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REVIEW

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# Prevalence, characteristics, and treatment outcomes of migraine headache in Nigeria: a systematic review and meta-analysis

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## Abstract

**Background** Headache disorders, including migraine, pose a significant burden globally, with varying prevalence rates across different regions. However, research on migraine in Nigeria and other low-income countries is limited. Understanding the prevalence, characteristics, and treatment outcomes of migraine in Nigeria is essential for informing healthcare policies and improving patient care.

**Methods** This systematic review and meta-analysis aimed to synthesize existing literature on migraine prevalence, characteristics, and treatment outcomes in Nigeria. Eligible studies were identified through comprehensive searches of multiple electronic databases and grey literature sources. Studies reporting migraine prevalence, diagnostic criteria, treatment modalities, and outcomes were included. Data extraction and quality assessment were performed following established guidelines.

**Results** Ten studies involving 7,768 participants met the inclusion criteria and were included in the meta-analysis. The pooled prevalence of migraine headache in Nigeria was calculated to be 16% (95% CI = 7–28), with significant heterogeneity observed among studies ($I^2 = 99.35\%$, $P < 0.001$). Subgroup analysis revealed a higher prevalence of migraine among women compared to men. Common triggers for migraine included physical activity, sleep deprivation, mental and physical fatigue, and emotional stress. Treatment modalities varied, with simple analgesics, NSAIDs, ergotamine derivatives, and amitriptyline being commonly used. However, many participants reported inadequate pain relief or significant side effects, highlighting the need for improved management strategies.

**Conclusion** The findings of this systematic review and meta-analysis underscore the significant burden of migraine in Nigeria and the need for improved healthcare policies and interventions. Addressing gaps in access to specialized care and implementing more effective treatment regimens could help alleviate the burden of migraine on individuals and healthcare systems in Nigeria. Further research is needed to standardize diagnostic criteria and methodologies and provide more reliable prevalence estimates.

**Keywords** Migraine, Nigeria, Prevalence, Characteristics, Treatment outcomes

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## Background

Global estimates of headache disorders and their subtypes reveal a significant burden across various regions, with prevalence rates ranging from 3 to 30% depending on the subtype [1]. The World Health Organization (WHO) ranks headache disorders among the most disabling chronic conditions, alongside quadriplegia, dementia, and psychosis [1, 2]. Migraine, in particular, contributes substantially to this burden, accounting for approximately 11% of all primary headache types worldwide [1]. Migraine disorders are classified globally into episodic migraine (EM) and chronic migraine (CM) based on headache frequency [3]. EM is characterized by headache episodes occurring fewer than 15 days per month, while CM involves headache on more than 15 days per month, with intense migrainous features on at least 8 of those days [3–5].

The economic impact of managing migraine further exacerbates the disease burden [6]. Comprehensive care for CM demands substantial financial resources and significant human capital investment, significantly damaging healthcare systems and society [7]. The costs associated with specialized care and indirect costs from productivity losses and reduced workforce participation highlight the substantial economic impact of CM [7]. Despite extensive research in high-income countries, data on headache disorders, particularly migraine, is notably limited in Africa [8]. Recent studies from Mali (21.0%) and Cameroon (17.9%) have provided valuable insights into migraine prevalence in these regions, revealing an often underrepresented burden in the global literature [9, 10].

In Nigeria, trends align with global patterns. A study among Nigerian undergraduates found a 9.6% prevalence of migraine, with a higher occurrence in females [11]. This gender disparity is consistent with findings in both Nigerian and global studies, where migraines are more frequently reported among females [11–13]. The increasing prevalence of migraine globally, including in Nigeria, can be attributed to several factors. In Nigeria, suboptimal health-seeking behavior, including reluctance to seek specialist care or adhere to treatment regimens, exacerbates the migraine burden [14]. Similar trends are observed globally, where patients with migraine often delay seeking medical attention [15, 16]. Contributing factors also include lack of health insurance, inaccurate diagnoses, poor medical consultations, and the burden of pharmacological therapy [17]. This study aims to provide systematic evidence on the prevalence and characteristics of migraine headache in Nigeria, addressing a critical gap in the literature.

## Methodology

This systematic review and meta-analysis were registered on PROPERO (CRD42024517960) and reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement Guidelines [18].

### Study eligibility criteria

Utilising a PICO-S framework, we constructed a detailed guide to the studies to be included. Our population included all age groups within the Nigerian study location. The intervention could range from noninvasive, simple pharmacotherapies to advanced therapies. Outcomes were hospitalizations, self-reported quality of life, or mortality.

#### *Inclusion criteria*

- Geographic Location: Individuals residing in Nigeria.
- Age: Participants of all age groups were included.
- Diagnosis: Individuals with a confirmed diagnosis of migraine based on established diagnostic criteria such as the International Classification of Headache Disorders (ICHD).
- Study Types: Original research studies, including cross-sectional, cohort, case-control, and intervention studies, reporting on the prevalence, characteristics, and treatment outcomes of migraine in Nigeria.

