

Are Sitting Position and Working Duration Associated with Low Back Pain in Workers?: A Meta-Analysis

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ABSTRACT

Background: Low back pain (LBP) is generally suffered by adults due to the position of the activity while working continuously. LBP can have an impact on an individual's quality of life because it can cause pain and impaired body/movement functions. This study aims to systematically and quantitatively synthesized the relationships of sitting posture position, working duration, and low back pain in workers.

Subjects and Method: A systematic review and meta-analysis was conducted by collecting articles from a number of databases such as PubMed, Science Direct, and Google Scholar. The keywords used in the article search were "Low Back Pain" AND "Low Back Pain" AND "Office Employees" "work attitude", "work attitude" AND "years of service OR "Low Back Pain" Low Back Pain OR work attitude" "years of service" OR "work attitude" "Work attitude AND Low Back Pain OR Low Back Pain AND "year of service "Low Back Pain" AND "adjusted odds ratio" "Years of service" AND "adjusted odds ratio "Pathophysiology Low Back Pain". Articles were collected and selected using the PICO model, including: (1) Population = office workers, (2) Intervention = sitting position and length of service, (3) Comparison= without intervention, and (4) Outcome= low back pain. Inclusion criteria in this study is full-text, the article uses an observational study design, the

article is published from 2004 to 2021, the research population is workers, reports the Adjusted Odd Ratio (AOR). The articles that have been collected are selected using the PRISMA diagram. The qualitative synthesis of research data was tested using the Review Manager application (RevMan 5.3).

Results: Meta-analysis of 9 cross-sectional studies showed that workers who worked 5 years had a risk of experiencing low back pain 1.43 times compared to <5 years (aOR= 1.87; 95% CI= 1.43 to 0.95; p= 0.08). Meta-analysis of 7 cross-sectional studies showed that workers who sat for 8 hours had a risk of experiencing low back pain 1.31 times compared to <8 hours (aOR= 1.31; 95% CI = 0.64 to 2.54, p= 0.43).

Conclusion: Length of work 5 years and sitting position 8 hours increase the risk of experiencing low back pain in office employees.

Keywords: low back pain, sitting position, working period, office worker

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BACKGROUND

Risk factors that can cause low back pain in a worker, namely gender, age, mass index, years of service and length of work on a worker, attitude, and standing position

(Chaman, 2015).

Complaints of low back pain can also occur due to work activities. Research conducted in Turkey (2014) reported that 48.3% of workers experienced mild pain,

24.8% experienced moderate pain, and 10.3% experienced severe pain. As many as 62.1% of these workers experience low back pain after working with the same body position continuously (Farnam, 2016).

Meta-analysis is an epidemiological design that aims to systematically examine and combine quantitative estimation results from a number of previous studies that answer the same research problem and can be combined. Many primary studies have investigated the effect of work attitude and tenure on low back pain. Further analysis is needed to reach convincing conclusions. Based on this background, researchers are interested in conducting a systematic review and meta-analysis on "the influence of work attitudes and tenure on Low Back Pain".

SUBJECTS AND METHOD

1. Study Design

This study is a systematic review and meta-analysis. The articles used in this study were obtained from several electronic databases of research journals, including: PubMed, Science Direct, and Google Scholar. The keywords used in the article search were: "Low Back Pain" AND "Low Back Pain" AND "Office Employees" "work attitude", "work attitude" AND "years of service OR "Low Back Pain" Low Back Pain OR work attitude" "years of service" OR "work attitude" "Work attitude AND Low Back Pain OR Low Back Pain AND "year of service "Low Back Pain" AND "adjusted odds ratio" "Years of service" AND "adjusted odds ratio " Pathophysiology Low Back Pain".

2. Inclusion Criteria

The inclusion criteria in this study were full-text, articles using an observational study design, articles published from 2007

to 2021, the study population was office workers, reporting Adjusted Odd Ratio (AOR).

3. Operational Definition of Variables

The search for articles was carried out by considering the eligibility criteria defined using the PICO model, including: (1) Population= workers, (2) Intervention= sitting position and work duration, (3) Comparison= without intervention, and (4) Outcome= low back pain.

