | Pollen | | M – P | |
| | Information | no. | % | no. | % | no. | % | no. | % | no. | % | no. | % |
| Mar. status | **Yes** | **20** | **31.74** | **18** | **33.96** | **7** | **26.92** | **12** | **23.08** | **11** | **22.92** | **4** | **19.05** |
| | **No** | **43** | **68.25** | **35** | **66.04** | **19** | **73.08** | **40** | **76.92** | **37** | **77.08** | **17** | **80.95** |
| Residence | **Urban** | **35** | **55.55** | **35** | **66.04** | **19** | **73.08** | **31** | **59.62** | **24** | **50** | **11** | **52.38** |
| | **Rural** | **28** | **44.44** | **18** | **33.96** | **7** | **26.92** | **21** | **40.39** | **24** | **50** | **10** | **47.62** |
| Blood group | **A-** | **2** | **3.18** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **4.76** |
| | **A+** | **30** | **47.62** | **30** | **56.6** | **10** | **38.46** | **31** | **59.62** | **29** | **60.42** | **14** | **66.67** |
| | **B-** | **1** | **1.59** | **1** | **1.89** | **2** | **7.69** | **1** | **1.92** | **2** | **4.17** | **0** | **0** |
| | **B+** | **11** | **17.46** | **6** | **11.32** | **2** | **7.69** | **6** | **11.54** | **4** | **8.34** | **3** | **14.29** |
| | **- O** | **2** | **3.18** | **4** | **7.55** | **0** | **0** | **2** | **3.85** | **2** | **4.17** | **0** | **0** |
| | **O+** | **13** | **20.64** | **9** | **16.98** | **10** | **38.46** | **8** | **15.39** | **10** | **20.83** | **3** | **14.29** |
| | **AB-** | **1** | **1.59** | **3** | **5.66** | **0** | **0** | **1** | **1.92** | **0** | **0** | **0** | **0** |
| | **AB+** | **3** | **4.76** | **0** | **0** | **2** | **7.69** | **3** | **5.77** | **1** | **2.08** | **0** | **0** |
| Chronic diseases | **B. press.** | **3** | **4.76** | **2** | **3.77** | **2** | **7.69** | **2** | **3.85** | **2** | **4.17** | **0** | **0** |
| | **Diabetes** | **1** | **1.59** | **1** | **1.89** | **0** | **0** | **1** | **1.92** | **1** | **2.08** | **0** | **0** |
| | **B.P. + Dia.** | **2** | **3.18** | **1** | **1.89** | **0** | **0** | **0** | **0** | **1** | **2.08** | **0** | **0** |
| | **None** | **57** | **90.48** | **49** | **92.45** | **24** | **92.31** | **49** | **94.23** | **44** | **91.67** | **21** | **100** |
| Birth | **Normal** | **59** | **93.65** | **52** | **98.11** | **25** | **96.15** | **49** | **94.23** | **46** | **95.83** | **21** | **100** |
| | **Sezerian** | **4** | **6.35** | **1** | **1.89** | **1** | **3.85** | **3** | **5.77** | **2** | **4.17** | **0** | **0** |
| Smoking | **Yes** | **0** | **0** | **1** | **1.89** | **0** | **0** | **6** | **11.54** | **6** | **12.50** | **3** | **14.29** |
| | **No** | **63** | **100** | **52** | **98.11** | **26** | **100** | **46** | **88.46** | **42** | **87.50** | **18** | **85.71** |
| Family history | **Yes** | **44** | **69.84** | **30** | **56.6** | **19** | **73.08** | **28** | **53.85** | **33** | **68.75** | **16** | **76.19** |
| | **No** | **19** | **30.19** | **23** | **43.4** | **7** | **26.92** | **24** | **46.15** | **15** | **31.25** | **5** | **23.81** |
| Allergy | **Eczema** | **34** | **53.97** | **16** | **30.19** | **9** | **34.62** | **20** | **38.46** | **17** | **35.42** | **6** | **28.57** |
| | **Asthma** | **3** | **4.76** | **12** | **22.64** | **5** | **19.23** | **11** | **21.15** | **6** | **12.50** | **1** | **4.76** |
| | **Rhinitis** | **11** | **17.46** | **13** | **24.53** | **11** | **42.31** | **11** | **21.15** | **7** | **14.58** | **8** | **38.10** |
| | **Laryngitis** | **10** | **15.87** | **9** | **16.98** | **0** | **0** | **7** | **13.46** | **16** | **33.33** | **5** | **23.81** |
| | **Pharangitis** | **0** | **0** | **1** | **1.89** | **1** | **3.85** | **1** | **1.92** | **0** | **0** | **1** | **4.76** |
| | **Conjunctivitis** | **5** | **7.94** | **2** | **3.77** | **0** | **0** | **2** | **3.85** | **2** | **4.17** | **0** | **0** |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Occupation | **Yes** | **5** | **7.94** | **2** | **3.77** | **0** | **0** | **3** | **5.77** | **4** | **8.34** | **5** | **23.81** |
| | **No** | **58** | **92.06** | **51** | **96.23** | **26** | **100** | **49** | **94.23** | **44** | **91.67** | **16** | **76.19** |
| Weight/ Kg | **1-20)(** | **3** | **4.76** | **7** | **13.21** | **2** | **7.69** | **10** | **19.23** | **4** | **8.34** | **1** | **4.76** |
| | **21-40)(** | **10** | **15.87** | **6** | **11.32** | **4** | **15.39** | **5** | **9.62** | **11** | **22.92** | **5** | **23.81** |
| | **(41-60)** | **14** | **22.22** | **16** | **30.19** | **4** | **15.39** | **14** | **26.92** | **10** | **20.83** | **6** | **28.57** |
| | **61-80)(** | **26** | **41.27** | **16** | **30.19** | **12** | **46.15** | **12** | **23.08** | **10** | **20.83** | **5** | **23.81** |
| | **(81-100)** | **10** | **15.87** | **8** | **15.09** | **4** | **15.39** | **11** | **21.15** | **13** | **27.08** | **4** | **19.05** |

