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Research Article

Migraine in Children

Prevalence and Risk Factors of Migraine in Children, A Systematic Review

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Abstract: The most common main headache disease in children and adolescents is migraine. Migraine in children and teenagers is still diagnosed clinically. The doctor requires a thorough headache history that focuses on the kind, location, intensity, and duration of the pain. Most children's migraines are frontal rather than temporal/occipital and bilateral rather than unilateral, which makes them slightly different from adult migraines. Pediatric migraine can be successfully treated with a personalized regimen combining non-pharmacologic and pharmaceutical treatments. Pediatric patients have succeeded with pharmacological treatments for migraine prevention, including beta-blockers, calcium channel antagonists, serotonin antagonists, antidepressants, and antiepileptics. The study summarises current evidence regarding the Prevalence and Risk Factors of Migraine in Children. For article selection, the PubMed database and EBSCO Information Services were used. All relevant articles relevant to our topic and other articles were used in our review. Other articles that were not related to this field were excluded. The data was extracted in a specific format that the group members reviewed. The frequency of family fights and the amount of free time are two important contributors to the emergence of chronic headaches. The way the parents react to their daughter's headaches appears significant for females. Anaemia, obesity, disorders of the abdomen, and early menarche are a few more health issues connected to childhood headaches. Children frequently experience recurrent headaches, which is a serious medical comorbidity. The findings indicated that chronic migraine significantly contributes to headaches in children and adolescents, with various age groups being more concentrated in terms of headache features and risk factors.

keywords: Migraine, Primary Headache, Headache In Children, Pediatric Migraine, Chronic Migraine

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1. INTRODUCTION

A headache is one of the most prevalent somatic symptoms among children and adolescents. In the population of school-age children, the prevalence is estimated to be 10–20%, and as people become older, it rises steadily, reaching levels of roughly 27–32% at that age (when monthly crises are taken into account), and 87-94% at that age (considering the presence of headache at least once a year). Before puberty, there were no gender differences (with a small male predominance), but later on, a ratio of 2.5:1 was recorded, with an increase in females that continued until adulthood. In the paediatric population, migraine prevalence ranges from 3,3% to 21,4%, rising from infancy through adolescence. [1-5] One of the primary causes of disability and morbidity worldwide is headaches and migraine condition. The most common main headache disease in children and adolescents is migraine. It is shown that up to 18% of patients in the paediatric emergency room had migraine-related symptoms. Migraine in children and teenagers is still diagnosed clinically. The doctor requires a thorough headache history that focuses on the kind, location, intensity, and duration of the pain. Most children's migraines are frontal rather than temporal/occipital and bilateral rather than unilateral, which makes them slightly different from adult migraines. Pediatric migraine can be successfully treated with a personalized regimen combining non-pharmacologic and pharmaceutical treatments. [6] Of these few findings. One retrospective research found that participants' headaches improved with conservative treatment, including excellent sleep hygiene, a no-additives diet, and moderate sun exposure. When compared to older children, the impact was more pronounced among younger children (under six years of age). Managing stress and practising guided muscle relaxation in the neck and shoulders were evaluated in a cluster-randomized trial involving 1674 adolescents with migraine, tension-type headaches, or mixed headaches. The results revealed a significant decrease in tension-type headaches but not migraines. [7] Numerous children who suffer from migraines will require preventive treatment. To understand the nature of triggers and how to prevent them, a complete and thorough history from the child and parents is necessary for successful migraine care in the pediatric population. Pediatric patients have succeeded with pharmacological treatments for migraine prevention, including beta-blockers, calcium channel antagonists, serotonin antagonists, antidepressants, and antiepileptics—most patients, or around 61%, experience more than four significant migraine episodes per month. Only about 25% of patients experience one or fewer migraine attacks each month. During the assault, this severely impairs function and daily life. Like adult migraines, migraine disorders can be identified after secondary headache reasons are excluded. [6] According to recent investigations in adult population studies and children, obesity was substantially connected with migraine frequency and impairment. Numerous areas of overlap between migraine pathophysiology and the central and peripheral circuits regulating food have been found in translational and basic science studies. It has been proposed that neurotransmitters like serotonin, peptides like orexin, and adipocytokines like adiponectin and leptin have a role in eating and migraine. Because there is a connection between body mass index and migraine, treatments to lower body mass index might serve as a good model for research into whether modest weight reduction in obese migraineurs lowers the frequency and intensity of headaches. [1] According to a new idea, premonitory symptoms caused by migraines needs a hereditary sensitivity in the brain.

