

**Research Article**

**OBSERVATIONS IN COMMON RESPIRATORY AILMENTS AND PULMONARY FUNCTION PARAMETERS IN ETHNICALLY DIVERSE ELDERLY COMMUNITY SETTLED IN PUNJAB**

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**ABSTRACT**

Deterioration in pulmonary function tests (PFT) are known to occur with advancing age compromising functional capacity in elderly population. Such changes may be seriously compounded by additional factors like underlying airway disease, life style habits, diet, immunological status, genetic and ethnic background factors. This study was specifically aimed at finding out the incidence of Chronic Obstructive Airway Disease amongst elderly individuals aged  $\geq 60$  years and correlating it to their ethnic and religious backgrounds in a low socioeconomic population of urban Punjab. A total of 296 subjects underwent medical history, clinical respiratory examination and Chest X-ray and FEV1 evaluation. Observations revealed 76.23% to be having evidence of respiratory illness of which 14.23% overlooked these symptoms and accepted as part of normal aging, 69% took short term symptomatic treatment, 11.4% refused to accept their disease. The study also revealed interesting differences in prevalence of COPD in respect to age groups, area of permanent residence, socioeconomic status and religion/faith as well as varied ethnic groups found in the community under this study. Various physiological factors related to senescence that may have contributed to manifestation or exacerbation of COPD or its variants have also been discussed.

**Key Words:** *Aging, PFT, COPD and Ethnic Groups*

**INTRODUCTION**

Age related changes are known to occur in the respiratory system as much as they affect the other body organs. Generally, they do not handicap elderly people to perform their daily activities unless disease, strain or stress is imposed on the system. Normally the body systems do have enough reserves to tolerate and cope up with some degree of reduced organ function or efficiency without producing significant or noticeable symptoms. The normal daily activities may be seriously compromised in individuals who have an underlying chronic airway disease. Most of the chronic lung diseases are progressively disabling and hence may force the individual to seek medical advice. Our study was conducted to find out the incidence of COPD amongst elderly individuals of age 60 years or more reporting to a peripheral urban medical clinic with symptom directly or indirectly related to respiratory system. Our study further aimed to find out the distribution of COPD patients according to various ethnic or religious backgrounds in a community comprising of lower or lower-middle socio economic population groups. The study was based on medical history, clinical examination, chest X-ray and FEV1 evaluation.

**MATERIALS AND METHODS**

The study included 296 patients of age 60 years or above having symptoms directly or indirectly attributable to respiratory system. The study was conducted at CMC Ludhiana and Genesis clinic (a peripheral clinic situated at semi urban slum area of Ludhiana, Punjab). Smokers as well as non smokers or passive smokers were included in the study. A detailed medical history was taken regarding age, sex, smoking habits, relevant symptoms, socioeconomic status, ethnicity, occupation, dietary habits, past or concurrent medication and education status. Each patient underwent systemic clinical examination, chest X-ray PA view and a single pulmonary function parameter i.e. FEV1 evaluation.

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### **Observations**

Several interesting observations were made in this study which can be categorized as general observations or those made in context to a specific factor affecting the respiratory status of a patient, although these specific factors were limited by the number of available variations in the group of patients which constituted the study group.

### **General Observations**

Most elderly patients (73.26%) having either chronic bronchitis or emphysema with or without asthma underplayed their symptoms even in a condition where their lung functions were seriously limited. The reason for such underplaying is a complex social behavior coupled with financial constraints. Even in a culture of strong family ties and bonding with elderly parents, there is abundance of stories speaking the ground reality that elderly people in the society take selective place as far as their importance goes. While they are respected at family customs and rituals, very few elderly people enjoy the same respect when it comes to looking after their health needs by their own family members. In such a situation most elderly people will not complain about their ill health despite advanced disease and obvious distress. In India, there is a taboo of being labeled as TB (tuberculosis) patient as they fear being outcast in their own family or being considered as a burden on the family. Only a few elderly parents are able to support themselves financially. These are people who are living off their pension or interest on their savings or investments. Financial constraints are a big hurdle in seeking medical help. It literally makes such patients mute in front of a doctor. They rather skip many complaints than be burdened with a new diagnosis and consequent cost of treatment and follow up.

Some of the patients (14.23%) overlooked these symptoms and accepted these as part of the normal aging process. Many elderly patients believed that some cough, expectoration or breathlessness is part of the weakness that one is expected to endure due to aging process. So much so that they categorically request the attending physician to ignore these symptoms and treat them for a presenting complaint which would be joint pains, gastro intestinal, urinary or any such problems which is presently limiting their daily chores.