Low back pain is pain that is felt in the lower back area between the angle of the lower ribs to the sacrum.

Term of service is the period of time an employee works at a workplace.

Sitting position is the position spent by office employees when doing work.

4. Data Analysis

Data processing is carried out using the Review Manager (RevMan 5.3) by calculating the Adjusted odds ratio (aOR) on eligible research articles and forming the final results of the meta-analysis.

RESULTS

The process of searching and selecting articles in this meta-analysis can be seen in Figure 1. 9 articles were obtained for quantitative synthesis of the relationship between tenure and low back pain, which came from studies in Australia, Asia, Europe, and America. An overview of the research area can be seen in Figure 2.

1. The relationship between work duration and low back pain

There are 7 cross-sectional research articles that meet the inclusion criteria for a meta-analysis of the relationship between work duration and low back pain in office employees. Table 1 shows the identification of critical appraisal of the selected articles for quantitative synthesis.

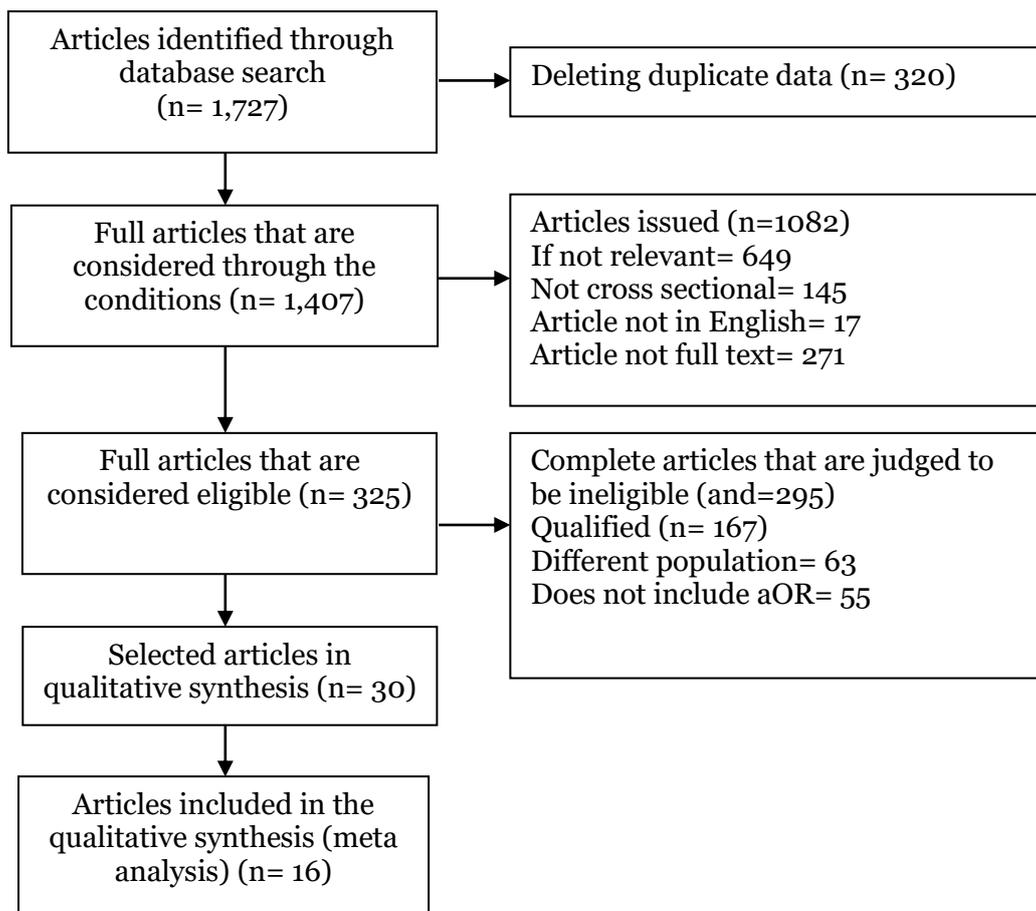


Figure 1. PRISMA diagram of the process of collecting and selecting research articles

