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Review Paper: Prevalence of Vascular Trauma and Related Factors in Iran: A Systematic Review

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ABSTRACT

Background: Managing patients with Vascular Trauma (VT) is essential. This study aimed to determine the prevalence of VT and its related factors in Iran.

Methods: This systematic review was performed by two skilled researchers. To access all the Persian and English articles on VT and its influencing factors (from 2000 to August 2019), in addition to Google Scholar search engine, other international databases, such as PubMed/ Medline, Scopus, Embase, Cochrane Library, Science Direct, Web of Science (ISI), and domestic databases, such as Magiran, IranDoc, National Library of Iran Organization, SID, and Barakatkns were used. Data analysis was conducted by MA (CMA) software.

Results: The incidence of lower Lower Vascular Trauma (LVI) trauma was equal to 58.4 (95%CI: 41.1-73.8) (I2= 94.67, Q=112.57, P<0.001); the prevalence of upper LVI trauma was measured to be 31.5 (95%CI: 17.7-49.7) (I2=94.48, Q=108.70, P<0.001); the prevalence of penetrating trauma was calculated as 61.3 (95% CI: 49.5-71.9); the prevalence of ulnar nerve injury equaled 9.8 (95%CI: 2.8-28.6); the prevalence of radial nerve trauma was equal to 7.7 (95%CI: 1.2-35.4); the prevalence of death cases was reported as 12.3 (95%CI: 5.1-26.9); the prevalence of amputation rate was observed as 8.8 (95%CI: 5.7-13.4); the prevalence of fasciotomy rate was equal to 22.2 (95%CI: 13.2-34.5); the prevalence of complete artery cutting equaled 55.7 (95% CI: 35.4-74.3),and the prevalence of incomplete artery cutting was measured as 25.5 (95%CI: 12.1-45.9).

Conclusion: According to the study results, VT has led to various complications in patients; thus, it is critical to provide the necessary conditions to preserve the patient's life and prevent life-threatening complications. Such goals could be achieved by preventing this type of trauma and its related complications.

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1. Introduction

Trauma is considered an essential phenomenon in the field of public health and among the main causes of death and disabilities [1, 2]. Trauma imposes great direct and indirect socioeconomic costs on the community [3]. Post-trauma problems include depression [4], reduced quality of life [5, 6], capabilities [7], and spiritual health [8]. Trauma can adversely affect different parts of the body and develop complications, such as head trauma [9, 10], dental trauma [11], spinal cord injury [12, 13], vascular trauma [14], and so on. Vascular Trauma (VT) is among the major and most dangerous traumas [13].

Trauma is among the leading causes of death; among the types of trauma, vascular injuries can be among the most important causes of patients' death [15, 16]. The causes of VT can be attributed to blunt or penetrating; the prevalence and mechanisms of which vary across the world. The causes for their occurrence include falls, accidents, as well as knife and war injuries [17, 18]. Open vascular injuries can lead to patients' death; closed vascular injuries can lead to the amputation of patients; thus, they are very important [19, 20].

Managing patients with VT is crucial [21, 22]. These patients should be treated at eth soonest possible [23]. When taking remedies, in addition to time, other factors that can help prevent complications and treat the patient's conditions can be the extent of injury, the patient's previous arterial diseases, trauma to the soft tissue, and so on. Amputation occurs in cases in which ischemia is prolonged or is irreversible by physical examinations and tests [24, 25]. Post-Trauma issues include amputation, fasciotomy, arterial injury, and even death [26, 27].

The prevalence of trauma types is considered as a topic of various Systematic Review (SR) and Meta-Analysis (MA) studies. In a review study, Othman et al. examined burn injuries in 12 countries; accordingly, trauma was identified as one of the causes of death [28] (Figure 1). In a review study by AzamiAghdash et al., the prevalence of dental trauma was reported as 17.5% [29]. A review study by Ning et al. indicated that the incidence of trauma-related to spinal cord injury was reported between 12.06 and 61.6 per million [30]. Another review study by Azami Aghdash et al. explored the prevalence of injury. As a result, the Mean±SD injury severity score was equal to 8.1±8.6; however, this study did not specifically examine vascular injuries. Only a few related studies were reviewed in this field [31]; thus, estimating the prevalence of trauma is essential for this group of patients [32, 33].

