Correlation between Superoxide Dismutase 1 and 2 Polymorphisms in Asthma Patients

Walaa Najah Majid[1], Layla Mohsen Mehdi[2]

[1]Research Scholar, Biology Department , Faculty of Science/University of Thi-Qar, Iraq,
[2]Professor, Biology Department, Faculty of Science , University of Thiqar, Iraq

Abstract

This study was designed to investigate the effectof polymorphisms of Superoxide desmutase1 and 2genes and how they contribute to the risk of developing asthma.A total 120 were involved in the present study and divided into four groups and each group included 30 samples. First group was consisted 30 asthma male patients with waterpipe smoking and second group was also 30 asthma male patients with no smoking, third group was control (no disease) with waterpipe smoking and the fourth group was control group (no disease and without waterpipe smoking).Blood samples were collected from Muthanna hospital and private laboratories from the periodmid-August to the mid-November 2020. To study the polymorphism phenomenon of SOD1 and SOD2 genes were assessed using RFLP- polymerase chain reaction (RFLP-PCR) technique. This study confirmed that the phenomenon of polymorphism of the SOD1 genewas not associated with the group of patients infected with asthma comparedto control group. This study conducted that the phenomenon of polymorphism of the SOD2 geneis not associated with the group of patients infected with asthmacomparedto control group in presence and absence of waterpipe smoking.

Keywords: *Asthma, Waterpipe Smoking, Oxidative stress,SOD1,SOD2*

Introduction

Asthma is a multifaceted inflammatory airway disease with a variety of clinical and molecular phenotypes [1-3]. In asthma genetic, immunologic, and environmental factors all combine to cause chronic inflammation in the airways[4]. Cigarette smoking is a significant factor in asthma Asthmatic smokers have a pronounced deficiency in asthma control, a faster deterioration in lung function, increased airflow obstruction, and a worsening of disease severity, according to the data[5] Normally, oxidative products found in environmental contaminants are inhaled by humans.However, the inflammatory condition of asthmatic patients' airways can promote oxidative stress by increasing levels of reactive oxygen and nitrogen species (ROS and RNS)[6] .This may lead to the inflammatory response's maintenance and development, as well as disease exacerbation [7].The NADPH oxidase pathway produces anion superoxide (O2•-) in activated inflammatory cells . The activity of superoxide dismutase enzymes (SODs), catalase (CAT), and glutathione peroxidase (GPX) neutralizes the(O2•-) [8] .

Furthermore, the enzymes that produce nitric oxide (NO) are known as nitric oxide synthase (NOS)[9]. another common free radical that forms RNS quickly in the presence of ROS[8].Peroxidation of membrane lipids, depletion of nicotinamide nucleotides, increased intracellular Ca2+, cytoskeleton breakdown, and DNA damage have all been linked to an excess of ROS and RNS[10].Tobacco smoke is a significant exogenous cause of oxidative stress in asthma, leading to the maintenance and development of the inflammatory response as well as disease chronicity . Cigarette smoke contains a variety of oxidant compounds that can cause direct and indirect oxidative harm[11]. The current study aims to study polymorphism phenomenon of the SOD1 35 A / C gene and the SOD2 Ala-9Val gene (C / T)) of Asthma patients by using (RFLP-PCR) technology to investigate SOD1

and SOD2 polymorphisms and risk of asthma.

Materials and Methods

Samples were collected from blood from asthma patients .As wall as the control groupe from the asthma center of Al-Muthanna hospitals , As the average age of the patient was (15±35)years Years, collected 120 samples , were examined,)A biochemical test was performed on (60) samples had been measured between superoxide dismutase 1 and 2 Polymorphismsin Asthma Patients by immunological method, by using RFLP-PCR reader(Huma Korea origin). Before using the samples, they were placed at room temperature, as well as the reagents. . All fluids were used with great care to prevent any errors as the checks were done step by step, All examinations were carried out by the apparatus of the College of Science,The-Qar University. Used RFLP-PCR Kit as follows from the global company(measured between superoxide dismutase 1 and 2 Polymorphismsin) iNtRON Korea.

Results

A total 120 were involved in the present study and divided into four groups and each group included 30 samples. First group was consisted 30 asthma malepatients with waterpipe smoking and second group was also 30 asthma male patients with no smoking, third group was control (no disease) with waterpipe smoking and the fourth group was control group (no disease and without waterpipe smoking). When genotypes of SOD1 35 AA, AC and CC were compared between groups (Table 1), the distribution rate was considered insignificant. There was no statistical difference for genotype and allele frequency between the groups (p = 0.76).Similarly, genotypes of SOD2 Ala9Val CC, CT and TT were compared between groups (Table 1), the distribution rate was considered insignificant. There was no statistical difference for genotype and allele frequency between the groups (p = 0.83, 0.81, 0.7) respectively.

