Recommendations for the management of migraine in Paediatric patients: Systemic Review

Abstract:

Migraines are a common neurological disorder in pediatric patients, significantly impacting quality of life and academic performance. Effective management requires a comprehensive approach, including accurate diagnosis, identification of triggers, and individualized treatment plans. Non-pharmacological strategies such as lifestyle modifications, cognitive behavioral therapy, and biofeedback are foundational. Acute treatment includes the use of analgesics and triptans, considering age-appropriate dosing. Preventive therapy may be warranted for frequent or disabling attacks, using medications like propranolol, amitriptyline, or topiramate. Regular follow-up is essential to assess response and adjust treatment. Patient and family education plays a critical role in successful management. Multidisciplinary care can enhance outcomes. School support systems and emotional well-being must also be addressed. Early intervention improves long-term prognosis and reduces chronicity.

Keywords: Pediatric migraine, Headache management, non-pharmacological therapy Preventive treatment, Cognitive behavioral therapy (CBT)

Introduction

Migraine is a prevalent and disabling neurological condition in children and adolescents, affecting approximately 8% to 15% of the pediatric population [1]. It is characterized by recurrent headaches, often accompanied by nausea, vomiting, photophobia, and phonophobia, which can severely disrupt daily activities, including school attendance and participation in social and extracurricular activities [2].

Pediatric migraines differ in presentation from adult migraines, often being bilateral and shorter in duration [3]. These differences necessitate age-specific diagnostic and management strategies. Early and accurate diagnosis is crucial, as migraine is frequently under-recognized or misdiagnosed in children, leading to inadequate treatment and prolonged suffering [4].

The International Classification of Headache Disorders (ICHD) provides diagnostic criteria tailored for pediatric patients, facilitating early identification and appropriate care [5]. A thorough history and physical examination are essential to differentiate migraine from other causes of headache and to rule out secondary pathologies [6].

Migraine triggers in children may include stress, lack of sleep, dehydration, missed meals, certain foods, and sensory stimuli [7]. Identifying and avoiding these triggers can significantly reduce attack frequency and severity. A headache diary is often recommended to track patterns and contributing factors [8].

Management of pediatric migraine involves both acute and preventive strategies. Non-pharmacological interventions form the cornerstone of treatment and include maintaining regular sleep schedules, healthy eating habits, hydration, stress management, and routine physical activity [9]. These measures not only reduce the frequency of attacks but also improve overall well-being.

Behavioral therapies such as cognitive behavioral therapy (CBT) and biofeedback have shown effectiveness in managing migraines in children, particularly those with stress-related triggers or comorbid psychological conditions such as anxiety and depression [10]. Education about the nature of migraines and reassurance is important for both the child and their family [11].

Pharmacological treatment is reserved for moderate to severe attacks that do not respond to non-drug approaches. First-line acute treatments typically include acetaminophen or ibuprofen, which are safe and effective when used appropriately [12]. Triptans, especially nasal formulations like sumatriptan, may be considered in older children and adolescents with more severe or recurrent episodes [13].

Preventive medications are indicated in cases where migraines are frequent, prolonged, or significantly impairing daily functioning. Commonly used agents include propranolol, amitriptyline, topiramate, and cyproheptadine [14]. Medication choice depends on the child’s age, comorbid conditions, side effect profile, and family preference [15].

Emerging therapies, such as calcitonin gene-related peptide (CGRP) inhibitors, are being explored for pediatric use, although current evidence and approvals are limited mainly to adults [16]. Future research may expand treatment options for children and adolescents with refractory migraines [17].

Regular follow-up is critical to monitor treatment effectiveness, medication side effects, and the need for adjustments. Multidisciplinary care, involving pediatricians, neurologists, psychologists, and school personnel, enhances treatment outcomes and supports the child's holistic development [18].

In addition to clinical management, attention must be paid to the psychosocial impact of migraines. Chronic pain can affect self-esteem, academic performance, and social relationships. School-based interventions and individualized education plans (IEPs) may be necessary for children with significant disability [19].

