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EVIDENCE FOR THE INCREASE IN ASTHMA WORLDWIDE

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ABSTRACT

The purpose of writing the current review paper is to review the history, current situation, control history, challenges, and ongoing management programs of asthma. Asthma is a disease of the airways that is characterized by chronic inflammation and disordered airway function. The government should make and adopt more strategies to promote the rational use of anti-asthmatic drugs and healthcare facilities and also make plans to disseminate more awareness among people about the schemes and programs made for safeguarding people against this life-threatening disease. The number of people suffering from asthma is more than the number of people suffering from HIV infection and tuberculosis. Understanding the recommendations of professional bodies will assist in medical decision-making in asthma management. The individual needs of patients should be considered by healthcare professionals. Asthma is chronic disease which mainly affects lungs. All over the world 300 million people are suffering from asthma. A recent review showed that most of "real-life" observational studies had not found significant effects of inhaled corticosteroids on growth in asthmatic children. The impact of asthma in children depends on complex interaction between disease severity, reaction of children towards disease, treatment efficiency, social roles, and social environment.

KEYWORDS: Asthma, epidemiology, etiological factors, pathophysiology, treatment.

1. INTRODUCTION

Asthma is a condition in which a person's airways become inflamed, narrow and swell and produce extra mucous which makes difficult to breathe".

The rising frequency of asthma worldwide is a serious issue that emphasizes how crucial it is to

research and comprehensive global asthma trends. Millions of people suffer from asthma, a chronic inflammatory disease of the airways that has a major negative impact on health for a variety of demographics. It is important to examine worldwide trends in asthma for a number of reasons.[1] In order to get insight into the environmental, behavioural, and genetic factors that may be contributing to the rise in asthma, it first allows policymakers and healthcare professionals to identify places with the greatest prevalence of the disease. Second, monitoring these patterns aids in evaluating how well asthma management and preventative techniques are working, especially in light of dietary and indoor living circumstances changes, urbanization, and increased air pollution. Additionally, researching asthma trends helps predict future medical requirements and guarantees that sufficient funds are set aside for research and treatment. Given the rising frequency of asthma worldwide, especially in low- and middle-income nations, it is critical to comprehend the underlying causes and geographical variations in prevalence in order to lessen the disease's effects. It is crucial to track and evaluate these trends as the prevalence of asthma rises globally in order to direct public health initiatives, enhance patient outcomes, and lessen the cost on healthcare systems around the globe.[2,3]

The "noisy breathing" was the proof that was discovered.[4] Ephedra, which was widely used as a natural remedy to treat asthma about 5000 years ago, was first tasted by Shen Nong in 2700 BC (Before Christ).[5] Usually occurring in spurts, asthma symptoms persist anywhere from a few hours to many days before subsiding when triggers are eliminated or asthma drugs are used. Asthma may be suspected if symptoms worsen at night or if they start as a result of exercise, exposure to cold air, or allergens. Exercise- induced asthma symptoms usually appear 15 minutes into an activity and go away 30 to 60 minutes later, unlike exertional dyspnea, which appears quickly after exertion begins and goes away within 5 minutes of stopping. Patients may also have a history of hay fever, eczema, or other types of atropy.

According to Indian ayurveda, asthma arises from an imbalance between the three doshas: pitta (bile), kapha (phlegm), and vata (wind). If these three humors are in balance, a person remains healthy. The Charaka Samhita, India's first Ayurvedic medical text, provides a thorough clinical account of this potentially fatal illness. According to a recent study on chronic bronchitis and respiratory symptoms, which involved 85,105 men and 84,470 women from 11 rural and 12 urban districts of India, the prevalence of asthma in

people over 15 is 2.05%, with an estimated 18 million people suffering from the condition nationwide.[6] This disease continues to be a significant public health concern in India despite tremendous progress in its management and treatment.

The objectives of Asthma review can include

- **Understanding the impact of asthma and treatment on growth**

Reviews can provide an overview of the data about the effects of asthma and its treatments on children's development.

- **Exploring lifestyle interventions**

Reviews can look at how lifestyle choices including yoga, meditation, diet, exercise, massage therapy and acupuncture can help manage asthma.

- **Establishing evidence- based rules**

Evidence- based guidelines for treatment intensification can be established by reviews.

- **Evaluating home based asthma programs**

Reviews can evaluate how well environmental interventions aand home-based asthma education work for kids with poorly managed asthma.

2. PHYSICALEXAMINATION

Widespread high-precitched wheezes, a symptom of asthma, are discovered during a medical examination. Wheezing, however, is not unique to asthma and usually does not occur in between severe flare-ups. Tachypnea, tachycardia, a prolonged expiratory phase, decreased air movement, trouble speaking in full words or phrases, discomfort when lying supine owing to dyspnea and adopting a "tripod position" are all signs of a severe asthma attack.[7] Just as crucial as a thorough history is a thorough physical examination. Atypical signs and symptoms must be recognized in order to consider other potential disorders, even though the examination is often normal.

