

Research Article

A Retrospective Evaluation of Acute Ischemic Stroke Patients Presenting to the Emergency Department

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Abstract

Objectives: Stroke is one of the most important diseases leading to severe disability and death. Ischemic stroke incidence increases with age. In this study, we aimed to define the etiological, epidemiological, demographic and clinical characteristics of patients with acute ischemic stroke and contribute to the acute stroke data of our country.

Methods: This descriptive study was planned retrospectively. In this study, patients admitted to the adult emergency department of our hospital due to acute ischemic stroke between 01/01/2017 and 31/12/2017 were examined.

Results: 57.9% (n=224) of the patients were male, and the mean age was 66.7 (17-96). 64.4% of the patients had a history of hypertension, 35.6% had coronary artery disease, and 32.2% had diabetes mellitus. The mortality rate of the patients was 22.9%.

Conclusion: The presence of a history of hypertension is the most important risk factor for acute ischemic stroke, and it is observed at much higher rates in men over 60 years of age. The time of admittance to the emergency department since the beginning of the event is key for the treatment regimen, and recent iv tPA and thrombectomy applications have had positive results for these patients.

Keywords: Acute ischemic stroke, emergency department, risk factors, thrombectomy

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Stroke is a clinical condition that occurs with sudden cessation of cerebral blood flow due to various reasons and that leads to neurological dysfunction. Despite all the developments in medicine, stroke is still one of the most important health problems, and the World Health Organization (WHO) defines stroke as "findings related to focal or global impairment of cerebral functions that develop suddenly and last for 24 hours or more or may result in death".^[1] Among all strokes, ischemic stroke comprises 75-80%, and hemorrhagic stroke comprises 20-25%. Stroke affects

about 15 million people worldwide each year and ranks third among the causes of death in the world following heart diseases and cancer.^[1, 2] It is also the third most common cause of death in our country and constitutes the reason for 6.8% of deaths.^[2] Correcting stroke risk factors is key to reduce the severity of stroke-related mortality and morbidity, and it is crucial to transfer patients with acute ischemic stroke (AIS) to the relevant center in a short time to restore perfusion, which is the main treatment strategy.^[3] The clinics where patients with AIS are first evaluated are

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emergency department (ED). For this reason, the documentation of the emergency data of acute stroke patients can guide the determination of their diagnosis-treatment strategies. Despite the high mortality and morbidity rates associated with AIS and the fact that these patients are first evaluated in emergency departments, there are few studies examining the epidemiological, demographic and clinical characteristics of stroke patients in emergency departments in our country.

In this study, we aimed to define the etiological, demographic and clinical characteristics of patients applying to the adult ED of Kahramanmaraş Sutcu Imam University (KSU) Medical Faculty Hospital due to AIS for a year and therefore to contribute to the acute stroke data of our country.

Methods

This was a descriptive cross-sectional study. Our study included patients 18 years of age who had AIS and were admitted to the adult ED of Kahramanmaraş Sütçü İmam University Medical Faculty Hospital with the diagnosis of cerebrovascular event (CVE) between 01.01.2017 and 31.12.2017. We planned to reach all patients through retrospective analysis of electronic patient records (EPR) on the hospital information management system (HIMS) and reached 387 patient records.

In the electronic patient records, the following variables were included in the data set for each patient: Age, gender, date of application, disease history (hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD), atrial fibrillation (AF), hyperlipidemia (HL), previous stroke, transient ischemic attack (TIA), etc.), symptoms (weakness, difficulty speaking, change of consciousness, imbalance, dizziness, headache, general condition disorder, visual impairment), findings (hemiplegia, hemiparesis, aphasia, dysphasia, ataxia, diplopia, vertigo, confusion), intubation (yes/no), cranial computed tomography (CT) and/or Magnetic resonance imaging (MRI) finding (Anterior cerebral artery (ACA), middle cerebral artery (MCA), posterior cerebral artery (PCA), total anterior circulation (TACI), lacunar infarct areas, type of treatment (intravenous tissue plasminogen activator (iv tPA), thrombectomy, antiaggregant therapy), complications after iv tPA (yes/no), hospitalization-discharge-referral status, clinical prognosis (discharge-referral-discharge with cure).