Considering the increasing prevalence of trauma and the role of VT in patients' life, it is necessary to conduct studies on VT. No SR and MA have been conducted in this field; therefore, this study aimed to determine the prevalence of VT and its related factors in Iran.

2. Materials and Methods

This SR study was conducted based on the PRISMA by two researchers who were skilled in SR. In case of any disagreement, the search was conducted by another member of the research team [34].

All the Persian and English articles on VT and its influencing factors (from 2000 to August 2019) were obtained by various databases, including Google Scholar search engine, and other international databases, such as PubMed/Medline, Scopus, Embase, Cochrane Library, Science Direct, Web of Science (ISI), and domestic databases, such as Magiran (https://www.magiran.com/), IranDoc (https://irandoc.ac.ir), National Library of Iran Organization (ISI) (http://www.nlai.ir), SID (https://www.sid.ir), and (http://www.barakatkns.com) Barakatkns.

After the screening step, the articles were imported into the EndNote™ resource software and the duplicates were removed. To improve the quality of the search, the source list of the extracted articles was also searched.

Databases were searched using the following keywords: "Epidemiology, Prevalence, Trauma, Artery Injury, Vascular Trauma, Popliteal Artery Injury, Brachial Artery Injury, Vascular Surgery, Blunt Injuries, Popliteal Injuries, and Iran" (using AND & OR operators). An example of a search strategy is as follows:

(Epidemiology [title/abstract]) OR Prevalence [title/abstract]) AND Trauma[title/abstract]) OR Artery Injury [title/abstract]) OR Vascular Trauma [title/abstract]) OR Popliteal Artery Injury [title/abstract]) OR Brachial Artery Injury [title/abstract]) OR Vascular Surgery [title/abstract]) OR Blunt Injuries [title/abstract]) OR Popliteal Injuries [title/abstract]) AND Iran.

The study inclusion criteria based on PICO included the following [35]: population: in all papers in Iran, intervention: VT diagnosis based on diagnostic findings and/or clinical examinations, comparison: target variables, including gender, year, etc., and outcome: The results of the prevalence survey.

The exclusion criteria included SR, MA, and qualitative studies, sample size in the overseas population of Iran, publishing papers not in Persian or English languages, and not having the full text of the articles.

A checklist, including the author's name, the year of publication, Mean±SD Age, place, aim, type of trauma (penetrating, blunt), the prevalence of trauma (LVI, upper LVI), the place of injury (ulnar nerve, radial nerve), the complications of trauma (death rate, amputation rate, fasciotomy rate, complete cutting of the artery, & incomplete cutting of the artery). Data analysis was conducted by comprehensive MA (CMA) software.

3. Results

In this study, 610 articles were found in the primary search. The title and abstract of the extracted articles were reviewed; accordingly, 594 articles were excluded, finally, 16 articles were entered into the SR and MA. There were 1500 patients in the study and articles published between 2002 and 2015 years were included in the research. The details of the articles entered into the SR/MA step are presented in Table 1.

According to the result, the prevalence of lower LVI trauma was measured as 58.4 (95% CI: 41.1-73.8) (I2=94.67, Q=112.57, P<0.001). The prevalence of upper LVI trauma was measured as 31.5 (95%CI: 17.7-49.7). Publication bias for lower LVI trauma was Z=0.901, P=0.367; the same for upper LVI trauma was Z=0.150, P=0.88. The nerve injury results showed the prevalence of ulnar nerve injury to be 9.8 (95%CI: 2.8-28.6) and the prevalence of radial nerve trauma as 7.7(95% CI: 1.2-35.4) (Figure 2 & 3).

The prevalence of penetrating trauma was calculated as 61.3 (95% CI: 49.5-71.9). Moreover, the prevalence of lower LVI trauma was equal to 30.2 (95% CI: 22.5-39.2).

According to the research findings, lower LVI trauma rate equaled 54.8 (95%CI: 41.1-73.8), upper LVI trauma: 31.5 (95%CI: 17.7-49.7), penetrating trauma: 61.3 (95% CI: 49.5-71.9), blunt trauma: 30.2 (95% CI: 22.5-39.2), ulnar nerve injury: 9.8 (95% CI: 2.8-28.6), death rate: 12.3 (95% CI: 5.1-26.9), amputation rate: 8.8 (95%CI: 5.7-13.4), fasciotomy: 22.0 (95% CI: 13.2-34.5), complete artery cutting: 55.7 (95% CI: 35.4-74.3), and incomplete artery cutting equaled 25.5 (95% CI: 12.1-45.9).

