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Schizophrenia and Genomics

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Introduction

- Patients with Schizophrenia (SZ) struggle to determine reality vs. non-reality. This neurodevelopmental disorder is not short-lived. Instead, SZ requires life-time treatment. Factors that impact SZ include genetics, environment, and brain disruptions (Mental Health Information, n.d.). SZ is usually discovered between the ages of 16 and 30. Most people do not develop SZ after the age of 45. Currently, a cure is not available (Schizophrenia, n.d.).
- Genomics is one of the future paths to better medicine. The purpose of this article is to understand how genetic studies can lead to improved treatment of SZ.
- This topic was chosen to bring awareness to what genomics can do for those who have SZ and acknowledge the need for more studies to be completed. There have been astonishing advancement in gene therapy. Gene therapy provides a cure for certain cancers (Roth, 2019). However, there has been a lack of studies for analyzing rare non-coding variants for SZ (Takata, 2019). The mental health charity showed that the United Kingdom spent 5.5 % of its budget on mental illness and 19.6% on cancer, even though mental health is a more significant burden (Kong et al., 2017).
- The genome-wide association studies have found a genic correlation between mental disorders, polygenic heritability, and other brain disorders. There are over 150 genome-wide hits for SZ, but there is a lack of transitioning this knowledge to public mental health. The lack of transition into public mental health is due to a lack of education for clinicians. This ongoing insufficient movement is why it is important to start discussing and educating. There is an urgent need to keep working on discoveries. (Merikngas & Merikangas, 2019).

Signs and Symptoms

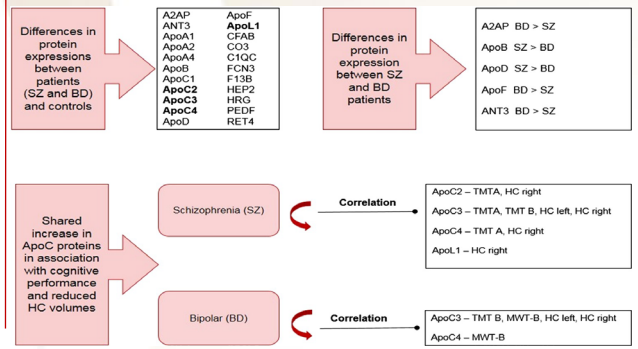
- Hallucinations auditory and visual
- Delusional
- Paranoia
- Nonsensical speech
- Withdrawn
- Cognitive issue effecting thought process
- Emotionless (Schizophrenia, n.d.)
- Lack of motivation
- Lack of planning
- Disorganized thoughts
- Lack of pleasure
- Abnormal movements
- Impaired memory and concentration (Patient & Families: Schizophrenia, n.d.)

Complications

- Financial problems and homeless
- Other mental health co-morbidities
- Substance abuse
- Suicide Ideation (Mayo Clinic, n.d.)

(Figure 1)

The findings displayed from Knochel et al., 2017 study showing the protein levels correlation between controls, SZ, and BD. Retrieved from https://login.ezproxy.otterbein.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=pbh&AN=121919330&login.asp&site=ehost-



Non-genetic Risk Factors

- Not all scientists support genetics as the alone cause of SZ. However, having an individual genetic predisposition may be influenced by other factors.
- Mothers who have been exposed to viruses have an increased chance their child will have SZ.
- Viruses can also attack the brain cells, lay dormant, affect neurotransmitters, and alter brain cell processes.
- Exposure to lead, such as lead found in lead paint.
- Evidence supporting people who have the herpes simplex virus and cytomegalovirus have antibodies that can cause genes to develop SZ.
- Antibodies to toxoplasmosis gondii have been associated with SZ.
- Someone is more likely to develop SZ in metropolitan areas versus rural areas..
- Women in famine during pregnancy have an increased chance of having a child with SZ (Cause and Risk Factors of Schizophrenia, n.d.)