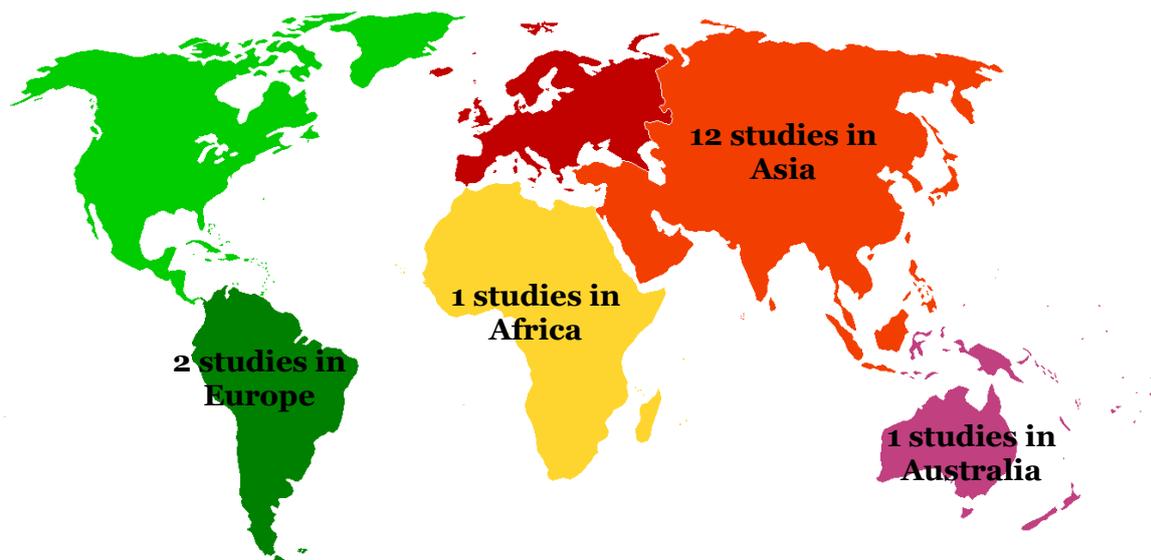


Figure 2. Overview of the research area

a. Forest plot

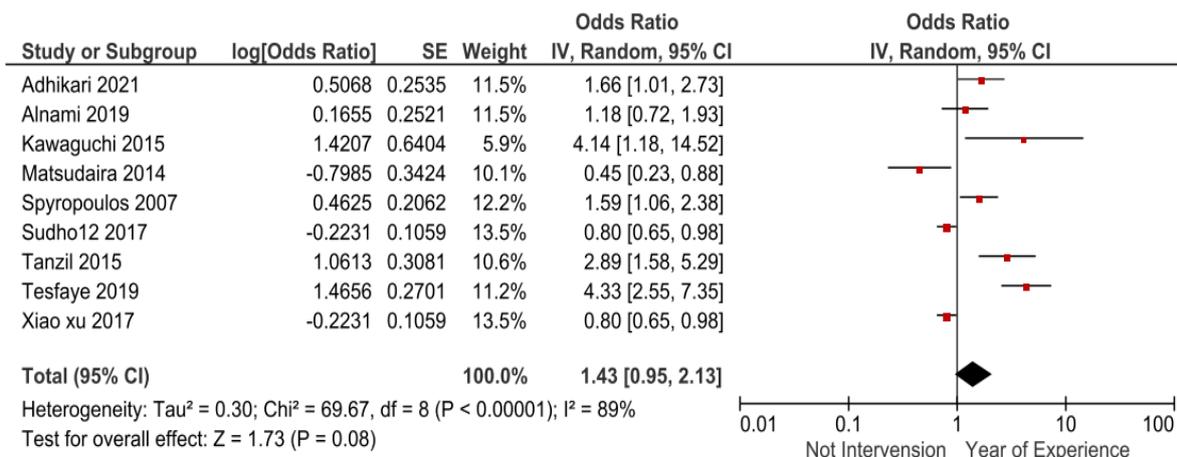


Figure 2. Forest plot of the relationship between work duration and low back pain

The forest plot in Figure 2 shows that there is an effect of length of service on the risk of office employees to experience low back pain, and the effect is statistically significant.

