

ECONOMIC BURDEN OF POLLEN ALLERGY:

A CASE STUDY OF ISLAMABAD



Submitted by

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CERTIFICATE

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I, Andleeb Afzal declare that I have authored this M.Phil. Thesis with my own work and means, and I have not used any further means except those I have explicitly mentioned in this report. All items copied from internet or other written sources have been properly mentioned in quotation marks and with a reference to the source of citation.

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DEDICATION

I dedicate this Research to my parents who have been a great source of inspiration and support; their love encouraged me at every step in life and particularly during my studies at PIDE.

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LIST OF ACRONYM

PA	Pollen Allergy
NIH	National Institute of Health
PMD	Pakistan Meteorological Department
TPC	Total Pollen Count
PIMS	Pakistan Institute of Medical Science
CDA	Capital Development Authority

ABSTRACT

The evidence of Pollen allergy disease is observed more in Islamabad as compared to other regions of Pakistan. This allergic disease is more sensitive to the age of Patients. The purpose of this research is to gauge the direct and indirect costs associated with the disease to explore the value of the economic burden on the population facing Pollen Allergy. This study has utilized a mixed-method approach using both primary and secondary sources while the study area of this research is Islamabad and its nearby places. The study concluded that most of the patients who are suffering from this disease are from the age group (31-40). The major cost faced by PA patients is direct cost while the lack of awareness and prevention measures lead to an increase in the economic cost.

Keywords: Pollen Allergy, Direct, Indirect Cost, Economic Burden

CHAPTER 1

INTRODUCTION

Pollens from flowers and trees are the leading cause of many seasonal allergies. Every year especially during the spring season, most people are acquainted with pollen allergy and they call it “hay fever.” Those having expertise in this field routinely name it as “Seasonal Allergic Rhinitis.”

Every year in the spring, summer, and even during autumn, many bushes and plants let go of very fine and yellowish powder to fertilize and make other bushes fruitful as well as plants of the same species. These small almost invisible pollen grains are spread by the fine and agile agency of wind. Naturally, the human immune system protects the systems of the body against injurious attackers such as bacteria and viruses but these pollen grains go straight into the lungs of the vulnerable people and cause allergic reactions inside.

The majority breeds of the pollen grains that result in allergic reactions are spread in the atmosphere from certain species of trees, weeds, and even the grasses. These plants produce tiny, lightweight, and quite dry pollen grains that are transported using the blowing wind. Amazingly, grasses are said to be the common agents of allergy. Ragweed is a type of weed that is considered as the main player in causing weed allergies while other sources of the ‘Weed pollen’ are Sagebrush, the Pigweed, the Lamb’s Quarters and the Tumbleweed. Some types of trees: like Birch, Cedar, and Oak when spread with the air ultimately cause pollen allergy. Plants that are fertilized with the help of vectors and insects: Like Roses and few flowering, trees, like Cherry trees and Pear trees, mostly do not result in Allergic Rhinitis.

In the scenario of Pakistan, cities such as Islamabad and Lahore has green belts which contains largest pollen releasing plants like Paper Mulberry, Acacia, Eucalyptus, certain Pines, some kind of grasses, Cannabis, Dandelion, and last but not the least Alternaria. From these Pollen producing plants, it is estimated that 97 percent PA cases comes from Paper mulberry. The pollen count in the Federal Capital is recorded to be the highest in the previous decade.

1.1 Background of the Study

Health issues in humans put an economic burden on human beings in terms of their treatment (direct cost) and productivity loss (indirect cost). People face different types of allergies, which have no permanent treatment without vaccination. Few people have allergies from edible products and few have from their environment. The people who have allergies from edible products, they stop eating those products for their surveillance by physician recommendations. However, those people who have allergies from their environments like weather and plants feel difficulty in avoiding such a type of condition. For them, as a precautionary measure, they have two options. First, they need to stay inside their home and secondly whenever they are going outside, they have to wear a mask. At the high stage of allergies for few people, it is also difficult for them to use a mask because it creates a problem in while inhaling oxygen from outside, so they need to consult doctors who help them in their surveillance. Similarly, Pollen allergy (allergy from Pollen grains, which are released by different kinds of grasses, weeds, and trees) creates problem in lungs and throat. Symptoms of pollen allergy are sneezing, nasal congestions, wheezing, runny nose, itchy throat, and eyes, etc. Majority of the individuals who are afflicted by severe allergic signs and symptoms for example asthma attacks are highly sensitive to the pollen grains released by paper mulberry plants (Rashid et al., 2014).

It has been noticed that Allergic rhinitis is not a deadly disease. However, few complications are possible from this medical condition if no treatment is received. Having said that, it can greatly affect the quality of life and result in various Indirect Costs. It is worth mentioning that NHS England lately changed its guidelines so that people having hay fever, coughs, and colds in moderation have to pay for their medicines instead of receiving the same via prescription. Pollen allergy poses a great threat to asthma patients and those individuals who have been suffering from lung diseases as they contract allergy directly from the air (D'Amato et al., 2007).

Few plants, which are the cause of pollen allergy, create problems for pollen patients in different seasons e.g. spring, summer and fall. The plant of paper mulberry is common in Pakistan for causing pollen allergy and it create problems for pollen patients in spring.

Figure 1.1: Pollen Plants



Source: Internet (www.pinterest.com)

Pollen Plants are the primary inhalant source of allergies which cause Pollen allergy and it affects 25 million people in each year all around the globe and 50 million in 2 years (Rashid, Abbas, & Rahman, 2014). Developed and under-developed world is going through this allergic situation but the developed world is affected more due to artificial plantation at a high level. More than 25 million Americans have the pollen allergic issue.

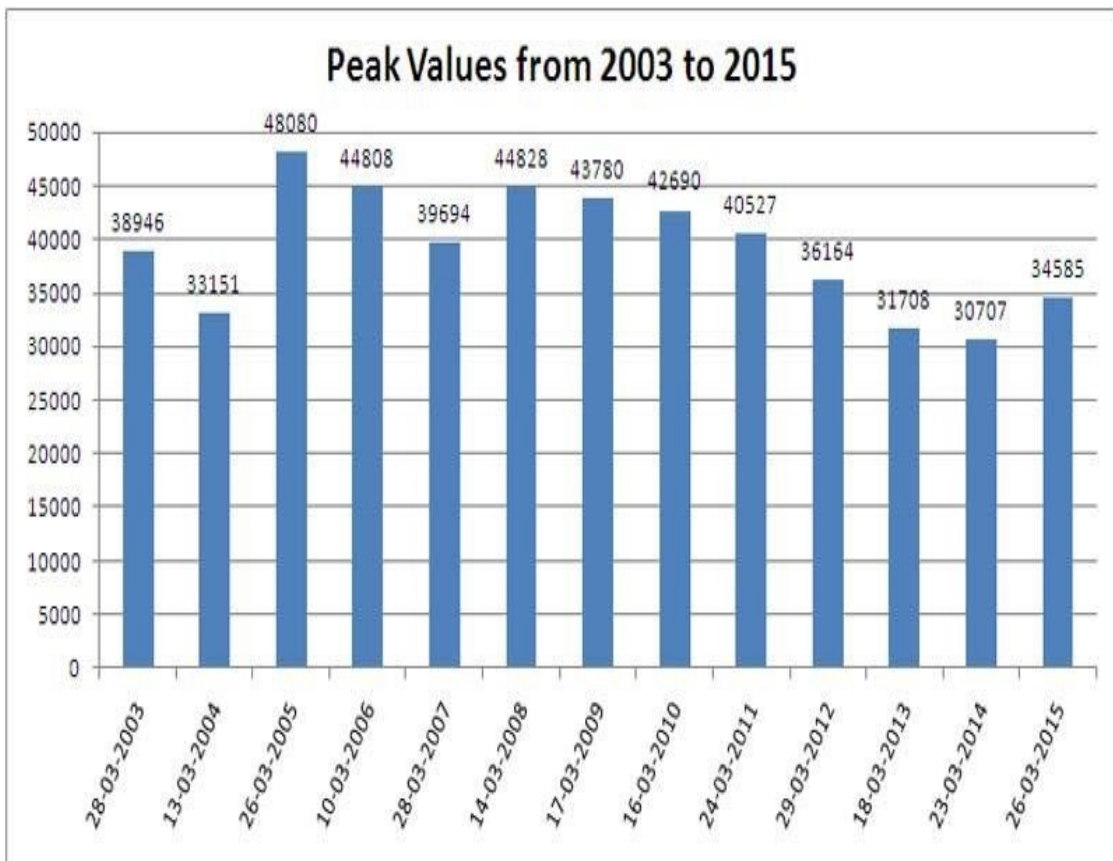
Table 1.1: Global Pollen Allergy Count

Centre	Hay fever (over the last 15 years)	
	Percentage	Annual change in percentage
Africa (English speaking)	29.5	0.39
Africa (French-speaking)	21.4	-0.26
Asia-Pacific	23.9	0.24
Eastern Mediterranean	20.1	0.66
Indian sub-continent	15.8	0.74
Latin America	23.7	1.03
North America	33.3	-1.12
Northern & Eastern Europe	12.3	0.19
Oceania	39.8	0.48
Western Europe	21.2	0.31

Source: *National Allergy Bureau (Year, 2018)*

Pakistan is one of those countries where people are affected by this disease and especially the residents of Islamabad (capital of Pakistan) are highly affected by pollen plants and trees. The pollen count in Islamabad goes very high. The highly affected area of Islamabad is H-8 sector in which in the last seventeen years pollen count goes maximum up to 48080 per m³ from 2003- 2020 (PMD, 2020).

Figure 1.2: Pollen cases during past years



Source: *Pakistan Meteorological Department (Year, 2015)*

Pollen allergy affects 30% population of Islamabad each year, and day by day, the number of patients has dramatically increased in the hospitals and clinics during the spring season.

Comparatively it is less known about the extent of its economic burden on society. According to previous studies, Pakistan is also facing this issue and the main hub of PA is Islamabad. According to Rashid, Abbas, & Rehman (2014) in Islamabad, Paper Mulberry constitutes 60 to 70% of total trees present, which is the major cause of pollen allergy (PMD, 2020). Paper Mulberry gained serious attention from research. Mostly researcher's research is health concerned caused by Paper mulberry but according to my knowledge, no one has calculated its cost. This specie has gained serious attention in discussions, ever since the reorganization of pollen allergy as a threat to human health in Islamabad.

1.2 Significance of the Study

The increasing trend of pollen allergy in Islamabad has become a serious issue for the inhabitants of Islamabad. Especially people migrated for education and work, are highly vulnerable to the pollen allergy in Islamabad. It is quite plausible to estimate the health cost of pollen allergy faced by Islamabad inhabitant. This study will be important for the policymakers in the ministry of health to formulate a policy with a plan of action against the root cause of PA in Islamabad and it will help in awareness of common masses in Pakistan regarding the cost and effects of pollen allergy in long run.

1.3 Problem Statement

Pollen allergy is a severe health issue all over the world, especially in the federal territory of Pakistan. Due to high pollen count, people of Islamabad are more affected from pollen allergy, and each year number of patients is increasing which affects the productivity of patients by losing their working hours and place an economic burden on individual and their family in terms of treatment cost and working hour loose. Researchers are working on the plants, which are causing pollen allergy, but according to my knowledge, there is limited work on the calculation of economic burden on an individual (pollen patient) and their family. Hence, this study is going to find out direct (Medicated and Non-Medicated) and indirect costs bear by patients and their families. Labor loses their working hours, which affects their livelihood and puts the family in Financial constraints. The proposed study will estimate the cost of the prevention and treatment of the patients to help the health and other relevant policy formulation makers of Pakistan.

1.4 Research Questions

- What is the direct cost (medicated and non-medicated) bear pollen, allergic patients?
- What type of indirect cost is associated with pollen allergic patients?
- Which age group is more suffering from Pollen allergy?
- What are the adaption techniques of inhabitant against pollen allergy?

