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Review Article

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Chronic Asthma: A Comprehensive Narrative Review of Biological, Psychological, and Social Determinants

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Abstract

Chronic asthma is a persistent respiratory condition characterized by inflammation, hyperresponsiveness of the airways, and mucus overproduction. This narrative review explores the multifactorial etiology, clinical manifestations, diagnostic considerations, and management strategies of chronic asthma. Environmental exposures, genetic predispositions, and lifestyle factors are discussed as key contributors to disease onset and progression. The review also highlights recent findings on diagnosis and control, particularly in relation to severe and uncontrolled asthma phenotypes. Emphasis is placed on a comprehensive understanding of risk factors, including tobacco use and air pollution, and their implications for treatment.

1. Introduction

Asthma is a chronic inflammatory disease of the airways affecting millions worldwide. Characterized by symptoms such as wheezing, breathlessness, chest tightness, and coughing, The condition significantly impacts quality of life. Chronic asthma in particular poses persistent health challenges due to its ongoing nature and resistance to typical treatment in some cases. Understanding the interplay of genetic and environmental factors is key to managing this condition effectively.

2. Methods

This narrative review was compiled through a selective literature search using PubMed, Google Scholar, and Scopus databases. Priority was given to recent peer-reviewed articles and systematic reviews from 2007 to 2023. Key terms included "chronic asthma", "airway inflammation", "asthma risk factors", and "asthma management".

2.1. Definition and Symptoms

Chronic Asthma is a persistent condition characterised by its significant effects on the respiratory system. It is mainly attributed to chronic airway inflammation and increased mucous secretion [1]. Asthma symptoms are variable and linked to the severity of asthma. The most common clinical manifestations would be symptoms of coughing, wheezing and breathlessness, with known irritants such as physical exertion and temperature, which make the condition worse [2]. The symptoms listed are critical markers in the clinical presentation of asthma. In more severe cases, such as uncontrolled asthma, which severely restricts the airways and thus not allowing enough oxygen to be delivered, many symptoms may be presented. Symptoms range from causing fingers and lips to become blue (cyanosis) to syncope (fainting) and cognitive confusion [3]. Research suggests it can be concluded that these symptoms arise from compromised oxygen, thus the perfusion of essential tissues [4].

2.2. Risk Factors and Diagnosis

Asthma is a complex disease influenced by environmental and genetic determinants [5]. The risk factors for asthma encompass a spectrum of potential causes, with tobacco smoking being the most notorious. Numerous studies present the connection between the inhalation of the toxic compounds in tobacco-based products and the manifestation and worsening of asthma [5]. Another determinant would be air quality pollution. Air quality pollution, an environmental factor, is a notable risk factor for the development of asthma [6]. However, this would depend on where the individual lives, as asthma prevalence would differ in comparing those who live in an urban setting and those who do not [7]. In addition to the factors listed, many other factors can lead to the eventual manifestation of asthma, such as allergies, obesity, occupational exposures, microbial agents, and the individual's genetic predisposition to asthma [5]. The interplay of the mentioned risk factors paints a picture of the nature of asthma's pathogenesis and its tendency to manifest in at-risk populations. To help diagnose asthma, tests such as peak flow, spirometry or fractional exhaled nitric oxide (FeNO) may be administered by a GP after they have asked for a history [8]. The tests are used to test things such as lung capacity, inflammation, and if there are

any obstructions present. The history would include asking about symptoms, when symptoms arise, what triggers them, and what history the family or the patient has, including conditions such as eczema and allergies [8].

