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ORIGINAL ARTICLE

Prevalence, causes, and predictors of discharge against medical advice (DAMA) in an emergency setting: an updated systematic review and meta-analysis

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ABSTRACT

Background: The prevalence of discharge against medical advice (DAMA) ranges from 1% to 2% in inpatient admissions and may reach up to 25.9% in some hospitals. The aim of this meta-analysis was to assess the prevalence, causes, and predictors of DAMA in the emergency departments.

Methods: We conducted a systematic electronic database search for suitable studies from inception till 20th January 2020 in nine databases. Meta-analysis was used to pool the results.

Results: Of the total 180 records screened, we included 14 studies. The overall prevalence rate of DAMA was 6.3% [95% confidence intervals (CI) = 3.41%-11.63%]. The most common cause of DAMA was not being content with the treatment or not agreeing with the diagnosis/treatment (19.93%; 95% CI = 11.02%-33.34%), followed by long waiting time (8.6%; 95% CI = 0.97%-47.45%) and financial problems (7.15%; 95% CI = 1.45-28.78). Regarding predictors, the reported significant unadjusted predictors were local emergency center [Odds ratios (OR) = 1.23%; 95% CI = 1.21-1.24%; *p*-value < 0.001], regional emergency center (OR = 0.83%; 95% CI = 0.82%-0.84%; *p*-value < 0.001), and non-urgent triage (OR = 12.74%; 95% CI = 1.13%-143.97%; *p*-value = 0.040). In the same context, the significant adjusted predictors were ≤40 years (males) (OR = 3.94%; 95% CI = 1.31%-11.83%; *p*-value = 0.014), male gender (youth and middle-aged) (OR = 1.2%; 95% CI = 1.19%-1.21%; *p*-value < 0.001), and Male gender (aged group) (OR = 1.09%; 95% CI = 1.07%-1.11%; *p*-value < 0.001).

Conclusion: DAMA prevalence in emergency departments is high. More attention should be devoted to those patients in relation to the possible DAMA causes for decreasing negative consequences resulted from committing DAMA.

Keywords: DAMA, emergency, causes, prevalence, predictors.

Introduction

The prevalence of discharge against medical advice (DAMA) ranges from 1% to 2% in inpatient admissions and may reach up to 25.9% in some hospitals [1]. These rates vary across different departments and are reported to range from 0.7% to 2.2% in general medical admissions, from 6% to 54% in case of admissions for psychiatric causes, and 0.9% in emergent ones [2-4]. Furthermore, the DAMA rate is highly variable according to the hospital type with reported rates of 0.3% to 2.2% in public hospitals [5-8], 1% in small rural ones [9], and up to 25.9% in other hospitals (teaching, private, and non-profit hospitals) [10-12]. Male gender, lack of health insurance, drug/alcohol addiction, mental health issues, and younger age have all been identified as predictors for higher DAMA rates [3,13-16]. The decision of DAMA was found to be made by patients' relatives in 58.4% of the cases, while 40.7% of DAMA decisions have been made by the patients themselves [17,18]. This is evidence of the significance of family members' effect

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on the DAMA prevalence rate, whether within in-patient or emergency settings [17,18].

Emergency care plays a crucial role in the healthcare process by preserving patients' lives [19]. DAMA is usually alarming since it usually means the patient is leaving too soon and some expected adverse outcomes may follow with discharge [13]. This is evident by higher readmission rates in DAMA patients, mostly due to the same reason for initial admission or at least a related cause [17,18]. It was found that 32% of DAMA patients will be readmitted within the first month following discharge, compared to only a 12% readmission rate for the patients with regular discharges [20]. Moreover, about 28% of the DAMA patients will be readmitted for the same (or related) cause, compared to only 8% of the regularly discharged ones [21]. These readmission rates differ among countries; a Canadian study has estimated readmission rates at 10% [10], while rates of 0.8%-2.2% have been reported in the United States [5], 6.2% in Australia [22], 20% in Iranian emergency setting [23], 6% in Italy [24], 0.72% in Nigeria [25], and 3.7%-24.4% in other countries [26,27].

In the same context, DAMA would have a negative impact on medical care with higher resource utilization, higher accumulating financial burden, and exhausting the healthcare providers' method [17,18,28]. A subsequent straining of the healthcare provider-patient relationship may be caused by DAMA in case of readmission [18,29]. An increase in healthcare costs has been reported to be up to 56% in both patients and the medical system [30,31]. In Australia, the total cost of 8.6$ million was estimated as a result of DAMA every year [32]. Therefore, the aim of this study was to investigate the causes and predictors of DAMA in patients referred to the emergency care setting.

