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Short Communication

An introduction number of genetic single nucleotide polymorphisms (SNPs) at the promoter region of HLA-DQB1 gene

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Abstract

Human leukocyte antigen-DQB1 (*HLA-DQB1*, OMIM: 604305) is the human major histocompatibility complex (MHC) system, belonging to the class II human major histocompatibility complex (MHC). This complex of genes is centrally involved in the actions of the human immune system. They play an important role in donor-recipient matching in transplants and can be associated with most autoimmune diseases. The aim of the present study was to introduce the *HLA-DQB1* unsearched frequent SNPs that may be associated with the risk. Previous studies have shown that genetic polymorphisms in the promoter region of other genes change gene expression. We suggest that *HLA-DQB1* gene numbers of unsearched single nucleotide frequent polymorphisms such as rs3891175, rs9274526, rs71542466, and rs9274526, which are highly frequent in worldwide populations, may alter *HLA-DQB1* gene activity and subsequently may be associated with the risk of autoimmune diseases, especially viral-related diseases. This suggests that more research is needed to support this study in the future.

Keywords: Human, HLA-DQB1, Gene, Polymorphism

Introduction

The human leukocyte antigen (HLA) system, also called the human major histocompatibility complex (MHC), is a term used to describe a group of genes in animals and humans that encode a variety of cell surface markers, antigen-presenting molecules, and other proteins involved in immune function (Mentzer et al., 2023; Gough & Simmonds, 2007). The HLA complex of genes is on the short arm of chromosome 6 (6p21). The HLA genes are divided into classes I, II, and III. The *HLA-DQB1* gene belongs to the class II family (Gough & Simmonds, 2007; Trabace, 2000). This class of molecule is a heterodimer consisting of an alpha (DQA) and a beta chain (DQB), both anchored in the membrane. It plays a central role in the immune system by presenting peptides derived from extracellular proteins, which are made by foreign invaders such as viruses and bacteria, and presenting them to $CD4^+$ and helper T cells (Mentzer et al., 2023; Trabace, 2000). The observation that some diseases are distinctly more common in individuals with a particular HLA-DQB1 allele or haplotype allowed studies on HLA and disease associations. Previous epidemiologic studies have shown that *HLA-DQB1* polymorphisms and allelic variation play a fundamental role in donor-

recipient matching in transplantations (Tambur et al., 2021), multiple sclerosis (MS), celiac disease (Fiorillo et al., 2017), viral infection (Mentzer et al., 2023; Malavige et al., 2011), hepatitis C (Arshad et al., 2019), hepatitis B, liver cirrhosis (Naderi et al., 2023), ovarian cancer, breast cancer cases with ataxia (Hillary et al., 2018), and childhood steroid-sensitive nephrotic syndrome (Jia et al., 2018).

This study was done to introduce four genetic single nucleotide polymorphisms (SNPs) at the promoter region of the HLA-DQB1 gene for future biological studies.

Materials and Methods

This investigation was conducted using the methods of our previous study. First, the HLA-DQB1 gene promoter sequence was obtained from the NCBI. Then all polymorphic sites (rs3891175, rs9274526, rs71542466, and rs9274526) were identified on a sequence from NCBI (https://www.ncbi.nlm.nih.gov/variation/view/).

Results and Discussions

The *HLA-DQB1* gene is the most polymorphic gene, especially at the promoter region. A number of genetic polymorphisms are more frequent alleles in worldwide populations. In this study, four genetic polymorphisms in the promoter region of this gene are introduced. Which are located at -33 A>G, -51 T>G, -71 G>C, and -80 T>C regions (rs3891175, rs9274526, rs71542466, and rs9274526), respectively (Figure). The alpha alleles of these polymorphisms are more frequent in worldwide populations. The allelic distributions of these polymorphisms are different between worldwide populations (Table). According to previous studies and the association of *HLA-DQB1* polymorphisms with autoimmune diseases, genetic polymorphisms in the promoter region of this gene can play an important role as a risk factor for autoimmune diseases (Mentzer et al., 2023; Jia et al., 2018). Previous studies have shown genetic polymorphisms in the promoter region of other genes change gene expression (Saify, 2016; Saify et al., 2016). This is the first study to introduce these polymorphisms, and I suggest that more research is needed to support this study.

Table. Allelic distribution of *HLA-DQB1* promoter polymorphism in the worldwide population

Population	-33 (rs3891175)			-51(rs9274526)			-71(rs71542466)			-80(rs9274529)		
	N	**G (%)**	**A (%)**	**N**	**T (%)**	**G (%)**	**N**	**G (%)**	**C (%)**	**N**	**T (%)**	**C (%)**
European	40580	78.8	21.2	13530	24.1	75.9	12080	84	16.0	14152	40.5	59.5
African	4452	78.5	21.5	2420	30.1	69.9	2816	79.2	21.8	2898	49.9	50.1
African Others	140	82.1	17.9	92	28.0	72.0	108	73.1	26.9	114	54.4	45.6
African American	4312	78.4	21.6	2328	30.2	69.8	2708	79.5	20.5	2784	49.8	50.2
Asian	164	87.8	12.2	112	8.9	91.1	108	78.7	21.3	112	38.5	61.5
East Asian	138	86.2	13.8	86	9.0	91.0	84	82.0	18.0	86	37.0	63.0
Other Asian	26	96.0	4.0	26	8.0	92.0	24	67.0	33.0	26	42.0	58.0
Latin American 1	168	71.4	28.6	146	19.9	80.1	146	80.1	19.9	146	41.8	52.2
Latin American 2	670	86.1	13.9	610	14.9	85.1	610	87.5	12.5	610	27.9	72.1
South Asian	94	80.0	20.0	98	8.0	92	94	72.0	28.0	98	50.0	50.0
Other	1606	81.3	18.7	500	19.2	80.8	478	81.0	19.0	504	40.5	59.5
Total	**52350**	**82.4**	**17.6**	**19948**	**18.2**	**79.1**	**19256**	**78.6**	**21.4**	**21530**	**42.9**	**57.1**

Figure. Genetic polymorphisms in the promoter region of the human leukocyte antigen-DQB1 (HLA-DQB1) gene and its different sites

Conclusion

In conclusion, HLA-DQB1 is involved in the actions of the human immune system associated with mostly autoimmune diseases, especially viral-related diseases. Previous studies have shown genetic polymorphisms in the promoter region change gene activity. rs3891175, rs9274526, rs71542466, and rs9274526 are more frequent in different populations. These polymorphisms may alter this gene's activity. We suggest that more research is needed to support this study.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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