1.5 Objectives of the Study

The objective of the study includes

- To find out the direct cost (medicated and non-medicated) bear pollen allergic patients
- To find out the indirect cost is associated with pollen allergic patients
- To find People of which age group is more suffering from Pollen allergy
- To find adaption techniques of inhabitant against pollen allergy

1.6 Organization of the Study

This specific piece of work is divided into five chapters. Chapter 1 is an introductory chapter that describes the main idea of the study i.e. Why this research has conducted, what are the objectives of this research, etc. Chapter 2 is about the review of the literature, which includes details & information about previous studies of pollen allergy. Chapter 3 is related to a methodology that is Applied to find out the objectives and research questions. Chapter 4 is about the results of the study and Chapter 5 is about the conclusion, recommendations and limitations of the study.

CHAPTER 2

LITERATURE REVIEW

According to Pacini & Hesse, 2004 Pollens out from trees, wildflowers, and grasslands these are the main source of allergens. It's spreading completely depends on the type of pollen. There are many methods use to avoid the release of pollen. Including carbohydrates and additional machinery to escape dehydration throughout pollen release. Lattore, (2009) explained the production of Pollen is primarily exaggerated by atmospheric influences between which temperature, rainfall, and the speed of the wind. The influence of ecological situations on airborne amounts of pollen has been extensively deliberate in the forest, illuminating a noticeable impact of middle temperature on procreative phenology, particularly in plants blossoming in the start of spring Menzel *et al.*, (2006).

Mandal, (2008) elaborate increase numbers of pollen put the significant impact on the social issues like pollinizers this is especially currently health problem in Islamabad. Ali & Malik., (2010) investigate the name of species which is the worst specie called *Broussonetia papyrifera* it also plays a major role in deteriorating the natural landscape in the area of study.

Anon., (2004) investigate that the pollen grows violently and its high seed production cause to slow the root system. Many plant species cause aggressive pollen allergy. According to Liu., *et al* (2010) grass and trees are the main reason to affect the people which causes asthma. Perveen *et al.*, (2014) determined the effects of airborne pollen in Karachi city. From August 2009 to July 2010, the maximum pollen is created by trees.

Ghufran *et al.*, (2013) studied the aerobiological effect of pollen in Islamabad. The data were taken from the Pakistan Meteorological Department (PMD) for the years 2009-

2010 daily.

The pollen patient was taken from the Pakistan Institute of Medical Science. The pollen count for Paper Mulberry in selected years was highest in March. In the year 2009, the pollen count in March was measured as 4143.07 pollen/m², followed by 4431.6 pollen per meter cubic in March 2010. The minimum pollen per meter cubic was recorded 1718.6 for September 2009, followed by the lowest pollen in September 2010.

Micheal et al. (2013) studied the paper mulberry pollen and sensitization of paper mulberry allergic patients which contribute pollinizer in the Pakistan population. The pollen allergy patients were nominated from the National Institute of Health, Islamabad. The number of selected patients was 29. The paper mulberry tree is more allergenic where the tree is planted, which produces more pollen in the urban as well as in the rural areas of Islamabad. In Islamabad, the paper mulberry is the leading tree which causes more pollen in the atmosphere and affects the residents of Islamabad.

Hussain et al., (2013) explored the effect of air pollen count on the respiratory system. A sample size of 60 asthma patients was used. The data from Feb to May of pollen count was taken from Pakistan Meteorological Department (PMD). The different test results were recorded from clinical examination and lung function tests. The pulmonary function Test was correlated with pollen count. The result showed that asthma patients were significantly positively correlated with air pollen count.

While the forced expiratory volume in 1 second (FEV₁) was a negative correlation with moderate strength the asthma patient was high pollen count. The study concluded that for the asthma patient spirometer is an effective technique for the study of pollen allergy.

According to Scevkova *et al.*, (2010) the releasing time of pollen grains and the type of their identification is convenient evidence for patients suffering from allergic

diseases. Shea *et al.*, (2008) elaborate that, adaptations in pollen and allergen are correlated to climate change and have enlarged the frequency of illnesses linked to asthma and allergies.

Haroon *et al.*, (2008) studied the meteorological effects of airborne pollen in Islamabad city. They selected five years (2003-2007) pollen concentration and meteorological data were utilized. In Islamabad, the pollen of Paper Mulberry is threatening to the pollen sensitive individual due to its massive amount in the atmosphere. It reaches to the highest level in March. In the study area, the peak month pollen is very harmful to allergy patients. The metrological parameters were positively related with daily pollen count, while inversely related precipitation.

Vannatta *et al.*, (2012) studied that Ash Tree plays an important role in the health of the North American urban forest. The result showed that only 3% original tree of Ash remains, 59% treatment option has left the Ash trees, while 71% of Ash trees were replaced with other trees. If mortality is greater than 20%, then Ash tree safety is possible by strategies like pesticide usage and pruning is highly appropriate in the study area. If Mortality is less than this 20%, treatment has become useless in this case for the Ash Tree for the urban forestry of North America.

According to Piotrowska, (2008) planning urban cities, green belts should be considered as an essential part of designing, as they support the link between the natural environment and humans. However, there is a critical issue that has been challenged in the designing of urban green belts, which needs critical planning, a selection of plant species that can have some serious health implications for the urban population such as Pollen Allergy.

Asher *et al.*, 2006 explain hiking impacts of allergies on human health have been practical and recorded in both the developing and developed parts of the world. It is estimated that 20 percent of the world population gets affected and suffers from allergic

diseases at different levels and different forms.

According to D'amato *et al.*, (2007) its prevalence is reported to be as high as 40% in the region of Europe. Pollen allergy is a serious risk for asthma patients and people suffering from lung diseases, as the allergy gets transmitted through the air.

In Pakistan, the plantation of Paper Mulberry was started in the 1960s for prettification and the attractive scenic beauty of Islamabad. According to Rashid *et al.*, (2014) in Islamabad, Paper Mulberry constitutes 60 to 70% of total trees present. This specie has gained serious attention in discussions, ever since pollen allergy has been initially recognized as a threat to human health in Islamabad. Most of the people who suffer severe allergic symptoms, like an asthma attack, are sensitive to the pollen grains of paper mulberry Abbas *et al* (2014). The pollen count goes maximum up to 55000 per m³ raising Grave concerns for the residents of Islamabad. Thirty Percent (30%) of the entire city's population, gets affected each year from pollen allergy in Islamabad (PMD... 2012).

Interestingly, as the studies reveal, the impacts of pollen allergy are not observed to be uniform in all age groups. According to (Bennett et al., 1997) females are more affected as compared to males, and as statistics show, people aged 40 years or above are at high risk to catch the impacts of pollen allergy.

Since the early 1990s, ill health resulting from pollen allergies has become one of the serious health issues of Islamabad. Every year, from January through 3 April, hundreds of patients are found to be visiting hospitals or clinics for treatment against spring allergies alone (Bennett et al., 1997). McPherson *et al.* (2002) analyzed the decision regarding the selection of plantation of trees in urban cities. It is a difficult decision keeping in mind the optimum choice with the least cost and most ecologically beneficial one. Nowak and Dwyer (2007) have studied how cost-benefit based method

is used for designing urban tree management.

The study by Haroon et al, (2008), Ghufraan et al, (2013), done before, have only indicated the relation of pollen count and number of patients while they did not mention which gender and age group is more affected by the pollen allergy.

Bennett, (1997) determined the effects of airborne pollen in rural areas of Islamabad. But this study has undertaken the effects of pollen allergy to a deeper level of understanding and observation. It has calculated the economic and environmental costs and benefits of Paper Mulberry along with its alternative plants which do not cause pollen allergy and are Better for the environment. This sort of work has not been performed before for the city of Islamabad, as per my knowledge.

Bosch-Cano, (2011) compared the effect of human exposure to allergic pollen of urban and rural areas in France. The hypothesis of the study was, that in rural area concentration of pollen in the atmosphere is higher as compared to urban areas and allergic pollen exposure on the extent of urbanization. For the study, pollen data were obtained from four different areas of eastern France, which varied in their level of urbanization i.e. rural, semi-urban, and two urban areas. First (medical device) type sensors were used for 7 obtaining pollen data from these different localities from January to June 2003 and from January to June 2006. Were found consistent with the hypothesis, the multivariate analysis also showed that exposure to allergic pollen varied accordingly with the form of area.

2.1 Literature Gap

As per my knowledge and in the light of previous literature, all the previous studies on PA were conducted in terms of a medical point of view, its incidence, and prevalence. However, in Pakistan, there are few studies on PA but there is no study available on the costing of this disease especially in case of Islamabad. I proceeded by considering

the gaps in the literature, which will be filled by not only considering the medical implication of PA but also by considering its cost. The mentioned cost will enter in my analysis both as direct and indirect. This added dimension will help to understand the economic burden of this particular disease on individuals of Islamabad. This differentiated dimension will help the readers to understand the cost implications of the disease.

CHAPTER 3

DATA AND METHODOLOGY

In social science, the triangulation technique is explained as mixed data or mixed methods due to these diversified viewpoints or standpoints that could be achieved and explained the topic. It involves mixing and mingling of different methods to find out results. Denzin Considered "Mixing of survey data and interviews is a better version of using the triangulation technique" (Denzin, 2005). In short, it may be termed as a combination of quantitative and qualitative analysis. This section provides a detailed description of the data analysis technique used for this study. This section is also further divided into subsections. Section 3.1 deals with Data source while Section 3.2 deals with Data collection instruments while 3.3 is about a complete description of primary and secondary data whereas 3.4 is about sampling size and its techniques and in Section 3.5 Research design and Conceptual Framework of study is explained.

3.1 Data Source

In this research, primary and secondary data has been used. Primary data collected From public and private hospitals. For this purpose, a questionnaire was designed. Whereas secondary data was collected from NIH and PMD.

3.2 Data Collection Instrument and Description

The main objective of this study was to determine the direct, indirect costs associated with this disease, and to ascertain the fact that people of which age group are more vulnerable to the suffering caused by Pollen allergy as well as to find out the adaptation techniques of the patient against pollen allergy. For this purpose, Primary, as well as Secondary data, have been collected. Primary data is collected through questionnaires, observation, and interviews. For its analysis, descriptive statistics were used.

3.2.1 Questionnaire

The Questionnaire was divided into three major parts. In Part A, questions were about general demographic information of respondents like gender, age, education, and employment status. Whereas questions in Part B were related to knowledge and understanding about PA disease, focusing on symptoms of PA, the stage at which it was diagnosed and major features of PA. Last part, which is Part C, is related to questions regarding costing e.g. price of medicines, vaccines, injections, etc. to measure the direct and indirect cost of this disease.

3.2.2 Ethical Consent

- Ethical approval for the research obtained from the Health Department (PIDE).
- Official written letter by the institute was given to the hospital for data collection.

Therefore, Permission is secured at all levels.

- After the introduction of the data collector, informed about the objectives and benefits of the research and its tentative findings, before the data collection.
- Moreover, Ethical consent was taken from each respondent and this information kept confidential in every step of data collection entry and estimation. The participant's names,

Addresses, and phone numbers were not required to write on the questionnaires.

Dignity and respect for all the study participants adhered to, throughout the research.

This information is used only for research purposes.

- This study was non-interventional and it involved no invasive technique at all.

3.3 Primary Data Collection

Primary data for this study has collected in two units

3.3.1 Unit of Data Collection 1

A questionnaire-based study has designed for the collection of primary data. The primary data is collected from the pollen allergy patients as well as doctors. The first unit of primary data of PA patients was collected personally from the respondents via field survey in different hospitals such as the National Institute of Health (NIH) Islamabad, Federal Government Hospital, PIMS, Polyclinic, and allergy clinic. However, due to the covid19 issue, remaining data was collected from pollen patients through Google forms in which the same questionnaire was shared with pollen patients.

3.3.2 Unit of Data Collection 2

The second unit of primary data collection was for cost analysis and adaptation techniques of pollen allergy patients. For this purpose, a semi-structured questionnaire for doctors was designed on that base interviews were conducted with two doctors from the public sector as well as the private sector for comparison of cost analysis.

3.3.3 Secondary Data Collection

The secondary data collection for this study is collected from NIH and PMD. NIH gave data about Gender wise, Age wise, and District wise details of pollen patients from all over Pakistan as well as from Islamabad whereas PMD gave total pollen count data of the last five years in graphs form.