Office employees who worked 5 years had a risk of experiencing low back pain 1.43 times compared to <5 years (aOR = 1.43; 95% CI = 0.95 to 2.13; p = 0.001).

b. Funnel Plot

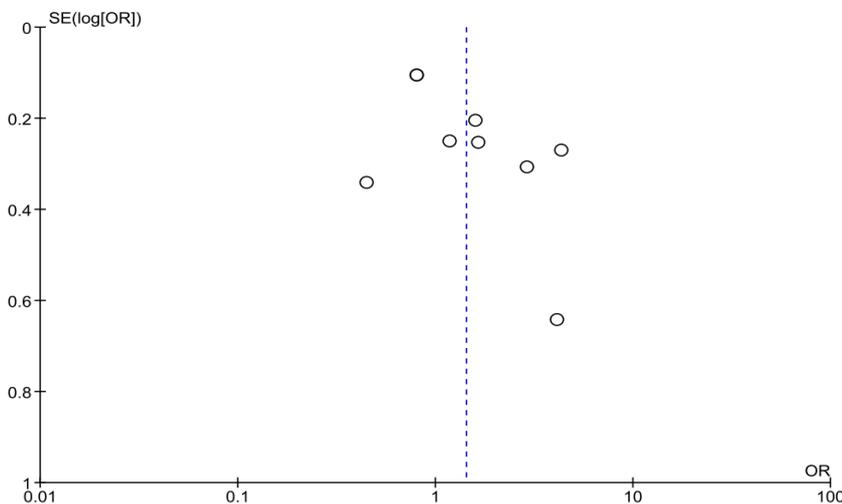


Figure 3. Funnel plot of the relationship between work duration and low back pain

The funnel plot in Figure 3 shows an asymmetric distribution of the estimated primary study results, weight to the left of the vertical line, which indicates that there is publication bias that overestimates the true effect (underestimate).

2. The relationship between sitting position and low back pain

There are 7 primary articles with cross-sectional research as a reference source for meta-analysis of the relationship between sitting position at work and low back pain

in office employees. The identification of each article can be seen in Table 2.

a. Forest Plot

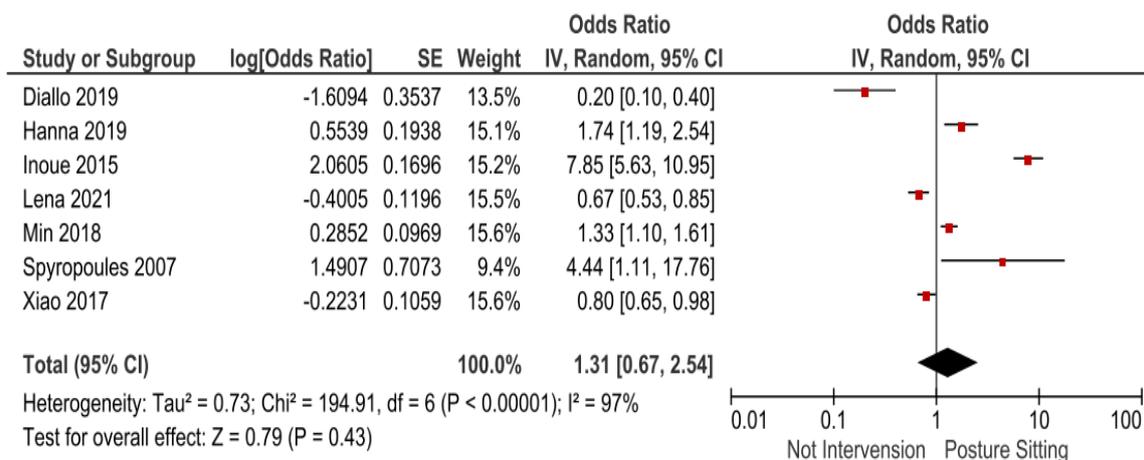


Figure 4. Forest plot of the relationship between sitting position and low back pain