#### *Exclusion criteria*

- Incomplete Data: Studies with insufficient data or incomplete reporting of relevant outcomes.
- Non-human Studies: Animal or laboratory-based research without direct relevance to human populations.

### Data sources, search strategies, and identification of studies

We searched PubMed, Google Scholar, the Directory of Open Access Journals (DOAJ), the Cochrane Library, and African Journals Online (AJOL). We also searched grey literature and a reference list of relevant articles. Figure 1 shows a flowchart of the identification process.

We used key concepts and MeSH terms, "Headaches," "Migraine," and "Nigeria," together with boolean operators AND or OR across the databases. We included only studies in humans with fully available texts in English, and we had no publication year restriction. Additional details can be found in supplementary file 1.

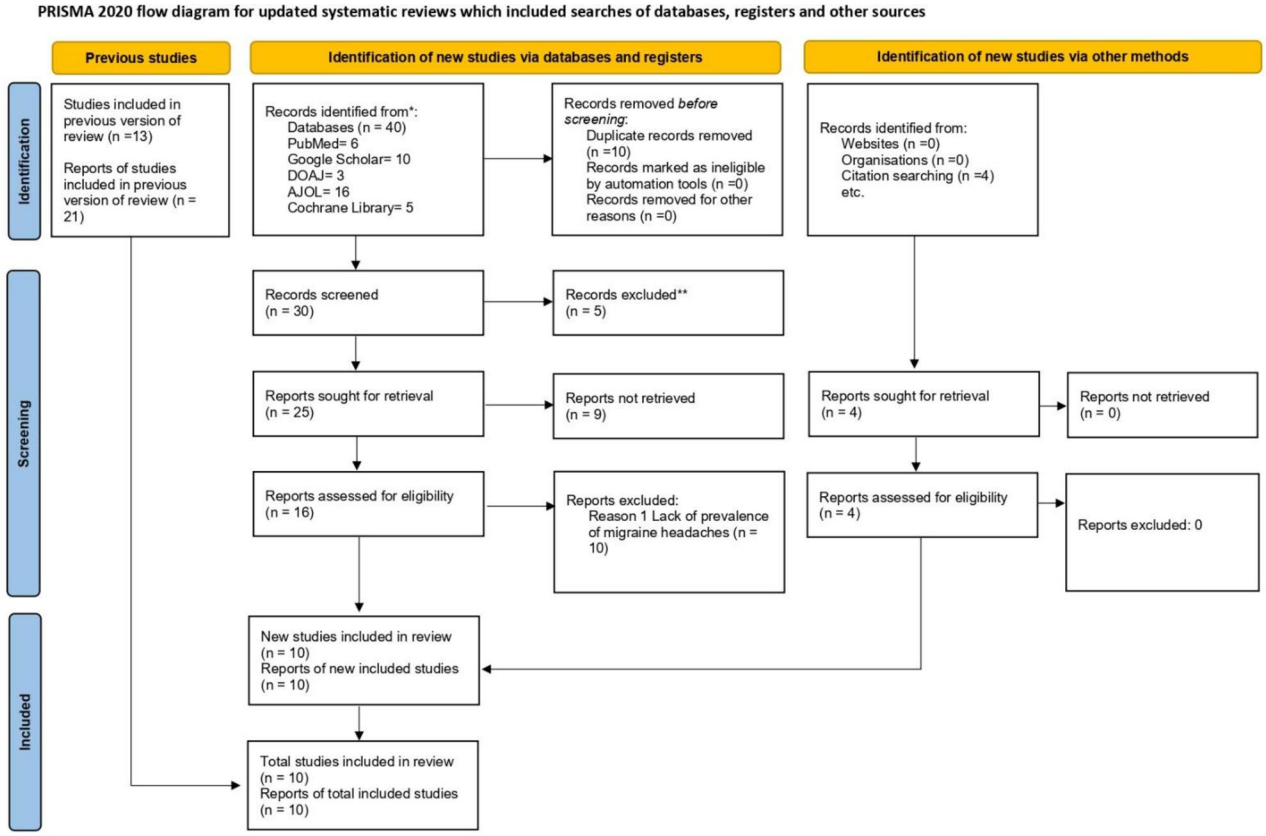


**Fig. 1** PRISMA flowchart

### Data extraction

All studies (CSV/bib.text/ris) were imported on the Rayyan software [19], automatically screened out for duplicates, and managed by two independent reviewers, A.E.B. and N.A. The studies had their titles and abstracts screened, and any concerns were resolved by a third independent reviewer (E.E). Clean data extraction was done on Excel spreadsheets (version 2401) and included (Authors and year, study design, sample size, prevalence, characteristics, Outcomes, treatment modalities, and treatment outcomes).

