International Journal of Medical Sciences And Clinical Research

VOLUME Vol.05 Issue03 2025
PAGE NO. 7-11
DOI 10.37547/ijmscr/Volume05Issue03-02

The role and importance of modern computer technologies in the diagnosis and treatment of neurological diseases among adolescents

Atakhanov Sanjarbek Anvarovich

Assistant at the Department of Biomedical Engineering, Biophysics, and Information Technologies, Fergana Institute of Public Health, Uzbekistan

To'xtamurodova Masumaxon Nurmurodjon qizi

1st-year student, Faculty of Pediatrics, Fergana Institute of Public Health, Uzbekistan

Received: 20 January 2025; **Accepted:** 19 February 2025; **Published:** 17 March 2025

Abstract: This article focuses on the identification and diagnosis of neurological diseases among adolescents using computer technologies. It highlights the role of modern medical advancements in improving diagnostics and emphasizes the increasing significance of computer technologies in daily life. Additionally, the paper discusses the importance of enhancing future medical professionals' efficiency in working with computer technologies.

Keywords: Artificial Intelligence (AI), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Neuropathology, Epilepsy, Migraine, Attention Deficit Hyperactivity Disorder (ADHD), Sleep Disorders, Parkinson's Syndrome, Virtual Reality (VR), Electroencephalography (EEG), Ultrasound Dopplerography (USDG).

Introduction: With the rapid development of computer technologies, their influence extends to various fields, including medicine. Modern computer technologies have significantly facilitated advancements in healthcare, making medical diagnostics and treatment more efficient and accessible. Specifically, Examples of These Technologies Include Artificial Intelligence (AI), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Virtual Reality (VR), Electroencephalography (EEG), and Ultrasound Dopplerography (USDG).The use of modern computer technologies has provided significant convenience and advantages for both the general population and medical professionals. These technologies are primarily used in the field of neurology, enabling medical personnel to diagnose various diseases more accurately and efficiently. Some of these technologies are not only used for diagnosing neurological diseases but also for their treatment.

METHOD

Neuropathology (from Greek: neuron – nerve, pathos – disease, logos – study) refers to the study, diagnosis, treatment, and prevention of nervous system diseases. It is one of the most extensively researched fields in medicine.Historically, neurology was first studied by ancient Egyptian scholars, who documented conditions such as cranial injuries and facial nerve paralysis. In ancient China, needle acupuncture and cauterization techniques were used to treat nervous system disorders—methods that are still in use today.During the ancient Greek period, renowned scholars such as Hippocrates (Buqrot) and Aristotle (Arastu) made significant contributions to neurology.Hippocrates approached neurological diseases based on their origin, emphasizing bloodletting and a balanced diet for treatment.Aristotle was one of the first to recognize the existence of nerve fibers and their connection to the brain.One of the most influential figures in medieval neurology was Avicenna (Abu Ali ibn Sina). In his works, he described the nervous system in detail, stating: "Nerves originate from the brain or spinal cord and are composed of fine, soft conductive fibers. They are designed for movement and sensory functions."Ibn Sina not only contributed to neurology but also provided valuable insights into general medical

treatments. According to medieval sources, the first hospitals were established in 1066 in cities such as Damascus, Samarkand, Astrabad, Hamadan, and Baghdad. In Baghdad, a medical licensing board was created to assess aspiring physicians through examinations, granting diplomas only to those who passed. The first pharmacies also appeared in the Arab world, and medicinal prescriptions were written in Arabic. Some notable examples include:

"Muskus" – used for brain and eye diseases

"Ambru" – used for epilepsy, heart diseases, and brain disorders

The study of children's neurological conditions dates back to the 6th century, when Hippocrates wrote the book "On the Nature of the Child." After him, Celsus, Galen, and Soran contributed significant writings on pediatric medicine.

Avicenna also emphasized the complexity of treating children, stating:

"Treating one woman is harder than treating ten men. Treating one infant is harder than treating ten women."The first pediatric hospital was established in Paris in 1802, followed by similar institutions in Vienna, Berlin, and other European cities.Modern Advances in Neurology Through Computer TechnologiesOver the years, technological advancements have revolutionized medical sciences, leading to the integration of computer technologies in neurology. These innovations have significantly improved diagnostic precision, allowing for more accurate test results and enhanced treatment strategies.With the introduction of computer-based analysis tools, medical practitioners now have access to advanced diagnostic techniques, enabling them to make faster and more precise medical decisions. Over the years, new ideas and investments have significantly influenced the development of medical technologies. Particularly in recent times, the use of computer technologies in medicine has grown rapidly. Technologies such as Artificial Intelligence (AI), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Virtual Reality (VR) are now widely utilized in neurology.The primary focus of these technologies is the diagnosis of neurological disorders. In today's world, neurological diseases among adolescents are becoming increasingly common. Some of the most prevalent conditions include:

Epilepsy Migraine Attention Deficit Hyperactivity Disorder (ADHD) Sleep disorders Parkinson's disease These conditions can be effectively diagnosed using the advanced medical technologies mentioned above. Accurate diagnosis is a key requirement when utilizing computer technologies in medicine. Techniques such as MRI, CT, EEG, AI, and VR provide medical professionals with detailed insights into brain function, making it easier to identify multiple abnormalities in brain activity.Each medical technology serves a specific purpose in diagnosis and treatment. The integration of these technologies in medical practice not only enhances diagnostic accuracy but also improves patient care. Future medical professionals who possess strong technical skills and foreign language proficiency will have a significant advantage in the global medical field. This will ultimately lead to an increase in the number of highly specialized doctors in Uzbekistan. Although some advanced medical technologies have yet to reach Uzbekistan, the country is actively incorporating numerous computer-based medical innovations. Below, we will explore the role of computer technologies in diagnosing neurological disorders among children.

Epilepsy

Epilepsy (from Greek Epilepsio – "to seize") is a chronic polyetiological disease characterized by abnormal brain activity leading to various involuntary movements, sensory disturbances, loss of consciousness, and epileptic seizures. The primary symptom of epilepsy is convulsions, and a diagnosis is typically confirmed if a patient has experienced two or more seizures.

Causes of Epilepsy:

Head trauma (e.g., car accidents)

Brain abnormalities (tumors, vascular changes)

Infectious diseases (including those during pregnancy)

Nutritional deficiencies and oxygen deprivation

Diagnosis and Treatment:

Artificial Intelligence (AI) is now used to analyze patient medical history and detect brain anomalies, helping doctors provide personalized treatment plans.

MRI (Magnetic Resonance Imaging) is utilized to identify structural changes in brain activity and vascular anomalies associated with epilepsy.

Migraine

Migraine (from French Migraine – "brain pain" or hemicrania) is a recurrent headache disorder primarily affecting women due to genetic vascular predisposition. It is commonly observed in adolescents during puberty and can be triggered by stress or fatigue.

Symptoms of Migraine:

Unilateral (one-sided) headache

Dizziness and light sensitivity

Nausea and vomiting

Attacks lasting from a few hours to several days

Diagnosis and Treatment:

AI-based analysis helps monitor daily activities and predict migraine attacks in patients.

Virtual Reality (VR) therapy is used to reduce stress, allowing patients to immerse themselves in calming environments.

EEG (Electroencephalography) is employed to study alpha and beta brainwave patterns associated with migraines.

Parkinson's Disease

Parkinson's disease is a chronic disorder of the central nervous system that affects movement. It was first described by James Parkinson in 1817, although it received little attention until the late 20th century, when deep brain stimulation (DBS) through electrical impulses became a promising treatment.

Symptoms of Parkinson's Disease:

Muscle rigidity and stiffness

Facial immobility

Small, shuffling steps and restricted movement

Diagnosis and Treatment:

MRI is used to analyze brain structures and assist in surgical planning, ensuring more effective outcomes.

EEG helps monitor beta wave activity to assess neurological deterioration.

These modern diagnostic tools significantly improve the accuracy of neurological disease detection and offer innovative solutions for treatment. As technology advances, the integration of AI, MRI, VR, and EEG in medicine will continue to enhance patient care and outcomes.

Hydrocephalus (Boshda Suv Yig'ilishi)

Hydrocephalus is a condition in which excess cerebrospinal fluid (CSF) accumulates in the brain, leading to increased intracranial pressure. This condition can result from impaired CSF absorption, excessive CSF production, or obstruction of CSF flow.

Symptoms of Hydrocephalus:

Enlarged head size (in infants)

Increased intracranial pressure

Headache, nausea, and vomiting

Sleep disturbances

Diagnosis and Imaging:

Computed Tomography (CT scan) is commonly used to detect the presence of excess CSF in the brain.

Magnetic Resonance Imaging (MRI) helps determine whether hydrocephalus is congenital, acquired, or compensatory, aiding in treatment planning.

Meningioma

Meningioma is a benign tumor that develops in the membranes covering the brain and spinal cord. Although slow-growing and rarely spreading, it can exert pressure on surrounding structures, causing neurological dysfunction.