Typically, a physical examination will concentrate on the skin, chest, and upper respiratory tract. As you breathe, a doctor will listen for indications of asthma in your lungs using a stethoscope. Wheezing, a high-pitched whistling sound made during exhalation, is a crucial indicator of asthma and a blocked airway. Additionally, doctors will look for nasal polyps, enlarged nasal passageways, and a runny nose. Skin disorders including hives and

eczema, which have been connected to asthma, will be checked. The physical examination of people suspected of having asthma is frequently unimpressive due to the diversity of asthma symptoms. Usually, physical findings only become apparent when the patient exhibits symptoms. Therefore, a diagnosis of asthma is not ruled out in the absence of physical signs.

Medical practitioners may notice extrapulmonary symptoms such nasal polyps, posterior pharyngeal cobble stones, pale, swampy nasal mucous membranes, and atropic dermatitis that help confirm the diagnosis of asthma. Patients with asthma may not always exhibit physical symptoms, and they may be diagnosed with asthma without exhibiting any physical symptoms at all.[8]

The physical examination may show loudly polyphonic expiratory wheezing as a characteristic or as normal, elevated respiratory rate in acute and moderately severe bouts, exceeding 30 cycles per minute.

Skin

- Profuse sweating in imminent respiratory failure.
- Severe hypoxia resulting in central cyanosis and hypoventilation in imminent respiratory failure.

Eyes

Conjunctival congestion as a consequence of constant rubbing are suggestive of associated allergic rhinitis.

Nose

Nasal examination is mandatory to rule out associated conditions such as aspirin sensitivity or allergic rhinitis.

Asthma test

Lung function tests, or pulmonary function tests, are the third component of an asthma diagnosis. Spirometry is a non-invasive test that requires taking deep breaths and forcefully exhaling into a hose connected to a machine called a spirometer. The spirometer then displays two key measurements:

Children younger than 5 years of age are difficult to test using spirometry, so asthma diagnoses will rely mostly on symptoms, medical histories, and other parts of the physical

examination. It is common for doctors to prescribe asthma medicines for 4 to 6 weeks to see how a young child responds.[9]

Other tests

A "Challenge Test" (or bronchoprovocation test) is when a physician administers an airway-constricting substance (or something as simple as cold air) to deliberately trigger airway obstruction and asthma symptoms. Similarly, a challenge test for exercise- induced asthma would consist of vigorous exercise to trigger symptoms. A spirometry test is then administered, and if measurements are still normal, an asthma diagnosis is unlikely.

Some other tests are

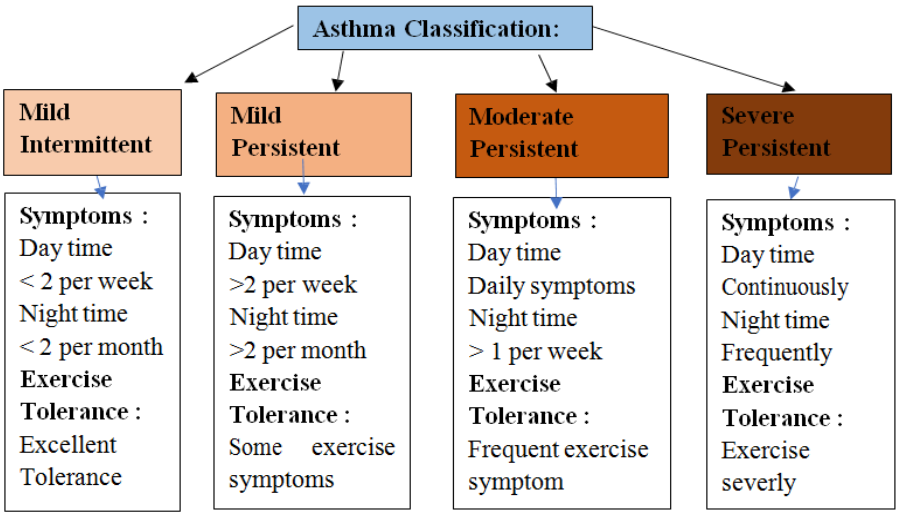
1. Spirometry: measuring lung function (FEV1, FVC)
2. Methacholine challenge test: assessing airway responsiveness.
3. Exercise challenge test: assessing exercise-induced bronchospasm.

3. CLASSIFICATION OF ASTHMA

- **Intermittent Asthma**: With intermittent asthma, patients can go for extended periods of time without experiencing symptoms, with symptoms occurring less frequently than twice a week and nighttime awakenings occurring less frequently than twice a month.
- **Mild Persistent Asthma:** This kind of asthma manifests symptoms less frequently than once a day but more than twice a week. Coughing, wheezing, or tightness in the chest three to six times a week are symptoms.
- **Moderate Persistent Asthma:** A form of asthma that is typified by abnormal lung function tests, flare-ups, and everyday symptoms. Individuals with moderate chronic asthma encounter: At least one symptom per day, days-long flare-ups, and coughing and wheezing that interfere with daily activities Without treatment, the lung function of those with mild chronic asthma is between 60 and 80 percent normal.
- **Severe persistent asthma**: At this point, symptoms happen virtually daily, multiple times a day. Additionally, you can have symptoms many evenings a week.

