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The epidemiology and unmet need of migraine in five european countries: results from the national health and wellness survey

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Abstract

Background Despite the high global prevalence, burden, and direct and indicated costs, migraines are often underdiagnosed and undertreated. Understanding the prevalence of migraine and unmet needs is crucial for improving diagnosis and treatment across Europe (EU) countries; however, real-world studies are limited.

Methods This retrospective cross-sectional survey utilized weighted patient-reported data from the 2020 National Health and Wellness Survey (NHWS) in five EU (5EU) countries (France, Germany, United Kingdom [UK], Italy, and Spain). The survey included adults aged ≥ 18 years who self-reported experiencing migraines in the past 12 months and had a physician's diagnosis. The survey assessed migraine prevalence by age and sex. Other measures included migraine characteristics, disability assessment, migraine frequency (monthly migraine days [MMDs] and monthly headache days [MHDs], menstrually-related migraine, treatment patterns, and provider characteristics.

Results The study included 7,311 respondents with diagnosed migraines, representing an estimated 30.5 million adults with a weighted prevalence of 11.5% in the 5EU. Spain had the highest prevalence (14.0%), followed by Italy, France, UK, and Germany. Migraine prevalence was highest in the age group of 30–39 years, and females had nearly twice the prevalence compared to males. About 56% of respondents reported disability due to migraines, with highest percentage reported in Germany (66.0%). About 46% of female respondents reported experiencing menstrually-related migraines. One-fourth of the study respondents reported > 4 MMDs and 56.2% reported > 4 MHD. Current treatment patterns revealed that 79.7% of respondents were receiving some form of migraine treatment, with non-steroidal anti-inflammatory drugs (NSAIDs), analgesics, and triptans being the most commonly reported prescription medications. Primary care physicians (PCPs) were the most common providers diagnosing migraines, followed by neurologists.

Conclusions In the 5EU, one-fourth of diagnosed respondents reported > 4 MMDs, and 56.2% reported > 4 MHDs. Nearly half of females experienced menstrually-related migraines. Although most patients reported taking medication for migraine, severe disability and medication overuse were observed. PCPs were the main treatment providers,

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highlighting the need for improved expertise and referrals to specialists. Further research is required for a better understanding of the disparities between migraine frequency and treatment approaches.

Keywords Migraine, Menstrually-related migraine, Prevalence, Migraine frequency, Migraine disability, European Union, Treatment patterns

Introduction

Migraines are a highly prevalent and disabling disorder that affects over 1.1 billion people globally with an increase of 1.7% (95% uncertainty interval [UI]: 0.7-2.8%) in the global age-standardized prevalence from 1990 to 2019 [1, 2]. Migraines account for 88.2% of the 46.6 million years lived with disability (YLDs) globally caused by headache disorders, which represented 5.4% of total YLDs [3]. According to the 2019 Global Burden of Disease Study (GBD), migraine is the second leading cause of disability worldwide and the first among young women (15–49 years) [4].

Migraines have been estimated to affect 41 million people in Europe (EU) with varying severity [5, 6]. In 2019, the highest age-standardized point prevalence rates (per 100,000) for migraines were reported in Italy (20,337.7 [95% UI: 17,724.7–23,405.8]) and Germany (19,436.4 [95% UI: 16,806.2–22,810.3]) [2]. However, the highest national age-standardized incidence rate of migraine was reported in Italy (1,528.4 [95% UI: 1,345.4–1,709.3]) [2, 7]. Data from the 2019 GBD revealed that women in Western EU are disproportionately affected with a higher prevalence of migraine compared to men (10–14 years: 19.8%; 15–49 years: 36.9%; and 50–69 years: 24.0%) [5]. A recent study on the gender differences in prevalence of migraine trigger factors reported menstruation as the most prevalent trigger factor in women [8].

Despite high prevalence, migraines continue to be a condition that is commonly under-diagnosed and undertreated worldwide, resulting in adverse health outcomes and economic burdens [9–11]. This includes reduced work productivity, impaired cognitive function, increased healthcare utilization, and a higher risk of comorbid mental health disorders [5, 12, 13]. In EU, migraine is reported as a common disease that is widely ignored, however the lost working hours and reduced productivity due to migraines result in huge economic losses totaling in €27 billion annually [14].

Treatment strategy for migraines involve acute and preventive treatments [15, 16]. Population based studies reported the inadequate use of migraine-specific medications in EU [9], especially low usage of preventive medication [17]. The majority of people who experience migraines across EU use self-medication including over the counter (OTC) analgesics to treat their headache leading to insufficient treatment of the condition [9, 18]. Recent studies reported a large gap in the quality of migraine treatment in EU, including lack of knowledge among the general practitioners (GPs), lack of services, lack of patient education, limited access to specialist care, delay in diagnosis, and correctness of treatments [9, 19, 20]. These unmet needs necessitate the immediate call for action in EU to improve care for people with migraine [9, 19, 21].

