

## REVIEW ARTICLE

### A MINI-REVIEW ON RESPIRATORY DISEASES- CHRONIC OBSTRUCTIVE PULMONARY DISEASE, TUBERCULOSIS, AND PNEUMONIA- A GLOBAL HEALTH ISSUE

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**Abstract:** The lungs are the crucial organ that can be infected or injured by airborne particles. Respiratory disorders are the main cause of mortality and morbidity worldwide. COPD affects around 65 million people globally and kills three million people annually, the world's third greatest reason for mortality. Pneumonia kills millions of citizens each year and is the top cause of mortality in kids under the age of five. Every year, about Ten million people contract tuberculosis (TB), and more than one million people die from it, ranking it as the most prevalent fatal infectious illness. "Prevention, control, and cure" of these disorders, as well as improvement of lung diseases, must be primary concerns in global health judgment. The current article will, without hesitation, raise global understanding about the major respiratory illnesses and spur actions among all stakeholders. This article presents a comprehensive study and highlights the recent changes in respiratory diseases such as Chronic Obstructive Pulmonary Disease, Tuberculosis, and Pneumonia considering the extent of a global problem, Epidemiology, Pathology and pathogenesis, preventive strategies, and treatment.

**KEYWORDS:** Respiratory Disease; COPD; Tuberculosis; Pneumonia

#### **INTRODUCTION:**

Because of its frequent contact with particulates, toxins, and infectious organisms in the surrounding atmosphere, the lung as the internal organ is most sensitive to infection and harm from the surrounding factors. An estimated two billion people have been exposed to harmful smoke from biomass fuels, which are often inefficiently burned in poorly ventilated domestic stoves or fireplaces. 1 billion people breathe contaminated outdoor air, and another billion breathe cigarette smoke. Poverty, overcrowding, environmental triggers, and bad living conditions promote sensitivity to this vast set of illnesses, which

causes disability and mortality in all countries of the globe and all social groups. Respiratory infections wreak havoc on the global health system. There is primarily 5 disease that led to death or severe illness in the human body <sup>[1]</sup>. Approximately three million people worldwide die every year from moderate to severe "chronic obstructive pulmonary disease (COPD)", the world's third greatest cause of death worldwide, and the count is still increasing <sup>[2]</sup>. Asthma affects around 334 million people worldwide and is the most prevalent chronic disease of childhood, impacting 14 percent of children worldwide. Asthma is becoming more common in youngsters <sup>[3,4]</sup>.

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"Acute lower respiratory tract infections" have been one of the leading causes of mortality and morbidity in both adults and children for years. Though it's difficult to measure the impact, it is believed that it kills about four million people each year and is the main cause of mortality in kids under the age of five. In addition, "acute lower respiratory tract infections" in children are linked to the development of chronic respiratory disorders later on in life. Influenza-related respiratory tract illnesses kill approximately 500,000 individuals each year<sup>[5,6]</sup>. Tuberculosis (TB) affected 10.4 million people in 2015, with around more than one million deaths. Lung cancer is the most frequent deadly neoplasm in the world, killing more than 1.5 million people every year. Moreover, sleep-disordered breathing, pulmonary hypertension, and occupational lung diseases are the other respiratory diseases, however, less quantified<sup>[7]</sup>.

More than 10 percent of all "disability-adjusted life-years (DALYs)", a statistic that measures the quantity of active and involved life lost owing to a disease, are attributable to respiratory diseases. Only cardiovascular disorders are more common than respiratory diseases. 5 of the top Thirty causes of mortality are respiratory diseases. More than a billion people worldwide struggle with acute and chronic respiratory illnesses. The harsh reality is that four million individuals die early each year as a result of chronic respiratory illness. Infants and small kids are especially vulnerable. The present article presents a comprehensive study of respiratory conditions such as Chronic Obstructive Pulmonary Disease, Tuberculosis, and Pneumonia<sup>[8,9]</sup>.