Pathophysiology Genetic Factors

- Large genome-wide associated studies (GWAS), have made advancements in understanding genic make-up and SZ. SZ is not determined by just one gene. There is estimated to be over 100 risk gene loci. Correlation between cognitive and gene factors SZ has also been noted. It is believed the phenotypes are polygenic. The strongest correlation lies in chromosome 22q13.2.
- There is a 60 to 80% chance SZ will be passed on to children, and family members who do not express the traits still have a chance their children will have cognitive and psychiatric issues.
- Those diagnosed with SZ have shown notable amounts of cognitive impairment with insight, judgment, memory, and concentration. Another correlation is that premorbid cognitive issues are related to later developing psychotic disorders (Smeland & Andreassen, 2018).
- A study conducted by Knochel et al., 2017, researched genomics to discover protein levels that reflect SZ and bipolar disorder's pathophysiology. They also used a trans-diagnostic approach with MRI measurements and found differing protein levels; see figure 1. ApoC also differed between participants and showed correlations to cogitative impairment. Furthermore, ApoC showed a relationship between hippocampus volumes and the severity of impairment. The more cognitive issues a participant had, the more considerable changes in Apo concentrations. Findings showed that low hippocampal (HC) volume equaled increased ApoC.
- A study conducted with catechol-O-methyltransferase (COMT) DNA methylation extracted from the peripheral blood using a linear regression analysis showed the relationship between COMT DNA methylation and excitement and depression symptoms of SZ (Nou El Huda et al., 2018).

Image retrieved from: https://www.123rf.com/photo_52545507_photo-of-psychotic-woman-with-schizophrenia-during-treatment.html?vti=mqkdlco09ouubr98fm-1-8

Significance

- Currently, no treatment exists for cognitive dysfunction for those with SZ. Cognitive function can be a predictor of overall life outcomes in psychotic disorder.
- Researchers are gaining more biological insight to discover treatments. The Psychiatric Genomics Consortium is gaining recognition for advancement in analyzing genetic data. However, new statistical procedures are required to discover the missing genetic links.
- By discovering a single gene characteristic, it has become possible to make advancements in target drugs. The FDR method has been utilized to reference SZ with other traits, and when another trait is recognized to co-exist with a SZ trait, that information can be used to prioritize by suggestive association (Smeland & Andreassen, 2018).
- Apo can be used as biomarkers for psychomotor speed, executive functioning, and intelligence, which can be SZ indicators.
- Low volumes in HC can mean more suffering for those with SZ. More care measures can be implemented.
- Findings from Knochel et al., 2017, and GWAS may lead to finding biological diagnostic tools for SZ (Knochel et al., 2017).
- DNA methylation of COMT in peripheral blood can be used for biomarkers for SZ. The event of hyperfunction of dopamine suggest the methylation-gene expression is difficult to obtain correctness due to methods used and demographics, and the dopamine hypothesis of SZ may not hold (Nour El Huda et al., 2018).

Nursing Implications

- Genomics has been added to the Scope and Standards of Practice by the ANA.
- The Advanced Practice Nurse should be prepared for continual up to date education for genomic and SZ.
- Clinicians need to have a full understanding of pharmacogenomics.
- Be prepared to educate patients understandably based on their culture, knowledgebase, reading capability, and language.
- Present all aspects of genomics with patients. There are both ethical and legal issues to consider.
- Be able to perform a risk assessment to relay information to pharmacists, genetic counselors, and geneticists (McCormick, 2017)

Conclusion

- Research is changing rapidly, and clinicians need to stay on top of new data to manage their patients' care properly. There have been many advancements in genomics related to SZ, such as phenotypes are polygenic, DNA methylation of COMT can lead to biomarkers, and the correlation with cognitive impairment and SZ. There is an ongoing issue with funding for genomic studies toward mental health disorders. Mental health studies are funded less compared to that of cancer. All three studies discussed in this project ends with a cautionary note that the study of genomic and SZ still require further investigation. As long as more extensive research is completed, there is hope for more quality outcomes.

Additional Sources

American Foundation for Suicide Prevention . (n.d.). https://afsp.org/

Genetic Home Reference. (n.d.). https://ghr.nlm.nih.gov/primer/genomicresearch/gwastudies

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