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COPD Patient: Analysing the Role of Blood Group and Vitamin C

Shashi Mathur*, Pratibha Singh

Department of Nutrition and Dietetics, MRIIRS, Haryana, India

**Corresponding e-mail: dtshashim@gmail.com*

ABSTRACT

Chronic obstructive pulmonary disease (COPD), which affects 15-20% of smokers, is greatly increased by tobacco use. Environmental and socioeconomic factors, as well as genetic predisposition, contribute to the development of chronic respiratory diseases. One genetic component underlying the likelihood of developing such diseases is the ABO blood group system. ABO blood type distribution varies not only between populations but also within subpopulations. Antioxidants' pleiotropic functions in a number of diseases have drawn a lot of attention recently. A well-known antioxidant, vitamin C, has been used to treat patients with chronic obstructive pulmonary disease. When quality of life is evaluated by serum levels or food frequency questionnaires, vitamins have been shown to enhance pulmonary function, lessen exacerbations, and enhance overall health. This study's objectives are to examine the role of blood type and show how vitamin C supplementation affects COPD patients.

Keywords: Chronic obstructive pulmonary disease (COPD), chronic diseases, Blood type, Vitamin C.

INTRODUCTION

Worldwide, chronic obstructive pulmonary disease has a high incidence of morbidity and mortality. According to spirometry, its primary characteristic is poorly reversible airway obstruction, which includes emphysema and small airway obstruction [1]. Air trapping and dyspnea are brought on by these in response to physical exertion. The underlying mechanisms are connected to accelerated lung ageing and chronic inflammation. The abnormal repair mechanism may be being driven by oxidative stress. Nearly 210 million people worldwide are thought to have COPD, according to estimates from the World Health Organization [2]. The prevalence varies between 1–4% of the world's population and 11.7% of people over 40 [3]. On the list of the leading causes of death worldwide, it comes in at number four [4]. This disease is preventable, yet it kills about three million people annually. Over the past several decades, the mortality rate from COPD has been rising steadily. The tobacco epidemic across the globe is primarily to blame. Only 15-20% of smokers develop COPD, despite the fact that smoking is a major risk factor [5]. As a result, host factors may affect how susceptible an individual is to the components of tobacco smoke or to other factors that increase the risk of developing COPD, such as air

pollution, exposure at work, recurrent respiratory infections, and so on. This study's objectives are to examine the role of blood type and show how vitamin C supplementation affects COPD patients.

In addition to environmental factors like cigarette smoke, allergens that encourage the development of asthma, and atmospheric air pollution, which is the main cause of COPD, respiratory diseases are also influenced by genetic predisposition [6, 7, 8, 9]. In [10], authors compared a group of 435 sick people to 411 healthy people in order to confirm the association between ABO blood type agglutinins and the rate of respiratory allergic diseases like asthma and hay fever. Based on ABO blood type, they exhibit no appreciable differences in secretory status or isoagglutinin titer in serum or saliva. Similar results for COPD have been stated by Cohen et al. [11], who discovered a correlation between COPD in white people and both the absence of blood type B and the presence of type A. Similar research was conducted by Brachtel et al. [12] and compared the blood types of asthmatic children and adults and found that A and B blood types are linked to a number of atopic conditions. A and B erythrocyte phenotypes are more prevalent in adult patients with various atopic diseases than in control groups, according to other studies. Since childhood asthma is one of the most prevalent chronic pediatric diseases, the majority of studies on the potential influence of blood typing on the risk of chronic respiratory diseases date back before 2000 [13].

The ABO blood type system can be a genetic factor in some populations that increases vulnerability to chronic respiratory diseases [6, 7, 8, 9]. Asthma and allergic rhinitis are both manifestations of a single syndrome with varied range of severity, as Baiardini et al. [14] showed that they share similar immunopathology mechanisms. Bijanzadeh et al. and Togias et al. contend that factors influencing asthma, such as genetics and the environment, also make people more susceptible to allergic rhinitis.

Socioeconomic factors, particularly poverty and malnutrition shown by significant weight loss, also play a role in the development of these conditions [17]. A global rise in the incidence of COPD can be attributed to genetic predisposition in addition to environmental factors [18, 19]. One of the potential genetic risk factors could be having a particular blood type. The Hirszfeld et al. [20] showed that different populations have different prevalence of blood types A and B. This finding has been used as a springboard for discussion of the link between ABO blood types and disease susceptibility [21, 22, 23, 24]. The extracellular surface of the erythrocyte cell membrane is home to the complex carbohydrate molecules known as the ABO blood type antigens. These antigens can also be found on the surfaces of many other human cells and tissues, such as the epithelium, sensory neurons, thrombocytes, and vascular endothelium, in addition to erythrocytes. Therefore, ABO blood groups have clinical significance outside of transfusion medicine. This system may be involved in the emergence of cardiovascular, oncological, and other diseases, according to several studies [25, 26].

ROLE OF BLOOD GROUP ANTIGENS

The association between COPD and the ABO, secretor, and Lewis genes has been examined in a number of studies. The activity of a glycosyltransferase that changes glycoprotein H into A or B antigens is controlled by the ABO locus on chromosome 9. An association between the ABO locus and COPD was found by Cohen et al. [27]. The results of this study indicate that having type A blood is linked to poor lung function. This was supported by the same authors' 5-year longitudinal study, which found that group A subjects' lung function

declined more rapidly than that of non-A subjects [28]. Contrary to these studies, Krzyzanowski et al. [29] found that blood group A individuals experienced a slower failure in lung function than individuals with other blood types. ABO alleles and pulmonary function have not been linked in any other studies [30, 31, 32]. ABO antigens are present on almost all body cells. About 80% of people secrete ABO antigens into their saliva, plasma, and respiratory tract secretions. This ability, which is a dominant trait, is determined by the secretor locus on chromosome 19q. It has been demonstrated that nonsecretors have worse lung function than secretors [33, 34]. This implies that ABO antigens may provide protection against lung impairment in respiratory tract secretions.