### **Chronic Obstructive Pulmonary Disease**

"A potentially preventable and treatable condition characterized by airflow limitation that is not reversible," according to the definition of COPD. The airflow restriction is generally progressive, and it's linked to an aberrant inflammatory response of the lungs to irritating particles or gases, which is most commonly induced by cigarette smoking. While COPD damages the lungs, it has far-reaching

repercussions throughout the body." COPD is the 3rd biggest cause of death worldwide, according to the global burden of disease estimates. COPD was the 2nd largest cause of "disability-adjusted life-years lost" in 2010, with almost 3 million deaths. COPD also has major systemic implications, such as an elevated risk of "vascular disease, osteoporosis, muscle wasting, and cancer". COPD places a significant strain on the patients and their families in terms of wellness quality of life and health status on an individual basis<sup>[10-12]</sup>.

The pathogenesis of COPD is complicated, with systemic and pulmonary inflammation playing a role in disease progression and the emergence of comorbidities. COPD is characterized by inflammatory cell infiltration and elevated levels of pro-inflammatory cytokines in the blood and lungs. COPD patients with higher levels of inflammation have a faster loss of lung function and a higher incidence of linked comorbid illnesses. Diet and nutrition have been linked to the loss of lung function which is characteristic of COPD. Nevertheless, little is known about the influence of "medical nutrition therapy (MNT)" and "nutrition-related therapies" on COPD outcomes. Because existing COPD medications are limited, addressing measures for postponing the onset and progression of COPD is critical for enhancing "quality of life (QOL), prolonging survival, and controlling costs in COPD patients"<sup>[13-15]</sup>.

In the "Evidence Analysis Library, the Academy of Nutrition and Dietetics" issued its first COPD "Evidence-Based Nutrition Practice Guideline (EBNPG)" in 2008. "EBNPGs" is "a series of guiding statements that are generated utilizing a systematic procedure for locating, assessing, and synthesizing scientific evidence," according to the Academy. EBNPGs give timely and comprehensive information to "registered dietitian nutritionists (RDNs)" when making nutrition care decisions for their patients. An additional evidence assessment workgroup was established in 2014 to update the original EBNPG, which was then published on the EAL in August

2019. This report explains how the systematic review and guidelines were completed, as well as the recommendations and supporting evidence. The COPD EBNPG presents the most up-to-date, evidence-based overview of successful nutrition management for COPD patients. The effectiveness of MNT, methods for estimating energy requirements, macronutrient composition of the diet, the impact of body weight (BW), vitamin D supplementation, and serum 25-hydroxyvitamin D (25[OH]D) status are some of the main areas of research. These suggestions, which are based on the Nutrition Care Process (NCP), start with an individualized nutrition assessment, and then move on to "intervention, monitoring, and evaluation". RDNs and other clinicians will benefit from the implementation of this EBNPG by being able to better care for COPD patients<sup>[16, 17]</sup>.

### Prevention and Treatment

The first and most essential tasks in preventing COPD are to discourage people from starting to smoke tobacco and to encourage smokers to minimize and quit. Chimney cookstoves and associated devices that reduce interior smoke exposure reduce the risk of respiratory conditions in kids and may reduce the prevalence of COPD in nonsmokers, especially women. Childhood immunizations, as well as early diagnosis and treatment of lower respiratory tract infections, will help to reduce the airway injury that leads to COPD later in life. COPD can start as early as childhood. Controlling workers' exposure to dust, as well as other environmental measures, could have a significant impact on reducing the prevalence of COPD. In asymptomatic people, extensive population screening for COPD is not suggested, however, spirometry is advised in communities with risk factors and respiratory symptoms. People who have been subjected to smoke from cigarette and biomass fuels, industrial dust, and toxins, and have a family history of "α1-antitrypsin deficiency" should be diagnosed<sup>[18, 19]</sup>.