These neurochemical alterations cause trigeminovascular activation and, finally, neurogenic inflammation. The threshold for trigeminal input to reach the brain stem's nucleus caudalis is lowered by this inflammation. These sensory alterations from the C1 and C2 dermatomes eventually form synapses in the limbic and somatosensory cortices, where headache consciousness is experienced. Children's lower cholinergic function may cause more intense and cyclic vomiting compared to adults. Area-postrema, which is thought to be the trigger zone in the centre, reacts to circulating neuronal and chemical emetic cues. Vagal pathways have a role in emetic activation at the periphery. [6, 8-10]

2. METHODOLOGY

2.1 Study design

A systematic review of the current evidence on the Prevalence and Risk Factors of Migraine in Children is considered a robust way of identifying and synthesizing the peer-reviewed articles for evidence in this area to define a cohesive empirical research agenda that builds on prior knowledge. This review included qualitative evidence only to produce an interpretation. Further, a synthesis of qualitative data aims to generate findings that are meaningful, relevant, and appropriate to individuals, to inform a research agenda and ultimately to more effective practices on the Prevalence and Risk Factors of Migraine in Children. The review used methods of qualitative synthesis to combine, integrate and interpret, where possible, the evidence from the included papers. The review aims to move beyond the aggregation of available data to provide further interpretive insights on the Prevalence and Risk Factors of Migraine in Children and define where future research can add to what is known.

2.2 Study eligibility criteria

The review included qualitative peer-appraised studies. Qualitative data from mixed methods studies was screened for inclusion and included if the qualitative element was pertinent. We included those studies that have been conducted over twenty years. In addition, all peer-reviewed articles published in English reporting the Prevalence and Risk Factors of Migraine in Children was included. To be included in the review, the studies should have been published from October 2002 up to October 2022 to ensure the currency of the work while enabling a broad view of the emerging issues to be identified.

2.3 Search strategy

A systematic search strategy was developed using a combination of Medical Subject Headings (MeSH) and controlled vocabulary to identify peer-reviewed articles on the Prevalence and Risk Factors of Migraine in Children. The databases were PubMed/MEDLINE, Scopus/Embase (Elsevier), EbscoHost, and Google Scholar. We limited our search from October 2002 to October 2022.

2.4 Selection of study

The ENTREQ guidelines for reporting systematic qualitative reviews were used to demonstrate the selection processes and results. All retrieved studies were initially imported into the Endnote library to assist in removing duplicates. After removing the duplicates, the Endnote library was shared

between the two reviewers to screen the articles by title and abstract, guided by the eligibility criteria. The studies that the two reviewers agreed on were subjected to a full-text review. A third reviewer adjudicated any discrepancies between the two reviewers. The two reviewers independently reviewed the full text of all eligible studies. In the case of differences between the two reviewers, a consensus was sought by discussing the differences with the third reviewer. Finally, the full texts of all relevant studies found to meet the inclusion criteria were retained for the final framework synthesis.

2.5 Data extraction

Two reviewers independently extracted data from eligible studies onto a customized data extraction form and populated it with variables about the study population and phenomena of interest. The third review author double-checked and verified extracted articles. Study characteristics that were extracted included the name of the first author and year of publication, data collection period and region in which the study was conducted. In addition, specific study details were captured, including the study design, population, sample size, sampling procedures and data collection procedures. The Prevalence and Risk Factors of Migraine in Children was systematically identified.

2.6 Risk of bias assessment

To evaluate the quality of the included research, the qualitative data synthesis employed the non-randomized studies ROBINS-I technique. In addition, the reviewers looked into and corrected any anomalies in the quality evaluation.

2.7 Publication bias

We tested for publication bias using the informal funnel graph as recommended by Begg and Berlin.