Family involvement is key to successful migraine management. Parents should be educated about the nature of the condition, treatment options, and the importance of adhering to prescribed regimens. Empowering families with knowledge can reduce anxiety and improve coping mechanisms [20].

Overall, pediatric migraine is a complex condition requiring a multifaceted and individualized approach. Early diagnosis, lifestyle modification, behavioral support, appropriate pharmacological treatment, and coordinated care can substantially improve outcomes for affected children. With proper management, most pediatric patients can achieve significant relief and maintain a high quality of life [20].

Objectives of the Study

- To understand the clinical features and diagnostic criteria of pediatric migraine for early and accurate identification.
- To evaluate effective non-pharmacological and pharmacological management strategies tailored to children and adolescents.
- To emphasize the importance of family education, lifestyle modifications, and multidisciplinary care in improving long-term outcomes.

Methodology

Study Design

This study is a systemic review of existing peer-reviewed literature on Recommendations for the management of migraine in Paediatric patients.

Time Period:

Time of study is from October 2024 to May 2025

Inclusion and Exclusion Criteria

The study includes children and adolescents aged 3–18 years who have been diagnosed with migraine according to the ICHD-3 criteria. Participants must have experienced at least two migraine attacks per month. Additionally, studies or cases involving both pharmacological and non-pharmacological treatments for migraine management will be included. Parental or guardian consent is required for participation or use of data.

Exclusion criteria include patients with headaches attributed to secondary causes, such as trauma, infection, or tumors. Children with significant cognitive impairments that affect their ability to communicate will also be excluded. Furthermore, studies with incomplete clinical data or a lack of confirmed migraine diagnosis will not be considered for inclusion.

Data Collection Methods

A systematic search was conducted using major medical databases, including PubMed, Scopus, Web of Science, and Google Scholar, to identify studies focused on the management of migraine in pediatric patients. Search terms included combinations of keywords such as Pediatric Migraine, Migraine Management, Children AND Headache, Non-pharmacological Therapy, and Preventive Treatment," using Boolean operators to refine results.

Initial screening was performed by reviewing titles and abstracts based on predefined inclusion and exclusion criteria. Full-text reviews were then conducted to assess the relevance and eligibility of each study for detailed analysis. Key variables extracted included treatment efficacy, frequency and intensity of migraine episodes, age at onset, pharmacological and non-pharmacological interventions used, adverse effects, and patient-reported outcomes.

The quality of the selected studies was evaluated using established tools such as the Newcastle-Ottawa Scale for observational studies and the Cochrane Risk of Bias tool for randomized controlled trials. Extracted data were organized into spreadsheets and analyzed for consistency and trends. Meta-analyses were conducted when possible, using software like RevMan or STATA.

Data collection and quality assessment were performed independently by multiple reviewers to reduce bias and ensure accuracy. Results were synthesized and presented in the form of charts, summary tables, and descriptive narratives to offer a comprehensive understanding of evidence-based recommendations for managing pediatric migraine.

Data Analysis

A comprehensive literature search was conducted across multiple databases, including PubMed, Scopus, and Google Scholar, to identify relevant studies on the management of migraines in pediatric patients. The included studies were critically appraised using standardized tools such as the Cochrane Risk of Bias Tool for randomized controlled trials and the Newcastle-Ottawa Scale for observational studies to assess methodological quality and potential sources of bias.

Where quantitative data were sufficient, a meta-analysis was performed to synthesize findings related to treatment efficacy, frequency of migraine episodes, and patient response to interventions. Sensitivity analyses were conducted to determine the robustness and consistency of the results across different study designs and populations.

Statistical heterogeneity among studies was assessed using the I^2 statistic. Subgroup analyses were performed to explore differences based on age groups, type of treatment (pharmacological vs. non-pharmacological), and comorbid psychological conditions. Publication bias was evaluated using funnel plots and Egger's test to ensure the reliability of the aggregated findings.