Table 3.1: Secondary Data Collected from the National Institute of Health

S. No	Patients Detail	Total
1	Total number of patients visited the Allergy Center	256,000
2	Patients from Islamabad	80,000
3	Patients from Other Districts	175,040
4	Foreign Patients	960
5	Male patients	118,400
6	Female patients	137,600
7	Islamabad Female patients	36,033
8	Islamabad Male patients	43,967
Age Wise Detail		
	10-20 Years	28,263
	21-30 Years	35,737
	31-40 Years	80,000
	41-50 Years	64,000
	51-60 Years	48,000

Secondary Data –NIH (Year, 2020)

3.4 Sample Size and Sample Techniques

3.4.1 Population

Our target population was pollen allergy patients of Islamabad approaching the hospital for treatment. The population for this study was Islamabad because it has more pollen cases and is increasing day by day due to the high concentration of paper mulberry plant. According to PMD Islamabad is more affected than other cities.

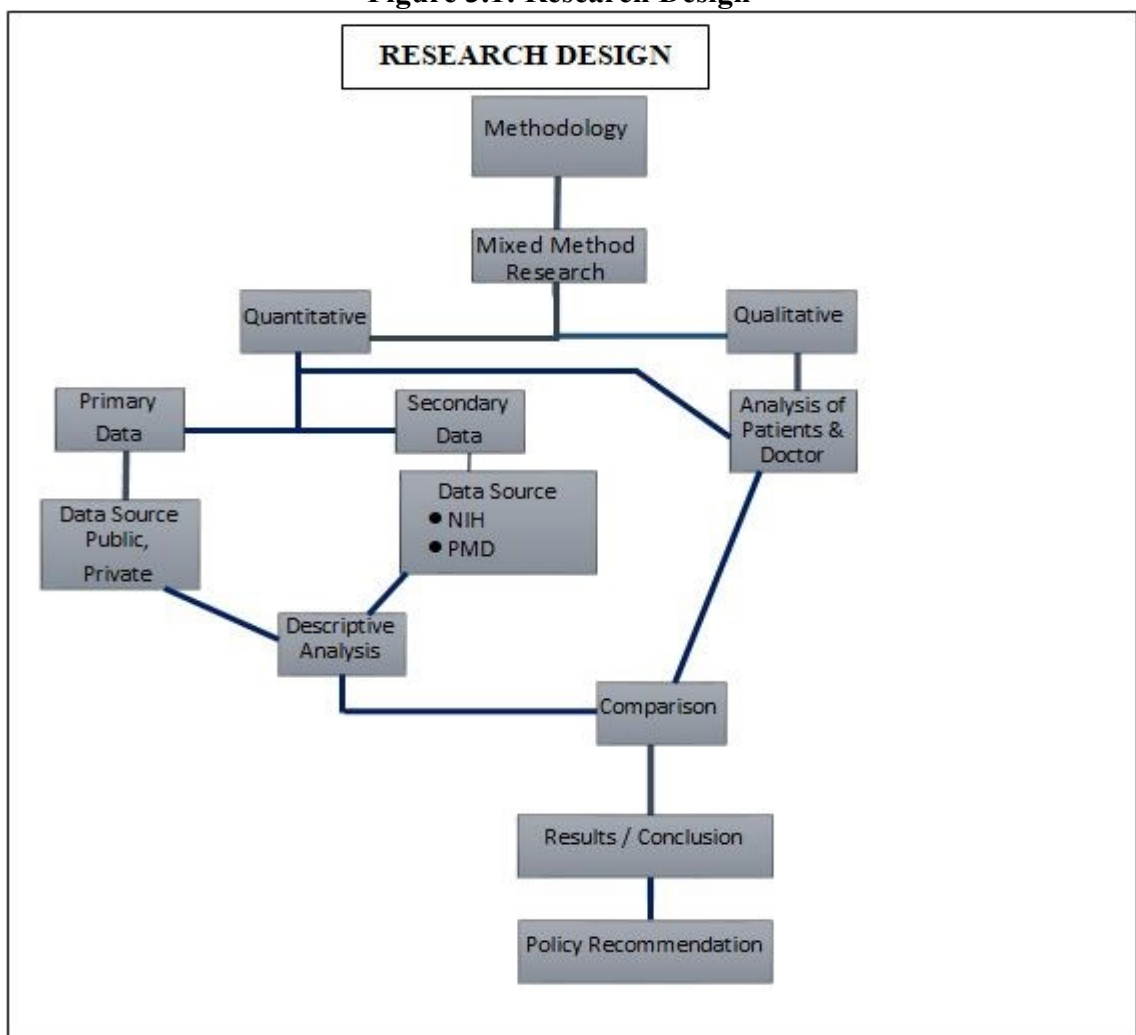
3.4.2 Sample Size

The sample of this study is 250 which was collected through a structured questionnaire and the sampling technique in this research has utilized the convenient sampling technique, where the respondents are PA patients taking treatment of PA in selected public and private hospitals of Islamabad Rawalpindi. The following hospitals from Islamabad and Rawalpindi were included for the study purpose: NIH Islamabad, Federal Government Hospital, PIMS, Polyclinic, allergy clinic

3.5 Research Design

The strategy and research techniques that are used in this research are shown in fig 3.

Figure 3.1: Research Design



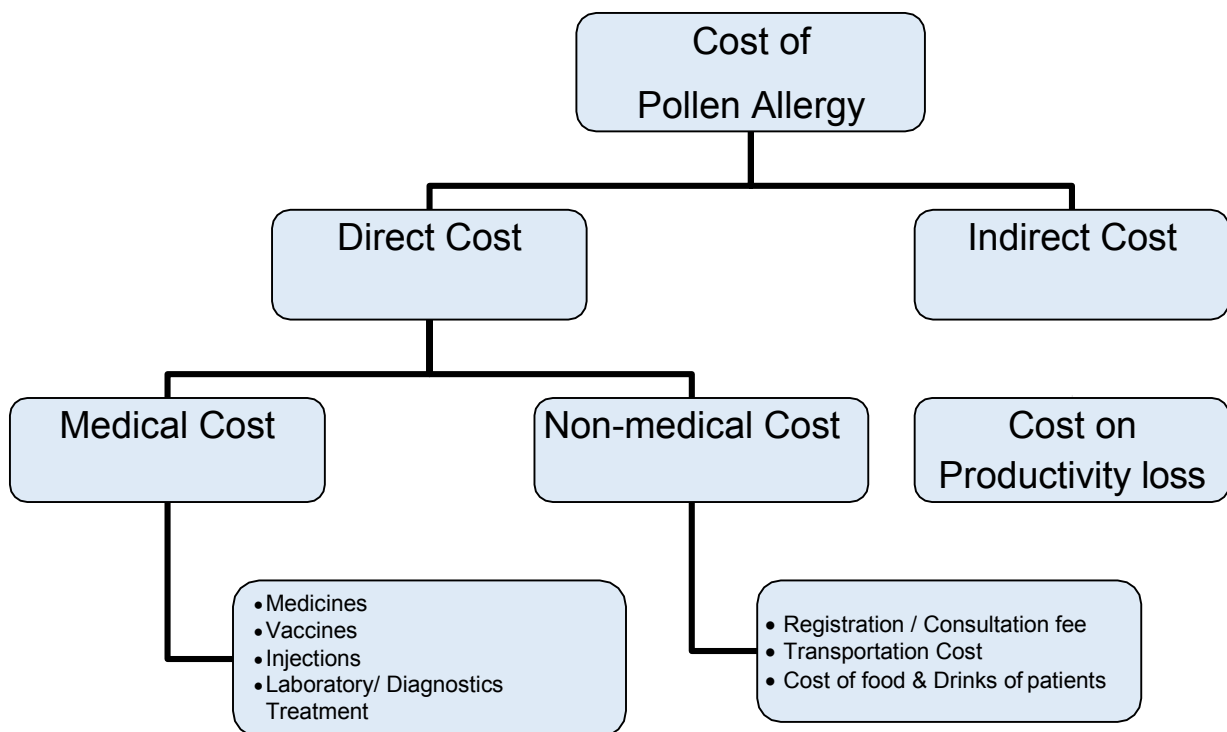
Source: Designed by Author (Year, 2020)

In this study, the mixed-method technique is used which is the combination of both quantitative and qualitative data tools. For this, SPSS is used in which data is analyzed with a descriptive technique in which frequencies and crosstab techniques are used for quantitative part in order to compare primary and secondary data results whereas the second section is based upon the doctor's interviews in which quantitative and qualitative both techniques are used.

3.5.1 Conceptual Framework of the Study

A conceptual framework is an analytical tool with several variations and contexts, which illustrates the main idea of the whole research.

Figure 3.2: Conceptual Framework



Source: Designed by Author (Year, 2020)

According to this conceptual study, the main idea is to find out the cost associated with this pollen allergy disease. A person who is suffering from pollen allergy bears both

types of costs like Direct and Indirect cost. Direct cost is divided into two categories like Medical Cost and Non-medical Cost. In medical, we can see in fig.4 that it includes the cost of medicines, vaccine cost on injections laboratory tests whereas in non-medical cost, we measure the cost of registration or consultation fee and the transportation cost which a person bear while coming from home to hospital for treatment. In-direct cost includes the loss of productivity which means when a person is suffering from pollen issue or there is peak season of this allergy many people quit their work. For example, students are unable to focus on their studies due to this issue whereas labors or other workers like a public or private employee get leave from work so some of them have to bear the loss in their income who is working on daily wages etc. Therefore, the main purpose of this study is to find out the costs associated with this disease.

CHAPTER 4

RESULT AND DISCUSSION

This chapter has three parts. The first part of this chapter discusses the Descriptive analysis of important variables included in this study. The second part is related to the Quantitative and qualitative Analysis while the third part of this chapter gives a Qualitative Analysis, which is based on doctor interviews.

4.1 Descriptive Analysis

To find out the results of this study descriptive analysis technique is used on the primary data collected through utilizing a structured questionnaire that is analyzed on SPSS.

The overall frequencies and percentages of the study are given below in Table 4.1.

Table 4.1: Summary of social, Economic information of patients

Questions	Category	Frequency	Percentage	Questions	Category	Frequency	Percentage
Gender	Male	158	63.2	Numbers of household in family	1-3.	123	49.2
	Female	92	36.8		4-6.	62	24.8
City	Islamabad	168	67.2		7-9.	65	26
	Rawalpindi	82	32.8	When were you Diagnosed as PA patient	From Childhood	43	17.2
Age	10-20.	16	6.4		From Teenage	94	37.6
	21-30	78	31.2	From Adult	97	38.8	
	31-40	93	37.2	other	16	6.4	
	41-50	17	6.8	How many numbers of earners in your family	one	103	41.2
	51-60	28	11.2		Two	81	32.4
	Above 60	18	7.2		Three	56	22.4
Occupation	Student	91	36.4		More Than Four	10	4
	Public sector Employee	47	18.8	Major symptoms of this allergy	Sneezing	133	53.2
	Private Sector Employee	44	17.6		Nasal Congestion	51	20.4
	other	68	27.2		Runny Nose	29	11.6
Educational status	Uneducated	14	5.6		Watery Eyes	15	6
	Secondary	12	4.8		Itchy	14	5.6

