4-2024

Anxiety and its Relation to the CR1 Gene Variants

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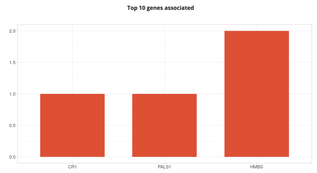
ABSTRACT

Anxiety disorder is characterized by experiencing frequent and intense panic in response to everyday situations. Those with this disorder tend to deal with persistent episodes that can escalate rapidly, making routine tasks dreadful and stressful. This study analyzes the different variants with possible correlations or relationships to generalized anxiety disorder. The research involved computational biology tools: Simple ClinVar, SIFT, Polyphen-2, and SWISS modeling. Simple ClinVar identified the CR1 gene and gene variants associated with generalized anxiety disorder, providing a summary of the CR1 gene and its different variants. SIFT and Polyphen-2 were used to predict if an amino acid substitution is going to affect the protein function and/or be damaging to the protein. PolyPhen-2 predicted that Gly2109Ser was concluded to be possibly damaging. SWISS modeling was used to visually see the modeling of the protein. The CR1 gene is on chromosome one and is part of the receptor of complement activation family. It encodes a monomeric single-pass type 1 membrane glycoprotein on erythrocytes, leukocytes, glomerular podocytes, and splenic follicular dendritic cells. The gene plays a role in the capture and clearance of complement-opsonized pathogens. It watches the binding through erythrocytes, monocytes, and immune complexes. It can also inhibit spontaneous complement activation by impairing the C3/C5 pathway's function and structure. These genes are found mainly among appendix, spleen, and lymph node cells. This data can be used to develop understanding of the relationship between the inhibition of the CR1 gene and generalized anxiety disorder.

INTRODUCTION

Anxiety disorder is characterized by experiencing frequent and intense panic in response to everyday situations. Those with this disorder tend to deal with persistent episodes that can escalate rapidly, making routine tasks dreadful and stressful. Individuals who suffer from this disorder often perceive a lack of control and combat it by avoiding such situations. Though symptoms may start developing during early childhood, they become more apparent during later adolescent years. There is no direct cause of anxiety, though it can progress due to familial inheritance or a triggering event. Having an episode consists of more than just worry or fear; it can also be presented through symptoms such as insomnia, heart palpitations, irritability, or abdominal distress.

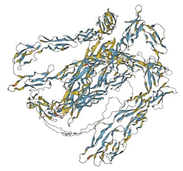


The purpose of this study is to analyze the different variants of the CR1 gene and the relationship it has with generalized anxiety disorder. Understanding how the CR1 gene affects anxiety can lead to an understanding of the correlation between genetic inheritance and mental health disorders.

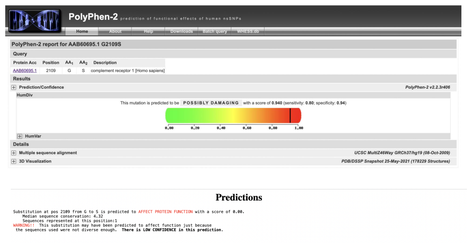
METHODS

The methodology for this research was divided into four different databases: Simple ClinVar, SIFT, PolyPhen, and Swiss Model. Simple ClinVar was used to provide a summary of the CR1 gene and its different variants. SIFT and PolyPhen 2 were databases used to predict if an amino acid substitution would affect the protein's function. The Swiss Model database was utilized to visually model the protein's structure.

RESULTS

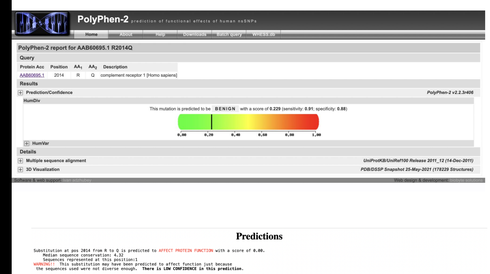


Protein Homology of CR1



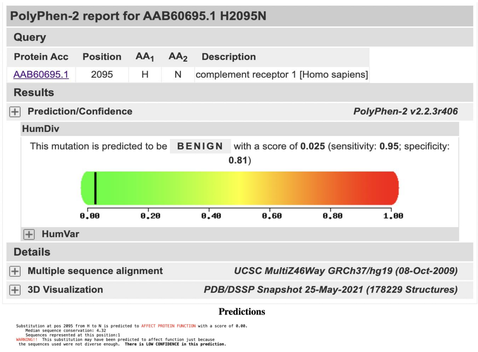
Using Polyphen the missense mutation G2109S is predicted to be possibly damaging with a score of .904

Sift programing established that the mutation G2109S does affect protein function with a score of 0.00. Though there is little confidence in this prediction.



Using Polyphen the missense mutation R2014Q is predicted to be benign with a score of .229

Sift programing established that the mutation R2014Q does affect protein function with a score of 0.00. Though there is little confidence in this prediction.



Using Polyphen the missense mutation H2095N is predicted to be benign with a score of .025

Sift programing established that the mutation H2095N does affect protein function with a score of 0.00. Though there is little confidence in this prediction.

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DISCUSSION AND CONCLUSION

- The CR1 gene is on chromosome one and is part of the receptor of complement activation family. It encodes a monomeric single-pass type 1 membrane glycoprotein on erythrocytes, leukocytes, glomerular podocytes, and splenic follicular dendritic cells.
- The decrease in the amount of functional CR1 genes leads to the reduction of erythrocyte's ability to buffer and transfer immune complexes, which results in the impairment of immune complexes by the spleen and liver
- CR1 monitors bonding through erythrocytes, monocytes, and immune complexes
- The mutations associated with the CR1 gene have also been associated with diseases such as gallbladder carcinomas, mesangiocapillary glomerulonephritis, systemic lupus erythematosus, sarcoidosis and Alzheimer's
- Mutations in this gene have additionally been linked to a decrease in Plasmodium falciparum rosetting, providing protection against severe malaria
- CR1 has also been seen to have a role in the pathogenesis of COVID-19
- Due to the uncertainty of the effects CR1 has on anxiety continued research is needed

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ACKNOWLEDGEMENTS

This research was supported By HBCU Undergraduate Program Research
Thanks to Elaine Vanterpool,PhD