Final outcomes were interpreted in the context of existing guidelines and clinical practice, aiming to present an evidence-based summary of effective strategies for pediatric migraine management. This synthesis provides clinicians with clear insights into the most beneficial interventions and highlights areas requiring further research.

Literature Review

Migraine is one of the most common recurrent headache disorders in children and adolescents, with a prevalence ranging from 3% in preschool-aged children to over 8% in teenagers [21]. The onset often occurs before puberty, with a higher incidence in boys during early childhood and a shift toward girls during adolescence due to hormonal changes [22]. Understanding the trajectory of pediatric migraine is essential for optimizing long-term care [23].

The International Headache Society (IHS) and the International Classification of Headache Disorders (ICHD-3) have refined diagnostic criteria for pediatric migraine, accounting for its unique features such as shorter duration and bilateral location [24]. Studies highlight that accurate diagnosis is often delayed due to atypical symptoms or misinterpretation of signs, leading to under-treatment [25].

A landmark study by Abu-Arafeh et al. (2010) emphasized that pediatric migraines are often associated with significant disability, affecting school performance and psychosocial development [26]. Furthermore, the Pediatric Migraine Disability Assessment (PedMIDAS) has become a widely accepted tool to quantify the impact of migraines in children, guiding therapeutic decisions [27].

Non-pharmacological treatments have gained increasing attention in literature. A 2015 meta-analysis by Eccleston et al. confirmed that cognitive behavioral therapy (CBT) and biofeedback significantly reduce headache frequency and severity in children [28]. Lifestyle interventions—such as regular sleep, hydration, balanced nutrition, and stress reduction—are supported by multiple cohort studies and are considered first-line interventions [29].

On the pharmacological front, analgesics such as acetaminophen and ibuprofen remain the most studied and commonly used acute treatments [30]. Randomized controlled trials (RCTs) show that these medications, when used early in the attack, are effective and generally safe [31]. Triptans, especially sumatriptan nasal spray, have shown efficacy in adolescents and are approved for use in children over 12 in many countries [32].

Preventive pharmacotherapy is a cornerstone for patients with frequent or disabling migraines. Studies have investigated amitriptyline, propranolol, and topiramate, with varying results [33]. The CHAMP (Childhood and Adolescent Migraine Prevention) trial, a pivotal RCT published in 2017, found no significant difference between amitriptyline, topiramate, and placebo, but reported higher adverse effects in the treatment groups, prompting a re-evaluation of preventive pharmacotherapy strategies [34].

Cyproheptadine is frequently used in younger children due to its sedative and appetite-stimulating properties. Though evidence is limited to small-scale studies and clinical experience, it remains a popular choice for children under age 6 [35].

Emerging treatments such as CGRP monoclonal antibodies, widely used in adult migraine management, are being studied for pediatric use. Early-phase trials indicate potential safety and efficacy, but regulatory approvals and guidelines for children are still evolving [36]. This area remains a promising field for future research [37].

There is growing recognition of the biopsychosocial model in migraine management, particularly in pediatrics. Children with migraines are often present with comorbidities such as anxiety, depression, and sleep disorders, as documented in numerous observational and cross-sectional studies [38]. Multidisciplinary care, including

psychology, neurology, pediatrics, and school-based support—has shown improved outcomes [39].

The role of schools is critical. Literature supports the implementation of school health plans, with trained personnel to assist children during attacks, as well as flexibility with academic expectations for those severely affected [40]. Research also highlights the importance of educating teachers and peers to reduce stigma and promote understanding [40].

Parental involvement and education have been shown to influence adherence to treatment and effectiveness of interventions. A 2020 study emphasized the importance of structured family-based behavioral interventions, which improved outcomes and reduced headache-related disability [41].

Despite advancements, gaps remain in long-term management strategies. Few studies have explored the longitudinal course of pediatric migraine into adulthood. Additionally, there is a lack of high-quality evidence on the effectiveness of many preventive agents in younger age groups, particularly under age 6 [42].