Methods

Search strategy and study selection

The study process was conducted following the accepted methodology recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist for systematic review and meta-analysis, where registration of the protocol is not mandated [33]. We conducted a systematic electronic database search for suitable studies on 20th January 2020 in nine databases, including Google Scholar, System for Information on Grey Literature in Europe, Scopus, Web of Science (ISI), PubMed, Virtual Health Library, Clinical trials.gov, metaRegister of Controlled Trials, and the World Health Organization International Clinical Trials Registry Platform databases using the following keywords: "DAMA", and "Leaving against medical advice". Missed relevant papers were collected via manual searches of trials in Google Scholar and references of the included papers [34]. We included all relevant original publications reporting the prevalence, causes, and predictive factors of DAMA. There were no restrictions on the study design, country, or language. However, we restricted our search for the last 5 years for collecting the most updated papers. For non-English papers, we sought help from a native speaker or a certified translator.

Papers were excluded if there was one of the following exclusion criteria: (1) published before 2015; (2) *in vitro* or animal studies; (3) data duplication, overlapping, unreliably extracted, or incomplete data; and (4) abstract-only articles, reviews, thesis, books, conference papers, or articles without available full texts (conferences, editorials, author response, letters, and comments). Three independent reviewers screened the titles and abstracts for selecting eligible papers. Further full-text screening was carried out to ensure the inclusion of relevant papers in our systematic review. Any disagreement was resolved by discussion and consulting a senior member when necessary.

Data extraction

Two authors carried out the extraction sheet on a Microsoft Excel file by pilot extraction of at least three papers. Three reviewers independently extracted data from included studies using the excel sheet. The fourth reviewer carried out data checking for checking the accuracy of the extracted data. All disagreements and discrepancies were resolved by discussion and consultation with a senior member when necessary.

Quality assessment

Three independent reviewers evaluated the risk of bias in included studies. The National Institutes of Health quality assessment tool was used to assess the quality of each included study [35]. Quality assessment of each study was obtained through a scoring system including 14 questions. The criterion was judged as follows: a score of 13-14 was good, 9-12 was fair, and studies scoring below 9 were considered as poor quality [36]. Any discrepancy between the reviewers was resolved by discussion.

Statistical analysis

All data were analyzed using R software version 3.6.1 [37]. Using the "meta" package, DAMA rates and the prevalence of different causes were calculated [38]. The corresponding 95% confidence intervals (CI) of pooled effect size were calculated using random effects due to the presence of heterogeneity. Moreover, the calculated predictors, whether adjusted or not, have been pooled or graphically represented (if the predictor reported in one study). Heterogeneity was assessed with Q statistics and I^2 test considering it significant with I^2 value >50% or $p < 0.05$ [39]. Publication bias could not be assessed using Egger's regression test due to the small number of included studies (<10) [40,41]. The publication bias was assessed using Egger's regression test [40,41] and represented graphically by Begg's funnel plot [42] when there were 10 or more studies. Egger's regression test ($p < 0.10$) was considered significant. Whenever publication bias was found, the trim and fill method of Duvall and Tweedie was applied to add studies that appeared to be missing [43] to enhance the symmetry. A leave-one-out sensitivity analysis was also carried out by iteratively removing one study at a time to confirm that our findings were not driven by any single study [44].

Results

Search results

We identified 180 records after excluding 52 duplicates by using the EndNote software. Title and abstract screening resulted in 36 records for further full-text screening, which yielded 11 eligible papers for inclusion in our study. Moreover, the three papers we added after carrying out manual search trials. Finally, we included 14 studies for this systematic review and meta-analysis (Figure 1) [45,58].

Study characteristics and quality of the included studies

There were six retrospective cohorts, two prospective cohorts, five cross-sectional studies, and one case-control study. The total sample size was 8,320,353. In terms of risk of bias, all studies were of fair criterion. Regarding the country of patients, there were three Korean studies, two Indian and one for each of the following countries: Malaysia, Iran, Bahrain, China, Saudi Arabia, Australia, Lebanon, USA, and Germany (Tables 1 and 2).

