Investigating prevalence of musculoskeletal disorders among Iranian nurses: A systematic review and meta-analysis

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ABSTRACT

Introduction: Musculoskeletal disorders are one of the most common and costly occupational injuries. Nursing profession, considering the nature of the work, is one of the occupations in hospital in which work-related musculoskeletal disorders are highly prevalent. This review study was conducted to determine the prevalence of musculoskeletal disorders among Iranian nurses.
Materials and methods: The present study was conducted on the basis of the PRISMA checklist for systematic review and meta-analysis. To access eligible articles, domestic and foreign databases such as Web of Science, Scopus, Science Direct, PUBMED, Magiran, SID, Medlib Irandoc, and the Google scholar search engine and keywords of musculoskeletal disorders, ergonomics, nurses, and Iran were used. In this review, two researchers reviewed the relevant articles published from 2000 to 2017. At first, 1349 papers were entered but finally, 33 eligible articles were analyzed. Data analysis was carried out using STATA software (ver. 11.5).
Findings: The results of the review of 33 eligible articles showed that the prevalence of musculoskeletal disorders and low back pain in nurses were 0.84 (95% CI: 0.83–0.95) and 0.60 (95% CI: 0.60–0.61) respectively.
Conclusion: The results of the previous studies revealed that the prevalence of musculoskeletal disorders, especially low back pain in nurses, is high. Therefore, planning and intervention should be performed to prevent and reduce musculoskeletal disorders in nurses.

1. Introduction

Musculoskeletal disorders which are referred to as permanent injury or permanent pain in the body structure, such as muscles, joints, tendons, ligaments, nerves, bones, and the circulatory system,[1] are prevalent worldwide and are considered to be major occupational injuries in developed and developing countries[2,3].

Work-related skeletal-musculoskeletal disorders (WMSDs) are the most important common cause of lost work days, increased costs and human injuries and the main cause of disability.[4,5] On the other hand, healthcare staffs are more likely to develop musculoskeletal disorders than workers in construction, mining and manufacturing industries.[6,7] Among healthcare staffs, nurses who play an important role in healthcare organizations are the largest group at risk for musculoskeletal disorders.[8,9]

The nursing profession, due to the nature of work, is among occupations in which WMSDs are highly prevalent. These disorders occur in various parts of the body, including the neck, shoulder, arm, wrist, and lower back, in which the back pain is most prevalent one.[10,11] Several factors lead to musculoskeletal disorders in nurses, such as frequent lifting of heavy objects,[12,13] moving the patients,[2] inappropriate physical posture,[14] fixed and constant posture of the neck,[15] long standing,[16] excessive rotations,[14] psychological factors[18] and work experience and body mass index (BMI),[15] increasing working hours,[16] increasing age and work experience.[3] In a systematic and meta-analysis study aimed at assessing the relationship between psychological risk factors in the workplace and musculoskeletal disorders among nurses and nursing assistants Bernal et al., referred to psychological disorders as an important factor in increasing the incidence of low back pain and shoulder pain in the workplace.[1]

There are many foreign studies on the prevalence of musculoskeletal disorders among nurses. For example, Eunkwang Ryu et al. reported a prevalence rate of 70.8% for musculoskeletal disorders among nurses.[18] Marina Nützi et al. in Switzerland and Sofia Backåberg[19] in Sweden
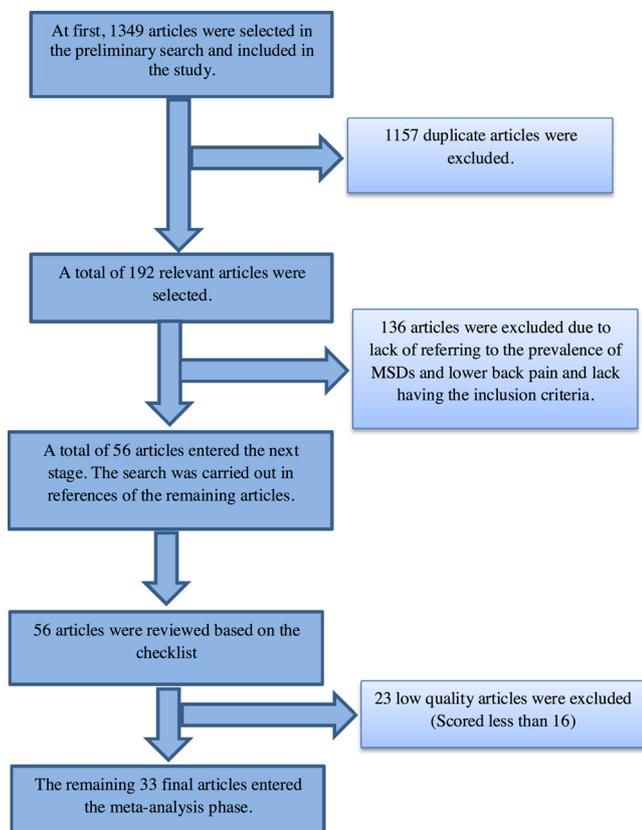
Flowchart 1. The inclusion stages of studies into systematic reviews.