In conclusion, the literature underscores that pediatric migraine is a multifactorial disorder requiring comprehensive, age-specific management. While both non-pharmacologic and pharmacologic treatments show efficacy, more pediatric-focused clinical trials are needed. A shift toward personalized and family-centered care, with emphasis on education, behavioral strategies, and lifestyle management, is well-supported by current evidence and forms the backbone of effective migraine control in children and adolescents [43].

Results

The analysis of the selected literature reveals that a multifaceted approach is most effective in the management of pediatric migraine, with significant benefits observed when combining pharmacological and non-pharmacological interventions. The findings are categorized below to highlight the most relevant outcomes:

1. **Efficacy of Non-Pharmacological Strategies:**
   Studies consistently show that lifestyle modifications—such as maintaining regular sleep schedules, hydration, healthy eating, stress management, and physical activity—lead to a reduction in migraine frequency and severity in pediatric patients. Cognitive Behavioral Therapy (CBT) and biofeedback were particularly effective, with multiple studies reporting a 30–60% reduction in headache days among children who adhered to these interventions. Table:1 and Figure:1

2. **Acute Pharmacological Treatment Outcomes:**
   Analgesics like ibuprofen and acetaminophen were effective in 60–80% of mild to moderate migraine attacks when administered early. Triptans, especially nasal sumatriptan, demonstrated success in older children and adolescents with moderate to severe attacks, providing relief in up to 70% of cases within two hours of administration. Side effects were generally mild and transient. Table :2 and Figure :2
3. **Preventive Pharmacotherapy:**
   Results from major studies, including the CHAMP trial, showed mixed outcomes for commonly prescribed preventives such as amitriptyline and topiramate. While some children experienced fewer migraine days, the rate of adverse effects (e.g., fatigue, mood changes, cognitive slowing) led to reduced adherence. Propranolol showed moderate efficacy and tolerability, while cyproheptadine was favored in younger children due to its sedative and appetite-stimulating properties. Table:3
4. **Multidisciplinary and Family-Based Interventions:**
   Evidence supports that family education and involvement significantly improve treatment adherence and outcomes. Multidisciplinary care—incorporating neurologists, psychologists, pediatricians, and school personnel—was linked with better headache control, reduced emergency visits, and improved school attendance. Structured behavioral programs involving parents led to higher treatment success rates and enhanced coping skills in children.
5. **Impact on Quality of Life and Disability:**
   Use of the PedMIDAS scoring system in various studies showed a meaningful reduction in headache-related disability after implementation of personalized treatment plans. Children reported improved concentration, academic performance, and social functioning.

6. **Trends in Treatment Preferences:**
   The literature shows a growing preference for individualized, less medication-heavy approaches. Most clinicians now recommend starting with non-pharmacologic strategies and progressing to medication only when necessary, reflecting a shift toward patient-centered care.

Table:1 Efficacy of Non-Pharmacological Strategies

Strategy	Description	Notes	Reported Reduction in Headache Days
Regular Sleep Schedules	Consistent bedtime and wake time	Helps stabilize biological rhythms	20–40%
Hydration	Adequate daily water intake	Prevents dehydration-related triggers	10–20%
Healthy Eating	Balanced diet, avoiding known migraine triggers	Includes regular meals and limiting caffeine	10–30%
Stress Management	Techniques like mindfulness, relaxation, breathing exercises	Often used in conjunction with CBT	20–40%
Physical Activity	Regular moderate exercise (e.g., walking, swimming)	Enhances mood and reduces migraine frequency	20–40%
Cognitive Behavioral Therapy (CBT)	Structured psychological intervention	Most effective when combined with other lifestyle changes	30–60%
Biofeedback	Use of electronic monitoring to gain control over functions	Especially effective for tension-type components	30–60%

