



Review Article

The prevalence of low back pain in emergency medical services personnel: A systematic review and meta-analysis

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ABSTRACT

Background & Aim: Among musculoskeletal disorders, low back pain causes the most common complaints among emergency medical services personnel worldwide. This study aimed to investigate the prevalence of low back pain among emergency medical services personnel.

Methods & Materials: We used the PRISMA guideline in the present systematic review and meta-analysis. The search was conducted in PubMed, Scopus, Web of Science, Cochrane, ProQuest, Science Direct, Google Scholar, and Embase using English keywords and SID, Irandoc, and Magiran data resources with equivalent Persian keywords. Studies were selected based on inclusion and exclusion criteria. The data were gathered without a time limit until the end of June 2021. The quality evaluation of the selected studies was performed using the Appraisal tool for Cross-Sectional Studies (AXIS) tool. The random-effects model was used for meta-analysis, applying the I^2 index as a measure to estimate heterogeneity among studies.

Results: In the present study, a total of 1038 articles were identified in the primary search, of which ten studies entered the final evaluation phase and meta-analysis after initial screening and removing duplicates. In these studies, 7499 emergency medical services personnel were examined; the prevalence of low back pain was 50.30% (95% CI: 37.98-62.62, $I^2=99.1\%$).

Conclusion: Our results indicated a considerable prevalence of low back pain among emergency medical services personnel. Also, the heterogeneity between studies was very high. It is recommended to teach the correct methods of lifting the stretcher and equipment as well as redefining the duties of the staff with low back pain.

Introduction

Low Back Pain (LBP) encompasses any pain or discomfort in the lower part of the back with or without the involvement of the legs (1). Low back pain is the most important debilitating factor in the workplace and imposes a significant economic burden on

governments by influencing people's lifestyles (2).

Musculoskeletal Disorders (MSDs) are noticeably rising among healthcare providers (3). Emergency Medical Services (EMS) personnel, one of the key groups providing



medical services to patients in critical and dangerous situations, are exposed to a number of occupational hazards, including LBP (3-5). Therefore, MSDs are one of the most common complaints of EMS personnel because these persons, such as lifting patients, transporting patients to stretchers, and transporting patients from ambulance to hospital, are prone to especially back problems (6-8). Also, EMS personnel work in stressful environments and meet various patients with physical and mental problems (9, 10). Studies have shown that job stress has been a major cause of musculoskeletal problems in EMS personnel (11).

The results of a study in South Korea showed that 85.1% of EMS personnel experienced LBP (12). Also, Studnek et al. showed that 50.5% of EMS personnel complained of back and leg pain for one or more days during a 2-week period, and parameters such as a history of back problems and job satisfaction were associated with back pain and its severity (13). MSDs significantly affect the quality of life and can lead to varying degrees of disability, long-term illness, work restrictions, high treatment costs, and absenteeism (14). According to studies, about 40% of the cost in India is spent on treatment for work-related injuries. Also, the cost of work-related musculoskeletal disorders is estimated to have been around 38 billion Euros in 2002 in Germany (15). Therefore, LBP is one of the most common reasons for changing jobs and early retirement and the main concern affecting the quality of life and work productivity (16).

Since EMS personnel are the first responders to accidents and have an essential role in saving patients' lives during emergencies and disasters, they face numerous stressful and dangerous situations, so their physical health can affect their quality of performance. Numerous primary studies have been performed on the prevalence of LBP among EMS personnel; however, a comprehensive systematic review is not available on these studies. In the present systematic review and meta-analysis, we aimed to determine the prevalence of LBP among EMS personnel. This research results

can be used to implement planning and policies to ensure the health of EMS personnel.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was employed for conducting the present systematic review and meta-analysis (17). The protocol of this review was also registered in the International Prospective Register of Systematic Reviews (PROSPERO) database under the code CRD42021287522. According to the PRISMA checklist, the steps of literature search, study screening and selection, quality assessment, and data extraction were all performed. In the stage of selecting studies, quality assessment, and extracting the data, disagreements between the two authors were resolved by group discussion