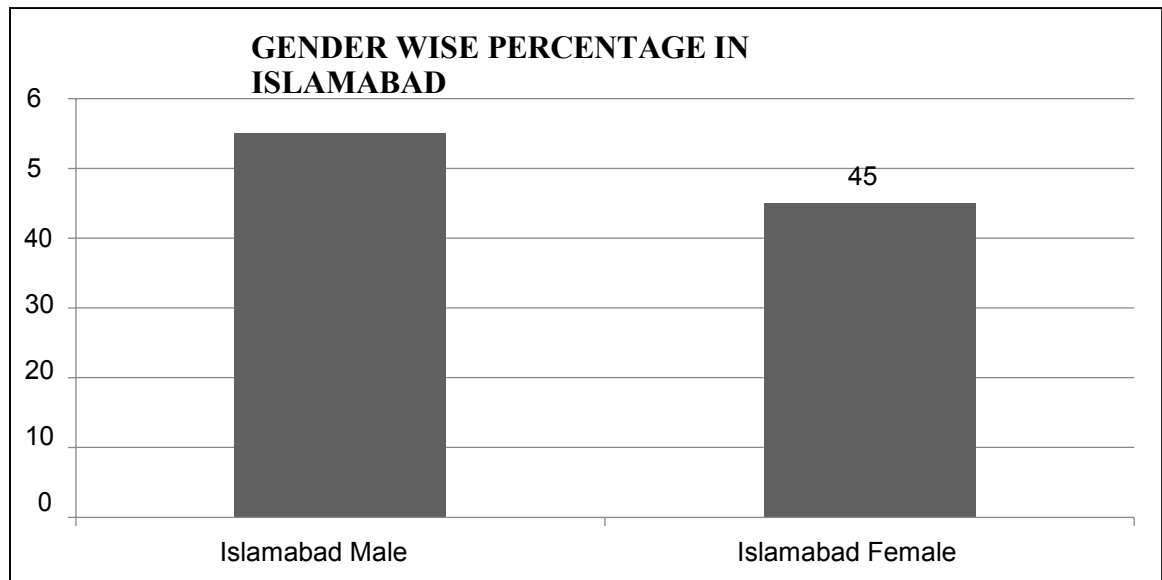
Questions	Category	Frequency	Percentage	Questions	Category	Frequency	Percentage
	Higher	161	64.4		Throat and Eyes wheezing	4	1.6
	other	63	25.2		other	4	1.6
Questions	Category	Frequency	Percent age	Questions	Category	Frequency	Percent age
Employment status	Unemployed	131	52.4	How you were diagnosed with this disease	Through Tests	148	59.2
	Employed	119	47.6		Self-Digonsis	90	36
Monthly income	No Income	133	53.2		other	12	4.8
	Below 20,000	19	7.6	Hospital	public	178	71.2
	21000-35000	38	15.2		Private	70	28
	36000-50000	17	6.8	Do you take medicines for allergy treatment	yes	220	88
	51000-60000	17	6.8		no	30	12
	Above 60	26	10.4	Do you also take the vaccine for allergy treatment?	yes	148	59.2
			no		102	40.8	
Are you head of Your family	Yes	24	9.6				
	No	224	89.6				

Source: Field Survey Data (Year, 2020)

4.2 Gender wise Pollen Allergy affected patients

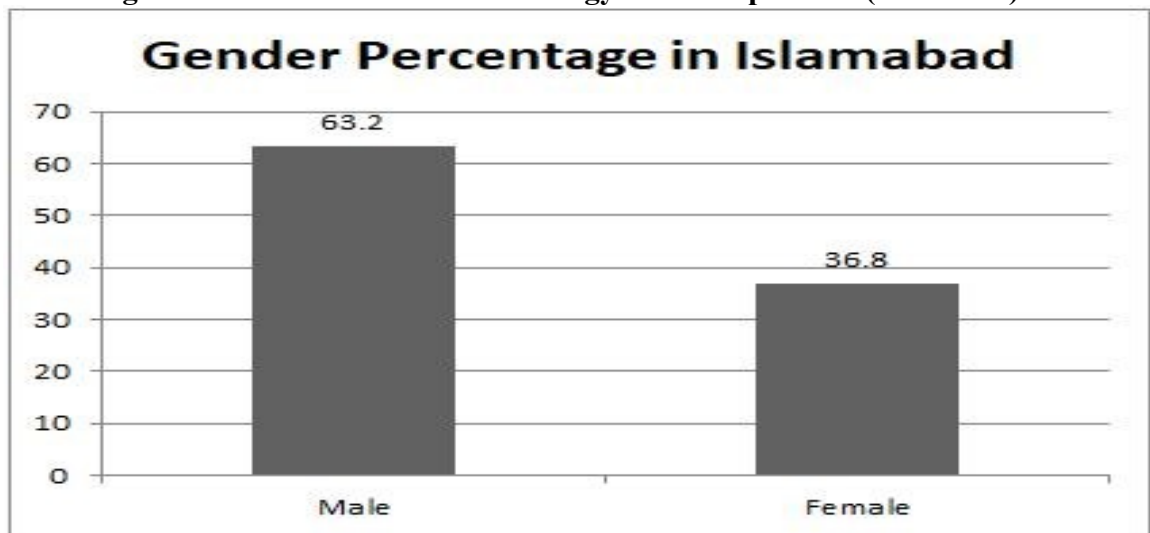
The ratio of gender wise affected PA patients in Islamabad is shown in Figures 4.1 and 4.2.

Figure 4.1: Gender wise Pollen allergy Affected patients (Field Survey Data), 2020



Source: Field Survey Data (Year, 2020)

Figure 4.2: Gender wise Pollen allergy Affected patients (NIH Data)



Source: NIH Data (Year, 2020)

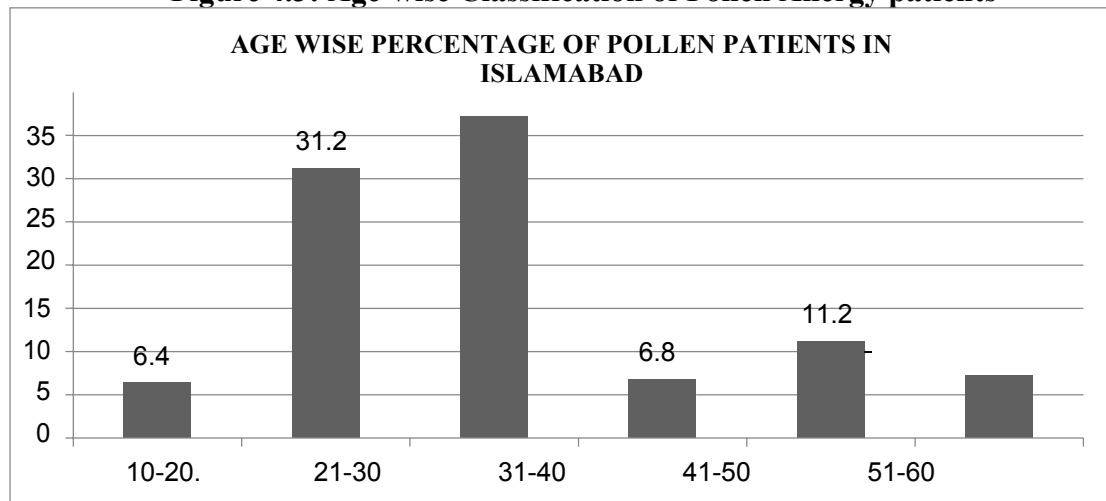
According to figure 4.2 (NIH data) shows that the general ratio of pollen allergy patients in the male population is greater than the female population that comes for the treatment from all over Pakistan and even in Islamabad. The figure 4.1 shows the ratio of PA which was observed through field survey data in which Males were more affected by PA as compared to the Female population. So both results cross-validated each other and the reason behind this result is that the male population is more

vulnerable to catch pollen allergy than females and they are more exposed to open environment as compared to females.

4.3 Age wise Classification of Pollen Allergy patients

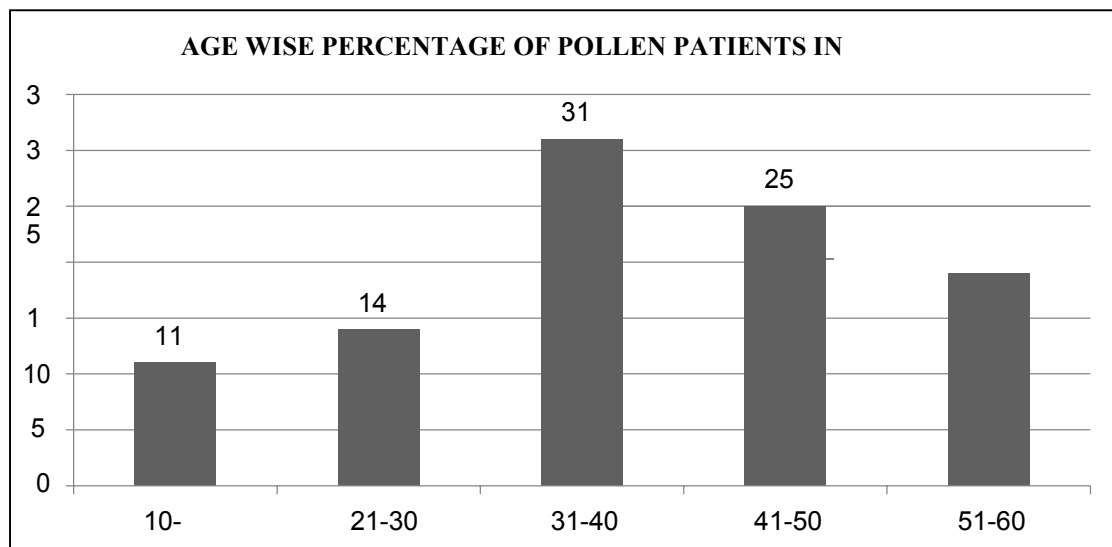
Pollen allergy data among different age groups is shown in fig 4.3 and fig 4.4.

Figure 4.3: Age-wise Classification of Pollen Allergy patients



Source: Field Survey Data (Year, 2020)

Figure 4.4: Age wise Classification of Pollen Allergy affected (NIH Data)



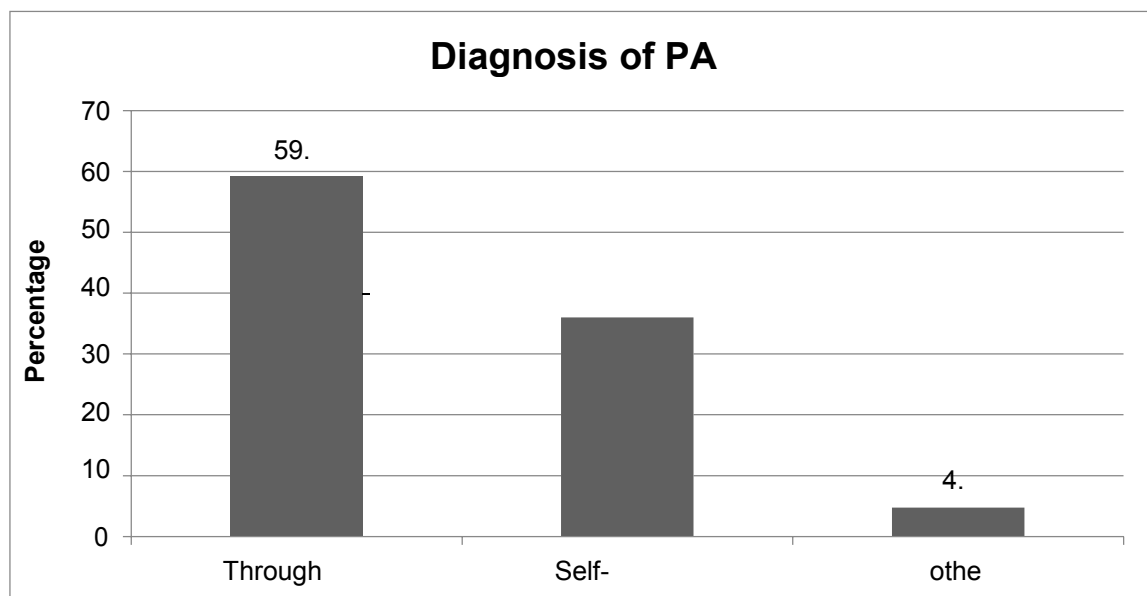
Source: NIH Data (Year, 2020)

In fig 4.4 the secondary data of NIH shows that the effect of PA is found to be higher in the age group of 31-40 whereas according to field survey data the highest ratio of PA patients is also observed among the 31-40 age bracket so both results cross-validate each other perfectly.

