Management and Burden of Acute Migraine at the Emergency Department in Southwest China: a Retrospective Study

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Research article

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Abstract

Background:

Migraine is the most common cause of headache patients for medical consultation to emergency department (ED). However, the management and cost of those patients are less known. Our study aimed to survey detailed diagnosis, clinical characteristics, management, and cost of migraine patients in the emergency department in China

Methods:

We performed a retrospective study from April 1, 2014, and September 31, 2020, at West China Hospital. This study enrolled patients with migraine diagnoses and analyzed their investigations, medical treatment and cost during their stay at ED.

Results:

Our study included 300 patients, 77.3% were female and the mean age was 38 years. 36% were conducted cranial CT scan. Non-steroidal anti-inflammatory drugs (NSAIDs) were the most used at ED. We found that none of the patients received triptans nor prophylaxis medicine. The mean cost of emergency room visits was 57.17USD.

Conclusion:

Our study found that most migraine patients who came to the ED were not receiving the evidence-based acute treatment. A timely referral system should be established to minimize the disease costs of patients.

Background

Migraine is the second largest contributor to global neurological disability-adjusted life years (DALYs)(1). About 5 million people complain of headache in emergency department each year, and about a third of them are diagnosed as migraine (2). In addition, studies have found that medical treatment in the emergency department (ED) for migraine patients was inappropriate (unnecessary testing and treatment) (3), with approximately 25% of patients re-consulted the emergency department within 6 months for an acute migraine attack, which may lead to medical cost(4).

In China, the 1-year prevalence of migraine ranges from 7.9–14.3% in adults (5). However, a survey showed primary headache are misdiagnosis and underestimate in China. Non-steroidal anti-inflammatory drugs (NSAIDs) (68.8%) is the most commonly prescribed acute medication in outpatient clinic (68.8%). Preventive medication was prescribed for only 15% of patients(6). Studies have shown that there are significant differences between countries and regions in the treatment of ED migraine patients(7, 8). However, the status of treatment and examination of these patients in the emergency department of China is still unclear. For this reason, we conducted a study to provide detailed statistics on the clinical

characteristics, diagnosis, and therapeutic management of migraine patients in the emergency department, as well as the direct medical cost, in order to optimize the diagnosis and treatment process of migraine.

Methods

This is a retrospective study of patients with migraine who visited the ED of a tertiary hospital for a migraine attack between April 1, 2014, and September 31, 2020. We enrolled patients from the hospital medical system with a migraine diagnosis. Exclusion criteria were 1. diagnosed as a secondary headache when discharged from ED; 2. migraine patients visited ED for other reasons. This study was approved by the Ethics Committee of West China Hospital, Sichuan University. We collected data as follows: baseline demographics, migraine type (according to the International Classification of Headache Disorders (ICHD)-3 or (ICHD-3 β) criteria), medication administered in ED, auxiliary examination (CT scan, blood test, lumbar puncture and so on), referral after ED and medical cost during the ED.

Statistical analysis was conducted using the SPSS version 24.0 software (SPSS, Chicago, IL). Categorical variables were presented as percentages and frequencies. Continuous variables were expressed as mean and standard deviation (SD), or median and interquartile range (IQR) when the data were not normally distributed.

Results

We included a total of 308 visits during the study period. 300 of these were eligible. 77.3% (232/300) were female and the mean age was 38 years. Ages ranged from 9 to 89. Table 1 shows the demographics characteristics of patients.

Diagnosis:

294 (98%) patients diagnosis with migraine without aura, among them 21 had referred to the neurology department. 2 cases and 4 cases were diagnosed as chronic migraine and vestibular migraine (VM) respectively. Two of the patients diagnosed with VM were referred to neurology (table 2).

Examination:

Regarding urgent complementary tests, cranial CT scan was conducted in 108 cases (36%), cranial MRI in one patient (0.3%), blood testing in 76 (25.4%), arterial blood gases test in 14 (4.7%), lumbar puncture (LP) in 4 (1.3%) and EEG in 5 patients (1.7%). Table 3 shows the investigations on all patients. Chest CT scan was performed in 13 (4.3%) to exclude Covid-19 infection.

Treatments for ED migraine patients:

NSAIDs Loxoprofen were the most prescribed at ED (19%). Intravenous therapy was used in 58 patients (19.3%). In addition, opioids and antiemetic drugs were also used in the emergency department. However,

we found that none of the patients received triptans, nor none of the patients was discharged from the hospital with prophylaxis medicine (Table 4).

The direct cost for ED migraine patients

We calculated the direct cost of these patients, including the total cost of the stay at emergency room duration, the cost of the examination and the administration of medication. Among the 300 patients, the average emergency department expenditure was \$57.17, although there was heterogeneity among these patients, ranging from \$0.09 to \$891.14, with a median expenditure of \$13.25 (table 5).

Discussion

Few studies have been conducted in the ED of China regarding the acute treatment of migraine. We retrospectively collected data of 300 ED visits of patients with migraine for a migraine attack for six years.