3. STATISTICAL ANALYSIS

We show the raw data in tables and our assessments in figures. Heterogeneity between studies for point-in-time prevalence, method of data collection, and age range of childhood populations are included. We used Confidence Interval Analysis software (published by the British Medical Journal Publishing Group7) and analyzed the differences between the percentages by a $\chi 2$ test. We also used Excel and Stata for the odds ratio (OR) with 95% confidence intervals (CIs) where appropriate. The analysis included a graphic data summary and Forest Plot.

4. RESULTS

Figure 1 shows the selection and identification of studies. The search of the mentioned databases returned a total of 286 studies that were included for title screening. One hundred ninety-eight were included for abstract screening, leading to the exclusion of 52 articles. The remaining 146 publications' full texts were reviewed. The full-text revision led to the exclusion of 137 studies due to differences in study objectives, and seven were enrolled for final data extraction (Tables 1 & 2). Table 1 included the participants' sociodemographic characteristics, while table 2 included the criteria of diagnosis, methodology, and objectives. According to Straube, A. (2013), Children at school are experiencing increased headaches. Currently, 33% to 40% of 12- to 15-year-olds experience at least one headache each week, and 66% to 71% experience at least one headache per three months. Headache frequently has other physical and emotional symptoms. According to studies from Scandinavia, prevalence increases in age groups starting at eight years old and higher. A dysfunctional family situation, routine alcohol use, caffeine consumption, smoking, a lack of physical activity, physical or emotional abuse, peer bullying, unfair treatment in school, and a lack of leisure time are among the risk factors for headache or its cornification (up to a 5.8-fold elevation of risk). [11] Another study by Gassmann, J., et al. (2009) found that Boys who encountered family disputes more frequently than once per week had a factor of about 1.8 increased chance of acquiring recurring headaches between the first and second surveys, whereas boys who only "sometimes" got time to themselves had a factor of 2.1 increased risk. Girls were 25% more likely to experience repeated headaches, whether their parents' actions encouraged or discouraged the onset of headaches. [12] Lateef, T. M., et al. (2009) study showed that 17.1% of children reported having frequent or severe headaches, including migraines, in the previous 12 months. Children with headaches were more likely to have asthma, hay fever, and recurrent ear infections, with at least 1 of these conditions occurring in 41.6% of children with headaches as opposed to 25.0% of children without. Anaemia, obesity, disorders of the abdomen, and early menarche are a few more health issues connected to childhood headaches. [13] The rest of the results are detailed in Tables 1 & 2**.**

2.8 Role of sex on the prevalence of migraine

Male gender was significantly associated with a higher risk of migraine as illustrated in 5 of the 7 included studies [11]. Gender and father and sibling headache history were discovered to be the main risk factors for CM [14].

2.9 Role of Age on the prevalence of migraine

33% to 40% of 12- to 15-year-olds experience at least one headache each week, and 66% to 71% experience at least one headache per three months [12]. Age-related increases in CM (chronic migraine) frequency was seen (doubling at 12 years, $P = 0.035$). Age, gender, and father and sibling headache history were discovered to be the main risk factors for CM [14].