Treatment may not be effective at this stage of asthma.

Table No 1: Asthma classification.



4. EPIDEMIOLOGY OF ASTHMA

Asthma epidemiology is a complicated field of study that is crucial to improving our knowledge of a condition that significantly affects the morbidity and death of many individuals. The absence of a common definition for asthma that is applicable to both pathophysiology an According to the International Study of Asthma and Allergies in Childhood (ISSAC), there are significant differences in the prevalence of asthma symptoms between Latin American nations.[10] Asthma starts early in life, and the majority of the data on asthma prevalence in Los Angeles focuses on children and teenagers.

Westernized, English-speaking/nations had the highest 12-month prevalence of wheeze. The only other similar international asthma survey is the European Community Respiratory Health Survey (ECHRS). Male and female participants aged 20 to 44 who are primarily from European centers are included in this study. This rise and the allergy that goes along with it are especially noticeable in children and young people, where up to 15% of the population may be afflicted. In more developed nations, asthma is increasingly prevalent. There are few adult asthma data available in LA. While a research in Mexico reported a prevalence of 5%, a nationwide study in Colombia showed a prevalence of 6.3% of individuals having a medical diagnosis of asthma.[11,12]

Wheezing in the first years of life

Due to its prevalence and the emotional and financial strain it causes on families and healthcare systems, wheezing in the first few years of life is a very important problem. The Global Initiative for Asthma (GINA) states that among infants and pre-schoolers, recurrent wheezing (three or more episodes) is employed as a diagnostic criterion (i.e., synonym) of asthma.[13] Furthermore, the greater risk of sequelae among these individuals, including hospitalizations owing to pneumonia, medical diagnoses of pneumonia, and wheezing-related hospitalizations, may be explained by the poor management of these patients.[14,15]

Asthma control

Some reasons for this failure include patients' inability to access healthcare, lack of diagnosis of asthma, inappropriate treatment, and patients' inability to take prescribed medications as directed, whether due to a lack of knowledge or treatment adherence.[16,17] The Asthma Insight and Management (AIM) survey was developed in response to the need for a standardized tool that could be used globally, as well as the need to gather more thorough and comprehensive information, including general patient expectations and unmet needs regarding the current state of their asthma treatment.[18] Asthma reported prevalence has increased significantly in recent years worldwide, leading to a plethora of study on the condition's characteristics and prevalence. These include two important global initiatives that have collected data using validated questionnaires: the European Community Respiratory Health Survey for young adults and the global Study of Asthma and Allergies in Childhood for children. While asthma prevalence was stable or declining in some parts of the world between 1991 and 1993, the International Study of Asthma and Allergies in Childhood found that it had significantly increased in many other areas, especially among children age 13 to 14.

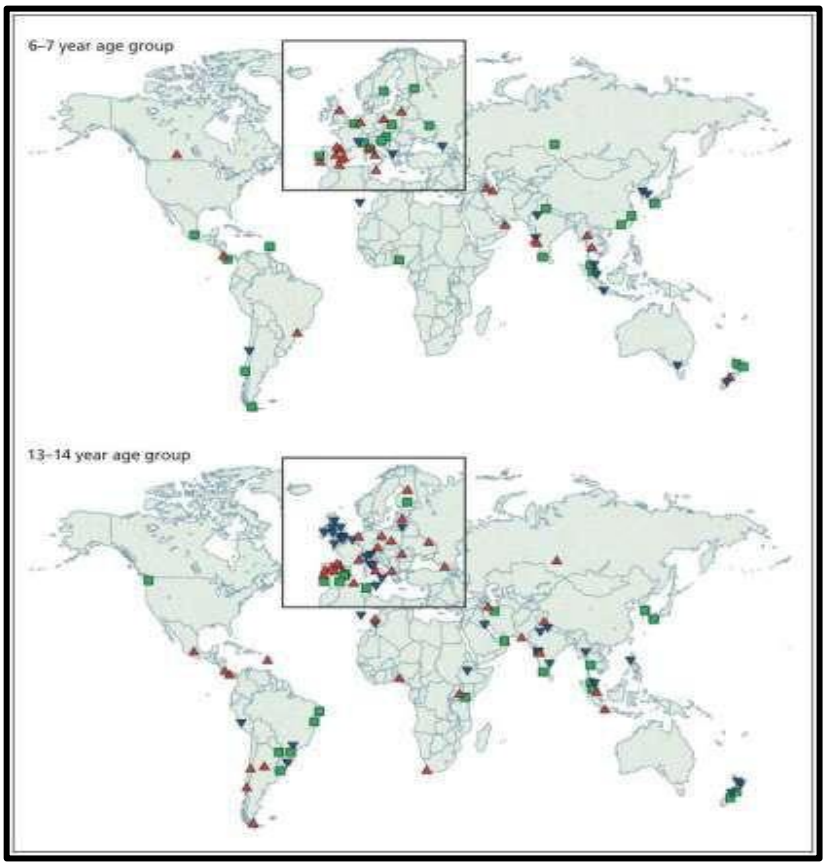


Figure No. 1: Annual changes in worldwide prevalence of asthma symptoms among children 6-7 years old and 13-14 years old.