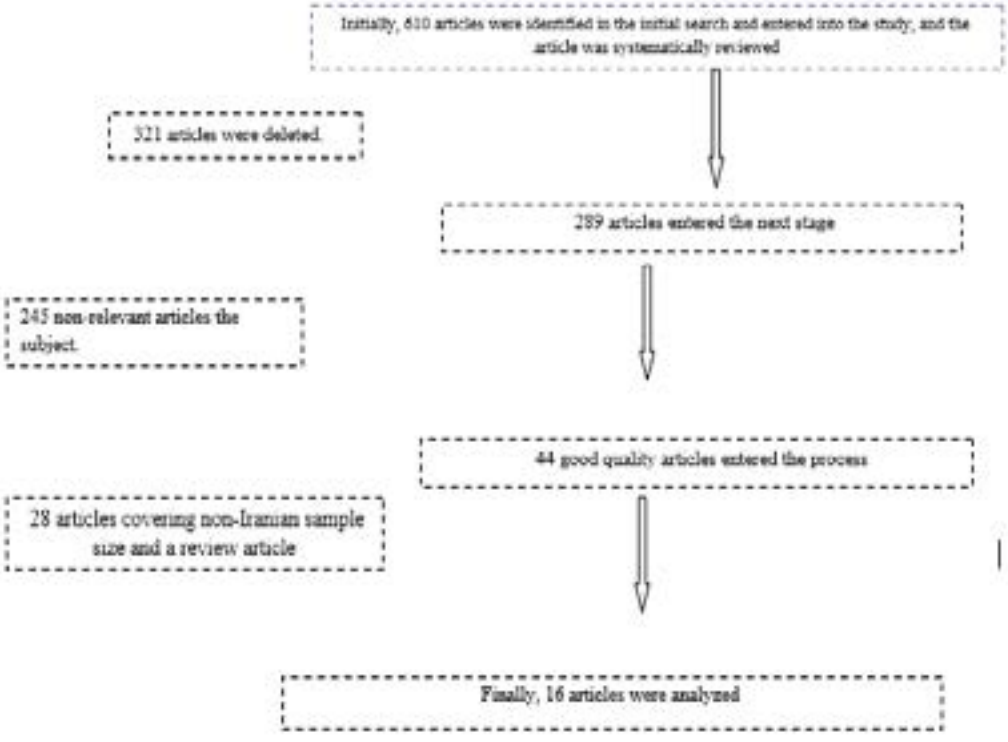

Figure 1. The flowchart of systematic review

Table 1. Characteristics of studies entered into the SR/MAphase

No.	Author (Years)	N	Age (Mean±SD)	Place	Aim	No. (%)										
						The Prevalence of Trauma					The Complications of Trauma					
						Penetrating	Blunt	Lower LVI	Upper LVI	Ulnar Nerve	Radial Nerve	Death Rate	Amputation Rate	Fasciotomy	Complete Cutting of the Artery	Incomplete Cutting of the Artery
1	Rasouli et al. (2009) [36]	130	27.13±13.87	8 major cities	Civilian TVI	91 (81)	19 (20.4)	-	-	9 (33)	3 (11)	5 (4.4)	3 (2.6)	-	-	-
2	Pourzand et al. (2010) [23]	62	34.1	Tabriz	Popliteal VBT	-	-	-	-			25 (40)	7 (11.3)	6 (9.7)	-	-
3	Moeini et al. (2002) [37]	100	-	Tehran	TVI	76 (76)	24 (24)	-	-	-	-	3 (3)	-	9 (9)	-	-
4	Hossieni et al.(2014) [38]	50	30.34±9.69	Tehran	acute radial or ulnar artery injury	-	-	-	-	14 (28)	34 (68)	0 (0)	-	-	34 (68)	16 (32)
5	Moosavi (2003) [39]	269	27.31	Tehran	War TVI	208 (77.3)	61 (22.7)	233 (87)	36 (13)	-	-	-	21 (7.80)	32 (42.2)	-	-
6	Davudi et al. (2010) [25]	50	28.43±12.45	Saris	Popliteal artery injury	0 (0)	50 (100)	50 (100)	0 (0)	-	-	-	17 (34)	22 (44)	-	-
7	Nemati et al. (2009) [40]	75	28.68±12.21	Tabriz	Arterial Injury in Limb Trauma	-	-	-	-	1 (1.3)	1 (1.3)	-	-	-	47 (62.7)	28 (37.3)
8	Ghafari et al. (2003) [41]	135	-	-	TVI	-	-	-	-	-	4 (2.9)	-	-	-	-	-
