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Systematic Review / Meta-analysis

Low back pain and its related risk factors in health care providers at hospitals: A systematic review☆

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ABSTRACT

Background: Health care personnel are exposed to ergonomic hazards, musculoskeletal disorders, and other work-related injuries. Low back pain is the most common musculoskeletal disorder. The aim of this study was to determine the prevalence of low back pain and the risk factors in health care personnel at the hospital in a form of a systematic review and meta-analysis.

Methods: In this systematic review and meta-analysis, the articles published in international electronic databases including Web of Knowledge, Embase, Scopus, PubMed were searched until May 2019. We included cohort, case-control and cross-sectional studies estimate the prevalence and risk factors for low back pain in health personnel. Data were analyzed using Stata-14 software and random effect model at 95% confidence level.

Findings: 154 studies were included in the study for analysis. The estimated lifetime prevalence of lower back pain in health care personnel was 54.8%. The estimated odds ratios were as follows: age 1.23, female gender 1.11, BMI 1.17, lack of regular physical activity 1.56 occupational factors 1.12, patient related factors 1.24, body position at work 2.55, and stress 1.67.

Conclusions: /application to practice: The prevalence of low back pain in health care personnel is high. Body position at work, stress and lack of physical activity were the strongest risk factors, respectively. Future studies and educational programs are required to reduce the incidence of low back pain in health care personnel.

1. Introduction

The prevalence of low back pain is high among health care personnel. In European countries and the United States, low back pain is one of the most common and costly health problems among health care personnel [1,2]. According to other studies, the lifetime prevalence of low back pain is 66.6% among healthcare workers aged between 30 and 49 years [3]. Lower back pain is also associated with psychosocial factors such as (stress, lack of sleep, and fatigue during the day) [4,5].

In different categories of healthcare providers, nurses have the highest incidence of low back pain [6]. Every year, thousands of nurses around the world face lower productivity, receiving medical services and early retirement due to low back pain [7,8]. Some nurses in intensive care units suffer from low back pain due to prolonged flexion, high workload, and long patient time [9]. Also, carrying patients and changing their posture requires a set of movements and postures that bend and twist hands and back, and repetitive movements cause a lot of compressive forces and shear on the spine [10]. The prevalence of musculoskeletal disorders in hospital staff showed that the frequency of these disorders in different organ systems varies [11]. Since lower back pain is a multifactorial disorder, various physical and mechanical risk factors can contribute to the pain and progression [12]. Risk factors such as demographic or occupational factors (nurses have the highest rate of low back pain compared to other categories) of the workplace (internal medicine, orthopedics and neurology reported the highest rate of low back pain) [13], many factors related to working conditions such as shifts, patient conditions, recreation and leisure activities and patients' weight can contribute significantly to the pain [14]. Age is also an

☆ The study was approved by the board of ethical committee of Hamadan University of Medical Sciences, Hamadan, Iran (IR.UMSHA.REC.1398.390).https://ethics.research.ac.ir/ProposalCertificateEn.php?id=76876&Print=true&NoPrintHeader=true&NoPrintFooter=true&NoPrintPageBorder=true&LetterPrint=true.

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important factor that has a significant relationship with low back pain in various studies [15]. Because with age, the probability of osteoporosis increases and the supporting muscles become weaker, and also with increasing years of work and the passage of time, the probability of physical injuries increases [16]. Other factors that can be associated with increased prevalence of lower back pain in healthcare workers include BMI, gender and stress [17].

Patients with low back pain are seen to have difficulty in actively controlling the movement of lower back. The pain is reported to interfere with the activity of health care professionals, as a result of physical inactivity and deconditioning [18]. This can lead to hindrance in effective patient care, loss of working days and additional financial burden [7]. Studies are, therefore, required to investigate the factors that contribute to back pain in health care personnel in order to provide prevent it and provide timely management at its onset. This systematic review and meta-analysis is aimed to determine the prevalence of lower back pain and related risk factors in health care personnel at hospitals.

2. Methods

In this systematic review and meta-analysis, all observational studies including cohort, case-control, and cross-sectional, regardless of language and print status, were included in the study. The population of this study was all health care personnel at hospitals. Risk factors (intervention/exposure) evaluated included: age, sex, body mass index, regular physical activity, occupational factors (work shift, workplace ward, and work experience), patient-related factors (movement, patient movement, and dressing), stress and posture of the body during work (standing, sitting, body rotation). All studies that examined these risk factors or the association of one of these risk factors for low back pain were included in this research. The control group included medical personnel who did not have lower back pain.