### Risk of bias assessment

N. A used the ROBIN-E tool to assess the Quality of the included studies. Figure 2.

### Statistical methods

A meta-analysis was considered for studies deemed sufficiently homogeneous. Models: Random-effect models were preferred due to the expected heterogeneity across studies. Outcome Measures: For prevalence, odds ratios (OR) or prevalence ratios (PR) were calculated. For continuous outcomes (e.g., treatment outcomes), mean differences (MD) or standardized mean differences (SMD) were used. Statistical Heterogeneity: Statistical heterogeneity was assessed using the $I^2$ statistic. Substantial heterogeneity was explored through subgroup analyses and sensitivity analyses.

## Results

Our initial search yielded 40 studies, of which 30 underwent full-text screening (Fig. 1). Ten studies [20–29] were eligible for inclusion. The total sample size for this meta-analysis and systematic review was 7,768 individuals. Study-specific details and references are provided in Table 1.

### Prevalence of migraine

Figure 3 shows the pooled prevalence of migraine headache in Nigeria. Ten studies involving 7,768 participants were assessed, with ages ranging from 19 to 24.2 years and a prevalence range of 2.4–69.2%. The heterogeneity among studies, assessed using a random effects model, was statistically significant ($I^2$ = 99.35%, $P<0.001$), indicating substantial variability across the included studies. The funnel plot for publication bias in Fig. 4 shows some degree of asymmetry, suggesting the possibility of publication bias. Based on the included studies, the prevalence of migraine in Nigeria was calculated to be 16% (95% CI=7–28).

A subgroup analysis was performed based on gender. The results indicated a higher prevalence of migraine in

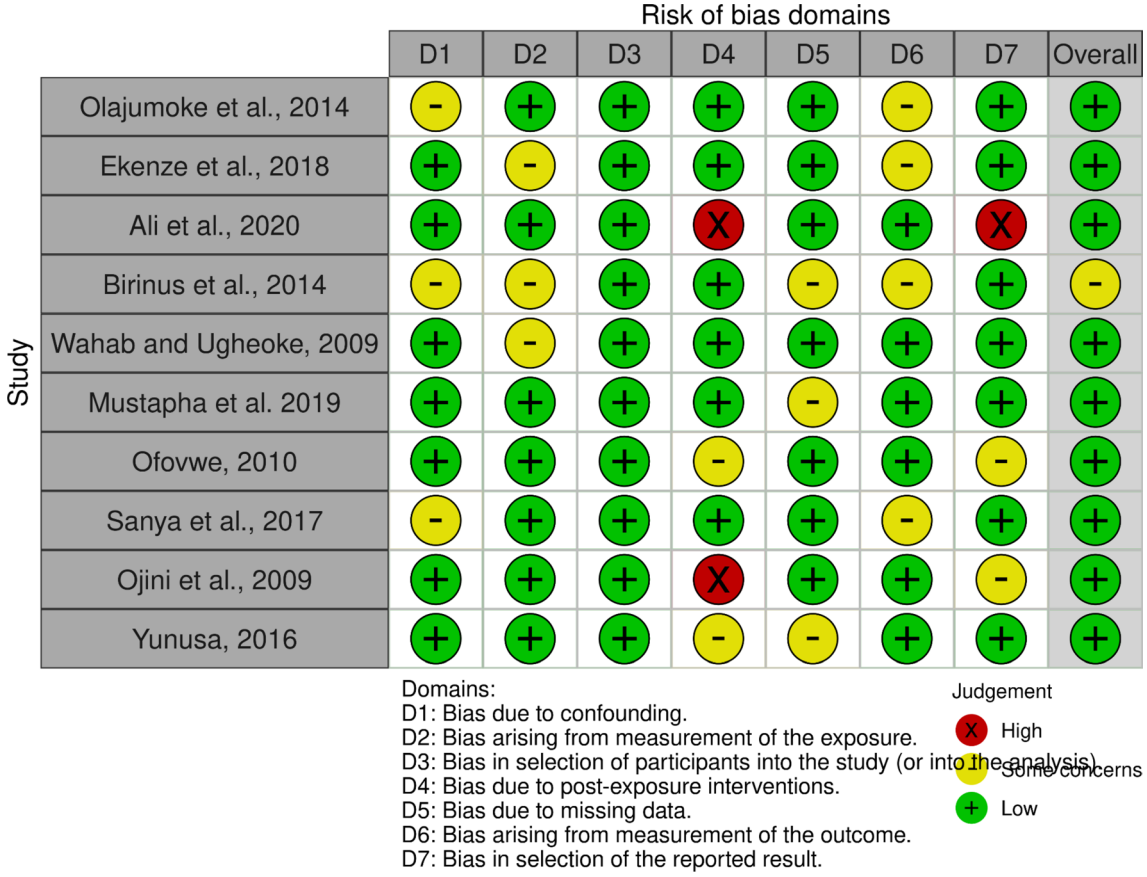


**Fig. 2** Risk of bias

women compared to men, with 13% (95% CI: 6–21) in women versus 7% (95% CI: 4–12) in men (Fig. 5).