Examining table (1) and after classifying the total data on the basis of sex and the type of allergen for each of the sexes , it is noticed that their correlations on the basis of percentages are as follows:-

1- **Marital status** :- For females , the percentage of those allergic to mite is 68.25% who were all unmarried , while in the case of pollen the unmarried females formed 66.4% of the total and those who are allergic to both mite and pollen formed 73.08% of the total.

For males, it is seen that the percentage of those allergic to mite is 76.92% who were unmarried. The percentageof those allergic to pollen is 77.08% (also unmarried) and that for those allergic to both mite and pollen is 80.95%.

This indicates that marital status does not bear a strong relationship to being allergic since all the percentages shown are over 2/3 of the cases as shown in Figure(1).

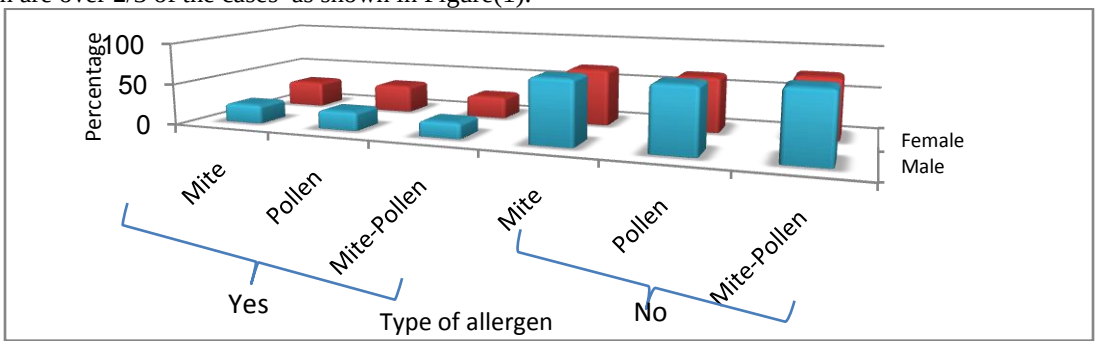



**Figure 1**: Percentage of allergic patients responsive to the used allergens according to marital status.

In spite of numerous trials, no previous literature could be obtained discussing the relationship between allergy and marital status.

2- **Residence**:-The percentages of allergic cases among females is higher for those who are urban residents who formed over 50% for all allergens under study especially for pollen and mite – pollen. However, the percentages for males differ for all allergens. The number of allergic cases for mite and mite – pollen is higher for urban residents than those who are not, while for pollen the percentages were equal.