Search strategy and databases

The data of this research were obtained by searching the data sources of PubMed, Scopus, Web of Science, Cochrane, ProQuest, Science Direct, Google Scholar, and Embase, as well as SID, Irandoc, Magran. For this purpose, the valid English keywords and their Persian equivalents include "Low Back Pain", "Lumbago", "Lower Back Pain", "Low Back Ache", "Low Backache", "Postural Low Back Pain", "Recurrent Low Back Pain", "Mechanical Low Back Pain", "Emergency Medical Staff", "Emergency Medical Personnel", "Prehospital Emergency Personnel", "Prehospital Emergency Staff", "Emergency Medical Technician", "Emergency Paramedic", "Emergency Medical Technician", "Paramedic" were used. Also, other resources including a reference list of selected articles, systematic reviews, key journals, and conference and congress papers, were searched. Keywords, Search fields, and Operators were used to compiling search strategies. The searches were conducted in both Persian and English with no time limit until the end of June 2021.

Search strategy in PubMed including: ("Low Back Pain*" OR Lumbago OR

"Lower Back Pain*" OR "Low Back Ache*" OR "Low Backache*" OR "Postural Low Back Pain" OR "Recurrent Low Back Pain" OR "Mechanical Low Back Pain" OR "Musculoskeletal disorder*") AND ("Emergency Medical Services personnel" OR "Emergency Medical Services Staff" OR "Prehospital Emergency personnel" OR "Prehospital Emergency Staff" OR "Emergency Medicine Technician*" OR "Emergency Paramedic*" OR "Emergency Medical Technician*" OR "Paramedic*").

Inclusion and exclusion criteria

Both Persian and English studies reporting LBP prevalence among EMS personnel were enrolled. On the other hand, reviews, qualitative studies, interventional studies, those reporting the prevalence of mid and upper back pain, and studies without full-text availability were excluded.

Selection of studies

In order to manage the retrieved references, all of them were initially entered into the EndNote 7 software. After excluding duplicates, 823 studies were screened by reading their titles and abstracts. Next, two researchers (AS and MG) independently assessed 36 possibly related studies in detail, of which ten studies were finally selected.

Quality assessment

Two researchers (AS and MG) independently assessed the quality of the ten selected studies using the Appraisal tool for Cross-Sectional Studies (AXIS) tool (18). The tool comprises 20 questions, delivering the minimum and maximum scores of 0 and 20, respectively. Higher scores based on the AXIS tool indicate higher quality studies.

Extracting the data

Two researchers independently evaluated all the studies entering the final step (AS and MG), and the intended data (the first author's name, the study's location

and year of publication, sample size, and the prevalence of LBP) were extracted using a pre-prepared checklist.

Statistical analysis

In this study, the random-effects model was used for meta-analysis. The heterogeneity rate among the studies was checked using the I^2 index. I^2 less than 25%, 25-50%, 50-75%, and above 75% indicate no heterogeneity, moderate heterogeneity, high and very high, respectively (19). Also, publication bias was estimated based on Begg's test. Meta-regression was used to investigate the relationship between the year of the study and the prevalence of LBP. The effect of any single study on the study's overall results was evaluated using Sensitivity analysis. Data analysis was performed in STATA software (version 14).

Results

In the present review, 1038 studies were identified in the primary search. After removing duplicates, 823 studies remained for screening, out of which ten studies finally entered the qualification and meta-analysis phases (Figure 1). In the finally evaluated studies, a total of 7499 EMS personnel were examined. The quality score of the included studies based on the AXIS tool ranged from 12 to 18. The methodology of all the selected studies was cross-sectional (Table 1). In this study, the prevalence of LBP among EMS personnel was 50.30% (95% CI: 37.98-62.62, $I^2 = 99.1\%$).

The I^2 index showed a very high heterogeneity among the studies (Figure 2). The results of the meta-regression showed that the prevalence of LBP among EMS personnel increased over time at a steep pace (Figure 3). Based on Begg's test ($p = 0.788$), publication bias in the present study was insignificant. Based on the results of the sensitivity analysis, the prevalence of LBP in EMS personnel did not change after the exclusion of any single study (Figure 4).