Based on the existing data, new variables that were not included in the EPR were also created. Temporal variables such as seasons and months were produced based on the application date. Continuous variables such as age were also analyzed by converting them into categorical variables in accordance with the study aim. No data completion with

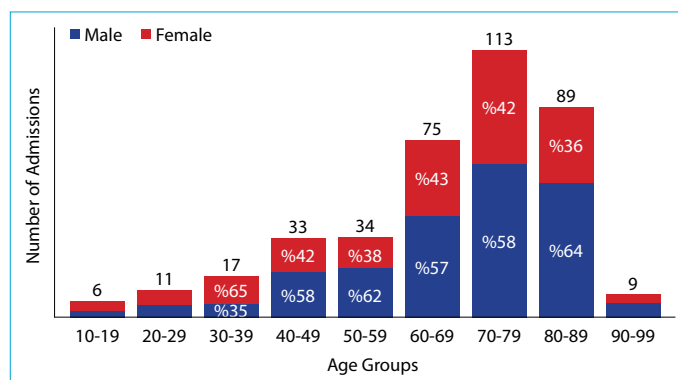


Figure 1. Frequency of admission according to age groups and genders.

statistical models was done for missing data in the data set obtained from HIMS; for comparison groups, patients with existing data for the relevant analysis were divided into groups, and analyzes were done accordingly.

Frequency distributions were used to analyze the data, Chi-squared test was done between dependent and independent categorical variables, and Mann-Whitney U test was used to analyze non-normally distributed continuous variables. The level of statistical significance was set as $p < 0.05$. Excel v.1911 (Microsoft) was used for data preparation, and IBM SPSS v.24 was used for statistical analyses.

The study was approved by the Scientific Research Ethics Committee of Kahramanmaraş Sütçü İmam University (decision date: 13.07.2018, decision number: 15).

Results

It was determined that there were 96.264 applications to the adult ED of our hospital in 2017, that 409 (0.4%) of these applications were CVEs and that 387 (94.6%) of CVE cases were diagnosed with AIS. 57.9% of the patients with AIS were male ($n=224$) and 42.1% ($n=163$) were female, and the frequency of admission was significantly higher in men ($p < 0.05$).

Examining the age distribution of the patients, the mean age was 66.71 with the smallest value of 17 and the highest value of 96 ($s=17.38$). The mean age was 68.16 ($s=16.16$) for men and 64.72 ($s=18.81$) for women, and the median values were 72 and 70, respectively. The differences between the mean ages were not statistically significant ($p > 0.05$ MWU t-test). > Examining the age distribution histogram, it was found that the distribution shifted towards the right and was concentrated in high age groups (Fig. 1). AIS incidence was statistically significantly higher in older age groups, and 71.6% of the patients were in the 60-89 age range ($p < 0.001$).

Examining the temporal distribution of the number of patients according to years, months and seasons, the frequency of admission was seen to increase in July (Fig. 2). Howev-

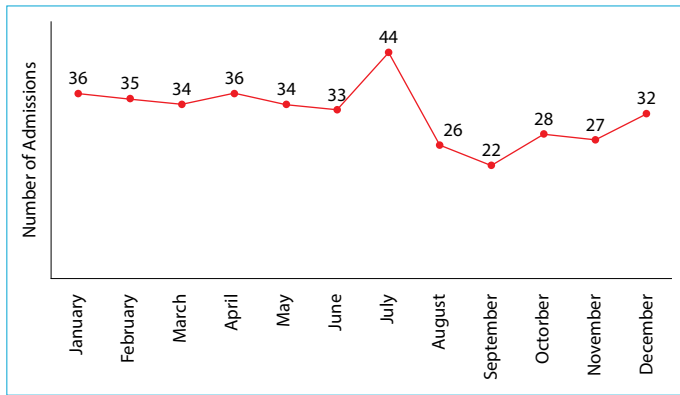


Figure 2. Distribution of number of admissions according to months (2017).