reported a prevalence rate of 66% and 64% for the aforementioned disorders, respectively.[20] Similarly, numerous studies have also been carried out across the country such as Chubineh et al in Shiraz,[21] Arsalani et al. in Tehran[3] and Imanzad et al. in Qom[22] that respectively reported a prevalence rate of 84.4%, 88% and 47.5%, for MSDs among studied nurses. Considering the importance of the issue and the impact of various factors on MSDs, it would be useful to reach a conclusion by reviewing all relevant documentations and presenting an overall estimate so that we can provide a solution to the nurses' problem. Therefore, the present study aimed to investigate the prevalence of MSDs among Iranian nurses using systematic review and meta-analysis.

2. Materials and methods

The present study is a systematic review and meta-analysis that is based on reporting system for systematic review and meta-analysis studies (PRISMA).[23] To avoid bias in the study, the search, selection of studies, qualitative evaluation and data extraction were carried out independently by two researchers. In case of disagreement between the two researchers, the third researcher was referred and the final agreement was carried out in the form of a general discussion.

The findings of this study are based on studies conducted within Iran. The Persian and English related documentations were used from national electronic databases, SID, Iranmedex, Magiran and international electronic databases, including PubMed, Scopus, Web of Science, Science Direct, Online Library Wiley, Springer, and the Google Scholar search engine. Searching was carried out using keywords of Musculoskeletal disorders, Ergonomics, Nurses and Iran, and all possible conjunctions of words using AND, OR operators for the English databases.

Table 1
Characteristics of studies entered into the meta-analysis.

Author	year	Place	Sample size	instrument
Gholami[28]	2016	Tehran	325	**Body Map Questionnaire**
Abedini[29]	2012	Shiraz	400	**Nordic Questionnaire**
Azma[9]	2014	Tehran	144	**Cornell Musculoskeletal**
Taheri[30]	2014	Esfahan	247	**Nordic Questionnaire**
Shafiezadeh[31]	2011	Ahvaz	161	**Nordic Questionnaire**
Sharif Niya[32]	2010	Amol	400	**Nordic Questionnaire**
Habibi[33]	2015	Esfahan	250	**Nordic Questionnaire**
Habibi[34]	2015	Esfahan	200	**Nordic Questionnaire**
Zarrin Ghabaee[35]	2016	Sari	940	**Nordic Questionnaire**
Raeisi[36]	2013	Tehran	447	**Nordic Questionnaire**
Rokni[16]	2015	Ghaemshahr And Sari	110	**Nordic Questionnaire**
Rahimi[37]	2015	Hamedan	180	back pain scale
Dehdashti[38]	2015	Damghan	48	**Nordic Questionnaire**
Dadarkhah[39]	2013	Army Hospital	200	**Nordic Questionnaire**
Choobin[21]	2007	Shiraz	642	**Nordic Questionnaire**
Khoshbakht[40]	2011	Rasht	91	**REBA tool**
Barzideh[17]	2013	Shiraz	385	**Nordic Questionnaire**
Imanzad[22]	2013	Ghom	264	**Nordic Questionnaire**
Mehdipour[41]	2012	Ghazvin	54	**Nordic Questionnaire**
Rezai[42]	2014	Tehran	1246	**questions about LBP and its risk factors**
Choobin[43]	2010	Shiraz	375	**Nordic Questionnaire**
Bandpei[44]	2006	North Of Iran	1226	**Self-made questionnaire**
Farahabadi[45]	2016	Ghom	127	**Nordic Questionnaire**
Arsalani[3]	2016	Tehran	520	working conditions and MSDs
Farokhi[46]	2016	Esfahan	250	**Nordic Questionnaire**
Nikpour[47]	2009	Tehran	615	**Nordic Questionnaire**
Sadeghiyan[48]	2005	Shahroud	245	**Nordic Questionnaire**
Asadi[49]	2016	Rasht	350	information on the status of skeletal pain
Raeisi[50]	2011	Tehran	650	**Nordic Questionnaire**
Akbari[51]	2015	Tehran	220	**Nordic Questionnaire**
Taghinejad[52]	2016	Ilam	240	**Nordic Questionnaire**
Samaei[53]	2014	Kerman	243	**List of MAPO and PTAI**
Zamanian[54]	2015	Shiraz	200	**Nordic Questionnaire**