A significant number of patients of COPD (69%) took short term symptomatic treatment at the time of acute exacerbations. Such patients took partial cure as great relief and carried on with the residual disease till it became serious or distressing enough to return for medical help. Most of the people observed in this group were daily wage workers in the factories who did not want to lose either their wages or the working hours and hence showed poor compliance.

None of the patients had ever been properly explained by their attending physician or any other health care worker about their disease nor did they come across any literature in simple local language educating them about chronic lung disease (COPD). There is a general lack of health education material released for public education specifically for chronic bronchitis, emphysema or bronchial asthma.

Some of the patients (11.4 %) were not willing to accept that they have COPD or asthma and sought routine treatment for cough or breathlessness. As no one wants to live with a stigma of a chronic disease in later phase of their lives, the initial reaction of such patients was that of denial.

A good number of female patients (16 %)visiting to seek medical health for non respiratory problems, also exhibited symptoms and signs of COPD though with much less acute events of infections or frequent bronchospasm. Most of these patients were working in polluting environment eg in factories with either fumes or lint in the work area.

*Prevalence of COPD in different groups:* Interesting observations were made while analyzing the prevalence of COPD as per the area of permanent residence of the patients, their religious beliefs, ethnic groups and socio economic status. These factors were seen to play a role in the pattern of occurrence of the disease.

*Area of permanent residence:* The incidence of COPD amongst Punjabi community was much less than those belonging to Uttar Pradesh, Bihar, Madhya Pradesh and Delhi. Minimum number of cases was

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observed in patients belonging to south Indian states. The percentage of Punjabi COPD patients was 17% of all the diagnosed patients.

*Socio economic status:* In our study, there was no significant difference found in the pattern of presentations of COPD in lower or middle class socio economic groups. In fact the patients belonging to poor socio economic strata had marginally lesser incidence of COPD.

The upper middle class patients showed slightly higher number of cases of COPD.

*Religion/ faith:* Our study showed that Sikhs have least cases of COPD (2.02% of the total number of COPD patients) except in the occasional patient engaged in agricultural activity or working in a cotton factory.. This is most probably due to non smoking, as smoking is prohibited amongst the followers of sikh faith.

Muslim population from Uttar Pradesh (UP, India) have the highest cases of the disease (31% of all diagnosed as COPD.) This pattern was also noticed in female patients where the incidence was much higher than the non muslim community. Maximum number of smokers (bidi, hookah, non filter cigarettes and chillum) was found in this group. Exposing the family members to passive smoking appears to be socially acceptable norm in this community. Some female patients who had migrated from UP villages also gave history of prolonged smoking. Another reason for observed higher incidence of COPD particularly in this group was the fact that this data was collected in the centre/ clinic which is located in an area of predominant muslim population from Uttar Pradesh in India.

*Ethnic groups:* COPD was very common amongst gypsies and tribal groups, commonly called as Banjara groups. This was probably due to their constant exposure to dust, smoke and allergens as they do not have any permanent houses and adopt temporary housing and cooking facilities. The practice of smoking is also prevalent amongst these groups. Besides, these people rarely stay long enough in an area for completion of diagnostic tests and follow up of treatment. The centre caters to health needs of the migratory population as well as some tribals who camp in the vicinity of the centre. COPD was the commonest ailment after fever and gastrointestinal infections that brought them to the centre to get medical help. Some of the Banjara groups like Saansi group have permanently settled in the suburbs of Ludhiana city. They are no more following nomadic life style for the past couple of generations. Still in these families the occurrence of the disease was frequently observed.

Very few cases ( 4 out of 127 cases diagnosed) were seen in Jain community of the hindu faith. No specific reason for this low incidence was found. The only peculiarities found with this group were their food habits which are pure vegetarian diet without use of garlic in food preparation.

Gujar population belonging to Rajasthan area and settled in Punjab for over three decades also show significant incidence of COPD. Most of these individual are engaged in business of confectionary of a specific variety, namkeen and papadum, a preparation that involves extensive frying. There was also higher incidence of smoking bidis (tobacco rolled in a dried leaf) in this group.

### **Factors in Old Age**

Changes in the respiratory system anatomy and gas exchange process due to old age are almost indistinguishable from those happening due to other factors like air pollution, smoking, occupational hazards and life styles. Respiratory efficiency definitely decreases with age. However when an aging respiratory centre is subjected to other factors like pollution and smoking etc, the insult to the system becomes cumulative and the damage becomes much more pronounced.

Unfortunately these factors, though permitted to cause damage to ones respiratory system, continue to play havoc even in the old age as the person continues to live with the same practices of smoking, work habits and living conditions. There is an urgent need to educate the community on modifications of such factors wherever these can be changed. There is also a need to educate the community at large on the factors which lead to chronic obstructive airway disease (COPD), its complications like bronchiectasis, repeated infections like pneumonias and possible ways to avoid or decrease the distress due to this disease.