Additionally examined as a possible risk factor for airflow obstruction is the Lewis blood group [35]. 90% of Caucasians produce Lewis a because they have the dominant Le allele. People who secrete this substance transform it into Lewis b substance, and as a result, their serum contains both a and b substances. The sole component of Lewis-positive nonsecretors' serum is that. Horne et al. found that Lewis negative subjects had significantly more airflow obstruction, with an RR of 7.2. The authors propose that airflow obstruction is prevented by the presence of b substance rather than secretor status. A recent study considered all three gene loci because the blood group systems interact at the protein level [37]. Lewis-negative or non-secretor individuals with blood group O were found to have impaired lung function as well as a higher prevalence of wheezing and asthma. People who were nonsecretors and Lewis negative had significantly worse lung function. Blood group A Lewis-positive secretors had worse lung function than blood group O secretors.

ROLE OF VITAMIN C

Innate and adaptive immunity, oxidant-antioxidant imbalance, and pulmonary inflammation have all been linked to the development of COPD. Food frequency questionnaires or serum levels used to measure symptoms or exacerbations have shown that vitamins can improve pulmonary function, lessen exacerbations, and improve symptoms. A well-known antioxidant, vitamin C, has been used to treat patients with chronic obstructive pulmonary disease. Because they shield the lungs from the delirious effects of different oxidants and/or reactive oxygen, antioxidants are the first line of defense against oxidants [38].

Popular natural supplement vitamin C is well-known for having antioxidant properties [39]. It functions as an antioxidant by maintaining the reduced state of both short-lived oxidants like $O^{2\bullet-}$and nitric oxide as well as long-lived oxidants like semiquinone radicals [38, 40, 41]. Our objective is to evaluate how vitamin C supplementation for COPD patients affects their clinical therapeutic outcomes. According to the research by Kanani et al. [42], vitamin C consumption and adult lung function are positively correlated [43, 44]. However,Gouzi et al. [45] found a positive correlation between the two parameters, whereas the authors Shaheen et al. [43] found a negative correlation between vitamin C supplements and serum antioxidation levels of vitamin C and SOD (superoxide dismutage). Furthermore, despite the fact that numerous studies have shown that malnutrition can result from COPD, [46, 47] there has been no discernible improvement in fat-free mass index (FFMI) or body mass index (BMI) following vitamin C supplementation. In turn, this establishes a connection between vitamin C supplementation and antioxidative stress in COPD patients.

Vitamins and lung function are linked in a significant number of studies and reviews, both in healthy individuals and COPD patients [48–54]. An increase in the consumption of foods high in antioxidants was linked to better lung function, according to a recent randomized controlled trial. A number of studies [56–65] have also connected vitamins to a decrease in symptoms, respiratory infections, and exacerbations.

In a study of 72,043 women, Varraso et al. [66] found 754 cases of newly diagnosed COPD. In this study, a healthy diet consisting of fruits, fish, vegetables and whole-grain products was contrasted with a Western diet (refined grains, desserts, cured and red meats, French fries). A balanced diet has been associated with a lower risk of COPD. This could be attributed to the diet as a whole or it could suggest that vitamins may reduce the risk of COPD, as fruits are rich in vitamins. In 111 self-reported cases of newly diagnosed COPD in men, a different study by the same author comparing the same dietary patterns produced the same outcomes. Using a food frequency questionnaire, Celik et al. [67] found that COPD patients significantly consumed less fruit and vegetables than the control group. Fruit consumption has been associated with improved spirometry [69], as well as a 25-year reduction in the incidence of chronic bronchitis and emphysema [68]. Eating more antioxidant-rich foods, such as fruits and vegetables, has been linked to improved lung function, according to a recent randomized controlled trial [70].

The South Korean researchers discovered that consuming dietary antioxidants, such as vitamin C, has a beneficial effect on the lungs. The antioxidants' ability to prevent oxidative damage in the lungs — the primary damage caused by smoking — was discovered to be responsible for this protective effect in the study. The discovery adds to evidence that a diet high in fruits and vegetables is beneficial to the lungs due to their high antioxidant content. This means that eating a healthy diet rich in fruits and vegetables may help to mitigate the effects of COPD on the lungs [71]. The team obtained data for the study from a cohort study that included both rural and urban areas in South Korea. They discovered at least 6,700 people with COPD in the study, which they followed and analysed for two years. During this time, researchers assessed the participants' lung function, recorded their antioxidant intake, and looked for signs of oxidative damage. They discovered that, while smoking and other socioeconomic factors can increase the risk of COPD, increasing antioxidant intake can significantly reduce these risk factors. Simply put, antioxidants can reduce the likelihood of developing COPD regardless of lifestyle or other factors.

CONCLUSION

As a result, we conclude that chronic obstructive pulmonary disease (COPD) is a worldwide disease with high morbidity and mortality. The occurrence of respiratory diseases is determined by both genetic and environmental factors. Socioeconomic factors, particularly poverty and malnutrition manifested by significant weight loss, also contribute to the development of these conditions. Aside from environmental factors, genetic predisposition can explain the global rise in COPD incidence. One of the potential genetic underling risk factors could be having a specific blood type. We also discovered that giving vitamin C supplements to COPD patients had a significant clinical impact. By reducing oxidative damage to the lung, it can improve lung function and serum antioxidant levels. Thus, the purpose of this study was to investigate into the role of Blood Group and show how vitamin C supplementation can help COPD patients.

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