Table 2
The results of meta-analysis to combine the prevalence of Musculoskeletal Disorders in Nurses.

| Study	ES	[95% Conf. Interval]		% Weight
Gholami[28]	0.783	0.738	0.828	5.38
Habibi[33]	0.876	0.835	0.917	6.47
Abedini[29]	0.882	0.850	0.914	10.81
Shafiezadeh[31]	0.925	0.884	0.966	6.53
Khoshbakht[40]	0.777	0.691	0.863	1.48
Choobin[21]	0.844	0.816	0.872	13.72
Barzideh[17]	0.899	0.869	0.929	11.93
Imanzad[22]	0.475	0.415	0.535	2.98
Farahabadi[45]	0.827	0.761	0.893	2.50
Arsalani[3]	0.880	0.852	0.908	13.85
Farokhi[46]	0.876	0.835	0.917	6.47
Nikpour[47]	0.798	0.766	0.830	10.73
Akbari[51]	0.795	0.742	0.848	3.80
Taghinejad[52]	0.719	0.662	0.776	3.34
I-V pooled ES	0.842	0.832	0.853	100.00
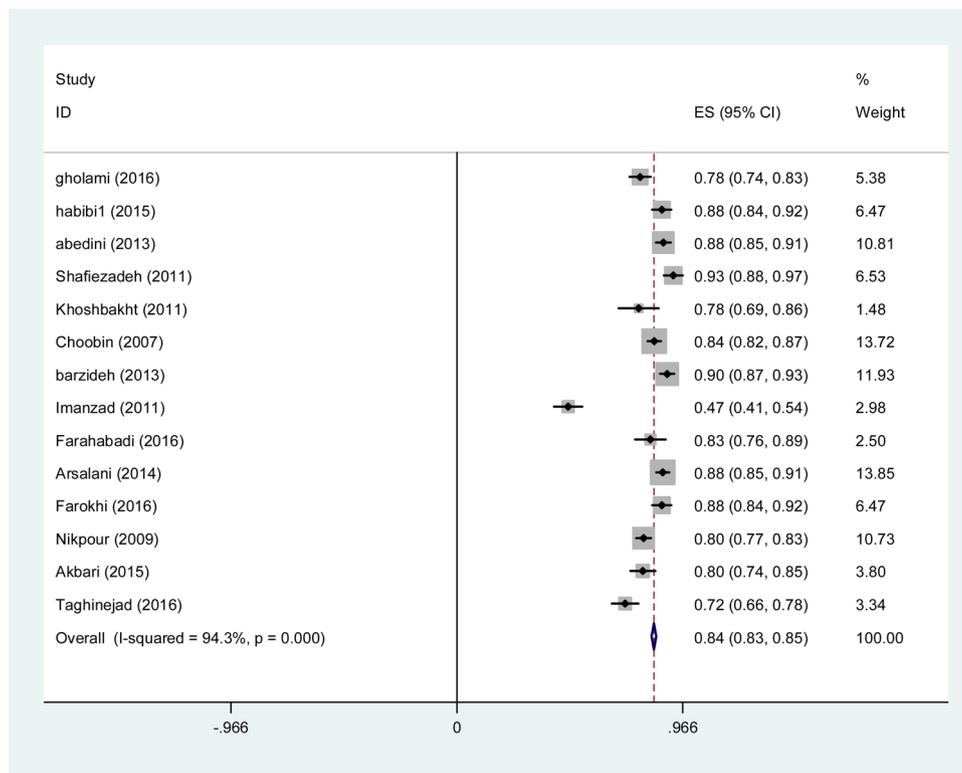
Fig. 1. Forest plot of meta-analysis of the prevalence of Musculoskeletal Disorders in Nurses. Data are pooled prevalence's with 95% CIs.
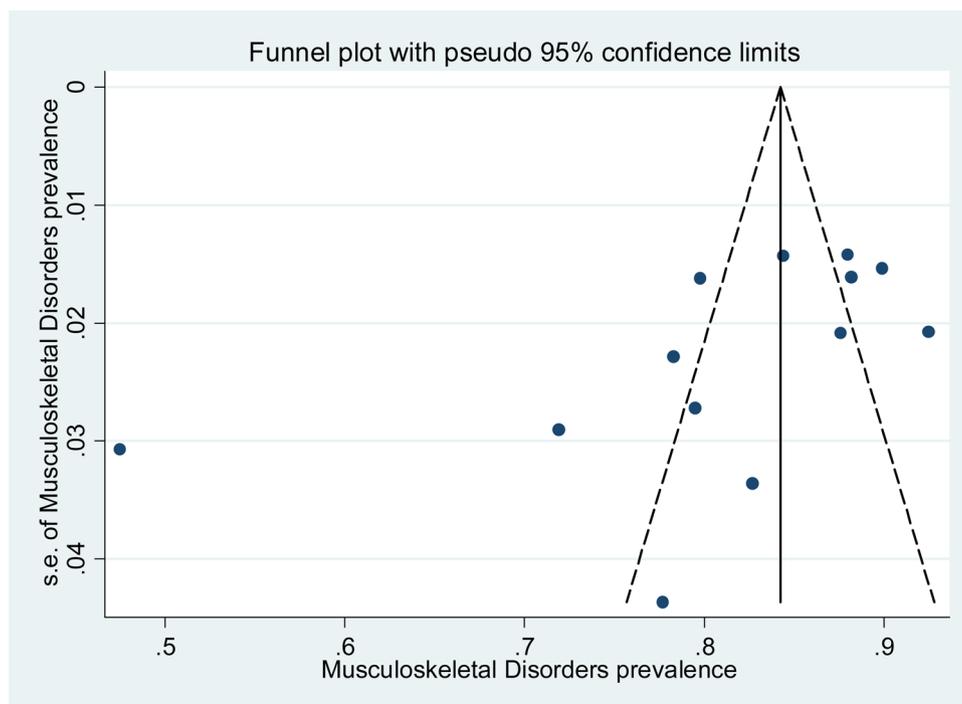