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In India, one respiratory illness which has received adequate attention of the government regarding public health education is tuberculosis. The government has worked extensively on spreading the message of controlling tuberculosis through print and electronic media as well as setting up centres which has field workers engaged in diagnosis and treatment of the disease. These mechanisms, which are limited to only government institutions, are still effective in containing the disease to a great extent. The flip side is that most of the people are now aware that any chronic cough could be tuberculosis, a disease which is considered to be a stigma despite the effective therapy which is available to cure the disease completely. As a result and fear of the so called dreaded disease most of the individuals, young or old are not very open about expressing the symptoms of providing detailed medical history of their respiratory symptoms or past illness. Various changes in the respiratory system which may help in progress of the disease or intensifying the severity of COPD symptoms are as follows:

The respiratory system undergoes various anatomical, physiological and immunological changes with age. Chest wall and thoracic spine deformities impair the total respiratory system compliance leading to increased work of breathing. Respiratory muscle strength decreases with age and can impair effective cough, which is important for airway clearance. After the age of 20-25 years, aging is associated with progressive decline in lung function. The alveolar dead space increases with age, affecting arterial oxygen without impairing the carbon dioxide elimination. Older adults have decreased sensation of dyspnea and diminished ventilatory response to hypoxia and hypercapnia, making them more vulnerable to ventilatory failure during high demand states (ie, heart failure, pneumonia, etc) and possible poor outcomes (Sharma G, Goodwin J, 2006). There is a reduction in the elastic recoil of the lung causing "senile emphysema", a condition characterized by reduction in the alveolar surface area without alveolar destruction (Oyarzún GM 2009).

There is calcification of the laryngeal and tracheal cartilage resulting in their stiffness. The bronchial mucosal activity as well as the number of cilia is reduced. The glandular cells secreting the protective mucous are also reduced in function (Connolly MJ, 1998). Blunted cough reflex, reduced sensitivity to particles exposed, greater risk of choking and possible aspiration pneumonia (Blair, KA, 1999). Set a perfect stage for progress of COPD if present also aging is associated with a progressive deterioration in the structure and function of the pulmonary circulation. Remodeling of the pulmonary vasculature occurs from maturity to senescence that is characterized by an increase in pulmonary vascular stiffness, pulmonary vascular pressures, and pulmonary vascular resistance along with increased heterogeneity of alveolar ventilation and pulmonary perfusion and decreased pulmonary capillary blood volume and membrane diffusing capacity that is consistent with a reduction in alveolar-capillary surface area (Taylor BJ, Johnson BD, 2010). In the elderly people, the capillary network is found to lose some small loops, which are substituted by a connective tissue. Increase in thickness of air-blood barrier causes a deceleration of oxygen diffusion from alveolar lumen into the blood of pulmonary capillaries. In the aged persons sclerotic changes occur in the interalveolar septa and the disappearance of Kohn pores could be considered as one of their manifestations. All these changes seem to disturb the uniformity of intraacinar ventilation and may significantly influence gas exchange conditions ( Ustiuzhaninova NV, Shishkin GS, 2002). The declining performance of the immune system with age plays an important role in the development of lung diseases in the elderly. The dominant risk for morbidity and mortality lies in respiratory infections with pneumococci and influenza virus. These risks are increased by immunosenescence, either intrinsic due to ageing or secondary to underlying diseases, poor diet, medication etc. After the age of 50 several abnormalities develop in the lungs: reduced muco-ciliary clearance, loss of elastic fibres, and low grade inflammation that manifests itself as changes in broncho-alveolar lavage (neutrophilia, increased production of interleukin and elastase-antiprotease complexes) (Duchateau J, 2003). Aging and COPD are characterized by increases in proinflammatory cytokines such as interleukin (IL)-6 and tumor necrosis factor (TNF)-alpha, which are implicated in aging-related inflammatory diseases and correlate with degree of obstruction in COPD ( Sharma G, Hanania NA, Shim

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YM ,2009).The macrophage activity in the lungs and tracheobronchial tree as well as the diminished immunoglobulins (Ig A) limit the ability of respiratory passage to contain viruses ( Britt, TL, 1993).