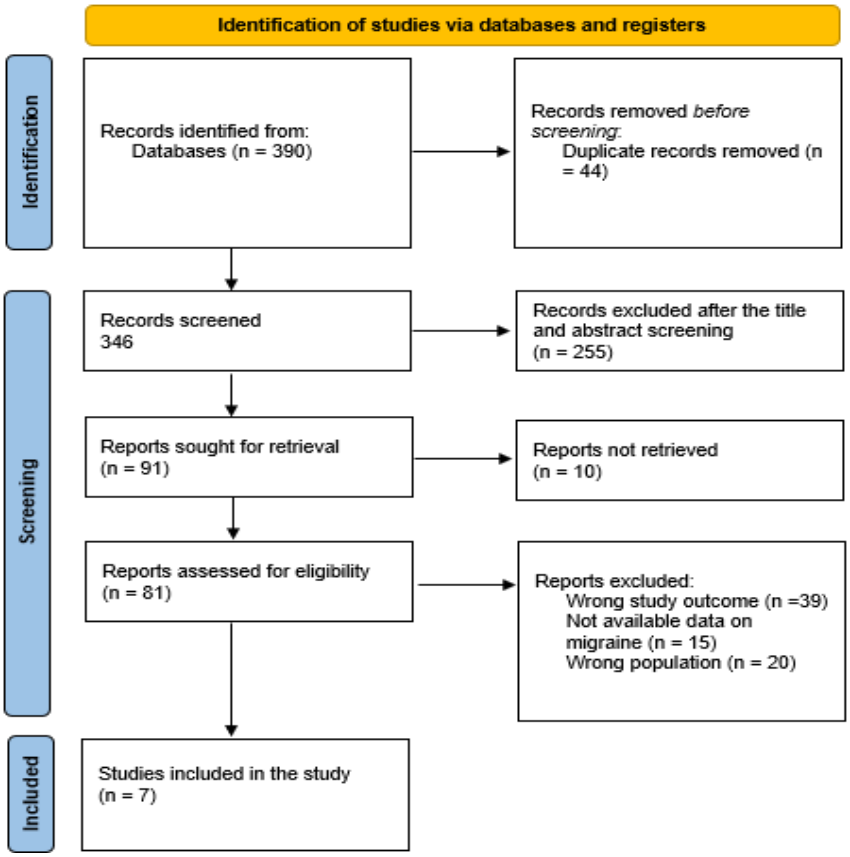

Fig (1): PRISMA flowchart summarizes the study selection process.

Table 1: Sociodemographic characteristics of the included participants:

Study (Ref)	Publication year	Study design	Country	Age of headache onset	Participants (n)	Males (%)
11	2013	Review	Germany	8 years and more	NA	NA
12	2009	Longitudinal epidemiological study	Germany	7-14	2952	1519 (51.5)
13	2009	Cross-sectional	USA	4-18	10918	5437 (49.8)
14	2013	School-based epidemiological stud	Turkey	8-12	576	273 (47.4)
15	2020	Cross-sectional	Ethiopia	7-17	2344	1157 (49.4)
16	2014	Prospective cohort study	New Zealand	11	65	34 (52.3)
17	2016	Cohort study	Israel	5-18	260	120 (46.2)

Table 2: Author, year of publication, criteria of migraine diagnosis methodology and outcome:

Study	Criteria	Objectives and Methodology	Prevalence	Risks
Straube, A. et al. 2013. [11]	NA	Articles published in either English or German up to April 2013 were considered. In addition, researchers conducted a selective search of the PubMed database for appropriate papers that contained the phrases "primary headache AND children/adolescent AND risk factors/prevalence."	33% to 40% of 12- to 15-year-olds experience at least one headache each week, and 66% to 71% experience at least one headache per three months.	A dysfunctional family situation, routine alcohol use, caffeine consumption, smoking, a lack of physical activity, physical or emotional abuse, peer bullying, unfair treatment in school, and a lack of leisure time are among the risk factors for headache or its carbonification (up to a 5.8-fold elevation of risk).