Prevalence of DAMA

A total of 11 studies with 8,317,881 patients have been pooled in the prevalence analysis. The overall prevalence rate was 6.3% (95% CI = 3.41%-11.63%). The highest prevalence rate of 45.5% was observed in an Indian study [54], while the lowest rate was detected in a Saudi study (0.98%) [58] (Figure 2). The leave-one-out sensitivity analysis did not show a significant change (> ±1%) in the overall prevalence rate. A highly significant heterogeneity ($p < 0.001$) has been detected among the included studies, with $I^2 = 100\%$ and $\tau^2 = 1.07$. However,

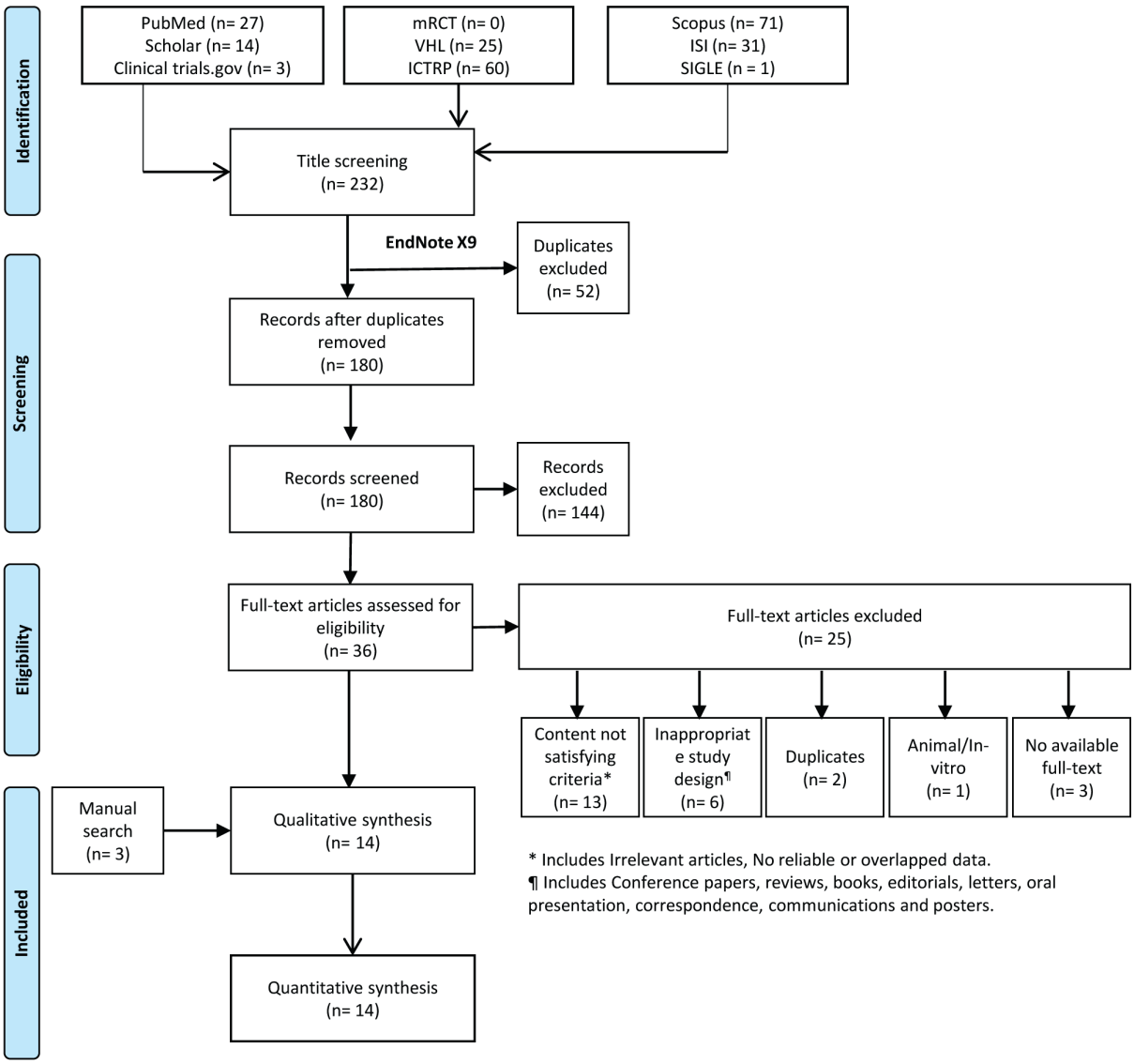

Figure 1. *PRISMA flow diagram showing the process of the review.*

no risk of bias has been detected by Egger's regression test ($p = 0.215$).