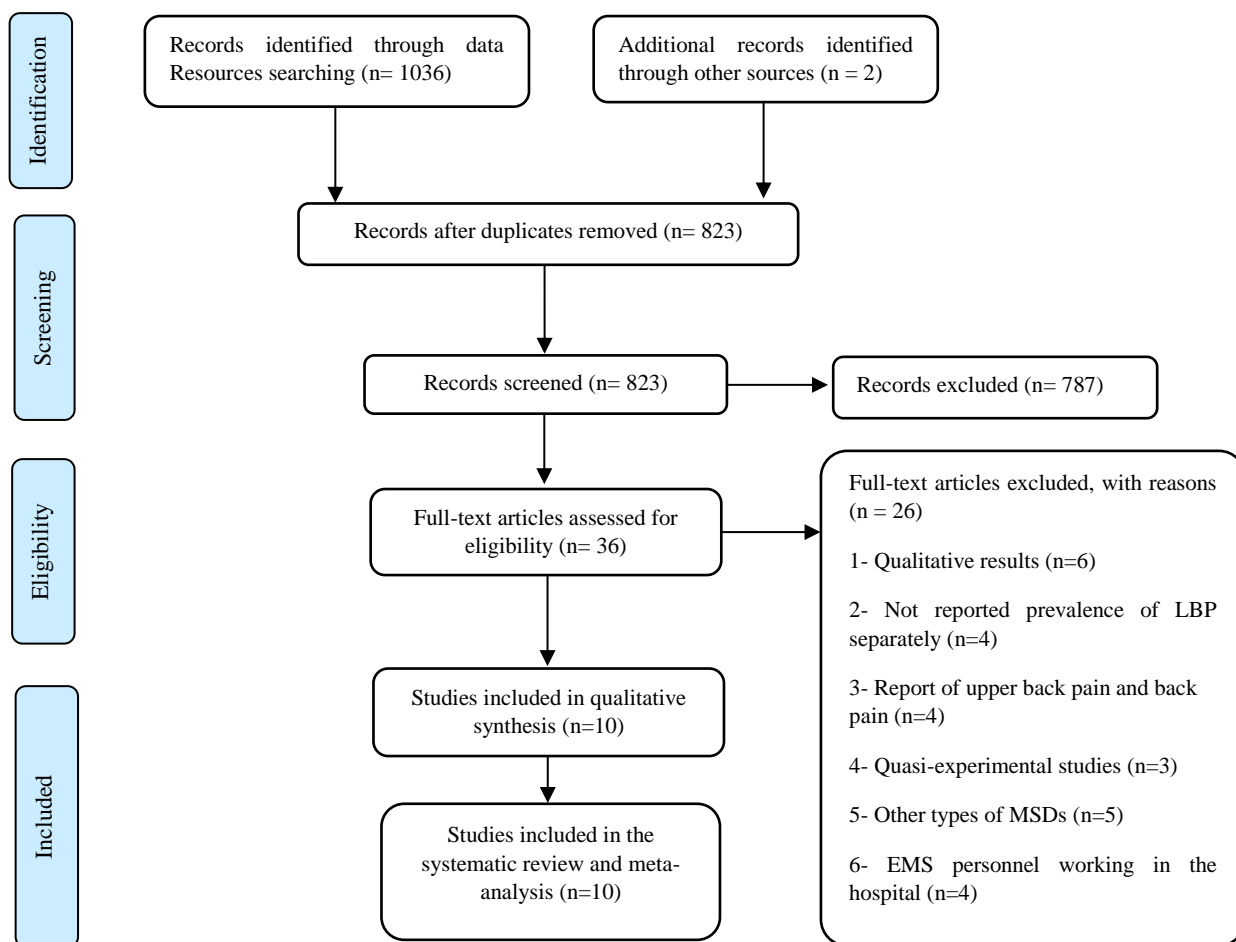


Figure 1. Flowchart of the Selection of Studies Based on PRISMA

Table 1. The specifications of studies included in the systematic review and meta-analysis

First name author	Location	Year of publication	Sample size	Prevalence of LBP
Zhang (20)	China	2019	498	66.03%
Tuan Lonik (21)	Malaysia	2017	143	65.0%
Osae (22)	Ghana	2019	151	48.2%
Imani (23)	Iran	2019	298	46.3%
Kılınc (24)	Turkey	2020	372	75.3%
Aljerman (6)	Saudi Arabia	2018	360	37.2%
Okada (25)	Japan	2012	1551	19.8%
Kim (26)	South Korea	2017	3906	31.8 %
Rahimi (3)	Iran	2015	75	39.4%
Alnaami (27)	Saudi Arabia	2019	145	74.5%