Ageing tends to diminish the reserve of the respiratory system in cases of acute disease. Decreased sensitivity of respiratory centres to hypoxia or hypercapnia results in a diminished ventilatory response in cases of heart failure, infection or aggravated airway obstruction. Furthermore, decreased perception bronchoconstriction and diminished physical activity may result in lesser awareness of the disease and delayed diagnosis ( Janssens JP, Pache JC, Nicod LP ,1999). Residual volume, closing volume and functional residual capacity increase, whereas vital capacity and FEV1 progressively decrease. Whether these changes are due to aging or associated with aging is a matter of debate. However, the aging lung is more fragile in the face of respiratory and systemic diseases than the respiratory system of young adults. Nutrition, smoking habits and sleep-related disorders also affect the respiratory system. Although bronchial asthma may also appear in the elderly, chronic obstructive pulmonary disease is one of the most common respiratory diseases in advanced life and is a major cause of respiratory failure and ICU admission. Age in itself is not a risk factor of respiratory failure, but elderly patients have an increased risk of mortality for both acute respiratory failure (the failing lung), and exacerbated chronic ventilatory failure (Rossi A et al., 1996).

Smoking, which is one of the important factors in development of COPD, helps to accelerate the changes and leads to slow degeneration of respiratory functions. It causes reduced ciliary action, inflammation of the respiratory passage, constriction of bronchioles and reduced breathing capacity. The irritant and toxins in the inhaled smoke like carbon monoxide, nitrogen dioxide and hydrogen cyanide cause significant damage. The forced expiratory rate declines at double or triple the rate for a non smoker.The forced expiratory volume decreases and there is gross mismatch between ventilation and perfusion. Eventually, 15% of the smokers develop COPD with permanent damage to the lung parenchyma.

Other risk factors for COPD include environmental pollution in the area of residence or work place, presence of other chronic diseases, repeated respiratory infections like pneumonia, influenza, poor immunity and response to frequent exposure to allergens.

There may be a few individuals, which form a much smaller group of COPD patients, who are genetically predisposed to development of COPD. They either do not secrete Alpha-1 Antitrypsin or altered function of Alpha1 antitrypsin. Individuals with Alpha-1 Antitrypsin deficiency may develop emphysema during their thirties or forties even without a history of significant smoking, though smoking greatly increases the risk for emphysema (Kumar V, Abbas AK, Fausto N, ed. 2005).

All these factors lead to one of the following:

Reduced flow of air in and out of the respiratory system

Excessive secretion of mucus within the airways

Increase in the airspaces beyond terminal bronchioles and associated loss of alveolar walls

Decrease in the elastic recoil of the lungs

Prolonged periods of bronchospasms

Chronic lung infections

All the above stated mechanisms result in either chronic bronchitis (recurrent, prolonged and sustained inflammation) or emphysema (permanent dilation of alveoli) which are described under COPD. Both entities can coexist. A patient of COPD very frequently develops episodes of bronchial asthma due to triggering of bronchospam.

### **REFERENCES**

**Blair, KA (1999).** The aging pulmonary system. In M Stanley and P Beare (Eds) *Gerontological Nursing* Philadelphia: FA Davis.

**Britt TL (1993).** Elderly Patients. In: JM Closhesy, C Breu, S Cardin, EB Rudy and AA Whittaker (Eds. *Critical care nursing* 1351-1372.

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**Connolly MJ (1998).** Age related changes in the respiratory system. In RC Tallis, HM Fillit and JC Brocklehurst (Eds). *Geriatric Medicine and Gerontology* London: Churchill Livingstone.

**Duchateau J (2003).** Immunosenescence and the lung. *Revue des Maladies Respiratoires* **20**(5 Pt 1) 735-741.

**Janssens JP, Pache JC and Nicod LP (1999).** Physiological changes in respiratory function associated with ageing. *European Respiratory Journal* **13**(1)197-205.

**Kumar V, Abbas AK and Fausto N (2005).** *Robbin and Cotran Pathological Basis of Disease* (7th Ed.) 911–912.

**Oyarzún G M (2009).** Pulmonary function in aging . *Revista médica de Chile***137**(3) 411-418.

**Rossi A, Ganassini A, Tantucci C and Grassi V (1996).** Aging and the respiratory system. *Aging (Milano)* **8**(3) 143-161.

**Sharma G and Goodwin J (2006).** Effect of aging on respiratory system physiology and immunology. *Journal of Clinical Interventions in Aging* **1**(3) 253-260.

**Sharma G, Hanania NA and Shim YM (2009).** The aging immune system and its relationship to the development of chronic obstructive pulmonary disease. *Proceedings of the American Thoracic Society* **6**(7) 573-580.

**Taylor BJ and Johnson BD (2010).** The pulmonary circulation and exercise responses in the elderly. *Seminars in Respiratory and Critical Care Medicine* **31**(5) 528-538.

**Ustiuzhaninova NV and Shishkin GS (2002).** Age changes in interalveolar septa and their relationship to a decrease in gas exchange. *Morfologiya* **121**(1)84-88.