Cause and predictors of DAMA

Four studies with 2,109 patients were pooled in the analysis of causes. The most common cause was not being content with the treatment or not agreeing with the diagnosis/treatment (19.93%; 95% CI = 11.02%-33.34%), followed by long waiting time (8.6%; 95% CI = 0.97%-47.45%), financial problems (7.15%; 95% CI = 1.45%-28.78%), insurance problems (3.56%; 95% CI = 0.6%-18.53%), distance from patients' living place (3.43%; 95% CI = 1.62%-7.1%), feeling of wellbeing (1.64%; 95% CI = 0.01%-83.66%), and others (0.75%; 95% CI = 0.01%-31.63%) (Figure 3).

Five studies with 2,252 patients provided different causes, which could not be pooled (presented only in one study); so, they have been graphically shown in Figure 4. The most common causes were no reason mentioned (0.44%; 95% CI = 0.41%-0.47%), overcrowded emergency department (ED) (0.34%; 95% CI = 0.27%-0.42%), unwillingness to be observed in the ED (0.34%; 95% CI = 0.3%-0.37%), improved health condition (0.32%; 95% CI = 0.25%-0.39%), and incomplete workup (0.31%; 95% CI = 0.28%-0.33%).

Regarding predictors, the reported significant unadjusted predictors were local emergency center [Odds ratios (OR) = 1.23%; 95% CI = 1.21%-1.24%; p-value < 0.001], regional emergency center (OR = 0.83%; 95% CI = 0.82%-0.84%; p-value < 0.001), and non-urgent triage (OR = 12.74%; 95% CI = 1.13%-143.97%; p-value = 0.040). In the same context, the significantly adjusted predictors were ≤40 years (males) (OR = 3.94%; 95% CI = 1.31%-11.83%; p-value = 0.014), male gender (youth and middle-aged) (OR = 1.2%; 95% CI = 1.19%-1.21%; p-value < 0.001), and male gender (aged group) (OR = 1.09%; 95% CI = 1.07%-1.11%; p-value < 0.001) (Figure 5).

Discussion

DAMA is a serious problem that encounters physicians with varying prevalence among hospital departments [7]. The ethical dilemma between discharging the patient without completing full investigations or treatment is still a major concern among primary care providers [57,59]. Leaving the hospital against medical

Table 1. *Study design and quality of the included studies.*

Reference ID	Study design	QA
Ismail/2016/Malaysia	Case-control	Fair
Hadadi/2015/Iran	Cross-sectional	Fair
Abuzeyad/2017/Bahrain	Cross-sectional	Fair
El-Metwally/2019/Saudi Arabia	Cross-sectional	Fair
Ba/2015/China	Retrospective cohort	Fair
Lee/2016/Korea	Retrospective cohort	Fair
		Fair
Bhoomadevi/2020/India	Cross-sectional	Fair
Guo/2019/Australia	Prospective cohort	Fair
Abhilash/2019/India	Retrospective cohort	Fair
Jeong/2016/Korea	Prospective cohort	Fair
Jung/2015/Korea	Cross-sectional	Fair
Manzano-Nunez/2019/USA	Retrospective cohort	Fair
Hoyer/2019/Germany	Retrospective cohort	Fair
El Sayed/2016/Lebanon	Retrospective cohort	Fair

Table 2. *Study characteristics.*

Reference ID	Compared groups	Sample size	Age in months [mean (SD)]	Male (event)
Ismail/2016/Malaysia	DAMA	31	45.4 (21.2)	20
	Control	62	51.42 (20.2)	28
Hadadi/2015/Iran	TEDP	5,376	NR	NR
Abuzeyad/2017/Bahrain	DAMA	389	0 - >61 #	99
El-Metwally/2019/Saudi Arabia	DAMA	59	34.79 (12.4)	14
	Control	5,939	37.53 (13.2)	1590
Ba/2015/China	TEDP	3,343	NR	NR
Lee/2016/Korea	DAMA	222,389	43.84 (23.1)	122,267
	Control	7,778,140	34.75 (25.6)	4,142,434
Bhoomadevi/2020/India	TEDP	91	<18->60 #	NR
Guo/2019/Australia	TEDP	158,903	NR	NR
Abhilash/2019/India	TEDP	427	69 (6.8)	256
Jeong/2016/Korea	DAMA	3,473	18->60 #	2140
	Control	121,854		70374
Jung/2015/Korea	TEDP	6,394	10-19 #	2,345
Manzano-Nunez/2019/USA	TEDP	6,930	48*	NR
Hoyer/2019/Germany	TEDP	5,340	56.2 (0.3)	NR
El Sayed/2016/Lebanon	DAMA	1,213	46.9 (20.9)	654

TEDP = total emergency department patients; DAMA = discharged against medical advice; # = range; * = median.