4.4 Symptoms of Pollen affecters

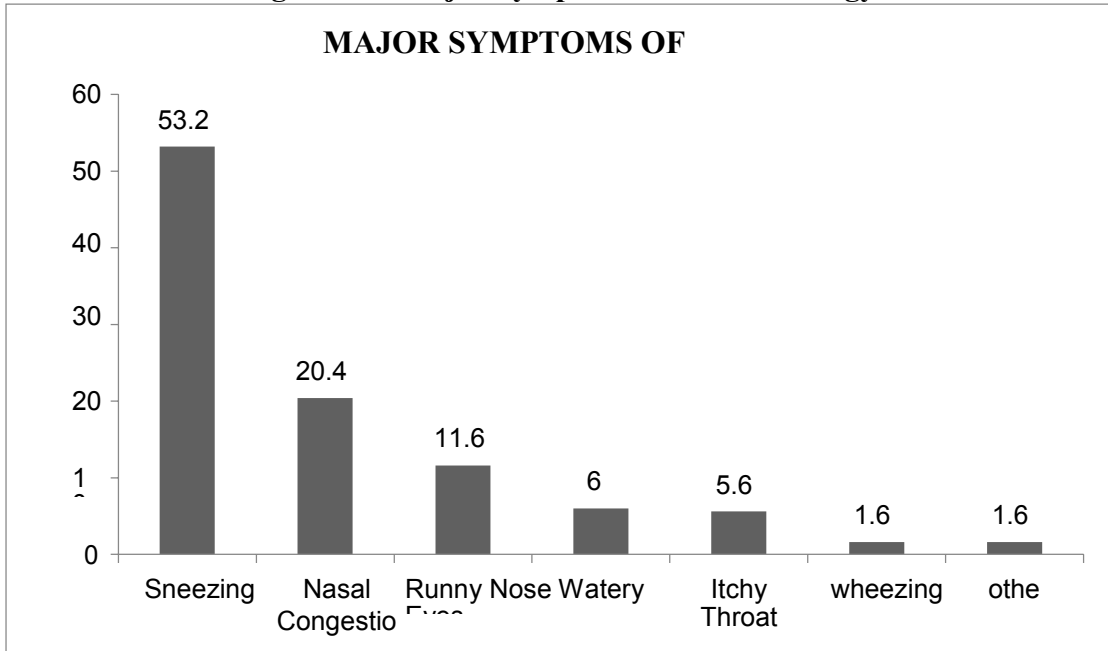
When surveyed about diagnosis and symptoms of this PA disease were observed it showed that most of the patients only knew about the general allergy and did not know about specific pollen allergy disease and its features. The majority of them being diagnosed with the help of laboratory tests in which ratio is found to be as follows: 59.2% are diagnosed through tests whereas 36% patients know it through self-diagnosis whereas 4.8 % are others in which some of them are those who have acquired it genetically from family as shown in figure 45. Pollen allergy patients are affected by different symptoms like runny nose, nasal congestion, watery eyes, itchy throat & eyes, wheezing, etc. But according to the information collected from the respondent's majority, 53.2 % of the pollen affected patients were facing sneezing, followed by nasal congestion 20.4%, runny nose 11.6 %, watery eyes 6 %, itchy throat and eyes 5.6 %, wheezing coughing 1.6 % and other like skin allergy 1.6 % shown in the figure 4.6.

Figure 4.5: Types of Diagnosis for Pollen Allergy



Source: Field Survey Data (Year, 2020)

Figure 4.6: Major Symptoms of Pollen Allergy

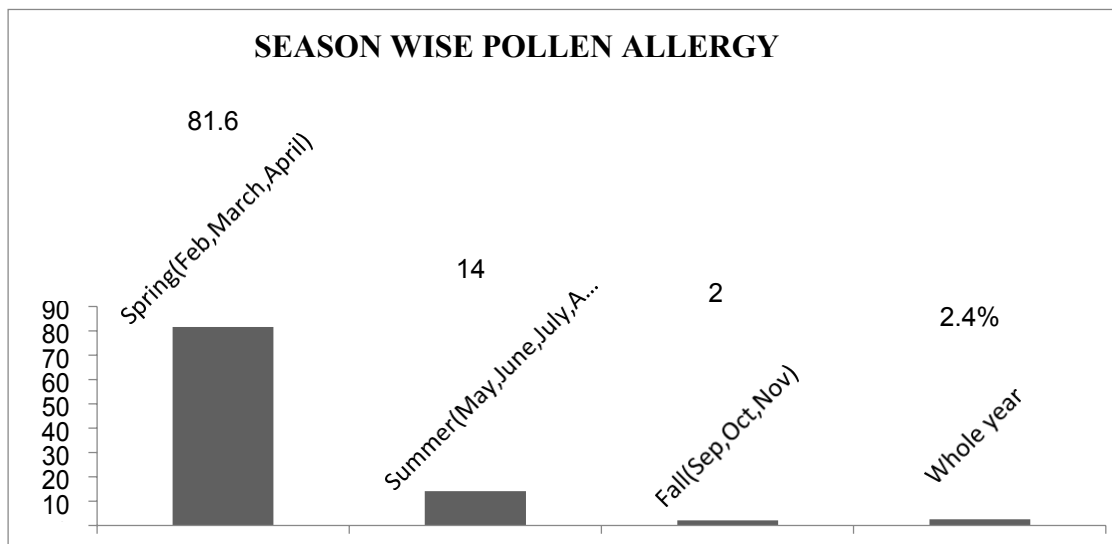


Source: Field Survey Data (Year, 2020)

4.5 Maximum number of pollen ratio in different Seasons and TPC in past years

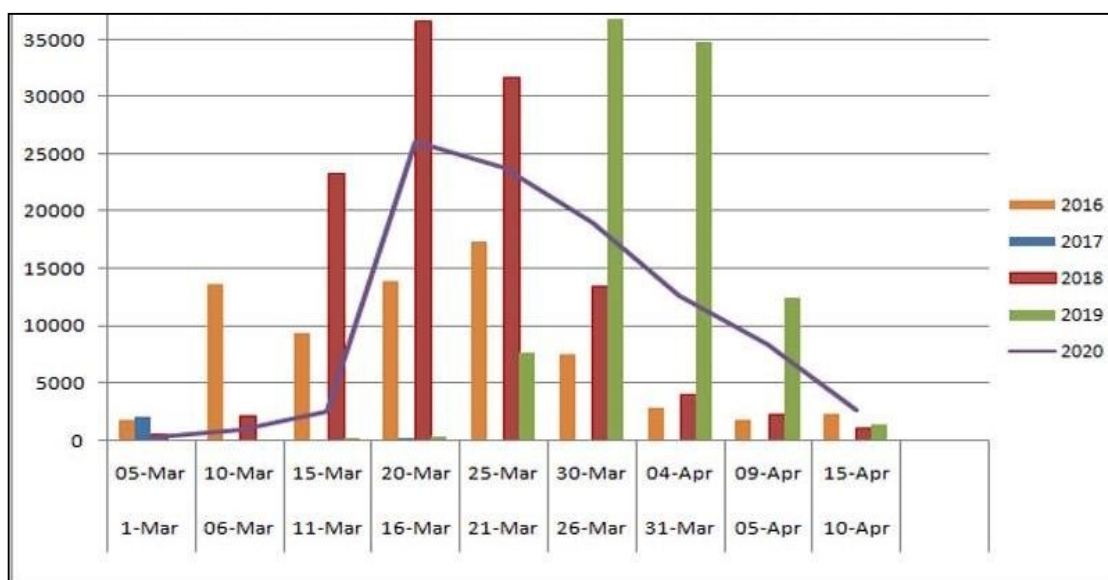
Pollen allergy issue prevails throughout the year and there are three main seasons of pollen allergy-like spring, summer, and fall but its count differs in every season Results of these both variables are given below in Figure 4.7 and 4.8

Figure 4.7: Seasonal Pollen allergy patients



Source: Field Survey Data (Year, 2020)

Figure 4.8: TPC of the past five years



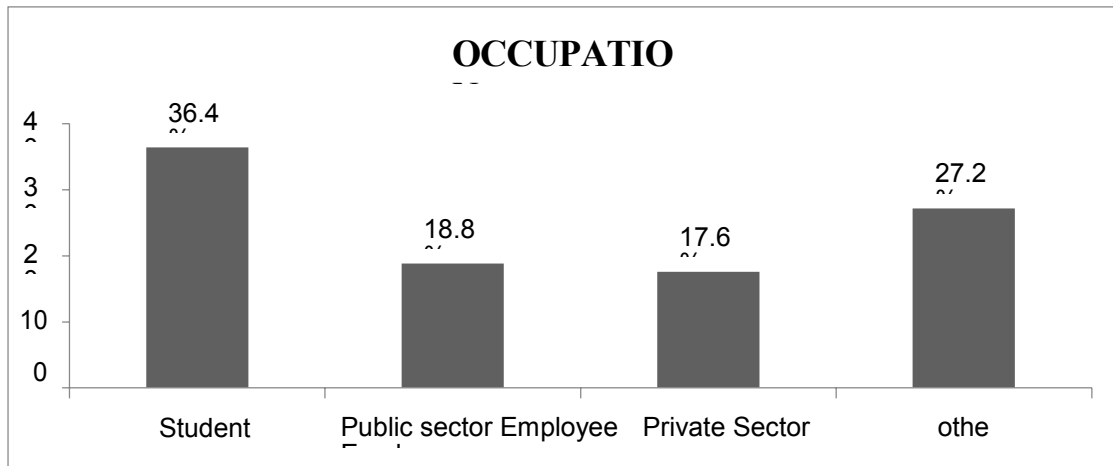
Source: PMD Data (Year, 2020)

According to a field survey, It is clear from figure 4.7 that the pollen allergy incidents increase in spring season and it can be seen in Islamabad in Feb, March, April and the number of affected patients is maximum i.e. 81.6%. On the other hand, according to PMD data, the total pollen count also increases in March figure 4.8 so, a positive relationship can be observed between the pollen count and pollen allergy affected w.r.t season. The Pakistan meteorological department recorded the pollen in the atmosphere for different years. The highest average pollen in the atmosphere recorded for March while the second-highest average pollen count is observed to be prevalent in April. November, December, and January have the least pollen counts in the observed years.

4.6 Occupation and Education status of Pollen allergy patients

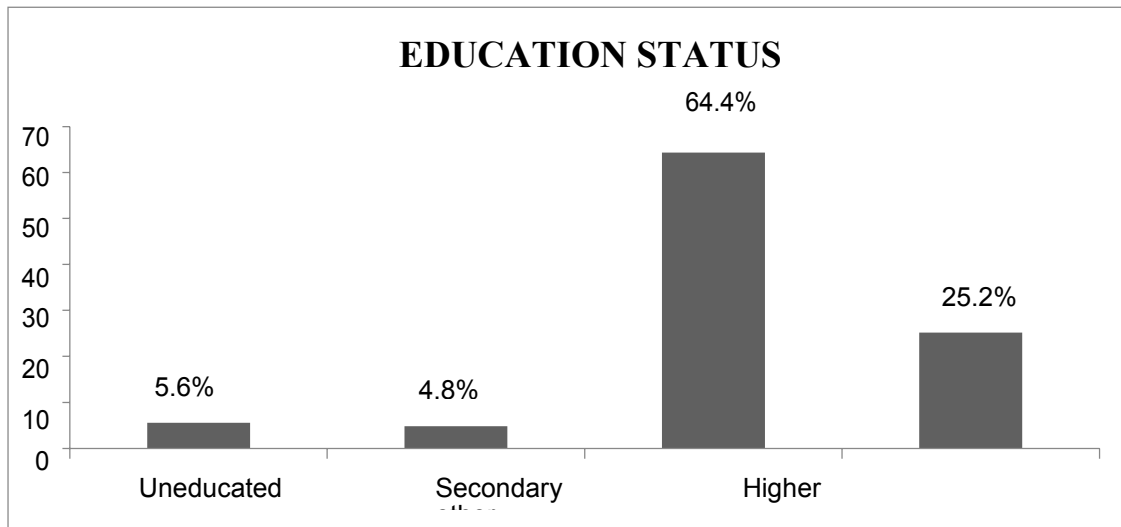
Occupation and Education status of pollen patients are also directly linked with Pollen's allergy disease because occupation status describes what type of employees are more vulnerable whereas education status covers the results about the knowledge of this disease as shown in figure 4.9 and 4.10.