Spirometry is the 1st stage in COPD treatments and is critical to creating a clinical diagnosis. Spirometry prevents misinterpretation and aids in determining the degree of airflow restriction. To diagnose and cure the disease, it is critical to identify risk factors and reduce their exposure. It is also crucial to avoid pollution levels and other triggering variables. All smokers must be recognized and offered assistance to help them quit. Seasonal influenza vaccination can minimize the incidence of severe exacerbations caused by influenza. Inhaled bronchodilators are the fundamental drugs that aid these individuals, along with the elimination of respiratory irritants and the timely detection and treatment of respiratory infections. Patients with recurrent relapses and significant airflow blockage may receive treatment with long-acting "bronchodilators, inhaled corticosteroids, and other pharmacological and nonpharmacological treatments"<sup>[20]</sup>.

Oxygen therapy may be required for people with decreased blood oxygen levels. Long-term oxygen therapy can help patients with very low oxygen levels live longer and have an improved way of life. Although trouble breathing can lead to decreased activity and eventual deconditioning, keeping physical fitness and exercise is critical. As a result, many persons with COPD benefit from exercise-based pulmonary rehabilitation. Most people's lives can be extended by treating comorbid ailments. Medical strategies that define the proper management of persons with COPD are available. Numerous studies have indicated that COPD is undertreated in both its early and severe stages, despite the abundance of clinical practice standards<sup>[21]</sup>.

### Diagnosis

Dyspnea, a persistent cough that is either productive or non-productive, a reduced ability to exercise, loud wheezing, and more frequent or long-lasting bronchial infections are all clinical signs of COPD. Weight loss is another sign of severe COPD. The progression of the disease's symptoms is typically sluggish. Shortness of breath is avoided by reducing physical activity, but those who don't exercise much,

to begin with, can frequently sustain a considerable restriction of their pulmonary function without any symptoms at all. According to a study<sup>[42]</sup>, at the time of diagnosis, 31% of COPD patients had significant airway blockage (GOLD 3 or 4) previously.

The physical exam is used to identify further COPD symptoms, find comorbid illnesses, and rule out the most significant differential diagnosis. Inspection may uncover thoracic skeleton anomalies, such as kyphoscoliosis. Evidence of a pleural effusion or left heart failure may be found through auscultation and percussion. Adventitious lung sounds that are continuous or melodic are typical findings but are not always present. They are audible during asthma attacks and result from the mucous coating and airway constriction. Only really severe symptoms and indicators have a strong positive predictive value, not the history or physical findings. To securely confirm the diagnosis of COPD, airway obstruction must be proven by pulmonary function testing (Figure 2). The major purpose of additional diagnostic tests is to eliminate competing differential diagnoses.

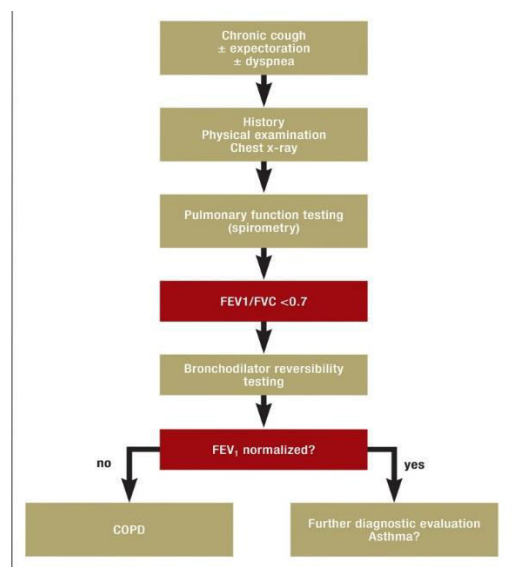


Figure 1: COPD diagnostic procedure<sup>[36]</sup>

A two-plane chest x-ray is a requirement of the initial assessment. It aids in excluding the following potential differential diagnoses: interstitial lung disease, pleural effusion, congestive heart failure, and

lung tumor are the first four conditions. During the initial assessment, an electrocardiogram (ECG) should also be taken. The Copenhagen City Heart Study found that 14.6% of COPD patients in GOLD stage 2 and 16.3% of COPD patients in GOLD stages 3 and 4 also had coronary heart disease. If cor pulmonale is suspected or if there is any indication of left heart failure, echocardiography should be performed<sup>[41]</sup>.