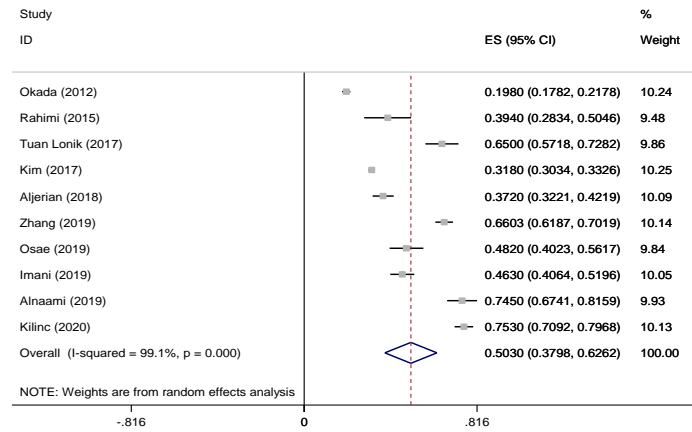


Figure 2. The forest plot of overall and individual prevalence of LBP in EMS personnel with 95% confidence interval

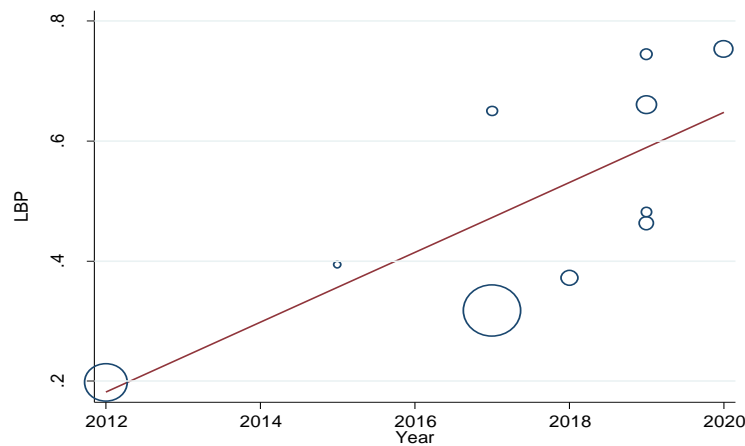


Figure 3. Meta-regression based on the relationship between the year of study and prevalence of LBP in EMS personnel

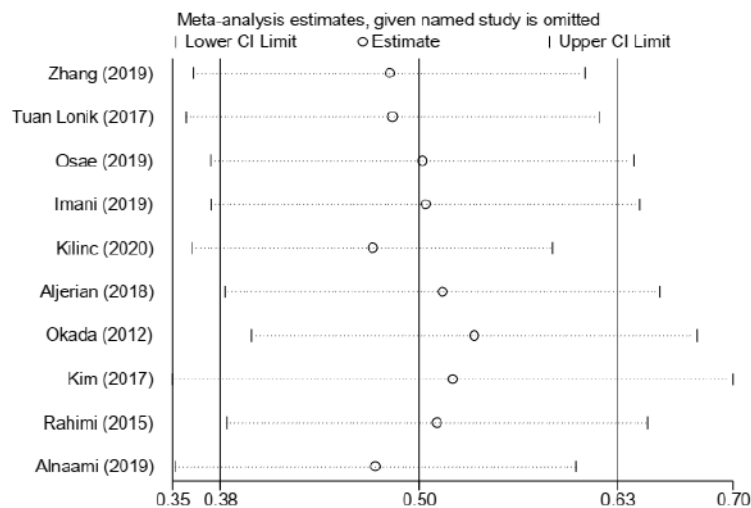


Figure 4. Sensitivity analysis for the prevalence of LBP in EMS personnel

Discussion

The results of this systematic review and meta-analysis showed that the prevalence of LBP among EMS personnel was 50.30%. A meta-analysis by Al Amer et al. showed that the prevalence of LBP among health care workers was 40.8% and 65% during the week and year, respectively (28). The results of another systematic review and meta-analysis study by Azizpour *et al.* showed that the prevalence of LBP among Iranian nurses was 63% (29). Likewise, Wong *et al.* in a systematic review and meta-analysis, reported that the prevalence of LBP among nurses was 44% (30). In fact, health care workers can be vulnerable to LBP due to job-related physical and emotional factors (31). The mentioned studies are consistent with the present one in reporting LBP prevalence among health care providers. EMS personnel play an important role in transporting patients among health care providers. According to a comprehensive review study, some risk factors of MSDs in EMS personnel originated from working in inappropriate positions, lifting and placing patients in the ambulance, and performing cardiopulmonary resuscitation (32). On the other hand, these people may not adhere to ergonomic principles when moving patients, exposing themselves to LBP. Therefore, it is suggested to provide in-service training to educate these individuals about the ergonomic principles of patient transfer.