Age and Gender

There is a time-dependent relationship between sex and asthma development. Boys have a higher incidence and prevalence of asthma than girls until they are 13 or 14 years old.[19,20] Research during puberty[21] have demonstrated a higher percentage of males with asthma remission and a higher frequency of asthma among female adolescents and young adults.[22] Before age 12, boys have more severe asthma than girls, with higher rates of admission to hospital.[23,24] On the other hand, adult females have more severe asthma than males, as evidenced by greater readmission rates, longer hospital stays, slower improvement and more hospital admissions.[25,26] Although causes for differences between the sexes have not been demonstrated, the majority of publications have attributed these changes in prevalence and severity to puberty events.[27,28]

Socioeconomic trends

According to the World Health Organization (WHO), asthma, a chronic respiratory disease marked by airway inflammation and hyperresponsiveness, affects an estimated 262

million people globally and was responsible for over 455,000 fatalities in 2019. Asthma affects people in different ways, and socioeconomic circumstances are a major cause of these differences. The relationship between socioeconomic trends and asthma epidemiology is examined in this overview. The prevalence of asthma and socioeconomic status (SES) have a complicated relationship:

Low-Income Populations

People with lower socioeconomic status are frequently found to have a higher prevalence of asthma. Increased exposure to environmental risk factors like tobacco smoke, poor housing, air pollution, and occupational risks is the reason behind this.

High-Income Countries

Due to urbanization, changes in lifestyle, and the "hygiene hypothesis," which postulates that a lower childhood exposure to illnesses may make a person more susceptible to asthma, asthma prevalence is typically higher in affluent areas.

Middle-Income Countries

Asthma prevalence increases with urbanization in emerging economies, but access to diagnosis and treatment is still restricted in underprivileged areas.

5. RISK FACTORS

Risk factors for the development of asthma include exposures that occur during a patient's entire life, including during pregnancy. Atopy, which is defined by the genetic propensity to develop particular immunoglobulin E (IgE) antibodies in response to common environmental allergens, is the most significant known risk factor. Almost one-third of kids with atopy will grow up to have asthma.

I. Childhood onset asthma

The Inner-City Asthma Network Program was created about thirty years ago to enhance outcomes for these high-risk children in urban settings due to the inner-city population's unique propensity for developing pediatric asthma. Although a wide range of factors affect the disease, tobacco smoke and allergy sensitization were the two main causes of asthma development. exposure in a causal network study of a group of asthmatics living in inner cities.[29]

II. Genetics

Asthma has long been known to have a strong hereditary foundation. About 50% of monozygotic twins have asthma concordance. Significant ($P < 10-8$) asthma-related single nucleotide polymorphisms (SNPs) have been found by genome-wide association studies (GWAS) in sizable pediatric and adult cohorts, and these findings have been confirmed in many investigations.[30] These findings have highlighted the significance of genetic variations in genes including HLA-DQ, SMAD3, TSLP, IL1RL1/IL18R1, and IL33 that are known to contribute to asthma. However, even for the most replicated sites, the individual contributions of these genetic variants are typically quite small. It is believed that 10% of asthma prevalence and heritability can be predicted by the total risk of all these genetic variations. The expression of transcription factors and cytokines involved in T-cell differentiation is known to be regulated by epigenetic changes.

III. Air pollution

Epidemiologic studies of air pollution and asthma have found that prolonged exposure to ambient air pollutants increases the risk of developing and/or impairing asthma, as well as increasing the risk of lung disease exacerbation with acute exposure. Even at concentrations below the current National Ambient Air Quality Standards, a number of pollutants, such as ozone, nitrogen dioxide (NO2), particulate matter (PM), and others, have been implicated.[31]

Changes in exposure to aeroallergens are also a result of global climate change. There is also growing data regarding the potential consequences of diesel exhaust particles, both in terms of sensitization and as a direct lung irritant. Children who live close to busy roads and are exposed to air pollution from traffic are more likely to develop asthma. Using holistic methods to reduce the impact of air pollutants.

IV. Stress events

Stress can increase sensitivity to allergens and infections, alter lung development, and affect neuroendocrine and autonomic responses.[32] Clarifying these systems could lead to better asthma outcomes, especially for economically disadvantaged people and members of ethnic minorities. Asthma prevalence is increased in people who experience stress. Stress-induced increases in asthma-related behaviors, including smoking, could account for a portion of this. Recent studies, however, have indicated that stress also alters the immune system.

V. Adulthood

Adults with rhinitis or atopy, occupational exposure, and tobacco smoking are the main risk factors for adult-onset asthma. Additionally, research points to a slight rise in the prevalence of asthma among postmenopausal women undergoing hormone replacement treatment.