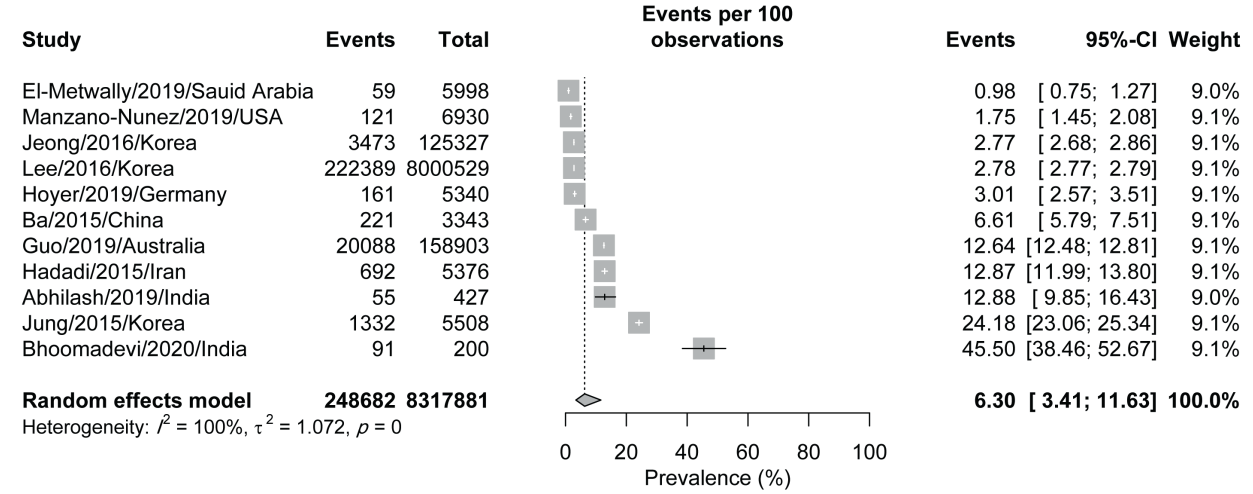

Figure 2. *Forest plot of DAMA prevalence rate and associated 95% CI.*

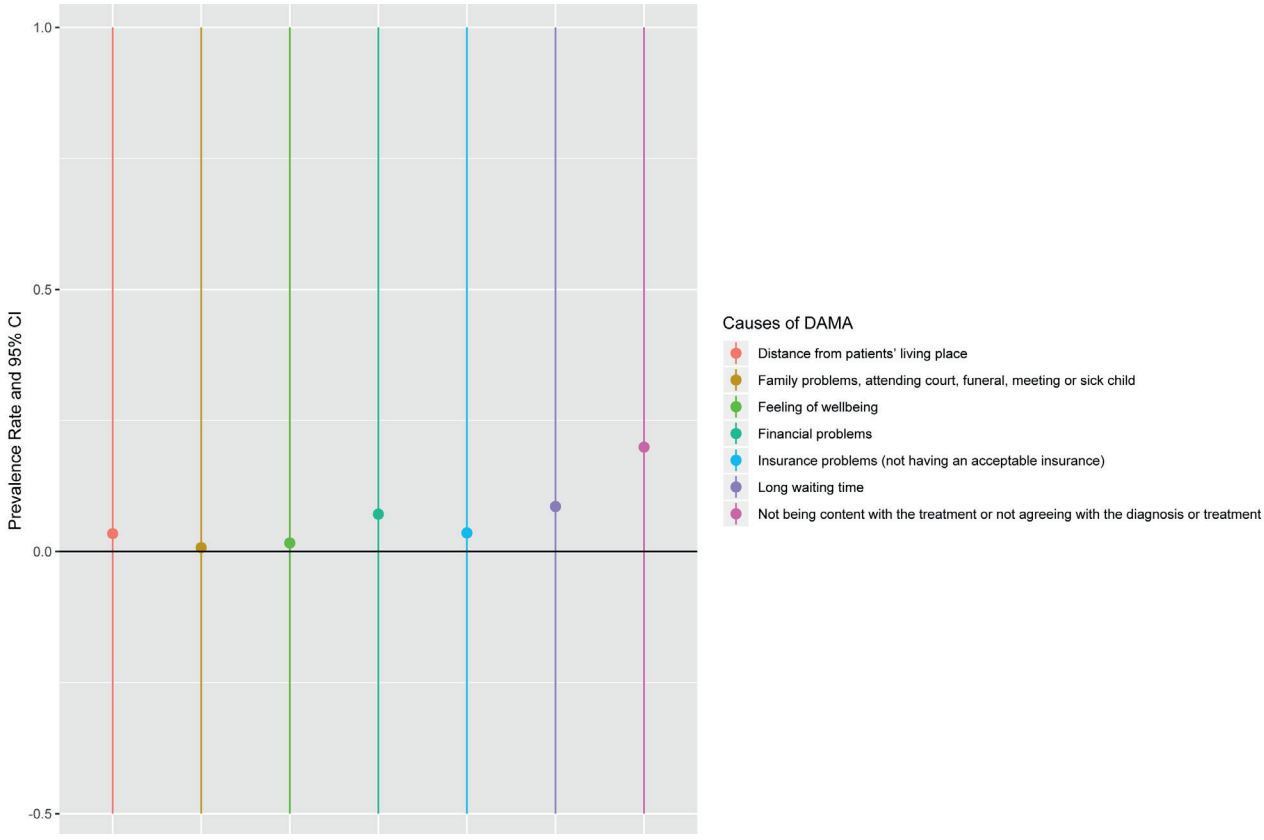

Figure 3. *Prevalence rates of different DAMA causes and associated 95% CI.*

advice requires a consent signature from the patient, as DAMA is associated with negative consequences, such as the increase in the readmission rates and mortality in severe cases without completing adequate treatment [60]. Patients admitted to emergency departments usually have critical illnesses; therefore, understanding the etiologic origin and the predictive factors are of paramount interest for limiting the phenomenon of DAMA in emergency departments that are associated with worse outcomes in most cases.

The prevalence of DAMA in the emergency department was 6.3% in our study, which was similar to the retrospective cohort study of Ba et al. [45], where the prevalence of DAMA in the Chinese emergency department was 6.6% [45]. However, the prevalence of DAMA was lower than our study in the two Korean reports conducted by Lee et al. [46] and Jeong et al. [47] estimating a prevalence of 2.78% and 2.8%, respectively. A higher prevalence of DAMA was reported by a retrospective cohort study that recruited