Figure 4.9: Occupation Status of Pollen Allergy Patients



Source: Field Survey Data (Year, 2020)

Figure 4.10: Education Status of Pollen Patients



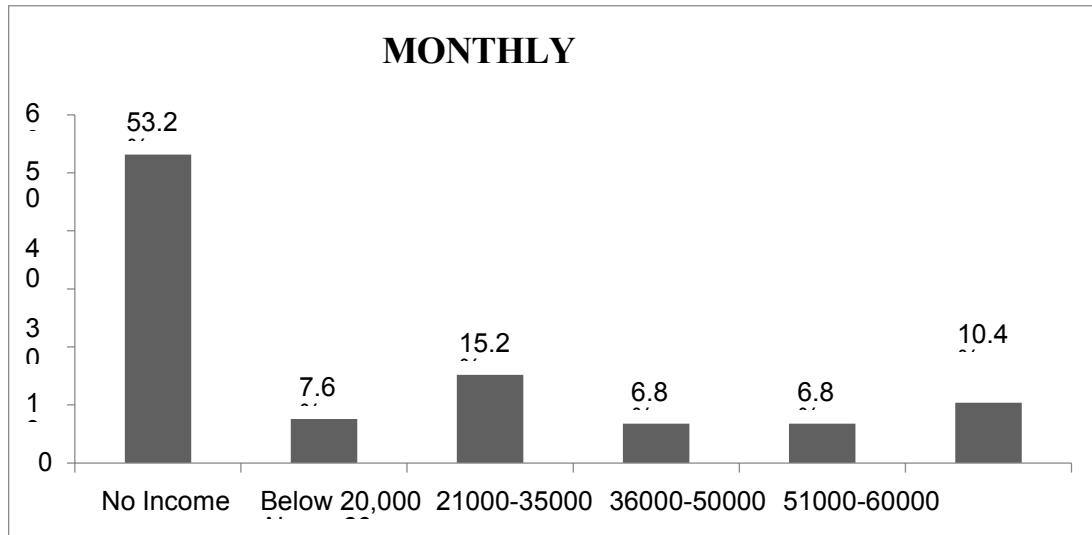
Source: Field Survey Data (Year, 2020)

According to the field survey in figure 4.9, it was observed that most of the students and others, which include labors, taxi drivers, daily wages workers etc., are more affected by PA. Similarly, in figure 4.10, when we have compared the same thing with education status so higher education group is more affected and the reason is, that most of the educational institutes are located in areas where there is a high concentration of plants which release pollen grains.

4.7 Average Monthly Income of Pollen Patients

Monthly income explains the level of the economic burden faced by different income groups as shown in figure 4.11.

Figure 4.11: Average Monthly Income



Source: Field Survey Data (Year, 2020)

It is clear from figure 4.11 that high ratio in the monthly income question survey lies with no income groups so in this most are students that may be dependent on their families and they said when they are suffering from this situation it causes an economic burden on their families.

4.8 Quantitative findings and Cost Analysis

Quantitative Analysis related to the costing of PA was established through interviews with 2 doctors one from the public sector and the other from the private sector in which they give us information about direct and indirect costs i.e. registration fee and Average prices of Medicines and vaccines etc. Moreover, this technique is used to find out the objectives of my study, which were as follow.

1. To find out the direct cost (medicated and non-medicated) bear pollen allergic patients.
2. To find out the indirect cost is associated with pollen allergic patients

4.8.1 Direct Cost

Direct cost = the cost of medical and nonmedical costs.

4.8.2 Medical Cost

The medical cost was calculated which includes (1) cost of medicine (anti-allergies) used by the patients of Pollen allergy (2) Vaccine cost when prescribed by doctors. (3) In-haler cost if the patient has the problem of shortness of breath (asthma) because of lungs problem.

4.8.2.1 Medicine Cost

In this, the medicine cost of anti-allergies is calculated. From interviews with doctors, the maximum and minimum costs of anti-allergies were known. By taking an average of the cost of one tablet of anti-allergic, one-time cost is calculated. Through interviews of doctors, the maximum and minimum quantity of medicine in one day in peak season is recognized as well as a cost during the non-peak season. Interviews with doctors familiarized us with the fact that in the peak season, pollen patients usually take two anti-allergies a day, and other than peak season, they use one tablet a day. The doctors' interview helped to calculate the cost of anti-allergies of PA patients used in a year as shown in the table. In one year, patients who take treatment from the public or private sector bear PKR 6075/- taking anti-allergies.

4.8.2.2 Vaccine Cost

According to interviews of private-sector doctors, vaccination treatment varies from person to person. Usually, vaccination aims to prevent asthma attacks, and that some patients get relief from medicines alone whereas some have to go for vaccination depending on the staging and Condition of patients and that was the reason that vaccination was not effective in every patient. According to data given by doctors every year PKR 256,000 patients come to the allergy center for pollen allergy treatment in which only PKR 66666 patients are treated with the vaccine. Whereas in the public

sector patients who are suffering from any type of allergy go for laboratory test first and if the test of the patient is positive then the patient must have to take a vaccine course which is for 3 months and after every week one injection is given and total doses are 12. As shown in the above table, the cost of vaccine in the public sector is PKR 640 per unit, the total cost of three months course is PKR 7680, and for 1 year, it is PKR 2560. Whereas in the private sector price of one vaccine is PKR7500 and its total cost per year is PKR90000 and their vaccine treatment course ends in 2 to 3 years.

4.8.2.3 Cost of Inhalers

According to the information given by doctors mainly, there are two types of Inhalers available in the market and recommended by doctors. One is for those patients having little bit issues of breathing or sinus whereas the second type of In-haler is recommended specifically for asthmatic patients and Pollen allergy patients for their permanent relief from signs and symptoms of pollen allergy and it is only recommended when there is the peak season of Pollen Allergy. Therefore, a type of inhaler, which is recommended, for minor symptoms of pollen allergy, its market price on average is around PKR 400, which is less than the second type of inhaler which is only recommended for severe asthmatic or pollen allergy patients and whose market price is PKR 1000-2000 on average which is PKR 1500”

It is pertinent to mention here that the public sector and private sector both recommend these 2 types of Inhalers to patients and their prices are almost the same as shown in the table. If doctors from both public and private sectors recommend type one Inhaler, which is used for relief of minor symptoms then its cost will be PKR 4,800 for one year. Whereas the second type of inhaler, which is, used for the cure of severe asthmatic or pollen allergy issues, its cost per year, will be PKR18000 per year hence in both sectors there is no difference between the cost of Inhalers.

4.8.2.4 Cost of Injections

In the light of doctor's interview, we began to know that if a patient who is taking treatment from a public sector hospital is diagnosed with Pollen Allergy disease, he or she has to take vaccination course, in which 4 injections from total vaccine course are given to patients in one month. For each injection patients just have to bring their syringe, its cost is only 50 rupees, and per month, it is PKR 200 whereas total cost on syringes per year is PKR 2400 as shown in the table. There is no extra injection other than that vaccine course recommended in public hospitals whereas in Private sector situation is different as vaccination treatment is not recommended to every patient and it depends on patients staging and requirement. Therefore, patients who are taking treatment from Private sector hospitals are recommended vaccination course in which the cost of each injection is PKR 2500 per month and PKR 30,000 per year. Other than the vaccine course, there is an extra injection, which is also included in that vaccine course so that patients taking treatment of pollen allergy in the private sector have to bear the cost of extra injection.

4.8.3 Non-Medical Cost

Non-medical cost includes transportation cost, registration, and consultation fee and Cost on Laboratory test of pollen allergy as well as stay cost is also included if anyone needs residential services and stay there for the sake of medical treatment.

4.8.4 Stay Cost

As this case study is based on Islamabad and collected data is that of Islamabad and Rawalpindi patients only, therefore, majority of respondents are residents of Islamabad that is why their stay cost is zero as shown in Table.

4.8.5 Registration Cost

According to public and private doctors, it is evident from their interview that Registration Cost is a one-time cost, which is necessary in both sectors. Whereas if patients are taking regular treatment from a specific private hospital than they bear only a one-time registration cost after that they don't have to give any registration cost on the subsequent visit which is recommended by a doctor for vaccination or injection course. However, if any patient visits public hospital other than treatment course in any emergency for sake of treatment or consultation then, in that case, a patient has to pay registration cost again. Whereas in the public sector, there is only a one-time registration cost even if a patient visits in an emergency it is PKR 1000 and per year it remains the same but in the private sector Registration Cost on average is PKR 2500 per visit and for a whole year it remains same for regular patients but for random visitors or non-regular patients they charge PKR 2500 on each visit.

4.8.6 Transportation Cost

Transportation Cost data were collected by patients through a field survey of this study and according to survey results transportation cost is different for patients who use public transport for approaching hospitals and patients who use private transport. For public users, it is PKR 860 on average and per year it is PKR 10320 whereas those patients who use private transport their cost is PKR 1329 and per year it is PKR 15948 as shown in Table.

Table 4.2: Direct Cost Effect

S. No	Nomenclature	Units	Public	Public (Per year)	Private	Private (Per year)
<u>Medical Cost:-</u>						
1.	Medicines	(1-tablet)	13.5	6075	13.5	6075
2.	Vaccine	(1-Vaccine)	640	2560	7500	90000
3.	In-haler (for ease in inhaling issue)	(1-in-haler)	400	2000	400	2000
4.	In-haler (for cure inhaling issue)	(1-in-haler)	1500	18000	1500	18000
5.	Injection	(1-injection)	50	2400	2500	30000
6.	Laboratory Test	1 time	1000	1000	16000	16000
Total medical Cost				32035		162075
<u>Non-Medical Cost</u>						
1	Registration/Consultation Fee	Different in Public & Private	1000	1000	2500	2500
2	Transportation Cost		860	10320	1329	15948
3	Stay-Cost ¹	0		0	0	0
Total Non-medical Cost				12320		34448
G. Total medicated and non-medicated cost				43355		180523

Source: Analysis by author through field survey Data (Year, 2020)

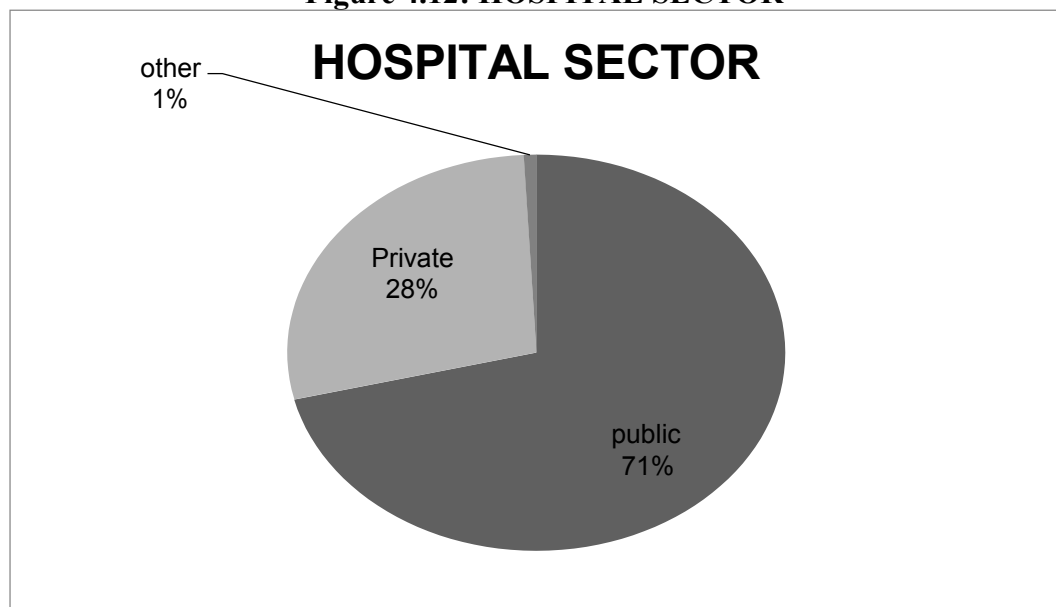
¹ As my case study is based upon Islamabad all the patients who visited hospitals for treatment they are residents of Islamabad so their stay cost is zero whereas the patients who came from other cities for treatment their average stay cost is 5000

As mentioned in the table above that total medical cost of the public sector is PKR32035 whereas in the private sector it is PKR162075 and after detail analysis of interviews and costing it has been ascertained that another information which is related to efficient services and treatment i.e. which sector's treatment is more effective for example private or public. According to field survey and interviews analysis, majority patients of the private sector as well as doctors highlighted that private sector medical services are more efficient and effective as compared to the public sector. As private sector, vaccination is more reliable and it gives long-term results whereas public sector patients were just satisfied on their treatment but they elaborated that even after completion of vaccine course, after some time they have to take again that vaccination

treatment course and it took almost 3 years to be cured completely. They did not give any response in terms of comparison but stressed that the cost of treatment should be minimized more so that it would reduce their economic burden.

