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Artificial Intelligence and Migraine: Insights and Applications

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Dear Editor,

The second most common cause of neurological disorders is migraine, which is known as a complex neurological disease causing unilateral headaches. Although the exact cause of this disabling neurovascular disease is still unclear, as an autonomic dysfunction, polygenic, and complicated neurological disease, migraine is affected by several factors such as cytokines, genes, immune cells, tumor necrosis factors α, and environmental factors (1-3).

High risk for chronification and increased treatment complexity are causes of delay in headache diagnosis, simply more than a decade. To reduce the inaccuracies and diagnostic delays, facilitate access, and continue care and remote management, some digital health applications are practical, such as health information technology, computerized expert systems or software, Internet of Medical Things, mobile health, telehealth and telemedicine, wearables, and robotic surgery (4, 5). According to computing power improvement, availability of big data (derived from wearable health monitors and medical history), learning algorithms, and Artificial Intelligence (AI) can play a prominent role in healthcare and medicine (6). In this regard, AI for medical decision support systems implantation has been employed for migraine diagnosis and as a predictor for outcomes of migraine treatments for more than a decade. These include artificial immune systems (AIS), support vector machines (SVM), and artificial neural networks (ANNs), that have shown promising results (7).

Artificial Intelligence in Medicine (AIM) can help physicians to improve and optimize their previous work. Specialist's thinking is stimulated by software in AI approach, and this software can diagnose and treat diseases depending on the information of the specialist in that subject. However, we should consider that AIM cannot replace a physician (6, 7).

Instead of being reported by the patient, AI and neural imaging are used to assess neurological pain signals (8). One of the advantages of using AI is the early and prompt identification of migraine headaches, hence reducing the disease's societal impact. Pre-headache signs can also be detected using AI and other computer technologies. AI technologies for identifying migraines have a sensitivity and specificity of more than 87%, making them valid diagnostic tools for migraine headaches (4). Patients' information, recollections, and statements can be classified using digital devices and AI, reducing bias during the interview and treatment process. Some AI technologies allow for remote patient care, which has numerous advantages (4).

AI is used to quantify the amount of gray and white matter alterations on magnetic resonance imaging (MRI) scans, in addition to determining the exact quantity and location of migraine pain in the brain (9).

Another use of AI is to forecast whether a migraine patient's surgery will succeed or fail. AI is used to determine the main site of pain in this procedure, allowing the surgeon to predict the operation's success and evaluate the pain's location (10).

Medication overuse (MO) is one of the most common causes of migraine headaches. Data collection, analysis of patients' medical records, and computer programming demonstrated that AI could predict and regulate MOs; so, it improves the patient treatment (7).

AI could be used when patients with low Glasgow

Coma Scale (GCS) scores are unable to verbalize their discomfort. As a result, the physician can use AI to determine the timing and location of the patient's pain (8).

In conclusion, AI could be used to improve preventing, diagnosing, treating, and caring of patients with migraine. The application of AI in migraine is rapidly evolving and the advancement of these tools can improve health outcomes.

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