A better understanding of the prevalence, burden, and unmet need of migraine can help identify the need for improved diagnosis and treatment across different countries in the EU. The present study aimed to assess the burden of migraines in the five EU countries (5EU) (France, Germany, United Kingdom [UK], Italy, and Spain) from the National Health and Wellness Survey (NHWS). Additionally, this study determined the healthcare providers (HCPs) involved in treating migraine and evaluated the unmet needs of patients with migraine through self-reported treatment utility (both OTC and prescription [Rx] medications), treatment satisfaction, and migraine-related disability.

Methods

Study design and data source

This retrospective cross-sectional survey utilized weighted patient-reported data from the 2020 5EU NHWS. The NHWS is a cross-sectional, patient-reported, internet-based survey that is designed to describe the health and disease burden of the general adult population each year for more than 200 therapeutic conditions [22, 23]. Eligible respondents were adults aged ≥ 18 years who provided consent for participation in the survey and could read and write in the primary language of their home country (France, Germany, UK, Italy, and Spain). Those who self-reported experiencing migraines in the past 12 months were considered eligible to complete the migraine module with items about migraine characteristics.

Survey respondents were recruited from opt-in survey panels from Lightspeed Research and its partners. Recruitment was conducted through opt-in email, e-newsletter campaigns, banner placements, and internal and external affiliate networks. No identifiable information was within the data files; no data included respondent names, addresses, or any other information that could personally identify any respondent. To ensure a representative sample was included, quota sampling was used to recruit respondents based on their age and gender in each country based on available government statistics provided by the International Database of the United

States (U.S.) Census Bureau. The study protocol and questionnaire for the NHWS were reviewed by the Pearl Institutional Review Board and were granted an exemption from review. Potential respondents were invited to complete the survey via an email invitation. Respondents who clicked the email link from their invitation were then directed to an informed consent statement and, if they provided consent, were provided screening questions to assess eligibility. Eligible respondents then proceeded to complete the survey itself which took approximately 40 min depending upon their responses. Respondents were given points as compensation upon completion of the survey; these points were valued between €/£2 and €/£3.

Study sample

This study collected complete responses from a total of 62,319 consenting adults who were at least 18 years old. The cohort of interest included 14,536 respondents who self-reported experiencing migraines in the past 12 months and completed the migraine module. Within the self-reported migraine cohort, the study further narrowed the focus to respondents who reported a diagnosed migraine by a physician, resulting in a final sample of 7,311 eligible respondents as shown in Table S1.

Study measures

The study assessed the prevalence of migraine in aggregate and at country-level for those with diagnosed migraine. Migraine status was also stratified by country, age group, and sex. Migraine disability was assessed using Migraine Disability Assessment (MIDAS) score, a self-administered questionnaire used as a metric to measure headache-related disability over a 3-month period [24]. Migraine frequency was assessed in terms of monthly migraine days (MMDs) and monthly headache days (MHDs). Other study measures included current treatment patterns, treatment satisfaction of current treatments, the type of providers diagnosing, current prescribed treatment for respondents who reported migraine, and medication overuse. Medication overuse was defined by reported use of Rx or OTC ergotamine, triptans, opioids, or combination medications for ≥10 days or using Rx or OTC analgesics or NSAID for ≥15 days. The different medication classes of migraine treatment included analgesics, anticonvulsants, beta-blockers, onabotulinumtoxinA, monoclonal antibodies (mAbs), non-steroidal anti-inflammatory drugs (NSAIDs), triptans, and others.

Statistical analysis

All NHWS responses were weighted to reflect the gender and age proportions of each country using the International Database of the U.S. Census Bureau. Prevalence was calculated in aggregate and at country-level for those with diagnosed migraine. Descriptive statistics were used to illustrate the collected data. Outcomes were described in terms of frequencies and percentages where appropriate, which included treatments used for migraine, treatment satisfaction, MIDAS score, menstrually-related migraine, migraine frequency, headache frequency, provider who diagnosed migraine, and provider who prescribed treatment for migraine.

Results

General prevalence of diagnosed migraine

Among 62,319 (weighted $N = 265$ million) respondents who completed the 2020 5EU NHWS survey in Europe, 14,536 (23.3%) self-reported having migraine in the past 12 months and 7,311(50.3%) of those reported having a physician diagnosis and were included in the analysis. This represented an estimated 30.5 million adults with diagnosed migraine and a weighted prevalence of 11.5% in the 5 countries. (Table S1) The prevalence of diagnosed migraine varied across geographies with highest prevalence in Spain (14.0%) followed by Italy (12.7%), France (11.9%), and the UK (10.4%), whereas Germany reported the lowest prevalence (9.7%; Fig. 1).

Prevalence by age and sex

Comparison of prevalence of migraine across age groups reported the highest rate in the age group of 30–39 years (15.0%), followed by 18–29 years (14.5%), and 40–49 years (14.5%). Country-level breakdown of age-specific prevalence data reported the highest prevalence in younger adults (age group of 18–29 years) in France (16.3%), and Germany (14.2%). However, in Italy and Spain, the highest prevalence of migraine was reported in middle-aged adults (particularly among the age group of 30–39 years [Italy,16.4%; Spain, 20.3%]), and 40–49 years in the UK (13.8%). Migraine prevalence was lower among older adults (aged ≥70 years) in the overall population (4.7%), and in all 5EU countries, ranging from 2.3 to 7.1%. (Fig. 2a)

Sex-specific analysis of the diagnosed migraine group reported the prevalence of female respondents to be nearly twice that of male respondents (14.9% vs. 8.0%) in the overall 5EU population. A similar trend was observed in the prevalence of migraines in each of the 5EU countries (Fig. 2b).