In this study, in order to extract the required data, articles published in databases and other valid Latin search engines until May 2019 were used. These resources include Web of Science of Knowledge, Embase, Scopus, and PubMed. To explain the search strategy, use the keyword combination of Prevalence OR incidence OR occurrence OR commonness OR frequency AND back pain OR low back pain OR sciatic neuropathy OR lumbar pain OR coccydynia OR back disorder AND health personnel OR nurse OR physician OR health worker OR Hospital staff OR doctor OR healthcare workers OR Healthcare Provider OR Medical Staff OR health Staff AND Risk factors and other related factors were used. To access more resources, the site of related conferences and the resource list of selected articles were reviewed for further study.

The study population in this study included all medical personnel without age, sex,- and racial restrictions.

In order to extract information from selected articles, a summary and collection form was designed and used in an electronic data spreadsheet. Extracted information included: name of the first author, year of publication, country, sample size, gender, age, body mass index, regular physical activity, job factors (work shift, workplace department, work experience, etc.), factors related to patients (movement, patient movement, dressing, etc.), stress, posture at work (prolong standing, long sitting, body rotation, etc.) and the effect size reported in the studies included odds ratio, relative risk and hazard ratio with 95% confidence interval.

In order to ensure the correct selection of articles related to the research topic and in accordance with the inclusion criteria, two researchers (Heshmati and Mousavi) were responsible for selecting articles. The names of the authors of the articles, the names of the journals and their results were not hidden from these researchers. In cases of disagreement, the decision was made through negotiation.

In this study, the Newcastle Ottawa Checklist [19] was used to evaluate the quality of studies and possible biases. This checklist allows evaluating the risk of deviation in studies. A maximum of 9 stars is assigned to the following areas: how to select samples, ability to compare groups, how to evaluate exposure and outcome. The evaluation was conducted by two researchers independently, in cases where there was disagreement between the researchers, decisions were made through negotiation.

The study outcome was the presence of low back pain (with a medical diagnosis based on standard criteria). Relative risk (RR) and odds ratio (OR) were used to measure the effect of risk factors on the study outcome. All results were estimated and reported at 95% confidence level.

The outcome was the presence of lower back pain, which was reported based on medical diagnosis using standard criteria in studies. To examine the heterogeneity of the studies in the present meta-analysis and to hypothesize that all studies evaluate the same effect, the I^2 test was employed, that describes the percentage of overall heterogeneity between studies and τ^2 (tau) was used to examine the variance between studies. Bias in publishing studies was investigated using Begg and Egger statistical tests and Trim & Fill method. The Trim & Fill method is a statistical technique that estimates the number of possible studies not found based on the symmetry of the funnel diagram, and then reports two outcomes, one without considering the possible studies and the other by applying the effect of possible studies [20].

Stata 14 statistical software was used to analyze the data. A statistical model of random effect at 95% confidence level was used to analyze the data. In the stochastic model, it was assumed that the measured parameter has a normal distribution and each study has at least measured a part of it. Therefore, in the stochastic model, the observed differences between the results of the initial studies have two roots, one due to the accidental result of repeated sampling and the other due to random changes in the actual value of the parameter in different studies.

The study was approved by the board of (XXX).

Unique identifying number is: researchregistry7143.

The work has been reported in line with the PRISMA criteria [21].

The level of compliance with AMSTAR 2 [22].

3. Results

Fig. 1 shows the process of reviewing and selecting studies for meta-analysis. A total of 4462 studies were obtained as of May 22, 2019, of which 4425 studies were obtained from electronic database searches and 37 studies were obtained from reviewing the source list of selected articles. 1494 duplicate studies were identified and removed. Of 2968 studies reviewed further, 2743 studies were deleted due to lack of relevance to the objectives. A total of 225 studies were selected to review the full text, of which 71 studies did not meet the conditions for inclusion in this study, structured review and meta-analysis, and finally 154 studies were selected for analysis.

Estimated the prevalence of low back pain in health care personnel is presented in Fig. 2. The prevalence of low back pain was reported in 112 studies that were included in the meta-analysis. Based on the results, the lifetime prevalence of low back pain in health care personnel was estimated at 54.8% (with a confidence interval between 57.4 and 52.8). The results of heterogeneity studies for I2 was equal to 96.3% and for τ^2 was equal to 0.018.