Fig. 2. Funnel plot of prevalence of musculoskeletal disorders.

Table 3
The results of meta-analysis to combine the prevalence of low back pain in Nurses.

Study	ES	[95% Conf. Interval]		% Weight
Gholami [28]	0.591	0.538	0.644	2.53
Habibi [33]	0.756	0.703	0.809	2.55
Azma [9]	0.458	0.377	0.540	1.09
Abedini [29]	0.715	0.671	0.759	3.69
Taheri [30]	0.761	0.708	0.814	2.55
Sharif Niya [32]	0.810	0.772	0.848	4.88
Habibi [34]	0.790	0.734	0.846	2.26
Zarrin Ghabaee [35]	0.609	0.578	0.640	7.42
Raeisi [36]	0.568	0.522	0.614	3.42
Rokni [16]	0.582	0.490	0.674	0.85
Rahimi [37]	0.718	0.652	0.784	1.67
Dehdashti [38]	0.583	0.444	0.722	0.37
Dadarkhah [39]	0.478	0.409	0.547	1.51
Choobin [21]	0.549	0.511	0.587	4.87
Barzideh [17]	0.618	0.569	0.667	3.06
Imanzad [22]	0.749	0.696	0.801	2.64
Mehdipour [41]	0.722	0.603	0.841	0.51
Rezai [42]	0.462	0.435	0.490	9.42
Choobin [43]	0.606	0.557	0.655	2.95
Bandpi [44]	0.620	0.593	0.647	9.77
Farahabadi [45]	0.638	0.554	0.722	1.03
Arsalani [3]	0.653	0.612	0.694	4.31
Farokhi [46]	0.756	0.703	0.809	2.55
Nikpour [47]	0.541	0.502	0.580	4.65
Sadeghiyan [48]	0.499	0.436	0.562	1.84
Asadi [49]	0.703	0.655	0.751	3.15
Raeisi [50]	0.590	0.552	0.628	5.05
Akbari [51]	0.691	0.630	0.752	1.94
Taghinejad [52]	0.400	0.338	0.462	1.88
Samaei [53]	0.695	0.637	0.753	2.15
Zamanian [54]	0.124	0.078	0.170	3.46
I-V pooled ES	0.605	0.596	0.613	100.00

The present research reviewed the studies that investigated the prevalence of musculoskeletal disorders in Iranian nurses working in hospitals during the period from April 2000 to April 2017 in Persian and English domestic and foreign language journals. Studies in which the samples were selected nonrandom, the data were inadequate, or the diagnosis of disorders was not based on laboratory diagnostic findings, were excluded.