#### Treatment modalities

The ten studies included in this systematic review and meta-analysis examined various aspects of migraine characteristics and treatment modalities in Nigeria. Physical activity was identified as a significant aggravating factor in 25% of cases by Olajumoke et al. (2014) [20]. Common relieving factors included rest (62.5%) and over-the-counter analgesics (17.5%). The treatment modalities used in this study were simple analgesics (16.1%), NSAIDs (19.4%), ergotamine derivatives (32.3%), amitriptyline (29%), and beta-blockers (3.2%).

Ekenze et al. (2018) [21] found that migraine without aura was the most common type, accounting for 73% of cases, while migraine with aura represented 27%. This finding was consistent with the results of Ali et al. (2020) [22], who reported that migraine without aura was prevalent in 65.4% of cases, migraine with aura in 26%, and a combination of both in 8.7%. The mean age at headache onset was 19.3±7.0 years, and the mean age at migraine diagnosis was 23.7±6.9 years. Prophylactic medications were used by 45.1% of participants, with amitriptyline (39.8%) and propranolol (23.5%) being the most common. Despite this, 27.3% reported benefits with side effects, 12.7% saw no benefit, and 16.4% were classified as refractory.

Birinus et al. (2014) [23] observed that migraine without aura was more prevalent (4.5%) compared to migraine with aura (1.8%). This trend was similar to the study by Wahab and Ugheoke (2009) [24], which reported that a significant proportion of participants used paracetamol (67.6%) and NSAIDs (6.2%) for treatment. For acute attacks, 64.8% used simple analgesics, and 2.8% used ergot preparations. Mustapha et al. (2019) [25] identified sleep deprivation (65.6%) and mental/physical fatigue as common migraine triggers. Most participants self-medicated (66.7%) or treated their headaches with bed rest (33.3%), predominantly using paracetamol (84.4%). Similarly, Ofovwe (2010) [26] reported that migraine without aura (57.9%) was more common than migraine with aura (11.3%). Common triggers included emotional stress (23.3%) and sunlight (21.4%), with the main relieving factors being analgesics (56.4%), lying in dark rooms (29.2%), and eating (14.4%).

Sanya et al. (2017) [27] found that headaches mainly were unilateral (3.9%), with associated symptoms such

**Table 1** Study characteristics

| Authors & Year | Study Design | Sample Size | Prevalence | Characteristics | Treatment Modalities | Treatment Outcomes |
|---|---|---|---|---|---|---|
| Olajumoke et al., 2014 | Cross-sectional study | 402 (168 males and 234 females) | 18.9% (Females 23.7%, Males 5%) | The mean age of onset of migraine headache was 19.2 ± 8.24 years. Physical activity was the main aggravating factor and occurred in 25% (10/40) of cases. Migraine headaches showed female preponderance. | The relieving factors were rest in 62.5% (25/40) and over-the-counter analgesics in 17.5% (7/40) of cases. Simple analgesics, (16.1%) Nonsteroidal anti-inflammatory drugs (NSAIDs), (19.4%) Ergotamine derivatives (32.3%) Amitriptyline, (29%), and Beta-blockers 1/31 (3.2%) | Not Mentioned |
| Ekenze et al., 2018 | Cross-sectional study. | 449 (Females 264; Males 185). | 8.9% (10.6% in females and 6.5% in males) Migraine without aura (73%) Migraine with aura (27%) | The age range was 19–33 years, with a mean of 23.2 years (males-24.2 and females 22.5) years. Migraine without aura in this study took the higher proportion of migraine headaches (73%). The proportion of migraine with aura was 27% of migraine headaches in general. | Not Mentioned | Not Mentioned |
| Ali et al., 2020 | Multi-centre, Hospital-based, Cross-sectional study | 104 (Males = 27, Females = 74) | 69.2% Migraine with aura 68 (65.4) Migraine without aura 27 (26) Migraine with and without aura 9 (8.7) (Females: 74%; Males 26%) | The mean age at headache onset was 19.3 ± 7.0 years The mean age at migraine diagnosis was 23.7 ± 6.9 years. Sixty-nine (66.3%) participants were diagnosed with migraine within 5 years of headache onset. Prophylactic medications were used by 26 (45.1%) subjects. Thirteen (23.6%) subjects were not adherent with preventive drug treatment, while 16 (29%) participants used their preventive medications acutely. | Propranolol 23 (23.5) Amitriptyline 39 (39.8) Sodium valproate 4(4) Gabapentin 2(2) Combinations 28(28.6) | Thirty-one (56.4%) sub jects found preventive medications useful, and 15(27.3%) subjects admitted benefits but with side effects. Seven (12.7%) participants had no benefit from preventative treat ment, and 9 (16.4%) subjects were classified as refractory migraine |
| Birinus et al., 2014 | 3 Phase Cross-sectional Study | 1410 Males were 637(45.2%) and females 773(54.8%) | 6.4% (7.5% in females and 5% in males) Migraine with aura 26(1.8) Migraine without aura 64(4.5.) | Migraine without aura was significantly higher in females (5.7%) than males (3.1%) The highest prevalence of migraine occurred among farmers (8.1%) For 20–29 and the 50-59-year olds, the prevalence of migraine was similar at 7.1% and 7%, respectively. | Not Mentioned | Not Mentioned |