Symptoms of Meningioma:

Vision and hearing impairments

Developmental delays

Headaches and seizures

Diagnosis and Imaging:

MRI is the gold standard for identifying meningiomas, determining tumor size, location, and effect on surrounding tissues and blood vessels.

Differentiation between benign and malignant tumors is also possible using MRI techniques.

Hypoxic-Ischemic Encephalopathy (HIE)

HIE occurs when the brain does not receive enough oxygen and blood supply, leading to neurological damage. It is most commonly seen in newborns, particularly those with birth complications such as:

Maternal hypertension or diabetes

Umbilical cord problems

Congenital brain vascular disorders

Symptoms of HIE:

Breathing difficulties

Weak reflexes and movements

Seizures and cyanosis (bluish skin color)

Cognitive and motor impairment (if untreated)

Diagnosis and Imaging:

MRI is the most effective tool, providing detailed imaging of brain tissue damage and detecting subtle structural changes.

Ultrasound Doppler (UZDG) evaluates blood flow in brain vessels, identifying potential ischemic areas.

EEG (Electroencephalography) monitors brain activity and assesses oxygen supply deficiencies.

Early and precise diagnosis of these conditions using advanced medical imaging technologies significantly improves treatment outcomes and reduces complications in both children and adults.

Dementia (Demensiya)

Dementia is a progressive neurological disorder that leads to cognitive decline, including memory loss, impaired reasoning, and difficulty in daily functioning. The disease develops gradually and may take 10-15 years before noticeable symptoms appear, making

early diagnosis crucial. Currently, there is no definitive cure for dementia, which is why it is referred to as the "silent epidemic" or the "medical challenge of the future."

Symptoms of Dementia:

Memory loss (especially recent events)

Difficulty with problem-solving and decision-making

Language impairment

Behavioral and mood changes

Diagnosis and Imaging:

Electroencephalography (EEG) is used to analyze brain electrical activity but is primarily helpful in later stages of dementia when brain function has already deteriorated.

MRI and CT scans can identify structural brain changes, including brain atrophy and abnormal protein accumulation (e.g., in Alzheimer's disease).

Cerebral Palsy (Serebral Falaj)

Cerebral palsy (CP) is a neuromuscular disorder caused by brain damage during the perinatal period. It affects movement, posture, and coordination, often leading to intellectual disabilities, speech and vision impairments, and psychological challenges.

This condition is becoming more common due to environmental factors and higher survival rates among premature infants (e.g., babies born at 500 grams surviving due to medical advancements).

Symptoms of Cerebral Palsy:

Delayed motor milestones (difficulty sitting, standing, or walking)

Muscle stiffness or involuntary movements

Cognitive impairment

Speech, hearing, and vision problems

Diagnosis and Imaging:

Magnetic Resonance Imaging (MRI) identifies brain white matter damage and the severity of structural abnormalities.

Diffusion Tensor Imaging (DTI) evaluates nerve fiber connections, helping to assess how brain signals are disrupted.

Computed Tomography (CT scan) detects brain tissue damage and calcifications.

Autism Spectrum Disorder (Autizm Spektri)

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by social communication challenges, repetitive behaviors, and sensory sensitivities. It typically manifests by 6 months of age and persists throughout life.

Although the exact cause of autism remains unknown, it is believed to be multifactorial, involving genetic and environmental influences. Some individuals with autism exhibit extraordinary abilities in areas like music, mathematics, or art, known as savant syndrome.

Symptoms of Autism:

Lack of eye contact and social interaction

Repetitive movements (e.g., rocking, hand-flapping)

Deep focus on specific interests (e.g., memorizing facts about a topic)

Sensory processing difficulties (over- or under-reacting to stimuli)

Diagnosis and Imaging:

Magnetic Resonance Imaging (MRI) detects structural and functional brain abnormalities in autism.

Electroencephalography (EEG) monitors brain electrical activity, identifying neurophysiological patterns.

Artificial Intelligence (AI) analyzes MRI and EEG data to provide early detection and predictive modeling for ASD.

Virtual Reality (VR) is used in behavioral analysis, allowing doctors to observe responses to stimuli in controlled environments.

Conclusion

Modern medical imaging technologies play a crucial role in diagnosing neurological disorders. MRI, EEG, CT scans, AI, and VR have revolutionized how doctors detect, monitor, and treat conditions like dementia, cerebral palsy, and autism. Early diagnosis with advanced technology can significantly improve treatment outcomes and quality of life for patients.