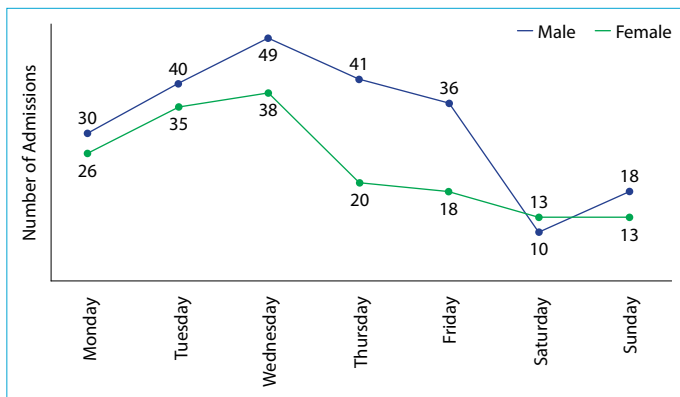


Figure 3. Distribution of number of admissions according to days.

er, the Chi-squared analysis revealed that the distribution of frequency of admission showed no significant difference according to months ($p>0.05$). Similarly, although the admissions increased in the summer ($n=103$, 26.6%), the distribution of the frequency of admission according to seasons was not statistically significant ($p>0.05$).

Examining the distribution of the number of admissions according to days, it was observed that admissions were highest on Wednesday and lowest on Saturday (Fig. 3). 86% of the patients ($n=333$) applied on weekdays, while 14% ($n=54$) applied on weekends, and the difference was statistically significant ($p<0.001$).

Seven different risk factors (HT, DM, CAD, AF, HL, CVE, TIA) that may be associated with AIS were identified in patients' backgrounds, and the frequencies of these diseases were examined by excluding cases with missing data (Fig. 4). Accordingly, the 3 most common diseases were HT (64.4%), CAD (35.6%) and DM (32.2%). It was also determined that at least one of these three diseases was present in 80.8% of the patients. Examining the distribution between these diseases and genders in patient backgrounds, it was found that there were statistically significant differences between HT, DM, AF and HL and gender ($p<0.05$) (Fig. 4).

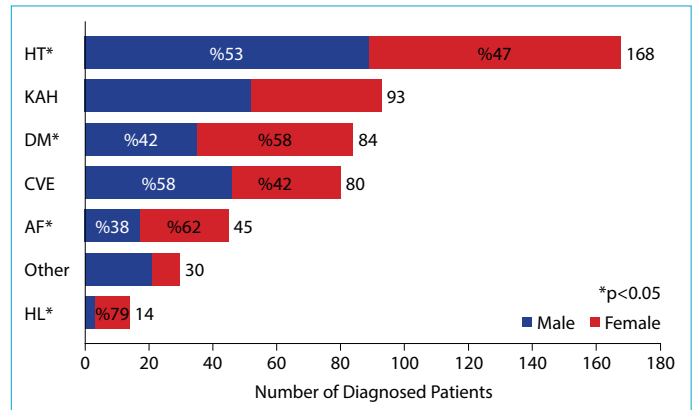


Figure 4. Distribution relationship between disease history and gender.

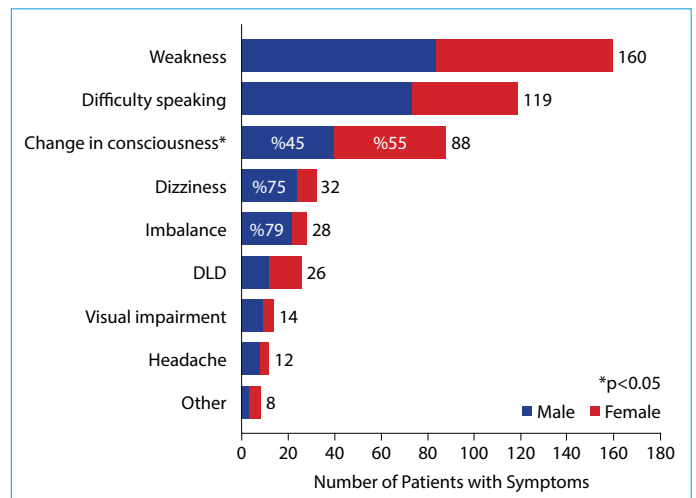


Figure 5. Relationship between symptoms and gender at admission.

The symptoms of the patients were examined, and the eight most common symptoms are shown in Figure 5. Weakness (55.4%), difficulty speaking (41.2%) and change in consciousness (30.4%) were the three most common symptoms. In addition, it was determined that at least one of these three symptoms was present in 80.9% of patients. It was determined that there was a statistically significant difference between change in consciousness, imbalance and dizziness and gender ($p<0.05$).