Age and sex distribution among diagnosed migraine population

More respondents diagnosed with migraine were in the age groups of 40–49 (21.4%) and 18–29 (20.6%). Country-wise data also reported maximum respondents in the 18–29 age category with diagnosed migraine (France, 24.7%; Germany, 22.5%, and UK, 21.9%), except Italy and

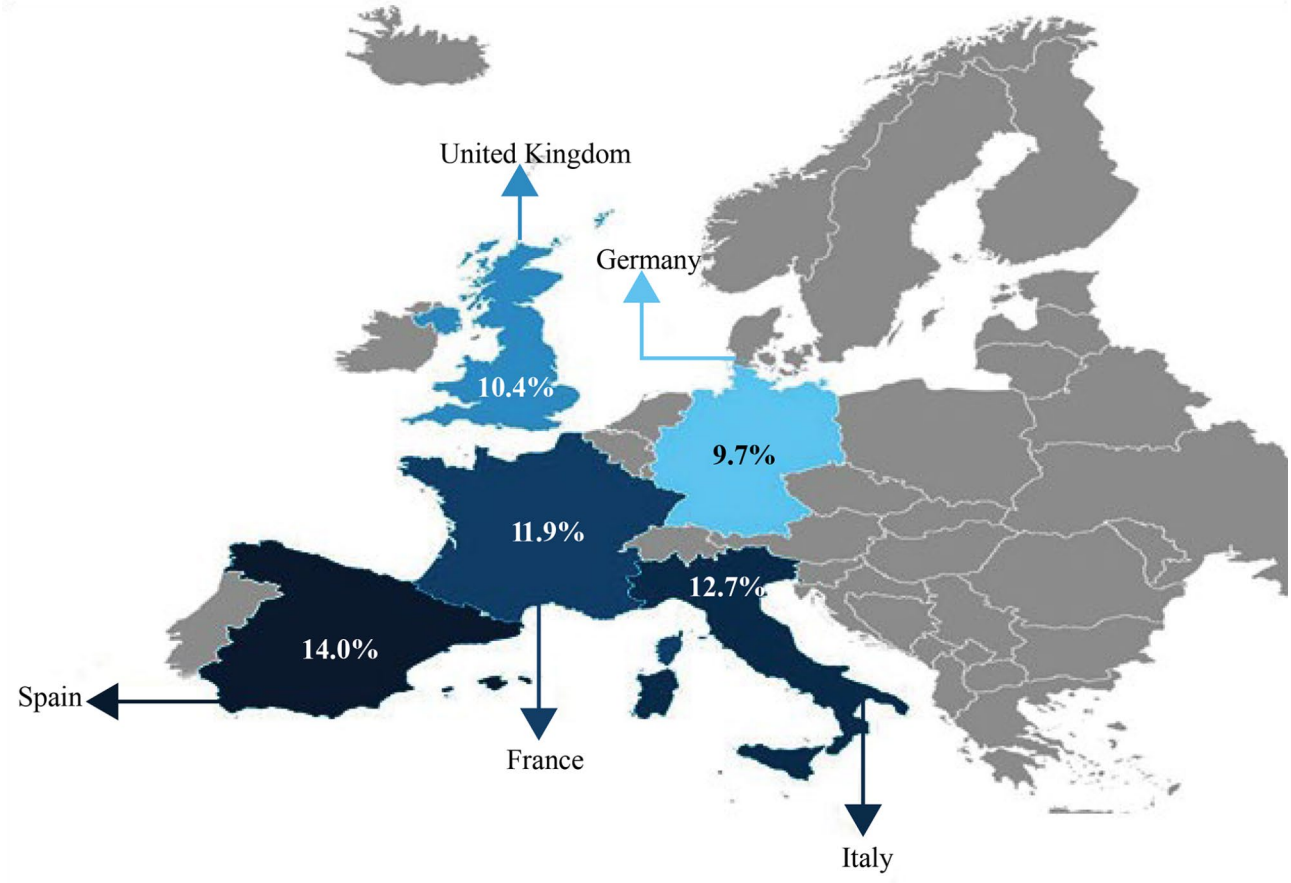

Fig. 1 Prevalence of diagnosed migraine in the 5EU* countries (weighted percentages)
*5EU – France, Germany, United Kingdom, Italy, Spain

Spain (Fig. 3a). Within the overall diagnosed population, the majority of respondents were female (66.4%) (Fig. 3b) Of the female respondents with diagnosed migraine who were pre-menopausal (11.7 M), 47.8% reported experiencing migraines related to their menstrual cycle. Country-wise data reported the highest percentage of menstrually-related migraines in Italy (67.4%) and Spain (58.0%), while the percentage of females who experienced menstrually-related migraines was lowest in France at 34.5% (Figure S1).

