

Lung Health in Old Age

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- Dr Kalpana Chandra

Introduction

Ageing is responsible for various structural and functional changes in the respiratory system. Alterations in normal functioning of the lungs is associated with decline in exercise capacity as well as occurrence of different diseases. Let us understand the issue in greater detail.

What are Age associated changes in Lung Structure and Function?

Ageing impacts the structure and functions of lungs as follows:

A. Changes in Lung Structure

There are three changes in lung structure in the elderly:

1. *Loss of elasticity:* Lungs are able to expand while we breathe in (inflation) and contract when we breathe out (deflation) as they are composed of elastin and collagen. With ageing, there is loss of elastin which leads to poor deflation and consequently, lungs become voluminous and rounded in shape. Further, with ageing there is an increase in number of crosslinks between the various subunits of collagen leading to increased rigidity of lungs.
2. *Bony changes:* Due to aging there is calcification of joints of ribs, breast bone and vertebral column, resulting in decreased chest expansion.
3. *Respiratory muscle changes:* With ageing there is decreased muscle strength and atrophy of muscles of chest and ancillary respiratory muscles.

B. Changes in Lung Function

There are two fundamental age-related changes in lung function in the elderly

1. Reduced ability to inhale and exhale completely leading to air trapping in the lungs.
2. Decline in Diffusion Capacity: With age, there is a gradual decline in gas exchange and blood flow (perfusion) of the lungs leading to decrease in capacity of the lungs to transfer inspired oxygen to blood i. e. reduced diffusion capacity.

Which other factors contribute to Lung Health and Disease in Elderly?

Apart from ageing, many other factors also influence functioning of the lungs.

1. *Decreased exercise:* Apart from age associated decline in exercise capacity, sedentary life style, reduction in daily activities (both instrumental activities of daily living (IADL) and activities of daily living (ADL) result in reduced gas exchange in the lungs.

2. *Disturbed sleep*: Difficulty in onset of sleep, maintenance of sleep, early morning awakening and non-restorative sleep all contribute to respiratory muscle fatigue along with adverse impact on respiratory centres in the brain.
3. *Altered gastrointestinal motility*: Regurgitation of food and acid is associated with risk of aspiration pneumonia.
4. *Impaired defence mechanisms* and reduced disease fighting ability (immunity) can also lead to various infections of lungs in the elderly. In addition, impairment in cough reflex with inefficient clearance of aspirated particles, results in discomfort, foreign body sensation and super-added infections.
5. *Exposure to Air Pollution*: There are cumulative adverse effects of exposure to occupational and environmental dusts and noxious gases on lung health.
6. *Tobacco smoking*: is the commonest and avoidable cause of lung injury and diseases like obstructive airway disease and lung tumours.
7. *Non-Communicable Diseases (NCDs)*: like diabetes, high blood pressure and certain cardiovascular and neurological diseases also impact lung function adversely.

What are common Lung Diseases in the Elderly?

The common lung diseases in the elderly may be classified as

- A. Infectious Lung Diseases
 1. Pneumonias
 2. COVID 19
 3. Tuberculosis

- B. Non-Infectious Lung Diseases
 1. Chronic obstructive pulmonary disease
 2. Bronchial Asthma
 3. Lung tumors
 4. Aspiration
 5. Obesity hypoventilation syndrome
 6. Sleep apnea syndromes

A. Infectious Diseases

A.1. Pneumonias

These are most common respiratory infections. Common symptoms are fever, malaise, fatigue, weakness and cough with or without expectoration. Occasionally blood-streaked expectoration may also be present. Pneumonias can be caused by a range of microorganisms like bacteria, viruses, fungi (in patients with reduced immunity like diabetics).

Treatment of pneumonia is with appropriate antibiotics, steam inhalation, proper hydration and adequate nutrition.

A.2. COVID-19

Due to the current COVID-19 Pandemic, this segment is being described in greater detail.

