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Therapeutic Opportunities for Headaches and Migraines in Pediatric Populations: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Headaches, migraine-like episodes, and other associated conditions are increasingly becoming the most frequent occurrence and a threat to the pediatric population in today's world. It has become the most sought-after therapeutic opportunity in the clinical setting in a way that can help to treat, diagnose and minimize its ill effects or side effects in today's world which has witnessed all severe forms of diseases and hopefully will witness more severe forms because of the everlasting unhealthy lifestyle and prevalent hypertension which can be maternal or paternal and can affect the newborn as well as all the pediatric age groups in today's world. Severe forms of Headachin children or pediatric age groups can be a massive challenge for the clinician to identify, diagnose, and provide effective treatment that can be curable in most cases but can be fatal. In pediatric populations, headaches or migraines can result from underlying conditions, pathologies, or effects of maternal and paternal habits or lifestyles that need more attention than the symptom itself. The treatment spectrum ranges from pharmacological interventions to more unconventional options like acupuncture and alternative medicine. All these options are worth considering, as several studies show high efficacy and success rates with each of these conditions and etiology discussed above. In this review, the authors aim to discuss these different therapeutic options and weigh out their pros and cons, which can help in better and effective treatment to control or eliminate this disease.

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1. BACKGROUND

Headaches can broadly be classified into primary and secondary headaches. Primary headaches, like migraine, tension-type headaches, and cluster headaches, have no underlying pathological causes but are still considered severe in today's clinical setting. Secondary headaches have a deeper neuropathological or systemic cause in the pediatric population. Secondary headaches and their causes pervade several medical disciplines, and the underlying pathologies can vary significantly from one person to another. Causes (of what?) can be classified as traumatic, inflammatory, cancerous, and tumorous, or those due to a rise in intracranial pressure are also important causes. Headaches are generally a part of a more significant medical condition, where the condition is greater than the sum of its parts. From a bird's eye view, the incidences of primary headaches far outnumber secondary headaches in the pediatric setting in today's world [1].

Headaches significantly affect a child's ability to carry out typical day-to-day activities with full potential and enthusiasm. It can exacerbate many psychological conditions like anxiety and depression and cause increased instances of absence from school, erratic social behavior, and mental stability. Identifying and diagnosing psychosocial conditions in patients with headaches can increase the likelihood of complete and effective management of the condition and can control its fatal progress in the patient. The conditions above also increase the likelihood of suicidal tendencies and other anti-social actions in children and adolescents. Thus, it makes the management of such migraine cases a matter of public health concern, and thus, its importance increases to a greater extent and should be considered with much priority and should be given significant attention too [2].

1.1 Scope of Treatment

Treatment for headaches in pediatric populations in today's clinical settings is hotly debated and highly variable in general practice from one clinician to another. Several established pharmacological interventions work wonders in almost all patient demographics worldwide. There has also been a constant generation of new research regarding better and more targeted pharmacological therapies to cure and prevent this disease. These include, but are not limited to, intravenous Sodium Valproate [3] administration and intravenous dihydroergotamine [4].

However, there is also a good body of evidence pointing towards associated side-effects and adverse reactions that accompany these pharmacological interventions in today's setting. This has to lead a new generation of practitioners to consider alternative therapy options which are highly beneficial and effective such as described below:

1. Acupuncture,
2. Behavioral management,
3. Stimulation therapy,
4. Physical therapy,
5. Transcutaneous Electrical Nerve Stimulation (TENS),
6. Transcranial Magnetic Stimulation (TMS),
7. Osteopathic manipulations,
8. Placebo therapies, and
9. Psychological counseling.

In the following text, we will critically important straightforward pharmacological and some best alternative medical interventions to be worked upon to better the pediatric group of patients.

1.2 Intravenous Sodium Valproate

In treating Chronic headaches and migraines in children, it is essential to have a tolerable, highly effective drug with an excellent safety profile in action, absorption, and elimination. Sodium Valproate can be utilized as a single substance to effectively manage episodes of migraine or severe headache for an extended length of time. According to the findings of migraine-like headaches clinical trials and prolonged extension trials, Sodium Valproate meets this standard of treatment in today's clinical setting. The mechanism through which Sodium Valproate alleviates migraine is unknown. Many processes in the migraine cascade may be influenced by Sodium Valproate and can cause beneficial and desired effects and outcomes in the pediatric populatio [5].

In a recent study into the efficacy of the said drug and administration method, the (Reformulate) of the drug, out of the total sample size, "83% were

discharged. Mean hospital admission duration before was 395 minutes, falling to 120 minutes after administration of the drug. Pain score reduction jumped from 17% before administration to 40% after using the drug [3].

In the early study, The Sodium Valproate and placebo groups of patients with Chronic Migraine were contrasted. After the first 30 days, there were remarkable differences in specific metrics between the Sodium Valproate and placebo groups. Upon the conclusion of the 3rd month, essential parameters were decreased, and so were other migraine markers [5].