Migraine disability assessment (MIDAS)

Among the overall population of respondents with diagnosed migraine in the 5EU (30.5 M), the majority (56.1%) reported mild, moderate, or severe disability due to migraine. Measured by MIDAS score, 15.8% of the respondents had mild disability (score: 6–10), 16.6% had moderate disability (score: 11–20), and 23.8% had severe disability (score: 21+) due to migraine. Nearly half of the respondents in each country in the 5EU experienced disability (score: ≥6) due to their migraines, with Germany reporting the highest percentage (66.0%). (Table 1)

Migraine frequency

Monthly migraine days (MMDs) and monthly headache days (MHDs)

The majority (74.5%) of the respondents reported having less than four MMDs, while 17.4% reported having between 4 and 9 MMDs, 3.9% had 10–14 MMDs, and 4.1% reported ≥ 15 MMDs (Fig. 4a). The mean MMDs among respondents was 3.1 ± 4.8 MDs in the past 30 days. Amongst patients with 1 + migraine days (17.2 M), 43.8% reported having less than four MHDs, followed by 34.0% respondents with 4–9 MHDs, 10.5% with 10–14 MHDs, and 11.7% respondents with ≥ 15 MHDs (Fig. 4b). There was a mean of 6.2 ± 6.2 MHDs in the past 30 days. Overall, this data suggests that one-fourth of study respondents diagnosed with migraine in the EU reported more than four migraine days a month, while 56.2% reported more than four headache days in a month (Fig. 4).

Current treatment patterns

The current treatment pattern for migraine across the 5EU, as well as the country-wise data are represented in Table 2. Of the total population with diagnosed migraine (30.5 M), 28.5% reported taking OTC only,