The eight most common findings and frequencies from the physical examination findings of the patients are shown in Figure 6. The four most common findings were confusion (31.9%), hemiplegia (31.9%), aphasia (28.7%) and hemiparesis (25.1%). At least one of these four findings was present in 79.9% of patients. There were statistically significant differences only between vertigo and ataxia ($p<0.05$) (Fig. 6).

According to the Oxfordshire Community Stroke Project (OCSF) classification, the most common finding was MCA infarction (41.8%). In the distribution of diffusion MRI and cranial CT findings, it was found that there was a statisti-

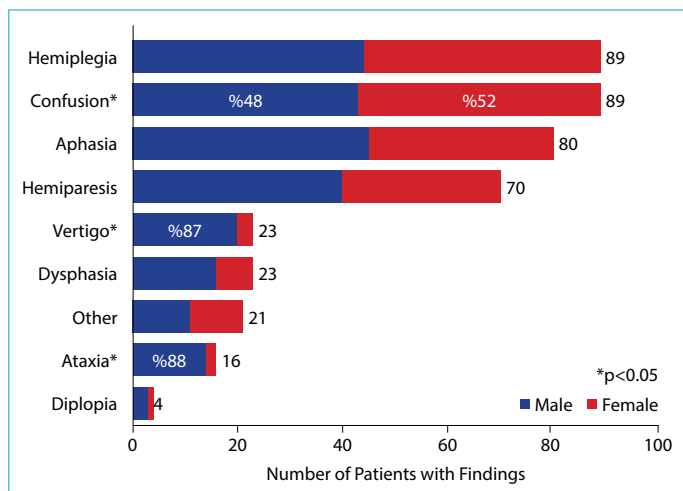


Figure 6. Relationship between frequency of physical examination findings and gender.

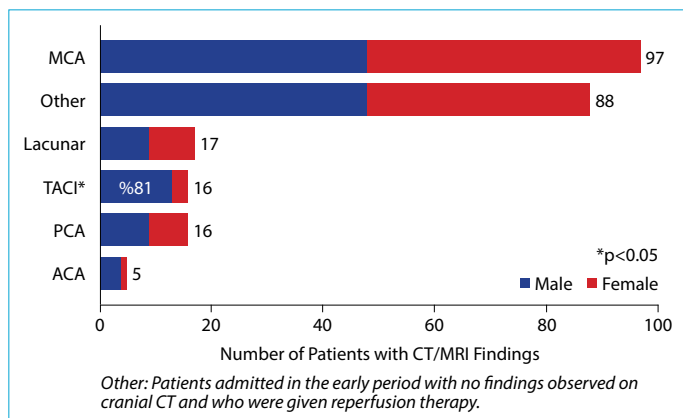


Figure 7. Relationship between AIS types and gender according to diffusion MRI and cranial CT results.

cally significant difference only between TACI and gender ($p<0.05$). In addition, since 88 (36.8%) patients admitted in the acute period, it was determined that acute periods were evaluated as normal cranial CT, and reperfusion therapy was initiated for these patients (Fig. 7).

It was found that 263 (90.1%) of the patients were treated in the neurology intensive care unit, 26 (8.9%) were transferred to the neurology department, and 3 patients (1%) were referred to another health institution.

It was found that the patients were most frequently given antiaggregant therapy (90.9%), followed by iv tPA (8.4%) and thrombectomy (1.8%) (Fig. 8). In addition, 7 of the 24 patients (29.1%) given iv tPA developed hemorrhagic complications.

The mortality rate of 288 patients followed with the diagnosis of acute ischemic stroke was found to be 22.9% ($n=66$). The rate of exitus was found to be significantly high in the age group of 60 and above ($p<0.001$). Moreover, the rate

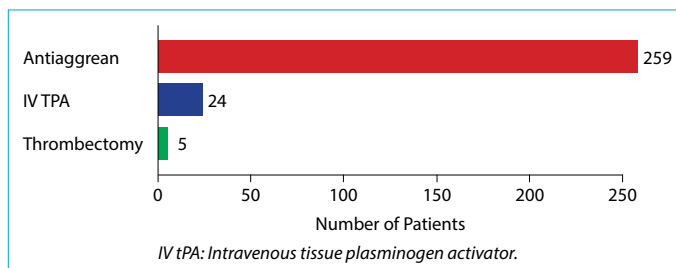


Figure 8. Types of treatment.

of exitus was found to be more significant in patients with AF history ($p<0.05$). It was determined that dizziness of the symptoms and hemiparesis, dysphasia, ataxia and vertigo of the the physical examination findings were significant in terms of discharge ($p<0.05$).