Estimation of the relationship between age and low back pain in medical staff using a random effect model based on odds ratio is presented in Fig. 3. Based on the results, the odds ratio for the relationship between age and low back pain was estimated to be 1.23 (with a confidence interval between 1.32 and 1.13). The results of heterogeneity between studies were 81.6% for I2 and 0.0111 for τ^2.

Estimation of the relationship between gender and low back pain in medical personnel using a random effect model based on odds ratio is presented in Fig. 4. The odds ratio of the relationship between female gender and low back pain was estimated to be 1.11 (with a confidence interval between 1.24 and 0.99). The results of heterogeneity between studies were 0% for I2 and 0.00% for τ^2.

Fig. 5 shows the relationship between body mass index and low back

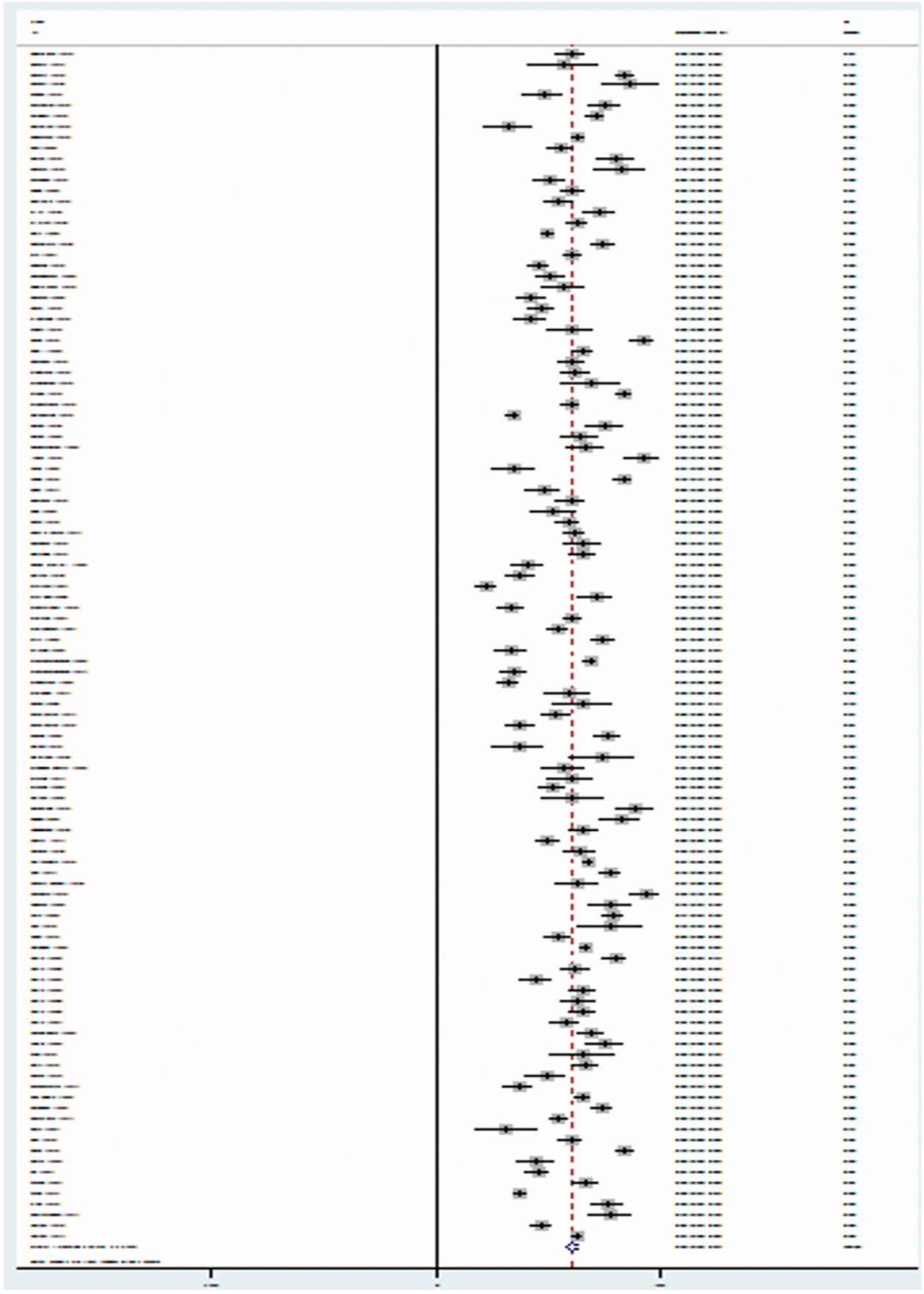

Fig. 1. Accumulation chart of low back pain prevalence in medical staff.

