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"THE USE OF BIG DATA AND MACHINE LEARNING IN THE DIAGNOSIS AND TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER: A NARRATIVE REVIEW"

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Abstract: Introduction: Big Data has improved the ability of machines to make intelligent decisions given the high volume, speed and variety of information available, enabling Machine Learning (ML), an artificial intelligence model that uses algorithms that identify and analyze data patterns and make own decisions. In healthcare, ML is recognized for its predictive capacity and for increasing the accuracy of decisions; and has already been used in studies, diagnosis and treatment of Attention Deficit Hyperactivity Disorder (ADHD), a neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity and impulsivity. Purpose: To document the importance of Big Data and artificial intelligence in scientific predictions about ADHD. Methodology: The narrative review used PubMed and SCOPUS databases and the descriptors "ADHD", "Attention Deficit Hyperactivity Disorder" and "Big Data". Articles that used Big Data to obtain data analyzed by algorithms on ADHD were included. Articles related to case studies, literature review, animal model and those not available in English were excluded. Results and discussion: 17 studies were reviewed. The use of Big Data has changed the understanding of the pathogenesis, comorbidities, diagnosis and treatment of various diseases. Tools, such as the Spatial Transformation Model STM), which allow the recording and analysis of neuroimaging patterns in identified ADHD patients, help to determine neuroanatomical characteristics in the disease phenotype. It was also possible to analyze ADHD susceptibility genes, such as the DAT1 dopamine transporter gene, and verify the predictive value of the ML used to determine the relationship between behavioral patterns in social networks and the diagnosis of ADHD. With regard to treatment, Big Data has enabled greater knowledge about the impacts of the use of antipsychotics, the subject of great controversy. Conclusion: Big

Data applied to research on ADHD acts as a new tool for the assessment and treatment of this disorder, which increases the quality of research on the subject, enabling the improvement of neuropsychiatry services, facilitating the screening and management of this disorder and reduces the economic burden of disease.

Keywords: "ADHD", "Attention Deficit Hyperactivity Disorder", "Big Data".

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that manifests itself with symptoms classified into three categories: inattention, hyperactivity and impulsivity. With the advent of Big Data, the ability of machines to make intelligent decisions was improved given the high volume, speed and variety of information available, achieving what we now know as Machine Learning (ML), an artificial intelligence model that uses algorithms capable of to identify and analyze complex data patterns and thus make their own decisions. In this context, LM is recognized for its predictive capacity and for increasing the accuracy of decisions, which has already been used in studies, diagnosis and treatment of ADHD. To document the importance of using Big Data and artificial intelligence in predictions about Attention Deficit Hyperactivity Disorder.

METHODOLOGY

The narrative review followed the norms of the PRISMA Protocol. PubMed and SCOPUS databases were used. The descriptors searched on the DeCS platform were: "ADHD", "Attention Deficit Hyperactivity Disorder" and "Big Data". Articles written in English were included, which used Big Data to obtain data analyzed by algorithms in Attention Deficit Hyperactivity Disorder in order to interpret the use of artificial intelligence and its predictive capacity in this neurological disorder. Articles related to case studies, literature review, animal model and those not available in English were excluded.
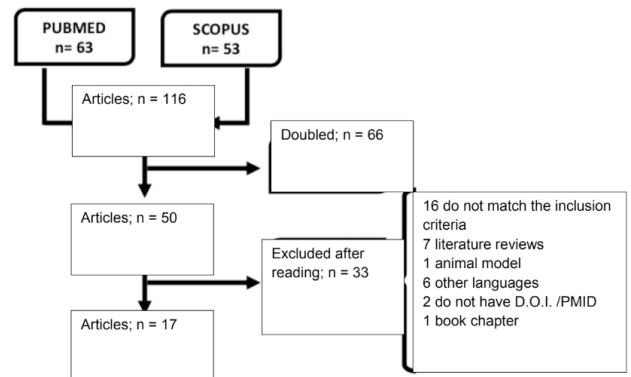

Diagram 1: Flow of selection of articles used in the review.

DISCUSSION

Big Data is a structured database that can be used both in epidemiological studies and traditional statistical tests and in artificial intelligence models. This last form of analysis is changing the way we understand the pathogenesis of several diseases and helping to build more solid evidence for diagnostic and treatment conclusions. This review addresses studies that deal specifically with ADHD or that include the relationship between this disorder and a given variable. Among them, tools have been developed, such as the Spatial Transformation Model (STM), which allow the recording and analysis of neuroimaging patterns, using magnetic resonance to determine neuroanatomical characteristics and their predictive values.[2]

These patterns are identified by models that impose mathematical restrictions on the types of geometric distortions in the image exam.[2] It was also possible to analyze ADHD susceptibility genes, such as the DAT1 dopamine transporter gene, suggesting its role in modulating the disease phenotype.[4] The predictive value of the ML used to determine the relationship between behavioral patterns
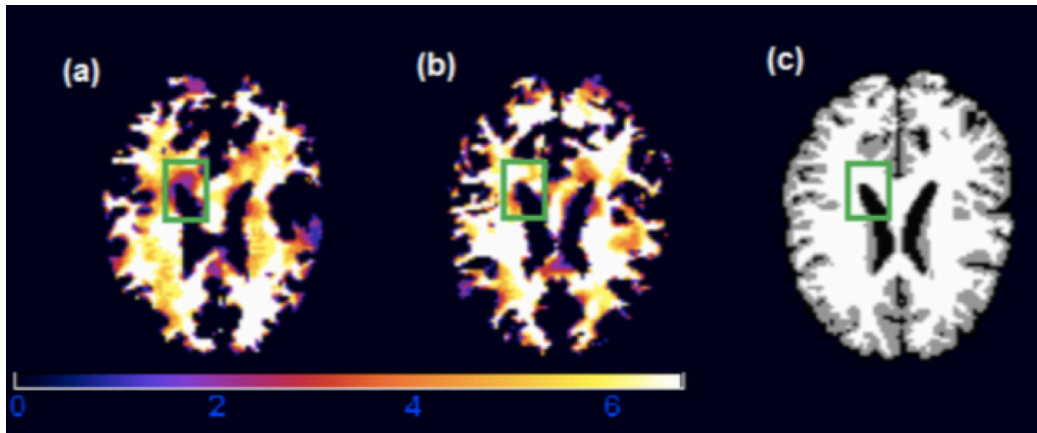
Figure 1: Example of ML applied to neuroimaging of two randomly selected children in an ADHD study (image a and b). The image of subject b shows more intense brightness within the highlighted area, showing that he has a greater volume of white matter in this specific region (image c).[2]

in social networks and ADHD diagnosis is also being verified.[1] Artificial intelligence is also improving knowledge about movement patterns, such as signs of wrist and ankle acceleration associated with this neurological condition.[3] With regard to the treatment of the disease, Big Data has enabled greater knowledge about the impacts of the use of antipsychotics, currently the subject of great controversy.

CONCLUSION

Big Data applied to ADHD research acts as a new tool for the assessment and treatment of this disorder, which raises the quality of research on the subject and enables the improvement of neuropsychiatry and neurology services, facilitating the screening and management of this disorder, and reducing the economic burden of disease. Thus, the creation of a large data volume network enables the involvement of more collaborators in the care of individuals with ADHD, the development of state-of-the-art technology and, thus, the improvement of the quality of patient care.

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