However, Sodium Valproate therapy is only beneficial on the early parameters with more minor side effects in Chronic Tension-Type Headache patients. Other metrics showed no significant decreases. In an open, prospective trial evaluating the preventive effectiveness of Sodium Valproate in 56 patients, including 35 migraineurs, seven chronic tension-type headache patients, and 14 patients with mixed headaches, 60% of participants improved by 3/4ths or more in the frequency of episode days while using Sodium Valproate with the prescribed dose [5].

Thus, Sodium Valproate infusion appears to be safe and effective in pediatric populations suffering from all forms of severe headaches and migraines. Theirs are also some non-specific treatments for the pediatric population in today's clinical setting ketorolac, Ibuprofen; Naproxen is often used to treat migraine by clinicians. Some common contraindications shown by the above drugs are upper GI diseases, the renal system becoming impaired, and some bleeding disorders.

1.3 Transcranial Magnetic Stimulation (TMS)

TMS (transcranial magnetic stimulation) is a powerful force field of electromagnetism produced by a current passing via a coil wound over the head or scalp. Single-pulse transcranial magnetic stimulation, pair-pulse transcranial magnetic stimulation, and repetitive transcranial magnetic stimulation are all the best examples of transcranial magnetic stimulation (TMS). TMS (Transcranial magnetic stimulation) can be used to monitor neural conduction and assist or stop the electrical impulses of the cerebral cortex in neurophysiology which itself is a very dynamic and essential concept. TMS has shown enormous growth in the past eight years as the FDA has approved several new devices to treat severe migraine in the pediatric population.

TMS is a non-invasive treatment that can excite (or decrease) the excitability of the brain, in particular the cortex. Due to the lack of proper Randomized Controlled Trials, the European Headache Federation put out a statement in 2013 stating that at this time, it isn't evidence-based or advisable to use a noninvasive therapy in chronic headaches and that a neuro-stimulator should be thought about only after all other drugs and behavioral interventions as advised by global guidelines have not been successful, drug overuse episode is excluded and with more minor side effects. Because few medicines can help patients with migraines improve their quality of life and well-being, Transcranial Magnetic Stimulation is a potential therapy that can either stimulate or block the electrical impulses generated by the cortex [6].

We only include Randomized Controlled Trials to enhance the dependability of our analysis and trial. Even though a meta-analysis of Randomized Controlled Trials can offer a more accurate conclusion and better results with detailed data, just 5 Randomized Controlled Trials were involved in the meta-analysis restricted us from achieving a more reliable result a lack of studies on the subject. Subjects were not classified by the intensity of infectious ailment, gender, age, or other factors in any of the studies included. As a result, the effectiveness and action of Transcranial Magnetic Stimulation should be considered with all priority [6].

Based on the research reviewed, a meta-analysis concludes that Transcranial Magnetic Stimulation is beneficial for migraine-like episodes in the pediatric population. According to the research in the publication, employing an 8-shaped loop around the Levo-motor-cortex with increased frequency may be helpful for stimulation parameters. However, the effectiveness of TMS for migraine-like episodes should be evaluated in additional RCTs in the later stages due to constraints [6].

We found no statistically significant difference in impact between the active Transcranial magnetic stimulation group and the sham Transcranial magnetic stimulation group when evaluating the effect of Transcranial magnetic stimulation on chronic migraine or headache. In light of this, we

propose the following hypothesis: chronic migraine is a persistent pathogenic process with a much higher pain threshold. Transcranial magnetic stimulation has the power to alter the excitability of the cortex, but it takes time to complete its process [6].

2. PSYCHOTHERAPY AND COUNSELLING

Psychological treatments are more effective when combined with suitable pharmacological therapies. These therapies are highly effective in reducing the disability in pediatric patients suffering from mixed chronic pain-like conditions and for children with headaches at follow- up whenever needed.

When cognitive behavioral therapy was compared to a waiting list control, the findings were inconsistent and not of any value. Some studies suggested that cognitive-behavioral therapy was more beneficial on some outcomes than others. This research gives some evidence for cognitive behavioral therapy above and beyond typical therapeutic variables for cognitive behavioral therapy with relaxation compared to relaxation alone. Cognitive-behavioral therapy combined with relaxation was more helpful than antidepressants alone. However, unfavorable side effects of antidepressant medication may have muddled outcomes, implying that adverse side effects for some people may outweigh any potential advantages for others [7].

Relaxation training (RT), cognitive behavioral therapy (CBT), and biofeedback are the most common psychological treatments used to treat migraine today. Despite about 40 years of study and support from organizations worldwide, which also involves the US Headache Consortium and even the WHO and their other agencies, these therapies aren't officially approved for therapy in migraine sufferers in powerful nations around the world. In the early 2010s, the National Institute of Clinical Excellence (NICE), UK, brought out research advice for a practical randomized trial to conclude the effectiveness of mental interventions for therapy of long-term headache-like episodes, which makes way for long-term provisions [8].