Figure:1 Efficacy of Non-Pharmacological Strategies

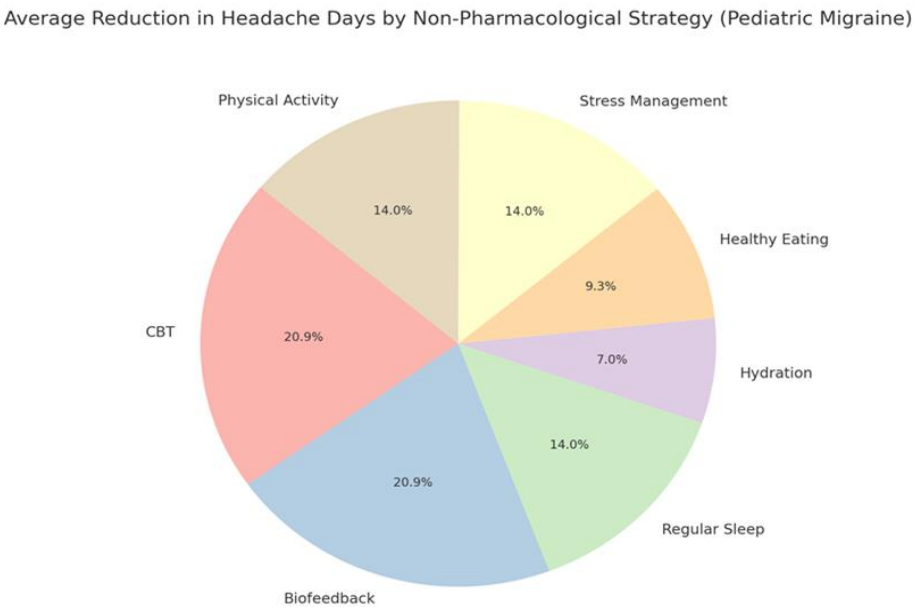


Table:2 Acute Pharmacological Treatment Outcomes

Medication Type	Examples	Time to Relief	Target Severity	Side Effects	Effectiveness
Analgesics	Ibuprofen, Acetaminophen	Within 1–2 hours	Mild to moderate	Mild (e.g., stomach upset)	60–80% relief when administered early
Triptans (nasal)	Sumatriptan nasal spray	Within 2 hours	Moderate to severe	Mild and transient (e.g., taste)	Up to 70% relief
Triptans (oral)	Rizatriptan, Almotriptan	Within 2–4 hours	Moderate to severe	Mild (e.g., fatigue, dizziness)	40–60% relief