COVID-19 is a novel coronavirus and is also called **Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV 2)**. COVID-19 results in complete spectrum of respiratory illness ranging from mild cough and cold to life threatening pneumonia and respiratory failure.

The elderly with comorbidities such as COPD (Chronic Lung diseases), Diabetes, High blood pressure, **obesity**, chronic liver and kidney diseases and those on immune suppressants **are at high risk for COVID 19 and** more severe illness.

The common symptoms of COVID 19 are fever, shortness of breath, cough and fatigue. The other symptoms are sore throat, running nose, nasal congestion, loss of smell and taste, muscle pains and chills associated with shaking.

COVID-19 remains suspended in droplets in air and survives on surfaces for a long period of time. The spread of infection is through exposure to droplet infection in the form of inhalation of infected aerosol as well as contact with a person or a surface contaminated by COVID-19. The virus is very contagious and has an incubation period between two to fourteen days. Of late air borne transmission has also been postulated as mode of transmission.

COVID-19 in elderly can be a life-threatening illness as the infection begins in small areas of lungs and then spreads rapidly like wildfire. COVID-19 pneumonia also lasts longer than other pneumonias. The virus damages the lung tissue and causes multiple organ dysfunction and fall in blood pressure.

Diagnosis is by detecting the virus in samples taken from nose and throat and analysed through RT PCR. X-RAY Chest, CT scans of lungs and blood investigations.

Treatment is by oxygen therapy and mechanical ventilation in case of respiratory failure. In case **secondary bacterial infection** antibiotics are used. The recommended **target oxygen saturation** range for patients with **COVID-19** is 92–96%. It is advised to monitor for oxygen saturation and may need hospitalisation if the oxygen saturation starts falling. Elderly persons may require also hospitalization if they develop breathing difficulties, confusion, drowsiness, chest pain, palpitations and bluish discolouration of lips. Most patients recover from COVID-19 provided they do not delay investigation and treatment after experiencing symptoms and if they follow appropriate treatment as advised.

In some cases there may be long term effects due to lung scarring and breathing difficulties may continue even after recovery from COVID19 pneumonia.

A.3. Tuberculosis

Older people are especially vulnerable to Tuberculosis. Tuberculosis in the elderly may be due to reactivation of previous tubercular infection (previously dormant focus) or fresh infection due to reduced immunity. The common symptoms are low-grade fever, malaise, sputum production, occasionally with blood, loss of appetite and weight. Tuberculosis in the elderly is a serious disease and may spread to other organs too. Common investigations include Chest X-ray and Sputum test (for AFB).

Tuberculosis in the elderly is treated with Anti Tubercular Treatment (ATT). ATT has defined regimes including both first- and second-line drugs. The regimen for ATT must be strictly adhered to prevent treatment failure and treatment resistance to first and later second line drugs. Government of India provides free ATT under its Directly Observed Treatment Strategy (DOTS) programme.

B. Non-Infectious Diseases

B.1. *Chronic Obstructive Pulmonary Disease (COPD)*

COPD begins in the middle age and progresses over time. It is commonly seen in smokers which includes those using cigarettes, beedis, hookahs etc. In addition, exposure to air pollution (occupational and environmental dusts and noxious gases as well as household air pollution due to use of biomass fuels) can also contribute to COPD. The most common symptom is breathlessness which may occur with mild exercise or rest. Further, recurrent infections increase morbidity. If there is associated obesity, there is increased work of breathing and further respiratory weakness.

The first step in COPD management is strict cessation of smoking and tobacco use in any form. Treatment includes use of bronchodilators (inhalers, nebulised forms and oral tablets) and expectorants. Prompt treatment of concomitant infections is also required. Domiciliary oxygen also goes a long way in improving quality of life. Chest exercises to strengthen respiratory muscles helps in mitigation of symptoms of breathlessness.

B.2. *Bronchial Asthma.*

It rarely starts de-novo in old age and is usually attributed to pre-existing bronchial asthma from young age. Bronchial asthma in the elderly is poorly tolerated.