After the initial screening of studies, screened studies were independently reviewed by two researchers using the standard STROBE checklist, which has 22 sections.[24] The researchers evaluated selected articles from methodological aspects, including sampling method, variables measurement, statistical analysis and study objectives. Articles that scored at least 16 based on this checklist were selected for the meta-analysis stage. Any disagreement between the two researchers was investigated by the third person. The data of the final articles, which were included in the study process, were extracted from a pre-prepared checklist. The checklist includes the name of the author, year of study, place of study, sample size, mean age, prevalence of MSDs, lower back pain, neck pain, arm pain. Data obtained from the prevalence of MSDs among nurses were analyzed using STATA software (ver. 11.5). The significance level in all tests was considered as lower than 0.05.

3. Findings

In the present systematic review, 1349 articles were identified, 1157 of which were deleted due to repeatability, 136 articles were deleted due to lack of full text and not having the inclusion criteria after a preliminary review. Then, 56 articles were selected and underwent full text review, which ultimately 33 articles were entered into meta-analysis (Flowchart 1).

The total number of participants in the finally selected studies was 11,995. Table 1 shows the characteristics of each study. Of the 33 articles that were entered into the systematic review, 15 articles contained information on the prevalence of MSDs in general (Table 2). In addition to the confidence interval, the extent of the effect of each study on the final outcome and the overall prevalence rate were also presented in each study. Studies were heterogeneous (I-squared = 93.9%, Q = 230.80, Tau-squared = 0.0063), as indicated by the indicators of the homogeneity study. Therefore, the studies were weighted based on random-effects model so that we obtained the final prevalence rate of 0.842 (Fig. 1). Fig. 2 shows that there was publication bias exists between studies. However, the results of Egger test also confirm this finding (P-value = 0.042). This means that lack of homogeneity between the studies may be due to the publication bias. In other words, all existing studies have not been used to assess the extent of the final prevalence rate.

The prevalence of low back pain in nurses was reported to be 0.613 (Table 3). In addition to the confidence interval, the extent of the effect of each study on the final outcome and the overall prevalence rate were also presented in each study. Studies are heterogeneous (I-squared = 96.9%, Q = 1014.65, Tau-squared = 0.0189), as indicated by the indicators of the homogeneity study. Therefore, the studies were weighted based on random-effects model so that we can obtain the final prevalence rate of 0.613 (Fig. 3). Fig. 4 shows that there is no publication bias between studies. Egger test results also confirm this finding (P-value = 0.460). This means that lack of homogeneity between the studies may not be due to the publication bias. In other words, all existing studies have been used to assess the extent of the final prevalence rate and it is necessary to look for another cause for lack of heterogeneity between studies.

4. Discussion

The present systematic study aimed to investigate the prevalence of MSDs in Iranian nurses. A prevalence of 82% (95% CI: 0.78%-%86) was determined for MSDs among Iranian nurses after reviewing 33 cross-sectional studies with a sample size of 10,393 people. Parnu et al. reported in their study a MSDs prevalence rate of 31.8% (95% CI: 24.1 ± 39.4) and 36.8% (95% CI: 29.4–44.1%) in the neck and shoulder regions, respectively.[25]