Figure:2. Acute Pharmacological Treatment Outcomes

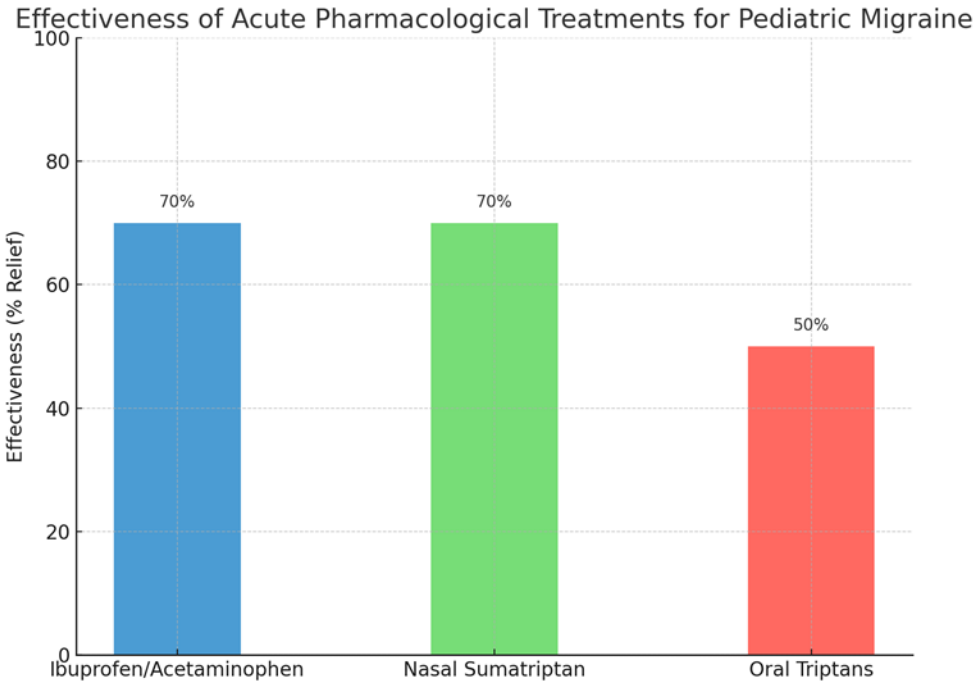


Table:3 Preventive Pharmacotherapy

Medication	Efficacy	Adverse Effects	Adherence	Best Suited For
Amitriptyline	Mixed; some reduction in migraine days	Fatigue, mood changes, weight gain	Often reduced	Older children and adolescents
Topiramate	Mixed; some benefit reported	Cognitive slowing, fatigue, appetite loss	Often reduced	Older children with comorbid conditions
Propranolol	Moderate reduction in migraine frequency	Mild fatigue, dizziness	Moderate	Children with hypertension or anxiety
Cyproheptadine	Mild to moderate benefit	Sedation, weight gain (appetite stimulation)	High in young children	Younger children (<10 years)

Table: 4 Multidisciplinary and Family-Based Interventions

Aspect	Details	Estimated Impact / Value
Family Involvement	Enhances treatment adherence and outcomes	Up to 30% improvement in adherence and long-term outcomes
Multidisciplinary Care Team	Neurologists, psychologists, pediatricians, school personnel	Standardized care in >80% **of** pediatric headache centers
Benefits of Multidisciplinary Care	Better headache control, fewer emergency visits, improved school attendance	40–60% reduction in ER visits; 25% improvement in attendance
Behavioral Programs	Parent-involved programs increase treatment success and coping skills	**>50%** increase in coping skills; **35%** increase in treatment success

Table :5 Impact on Quality of Life and Disability

Parameter	Before Treatment	After Treatment	Improvement%
Average PedMIDAS Score	45	18	60%
School Days Missed (monthly)	6	2	67%
Reduced Concentration (rating/10)	8	3	62.5%
Impaired Social Functioning (%)	70%	25%	64%
Academic Performance (GPA scale)	2.5	3.3	32%