Only in extreme COPD instances, in patients with polycythemia, or patients with cor pulmonale is an arterial blood-gas study required. Additionally, it is advised for individuals whose pulse oximetry oxygen saturation level is below 92%. A complete blood count is used in the differential diagnosis of COPD to rule out anemia as a potential cause of dyspnea. Alpha-1-antitrypsin deficiency testing is advised for persons under the age of 65 who have smoked fewer than 20 pack-years because it may be a genetic cause of COPD. The Box provides a summary of the diagnostic tests that are not advised as part of a routine examination<sup>[41]</sup>.

## Tuberculosis

Tuberculosis also known as TB is a long-established illness that has afflicted humans for over four thousand years. It's a long-term infection caused by the bacteria named "Mycobacterium tuberculosis" that spreads through the air from individual to individual. TB is most commonly associated with the lungs, although it can also damage the "brain, intestine, kidney, or spine". The symptoms of tuberculosis vary depending on where the germs are developing in the body. Symptoms of pulmonary tuberculosis include a "chronic cough, chest pain, hemoptysis, weakness or fatigue, weight loss, fever, and night sweats"<sup>[22]</sup>.

In impoverished nations, such as Bangladesh, tuberculosis remains a primary cause of mortality and morbidity. It was thought that once chemotherapy was discovered in the 1940s and the standardized short course was adopted in the 1980s, TB would be eradicated internationally. However, most developed

nations were seeing a decline, this was not the case in many developing countries. TB is the most prevalent cause of death from a single source of infection among adults in underdeveloped nations, accounting for around 7 percent of all deaths. This is the first infectious disease to be declared a global health emergency by WHO. Globally, there were more than nine million reported cases of tuberculosis in 2007, more than thirteen million prevalent cases, 1.32 million fatalities from TB in HIV-negative people, and around half a million deaths in HIV-positive people in 2007. Africa and Asia together account for 86 percent of all cases. In 2007, Bangladesh was the 6th most affected by tuberculosis among 22 high-burden nations [23-25].

Males are more likely than females to be affected. In most nations, males receive more case reports than females. In 2004, 1.4 million males and 775,000 females had smear-positive tuberculosis. Internationally, the ratio of women to men TB cases reported is 0.47:0.67. The causes of these gender disparities are unknown. These disparities could be related to "differences in infection prevalence, rate of progression from infection to disease, underreporting of female cases, or access to services". The relationship between poverty and tuberculosis is well-known, and the poorest members of the community had the highest TB rates. TB is more common in low-income people who live in congested places and people who have not completed high school. Poverty can lead to poor nutrition, which has been linked to immune system dysfunction. Poverty, on the other hand, is likely to enhance the risk of TB transmission due to overcrowding, poorly ventilated, and unhygienic practices [26-28].

### Prevention and Treatment

Inhaling very few tuberculous bacteria is enough to cause illness. However, only about one in every ten people infected with "Mycobacterium tuberculosis" will develop active disease, while the likelihood is substantially higher in youth and adults with immune deficiencies. Since this infection is contained by the body's immune system, tuberculosis remains

dormant, however, it can reactivate at any time during a person's lifetime. The disease's two-phase development affords a window of opportunity for prevention. The chance of getting active tuberculosis can be significantly decreased by identifying people who have been proven or are very likely to have the latent infection and treating those who have symptoms or circumstances that raise the risk of disease [29].

Different medication regimes for treating dormant tuberculosis have already been proven to be effective. Although the current vaccination, Bacille-Calmette-Guérin (BCG), only provides partial protection against tuberculosis, it does minimize the incidence of disseminated tuberculosis and tuberculous meningitis in children. BCG vaccine had a fifty percent protective efficacy against all forms of tuberculosis, although it was higher in serious infections (64 percent in cases of tuberculosis meningitis and 78 percent in disseminated infection). Numerous novel tuberculosis vaccines are being developed. These vaccinations are now being field-tested in several countries in various stages. Researchers from all across the world are attempting to develop a better tuberculosis vaccine [30].