VI. Prenantal and perinantal factors

Vitamin D also affects the development of the fetal lungs.[33] When a mother is 20 years of age or younger, the incidence of childhood asthma rises, and when she is 30 years of age or older, the rate falls. Pregnancy-related maternal nutrition is important; scientists hypothesize that vitamin D insufficiency causes early-life wheeze and asthma mainly via affecting the immunological function of several cell types, particularly dendritic and T regulatory cells.

According to research, preterm babies who have defective lung development even if they do not have any immediate respiratory issues are more likely to acquire asthma in the future.[34] Pregnancy-related exposure to maternal smoking reduces the newborn's lung function and raises the risk of childhood asthma. Additionally, smoking during.

Pregnancy raises the risk of asthma by being linked to a number of unfavorable pregnancy outcomes, such as an early birth.

VII. Occupational-Induced Asthma

Based on how they manifest following a latency period, occupational asthma can be divided into two categories: Both low- and high-molecular-weight compounds can cause a latency period, which is linked to an allergic or immunological process that causes occupational asthma brought on by workplace sensitizers. high molecular weight materials, including proteins, flour, and plant or animal-based polysaccharides. When paired with a human protein, low molecular weight compounds such as formaldehyde create a sensitizing neoantigen.

VIII. Obesity

Obesity by itself significantly affects asthma risk, phenotype, and prognosis in addition to raising the hazards of the respiratory impacts of air pollution. Epidemiological studies have unequivocally shown that obese patients are more prone to develop asthma, and that their health status is compromised; these patients with asthma have higher rates of symptoms, a lower quality of life, more healthcare utilization, and more severe asthma.

6. ETIOLOGY OF ASTHMA

There are genetic, environmental, and host risk factors for every asthma phenotype that has been identified. Although it is common, a family history of asthma is neither necessary nor sufficient for asthma to develop.[35] Although the exact cause of bronchial asthma is still unknown, it is generally accepted that both hereditary and environmental factors play a role in its pathogenesis. Indoor allergens (such as dust mites, pets, and cockroaches), outdoor allergens (such as pollen and dust), infection sources (such as bacteria, fungus, and parasites), occupational pollutants, or food additives are examples of environmental factors that can trigger asthma.

According to a Genome Wide Association (GWA) study, over 100 genes have been found to be substantially linked to the development of bronchial asthma. Furthermore, research on Single Nucleotide Polymorphisms (SNPs) has shown that the start of asthma is also closely linked to mutations in the ORM1 gene.[36,37]

The etiology of asthma remains unknown and is almost certainly multifactorial. Asthma is complex condition and its etiological factors involves:

Etiological factors

I. Bronchial asthma is multifactorial

Asthma is a complex multifactorial disease that affects both genetic and environmental factors, and it tends to cluster within families.

II. Allergic to certain foreign substances produce allergic

Allergies occur when the body's immune system overreacts to external substances, or allergens, such pollen or specific foods, which are generally safe to most people. The symptoms may be rather minor in certain situations, but they can also be a major annoyance and significantly affect day-to-day functioning.

III. Respiratory infections

For people with asthma, respiratory infections such as influenza (flu), coronavirus disease 2019 (COVID-19), and respiratory syncytial virus (RSV) can be more dangerous since they can cause asthma episodes and pneumonia.

IV. Change in climate

Climate change-related increases in temperature also encourage increased ground-level ozone pollution. Ozone can cause asthma attacks and is a strong lung irritant. Children whose asthma is triggered by allergies may experience episodes as a result of the lengthening pollen season brought on by climate change.

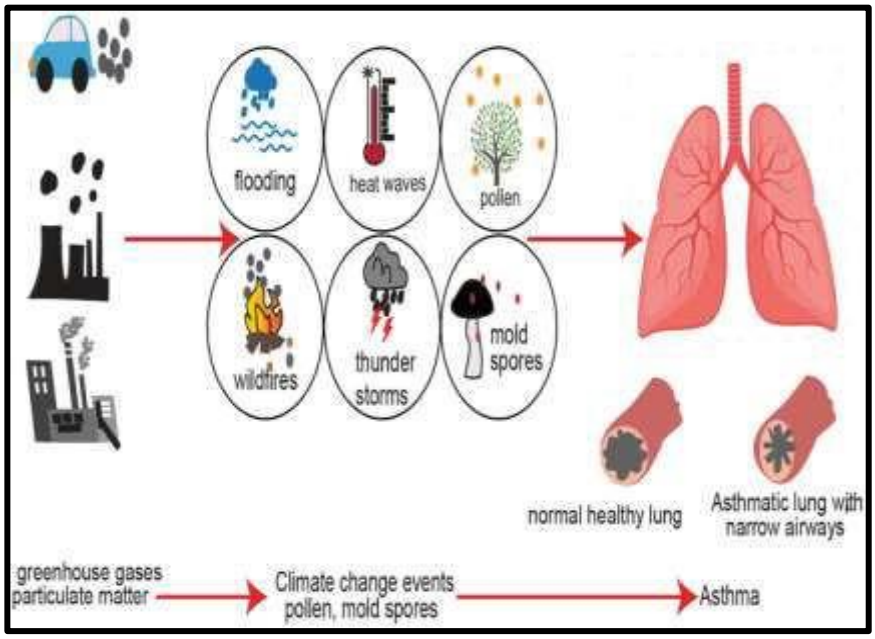


Figure No. 2: Role of Climate Change in Asthma.