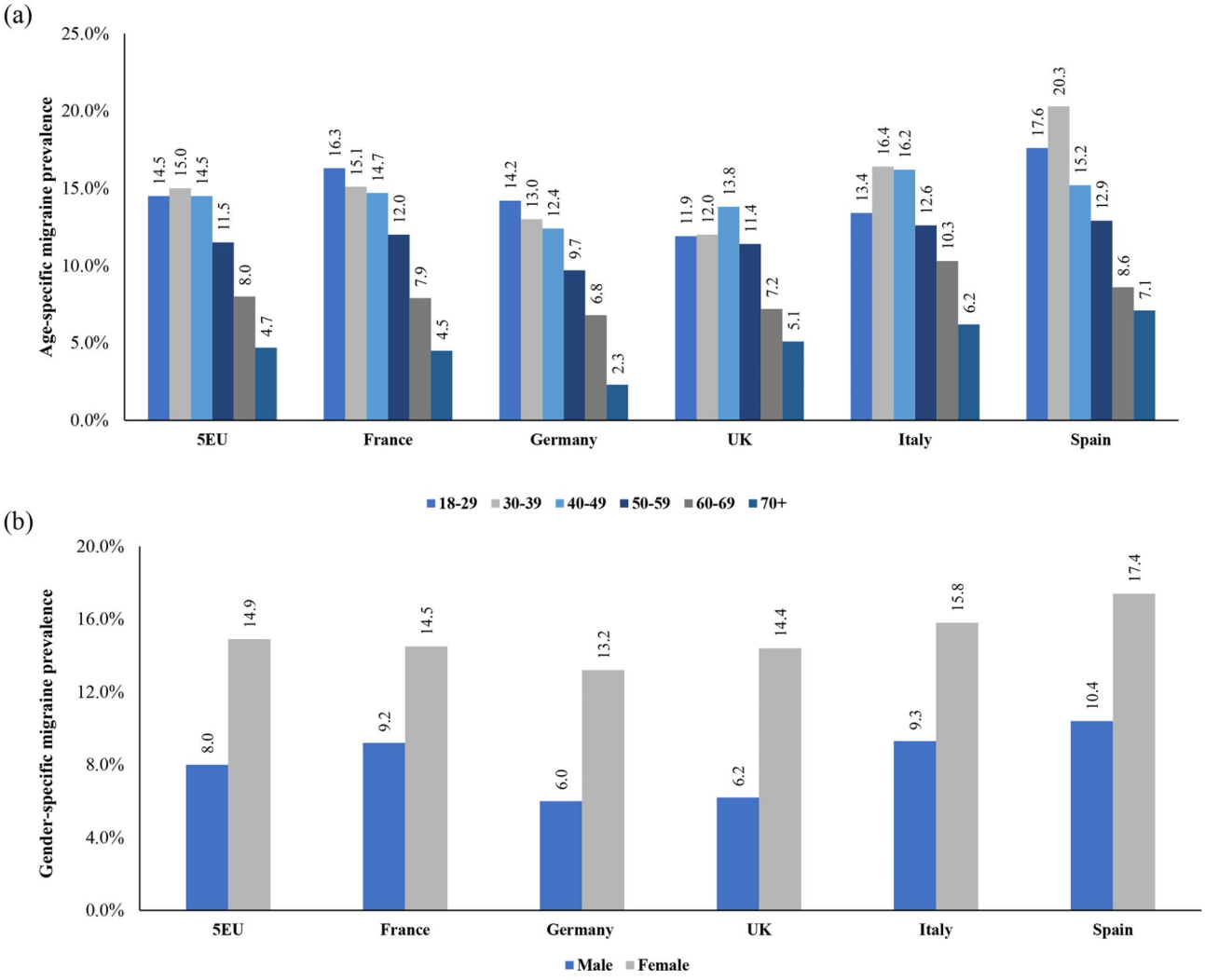

Fig. 2 Prevalence of diagnosed migraine (**a**) by age group (**b**) by sex (weighted percentages)
UK, United Kingdom
Note: Fig. 2(**a**) -The age group 70 + is the sum of "70–79", "80–89" and "90+" age groups. 5EU – France, Germany, United Kingdom, Italy, Spain

27.0% reported taking Rx only, 24.2% reported taking both Rx and OTC medications, and 20.4% reported no current treatment. Overall, about four-fifths (79.7%) of the migraine respondents reported current treatment for migraine. More respondents in France and Spain reported using Rx only (29.5% and 34.6% respectively); whereas more adults with diagnosed migraine reported using OTC only in Germany (35.3%) and the UK (36.8%). The lowest usage of only OTC medication and only Rx medication was observed in Spain (22.5%) and Germany (22.6%), respectively. Italy had the highest proportion of both Rx and OTC usage (33.8%), while its lowest proportion of usage was observed in Germany and UK (19.9% each in both countries). In all five countries, a considerable proportion of respondents reported not taking any treatment for their migraines with France reporting the most respondents (24.0%) with no medication use (Table 2).

Classes of current medications

Among respondents with diagnosed migraine who reported using Rx medication (51.2%, 15.6 M), NSAIDs were the most commonly reported class (50.2%) followed by analgesics (32.9%), and triptans (28.9%; Table S2). Based on frequency of use in the past 30 days, acute medication overuse was reported in 13.8% of the migraine diagnosed respondents [*data not shown*]. Other Rx medications reported were anticonvulsants, beta-blockers, onabotulinumtoxinA, and mAbs. Country-wise proportion of respondents using these different classes of medications are presented in Table S2.

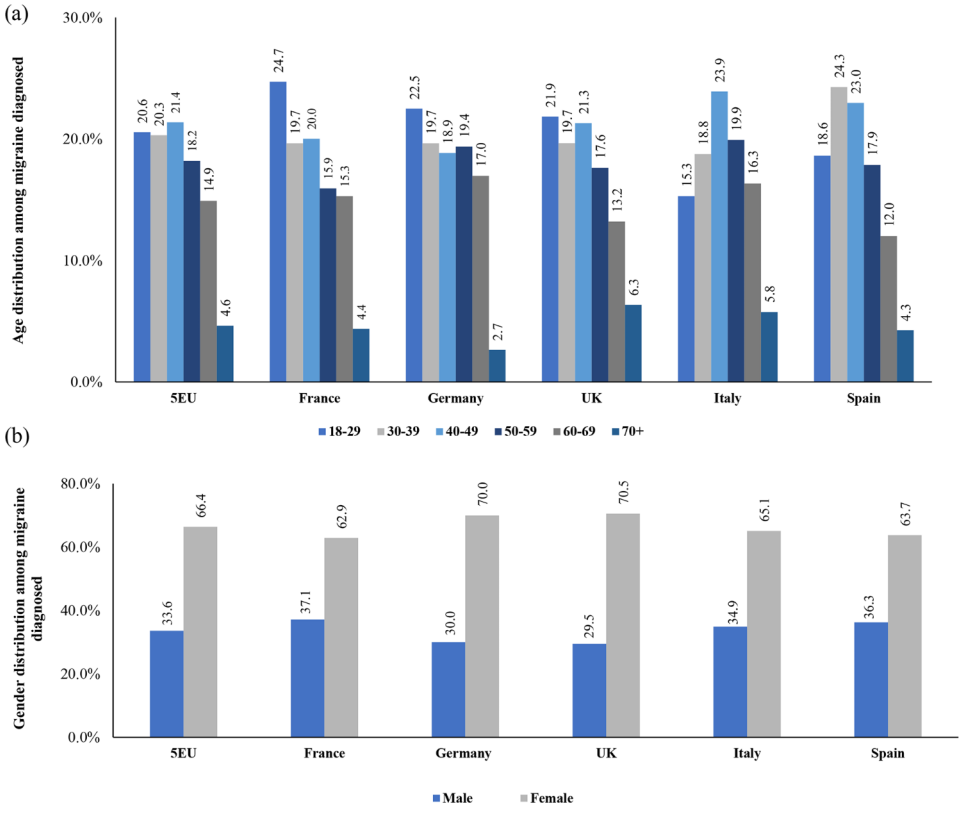

Fig. 3 (**a**) Age and (**b**) sex distribution among diagnosed migraine population (weighted percentages)
UK, United Kingdom
Note: Fig. 3(**a**)- The age group 70 + is the sum of "70–79", "80–89" and "90+" age groups. 5EU – France, Germany, United Kingdom, Italy, Spain