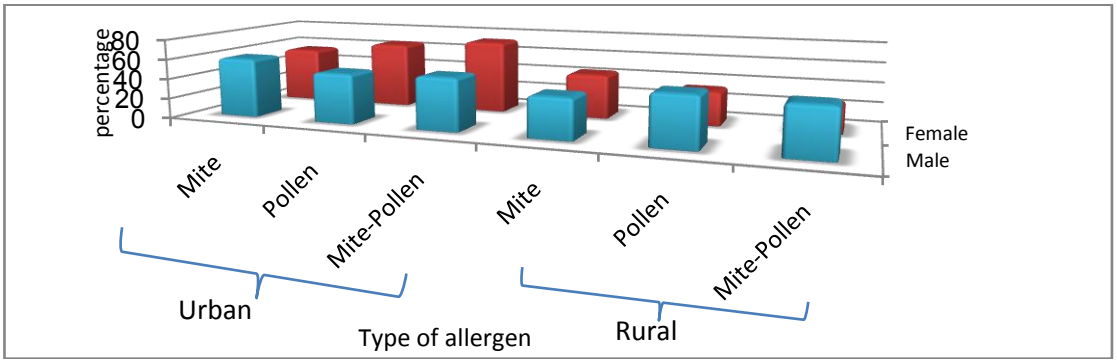


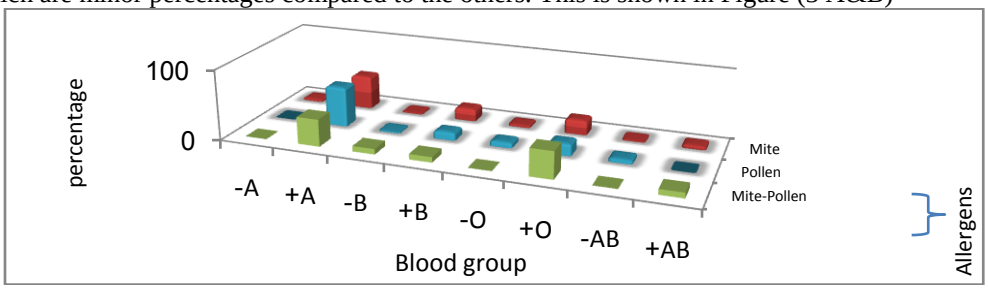

**Figure 2**: Percentage of allergic patients responsive to the used allergens according to residence

Hence, it can be concluded that urban residents, generally, are more susceptible to allergy than rural residents by over 50% as shown in Figure (2). This conclusion may be attributed to the fact that the rural residents are more

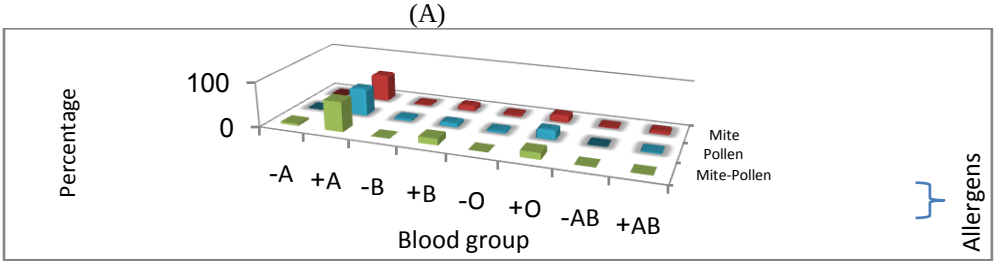
likely to be exposed to these allergens since their childhood and therefore they become acclimatized to them while urban resident are not,in addition to their exposure to pollutants in the city. Ridler*et al*(2000), Alkhalifa (2004) and Fereidouni*et al* (2010) arrived at the same conclusion and for the same reason.

3-**Blood group**:- It is noticeable from the previous table that the highest percentage of allergy in females for the mite allergen is for those who have $A^+$ blood group 47.62% , and the next higher is for the $O^+$ blood group which is 20.64% , then come those with $B^+$ blood group 17.46% . However , in the case of pollen , the highest percentage is for the $A^+$ blood group which is 56.6% followed by that for the $O^+$ group which is 16.98% and then comes that for the $B^+$ group which is 11.32% of the total number of allergic females. Moreover , with the case of mite – pollen the percentages for $A^+$ and $O^+$ blood groups are equal (38.46%) ; which is the highest for this case . As far as males are concerned, the highest percentage for mite is 59.62% for $A^+$ followed by 15.39% for the $O^+$ blood group and then comes 11.54% for the $B^+$ group. For pollen the highest percentage is for the $A^+$ group which is 60.42% followed by that for the $O^+$ group which is 20.83%, and finally comes 8.34% for the $B^+$ group. In the case of mite – pollen it is noticed that the highest percentage which is 66.67% is for the $A^+$ blood group and then comes equal percentages of 14.29% for $O^+$ and $B^+$ group.

Based on the above results, it can be pointed out that patients with blood group $A^+$ are more susceptible to being allergic to all allergens studied in both males and females with fairly high percentages compared to others, while those with $B^+$ group come next, at the time when the rest of the group have varying percentages of about 8% and below, which are minor percentages compared to the others. This is shown in Figure (3 A&B)




(A)




(B)

**Figure 3**: Percentage of allergic patients responsive to the used allergens according to blood group; (A) Females; (B) Males.