9	Baghi et al. (2015) [18]	88	29.12±11.20	Rasht	TVI	53 (60.2)	35 (38.8)	38 (43.2)	50 (56.8)	-	-	-	9 (10)	16 (18.2)	-	-
10	Rad et al. (2015)[42]	75	-	Birjand	Angiography in TAI	-	-	58 (77.3)	17 (22.7)	-	-	-	-	-	-	-
11	Rasouli et al. (2010) [43]	63	25.19±13.3	8 major cities	TVI	24 (38)	39 (62)	-	-	-	-	3 (5)	1 (5.5)	5 (28)	-	-
12	Salimi et al. (2006) [44]	123	26.8	Tehran	TVI	54 (43.9)	44 (35.8)	65 (59.1)	30 (27.3)	1 (0.8)	3 (2.4)	5 (4.06) 8 (6.5)	14 (11.4)	-	-	-
13	Nazem et al. (2009) [45]	52	9.7±3.7	Isfahan	TVI	41 (78.8)	11 (19.2)	12 (23.1)	35 (67.3)	-	-	-	-	1 (1.9)	-	-
14	Nazari et al. (2015) [46]	44	27.7±12.0	Ahvaz	Femoro-Popliteal VTS	16 (36.4)	28 (63.6)	-	-	-	-	16 (36.4)	5 (11.4)	18 (40.9)	-	-
15	Moini et al. (2008) [47]	27	27.84±11.70	Tehran	TBAI	20 (74)	7 (26)	-	-	-	-	-	1 (3.7)	-	-	-

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VBT: Vascular Blunt Trauma; TAI: Traumatic Arterial Injuries; PAT: Popliteal Artery Trauma; VTS: Vascular Trauma Surgery; TBAI: Traumatic Brachial Artery Injury; LVI: Limb Vascular Injuries; SR: Systematic Review; MA: Meta-Analysis.

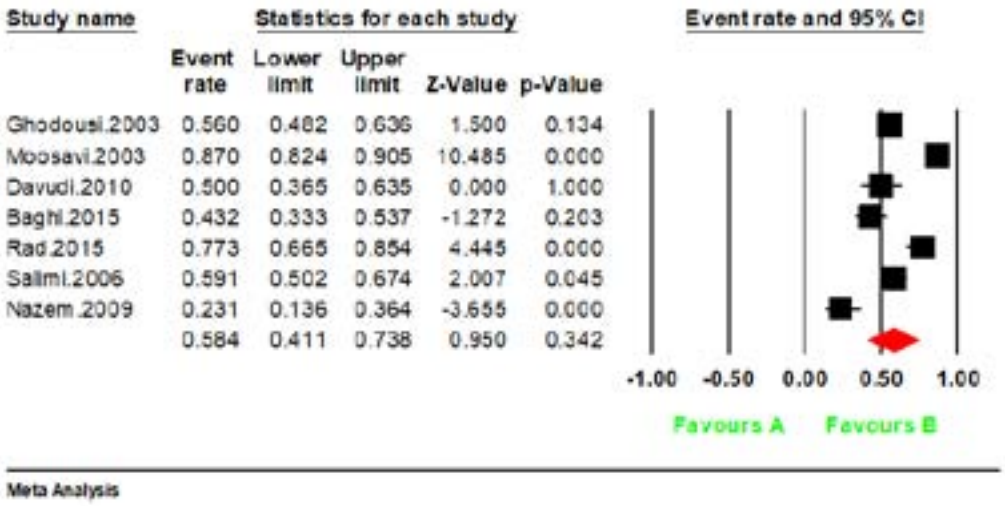

Figure 2. The prevalence of lower LVI trauma in patients with vascular trauma

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4. Discussion

Comparing the current study results as the first SR concerning VT and its related factors in Iran, with similar studies in other countries, is notable.