Most emergency department visits for migraines were female, which is consistent with previous studies (5, 6). The prevalence of migraines in women is higher than in men, which may also explain the higher number of female emergency department visits. According to the diagnostic criteria of ICHD-3 and ICHD-3 β versions, most patients were diagnosed with migraine without aura and only 7% of patients were referred to neurology after discharge from ED, similar to the UK study (7). The referral rate was relatively low when compared to other countries (9, 10). Possible reasons for the low referral rate: due to financial problems patients tended to back home directly after pain relief; Although at ED, at least one neurologist is available 24 h a day, 7 days a week. If prehospital assessment suggested any neurological problem, the neurologist would assess firstly. If a patient was diagnosed with a primary headache by an emergency physician, consulted with neurologist only when treatments were not effective. Our study also suggested that there was a lack of a referral system to a neurologist or headache specialist from ED. It is also necessary to develop a referral protocol for emergency patients with primary headache in the future.

As for medical treatment, we found that the most commonly used medicine was NSAIDs, among them, loxoprofen and celecoxib were most prescribed. However, these two drugs are not the first choice for acute migraine headache (11). A possible reason is that the emergency doctors were not familiar with migraine treatment guidelines. There were no patients used triptans because it was not currently available in ED. Our study also found that the second most used drugs were opioids (17.9%). In expert recommendations and guidelines, opioids are not the evidence-based treatment for the acute phase of migraine (12, 13) and with possible side effects, especially the risk of substance abuse and headache chronicity (14). Some researchers suggested that migraine patients who have previously used opioids in ED were associated with increased future health resource utilization (HRU) (15). The rate of opioids used in the emergency department of migraine patients had varied widely across the literature, from 6.9–69.9% (16). In addition, compared with previous studies, the proportion of opioid use in emergency patients was higher than that in outpatient patients (7.1%) (6). From our study, opioids should be restricted in emergency rooms in the future. Moreover, our study found that none of the enrolled patients was offered

prophylactic therapy at discharge. Knowledge of the management of migraine medications should be trained to non-neurologists.

In terms of examination, our study found that about 36% of patients underwent head CT and 0.3% underwent head MRI. The proportion of head CT and MRI in our emergency department was lower than that reported by Alberto Doretti et al. (53%)(17), and the meta-analysis showed that vascular and intracranial abnormalities were rarely detected by imaging in headache patients with no abnormalities on physical examination (18). Overuse of head CT may increase patients' disease burden and radiation exposure. Experts recommend that head CT or MRI should be used for differential diagnosis only when a secondary headache is suspected (13, 19). A recent study found that a 9.6% decrease in the use of head CT scans for patients presenting to ED with a major headache complaint was not followed by an increase in deaths or missed diagnoses(20). However, in the condition of emergency department, the primary responsibility of an emergency doctors is to distinguish whether headache is primary or secondary, to avoid misdiagnosis. A timely head CT examination can also relieve patients' anxiety and fear (21). Our study also revealed some migraine patients received blood tests (25.3%), which could be unnecessary. Cynthia M. C. Lemmens et al suggested that age 50 years or older, presentation within 1 h after headache onset, clinical history of aphasia, and focal neurological deficit at the examination were significantly associated with abnormal cranial CT results(22). Most of them are red flag symptoms that ED doctors are very familiar with. In future research, a multi-factor prediction model based on clinical symptoms and physical examination should be established to facilitate emergency doctors to quickly identify patients with intracranial lesions. It may help to avoid excessive use of cranial CT and blood test.

In this study, the average cost of emergency room visits for migraine patients was \$57.17. There have been no studies on ED visits for migraine patients in China. The mean annual cost per migraine outpatient was 46.5 USD (6)in China. This number may be related to patients with different health care conditions, hospital levels and different regions. Improving the evidence-based management of migraine among non-neurologists are expected to improve the disease burden of patients.

This study has some limitations:1. Although West China Hospital is currently the largest hospital in southwest China, our study was still a single-center study. It limits the representativeness of this study.2. Since the medical records of emergency department were difficult to obtain the patients' detailed history, such as patients' previous headache history, medication history and family history and so on. This is what limits our further analysis.

Conclusion

Our study found that most migraine patients who came to the ED were not receiving the evidenced-based acute treatment and there may be overuse of auxiliary examinations. In the future, the emergency treatment process for headache patients, especially migraine patients, should be improved, the treatment should be standardized, and a timely referral system should be established by administrators and policy makers to minimize the disease costs of patients.

Abbreviations

ED: emergency department

DALYs: disability-adjusted life years

NSAIDs: Non-steroidal anti-inflammatory drugs

ICHD: the International Classification of Headache Disorders

SD: standard deviation

IQR: median and interquartile range

VM: vestibular migraine

LP: lumbar puncture

HRU: health resource utilization

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of West China Hospital, Sichuan University

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

YZ and LH design of the work; WG the acquisition, analysis, NC, JG and MZ interpretation of data; YZ have drafted the work or substantively revised it

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Tables

Due to technical limitations, tables 1 to 5 xlsx are only available as a download in the Supplemental Files section.

Supplementary Files

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