**Table 1** (continued)

| Authors & Year | Study Design | Sample Size | Prevalence | Characteristics | Treatment Modalities | Treatment Outcomes |
|---|---|---|---|---|---|---|
| Wahab and Ugheoke, 2009 | Cross-sectional Study | 1513 (755 males and 758 females) | 9.6% (Females 10.3%, Males 8.9%). | The mean age of all migraineurs was 22.0 ± 3.3 years. There was a positive family history of migraine in a first degree relation in 32.4% while the overall mean pain intensity in the three months before the study was 4.7 with females having a higher score of 5.2 compared to 4.2 in males ($p > 0.05$). | 67.6% of them use paracetamol 6.2% use non-steroidal anti-inflammatory drugs (NSAIDs) 16.2% did not specify the type of medications they use for prevention. In the treatment of acute attack, majority of the sufferers (64.8%) use only simple analgesics (paracetamol and NSAID), 2.8% use ergot containing preparations while none reported having ever used triptans. | Not mentioned |
| Mustapha et al. 2019 | Cross-sectional descriptive study | 213 184 (86.4%) females and 29 (13.6%) males | 26.8% (Male 27.6%, Female 2.2%) Migraine without aura 5(21.1%) Migraine with aura 12(5.6%) | Migraine with aura (MA) was significantly ($P < 0.01$ more prevalent among the male students (27.6%) compared to the female (2.2%). Twelve (13.3%) of headache sufferers had history of refractive error. Family history of headache was present in 6 students (6.7%), who all had migraine headache. The most common trigger factors of headache attacks included sleep deprivation (65.6. %) and mental/physical fatigue. | Only 8.9% of respondents in the headache group sought medical care 66.7% self medicated, while 33.3% treated their headaches with bed rest. Majority used paracetamol (84.4%) while 25.6% and 16.7% used ergot derivatives and non-steroidal anti inflammatory drugs respectively during attacks of headache. Only 1 (1.1%) was on preventive medication (Amitriptyline). | |
| Ofovwe, 2010 | Cross-sectional Study | 1679 809 (48.2%) were girls while 870 (51.8%)wereboys | 13.5%. (Male 9.2%, Female 18.2%) Migraine without aura 190/328(57.9%) Migraine with aura 37/328(11.3%) | Triggers Emotional stress 72(23.3) Sunlight/bright light 66(21.4) Sleep deprivation 54(17.5) Hunger 40(12.9) Straining 31(10.0) Odors (perfumes, smoke) 7(2.3) Chocolate/milk/groundnut 2(0.7) Others 37(12.0) | Relieving factors among the migraineurs include analgesics in 172 (56.4%), lying in dark, quiet rooms in 89 (29.2%), and eating in 44 (14.4%) | Not Mentioned |
| Sanya et al., 2017 | Cross-sectional Study | 1500 791 were males (52.7%) and 709 were females (47.3%). | 2.4% (Females 57.5%, Males 42.5%). | Fifty-eight students (3.9%) reported their headache to be unilateral in location, 33 (2.2%) had bilateral headaches, and 128 (8.5%) had frontal headaches. One hundred students (6.7%) had their headache associated with photophobia, 159 students (10.6%) had phonophobia, while 62 (4.1%) had nausea and vomiting. A total of 263 of the 356 students who experienced frequent headaches had their daily physical and school activities limited by headaches | Majority of the students (90.2%) used acetaminophen to treat their headaches while 2.8% used other types of nonsteroidal analgesics for their pain. None of the students had seen a physician for a proper diagnosis of their headache; similarly, none was on antimigraine prophylactic medications. | Not Mentioned |