Gaßmann, J., et al. 2009. [12]	By frequency of headaches the in the last six months	In the initial study, conducted in 2003, 8800 homes with children aged 7 to 14 were issued questionnaires. Then, three further polls were conducted, one per year from 2004 to 2006. Based on the first survey, several predictors related to family traits and leisure activities were discovered, and their effects on headaches were subsequently examined in the second survey (n = 9502).	-	Boys who encountered family disputes more frequently than once per week had a factor of about 1.8 increased chance of acquiring recurring headaches between the first and second surveys. In contrast, boys who only "sometimes" got time to themselves had a factor of 2.1 increased risk. Girls were 25% more likely to experience repeated headaches, whether their parents' actions encouraged or discouraged the onset of headaches.
Lateef, T. M., et al (2009). [13]	Several Yes/ No questions identified headaches	This study aimed to identify the prevalence, sociodemographic correlates, and comorbidity of recurrent headaches in children in the United States. Participants participated in the National Health and Nutrition Examination Surveys between the ages of 4 and 18 (n = 10 198). Data on recurring illnesses and other ailments were examined.	17.1% of children reported having frequent or severe headaches, including migraines, in the previous 12 months.	Children with headaches were more likely to have asthma, hay fever, and recurrent ear infections, with at least 1 of these conditions occurring in 41.6% of children with headaches as opposed to 25.0% of children without. Anaemia, obesity, disorders of the abdomen, and early menarche are a few more health issues connected to childhood headaches.
Ozge A, et al (2013). [14]	Classificatio n of daily and near-daily headaches	Researchers conducted this school-based epidemiological study to assess the prevalence and determinants of migraine in children and adolescents. The initial phase of the study, which involved 5562 kids, was carried out in 2001. The second portion of the study, which involved 1155 teenagers, was conducted in 2007. After the primary results were released, researchers conducted a fresh database analysis with a migraine-specific emphasis.	10.4% of them (1.7% CM, 8.6% EM) were diagnosed with migraines, mostly females.	In children with CM, most migraine clinical features are not well-known by conventional standards. 18.6% of adolescents (1.5%CM, 17.1%EM) had migraine diagnoses, with girls predominating without regard to age. After six years, when they entered puberty, twice as many occurrences of CM were headache-free. During the follow-up period, most youths had headache characteristics changes unrelated to treatment techniques.
Zewde, D., et al. (2020) [15]	ICHD-3 beta criteria	The procedures adhered to the general research protocol. A cross-sectional survey served as the foundation of the investigation. To be nationally representative, self-completed structured questionnaires were distributed in classes at 24 schools chosen from seven different areas of Lithuania. The ICHD-3 beta criteria were used as the foundation for the headache diagnostic questions, although	There was a 92.2% lifetime prevalence of headaches observed. The 1-year prevalence, adjusted for gender and age, was 76.6% (migraine: 21.4%).	All headache categories, except UdH, were more common in women than men and in teenagers than younger children. Although there was a complicated association between UdH and age, it accounted for 38.0% of all headaches reported in children and 27.4% in adolescents. 17.5% of people reported having a

		undifferentiated headache was also included (UdH).		headache yesterday (HY), which is about double the projected 9.8% based on the prevalence and frequency of headaches.
Waldie, K. E., et al. (2014). [16]	IHS	According to the International Headache Society, the onset of primary headache occurs at age 11. Mother smoking throughout pregnancy, maternal perceived stress, gestational age status, sex, and maternal school-leaving age were all considered minor perinatal variables. Sleep length, body fat percentage, television viewing, parent- and self-reported overall bad behaviour, bullying, and sadness were all considered childhood risk factors.	The prevalence of tension-type headaches was 18.6%, and migraines were 10.5%, respectively.	Both sleep difficulties and behaviour issues were still statistically significant. Migraine was also linked to shorter sleep duration. TTH was also substantially correlated with bullying, increased body fat, and prenatal maternal smoking. After multivariable analysis, problem behaviour assessed at ages 3.5 and 11 years for TTH both remained significant.
Genizi J, et al. (2016). [17]	IHS-2	Retrospective reviews of the medical records of children who visited three paediatric neurology clinics in Haifa with headaches during the previous five years were conducted. The diagnosis of a migraine headache between the ages of 5 and 18 was an inclusion criterion.	26.2% of the 260 youngsters (140 of them were female) who had migraines also developed aura.	MWA was more prevalent in older children and women than in younger children (32.6% vs 18.9%, P .01). Visual aura was more prevalent in females than in males among those who reported having them (66.7% vs 33.3%, P .04). The chances of MWA were 2.46 times higher in children with a family history of migraine (P .02), which indicates a substantial relationship between family history of migraine and MWA.