Table (1):The genotype and allele distribution in asthma patient and control groups for the SOD1 35 A/C SOD2 Ala-9Val (C/T) polymorphism

Gene	Genotype	Patient (n)	Control (n)	Total	P value
SOD1	AA CA CC Total	47 8 5 60	50 10 0 60	97 18 5 120	0.76 0.63 0
35 A/C	A C Total	47 5 52	50 0 50	97 5 102	0.76 0
SOD2	CC CT TT Total	48 9 3 60	46 10 4 60	94 19 7 120	0.83 0.81 0.7
Ala9Val (C/T)	CC T Total	48 3 51	46 4 50	94 7 101	0.83 0.7

Table (2): The genotype and allele distribution in case and control groups for the SOD1 35 A/C SOD2 Ala-9Val (C/T) polymorphism and risk of asthma

Gene	Genotype	Patient (n)		Control (n)		Total	P value	OR
		Smokers	Non-Smokers	Smokers	Non-Smokers			
SOD1	AA CA CC Total	23 4 3 30	24 4 2 30	24 6 0 30	26 4 0 30	97 18 5 120	0.927 0.671 0	1.038 0.667
35 A/C	A C Total	23 3 26	24 2 26	24 0 30	26 0 30	97 5 102	0.927 0	1.038 0
SOD2	CC CT TT Total	24 5 1 30	24 4 2 30	22 6 2 30	24 4 2 30	94 19 7 120	0.8330.845.659	1.091 0.833 0.500
Ala9Val (C/T)	C T Total	24 1 25	24 2 26	22 2 24	24 2 26	94 7 101	0.8330.659	1.091 0.500

Table (3): The genotype and allele distribution in the patient and control groups for the SOD1 35 A/C SOD2 Ala-9Val (C/T) polymorphism and their relationship with waterpipe smoking

Gene	Genotype	Patient (n)		P value	Control (n)		P value	Total
		Smokers	Non-Smokers		Smokers	Non-Smokers		
SOD1	AA CA CC Total	23 4 3 30	24 4 2 30	0.927 0.671 0	24 6 0 30	26 4 0 30	1 1.000 0	97 18 5 120
35 A/C	A C Total	23 3 26	24 2 26	0.927 0	24 0 30	26 0 30	1 0	97 5 102
SOD2	CC CT TT Total	24 5 1 30	24 4 2 30	0.833 0.845 .659	22 6 2 30	24 4 2 30	0.996 1.000 1.000	94 19 7 120
Ala9Val (C/T)	C T Total	24 1 25	24 2 26	0.833 0.659	22 2 24	24 2 26	0.9961.000	94 7 101

Discussion

The SOD enzymes play a critical role in protection a cell against free radicalstogether with glutathione peroxidase and catalase.SOD enzymes comprise redox metals in the centers of their catalytic zones that transform superoxide radicals to hydrogen peroxide and oxygen[12]. The current study was conducted to find out the association between the SOD1 and SOD2 genetic polymorphism and the incidence of asthma. This study found that the was no relationship between the SOD1 and SOD2 genes and the severity of asthma in terms of the SOD1 35 A/C, CC genotyping frequency and SOD2 Ala-9Val (C/T), the TT genotype frequency in the patient group was statistically no significantly than the control groupimplying that there is no link between genetic polymorphisms in the SOD1 and SOD2 genes and the occurrence of asthma this corresponds to a study[13]. They discovered that these two genes are unlikely to function as major players in asthma on their own, based on their results. Along with genes involved in oxidative degradation, variants that interact with these genes have yet to be identified, and SOD genes may become significant in inflammatory airway diseases where oxidative stress is common.

The current study was conducted to find out the link between the SOD1 and SOD2 between smokers and non-smoking patients. There was no statistical difference for genotype and allele frequency between the groups (p = 1) between asthma patients with waterpipe smoking and control. At the same way, when the patient smoker's cohort and control group were compared for the presence of the SOD2 Ala9Val (C/T) polymorphism, the distribution of the genotypes (p = 0.996).The findings of the present study may explain why smoking isn't considered a risk factor for developing asthma in the samples examined, and the findings of this study were consistent with those of [14], interpretation of the results might be that another unknown polymorphism, which is in linkage disequilibrium with the SOD1gene and SOD2gene polymorphism and contributessusceptibility to asthma. Although the results have shown a statistically significant enrichment of specific SNPs in SOD genes across the asthma population,However, it is possible that the presence of these polymorphisms increases the probability or enhances the development of asthma through other unknown genetic mutations (such as polymorphic genes coding for enzymes involved in the metabolism of foreign chemicals (xenobiotics) as well as external factors (including pesticides, organic solvents, and metals including iron, copper, and manganese)[15].

Conclusions

Incapabilityto obtain enough patent sample to accurately measure SOD1 and 2 polymorphisms and measuring the enzyme activities of SOD1 and SOD2 genes and this is the ne of limitations of the current study. This may be usefulto highlight the effects of polymorphisms studied, and correlate the genotyping data with different factors

Ethical Clearance : Taken from University of Thi-Qar ethical committee

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Conflict of Interest : Nil

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