**Table 1** (continued)

| Authors & Year | Study Design | Sample Size | Prevalence | Characteristics | Treatment Modalities | Treatment Outcomes |
|---|---|---|---|---|---|---|
| Ojini et al., 2009 | Cross-sectional survey | 376<br>220 men and 156 women | 24 (6.4)<br>Males 7 (3.2)<br>Females 17 (10.9) | Among students with migraine, headache was unilateral in 70.8%, throbbing in 62.5%, associated with nausea and vomiting in 47.8% and with both photophobia and phonophobia in 91.7%. All the students with migraine reported aggravation of headache with routine physical activity, whereas four (16.7%) reported the occurrence of an aura (wavy lines in two students, disturbed speech and blind spots in one student each). | Sought medical assistance8 (4.6)<br>Self-medication118 (68.2)<br>No medication or any other coping strategy26 (15.0)<br>Sleep*53 (30.6)<br>Food1 (0.6)<br>Cold compress1 (0.6)<br>Most students (71.7%) used simple analgesics (67.6% took paracetamol, and 4.1% took aspirin). | Not Mentioned |
| Yunusa, 2016 | Cross-sectional Study | 122<br>Female students were 73 (59.8%) male students were 49 (40.2%) | 28.7% (Females 50.8%, Males 40.2%) | Of those who reported positive for migraine, 10 (29.4%) was left sided, 6 (17.6%) right sided, 10 (29.4%) both side of the head, while 7 (20.6%) reported generalized headache. The frequency of the migraine varied with some as frequent as 25 times a month. Fourteen (45.2%) reported the presence of sensory aura including visual and olfactory hallucination, while others complained of motor aura. | The majority took acetaminophen. | Not mentioned |

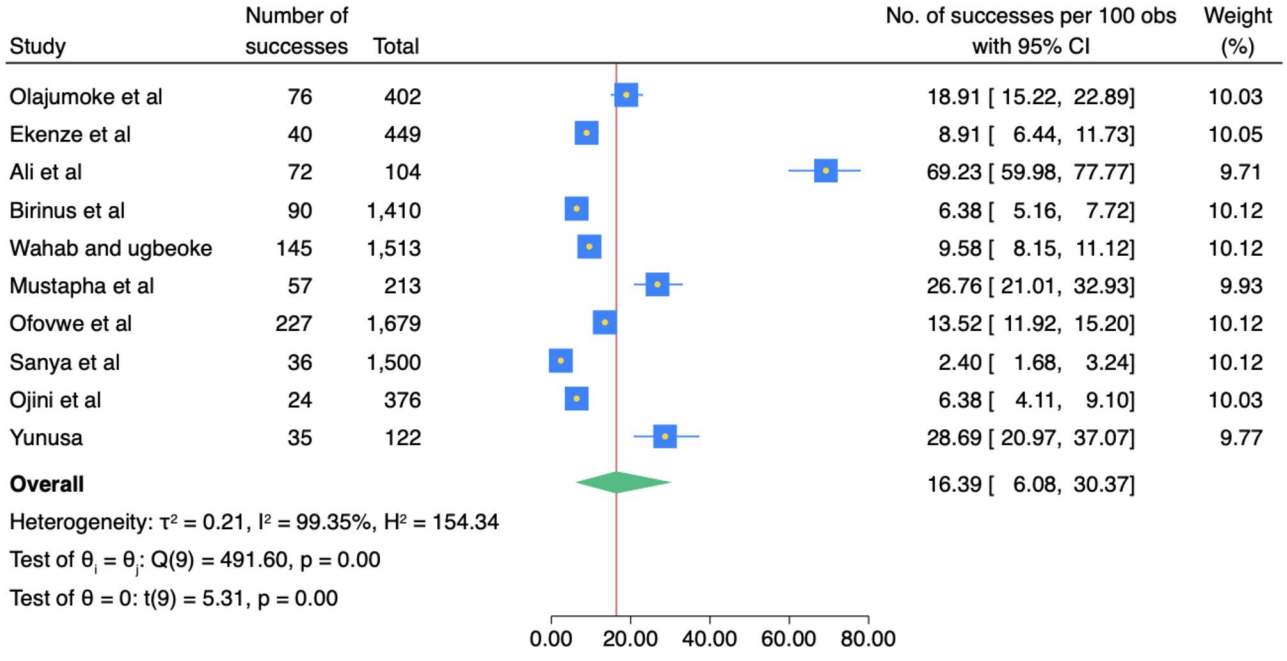


**Fig. 3** Prevalence of migraine

as photophobia (6.7%) and phonophobia (10.6%). Most used acetaminophen (90.2%) for treatment, and none sought physician care or used prophylactic medications. Ojini et al. (2009) [28] also reported that headaches were primarily unilateral (70.8%) and throbbing (62.5%), with significant associated symptoms like photophobia and phonophobia (91.7%). Most students (71.7%) used simple analgesics, primarily paracetamol (67.6%). Yunusa (2016) [29] reported a high prevalence of 28.7% among 122 participants. This study noted varied headache locations and frequencies, with 45.2% reporting sensory aura. The majority of students used acetaminophen for treatment.