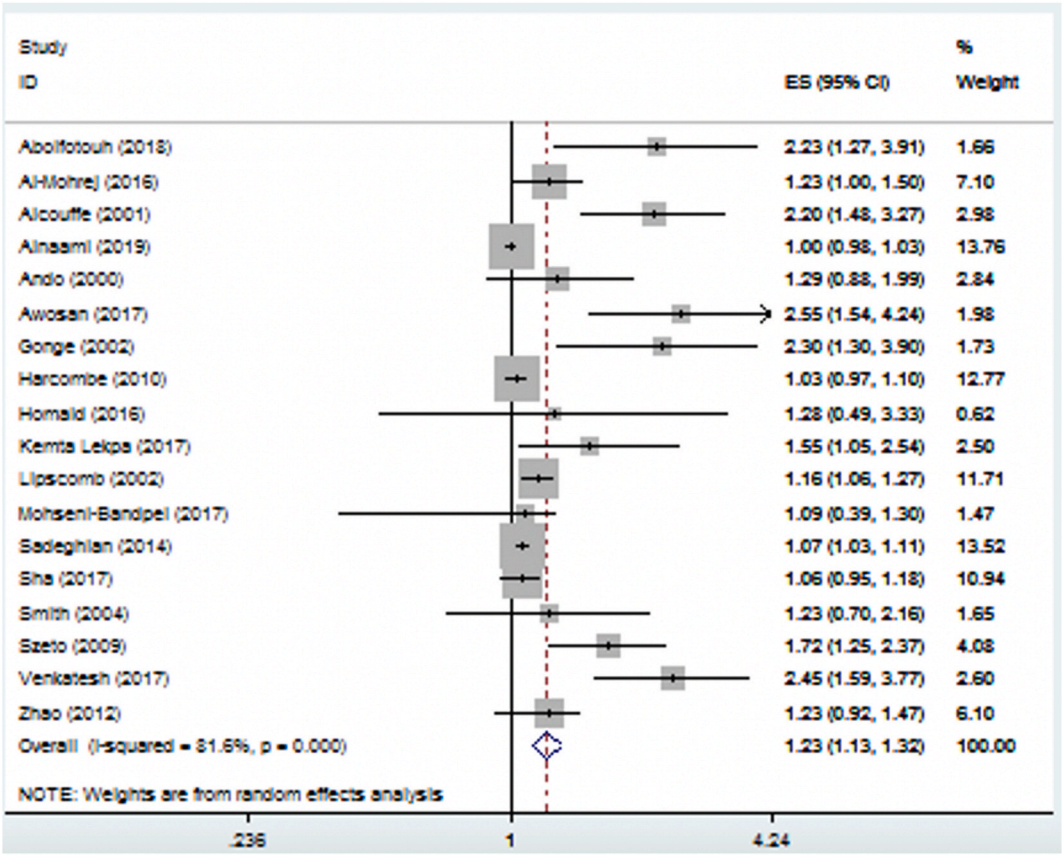

Fig. 2. Accumulation diagram of the relationship between age and low back pain in treatment personnel.