5. DISCUSSION

In this age range, it can be challenging to distinguish between migraines and tension-type headaches, and parents frequently underestimate their children's headaches. According to epidemiologic cross-sectional and longitudinal studies, the prevalence of headaches increases with age, from 37-51% in 7-year-olds to 57-82% in 15-year-olds. In the German Health Interview and Examination Survey for Children and Adolescents (KiGGS), headaches were the most common pain in the group of 11–17-year-olds, surpassing abdominal pain and back pain (the 3-month prevalence for all forms of pain was 77.6%). The prevalence of migraines was 3.8% for children aged 5 to 12 and 6.9% for children aged 12 to 15. In German research, children aged 7 to 14 had a headache prevalence of 39% and 63%, respectively. [11,13,18-24] When children complain of headaches to their parents, girls appear to take it more personally than males. Suppose parents react negatively to their girls' headaches. In that case, the daughters may report headaches more frequently in order to get specific privileges (such as staying home from school, which is a kind of negative reinforcement) or more parental attention (positive reinforcement). These parental responses should be carefully monitored and examined so that the treating doctor or psychologist may consider them. [12] Asthma, hay fever, and frequent ear infections were shown to have the highest correlations with headaches, with at least 1 of these illnesses occurring in 41.6% of children with headaches and 25.0% of children without headaches (P < .0001). Children with overweight headaches also had higher rates of anaemia, stomach or intestinal disorders, asthma, hay fever, and recurrent ear infections. For many years, clinical samples of headaches and allergic illnesses have shown a relationship between migraines, asthma, and other allergic disorders. In fact, one observer referred to asthma as "pulmonary migraine" because of the mounting evidence linking headache problems and migraine with allergens and asthma. [13] All headache categories, with the exception of UdH, were more common in women than men and in teenagers than in younger children. Age and UdH exhibited complicated relationships. Absolute prevalence grew from 19.3% between the ages of 7-8 years to a high of 30.7% between the ages of 11–12 years, then decreased to a minimum of 18.1% at the age of 17. UdH accounted for 38.0% of all reported headaches in children but only 27.4% in teenagers due to the rising incidence of all other headache categories at the time. Adolescents experienced headaches more than 15 days/per month, which was a lot more frequent.[15] Childhood migraine and TTH have all been associated with obesity, sleep disorders, and behavioural and psychological issues. Increases in body mass are correlated with an increase in headache frequency and headache-related impairment. Migraine has been notably linked to problems

with arousal, sleep breathing, and difficulty falling and staying asleep. Hyperactivity, focus issues, and conduct issues are examples of behavioural issues. More internalizing illnesses, especially significant sadness and anxiety, are present in children with headaches than in children without. Given that the two forms of headache in children may have different underlying pathophysiologies, it is unclear if these relationships are different. [16] Interprofessional care is used to treat migraines in children. Healthcare professionals, particularly nurse practitioners, need to be informed of the many therapy modalities available. The nonpharmacological strategy is regarded as the initial course of action. Patients start taking drugs if avoidance triggers and nonpharmacological treatment don't relieve the headaches. The literature has not sufficiently supported the use of nerve blocks or botulinum toxin in the paediatric migraine population. There is sufficient proof that the optimal course of action combines pharmaceutical and nonpharmacological methods. A comprehensive neurological and physical assessment is also essential to rule out secondary headaches. [17]

5.1 Strengths and limitations of the systematic review

The included studies had relatively small sample sizes, resulting in low power to our results. We could not conduct analyses to explore potential bias associated with the heterogeneity between studies because of the small number of included studies. Most of the included studies used cross-sectional, which reduces our confidence in these results because bias can be introduced.

6. CONCLUSION

The frequency of family fights and the amount of free time are two important contributors to the emergence of chronic headaches. The way the parents react to their daughter's headaches appears significant for females. Anaemia, obesity, disorders of the abdomen, and early menarche are a few more health issues connected to childhood headaches. Children frequently experience recurrent headaches, which is a serious medical comorbidity. The findings indicated that CM significantly contributes to headaches in children and adolescents, with various age groups being more concentrated in terms of headache features and risk factors.

7. AUTHOR CONTRIBUTION STATEMENT

Dr. Nisreen Omar Asraf conceptualized and designed the study. Dr. Mohammad Omar Algabri and Dr. Turki Fahad O Alotaibi and Dr. Sukayna Adil Alhamad searched databases for previous literature. Dr. Mona Ahmed Al Hamad and Dr. Saad Mohammed Almuqrin and Dr. Albandari Ali M Alzahid screened and filtered previous studies. Dr. Ahad Adel Mohamed and Dr. Mohammed Abdulelah Alabdulbaqi and Dr. Omamah Eid T Alharbi wrote the manuscript. Dr. Mohammad Kadhem M Abusaleh and Dr. Bassam Ibrahim Aljohani and Dr. Yazid Yousef Alharbi revised the manuscript and Dr. Ghena Ghazi Alenezi emailed the journal for publication.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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