Table 1 MIDAS in diagnosed migraine population (weighted percentages)

MIDAS, (%)	5EU*	France	Germany	UK	Italy	Spain
	30.5 M	6.3 M	6.6 M	5.4 M	6.6 M	5.7 M
Grade I-Little or no disability (score: 0–5)	43.9	50.7	34.1	48.7	42.8	44.3
Grade II-Mild disability (score: 6–10)	15.8	15.7	17.6	15.8	13.4	16.6
Grade III-Moderate disability (score: 11–20)	16.6	15.1	19.1	13.9	18.3	15.9
Grade IV-Severe disability (score: 21+)	23.8	18.6	29.3	21.6	25.5	23.2

MIDAS, migraine disability assessment; UK, United Kingdom
*5EU – France, Germany, United Kingdom, Italy, Spain

Treatment satisfaction of current medications

Overall treatment satisfaction for both Rx and OTC medication was low, as extremely or very satisfied responses were less than 50% for all medication groups (Figure S2). Among the Rx medication classes, triptans and beta-blockers had the highest treatment satisfaction rates, with 46.0% and 39.9% of respondents reported being extremely or very satisfied, respectively. On the other hand, mAbs and onabotulinumtoxinA had the lowest satisfaction rates, with only 25.6% and 19.3% of respondents being extremely or very satisfied respectively (Figure S2a). Among OTC medication classes, highest satisfaction (extremely or very satisfied) was reported for triptans (49.8%), followed by NSAIDs (40.9%) and analgesics (34.1%; Figure S2b).

Provider characteristics

HCPs diagnosing migraine and treatment prescribed by HCPs

In the 5EU, 66.5% of migraine respondents reported that migraine was diagnosed by primary care physicians (PCPs), followed by neurologists (26.3%) and nurse practitioners (NPs) (2.5%). In all 5EU countries, PCPs were the most commonly reported HCPs who diagnosed migraines. Italy had the highest percentage of migraine respondents diagnosed by neurologists (36.4%), followed by Germany (35.3%) and Spain (32.5%; Table 3). PCPs were reported the most common prescribers followed by neurologists for all prescription medications (Table 4).

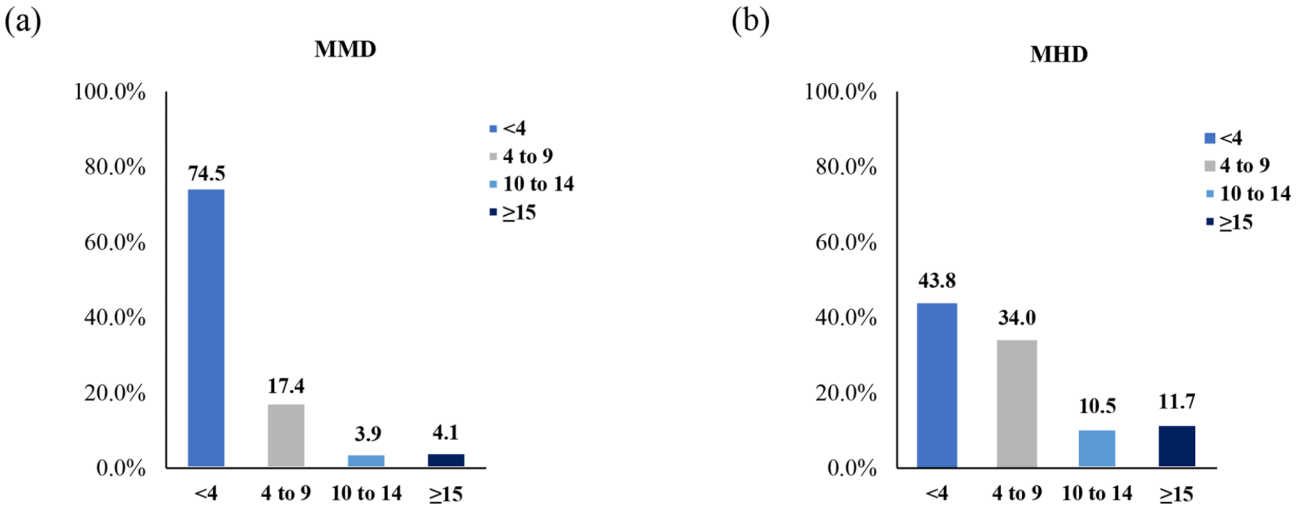

Fig. 4 Migraine frequency (**a**) monthly MMDs* and (**b**) monthly MHDs† (weighted percentages)
HD, headache day; MD, migraine day
*Base (30.5 M): Diagnosed migraine in 5EU. †Base (17.2 M): Diagnosed migraine population with ≥ 1 monthly MDs in 5EU. 5EU - France, Germany, United Kingdom, Italy, Spain