2.3. Management and Treatment

Asthma, a chronic condition, is commonly known to have no known cure. Nonetheless, with the prevalence and potential for severe symptoms, established frameworks and medical treatments have been developed for its management and care. Asthma treatment adheres to a stepwise approach, which involves a cyclic process encompassing assessment, adjustment to treatment, and a review of response to treatment [1]. The overall objective of asthma control medications is to reduce airway inflammation and prevent symptoms from developing any further. The internationally accepted standard to prevent asthma symptoms is inhalers [1,9]. Within the steps of primary asthma management, two distinctive categories of inhalers are used. The first type is a reliever inhaler, or Short-Acting-Beta-Agonists, which serves the primary function of relieving symptoms when they occur. The main side effects would be, most notably, shaking. The next step in treatment would be preventative inhalers and inhaled corticosteroids [8]. Preventer inhalers are prescribed when patients rely on their reliever inhaler too much. Preventers are mainly used to impede the progression of symptoms [8]. In cases of more severe asthma, administering oral tablets, such as Leukotriene Receptor Antagonists, Theophylline, and Steroid Tablets, may be employed when inhalers adequately control symptoms [8,9]. Surgery and injections may be considered when asthma is in a severe stage.

Regarding non-medical interventions, breathing exercises and other non-medical therapies can also be possible treatments. However, more evidence is needed to conclude that these therapies work [8,10]. Asthma has many different treatments and ways to manage symptoms, but symptoms can get worse, and this is still a condition that people have to live with.

2.4. Epidemiology

In 2022-2023, the national prevalence of asthma in the United Kingdom was recorded at 6.52%, which translates to 6250 cases per 100,000 individuals. This is a 0.05% increase from the preceding year, which showcases an upward trend in asthma diagnoses [11]. The escalation in asthma prevalence in the UK has been notable, with a prevalence of approximately 6.06% in 2019 [12]. Events such as the pandemic and monetary incentives given to GP practices have led to the diagnosis of asthma to increase even further, thus leading to the 6.5% it is presently at [12]. The presented information shows that asthma is prevalent in the UK and is responsible for much morbidity [13]. This growing prevalence puts a considerable financial burden on the NHS's funding, with estimated costs reaching £1.1 billion in 2016 [14]. To put this in perspective, Asthma resulted in 6.3m primary care consultations and 1160 asthma deaths [14]. The demographics of asthma diagnosis reveal an apparent trend. According to the Health Survey for England in 2018, children aged 0-15 years exhibit a higher prevalence of asthma diagnosis, with boys tending to be more affected.

In contrast, this result changes in adulthood, with women now showing a higher prevalence [8]. Asthma's prevalence is also affected by childhood asthma, which is known to be something one grows out of, but this is not always the case [8]. As mentioned earlier, location also plays an essential part in the prevalence of asthma [15]. The growing prevalence of asthma in the UK is apparent, and its consequences are becoming increasingly evident [8].

2.5. Sociology and Social Determinants

Chronic asthma itself cannot be examined purely in a scientific manner. It is imperative to address and understand that social determinants play a significant role in the development and severity of asthma. The many streams it encompasses lead to broader influences that can alter the susceptibility of asthma when compared to other groups. This section will analyse the implication of socioeconomic factors in the pathogenesis of asthma.

2.6. Socioeconomic Factors

An individual's socioeconomic status (SES) is a determinant with long-standing implications for lifelong functioning. SES, comprising multiple facets such as income, education, and occupations, affects an individual's access to healthcare, exposure to the immediate environment, and overall well-being [16]. This is noteworthy in the context of asthma, whose pathogenesis is saliently influenced by social determinants of health (SDH) [6].

Poor air quality, a well-known risk factor for asthma development, disproportionately affects those with lower SES, particularly those who hail from non-white ethnic groups [16]. Evidence shows that individuals in lower SES subgroups are more likely to reside in areas with higher air pollutants, known triggers for asthma exacerbation [16]. In addition, lower SES individuals have more chance of encountering exposure to cigarette smoke and indoor allergens, which are attributed to constrained financial resources and less desired housing conditions [16].

Research suggests that individuals with low SES, particularly those from non-white ethnic groups, face a higher risk of asthma due to its impact on biopsychosocial factors such as access to healthcare, levels of stress and daily life [16]. The interplay between socioeconomic factors further extends to morbidities such as obesity, which is known to share a close link with SES and significantly contributes to asthma pathogenesis because of the increased chest wall resistance [17,16]. The reason why comorbidities such as obesity are linked to lower SES can range from either poor knowledge of healthy choices, their environment and the increasing prices of healthy food [18].