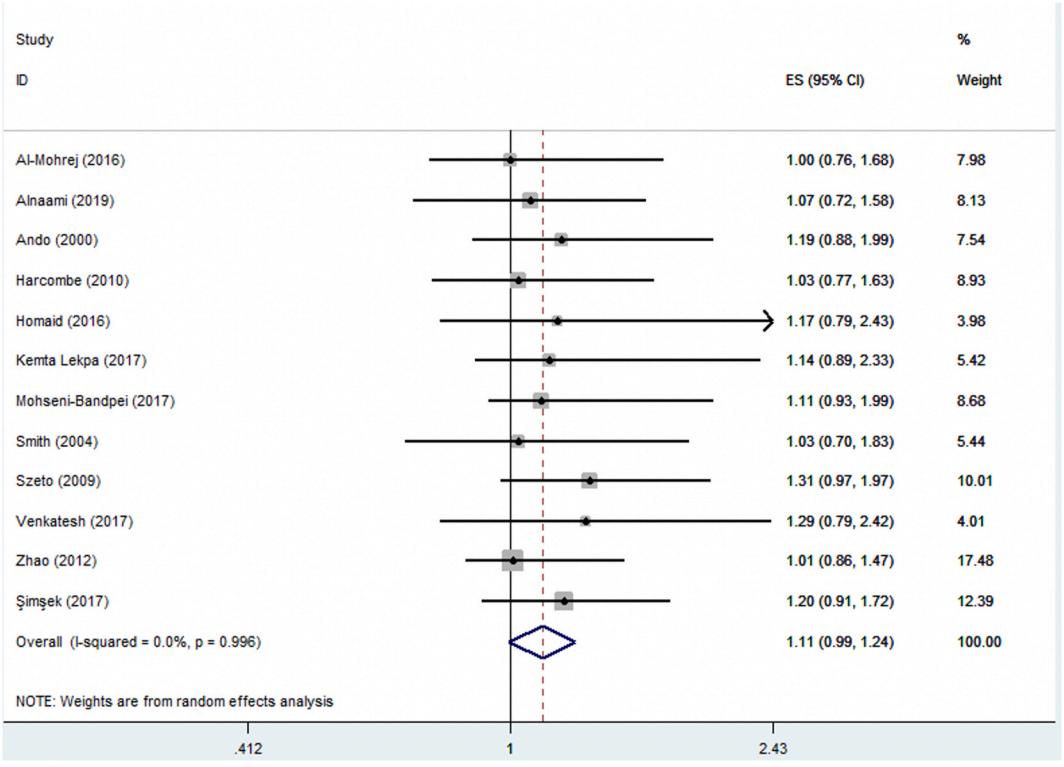

Fig. 3. Accumulation chart of the relationship between gender and low back pain in treatment personnel.

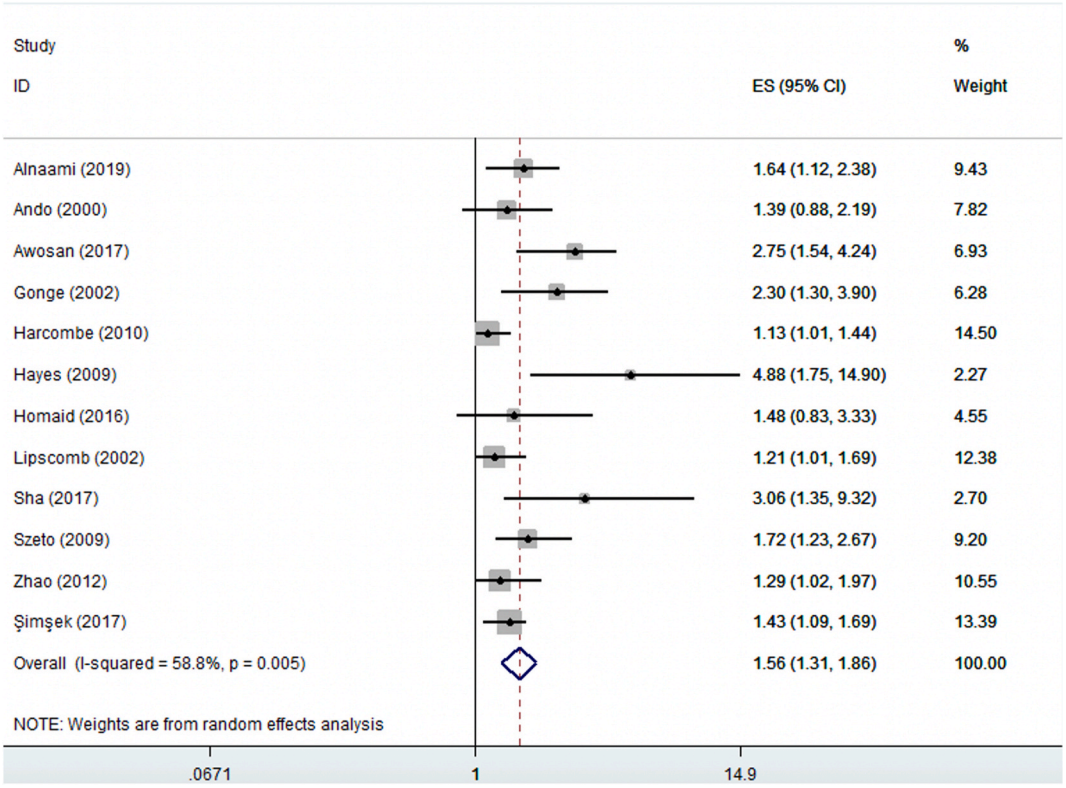

Fig. 4. Accumulation chart did not correlate between regular physical activity and low back pain in treatment personnel.

pain. The odds ratio for the relationship between body mass index and low back pain was estimated to be 1.17 (with a range of 1.28 to 1.07). The results of heterogeneity between studies were 31.9% for I2 and 0.0062 for τ^2.