About the treatment of Tuberculosis, "DOTS (directly observed therapy short course)" has been hailed as a breakthrough in tuberculosis treatment. It has become the foundation of tuberculosis treatment in many nations. Over time, the number of nations participating in DOTS has grown, as has the coverage of DOTS inside those countries. With the adoption of DOTS, approximately 35 million people have been cured and 8 million fatalities have been prevented during the last fifteen years. DOTS was first implemented in Bangladesh in 1993, and it progressively spread throughout the country.

Many cases of tuberculosis can be healed if detected early and treated adequately with standardized procedures. Providers in all healthcare sectors and nations should adhere to the "International Standards for Tuberculosis Care". Compliance with treatment is

difficult due to the long treatment duration, particularly in people who are taking multiple medications for chronic conditions like HIV infection. Failing to achieve the full course of prescribed medications can result in a relapse of "drug-resistant disease", which would be harder to treat and can be dangerous to others. As a result, monitored or directly observed treatment is advised as the gold standard of care to strictly adhere to during treatment<sup>[31]</sup>.

### Diagnosis

The collection and testing of two sputum smears are advised by the current WHO international policy on TB case detection for the diagnosis of pulmonary tuberculosis. Based on a systematic assessment of 37 studies that were eligible and assessed the incremental diagnostic yield of serial sputum samples, it was decided to reduce the number of smears from three to two. According to the findings, the first sputum sample detected around 85.8% of TB cases. The average incremental yield for the second sputum sample was 11.9%, whereas the incremental yield for the third sample, which was used when the first two samples were negative, was 3.1%. According to a Kenyan study, fewer smears analyzed for the detection of new pulmonary TB infections resulted in fewer patient visits to clinics and lighter workloads in the labs. Therefore, the evaluation of just two smears could reduce the workload of laboratories by one-third, especially in nations with a high microscope workload. Additionally, it is anticipated that the microscopic examination of two sputum smear samples will boost case results through better service, quicker diagnosis and treatment, and fewer patients abandoning the diagnostic pathway<sup>[37, 38]</sup>.

Patients will also spend less time in the diagnostic center, which might save costs for them and enhance infection control procedures. However, it is also advised that only in settings with a fully operational EQA program for smear microscopy, including the on-site evaluation and follow-up training for problem laboratories, and a network of well-established

laboratories should the recommendation to reduce the number of specimens examined for the screening of TB patients from three to two specimens be made.

Additionally, the WHO has advised that conventional Ziehl-Neelsen (ZN) microscopy be phased out in favor of LED microscopy in both high-volume laboratories and low-volume laboratories and that LED microscopy be replaced by conventional Ziehl-Neelsen (ZN) microscopy in all settings where fluorescent microscopy is currently used. Additionally, nations implementing LED microscopy ought to deal with issues like training requirements, particularly for lab staff unaccustomed to fluorescent techniques, validation during the learning phase, observation of trends in case detection and treatment outcomes, and the introduction of customized systems for internal quality control and external quality assessment<sup>[38]</sup>.

The WHO advises middle- and low-income nations to implement a liquid medium system for culture and DST in stages. A liquid culture and DST system should also be implemented based on need and following the NTCP's national plan for building and expanding TB laboratory capacity. If a national TB reference laboratory (NTRL) is already managing quality-assured (QA) microscopy of the laboratory network and carrying out TB culture and DST using solid media, then implementing the system in the NTRL would typically be the priority. Regional TB culture and DST laboratories should logically be included as part of the next expansion of the liquid culture and DST capacity. The WHO also examined noncommercial culture and DST techniques and advised that a few of these techniques, including the nitrate reductase assay (NRA) and the microscopically observed drug susceptibility (MODS) assay (both of which are described below), be used as a temporary fix in resource-constrained settings while the capacity for genotypic and/or automated liquid culture and DST is being developed<sup>[37]</sup>.