In the present study, the most common causes of trauma included accident [48-51], fall [52], and create hit [53]. Garg et al. conducted a research in India and concluded that 83.33% of patients had VT due to blunt trauma [48]. Additionally, the rate of blunt trauma in the study by Talbot et al. was measured as 3368 (57%) [49]; the same rate equaled 57% in the study by Eslami et al. [32]; all of which were reported to be above 50%. However, in a study by Ramdass et al., it accounted for 12(37%) and less than 50% of the causes of VT [50].

According to the obtained data, the incidence of death in these patients was equal to 12.3 (95%CI: 5.1-26.9). The mortality rate in a study by Eslami et al. on 3408 patients in the pediatric vascular injuries group was measured to be 7.9% [32]. Moreover, in a study by Dhillan et al. in India, the mortality rate of vascular injuries was equal to 6.52% [51]. Furthermore, in a cohort and retrospective study by Sharrock et al., this rate was equal to 10% [52], i.e., approximately the same as the current research results. However, according to Talbot et al., 5858 patients with vascular injuries had a mortality rate of 695 (21%), and the mortality rate of penetrating injuries was equal to 727 (31%) [49]. In a study by Prichayudh et al., the rate of mortality of 55 patients with abdominal vascular injuries was calculated as 40 (59%), i.e., greater than the rate mentioned in our study.

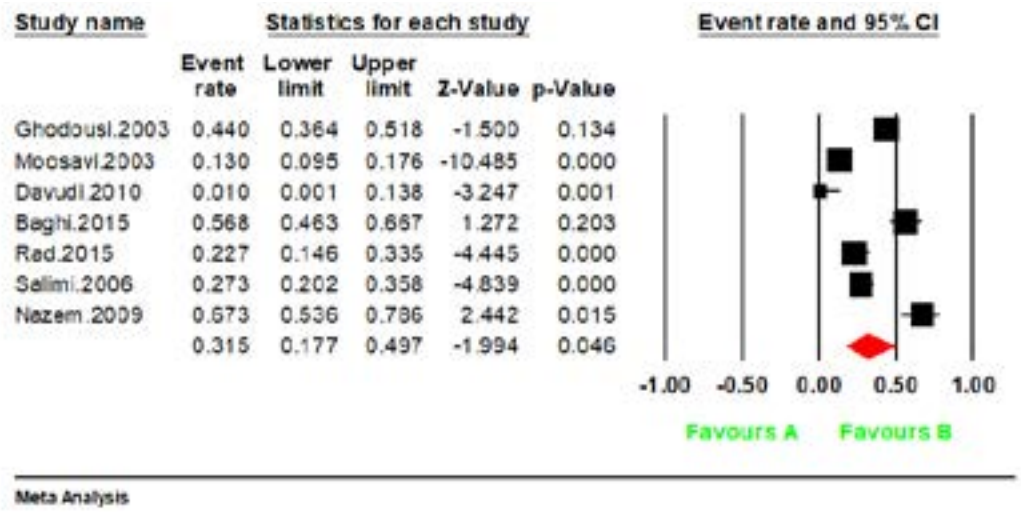

Figure 3. The prevalence of upper LVI trauma in patients with vascular trauma

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Furthermore, the rate of amputation was measured to be 8.8 (95%CI: 5.7-13.4). Garg et al. in India reported the rate of amputation of patients as 15(25%) cases [48]. Besides, a study by Ramdass et al. in India included 9 (28%) cases [50]. A study by Dhillan et al. included 3 (8.33%) cases [51]. However, in a study by Van Dongen et al. in the Afghan war injury group, the initial amputation rate was reported as 77.4% [53], which can be among the causes of trauma. Moreover, in a study by Van Dongen et al. [53] war injuries were studied, while all patients with different causes of VT were included in this study.

Failure to study the prevalence of vascular trauma based on geographical area, due to lack of geographical variation in studies was a limitation of this research. Besides, overlooking the investigation of VT based on gender, occupation, and socioeconomic status was another limitation of this study.

5. Conclusion

According to the present study results, VT has led to various complications in patients; thus, it is crucial to provide the necessary conditions to preserve the patient's life and prevent life-threatening complications. Such goals could be achieved by preventing this type of trauma and its complications.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of the he Student Research Committee, Kermanshah University of Medical Sciences (Code: IR.KUMS.REC.1398.811).

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Author's contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflicts of interest.

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