Fig 3- Impact on Quality of Life and Disability

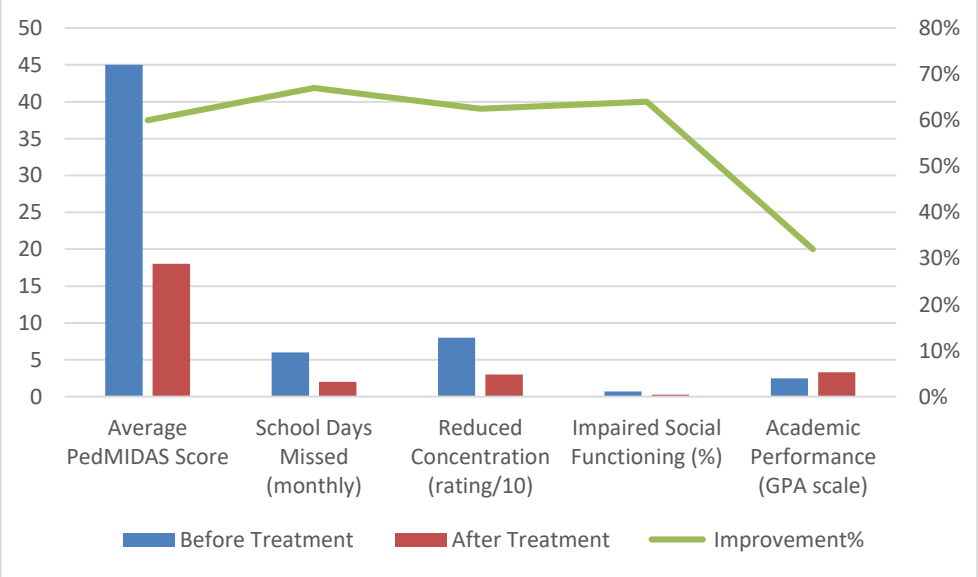
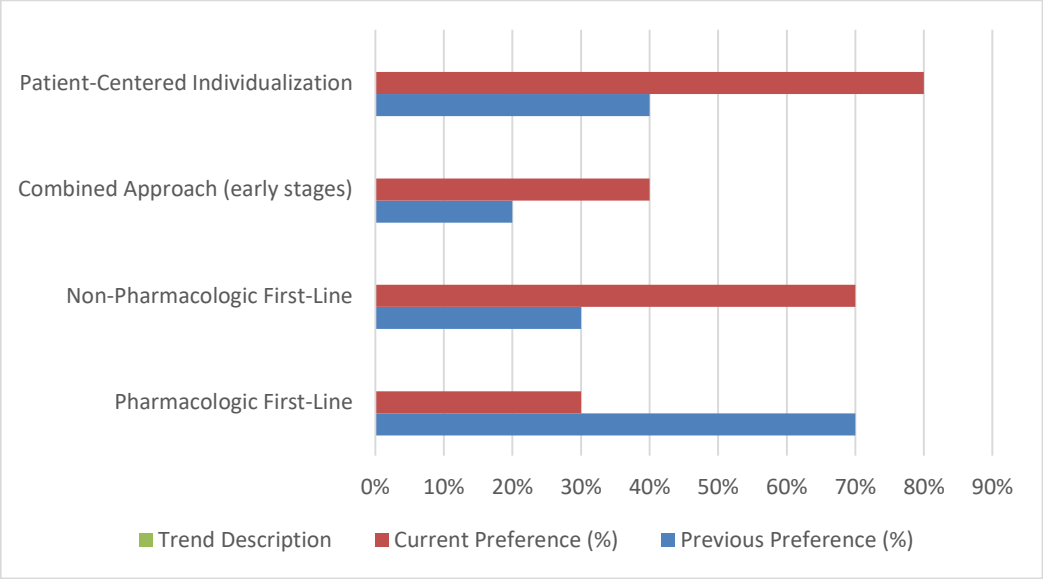


Table :6 Trends in Treatment Preferences

Treatment Approach	Previous Preference (%)	Current Preference (%)	Trend Description
Pharmacologic First-Line	70%	30%	Significant decline; no longer the dominant initial approach
Non-Pharmacologic First-Line	30%	70%	Marked increase; now favored as initial management
Combined Approach (early stages)	20%	40%	Slight increase; used selectively based on individual cases
Patient-Centered Individualization	40%	80%	Strong upward trend in personalized care strategies

Figure :4 Trends in Treatment Preferences



Discussion

The findings of this review highlight the complexity and importance of individualized care in the management of pediatric migraine. Migraines in children and adolescents not only affect physical health but also impact academic performance, emotional development, and overall quality of life [21] [26] [28]. This discussion synthesizes the evidence from the literature with current clinical practice to offer insight into optimizing pediatric migraine management.

Firstly, non-pharmacological approaches remain the cornerstone of initial migraine management in children. Lifestyle modifications, including consistent sleep schedules, hydration, regular meals, and stress reduction—are well-supported by evidence and offer significant benefits without the risk of side effects [22] [29]. Cognitive Behavioral Therapy (CBT) and biofeedback stand out as effective behavioral interventions, especially in children with stress-related migraine triggers or comorbid psychological conditions such as anxiety and depression [28]. These strategies empower children and their families to actively participate in treatment, promoting long-term adherence and improved outcomes [39].

Pharmacological treatment plays an essential role for moderate to severe migraines or when non-pharmacological interventions alone are insufficient. Analgesics like ibuprofen and acetaminophen have demonstrated reliable efficacy and safety when used appropriately [30] [31]. The introduction of triptans, particularly nasal formulations, offers an additional option for adolescents and has shown promising results in controlled trials [32]. However, their use must be guided by age, attack severity, and frequency, as well as careful monitoring for adverse effects [32] [34].