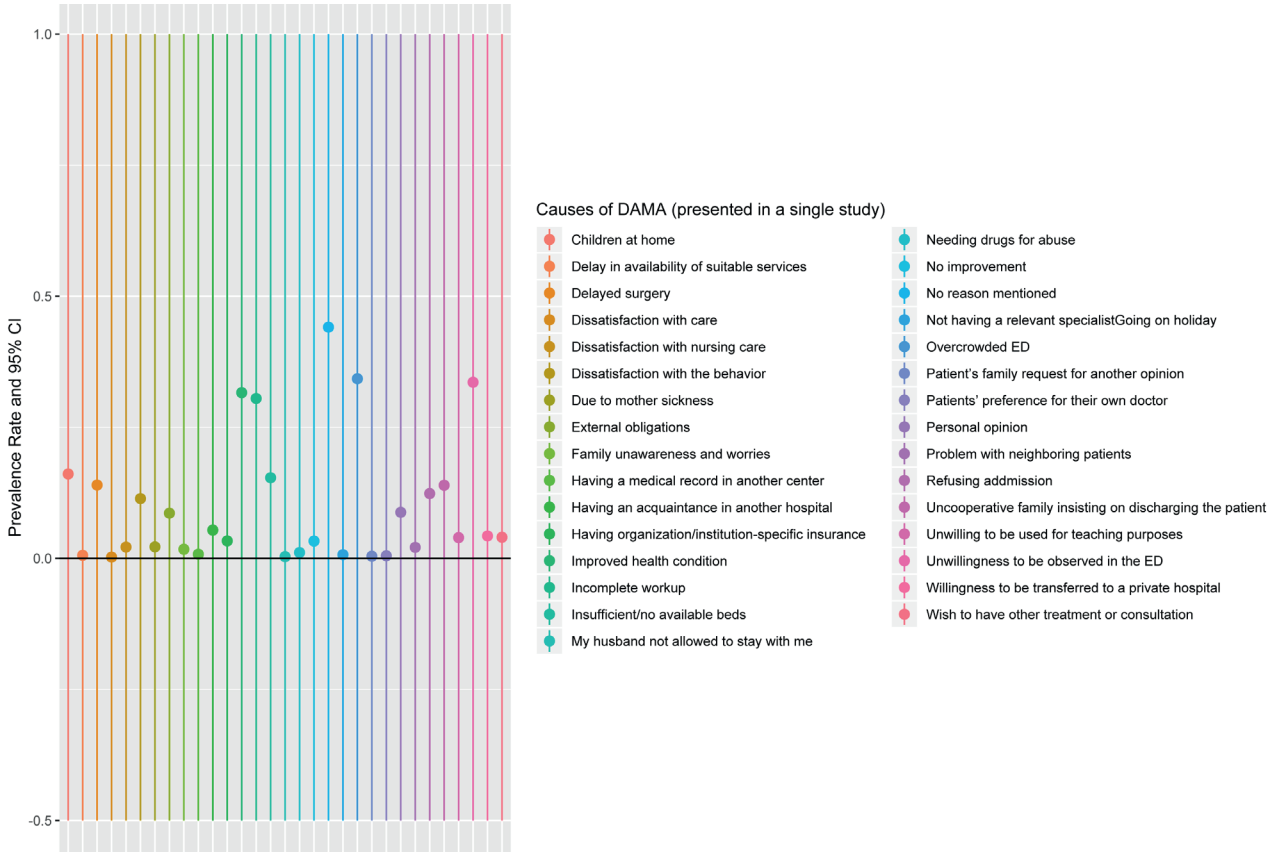

Figure 4. *Prevalence rates of one-time reported DAMA causes and associated 95% CI.*

Indian geriatric populations revealing a prevalence of 12.8% [49]. Moreover, Jung et al. [48] demonstrated a higher prevalence of DAMA in Korean patients after self-inflicted injury or attempted suicide revealing a prevalence of 22.8%. The difference in the prevalence of DAMA in the included studies can be explained by several hypotheses. The difference in the care systems among different countries plays an important role in the heterogeneity of DAMA prevalence [61]. Moreover, patients with terminal stages of the disease or estimated to have a poor prognosis have a higher prevalence of DAMA compared to their peers of early disease stage [48,49]. Additionally, the difference in the characteristics of patients constitutes an important factor that affects the patients' choice of leaving against medical advice [50-52].

Addressing the causes of DAMA constitutes the key part of it is prevention. Shorter time of hospital stay is favored for limiting the consequences induced by the long hospital stay; therefore, patients prefer to take the risk of DAMA to avoid hazards of long hospital admission [62]. In our study, not being content with the treatment or not agreeing with the diagnosis or treatment, long waiting time, and financial problems were the most common causes driving DAMA. In a retrospective cohort study conducted by Ibekwe et al. [26] on Nigerian children, financial obligations were the most common cause for DAMA request, the decision was obtained from their caregivers as children cannot take their own decision. Abuzeyad et al. [56] indicated that improved health conditions, followed by the long waiting time, was the most common causes of DAMA in Bahrainis patients. No reason mentioned, incomplete workup, and refusing admission were reported by El Sayed et al. [52], as the common reasons for DAMA decision.

Several factors were associated with an increase in the prevalence of DAMA. Moy et al. [63] reported that African American race, young age, male gender, drug, and alcohol-related diagnoses were associated with an elevation in the odds of DAMA. Moreover, certain comorbidities were associated with DAMA rather than controls, such as neurologic disorders, alcoholism, and psychiatric illness [60]. In our study, male gender, younger ages, and local and regional emergency centers were significant predictors for DAMA. Similar observations were reported by the case-control study of Weingart et al. [64]. Those patients preferred to choose DAMA than hospital admission due to many reasons. The predicted long duration of hospital stay plays a substantial role in increasing the rates of DAMA because of the low financial levels in addition to the absence of insurance [53,54]. Moreover, the sense of wellbeing drives DAMA decision in those patients [52,53]. Furthermore, patients who commit DAMA were significantly influenced by familial and work obligations and immediate cure of the disease [55].

In the same context, the process of discharging somebody against medical advice requires a physician-patient discussion of risks, benefits, and alternatives, as well as demonstrating that the patient has capacity to understand