Asthma is treated with nebulization with bronchodilators and agents to clear mucus. Steam inhalation is helpful in relieving symptoms. Coexisting infection is managed by appropriate antibiotics.

B.3. *Lung Tumours*

In the elderly lung tumours can arise primarily in the lungs or there can be secondary involvement due to spread of tumour from other parts of body such as breast, genital and reproductive and gastrointestinal tract and prostate. Primary lung tumours commonly occur in sixth and seventh decade of life.

B.4. *Pulmonary Aspiration*

Aspiration occurs due to disturbances in gastrointestinal motility in semiconscious and unconscious persons and results in pneumonia.

B.5. *Obesity Hypoventilation Syndrome*

In elderly with severe obesity, laboured breathing occurs during activity with daytime drowsiness and sleep apnoea. There are periods of complete cessation of breathing followed by increase in rate of breathing and snoring resulting in increased carbon dioxide and reduced oxygen levels in the blood.

B.6. *Sleep Apnoea Syndrome*

Both central and obstructive sleep apnoea are common in elderly and are due to hormonal and neuromuscular changes, reduced blood supply and decreased responsiveness of the central respiratory centres.

How are Lung Diseases Diagnosed and Treated in General?

All the lung diseases require diagnosis and management by specialist physician or chest physician. Investigations include X-Ray Chest, CT Scan, blood tests, sputum examination, lung function tests and sleep studies. Occasionally, invasive tests such as biopsy and bronchoscopy may be required. With advances in medical science, most lung disease have evidence-based treatment and good outcomes. Steam inhalation, nebulisation and chest physiotherapy are additional modalities apart from oral and injectable medications. Sometimes, treatment in the elderly is challenging as the elderly may have poor tolerance to drugs with increased risks of drug toxicity. Specific treatments have been described earlier.

What are Prevention Strategies to maintain Lung Health?

There are several strategies for maintaining lung health in the elderly.

1. *Tobacco cessation*: is the most important step in improving lung health. Tobacco cessation should be implemented regardless of previous duration of smoking. Within a few minutes after quitting tobacco heart rate reduces, in a few days carbon monoxide levels decline to that of non-smokers and

over the next one year the symptoms of coughing and breathlessness decline progressively. Stopping tobacco improves lung and cardiac functions, reduces worsening of COPD, reduces risk of cancers and enhances general health.

2. *Balanced diet appropriate* for nutritional needs of the elderly can enhance immunity and also reduce obesity which also compromises lung function.
3. *Age-appropriate exercise*: is essential for improving aerobic capacity and lung functions
4. *Breathing exercises and Pranayama*: help in improving lung expansion and deflation thereby improving gas exchange. The regulation of breathing cycle also improves exercise tolerance and maintains lung health.
5. *Rest*: It is important to recognise that the exercise and work capacity of elderly progressively declines as part of ageing. While exercise is beneficial, the elderly should also schedule regular rest as part of their daily routine to prevent excessive exertion.
6. *Sleep Hygiene*: refers to simple strategies to promote natural sleep, establish natural sleep-wake cycle and not to depend on sleeping pills.
7. *Regular treatment* of underlying lung diseases: is important to prevent worsening of lung functions and super added infections.
8. *Regular treatment of NCDs*: is important not just for general well-being but also to prevent adverse effects of NCDs (Hypertension, Diabetes) on lung function.

The elderly, often, neglect their symptoms and avoid investigations especially invasive investigations. Regular treatment implies regular consultation and follow up with treating specialist, compliance with advised investigations and adherence to prescribed treatment. If more than one specialist is treating any patient, it is important that the prescriptions of all specialists are shared with each other to prevent duplicate prescribing of same drugs and drug interactions between drugs prescribed by different doctors.

Conclusion

Ageing is a part of natural human cycle. While people are living longer with advances in medical science and better nutrition, it is equally important that people maintain lung health in old age. Implementation of preventive strategies as well as prompt diagnosis and treatment can reduce morbidity and ensure wellbeing.

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