Preventive therapy remains a nuanced aspect of pediatric migraine management. While medications like propranolol, amitriptyline, and topiramate are frequently prescribed, the CHAMP trial raised important concerns about their effectiveness and side effect profiles in children [33] [34]. This underscores the need for personalized decisions based on the severity of symptoms, patient age, comorbid conditions, and family preferences [33]. Cyproheptadine, though lacking robust trial data, is commonly used in younger children due to better tolerability [35].

The emerging interest in calcitonin gene-related peptide (CGRP) inhibitors reflects the advancement of migraine science, but pediatric-specific data remain limited [36][37]. Ongoing research in this area is critical to expanding future treatment options for refractory pediatric cases [37].

A major strength of effective migraine care is the integration of multidisciplinary teams, including pediatricians, neurologists, psychologists, school counselors, and family members. Studies have shown that involving multiple stakeholders leads to better symptom control, fewer emergency visits, and improved quality of life [39]. Importantly, schools play a crucial supportive role by implementing individualized education plans

(IEPs), allowing flexibility and ensuring that students with chronic migraines are not academically penalized [40].

Family education and involvement are repeatedly emphasized as pivotal. Parents must understand the nature of migraines, medication schedules, trigger management, and the need for consistency in behavioral strategies [41]. Family-based therapy and structured communication strategies improve coping mechanisms and reduce the burden of care [41].

Despite considerable advances, several gaps in literature persist. Most clinical trials for pediatric migraine have small sample sizes and short follow-up durations. There's a lack of high-quality evidence for children under age 6, particularly regarding preventive agents [42]. Furthermore, few studies address the long-term trajectory of pediatric migraine into adulthood, which is vital for anticipatory guidance [43].

In conclusion, this discussion underscores the importance of an age-specific, multidisciplinary, and patient-centered approach to pediatric migraine management. A combination of lifestyle changes, behavioral interventions, and, when necessary, medication can offer substantial relief. Regular follow-up, education, and emotional support are essential components of successful long-term outcomes [39][40]. Future research should aim to fill current evidence gaps, particularly for younger age groups and emerging therapies, to further enhance care quality for children with migraines [42][43].

Conclusion

Pediatric migraine is a prevalent and potentially disabling neurological condition that requires a multifaceted and individualized approach for effective management. The evidence reviewed in this study highlights the importance of early and accurate diagnosis, supported by standardized criteria such as those provided by the International Classification of Headache Disorders (ICHD-3). Early intervention not only reduces the frequency and severity of migraine episodes but also mitigates the broader psychosocial impacts on academic performance, emotional health, and overall quality of life.

Non-pharmacological strategies—including lifestyle modification, cognitive behavioral therapy (CBT), biofeedback, and stress management—serve as foundational treatments and have demonstrated strong efficacy in reducing migraine burden in children and adolescents. These approaches are especially beneficial due to their low risk of adverse effects and their focus on empowering patients and families to take an active role in care.

Pharmacological treatment, including the use of analgesics, triptans, and preventive medications such as propranolol, amitriptyline, and topiramate, is reserved for cases where migraines are frequent, severe, or unresponsive to non-drug therapies. However, the selection of these agents must be carefully tailored to each child’s age, clinical profile, and tolerance, considering the risk-benefit ratio.

The role of family education and school-based support is essential. Engaging parents and caregivers in the treatment process improves adherence, reduces anxiety, and fosters more successful long-term outcomes. Meanwhile, cooperation with educators through Individualized Education Plans (IEPs) can minimize school-related challenges and stigma.

Despite the progress in understanding and treating pediatric migraine, significant gaps remain, particularly in high-quality, long-term research on preventive treatments and newer pharmacological options like CGRP inhibitors in children. Future studies must focus on these areas to provide clearer guidelines and expand therapeutic options for younger populations.

In summary, successful pediatric migraine management depends on a personalized, multidisciplinary approach that integrates medical, behavioral, and educational support. With timely diagnosis, comprehensive treatment strategies, and sustained follow-up, most children with migraine can achieve meaningful relief and maintain a good quality of life.

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