Mental Health, another dimension influenced by SES, adds a layer to asthma outcomes. A study conducted by Reiss et al., 2019 described the effects of a lower SES and its relationship with the development of mental health issues. When juxtaposed with those with a higher SES status, those with lower SES were more

vulnerable to stressful situations [19]. Individuals with lower SES tend to exhibit a much higher prevalence of depression, anxiety and other mental illnesses, which are conditions known to worsen asthma symptoms [20,16]. The collaborative relationship between SES and health outcomes is further exemplified when illness worsens SES, manifesting a cycle of worsened asthma symptoms, decreased autonomy, and income loss [21,16].

When addressing asthma, it is essential to discuss the role social determinants have on the pathogenesis of this disease. Current papers provide clear-cut evidence that SDH plays a significant role in the development of asthma.

2.7. Gender

Asthma exhibits a much higher prevalence among women than men once reaching adulthood [8]. This apparent disparity has been linked to the multiple biopsychosocial factors, an area that has been vigorously explored in numerous research endeavours—Jenkins et al.'s. (2022) study delved into the correlation between sex, asthma severity and control. From this study, it was perceived that there is an increased susceptibility to asthma among women. It further advocated for personalised asthmatic care based on gender-specific considerations. In correlation, a study conducted by Senna et al. (2020) examined 1,123 individuals from the Italian Severe Asthma Registry, which revealed that the majority (66%) of entries were female, which was notable due to males continuing their behaviours like smoking, while females exhibited poorer control and significantly higher exacerbation rates, which resulted in more frequent hospitalizations [22].

The increased susceptibility of asthma in females has been frequently attributed to many diverse biopsychosocial factors. The biological perspective emphasises the influence of hormones in the development of asthma [23]. In contrast, the biopsychosocial model describes the link as one linked to the roles of women and how their emotions, such as stress and depression, can be linked to their increased excavations of asthma [24]. The stressors are caused by social and cultural expectations placed upon women and how these stressors can lead to heightened stress levels, as evidenced in Loerbroks et al.'s cross-sectional study (2017) [25]. Their findings suggest that elevated family life, which is pertaining to the stress that encompasses household chores, raising of children and other familial matters, or work-related stress, is associated with an increased amount of asthma occurrences, especially when these two are merged. With this, it can be concluded that numerous biopsychosocial factors lead to adult women being more susceptible to asthma.

2.8. Behavioural Intervention

Behavioural interventions are instrumental in changing and altering patients' psychological states and habits to enhance their quality of life. Interventions like these aim to equip individuals with the tools required to make informed decisions, with the primary emphasis on the education required to make health-conscious choices [26]. Ultimately, these interventions advocate for a patient-centred paradigm, allowing the condition to be treated more holistically. The National Institute for Health and Care Excellence (NICE) states that the primary objective of asthma treatment is to "achieve control of asthma." The aim of complete control is defined as "no limitations on activity, minimised symptoms, and minimal side-effects from treatment (NICE, 2007)." Nice recommends implementing asthma self-management programs and educational initiatives tailored for those with asthma. Such programs are carefully designed to provide patients with comprehensive information and guidance on effectively minimising their risk, as the goal is to enable healthy behaviours that allow the patient to adhere to treatment and avoid hospitalisation (NICE,2007; Pinnock, 2015).

The cornerstone of asthma self-management programs is the education component. They further enhance the knowledge of asthma, improve inhaler technique and give guidance on proper breathing exercises, which all provide practical methods to ensure long-term outcomes (Lee et al., 2019). This section will focus on using education and self-management tools for all individuals with asthma to achieve adequate knowledge of the disease and ways to prevent further deterioration.