Al-Ani(2002) showed that 33.8% of his patients had O blood group , 28.8% had A blood group , 25.8% had AB blood group and 21.6% had B blood group while Alkhalifa (2004) reported that 54.6% of her patients had O blood group, 30.4% of them had A blood group and 12% had B blood group .These two researchers had their samples taken in Mosul –Iraq. Furthermore a study conducted by Al-Shamma*et al*(2008) in Najaf Governorate indicated that in asthmatic patients , there was a significant increase in percentages of blood group (O) in comparison with other blood groups with no significant differences between other blood groups (A, B, and AB). In addition to that, a Brazilian study conducted by Falsarella*et al* (2011) reached the conclusion that the percentage of allergic males with rhinitis was higher than that in females having the same blood group (O).

4-**Chronic diseases:-** By examining the previous Table (1) in connection with the cases of patients with chronic diseases ,it is quite clear that the percentages of allergic females who do not have chronic diseases are 90.48% to mite, 92.45% to pollen and 92.31% to mite – pollen ,and the percentages of allergic males are 94.23% to mite, 91.67% to pollen and 100% to mite – pollen . This means that there is no sign of a direct effect of chronic diseases on developing allergy and no relationship exists between the two, since all the percentages are over 90% as seen in Figure (4).

Stene and Nafstad (2001) concluded that "a negative association has been observed between type 1 diabetes and atopic diseases in individuals". Roelofs*et al* (2010) concluded that "their results suggest no association between asthma and high blood pressure in adolescents. More prospective studies are needed to establish whether hypertension becomes more pronounced at a specific age in asthmatics, and if so, the possible factors that may contribute to this". In a recent study conducted in the USA, Li *et al* (2013) reached the conclusion that " hay fever diagnosis is not significantly associated with hypertension in adults overall".

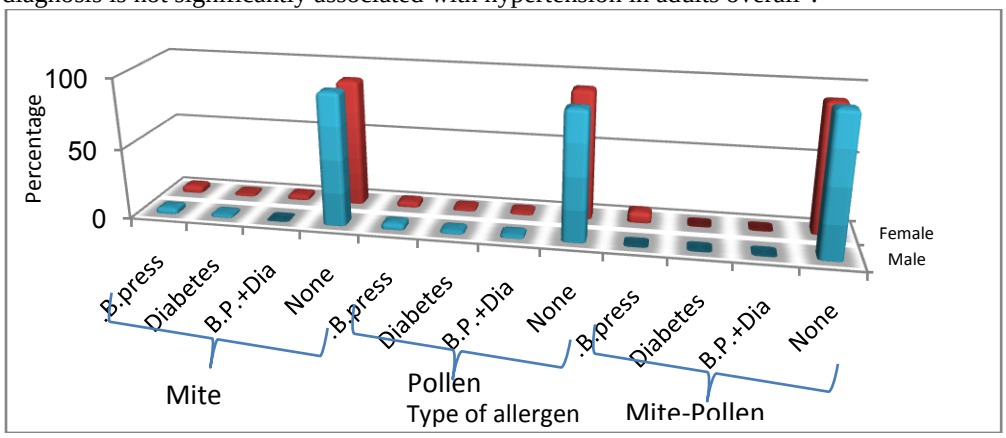



**Figure 4**: Percentage of allergic patients responsive to the used allergens according to chronic diseases.

**5- Birth (mode of delivery) :-** It is noticed from table (1) that there is no relationship between allergy and mode of delivery (vaginal or cesarean delivery) for both sexes since the percentages of those who were born vaginally ranged between a minimum of 93.65% in females and a maximum of 100% in males for all allergens. This makes clear that cesarean birth has little effect on the chance of developing allergy as shown in Figure (5).