V. Excessive fatigue, exhaustion

Associated with poor asthma control and sleep issues, significant fatigue is quite common in people with severe asthma and becomes better with pulmonary rehabilitation. The requirement for focused therapies outside of the asthma domain is implied by factors that predict chronic tiredness.

VI. Epigenetic modifications due to environmental exposures

Environmental exposures significantly influence epigenetic modifications, which can contribute to the development, progression, and severity of asthma. Epigenetic modifications, such as DNA methylation, histone modification, and changes in non- coding RNA expression, do not alter the genetic sequence but regulate gene expression. These changes are often influenced by environmental factors, including allergens, pollutants, diet, and lifestyle, which can impact asthma susceptibility and severity.

VII. Lifestyle and Urbanization

- **Westernized Lifestyles**: Increased adoption of processed foods, sedentary behaviour, and obesity rates are linked to systemic inflammation, which may exacerbate asthma.
- **Reduced Physical Activity**: Limited outdoor activity may reduce exposure to natural environments, potentially altering immune responses.
- **Hygiene Hypothesis**: Reduced microbial exposure due to improved sanitation and reduced infections in early life may hinder immune system development, leading to a higher risk of asthma and allergies.

Here are different types of hygiene hypothesis

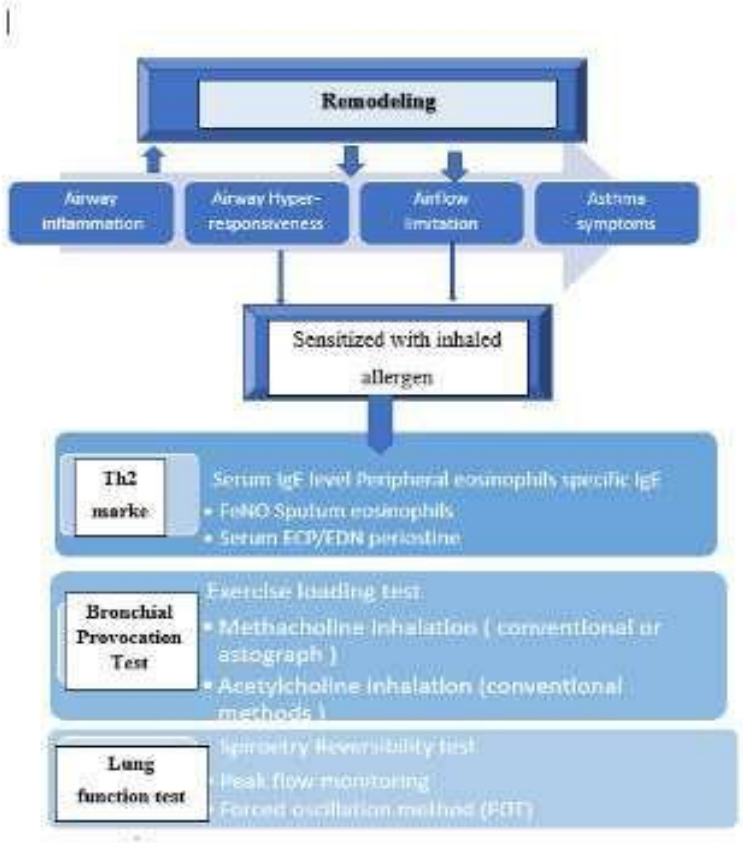
I. **Original Hygiene Hypothesis:** Focuses on the lack of exposure to infections and microorganisms in childhood.
II. **Extended Hygiene Hypothesis:** Includes the role of commensal microorganisms and the importance of exposure to a diverse range of microorganisms**.**
III. **Microbiome Hygiene Hypothesis:** Emphasizes the importance of the gut microbiome in shaping the immune system and the risk of developing allergic diseases.

7. PATHOPHYSIOLOGY OF ASTHMA

Asthma is a disease which is characterized by paroxysmal wheezing and coughing, as well as dyspnea brought on by airflow restriction. Asthma is rarely fatal, however many symptoms can be healed or remitted on their own or with treatment. Chronic airway inflammation and airway wall remodelling are pathological features of childhood asthma that are comparable to those of adult asthma.[38] In addition to verifying reversible airflow restriction, airway hyperresponsiveness, and recurrent paroxysmal wheeze and dyspnea.[39]

Accurately treating asthma during an acute exacerbation and assessing its severity— which serves as the foundation for choosing long-term pharmaceutical management— require this assessment. Symptoms are the primary indicator of asthma severity. However, it's critical to objectively assess the pathophysiology behind the symptoms, such as airflow restrictions, airway hyperresponsiveness, airway inflammation, and airway remodelling, in order to develop effective treatment strategies. Lung function test shows the characteristics of respiratory physiology in asthma, but this may be difficult to perform with children, especially younger children.