Discussion

Stroke is a clinical condition that occurs with sudden cessation of cerebral blood flow due to various reasons and that causes neurological dysfunction, and ischemic strokes constitute 80-85% of strokes. Among 96.264 admissions made to KSU Medical Faculty Hospital ED in 2017, 387 patients were diagnosed with AIS. AIS incidence in the total one-year emergency admission was 0.4%. Annual stroke incidence was 0.13-0.36% at the ages of 55-64, 0.49-0.89% at the ages of 65-74 and 1.3-1.7% at the ages of 75.^[3] Age is an important risk factor for stroke, and Gürger et al. found the mean age of their patients to be 68.6 ± 14.6 .^[4] In our study, the mean age of the patients was 66, similar to the literature. Many studies in our country have reported that acute stroke is more common in men and that stroke is observed less frequently in women, especially in older age groups.^[5] In the study of Demir et al. on young patients who had a stroke, there was an excess of stroke rates in women.^[6] It was concluded that the use of oral contraceptives in the young women in the study may have been related to increased pregnancy and postpartum hematological disorders. In the current study, AIS incidence was significantly high in men, similar to the literature.

The effect of seasonal changes on the incidence and mortality of cerebrovascular diseases has been reported in many countries in the northern hemisphere. Some studies have shown that deaths and hospital stays related to stroke have increased significantly, especially in winter. However, some studies have also reported that seasonal temperature changes in different regions have no effect on stroke incidence. One study reported that both ischemic stroke and hemorrhagic stroke cases occurred more frequently during summer in the Van region. In another study by Oberg et al., it was reported that the frequency of ischemic stroke peaked in May and was the lowest in December.^[7, 8] In the pres-

ent study, we found that the frequency of stroke was slightly higher in summer, especially in July. It was determined that the number of patients who had a stroke during weekdays was higher than those who had a stroke during the weekend. Considering different results, it is thought that regional climate differences, different genetic structures of races, meteorological parameters such as air pressure, temperature, humidity, etc., weekday working conditions and work stress may have affected these results.

Many studies have reported that the most common risk factors for stroke were HT, DM and HL.^[9-11] In our study, especially the association of HT, CAD and DM was found as an important risk factor, similar to the current literature. Moreover, the coexistence of these three diseases in almost 8 out of 10 patients is another issue that should be emphasized in terms of indicating a crucial risk factor. Randomized clinical studies have found that the presence of HT, HL, carotid stenosis and AF was causally associated with ischemic stroke, and it was clearly demonstrated that stroke incidence was decreased with the treatment of these diseases.^[12]

Examining the symptoms of the patients, the eight most common symptoms (weakness, difficulty speaking, change in consciousness, dizziness, imbalance, general condition disorder, headache, visual disturbances) were identified, and their frequencies were examined. Accordingly, the three most common symptoms were weakness, difficulty speaking and change in consciousness. At least one of these 3 symptoms was seen in 80.9% of patients. When the findings of the patients were examined, the 8 most common findings were confusion, hemiplegia, aphasia, hemiparesis, dysphasia, vertigo, ataxia and diplopia, and their frequencies were examined. The most common findings were confusion, aphasia, hemiplegia and hemiparesis. At least one of these four findings was seen in 79.9% of patients. In light of these data, the early diagnosis of stroke in patients with the most common symptoms and findings and thus initiating treatment early will increase the patient's survival and decrease disability/sequela.