The odds ratio for the lack of physical activity with low back pain was estimated to be 1.56 (with a confidence interval between 1.86 and 1.36). The results of heterogeneity between studies were 58.8% for I2 and 0.0458 for τ^2, shown in Fig. 6.

The odds ratio for the relationship between occupation-related factors and low back pain was estimated to be 1.12 (with a confidence interval between 1.186 and 1.07). The results of heterogeneity between studies was 76.9% for I2 and 0.0044 for τ^2.

The odds ratio for the association of patients-associated factors with low back pain was estimated to be 1.24 (with a confidence interval between 1.35 and 1.13). The results of heterogeneity between studies were 51.9% for I2 and 0.0247 for τ^2.

Based on the results, the odds ratio for the relationship between body posture at work and low back pain was 2.55 (with a confidence interval between 3.62 and 1.79). The results of heterogeneity between studies were 82.3% for I2 and 0.2814 for τ^2.

The odds ratio for the relationship between stress and low back pain was 1.67 (with a confidence interval between 2.04 and 1.36). Heterogeneity results between studies regarding I2 were equal to 89.0% and about τ^2 were equal to 0.0514.

4. Discussion

Low back pain is known in various studies as the most common musculoskeletal disorder [23]. Its prevalence among health care workers can impair the functioning of the health care system [24]. Assessing the risk factors for these injuries are important to design and implement intervention programs and improving the working conditions of health care providers [25]. The results of the present study showed that the prevalence of lower back pain in health care personnel is 54.8% [26]. Among the factors studied, age, body mass index, lack of regular physical activity, occupational-related factors, patient-related factors, posture at work and stress associated with lower [27]. Gender was not associated with back pain.

In the present study, the age of health care staff was identified as one of the risk factors associated with low back pain, although this relationship was not very strong. With age and in proportion to the analysis of physical strength and burnout, the risk of musculoskeletal disorders and especially low back pain increases.

The findings of the present study showed that sex was not associated with lower back pain. Men were predicted to have greater muscle strength and are thought to be able to cope better with hard work, however, the results of the present study showed that men and women health care personnel are at equal risk of developing lower back pain.

Body mass index is another risk factor associated with low back pain in health care personnel. A normal body mass index is a measure of fitness, which reduces the load on the lower back and reduces pain in this area. Body composition is an important factor in health. Maintaining a normal body weight reduces the pressure on the spine that otherwise, puts extra abdominal weight on the vertebrae, which can cause chronic spasms in the lower back, when the back muscles contract to hold the abdomen high. Abnormal forces on the vertebrae cause disc damage and arthritis in the spine [28].

According to the results of the present study, lack of regular physical activity is one of the risk factors associated with low back pain in health care personnel. It is possible that regular exercise can maintain the proper alignment of the lumbar arch by increasing the basal strength of the muscles around the lumbar region, thereby increasing the tolerance of loads applied to it through the trunk. Improving the movement pattern by sports activities is one of the positive consequences to prevent the increase of extra load due to incorrect posture. Increasing the muscular endurance of the muscles around the lumbar region in the face of continuous and repetitive spinal activity is another benefit of regular exercise. Also, by improving flexibility and increasing the weight