Table 2 Current treatment pattern among diagnosed migraine population (weighted percentages)

Treatment, (%)	5EU*	France	Germany	UK	Italy	Spain
	30.5 M	6.3 M	6.6 M	5.4 M	6.6 M	5.7 M
OTC only	28.5	23.9	35.3	36.8	24.4	22.5
Rx only	27.0	29.5	22.6	24.9	24.1	34.6
Both Rx and OTC	24.2	22.7	19.9	19.9	33.8	23.8
No treatment	20.4	24.0	22.2	18.4	17.7	19.1

OTC, over-the-counter; Rx, prescription medication; UK, United Kingdom
*5EU – France, Germany, United Kingdom, Italy, Spain

Table 3 HCPs who diagnosed migraine (weighted percentages)

HCPs who diagnosed migraine, %	5EU*	France	Germany	UK	Italy	Spain
	30.5 M	6.3 M	6.6 M	5.4 M	6.6 M	5.7 M
PCP	66.5	79.9	59.7	75.2	58.1	60.9
NP	2.5	1.6	0.0	8.3	0.0	3.5
Neurologist	26.3	13.2	35.3	11.8	36.4	32.5
Other	4.8	5.4	5.1	4.7	5.6	3.1

HCP, healthcare provider; NP, nurse practitioner; PCP, primary care physician; UK, United Kingdom
*5EU – France, Germany, United Kingdom, Italy, Spain

Discussion

This retrospective cross-sectional survey used the weighted patient-reported data from the 2020 5EU NHWS and reported the prevalence of migraine in the adult population of 5EU countries. The highest prevalence of diagnosed migraine was observed in the age group of 30–39 years. Prevalence of diagnosed migraine in females was reported as 14.9% and 8% in males and nearly half of females reported experiencing migraines related to their menstrual cycle. One-fourth of the study respondents reported ≥ 4 MMDs and 56.2% reported ≥ 4 MHDs. PCPs were reported as the most common HCPs involved in treatment. Further unmet needs of migraine in the 5EU countries were also reported in terms of treatment utility, treatment satisfaction, and migraine-related disability.

Projected prevalence of migraine in 5EU (11.5%) reported in the present study was in line with the previously estimated average prevalence of 11.4% [25]. Unlike the GBD 2019 data on the higher prevalence of migraine in Italy followed by Germany among 204 countries and territories [2, 7], the present study found Spain to have the highest prevalence (14.0%) among the 5EU. Germany reported the lowest prevalence of migraine. Geographical difference in migraine prevalence across different EU countries could be attributed to interregional variations in lifestyle, genetics, environmental and cultural factors, growth of urbanization, and healthcare accessibility

Table 4 Migraine treatment prescribing by HCPs in 5EU* (weighted row percentages)

Treatment, *n* (%)	PCP	NP	Neurologist	Other
Analgesic	79.4	3.8	7.7	9.2
Anticonvulsants	50.6	5.8	41.6	2.0
Beta-blockers	60.1	9.7	26.8	3.4
OnabotulinumtoxinA	29.1	31.2	32.9	6.8
mAb	45.6	10.6	40.8	3.0
NSAID	78.3	3.1	9.4	9.3
Triptan	65.7	2.1	30.6	1.6
Other	68.5	4.7	17.1	9.7

mAb, monoclonal antibody; NP, nurse practitioner; NSAID, non-steroidal anti-inflammatory drug; PCP, primary care physician

Note: Base (15.6 M): Diagnosed migraine, using migraine Rx

*5EU – France, Germany, United Kingdom, Italy, Spain

[25–27]. Menstruation was reported as the top trigger factor in females [8]. These results highlight the need for targeted interventions and to consider hormonal factors while determining migraine management for female population [7].

In concurrence with the higher prevalence of migraine among middle aged adults in the global population, prevalence of diagnosed migraine in 5EU was greatest in the age group of 30–39 years [28]. The study reported on ≥4 MMDs in 25% and ≥4 MHDs in 56.2% of respondents, highlighting the common frequency from which EU population experience migraines and headache days [13, 29]. Nearly one in five respondents of each country in 5EU reported MIDAS score of 21 or above indicating severe disability, correlating with the higher burden among respondents experiencing ≥4 MHDs in this study [12, 13]. These findings imply an unmet need for appropriate treatment for individuals with migraines.

Unlike prior study findings [9], the majority of migraine patients in this study were currently taking some form of medication for migraine relief. Adhering to the recent consensus statement on migraine management proposed by European panel of experts [16], PCPs were the most frequent providers diagnosing and treating migraine and NSAIDs were the most commonly used classes of migraine medication followed by analgesics and triptans in the 5EU. Yet only < 50% of the EU population reported high treatment satisfaction for Rx and OTC medications, indicating the need to understand the reasons behind these dissatisfactions and to improve the current treatment options for migraines. Surprisingly, satisfaction rates were lowest for mAb treatments and highest for triptans [16]. It is worth noting that treatment satisfaction was queried based on current treatment, thus prior treatment for migraine were not assessed. Overall findings emphasize the importance of migraine treatment in primary care and educational programs aimed at GPs [19, 21]. Medication overuse, defined by the frequency of days of use, was high at 13.8%, emphasizing the risk of medication overuse in migraine patients and the need for medications that do not contribute to medication overuse headache in these patients.