In stroke patients, the main purpose of the treatment is to provide perfusion. The main treatment models used for this purpose are antiaggregant, recombinant tissue plasminogen activator (r-tPA) and iv thrombolytic therapy and thrombectomy. With 'The National Institute of Neurological Disorders and Stroke' (NINDS) in 1995, the effectiveness of iv thrombolytic therapy in patients with acute ischemic stroke within the first 3 hours was demonstrated.^[13] Iv r-tPA was approved by the Food and Drug Administration in the USA in 1996 and was widely accepted.^[14] Today, it is recommended to use this treatment within 4.5 hours after the onset of symptoms in AIS.^[15] Turkey also obtained a license for

the use of the drug in AIS in 2006. As of this date, the application of iv thrombolytic therapy has become increasingly common in our country. In the study of Kutluk et al., the efficacy and safety criteria were defined with pharmacokinetic expressions, and it was stated that one out of every 8 patients fully recovered with this treatment, one out of every 3 recovered, and one out of every 30 were damaged.^[16] It has been shown that emergency thrombectomy with retractable stents is a safe and effective treatment in providing reperfusion, reducing the degree of disability and increasing the functional independence rate in the 3rd month after stroke. In cases where r-tPA is contraindicated and in patients with large vessel occlusion, endovascular methods, which mechanically provide direct intervention to the clot, come to the forefront. In 5 randomized controlled studies published in 2015 (MR CLEAN, SWIFT PRIME, EXTEND-IA, ESCAPE, REVASCAT), when endovascular methods are compared with iv r-tPA treatment in the presence of proximal artery occlusion, higher rate of recanalization and better functional outcome were achieved with endovascular treatment.^[17-21] In the current study, the rate of patients given iv tPA was 8.4%, and the rate of patients given thrombectomy was 1.8%.

The chances of success in these treatment methods are closely related to whether these patients are brought to the ED within the first 4.5 hours from the onset of symptoms. Unfortunately, many patients cannot be brought to the ED within this period. Although the delay in the onset of acute stroke treatment occurs at different stages, the largest time frame is lost outside the hospital. In one study, it was stated that the most important process causing delay in the pre-hospital period was the prolongation in the time of seeking medical help.^[5] The same study emphasized that the time from the onset of stroke symptoms to calling an ambulance constituted the biggest part of pre-hospital delay. The key factors in the delay of seeking medical help are not knowing the symptoms of stroke, not realizing its severity, ignoring the disease and expecting that the symptoms will recover spontaneously.^[10] In addition, living alone, having experienced a stroke at home, having a nighttime stroke, and especially applying to other health centers or family physicians rather than directly applying to the emergency departments of reference hospitals have been shown to be the most important reasons for late admission.^[5, 10]

In patients with ischemic stroke, the location and size of ischemia, age and concomitant diseases are very important in terms of the risk of mortality. After a stroke that developed for the first time, 30-day mortality rates are estimated to be at 10-17%, and the 5-year survival rate is around 40%. In addition to concomitant diseases such as DM, HT, AF and

CAD, the hemodynamic values of the patient at admission are also important parameters in determining the mortality rate.^[22] In our study, the mortality rate was 22.9% in patients followed-up with the diagnosis of AIS and was slightly higher than the literature. Moreover, similar to the literature, the rate of exitus was significantly higher in patients with AF history, especially in the age group of 60 and above.

Conclusion

Considering the results obtained in our study, although there was great parallelism with previous studies, some differences were observed. Further studies are needed to investigate the epidemiology of AIS in our country. The number of health centers that perform thrombolytic therapy and thrombectomy should be increased. To reduce the mortality and morbidity rates of ischemic stroke cases, it is crucial to reach the relevant health center within the first 4.5 hours, and patients should be transferred to the relevant health centers immediately. Awareness and detection of factors that can improve the prognosis of patients and that can affect mortality may lead to the early treatment of patients at risk. This way, we believe that the mortality rates, complications and sequelae rates of patients in the clinical follow-up process can be decreased.

Disclosures

Ethics Committee Approval: The study was approved by the Scientific Research Ethics Committee of Kahramanmaraş Sütçü İmam University (decision date: 13.07.2018, decision number: 15). The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki.

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Authorship Contributions: Concept – HH, MSG; Design – HH, MSG; Supervision – H.H., Y.I.; Materials – H.H., E.O.G., Y.I.; Data collection and/or processing – HH, EOG, YI; Analysis and/or interpretation – HH, MSG, YI; Literature search – HH, EOG; Writing – HH, MSG, YI; Critical review – HH, YI.

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