The results of current study showed that the prevalence of low back pain in nurses was 0.62 (95% CI: 0.57-0.67). The results of a review study conducted by Mehrdad et al. on the musculoskeletal disorders and the onset of lower back pain in the medical staffs showed that the prevalence of low back pain in nurses and medical staffs was 0.58 (95% CI: 0.58-0.59) and 18.1% (CI: 0.17–18%).[26] Also, in line with the present study, the results of Long et al.'s systematic study reported a prevalence rate of 35% for low back pain among nurses, midwives and physicians,[27] which indicated a high prevalence rate for low back pain among nurses living in other countries.
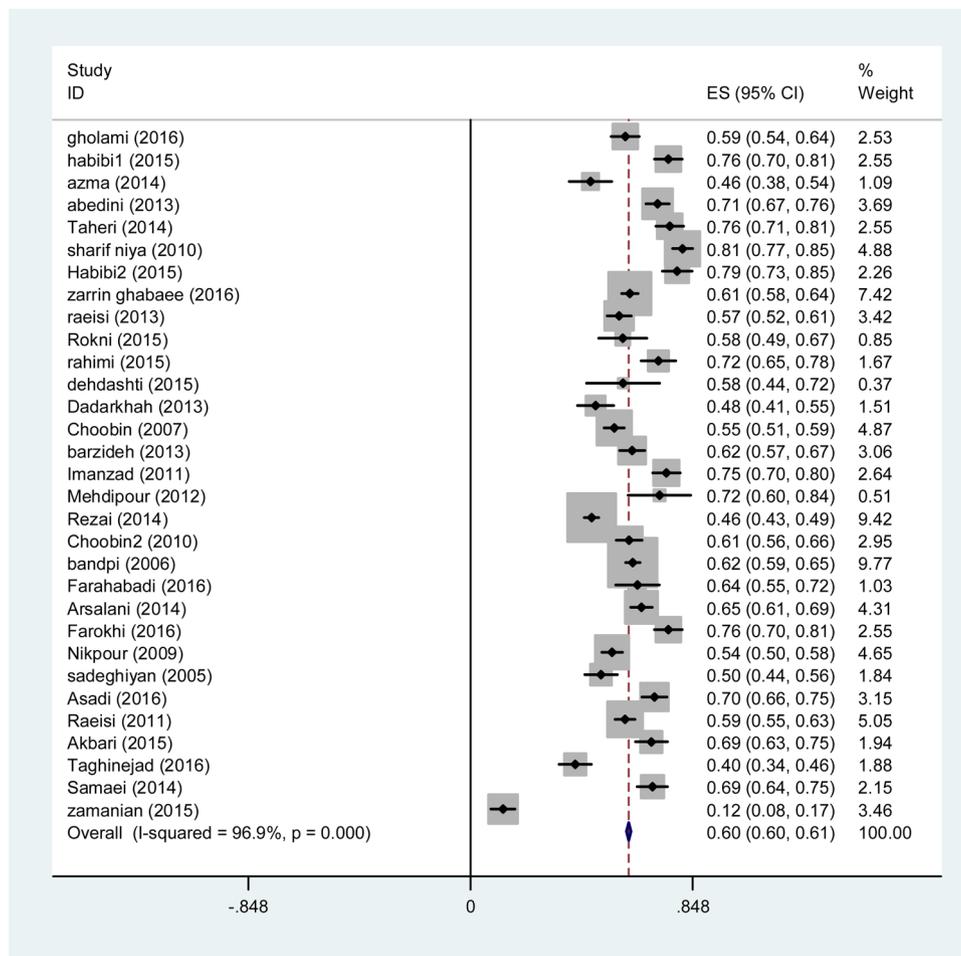
Fig. 3. Forest plot of meta-analysis of the prevalence of Back pain in Nurses. Data are pooled prevalence's with 95% CIs.
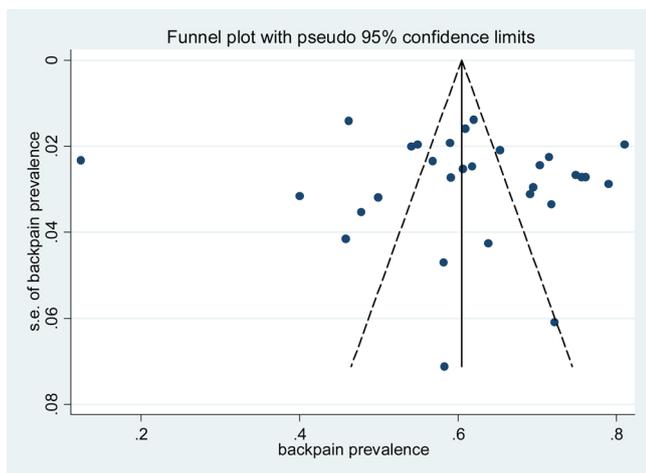

Fig. 4. Funnel plot of the back pain prevalence.

5. Conclusion

The results showed a high prevalence rate for MSDs, especially low back pain among Iranian nurses in the country. Therefore, it is essential to perform interventions at the macro level in order to perform ergonomics-related trainings and improve workplace equipment. It is also recommended that researchers conduct more systematic and meta-analytic researches focusing on the factors affecting nurses' MSDs.

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