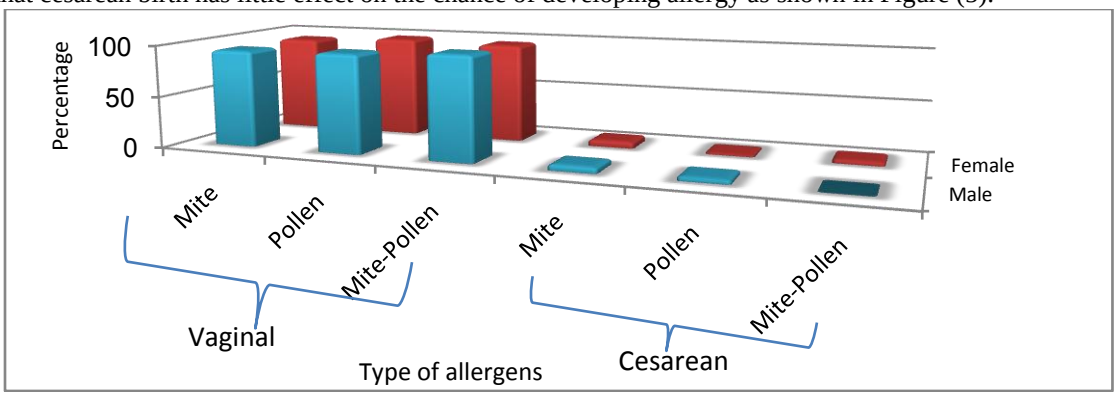



**Figure 5**: Percentage of allergic patients responsive to the used allergens according to mode of delivery.

On the other hand, Renz-Polster*et al* (2005)stated that "the risk of being diagnosed with allergic rhinoconjunctivitis was significantly higher in the children born by cesarean-section than in those delivered vaginally, and delivery by cesarean-section was also associated with the subsequent diagnosis of asthma".In addition to that, Pistiner*et al* (2008) reported that "cesarean delivery is associated with allergic rhinitis and atopy among children with a parental history of asthma or allergies. This could be explained by lack of contact with the maternal vaginal/fecal flora or reduced/absent labor during cesarean delivery". However, Park *et al* (2010) stated that "there were no differences in the prevalence of allergic diseases, allergic inflammation or allergic sensitization according to mode of delivery".

**6- Smoking:-**When analyzing the data in table (1) concerning the effect of smoking, it can be stated that most of the allergic females were nonsmokers for all allergens with a percentages of 98.11% except the case of one smoker who is allergic to pollen. As for males, the picture is slightly different since the percentages of allergic patients are 88.46% to mite, 87.5% to pollen and 85.71% to mite – pollen who were all nonsmokers.

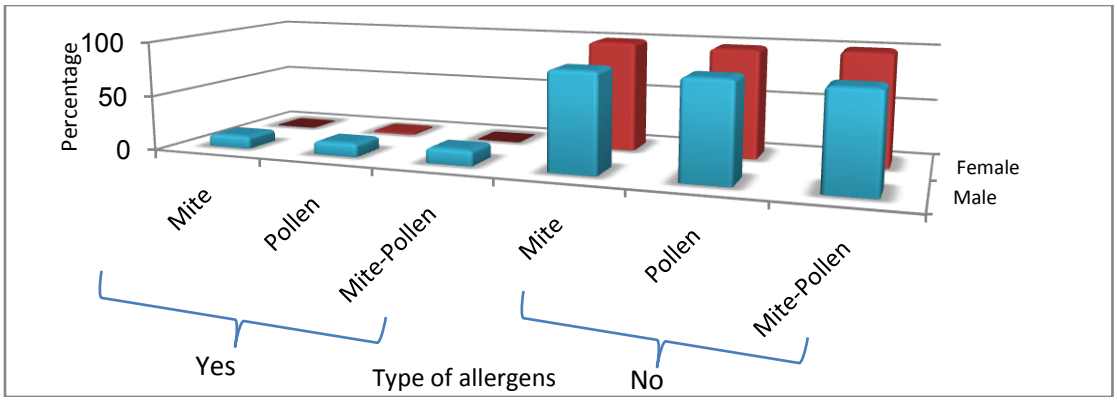



**Figure 6**: Percentage of allergic patients responsive to the used allergens according to smoking.

It can be concluded from this analysis that smoking has a weak effect on developing allergy as shown in Figure (6). This is different from the findings of other researchers. Goel*et al* (2008) stated that "Smoking seems to induce an atopic orientation and allergen sensitization in individuals". Pietinalho*et al*(2009) found that exposure to tobacco smoke causes a higher risk for asthma and the effects are the greatest when exposure occurs during pregnancy and in early childhood and also concluded that small children are the most vulnerable to the harmful effects of environmental tobacco smoke, if they are exposed to tobacco smoke in the home. Also adult population has a higher risk for asthma because of passive and active smoking. Nagasaki *et al* (2013) declared that "Epidemiological studies have shown that smoking increases the propensity for atopy and asthma" .Eriksson *et al* (2013) concluded that smoking was associated with a high prevalence of chronic rhinitis in both sexes and a low prevalence of allergic rhinitis in men. This diversity can be attributed to the inaccurate information given by the patients themselves because of social factors.

**7 – Family history :-**It can be seen from the table (1) under consideration that the percentages of the allergic patients are higher for those how have a family history of allergy ; ranging between (53.85% - 76.19%) for males and (56.66% - 73.08 % ) for females as shown in Figure (7).