As the first responders in emergencies, EMS personnel immediately show up at the bedside of patients with critical conditions, so they may be exposed to MSDs and job burnout due to physical and emotional pressures. On the other hand, their quality of work and life is affected, deflecting their performance. LBP has significant social, psychological, and economic consequences, also other its consequences including disability, activity limitation, frequent absences, and sick leave (27). Therefore, it is necessary for pre-hospital emergency managers and policymakers to consider the history of musculoskeletal diseases in their

initial recruitment examinations. Teaching the correct methods of lifting the stretcher and carrying the patient and equipment, including regular exercise and strengthening physical strength in the work plan to prevent back pain, redefining tasks, and treating staff with a history of low back pain are other steps that can be done to help them. Therefore, it is necessary for managers and policymakers in the prehospital emergency field to implement practical measures (such as investigating LBP at employment, avoiding recruiting people with a history of MSDs, educating proper methods for lifting stretchers and equipment, strengthening the paravertebral muscles by incorporating regular exercises in work schedules, and redefining the duties of and treating personnel with a history of LBP) to prevent and manage back pain and its consequence among EMS personnel.

According to studies, several factors can directly affect the incidence of LBP in EMS personnel. Among the most important of these factors have been lifting overweight patients, being a female or obese, lack of support from supervisors, compulsion to continue work despite back injury, providing care to the injured patients lying on the ground, cardiopulmonary resuscitation, driving the ambulance for long hours, transporting patient and carrying emergency equipment, performing emergency procedures in the standing position, climbing stairs while carrying a patient, frequent bending while working, long-lasting sitting in the ambulance cabin, stress of being responsible for saving patients' lives, witnessing stressful shocking scenes, maintaining the safety of oneself and colleagues while providing care, time limitation, being responsible for protecting the ambulance against damage, job dissatisfaction, passing inadequate training courses, having insufficient skills on how to properly transport the patient, the lack of proper equipment for transporting patients, and finally the lack of sports facilities for emergency personnel (7, 13, 20, 23, 33). Due to the presence of multiple factors affecting the development of LBP, studies have

suggested the necessity of considering physical and mental criteria for hiring people for this job. Strict medical examinations for the applicants of this profession at the beginning of employment, as well as periodic examinations to check personnel's health status, can help support them physically and mentally in case of developing LBP.

According to the results of meta-regression in this study, the prevalence of LBP is increasing with a steep slope, probably due to the growth of populations, increasing urbanization, and people's becoming aware of prehospital emergency services and consequently a rise in the number of missions. According to studies, age and work experience are directly associated with back pain, so more advanced age and a higher work experience increase LBP risk (23). In a study in Portugal, Davison *et al.* found that 90.2% of EMS personnel experienced LBP (34). Considering that various risk factors can increase the risk of LBP in EMS personnel with individual and biomechanical propensities, it is recommended to determine the level of awareness of managers and staff about the preventive principles of LBP and strategies to deal with this major health problem.

Strengths & Limitations

This research is the first study to investigate the prevalence of LBP in EMS personnel. One of the limitations of this study was the very high heterogeneity among the studies, which could be due to different sample sizes and data collection tools. Also, some studies did not report the age and gender of participants, which was another limitation of this review. Another limitation of this systematic review and meta-analysis study was that all studies were conducted in Asia and Africa.

Conclusion

The results of this study showed the considerable prevalence of LBP among EMS personnel, indicating that this problem is a major occupational threat in this job. Therefore, the considerable prevalence of

LBP among EMS personnel and the devastating effects of this problem on employees' physical and mental health pose a major challenge to the health system. To manage the problems associated with LBP, it is recommended to educate correct methods of lifting stretchers and carrying the patients and equipment, including regular exercise and strengthening physical strength in the work plan to prevent back pain and redefine the duties of the staff with a history of LBP.

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Conflict of interest

The authors declare that they have no conflict of interest.

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