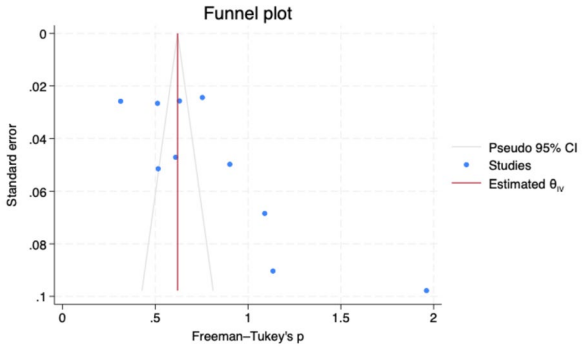


**Fig. 4** Funnel plot of pooled prevalence

## Discussion

The pooled prevalence of migraine headache in Nigeria was found to be 16% (95% CI=7–28), based on data from ten studies involving 7,768 participants. The studies included in this meta-analysis reported prevalence rates ranging from 2.4 to 69.2%, indicating a wide range of estimates. This variability was further supported by the significant heterogeneity observed ($I^2$ = 99.35%, $P<0.001$). Additionally, a subgroup analysis revealed a higher prevalence of migraine among women (13%, 95% CI: 6–21) compared to men (7%, 95% CI: 4–12).

When comparing these figures with other African countries, Nigeria's migraine prevalence appears consistent with regional trends. In Mali, a study has reported a migraine prevalence of 21.0%, which is slightly higher but within a comparable range to the Nigerian estimate [9]. Cameroon's prevalence is 17.9%, closely aligned with Nigeria's Fig. [10]. Moreover, the prevalence of migraines in Nigeria appears consistent with global trends, where migraines are more common in women than in men. This gender disparity aligns with findings from other regions and may be attributed to hormonal influences, lifestyle factors, and genetic predispositions. However, Nigeria's range of prevalence rates is notably broad, which could be due to differences in study populations, methodologies, and diagnostic criteria.

The broad range of prevalence rates observed within Nigeria highlights the need for more standardized diagnostic approaches and consistent research methodologies. This variability might reflect differences in regional healthcare access, awareness, and cultural attitudes toward headache disorders. Overall, while the prevalence of migraine headaches in Nigeria is comparable to other African countries, the significant variability within the Nigerian data emphasizes the importance of considering regional and methodological factors in interpreting these figures. The higher prevalence among women in Nigeria mirrors global patterns and further underscores the need for targeted research and healthcare strategies to address migraine burdens effectively.

Several studies identified common triggers for migraines, including physical activity, sleep deprivation, mental and physical fatigue, emotional stress, and exposure to sunlight. These triggers are consistent with those reported in other global studies, highlighting the universal nature of these factors.

Treatment practices varied across the studies, with simple analgesics, NSAIDs, ergotamine derivatives, and amitriptyline being commonly used. Despite the availability of these treatments, many participants reported inadequate pain relief or significant side effects, and a notable proportion were classified as having refractory migraines. The findings underscore the need for improved migraine management strategies, including better access to specialized care and more effective treatment regimens.

The findings highlight the significant burden of migraine in Nigeria and underscore the need for public health initiatives to improve awareness, diagnosis, and treatment of this condition. The high prevalence of self-medication and the low rate of seeking professional healthcare suggest a gap in access to and utilization of medical services. Addressing these gaps could improve treatment outcomes and reduce the overall burden of migraine on individuals and the healthcare system.

## Limitations

This meta-analysis has notable limitations, including heterogeneity and potential publication bias. Additionally, the reliance on cross-sectional studies limits the ability to infer causality or assess changes over time. Future research should aim to standardize diagnostic criteria and methodologies to provide more consistent and reliable prevalence estimates.

## Conclusion

This systematic review and meta-analysis assessed the prevalence, characteristics, and treatment outcomes of migraine headache in Nigeria, synthesizing data from ten studies involving 7,768 participants. The findings indicate a substantial burden of migraines, particularly among women, and highlight the need for improved migraine management and healthcare access. The significant burden of migraine in Nigeria calls for public health initiatives aimed at enhancing awareness, diagnosis, and treatment of migraines. The high prevalence of self-medication and the low rate of seeking professional healthcare point to gaps in access to and utilization of medical services. Addressing these gaps through improved healthcare infrastructure and patient education could enhance treatment outcomes and reduce the overall burden of migraine on individuals and the healthcare system. Future research should focus on standardizing diagnostic criteria and methodologies to provide more consistent and reliable prevalence estimates, and