Additionally, it was advised that all mycobacterial isolates be characterized at least to the point that the MTBC isolate can be distinguished from nontuberculous mycobacteria (NTM). It is crucial to utilize a quick and economical method of species identification when using liquid culture with a much shorter time to detection. Because of the lengthy turnaround time and the unpredictability of results, standard biochemical assays and other techniques requiring prolonged incubation durations are not regarded as suitable for identifying the MTBC isolate. Similar to corded AFB produced in liquid media, its presence is suggestive of the existence of an MTBC organism but it shouldn't be employed as the sole means of diagnosis.

### **Pneumonia**

Pneumonia is a type of acute respiratory infection that damages the lung parenchyma and oxygenation, according to the WHO. The condition is diagnosed depending on the medical presentation, which is supported by a chest X-ray that shows fresh shadowing. Bacteria are the most common cause; however, they can also be caused by other microbes. The classification of pneumonia can be given as "1. CAP - community-acquired pneumonia; 2. HAP - hospital-acquired pneumonia (occurs 48 hours after admittance); and 3. VAP - ventilator-associated pneumonia (develops more than 2 days after endotracheal intubation)"<sup>[32]</sup>.

Pneumonia rates vary depending on geographic area, health personnel, and demographics. "Lower respiratory tract infections, such as pneumonia", are the 4th leading cause of death worldwide. The World Health Organization last evaluated the prevalence of pneumonia in 2008, with more than 400 million illnesses and four million fatalities per year. CAP has been the most common cause of infection-related death worldwide, with an incidence rate of 5e11 per 1000 adults in North America And Europe<sup>[33]</sup>.

Pneumonia is induced by pathogens invading and overgrowing in the pulmonary parenchyma, causing

intra-alveolar secretions. Micro-aspiration is the most common way for pathogens to reach the respiratory tract. Once the natural defense mechanisms are beaten or extremely deadly infections invade the lungs, pneumonia can emerge. It can also be acquired through the bloodstream from other sources or by direct transmission from an infectious source. "Bacteremia, sepsis, meningitis, empyema, and septic embolism" can all result from infection spreading from the lungs. Several immune cells, such as neutrophils, travel into the lung air space to destroy bacteria as a result of the "acute inflammatory response" to pneumonia<sup>[34]</sup>.

### **Prevention and Treatment**

The BTS emphasizes the importance of regular influenza and pneumococcal immunization as a key CAP prevention strategy. These vaccines are presently being administered to adolescent and elderly people, and those with co-morbidities. Seasonal influenza vaccine and 23-valent pneumococcal polysaccharide vaccine should have been given to at-risk persons and individuals over the age of sixty-five, according to regulations. The Fluenz Tetra nasal spray is being used by Public Health England to increase influenza vaccine coverage in children, and a "13-valent conjugated pneumococcal vaccine" is also given to infants. All patients with a history of smoking cessation who've been diagnosed with pneumonia should be given smoking cessation advice. High alcohol use raises the danger of CAP, which should be addressed by sufferers. Children with lower respiratory tract infections should be avoided by immunocompromised and at-risk individuals. Improved dental hygiene may also be beneficial<sup>[34]</sup>.

The "probable pathogen, local resistance pattern previous microbiological specimens, patient's degree of disease, immunocompromised conditions, allergies, and travel history" are all considerations to consider when developing a treatment strategy for a patient with pneumonia. The localized epidemiology of resistance patterns is considered in most medical domains. Because streptococcal resistance to

penicillin is uncommon in the United Kingdom, numerous guidelines recommend penicillin-based therapy as the first line of defense. Antibiotic selection should be customized to the occurrence of resistant organisms in many different nations. People with severe pneumonia should have appropriate "fluid resuscitation, oxygen therapy, and close observation" with extra supportive treatment as needed, in addition to antibiotic treatment within about a 60-minutes. Because "Gram-negative and multidrug-resistant organisms" are more common in HAP and VAP, antimicrobial treatment may need to be broadened. Local sensitivities or past known microbial evidence in the individual patient must be carefully considered while developing guidelines<sup>[35]</sup>.