According to the above table calculation and all the results of the total medical cost, it is clear that private patients bear the highest cost as compared to public sector patients. In non-medical direct cost, it is seen that for public patients it is around PKR12, 320 whereas in private sector patients bear total PKR34, 448 of non- medical cost. As shown in the net shell table, in the public sector, cost of medicated and non-medicated is PKR 43,355 and for private it is PKR 180,523, which is very high as compared to the Public Sector.

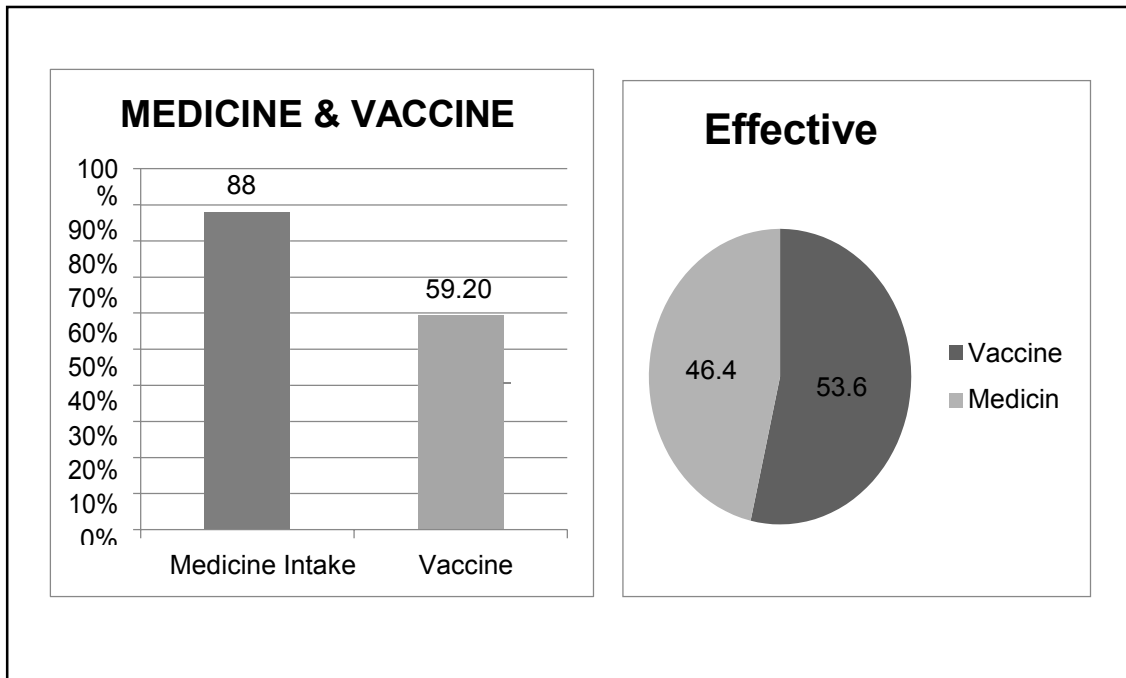
Figure 4.12: HOSPITAL SECTOR



Source: Field Survey Data (Year, 2020)

According to field survey, results 71% patients are taking treatment from the public sector, 28% of patients are from the private sector, and the reason behind this is that the majority of patients prefer public hospitals for treatment because of lower cost whereas in others 0.1 percent patients are those who prefer home remedies for its cure.

Figure 4.13: Medicines and Vaccine intake ratio



Most people only rely on anti-allergy medicines and do not go for further treatment. According to the field survey result same situation is shown in graph 88% Patients just rely on medicines and do not go for further treatment of vaccination whereas 59.2% patients take vaccine treatment. Moreover, when we survey about its effectiveness the majority of patients tell us that vaccine treatment is more effective for PA issue but due to its cost and long period course, they avoided this treatment. When we discuss these results with doctors and ask them for their opinion, they elaborate some reasons behind this. According to their point of view medicines, cost is only 6075 PKR on average, which is less, and bearable as compare to the vaccine so that is why the majority people just prefer medication treatment. They have also highlighted a thing that if the situation of pollen patient get severe like asthma than they must have to take vaccine treatment and should use inhaler which is recommended by doctors according to their situation. Therefore, in this case their cost suddenly become high, which is sometimes not bearable for patients. They also mentioned that although vaccination treatment varies person to person but any patient who must require vaccination course and doctor

recommend them according to their stage and situation and still they avoid this then it would be very harmful to them. In some cases, this type of non-seriousness leads to death.

4.9 In-Direct Cost

In-direct cost is a cost, which is affecting the patients of pollen allergy indirectly, and it includes Loss of productivity and loss of income.

Table 4.5: Indirect Cost Effect

Total Number of days patients absent from work					
Occupations	2-3 Days	7-14 Days	15-30 Days	Others	Total
Students	58	4	2	4	68
Public Employee	28	4	14	1	47
Private Employee	36	1	4	3	44
Others	45	16	26	4	91
Total	167	25	46	12	250

Source: Field Survey Data (Year, 2020)

According to results of primary data which was collected through field survey results as shown in Table, most of the people revealed that they remained absent from duty for 2 to 3 days and some people remained absent for a longer duration during the peak season. If any public sector or private sector employee was working on minimum, wage i.e. PKR 18000 per month or PKR 600 per day in both sectors. When they remained absent for 2 to 3 days due to PA then their indirect cost was PKR1200-1800 and that is how their net income was affected (This data is calculated by keeping in view the minimum average wage as per individuals who participated in the questionnaire). Whereas in the public sector there is no effect on their income due to leave or absentees but they had to bear the indirect cost in the form of suffering & that is why their

productivity is decreased. Therefore, we can conclude that although there is no loss in monetary terms suffering is affecting them in terms of indirect cost. The same is the case with students when they suffer from PA during peak season, as the majority of students remained absent for 2 to 3 days from their educational institutions and faced the indirect cost in terms of poor performance in studies due to lack of focus and concentration.

4.10 Qualitative Findings and Theoretical Analysis of Doctors interview.

The purpose of qualitative analysis to find out the answers to my Research Question as well as objectives like what are the adaption techniques of inhabitant against pollen allergy as well as detailed information about this disease its symptoms, prevention, and direct and indirect cost associated with this disease. To find out all of these things this study adopts structured interviews that were conducted with two doctors one from the public sector and another one from the private sector as a measure for the collection of information. The interviews are comprised of open and close-ended questions. This is the primary source of data collection.

4.10.1 Summary of Doctors Interview

4.10.1 Information about Pollen allergy

According to both doctors when certain individuals can develop severe nasal and respiratory symptoms, if microscopic particles enter their breathing passages through the nose or mouth, these particles can be of dust Pollen spores from fungus or whole substances. The resulting symptoms are due to an exaggerated response of the body's immune system, which is called allergy whereas Pollen allergy is caused by particle from pollen grains. The fact is that there are varieties of pollen grains that could be observed at the inner circle of small flowers and which are yellowish or reddish in color and sticky in consistency and are transported by the tender legs of flying insects. While

there is another variety of pollen grains that are extremely lightweight and blown by the wind. Tiny invisible pollen grains while flying may enter the lung passages (through noses and throats) of a susceptible individual, and result in mild to moderate to severe allergic reactions. They mostly arise from bushes of different types and trees of various types and their flowers are not visible as they are very small and not all pollen grains result in allergic reactions and certainly not all people are vulnerable to them. Individuals who have inherited an inclination to manifest allergies or those individuals who live near the green belts and so are exposed to huge loads of pollen are mostly those who will show signs and symptoms of pollen allergy.

4.10.2 Factors of Pollen allergy in Islamabad and its peak season.

When we ask questions about the factors and season of PA in Islamabad both doctors highlight this thing that in Islamabad there are a variety of wild trees that produce pollen grain at intervals. However, at the start of spring Paper Mulberry (*Broussonetia papyrifera*) is the known culprit whose pollens produced the most symptoms of allergy in the residents and travelers. After that – February till End April / Early May (depends on the weather) and then Baby flower (*Parthenium*) – April till September Grass (*Cynodon dactylon* / Johnson grass etc.) – April till August / September Wild Bhang (*Cannabis sativa*) – End June till End September / Mid October (depends on the rainfall) Various other trees, weeds and plants from February till November. However, there is a peak of pollen allergies in spring, and late summer.

4.10.3 The symptom of Pollen Allergy

The doctors also highlighted the salient features, signs and symptoms of pollen allergy and stressed that only the susceptible individuals may develop these symptoms. Which include Runny nose, bouts of sneezing and a frequently blocked nose, paroxysms of cough and a subtle discharge from the back of the nose into the throat which is called

in medical terminology as Post Nasal Drip, dyspnea which is shortness of breath, tightness in the area of Chest, Asthma, itching eyes, and skin, etc.

4.11 Prevention of Pollen Allergy

They discuss few things about prevention they said that Pollen allergy should never be taken lightly. Mild symptoms can aggravate suddenly and cause death within 8 to 10 minutes. One of them said, “Prevention is better than Cure. Despite the symptoms may feel serious but thanks to medical science that a small but correct dosage of suitable anti allergic medicine will relieve the allergy symptoms in the patient if taken early in the course of the reaction. In this way, out of pocket expenditures on part of the patient could be reduced significantly because treatment delayed may result in serious bouts of asthma and subsequent hospital admission or visits to outpatient departments. Wearing a disposable mask while going outside, or covering mouth & nose with a moist cloth, sealing the windows with the help of tapes to prevent pollen-laden air from coming inside, keeping all the doors and windows closed tightly and keeping the vent of air conditioning on recirculation instead of Fresh air will reduce the pollen count. Avoid working from 5 a.m. to 10 a.m. and also in the evening because at these times the pollen count is maximum recorded in the air, avoiding dusting during the peak season, avoiding work that result in tiredness and fatigue and exhaustion so that immune system can function properly. Taking healthy balanced diet, especially fruits and vitamin supplements if required, avoiding stress, anxiety and psychological issues during the peak season, using air purifiers where patient is supposed to spend most of his time, taking care not to dry the clothes outdoors, having enough sleep and rest, keeping windows of the vehicles rolled up will help the susceptible and vulnerable individuals a lot against pollen allergy during the peak season.

4.12 Treatment and its cost

In the end, they explain about different treatments of pollen allergy. The substance, which is causing allergy, needs to be avoided and in case one is exposed to it then vaccines and anti- allergic medicines are the way to go. Vaccination should be done right before the onset of the peak season. Once the signs and symptoms of allergy have set in then medicines are the only option. In the case of shortness of breath, choice of treatment is nebulized at hospitals and inhalers are prescribed for utilization at home. They tell that although vaccination is the most effective treatment it varies from person to person. Some patients do not need a vaccine course whereas some patients need this. They also tell us about the cost of vaccines. It was different in both sectors, according to the public sector doctor, vaccine price was 640 PKR per unit whereas according to the private-sector doctor, the price of vaccine ranges from PKR 50,000 to PKR 250,000 for one-year treatment depending on patients situation. Whereas the average price of anti-allergy medicine is 25 to 35 per tablet, which is same in both sectors hospital because even in public sector, patients have to buy anti allergies privately. When we asked this question that on average, vaccine takes how much time (in months/years) to recover patient so they said it is different from patient to patient, and what you are treating. WHO recommends vaccination for 5 years, whereas one question was about the recommendation of inhalers so they explain to us about it they said any patient who has difficulty breathing, coughing, or wheezing (whistling sounds from the chest) must get treated by inhalers. Inhalers are the safest, quickest, and cheapest form of treatment, and are the only treatment that prevents further damage and if a person has asthma due to pollen allergy then he should get an inhaler, but if there is no asthma, then no need for an inhaler. They also mentioned about the types and costs of inhalers .They said there are two main types of inhalers. One is for immediate relief. It cost between

PKR 200 to PKR 400 doses. The other one is for long-term cure and prevention of asthma. It cost between PKR 1000 to PKR 2,000 they also mentioned that there are some side effects of these medicines and vaccine during treatment patients may feel some dizziness and sometime headache but after completion, of the course, everything becomes normal.