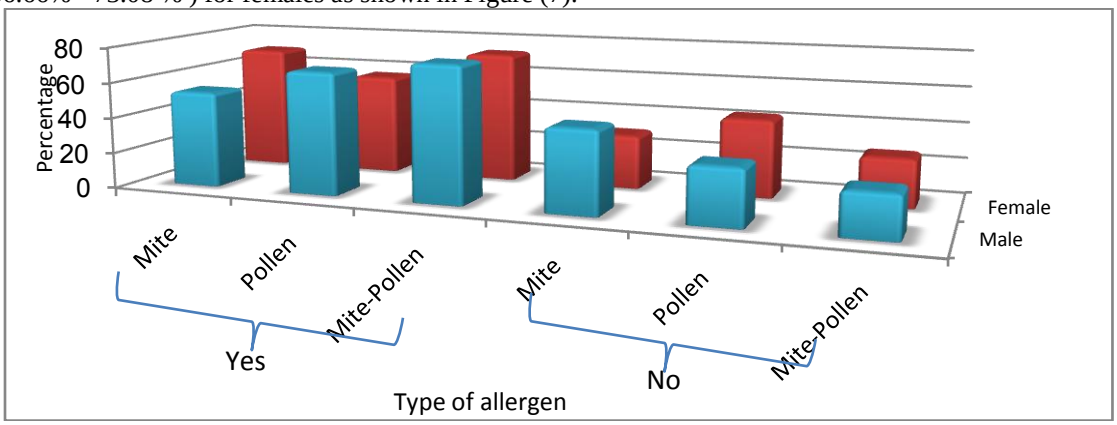


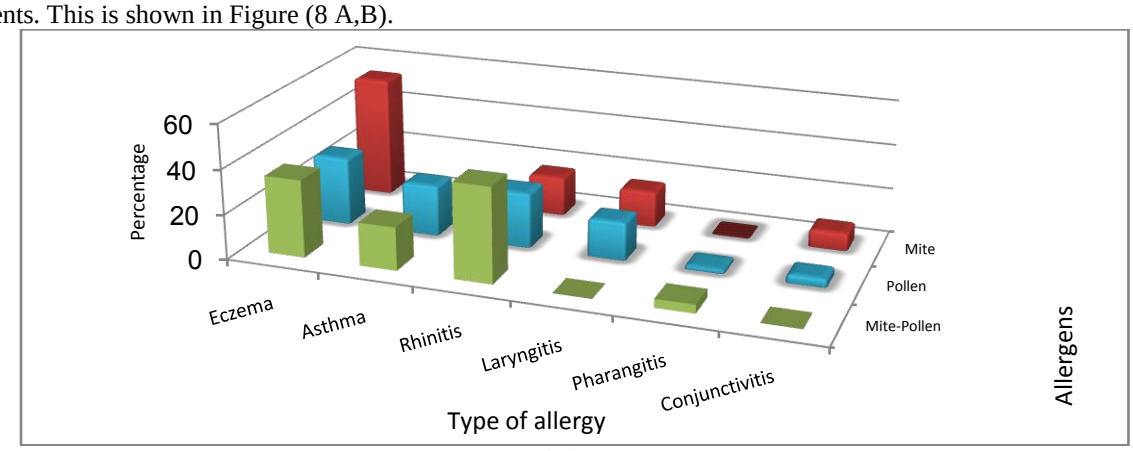

**Figure 7**: Percentage of allergic patients responsive to the used allergens according to family history.

This is a rather expected result and it goes along with those of Gysel*et al* (2007) and Thomas and Myalil (2010) who quoted that 64.8% of their patients had a family history of allergy. Locally, Alkhalifa (2004) found that an overall percentage of 62% of the patients she studied , had a family history of allergy , while Musah(2010) found that 47.5% of his patients had family history . It appears that most of the local and international studies point to the fact that family history has a positive effect on developing allergy.

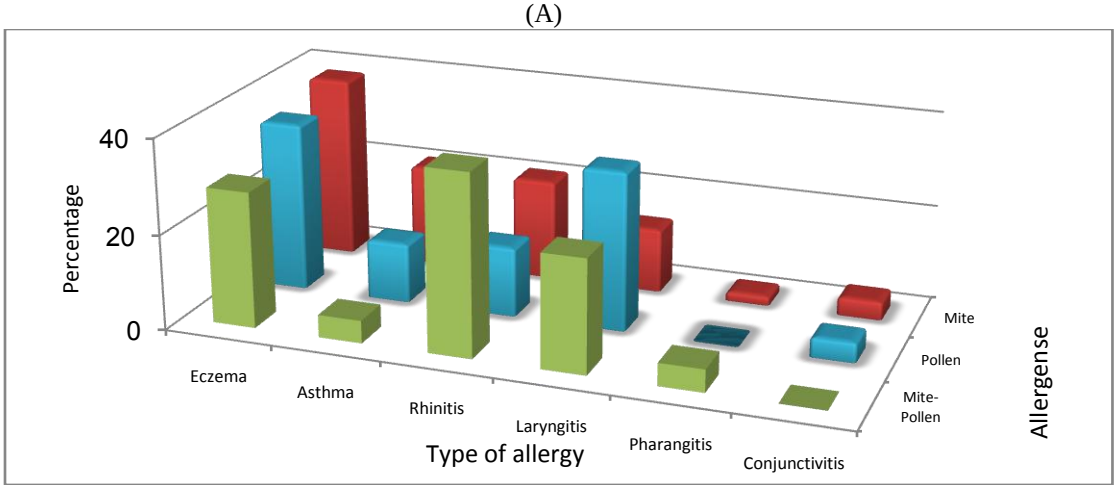
**8– Type of allergy:-**Considering the type of allergy, table (1) shows that in cases of mite allergy, eczema appears in females with a high percentage of 53.97% followed by rhinitis with a percentage of 17.46% then come laryngitis at 15.87%. For pollen allergy in females, eczema also appears with the highest percentage of 30.19% followed by rhinitis at 24.53%, then comes asthma at 22.64% .In the case of mite – pollen allergy in females, the results are 42.31% for rhinitis, 34.62% for eczema and 19.23% for asthma .As far as males are concerned, the highest percentage in mite allergy cases is 38.46% for eczema followed by 21.15% for both asthma and rhinitis. In pollen