No significant effects were seen on the depression and anxiety levels of the patient. Thus, psychological therapies help alleviate symptoms and reduce the frequency of occurrence of headaches conclusively [9].

3. OSTEOPATHIC MANIPULATION THERAPIES

Osteopathic Manipulation Technique is a non-invasive therapy approach with little to no adverse effects on the patient. There are several forms of headaches??. Osteopathic Manipulation Technique is beneficial with migraines, tension-type headaches, combat-related events, post-traumatic headache, sinusitis, tooth extraction, concussions, and other associated conditions. Osteopathic Manipulation Technique is a non-invasive therapy option for those who suffer from a variety of headaches to reduce its severity and prognosis. This treatment option is targeted to the patient's specific needs and is provided by certified and experienced osteopathic physicians worldwide. This literature assessment also identifies areas where more study is needed in the subject. [10].

In a systematic meta-analysis, spinal manipulation showed remarkably similar effects to amitriptyline in prophylaxis for migraine-like headaches. This effectiveness showed a sharp decline in the case of tension-type associated conditions.

A 2017 review study with a sample size of 265 stated that, in contrast to several other alternate therapies applied, Osteopathic Manipulation significantly benefits the receiver in terms of severity, frequency, and intensity of headaches, then rest of the procedures conducted.

There is significant tentative proof that OMT(?) is useful in treating migraines and severe forms of other headaches. Nevertheless, more demanding strategies and methodologies are required in future research to reinforce this data for better analysis and results [11-14].

4. INTEGRATIVE MEDICINE

Integrative medicine claims to treat the patient of migraine as a whole, combining mind-body-spirit with conventional medicine. It's a broader concept used to treat patients with severe migraine [5].

Nutraceuticals include therapeutic dietary interventions like:

1. vitamin D
2. magnesium
3. coenzyme Q10, and
4. melatonin.

While previous research has shown magnesium, riboflavin, feverfew, and butterbur to be highly beneficial in migraine and headache treatment, new research suggests that vitamin D, melatonin, and increased doses of vitamin B6 (80 mg) or folate 5 mg compose?, along with the amalgamation of magnesium 112.5 mg, Coenzyme10 (Q10) 100 mg and also feverfew 100 mg may also be beneficial and effective in today's clinical setting [15-18].

In migraine or severe headache, there is very minimal evidence of effectiveness for omega-3 fatty acids, and hence of no use in the pediatric population, it only reduces the intensity of migraine in some cases and has little or no role in reducing inflammation and healing the endothelial or vascular injury. To guarantee better safety, butterbur must be devoid of pyrrolizidine alkaloids (PA), which are hepatotoxic in such cases. Acupuncture is better than fake acupuncture and even placebo, while therapy with physical focus (PT) endures having lasting evidence of benefit in the patient.!!

With the exclusion of the fatal danger of cervical artery dismemberment with high-speed chiropractic management and liver toxicity with the Pas?? in butterbur, the adverse effects and hazards mentioned were limited and well endured generally. Several types of research are being conducted worldwide where more investigate mindfulness, physical therapy, exercise, melatonin, acupuncture, and chiropractic manipulation are done precisely.

The American Headache Society (AHS) and the American Academy of Neurology (AAN) are actively revising the strategies for better and integrated migraine management options, so more suggestions might be forthcoming shortly [19-21].

Clinicians, neurologists, and specialists in today's scientific world may consider and incorporate these alternative interventions into their clinical practice more often as and when required for better treatment and fast relief or recovery of the critical, diagnosed cases and undiagnosed cases.

5. PLACEBO THERAPIES

Analgesia caused via placebo was always thought of as a solely psychological phenomenon. However, this is not recognized any longer in today's setting and is of no value. Nonetheless, psychological mechanisms are unquestionably essential and are a healthy asset, and two in particular, the conditioning and expectation systems, need special emphasis in the current established scenario. The conditioning process, also known as the Pavlovian learning instrument, points to the habituated response in the migraine patient, meaning the ability of repeated benign stimulus or managements to elicit a reaction following divergences with active stimuli or treatments. In other terms, prior experience always impacts future results, and initial pain treatment reaction impacts impending analgesia.

The direct biological benefits of these therapies are small and very effective but raising issues about how the 'true value' of these and other medicines is determined, a recent meta-analysis of placebo-controlled trials using calcitonin gene-related peptide (CGRP) antibodies for migraine has found.

6. CONCLUSION

Upon a very comprehensive, well evaluated, and established exhaustive review of a vast body of clinical literature, we can now firmly and conclusively state that the treatment of headaches in pediatric populations is no longer restricted by a select few pharmacological options in today's clinical setting. The new-age alternative medicine, surgeries, and therapies are both safe and effective in the age group of our interest. Using this literature review, the authors urge clinicians and pediatric practitioners alike to give due consideration to the array of integrative options at their disposal when treating in the clinical setting in today's scenario and for future references.

DISCLAIMER

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CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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