### Diagnosis

Microbiological testing on CAP patients should at the very least include a sputum culture, a urine antigen test for *Legionella pneumophila* and *Streptococcus pneumoniae*, and a blood culture<sup>[12]</sup>. It is possible to do additional serological research for atypical bacterial infections. In investigations incorporating in-depth microbiological analysis of CAP patients, 53–75% of the sample had an aetiology determined. These investigations found *S. pneumoniae*, *Mycoplasma pneumoniae*, and *Haemophilus influenzae* to be the most prevalent pathogens<sup>[39]</sup>.

Although blood cultures conducted before the start of antibiotic therapy have very high specificity, they are only positive in less than 20% of circumstances. Because pathogens like *S. aureus* and Gram-negative bacilli are commonly isolated and unaffected by empirical therapy, blood cultures from patients with severe CAP have a greater yield. In about 40% of patients with CAP, pleural effusion is evident. Because pleural invasion occurs seldom, pleural exudate culture has a very high specificity but a low sensitivity. With a specificity of 93–96%, the Gram stain has a sensitivity of roughly 80% in pneumococcal pneumonia cases and 78% in staphylococcal pneumonia cases<sup>[39]</sup>.

A molecular diagnostic method based on DNA detection; PCR has the benefit of producing results in a short period. Additionally, because PCR does not require live bacteria, antimicrobial medication has less of an impact. In 184 consecutively admitted patients with a diagnosis of CAP in research by Johansson, 80% of those with a positive PCR test and a negative sputum culture had received antibiotic treatment before sputum collection. An aetiological diagnosis was made using molecular methods after 4 days or more of antibiotic treatment, but only in the first 2 days of treatment using conventional diagnostic methods in another study on the impact of antibiotic treatment on the accuracy of diagnosing invasive pneumococcal disease using culture or molecular methods<sup>[40]</sup>.

In the world, viral and atypical pathogens account for 10–22% and 1–28% of all pneumonia cases, respectively. A microbial aetiology was found in 853 (38%) cases in a recent study by Jain<sup>[1]</sup> that examined 2320 cases of pneumonia and used an elaborate microbiological diagnosis, including viral molecular methods. Respiratory viruses (23%), bacterial aetiology (11%), and co-infections (3%), were the three primary causative agents identified. This study was particularly significant for contextualizing two topics. Thanks to molecular approaches, 1) the isolation of viruses in CAP is considerably more common than previously believed, and 2) although molecular methods are superior to microbiological cultures, these methods are not perfect in terms of operational values<sup>[40]</sup>.

### Summary

Respiratory disorders pose a significant threat to human existence, wellness, and productivity. The "prevention, control, and cure" of these conditions, as well as the promotion of respiratory health, must be put paramount in international health judgment calls. The WHO considers respiratory illness "control, prevention, and cure" to be among the most expensive health interventions available — a "best-buy." Lifespan, healthy lifestyle periods, and



economies will all benefit from investments in respiratory health. Environmental control and public knowledge are crucial factors in preventing respiratory infections. Reduced tobacco smoking and improved air quality, which comprises less secondary cigarette smoke, smoke from indoor fires, and bad public and industrial air, are the most controllable aspects.

In low-income nations, improving childhood vaccination programs and increasing access to pneumococcal vaccination should be a top priority. HIV infection can be prevented and treated early, which can help to reduce the burden of respiratory sickness. To improve lung health, healthcare professionals must be properly trained, and treatments and tests must be readily available. Finally, research into respiratory disorders is both a source of hope and a source of promise for the future. Many issues must be answered in research, including how lung diseases develop, how diseases spread, who is at risk, and what steps can be taken to control or cure them, to name a few. In addition, research must aid in our understanding of what keeps individuals healthy. The research-based measures must be both cost-effective and generally accessible.

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