allergy cases eczema has the highest percentage of 35.42% followed by laryngitis with 33.33% and the next highest is rhinitis witha large difference at 14.5%. Finally, in the case of mite – pollen, the highest percentage is for rhinitis with 38.1% and next to it is eczema with 28.57% and after that come laryngitis with 23.81%.

Consequently, it is evident that eczema has the highest percentages of developed allergy in male and female patients. This is shown in Figure (8 A,B).




(A)




(B)

**Figure 8**: Percentage of allergic patients responsive to the used allergens according to the type of allergy; (A) Females; (B) Males.

These results have been partially supported ( regarding rhinitis and asthma ) by other researchers , some of whom are Leynaert*et al* (2004) who stated that " in all countries, asthma and bronchial hyperreactivity were more frequent in subjects with rhinitis than in those without , (74 - 81)% of subjects with asthma reported rhinitis, depending on sensitization to specific allergens " . Furthermore, as far as eczema is concerned, there is no conclusive evidence to support the present results. However, Darsow*et al* (1997) mentioned that "after contact with grass pollen, seasonal exacerbations of eczematous skin lesions have been described in a subgroup of patients with atopic eczema".

**9 – Occupation :-** By looking at table (1) and examining the effect of the patients occupations , it looks quite clear that being a government official , bears very little risk of developing allergy according to the available data . Most of the allergic patients were nongovernment officials , but working in the private sector as far as males are concerned and were housewives for females as shown in Figure (9) .