Table No. 2: Pathophysiology of asthma and its assessment method.



8. TREATMENT OF ASTHMA

Generally speaking, asthma drugs are divided into two classes: bronchodilators, which help patients avoid having to forcefully inhale powder to stop an asthma attack after it has already begun, and anti-inflammatories, which reduce airway inflammation and stop asthma attacks before they begin.

➢ Anti-Inflammatories

Anti-inflammatory drugs keep airways open constantly, preventing asthma attacks. Their purpose is to produce less mucus and less edema in the airways. Two examples of anti-inflammatory medications are nedocromil and cromolyn. The most widely used class of anti-inflammatory medications is corticosteroids, which are the recommended treatment for chronic asthma. Mast cell stabilizers are another type of anti-inflammatory drug.[40,41]

➢ Dry Powder Inhalers

Dry powder inhalers use powdered medicine from a capsule as an alternative to aerosol- based metered-dose inhalers. These devices can be more difficult to operate than metered-dose inhalers, and association studies have found differences in many devices that enter the lungs.

➢ **Emergency Department Care**

Patients should receive three doses of an inhaled SABA, such as albuterol, via a nebulizer or MDI within the first hour, with follow-up doses every one to four hours. Ipratropium, a short-acting muscarinic antagonist (SAMA), should be inhaled by patients experiencing severe asthma exacerbations in addition to a SABA. Patients also take glucocorticoids equal to 40–60 mg of prednisone each day for 5–7 days, much like with outpatient management. When compared to a lower dose with a shorter duration of prednisone or prednisolone, a comprehensive review finds no difference between a higher dose and a longer course.[42]

➢ **Additional Therapies**

Every patient who smokes should receive the necessary resources and assistance, as well as education on the advantages of quitting. Since the majority of infections that cause asthma flare-ups are viral, empiric antibiotics are not advised. Both (GINA) Global Initiative for Asthma and (NAEPP) National Asthma Education and Prevention Program guidelines state that intravenous methylxanthines, including theophylline, are no longer considered to be useful and should not be used as part of normal care.[43]

➢ **Goals of Asthma Treatment**

- Achieve and maintain symptom control.
- Prevent asthma exacerbations.
- Maintain normal lung function and activity levels.
- Minimize medication side effects.

➢ **Emergency Treatment of Asthma Attacks**

If symptoms worsen or do not respond to usual medications:

I. Use a rescue inhaler (e.g., SABA).
II. Administer oral corticosteroids if prescribed.
III. Seek immediate medical attention if breathing difficulty persists.

9. MANAGEMENT OF ASTHMA

Maintaining an active and healthy lifestyle with asthma can be achieved by recognizing and avoiding triggers. Depending on the severity of the condition and the needs of each patient, managing asthma entails a combination of lifestyle changes, medication, and education.

The list that follows talks about typical triggers and offers solutions.[44,45]

- **Avoiding triggers**

I. Tobacco smoke- Avoid inside and outside of the home

II. Air pollution - Try antihistamine medications and staying indoors

III. Pollen - Try antihistamine medications and staying indoors

IV. Animal dander - Keep pets outside, wash them often, find them a new home

V. Viral infections - See a physician

VI. Heavy exercise - Lower the impact of your exercise routine and consult a doctor

VII. Stress - Many methods of stress reduction exist, including breathing, meditation, progressive relaxation, and exercise.

VIII. Dry or cold air - Wear a scarf over your mouth and nose during winter months

IX. Dust mites - Keep sheets, blankets, pillows, and stuffed toys clean

X. Sulfites in dried food and wine - Avoid foods with allergens.

- **Lifestyle modifications**

I. Regular Exercise- With precautions to prevent exercise-induced bronchoconstriction

II. Weight Management- Maintaining a healthy weight to reduce symptom severity.

III. Vaccinations- Annual flu shots and pneumococcal vaccines to reduce respiratory infections.

IV. Stress Management- Minimizing stress, which can trigger symptoms

- **Emergency management**

I. Identifying symptoms of a severe asthma attack, such as pale lips and trouble speaking.

II. Taking painkillers as soon as possible.

III. Getting emergency care if symptoms worsen or don't get better.

10. DIFFERENTIAL DIAGNOSIS

In the absence of a clear definition of asthma it can be difficult to diagnose the condition in the absence of a clear definition of asthma it can be difficult to diagnose the conditions.[46] Diagnosis requires clinical experience and judgement, because signs and symptoms of asthma can vary from patient to patient, and may change within the same patient at different times and under different circumstances.[47] In addition to obtaining a detailed medical history and conducting lung function tests, careful physical examination can help with differential diagnosis.[48]

Differential Diagnosis in Children

Chronic cough is a problem, which needs Diagnosis in differentiation between asthma and not asthma. Chronic Children productive cough with purulent sputum is a reason for concern in children and is not usually a symptom of asthma. Nevertheless, respiratory infection presenting purulent sputum can exacerbate asthma in children previously diagnosed with asthma. The younger the child, the greater the need to exclude underlying disease at an early stage.[49] Wheezing in children can be an allergic (i.e., asthma) or non-allergic response.[50,51] Non-allergic wheezing in children occurs during acute infections, including viral bronchiolitis. Coughing and wheezing in bronchiolitis is difficult to distinguish from asthma.