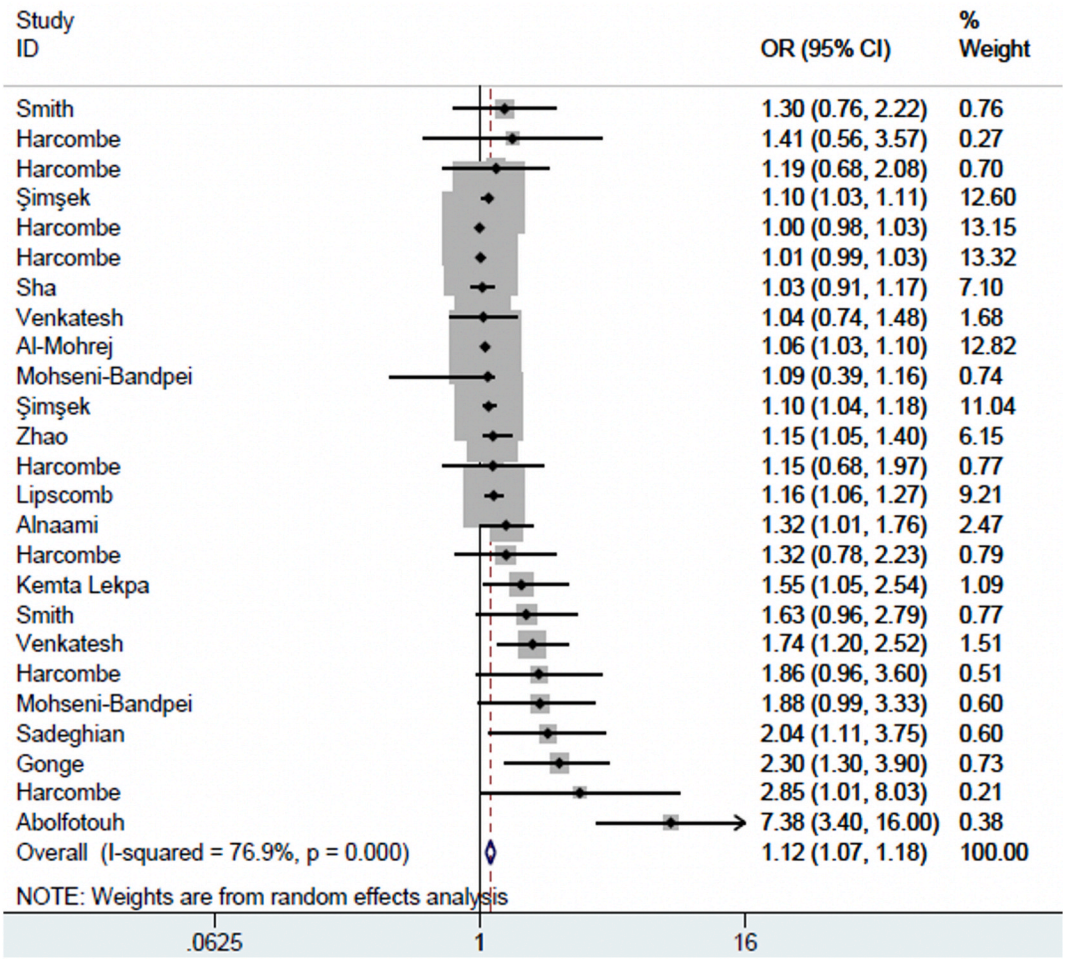

Fig. 5. Accumulation diagram of the relationship between occupationally related factors and low back pain in treatment personnel.

tolerance of the intervertebral discs, regular exercise will have a significant effect on improving and preventing low back pain.

In the present study, job-related factors, patient-related factors as well as body posture at work were the most important factors associated with low back pain in health care personnel. Occupational factors such as shift work, workplace department, work experience, job satisfaction, job security, etc. can increase the chances of low back pain in health care personnel. Night shifts, usually between 7pm and 7am, can lead to insufficient sleep. Inadequate sleep can be a critical factor in causing stress and can lead to discomfort and spasms or muscle stiffness [29].

Stress is a factor associated with low back pain in health care staff in the present study. The high levels of anxiety in daily life is one of the risk factors for musculoskeletal diseases. Anxiety increases the release of noradrenaline and adrenaline in the blood, which can cause tension and subsequent muscle spasm, which may lead to low back pain [30].

Our study only included health care personnel from hospital setup, which is one of the limitations of our study. Working conditions are likely to vary among different health care organizations such as hospitals and medical laboratories, which could lead to differences in the risk factors associated with low back pain. Additionally, the study did not evaluate the geographic prevalence of low back pain and the picture presented here could be the presentation of a few regions. The findings can be useful for hospital administration and health care policymakers to introduce practices and methods that can reduce the burden of low back pain among health care workers in the hospital.

5. Conclusion

In general, the results of this meta-analysis showed that the prevalence of low back pain in health care personnel is relatively high. Age, body mass index, lack of regular physical activity, occupation and patient-related factors, body posture at work and stress are the factors associated with lower back pain by health care personnel. Educational programs and interventions should be suggested in this area in order to achieve a high-functioning health care system.

Provenance and peer review.

Not commissioned, externally peer-reviewed.

Human and animal rights

No animals were used in this research. All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

Approval of the research protocol

N/A.

Informed consent

Informed consent was obtained from each participant.