4.13 Major Findings

1. The effects of pollen allergy among different age groups and gender are different. Children are more affected as compared to adults and the age group (31-40) while males are more affected as compared to females in the sample.
2. Pollen allergy symptoms are runny nose, coughing, wheezing, itchy eyes, and skin allergy. However, majority pollen patients were suffering by sneezing.
3. Pollen patients (81%) are mainly affected by pollen allergy in March.
4. The Direct Cost of treatment, for PA patients is a major challenge.
5. The lack of awareness and prevention measures lead to an increase in the economic cost of PA patients.

CHAPTER 5

CONCLUSION AND POLICY RECOMMENDATION

In this Chapter Conclusion, major findings, Recommendations/Policy implications, Limitation, and future Research has been discussed.

5.1 Conclusion

The evidence of Pollen allergy patients is more visible in Islamabad as compared to other regions of Pakistan. This allergic disease is more sensitive to the age of Patients. The study concluded that most of the patients who are suffering from this disease is from the age group 31-40 and belongs to the working group Direct cost is the major cost faced by PA patients. The lack of awareness and prevention measures lead to an increase in the economic cost of PA patients. The preventive measures in Pakistan are negligible and thus it adds up to the cost of PA for a common person.

The results of the study indicate that the duration of treatment is significantly increasing the cost of PA. Likewise, the stage of the illness is increasing the illness cost; higher stage patients are facing huge cost, which is also causing the indirect cost to patients. This research paper focuses primarily on patients from Islamabad & Rawalpindi. Most of the patients were from Islamabad and out of the total sample, 67.2% of patients of PA are from Islamabad whereas 32.8% of patients were from Rawalpindi. It is concluded that this disease is more frequently found in the age group of 31- 40 years. The patients of this age group are from the working-class and they are more exposed to the open environment & that is why they are more vulnerable to the PA issue.

This is a critically important issue that most of the patients are facing huge cost both economically and socially. The treatment is expensive even in public sectors for poor patients. The study found that PA patients incur a huge direct cost in seeking treatment.

Most of the respondents reported high in-direct burdens owing to PA disease patients indicating that the majority of the respondents experience many psychological problems due to their illness condition, which is the major source of this psychological burden. In general, the direct cost of treatment is a major challenge for PA patients.

5.2 Recommendation/Policy Implication

This Study helps to recommend few policies intervention in the health policy and other policies, which helps to change environmental attitude and practices.

1. As PA issue is increasing over time and every year people are facing severer situation, therefore, for this purpose Government as well as the Ministry of Health needs to launch awareness programs
2. The government should establish more Allergy centers and provide free of cost treatment and medicines for the pollen patient because even in the public sector allergy hospital medicines are not available to free of cost and also provide free masks in sever season for the safety to the pollen patient.
3. The pollen count in the allergy season in certain cities especially Islamabad are so high that allergy vaccination should be carried out. According to WHO and international guideline unfortunately, this form of treatment has gained a considerably bad reputation in Pakistan so Anti-allergy vaccine production units should Work more on the potency and efficiency of vaccine that is manufactured which people get through allergy hospital. The patient may recover in two or three rounds because its treatment time is very long and in that way, it causes an economic burden on patients and their families.
4. The government should take steps to remove the most allergenic/pollen produce plants from the city and now they should plant Environment-

friendly plants to overcome this issue and to reduce health costs.

5. According to the doctor's suggestion, Allergies could be controlled through medication but prevention is better than cure. People who allergic to it have to take some preventive steps which may help them, limited outdoor activities when the pollen count is high, avoid unnecessary travels, wear filter masks to avoid the dust in the air, and take allergy vaccines before pollen season begin. The media should also give some information about these diseases when these seasons are active.

5.3 Limitations of the Study

There are Few Limitations of my study. These are the following.

1. The first main limitation of this study is as it is mentioned in the title that this research is based on the Islamabad case and does not cover the pollen allergy disease issue of the whole country due to time constraints we can't take data from the patients of all the provinces.
2. We can also do a comparative study to understand the regional cost difference and its burden.
3. As my study is covering only the patient perspective and Demand-side so in the future this research can be conducted in the supply-side i.e. Government perspective.

REFERENCES

- Asher, M. I., Montefort, S., Björkstén, B., Lai, C. K., Strachan, D. P., Weiland, S. K., Group, I. P. T. S. (2006). Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. *The Lancet*, 368(9537), 733-743.
- Bennett, D. J., Qazilbash, M., & Qazilbash, A. A. (1997). *A Survey of Pollen Allergies in Six Villages of Islamabad*: Sustainable Development Policy Institute.
- BGCI. (2015). Plant Conservation Day > Why plants are important. Retrieved 24 Feb, 2015, from [http://www.bgci.org/plantconservationday/whyplantsimportant/CDA.\(2007\).](http://www.bgci.org/plantconservationday/whyplantsimportant/CDA.(2007).)
- Cauwenberge, P. (2007). Allergenic pollen and pollen allergy in Europe. *Allergy*, 62(9), 976-990. Ghufuran, M. A., Hamid, N., Ali, A., & Ali, S. M. (2013). Prevalence of allergenic pollen grains in the city of Islamabad, Pakistan, and its impact on human health. *Pak. J. Bot*, 45(4), 1387-1390.
- D'amato, G., Cecchi, L., Bonini, S., Nunes, C., Annesi-Maesano, I., Behrendt, H. Van Haroon, M. A., & Rasul, G. (2008). Effect of meteorological parameters on pollen concentration in the atmosphere of Islamabad. *Pakistan Journal of Meteorology* Vol, 4(8).
- Hussain, S. M., Khan, S. A., Ali, S. M., Ahmed, S. I., Jamil, N., & Hussain, S. A. M. (2013). Effects of Pollen Allergy on Pulmonary Function Tests. *Journal of Rawalpindi Medical College (JRMC)*, 17(1), 18-21.
- Linneberg A, Nielsen NH, Madsen F, et al. Increasing prevalence of specific IgE to aeroallergens in an adult population: Two cross-sectional studies 8 years apart; the Copenhagen Allergy Study. *J Allergy Clin Immunol* 106:247–252, 2000.
- Mackowiak JI. The health and economic impact of rhinitis. *Am J Manag Care* 3:S8 – S18, 1997.
- Maco, S. E., & McPherson, E. G. (2003). A practical approach to assessing structure, function, and value of street tree populations in small communities. *Journal of Arboriculture*, 29(2), 84-97.
- Malone DC, Lawson KA, Smith DH, et al. A cost of illness study of allergic rhinitis in the United States. *J Allergy Clin Immunol* 99:22–27, 1997.
- Micheal, S., Wangorsch, A., Wolfheimer, S., Foetisch, K., Minhas, K., Scheurer, S., & Ahmed, A. (2013). Immunoglobulin E reactivity and allergenic potency of *Morus papyrifera* (paper mulberry) pollen. *J Investig Allergol Clin Immunol*, 23(3), 168- 175.
- Nowak, D. J., & Dwyer, J. F. (2007). Understanding the benefits and costs of urban forest ecosystems Urban and community forestry in the northeast (pp. 25-46):

- Springer. Pbs. (2015).
- Peper, P. J., McPherson, E. G., Simpson, J. R., Albers, S. N., & Xiao, Q. (2010). Central Florida community tree guide: benefits, costs, and strategic planting.
- Perveen, A., Khan, M., Zeb, S., & IMAM, A. A. (2014). Impact and Correlation of Environmental Conditions on Pollen Counts in Karachi, Pakistan. *Iranian Journal of Allergy, Asthma, and Immunology*, 14(1), 83-90.
- Piotrowska, K. (2008). Ecological features of flowers and the amount of pollen released in *Corylus avellana* (L.) and *Alnus glutinosa* (L.) Gaertn. *Acta Agrobotanica*, 61(1), 33- 39.
- PMD.. (2012). Daily Pollen Count (per m³of air) of Islamabad. from http://www.pmd.gov.pk/rnd/rndweb/rnd_new/R%20&%20D.php
- Rana, M. P., & Akhter, F. (2010). Uses of invasive alien plant species in Rema-Kalenga Wildlife Sanctuary of Bangladesh. *Journal of Mountain Science*, 7(4), 380-385.
- Rashid, M., Abbas, S. H., & Rehman, A. (2014). The status of highly alien invasive plants in Pakistan and their impact on the ecosystem: a review. *Innovare Journal of Agricultural Sciences*.
- Sly RM. Changing prevalence of allergic rhinitis and asthma. *Ann Allergy Asthma Immunol* 82:233–248, 1999.
- The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. Worldwide variation in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema. *Lancet* 351:1225–1232, 1998.
- Upton MN, McConnachie A, McSharry C, et al. Intergenerational 20-year trends in the prevalence of asthma and hay fever in adults: The Midspan family study survey of parents and offspring. *BMJ* 321:88 –92, 2000.
- Vannatta, A., Hauer, R., & Schuettpelz, N. (2012). Economic analysis of emerald ash borer (Coleoptera: Buprestidae) management options. *Journal of economic entomology*, 105(1), 196-206.

A9	Employment status [1] Unemployed [2] Employed
A10a	Are you head of your family or not? [1]Yes [2] No
A10b	What is your Monthly family income? [1]No Income [2]Below 20000 [3]21,000-35,000 [4]36,000-50,000 [5]51,000-60,000 [6]Above 60,000
A11	How many numbers of household in your family? [1]01-03 [2]04-06 [3]07-09 [4]Above 9 [5]Other:
A12	How many numbers of earners in your family? [1]One [2]Two [3]Three [4]More than four [5]Other:
A13	When were you diagnosed as Pollen Allergy patient? [1]From Childhood [2]From teenage [3]From adult [4]Other:
A14	Is there any other pollen allergy patient in your family? [1] Yes [2] No
A15	What are the major symptoms of this allergy? [1]Sneezing. [2]Nasal congestion. [3]Runny nose. [4]Watery eyes. [5]Itchy throat and eyes. [6]Wheezing. [7]Other
A16	How you were diagnosed with this disease? [1]Through Tests [2]Self Diagnosis
A17	Which hospital you consult for its treatment? [1]Public [2]Private [3]Other
A18	Name of hospital? [1]NIH [2]PIMS [3]CDA hospital [4]Federal Government Hospital [5]Other
A19	Do you travel any other city for treatment or prevention? when there is peak season [1] Yes [2]No
A20a	Do you take medicines for allergy treatment? [1] Yes [2]No

A20b	What is the total cost of allergy medicines? [1]1000-2000 [2]2000-3000 [3]4000-5000 [4]Above 5000
A21a	Do you also take vaccine for allergy treatment? [1] Yes [2]No
A21b	What is the total cost of vaccine? [1]600 -1000 [2]1000-2000 [3]Other
A22	Which is more effective for it's treatment? [1] Medicines [2] Vaccine
A23	Number of visits in hospital during treatment? [1] 2-3 Times [2] 3-5 Times [3] 5-10Times [4] Other
A24	Are you satisfied with your treatment? [1] Yes [2]No
A25	What you think that what is the main factor of this disease? [1]Plants [2]Weather Conditions [3]Other
A26	Name of that plant? [1]Paper Mulberry [2]Acacia [3]Eucalyptus [4]Pines [5]Grasses [6]Cannabis [7]Dandelion and Alternaria [8] don't know
A27	During which season or months your allergy get severe? [1]Spring (Feb, March, April) [2]Summer (May, June, July, Aug) [3]Fall (Sep Oct Nov) [4]Spring and Summer [5]Whole year (Spring, Fall, Summer, Winters) [6]Other:
A28	Do you take precaution measures during allergy problems? [1] Yes [2]No

SECTION B: DIRECT COST		
Medical Cost		
B29. How much you and your household do spend on treatment per month?		
	Item/ Treatment Quantity	Cost (RS)
B29.a	Registration	
B29.b	Consultation	