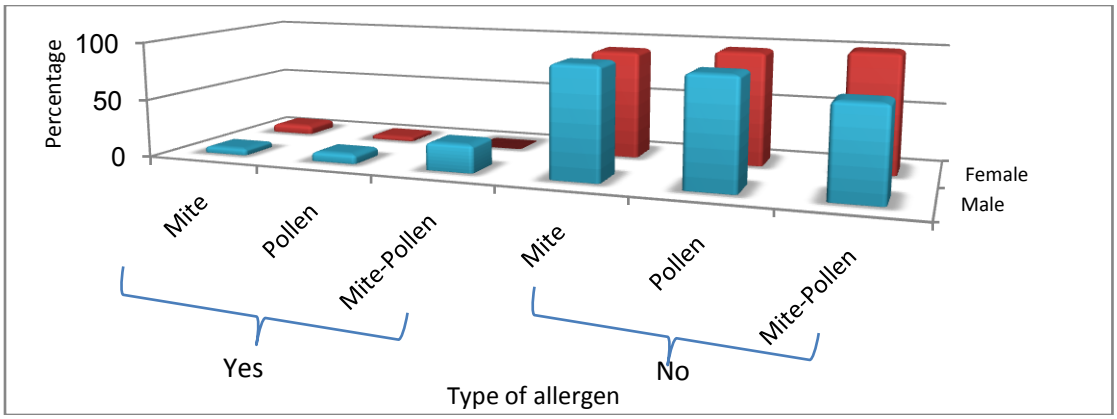


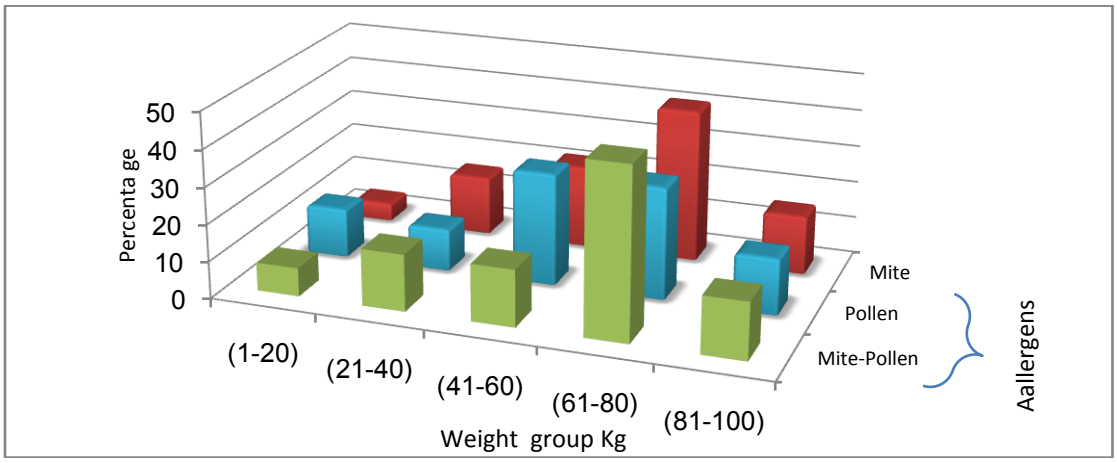

**Figure 9**: Percentage of allergic patients responsive to the used allergens according to occupation.

This is a rather logical result since patients working in the private sector are more likely to be exposed to different allergens. This is supported by Krakowiak*et al* (2007) who declared that patients develop allergy depending on the type of work they do and workers are more likely to be allergic, and Jones (2008) who stated that"evidence suggests that the risk of developing occupational allergy increases with allergen exposure; however, with some occupational allergens, this exposure–response relationship is more complex ".

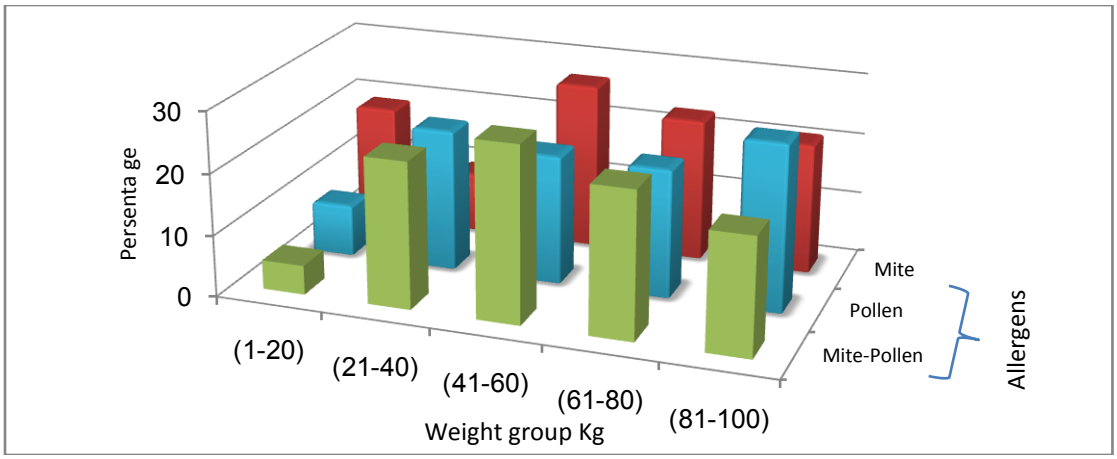
Locally, Musah (2010) mentioned that 79.8% of his allergic patients were private workers who work in different factories, restaurants, bakeries …etc. and are more susceptible to exposure to allergens in their work places rather than government employees.

**10 – Weight :-** It can be noticed from the table (1) above that the highest percentages of allergy cases in females for the three allergens occurred within the two weight groups (41 – 60)kg and (61 – 80)kg , while for males the highest values are within the three weight groups (21 – 40)kg ,(41 – 60)kg and (61 -80)kg . It is also noticeable that there is no clear pattern that can lead to any specific conclusion. This is shown in Figure (10 A,B) .

However, some researchers found that there is some sort of a relationship between obesity and developing allergy. For example , Hersoug and Linneberg (2007) hypothesized that " obesity, one of the hallmarks of – Western - lifestyle, results in immunological changes resulting in decreased immunological tolerance which in turn increases the risk of allergy".Visness*et al* (2009) stated that "obesity might be a contributor to the increased prevalence of allergic disease in children" Dixon *et al* (2010) concluded that "obesity is significantly associated with both prevalent and incident asthma". Finally, Kajbaf*et al* (2011) stated in their conclusion that "there is a strong association between asthma symptoms and obesity in both sexes among school-age children ".




( A )




(B)

**Figure 10:** Percentage of allergic patients responsive to the used allergens according to weight; (A) Females; (B) Males.

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