The differential diagnosis of children with frequent respiratory infection and wheezing should include

- Foreign body aspiration causing airway obstruction,
- Pneumonia/bronchiolitis,
- Cystic fibrosis,
- Bronchopulmonary dysplasia (in premature infants),
- Primary ciliary dyskinesia syndrome, and,
- Immune deficiency.[52,53]

Improved diagnostic capabiltites

Advances in the techniques, instruments, and technologies used to more precisely and effectively identify, assess, and comprehend illnesses or system failures are referred to as improved diagnostic capabilities. These advancements can take place in a number of fields, including information systems, engineering, and healthcare.[54] Here are some examples;

1. **Personalized diagnostic insights are provided by genomic tools**

Genetic testing: Determines an individual's susceptibility to asthma by looking at genes such as ORMDL3 and IL33.

Examine protein expression alterations associated with asthma through proteomic Studies.

2. **Novel use in artificial intelligence in asthma diagnosis**

Using machine learning (ML) models, a recent study investigated the diagnostic efficacy of methacholine challenge tests (MCT).[55] The study's AI model was designed to solve the present problem with asthma diagnosis, which is the MCT's very low sensitivity for the

condition. ML models including logistic regression, support vector machine, random forest, extreme gradient boosting, and artificial neural network were compared to the conventional model based on area under the receiver operator characteristic curves (AUROC) and area under the precision-recall curves (AUPRC). The study concludes that artificial intelligence-based models offer superior performance in asthma prediction compared to conventional methods, suggesting potential utility in enhancing clinical diagnosis of asthma.

3. Advanced Imaging Technologies in Healthcare

Medical imaging methods that aid in illness diagnosis and treatment are known as advanced imaging technologies. Some examples of advanced imaging techniques in healthcare are-

Magnetic resonance imaging (MRI)

A non-invasive method that offers a clear picture of the body's internal organs and tissues is magnetic resonance imaging (MRI).

Computed tomography (CT)

A method that produces cross-sectional pictures of the body is called computed tomography (CT).

11. FUTURE DIRECTIONS

With a wide range of potential future initiatives focused at enhancing diagnosis, treatment, and prevention, asthma continues to be a complex healthcare issue. The main areas for improving asthma research and care are listed below;

- Advances in epidemiological research

Accuracy in Risk Stratification

Future epidemiological studies will probably concentrate on pinpointing certain subgroups such as those influenced by genetic, environmental, and socioeconomic factors that are susceptible to exacerbations of asthma.

Global and Regional Studies

More localized study is required, as evidenced by the differences in asthma frequency and severity among various geographic regions. The impact of urbanization, pollution, healthcare access, and regional environmental factors on asthma outcomes will be better understood thanks to these studies.

Environmental and Lifestyle Factors

New research will keep examining how genetic predispositions interact with environmental triggers (pollution, allergens, climate change) and lifestyle changes (diet, exercise, sleep) to affect asthma risk and treatment. [56]

- **Integration of precision medicine in asthma management**

Personalized Treatment Methods: More specialized asthma treatments are becoming possible thanks to developments in immunological profiling, biomarkers, and genetics. Biologic therapies, for instance, are currently being utilized to target particular immune pathways and future therapies will probably be even more individualized, tailoring interventions to the unique genetic profile and phenotype of each patient.[57]

Biomarker Development

By identifying the underlying kind of asthma (e.g., allergic versus non-allergic) new biomarkers can help clinicians choose the best treatments, reducing the need for trial and-error prescribing and enhancing patient outcomes.

Telemedicine and Remote Monitoring

By incorporating wearable technology and telemedicine into asthma treatment, it will be possible to track symptoms, medication compliance, and triggers in real time, provide tailored feedback, and swiftly modify treatment plans.[58]

12. CONCLUSION

The chronic respiratory disease known as asthma is characterized by airway constriction and inflammation, which makes breathing difficult. Symptoms including wheezing, coughing, shortness of breath, and pressure in the chest are frequently linked to it. Asthma has a complex etiology, with behavioural, environmental, and genetic variables all being important. Among the main variables that raise the risk of having asthma include genetic predisposition, exposure to allergens, early childhood respiratory illnesses, air pollution, and occupational exposures.

Numerous research have demonstrated the increasing frequency of asthma globally, providing ample evidence of its prevalence and impact. Research indicates that asthma has important physical, social, and economic ramifications, such as higher medical expenses and a lower standard of living for those who have it. Although the illness can occur at any

age and its severity can vary, it usually starts in childhood. The goals of asthma management, which encompasses both pharmaceutical and non- pharmacological methods, are to improve quality of life, lower the total burden of the condition, and control symptoms and avoid exacerbations.

In summery asthma is a complicated illness with many underlying causes. To lessen its increasing worldwide impact, further study into its causes, evidence-based therapies, and preventative measures is necessary.

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