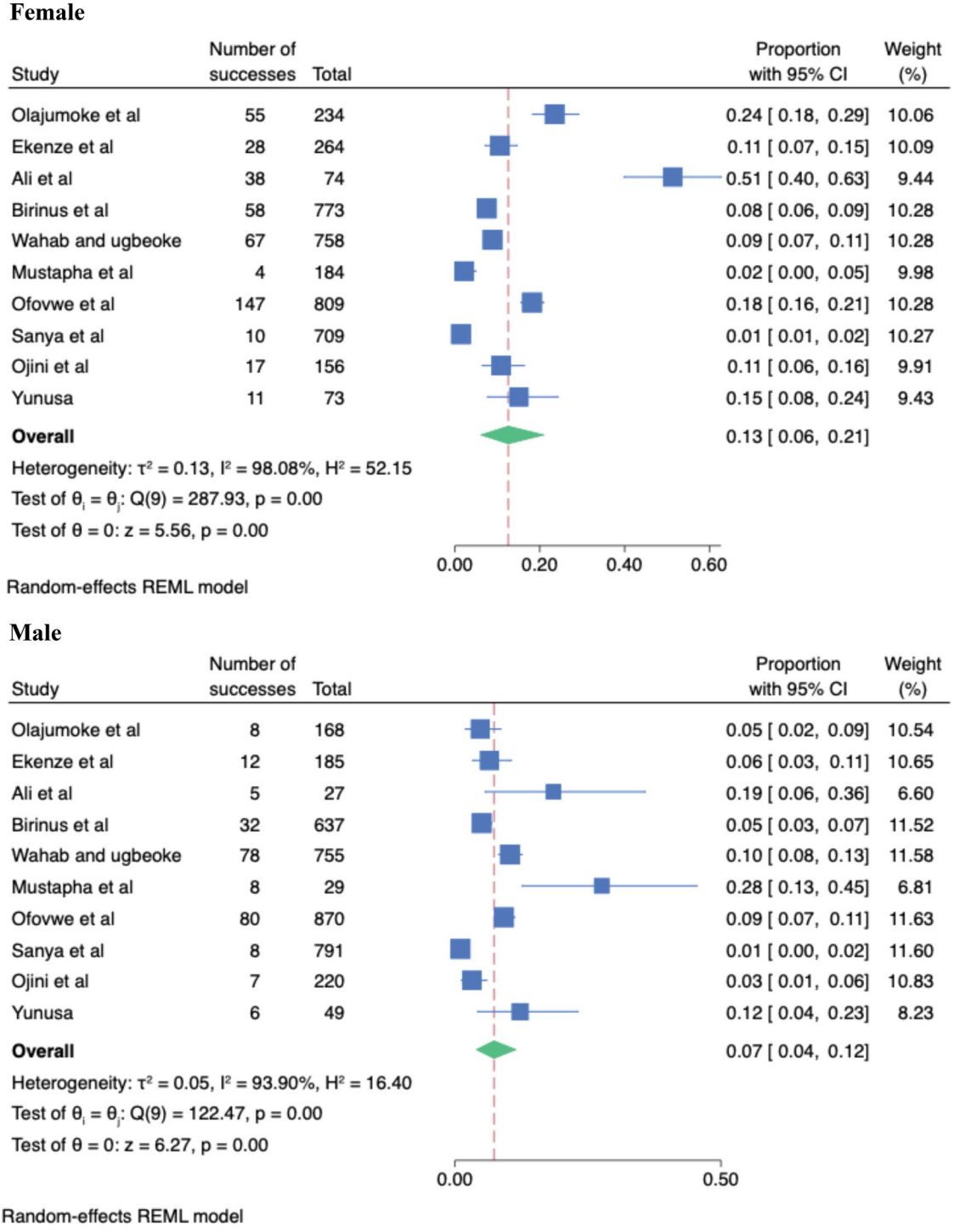


**Fig. 5** Prevalence based on gender

longitudinal studies are needed to understand better the temporal trends and causative factors of migraine in Nigeria.

**Abbreviations**

| | |
|---|---|
| AMPP | American migraine prevalence and prevention |
| CaMEO | Chronic migraine epidemiology and outcomes |
| CI | Confidence interval |
| CM | Chronic migraine |
| DOAJ | Directory of open access journals |
| EM | Episodic migraine |
| ICHD | International classification of headache disorders |
| MD | Mean difference |
| MeSH | Medical subject headings |
| NSAIDs | Non-steroidal anti-inflammatory drugs |
| OR | Odds ratio |
| PR | Prevalence ratio |

| | |
|---|---|
| PRISMA | Preferred reporting items for systematic review and meta-analysis |
| PROSPERO | International prospective register of systematic reviews |
| ROBINS-E | Risk of bias in non-randomized studies of exposures |
| SMD | Standardized mean difference |
| WHO | World health organization |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s10194-024-01869-1.

Supplementary Material 1

### Author contributions

Authors' contributions: N.A conceptualised the study; all authors were involved in the literature review; NA & A.E.B extracted the data from the reviewed studies; All authors wrote the final and first drafts. All authors read and approved the final manuscript.

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No funding was received for this study.

### Data availability

No datasets were generated or analysed during the current study.

## Declarations

### Ethical approval

Not applicable.

### Consent to participate

Not applicable.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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