Meningitis

Meningitis is an inflammation of the membranes surrounding the brain and spinal cord. The disease develops suddenly and is most prevalent in late autumn, winter, and early spring. Meningitis is classified based on its cause (viral, fungal, bacterial, etc.), severity (acute, subacute, and chronic), and cerebrospinal fluid (CSF) changes (purulent and serous).

The clinical symptoms of meningitis vary depending on its type, but some common signs include severe headache, neck stiffness, difficulty bending forward, involuntary leg contraction, and, in some cases, delirium and seizures. In newborns, bulging of the fontanelle is often observed. If not diagnosed and treated promptly, meningitis can lead to complications such as hearing loss, epilepsy, and brain damage.

Various diagnostic technologies are used to identify meningitis, including Computed Tomography (CT),

Magnetic Resonance Imaging (MRI), Electroencephalography (EEG), and Artificial Intelligence (AI). CT scans help detect functional changes in the brain and spinal cord membranes, while MRI allows for precise localization of inflammation. AI is increasingly used to analyze results obtained from CT and MRI for more accurate diagnosis.

Encephalomyelitis

Encephalomyelitis is an inflammation affecting both the brain and spinal cord, specifically targeting the myelin sheath, which insulates nerve fibers and facilitates impulse conduction. Damage to the myelin sheath disrupts normal nerve function and can impair multiple brain regions.

The disease typically manifests with sudden onset symptoms, including fever, headache, limb pain, dizziness, nausea, and visual disturbances. In cases where the inflammation is limited to the spinal cord, symptoms vary depending on the affected region. For example, if the cervical spinal cord is involved, quadriplegia (paralysis of both arms and legs) may occur. In children, additional symptoms such as loss of consciousness, seizures, severe headaches, fever, vomiting, and vision impairments are frequently observed.

MRI and EEG are essential diagnostic tools for encephalomyelitis. MRI identifies inflammation and damage to the myelin sheath in the brain and spinal cord, while EEG evaluates brain activity and function. If encephalomyelitis is diagnosed, immediate hospitalization is required, followed by appropriate pharmacological and therapeutic interventions.

CONCLUSION

In summary, neurological disorders in adolescents, including meningitis and encephalomyelitis, can be effectively diagnosed using modern computer-based technologies. Advances in CT, MRI, EEG, and AI have significantly improved diagnostic accuracy and treatment planning. In many cases, these technologies are primarily used for early disease detection. The future development of medical technology will further enhance pediatric neurology by improving diagnostic precision and enabling more personalized treatment approaches.

REFERENCES

Всемирная организация здравоохранения (ВОЗ) — https://www.who.int

Mayo Clinic — https://www.mayoclinic.org

Национальный институт здоровья США (NIH) — https://www.nih.gov

Американская ассоциация костных и минеральных исследований (ASBMR) — https://www.asbmr.org

Национальный фонд остеопороза (NOF) — https://www.nof.org

https://www.academy.oup.com

Healthline — https://www.healthline.com : КТ и МРТ, их плюсы и минусы.

Национальная служба здравоохранения Великобритании (NHS) — https://www.nhs.uk : МРТ и КТ, их показания и побочные эффекты.

Johns Hopkins Medicine — https://www.hopkinsmedicine.org : ресурс, МРТ и КТ в диагностике и чем они отличаются.

Sanjarbek, A. (2024). TIBBIY TA'LIMDA TALABALARNI BIOLOGIK MASALALARNI MODELLASHTIRISH TEXNOLOGIYALARI ORQALI TANQIDIY FIKRLARNI RIVOJLANTIRISH TEXNOLOGIYASI. Miasto Przyszłości, 46, 1192-1195.

Kadirova, M., & Atakhanov, S. (2024). TECHNOLOGY FOR THE DEVELOPMENT OF CRITICAL THINKING OF STUDENTS IN MEDICAL EDUCATION THROUGH MODELING TECHNOLOGIES OF BIOLOGICAL PROBLEMS. Theoretical aspects in the formation of pedagogical sciences, 3(7), 174-178.

Атаханов, С. (2023). РОЛЬ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИИ В ЛЕЧЕНИИ ОНКОЛОГИЧЕСКИХ ЗАБОЛЕВАНИЙ. Евразийский журнал академических исследований, 3(4 Part 2), 87-89.

Atakhanov, S., & Turdimatova, R. (2023). TECHNOLOGY OF CRITICAL THINKING OF STUDENTS ON BIOLOGICAL ISSUES. Academia Repository, 4(12), 121-127.

Sanjarbek, A. (2023). The role of information technology in the treatment of cancer. Asian Journal Of Multidimensional Research, 12(4), 32-34.