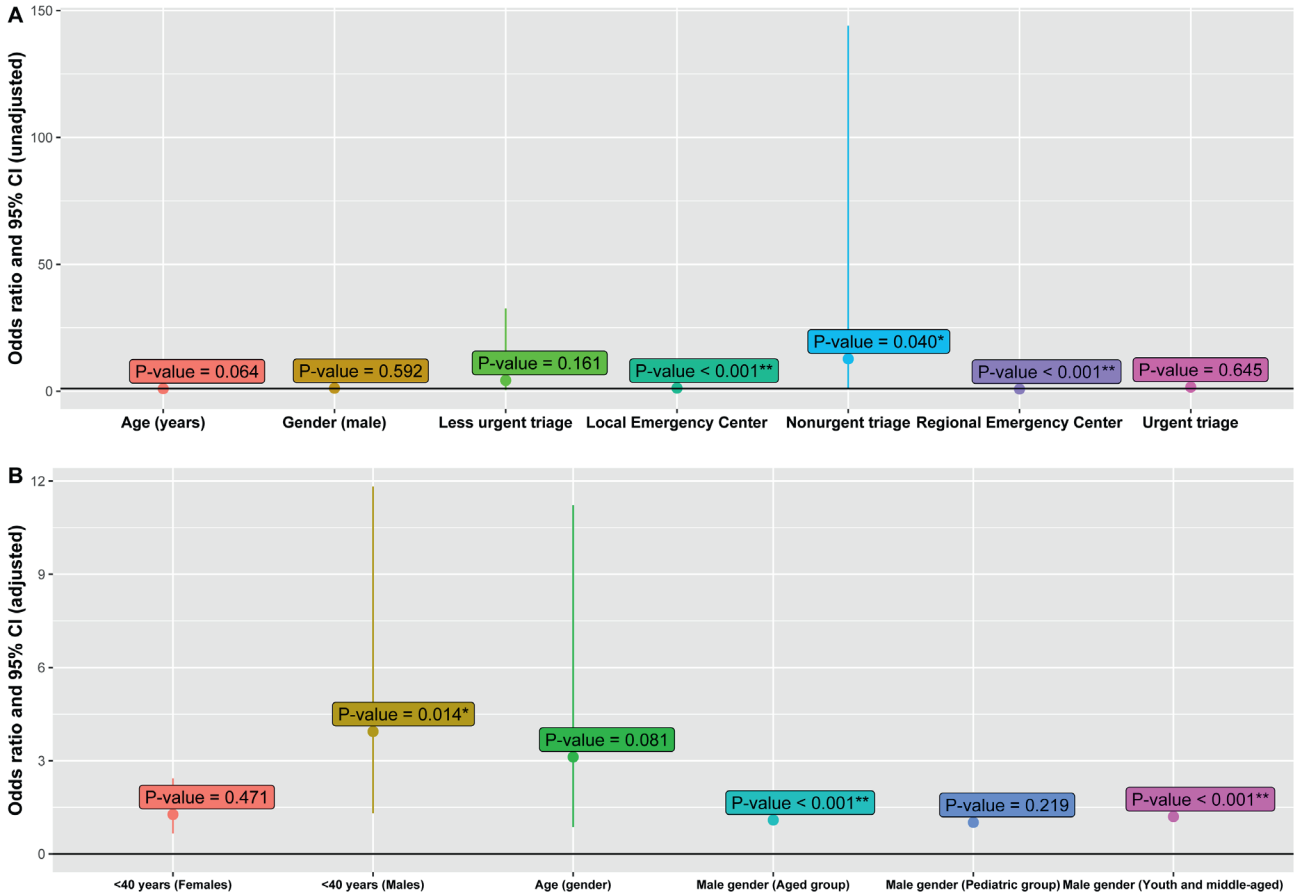

Figure 5. *OR and associated 95% CI of DAMA predictors. (A) Unadjusted factors and (B) adjusted factors.*

the decision. For that, the efficiency of medical staff and hospital environment should be considered in this regard. According to many studies in the literature, physicians and nurses' quality of medical service had the highest impact on patients' choice of DAMA [19,65,66]. Although the medical staff expected to provide a comprehensive overview to patients to make the right decision, Noohi et al. [19] found that most of the patients in their study did not have the adequate information about the side effects and outcomes of DAMA decision. Another study showed that most of the patients were discharged with their physician's order [67]. Additionally, patients' good relationship with the medical staff was recorded as a main factor helping to reduce the rates of DAMA [68]. Inadequate information among patients about the side effects and outcomes of their decision may be driven by the heavy workload of emergency staff, lack of medical staff knowledge/attention to the problem, and deficient manpower.

Our study should be interpreted with several limitations. Firstly, due to the inclusion of retrospective cohort studies in our study, selection bias could not be avoided. Secondly, significant heterogeneity was observed which stems from the different characteristics of the included populations regarding mean age, sex, occupation, financial levels, educational levels, and the country of the included patients. Finally, including three papers form Korea, out of 14 included ones, may bias the results.

Conclusion

DAMA prevalence in emergency departments is high. More attention should be devoted to those patients in relation to the possible DAMA causes for decreasing negative consequences resulted from committing DAMA.

Conflict of interest
The authors declare that there is no conflict of interest regarding the publication of this article.

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