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Environmental and Genetic Factors for COPD

Jambaldorj Jamiyansuren[1,2]

[1]Department of Molecular Biology and Genetics, School of Medicine, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia; [2]Central Scientific Research Laboratory, Institute of Medical Sciences, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia

Chronic obstructive pulmonary disease is a persistent progressive disorder with irreversible airway damage characterized by increasing breathlessness, which can be easily measured by spirometry. It is a group of disorders including emphysema, chronic bronchitis, refractory asthma, and some types of bronchiectasis, which have a different pathway and clinical features, but share common features of lower FEV1 and insufficiency of oxygen [1].

The mortality rate of COPD has increased through the last decade. In 2002, the COPD was the 6th position in all causes of mortality, but in 2012 it has moved up to 3rd. By statistics of 2012, 328 million people are affected with COPD and 65% of them were in the moderate and severe stages of the disease. Worldwide, 90% of COPD mortality occurs in developed and underdeveloped countries [2, 3]. In Mongolia, the prevalence of COPD is increasing, because of an increase of airway disorders due to an increasing population density, air pollution, and smoking. In 2003, there were 962 ca¬ses per 10000 and but it increased to 1339.4 cases per 10000 in 10 years and has become the number 1 cause of morbidity in the Mongolian population [4].

As a multifactorial disorder, COPD is induced by intrinsic and extrinsic factors. The main environmental factors are smoking, passive smoking, air pollution, infection, and chemical agents. Of COPD patients, 80-85% are smokers or passive smokers. Worldwide, 2.3 billion people are smokers and 80% of them live in developing countries [5]. In Mongolia, 65% of males, 21% of females, for a total 27% of the population are active smokers and 42.9% are passive smokers. Twenty percent of COPD patients developed COPD because of air pollution and a harsh occupational environment (miner and traffic police). The main air pollutants in UB are small particles and residues of biomass fueling. In the last decade, air pollution has becoming a serious problem in Ulaanbaatar which has become one of the most polluted capital cities of the world [6].

Excluding environmental risk factors, many other people are affected with COPD and a number of research studies have been done regarding their hereditary risk factors. There are multiple genes, such as *ADRB2, ACE, SERPINA1, GSTM1, TNFA1, TGFB* and *MMP9* that affect COPD development and result in exacerbation of certain respiratory conditions [7, 8]. *ARDB2* gene polymorphism had shown concordance in different ethnic groups, for example, Japanese, Caucasian, Chinese and Egyptian. For Mongolians, similar to other Asians, *ADRB2*

allele frequencies and genotype variations were significantly different between patients with COPD and healthy groups. For Mongolian patients with COPD, it has been confirmed that the Gly/Gly16 genotype has a higher prevalence (OR=2.31, 95% CI=1.23-4.32, p=0.027) in the COPD group compared to the controls. Ins/Del mutation of the ACE gene has confirmed as a genetic factor for COPD worldwide, however, this gene mutation has little effect on the Mongolian population as determined in our research [9]. *SERPINA1* is a widely accepted and used for diagnostics and prognosis and it is clear that genetic variants of alpha 1 antitrypsin play a similar role. *GSTM1* deletion polymorphism showed a higher prevalence in COPD patients. The risk of disease for those with the *rs1800629* variant of TGFb is 2.6 times higher in Leucine allele of a certain polymorphism. Genetic variants in tumor necrosis factor alpha have been studied as a susceptibility for COPD, but for Mongolians, it has shown no significance.

Thus, doing further research on COPD is crucial to develop better ways to diagnose and treat this disease. The genetic factors related to COPD need further study to understand their relationship to the environmental factors that dramatically increase morbidity, mortality of COPD. The high prevalence of COPD in Mongolians results in significant treatment expenditure. Understanding the genetic factors involved in COPD promises better ways of prevention and better therapies which ultimately may save lives and reduce costs.

The prevalence of chronic obstructive pulmonary disease is progressively increasing due to air pollution, the harsh climate, and smoking. With the arrival of spring, it is important for us that we not forget the harsh winter with its dense smoke. Measures are needed that effectively reduce our smoke air pollution. If we do not do this, every winter the situation will the same and COPD and lung cancer will be the main cause of morbidity and mortality for Mongolians.

To limit the increasing prevalence of COPD, nationwide actions through our government and nongovernmental organizations are required. Government authorities need to limit smoke air pollution, limit biomass fueling around UB, promote the usage of electricity to heat houses and apartments, reduce taxes on eco cars and increase funding to hospitals and diagnostic centers that can prevent or treat the symptoms. We also need preventative measures such as limiting smoking in public areas and the distribution of air filters in the schools and kindergartens, although these measures may be less effective. Lastly, individuals can protect themselves by wearing masks outdoors, using air filters indoors and not remaining outside for long periods of time.

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