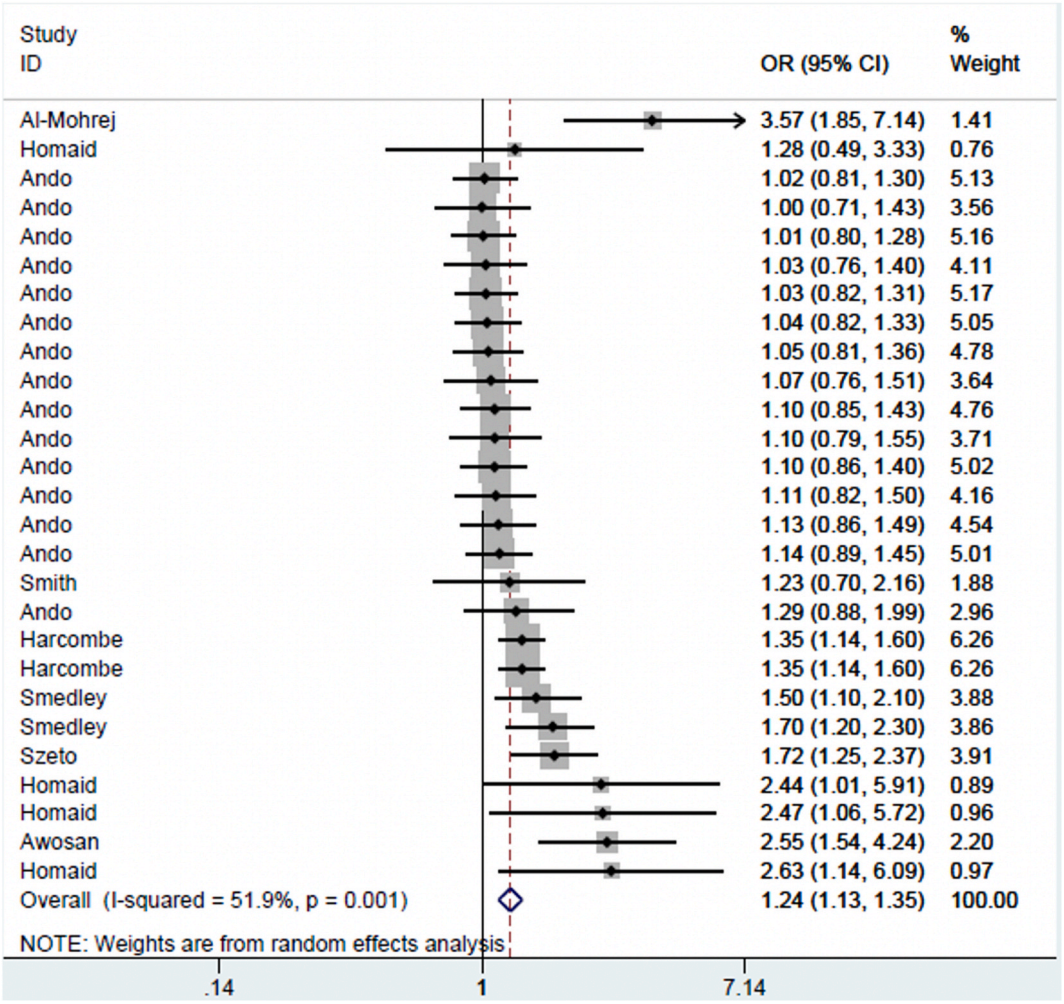

Fig. 6. Accumulation diagram of the relationship between factors related to patients and low back pain in treatment personnel.

Consent for publication

Informed consent was obtained from each participant.

Availability of data and materials

All relevant data and materials are provided with in manuscript.

Funding

None.

Contributors' statement page

Dr. Bareza Rezaei: conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

Dr. Elahe Mousavi and Dr. Shaphagh Asadi: Designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript.

Dr. Bahram Heshmati: Coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

Declaration of competing interest

The authors deny any conflict of interest in any terms or by any means during the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.102903.

Ethical approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Sources of funding

No funding was secured for this study.

Author contribution

Dr. Bareza Rezaei: **conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.** Dr. Elahe Mousavi: Designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript. Dr. Bahram Heshmati: Coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

Registration of research studies

Name of the registry: N/a.

Unique Identifying number or registration ID: IR.UMSHA.REC.1398.390.

Hyperlink to the registration (must be publicly accessible): https://ethics.research.ac.ir/ProposalCertificateEn.php?id=76876&Print=true&NoPrintHeader=true&NoPrintFooter=true&NoPrintPageBorder=true&LetterPrint=true.

Guarantor

Dr. Bareza rezaei.

Consent

Not applicable.

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