To our knowledge, this is the first real-world study that assessed the prevalence of diagnosed migraine in five countries in EU, particularly menstrually-related migraine and unmet needs among patients. Higher prevalence and low treatment satisfaction among migraine patients across EU highlight the general lack of awareness of the severity of migraine by payers, countries, and health technology assessments (HTAs). The estimated prevalence rate could aid in resource allocation and planning for the management of migraine in healthcare systems. Study findings further underline issues for patients accessing neurologists or headache specialists for migraine care in EU [30].

Although this study provides valuable insights into the prevalence and unmet needs of migraine in the EU, it is important to consider limitations while interpreting the results. Firstly, weighted estimates are based on the general population distribution by country based on age and sex. These distributions may specifically vary within migraine. While weighted estimates used in the study may be subject to bias due to variations in the distribution of age and sex among patients with migraine, the prevalence rates align with those reported in previous literature. Since the NHWS relies on self-reported responses from patients, this study may be prone to recall bias. While the NHWS panel administrators have deliberately set up the survey to recruit age and sex that mirror the EU populations, there may be bias in estimates where there are differences between populations within each country and the panel itself. This would be most likely among those who do not have access to the internet or the ability to read and write the common language utilized in the survey.

Conclusion

One-fourth of study respondents diagnosed with migraine in the 5EU reported more than four migraine days a month with 56.2% of respondents reporting more than four headache days per month. Additionally, nearly half of females reported experiencing menstrually-related migraines. Most patients with migraine in the 5EU reported current use of medication to alleviate their symptoms. Despite the availability of treatment options, approximately one-fifth of respondents in each country reported severe disability due to their migraines and a high prevalence of medication overuse, indicating an unmet need for appropriate migraine treatment. The study found that PCPs were the most frequent provider diagnosing patients. It is important to understand provider's expertise and familiarity with migraines, novel migraine treatment options, as well as their willingness

to refer patients to a specialist for appropriate treatment. Further research is warranted to gain a deeper understanding of the disparities between migraine frequency and treatment approaches by utilizing more representative samples or validating self-reported migraine diagnoses with medical records.

Abbreviations

EU	Europe
GBD	Global Burden of Disease Study
GP	General practitioners
HCP	Healthcare providers
HTA	Health technology assessments
mAb	Monoclonal antibody
MHDs	Monthly headache days
MIDAS	Migraine Disability Assessment
MMDs	Monthly migraine days
NHWS	National Health and Wellness Survey
NSAID	Non–steroidal anti–inflammatory drugs
OTC	Over the counter
PCP	Primary care physicians
Rx	Prescription
U.S.	United States
UI	Uncertainty interval
UK	United Kingdom
YLD	Years lived with disability

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-024-21244-8.

Supplementary Material 1

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Author contributions
JB was the project manager and oversaw the development, analysis, and writing of the manuscript. SD, NS, and ARM conducted the analyses and supervised the writing of the manuscript with funding from Pfizer, Inc. AJ, KHB, AG, and GC provided input into the study design, interpreted the results, and critically revised the manuscript. All authors of the manuscript have read and agreed to its content and are accountable for all aspects of the accuracy and integrity of the manuscript in accordance with ICMJE criteria.

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Data availability
The proprietary datasets are only available under license from Cerner Enviza, an Oracle Company.

Declarations

Ethics approval and consent to participate
The study protocol and questionnaire for the NHWS were reviewed by the Pearl Institutional Review Board and were granted an exemption from review. Potential respondents were invited to complete the survey via an email invitation. Respondents who clicked the email link from their invitation were then directed to an informed consent statement and, if they provided consent, were provided screening questions to assess eligibility.

Consent for publication
Not applicable.

Competing interests
JB, ARM, AJ, and KHB are employees of Pfizer, Inc. SD and NS are employees of Oracle Life Sciences, which was a paid consultant to Pfizer to conduct the study and to develop the manuscript. ARM was an employee of Oracle Life Sciences at the time of this study. AG reports financial support for ad boards, consulting and speaker honoraria from: Grünenthal, Mundipharma, Abbvie/Allergan, Lilly, Teva, Amgen, Novartis, Hormosan, Stada, Lundbeck, Pfizer, Hexal, Esanumperfood, Medscape, streamed up, Ärztekammer Nordrhein, Ärztekammer Westfalen Lippe, DGS, Regionalbeauftragte der DMKG. GC has received honoraria for participation in clinical trials and contribution to advisory boards or presentations from TEVA, Biohaven, Eli Lilly, Abbvie, and Pfizer. He serves as an Associate Editor for Cephalalgia, BMC Neurology – Pain section, Frontiers in Neurology – Neurotechnology section, Frontiers in Human Neuroscience – Brain Imaging and Stimulation section, and on the Advisory Board of The Journal of Headache and Pain.

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