Self-management education benefits asthmatic patients due to the results produced, as it significantly reduces emergency department attendance and unscheduled consultations, improves asthma control and improves the overall quality of life (Pinnock, 2015; Hodkinson et al., 2020; Lee et al., 2019). Numerous studies have been conducted on the effect of self-management. A rapid synthesis performed by Taylor et al., 2014 provides overwhelming evidence of the positive effect of self-management in the context of chronic conditions. Olivera et al. (2016) conducted a study with 119 patients in Brazil [27]. Sixty of these patients were provided with asthma knowledge, lifestyle, inhaler techniques, adhesion to treatment and quality of life, while the rest were control. The control group was not given any of the extensive knowledge or techniques. After four months of observation, it was clear that the asthma self-management model was overwhelmingly effective in improving the quality of life of asthmatic patients ($P < 0.001$). This shows the effectiveness of proper education and knowledgeable autonomy given to patients and how the confidence given by access to knowledge increases patients' quality of life drastically.

Asthma self-management interventions do not need to be confined to traditional written plans solely given by healthcare professionals; instead, they can be effectively delivered via online platforms, with evidence indicating they have been shown to possess long-term effects.

A study by van Gaalen et al. (2013) further investigated the impact of internet-based self-management (IBSM) delivered online to deliver IBSM to over 200 participants over 12 months [28]. Eventual follow-up assessments performed by van Gaalen et al. evaluated the persistence of outcomes amongst the participants 30 months post-intervention [28]. They reported that improvements in quality of life and overall asthma control were still being sustained in those who received the IBSM after a year and a half since the study ended. This suggests that the delivery of self-management

does not play a role in the adherence to the plan. As long as the plan has been delivered competently for a year, patients, even after long periods, will develop healthy habits and behaviours that will increase their quality of life overall.

Studies prove asthma self-management is an established and practical approach to controlling asthma and its symptoms. However, issues arise when it has to be promoted and used among healthcare professionals and patients (Miles et al., 2017). A study performed by Miles et al. went through 56 eligible papers between 1996 and 2017, and they identified barriers to suggest why existing ways of self-management were not always as effective as hoped. The study believed that the motivations of each patient should be looked into to uncover any potential barriers that would prevent successful self-management (Miles et al., 2017). The belief is that further educating healthcare workers on the effects of more holistic care, such as self-management, is a way to further promote the effectiveness of self-management in patients with chronic conditions [29].

As the pathophysiology of asthma is understood to a significant degree, the recommended pharmacological treatments have now been seen as the golden standard. Because of this perspective, it has eliminated the potential use of other, less pharmacological approaches. Medical professionals have taught the public that using an inhaler or another pharmacological treatment is the most effective and practical way to deal with symptoms. However, evidence heavily supports the idea that self-management is an effective and viable way to handle chronic conditions. The points here emphasise the importance of physician-patient education and holistic care.

3. Conclusion

In conclusion, chronic asthma represents an illness that should be treated and comprehensively looked at through a biopsychosocial lens. The pathogenesis of chronic asthma manifests mainly through inflammatory processes within the airways, which can be driven by numerous biological factors, which encompasses allergic responses and various risk factors, such as tobacco exposure. However, researchers have underscored the significant influence of psychological factors and their role in asthma exacerbations and their development, which solidifies the importance of adopting a biopsychosocial perspective in the evaluation and management of chronic asthma.

The pathophysiology and pharmacological interventions of asthma have been thoroughly researched and studied and have been appointed as the indisputable gold standard. However, the inadequate knowledge pertaining to the effects of other approaches, especially the lack of knowledge in the context of self-management, plays a role in the increasing hospitalisations of asthma and the lack of control and knowledge that patients possess. Research into the benefits of asthma self-management is extensive and proves its efficiency and efficacy, as it gives patients knowledgeable autonomy and reduces mentioned hospitalisations.

Finally, to effectively treat and manage chronic illness, knowing the effect of social influences is essential. Understanding patients' socio-demographic background, socioeconomic status and individual expectations is a pivotal foundation for personalising their treatment regimens and care plans. By fusing clinical expertise with patient-centred considerations, a well-tailored approach can be used to optimally address the interplay of biological, psychological and social factors underlying chronic asthma, further enhancing clinical outcomes and increasing patient satisfaction.

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