The forest plot in Figure 4 shows that there is an effect of working attitude in a long sitting position on the risk of office employees to experience low back pain, and the effect is not statistically significant. Office

employees who sat for ≥8 hours had a risk of experiencing low back pain 1.31 times compared to <8 hours (aOR= 1.31; 95% CI= 0.67 to 2.54, p= 0.43).

b. Funnel Plot

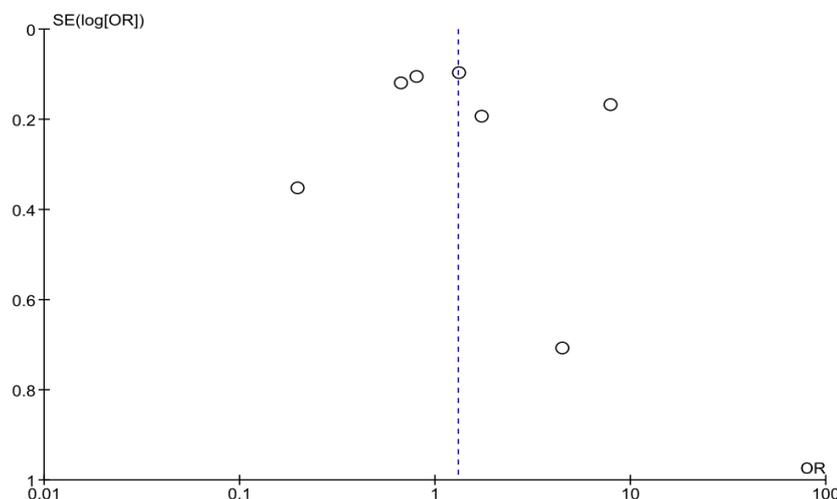


Figure 5. Funnel Plot of the relationship between sitting position attitude and low back pain

The funnel plot in Figure 5 shows a symmetrical distribution of the estimated results of the primary study, the right plot is four and the left plot is four, while there is one

plot that touches the vertical line. The distribution of these plots indicates that there is no publication bias.

Table 1. Critical appraisal of articles on the relationship between tenure and low back pain

No	Questions of Checklist	Adhikari et al (2021)	Alnami et al (2019)	Kawaguchi et al (2017)	Matsudaira et al (2014)	Spyopoulos et al (2007)	Sudholz et al (2017)	Tanzil et al (2015)	Tesfaye et al (2019)	Xioxu et al (2017)
1	Does this research address clearly focused issues	1	1	1	1	1	1	1	1	1
2	Is the cross-sectional research method appropriate to answer the research question?	1	1	1	1	1	1	1	1	1
3	Are there enough subjects to establish that the findings did not occur by chance?	1	1	1	1	1	1	1	1	1
4	Was the cross-sectional selection based on objective and validated criteria?	1	1	1	1	1	1	1	1	1
5	Is the cross-sectional representative of the defined population?	1	1	1	1	1	1	1	1	1
6	Was the follow-up done in sufficient time?	1	1	1	1	1	1	1	1	1
7	Are objective and unbiased outcome criteria used?	1	1	1	1	1	1	1	1	1
8	What is a low back pain intervention measurement method?	0	0	0	0	0	0	0	0	0
9	Are effect sizes practically relevant?	1	1	1	1	1	1	1	1	1
10	Is there a belief intervention provided?	1	1	1	1	1	1	1	1	1
11	Have confounding factors been taken into account?	1	1	1	1	1	1	1	1	1
12	Do the results apply to your research?	1	1	1	1	1	1	1	1	1
	Total	11	11	11	11	11	11	11	11	11

Answer: 1 Yes 0= No

Table 2. Critical appraisal of articles on the relationship between sitting position and low back pain

No	Questions of Checklist	Diallo et al (2019)	Hanna et al (2019)	Inoue et al (2015)	Lena et al (2021)	Min et al (2018)	Spyro-poules et al (2007)	Xio et al (2017)
1	Does the research address a clearly focused problem?	1	1	1	1	1	1	1
2	Is the research method cross-sectional?	1	1	1	1	1	1	1
3	Are there enough subjects to establish that the findings did not occur by chance?	1	1	1	1	1	1	1
4	Did you choose cross-sectional based on objective and validated criteria?	1	1	1	1	1	1	1
5	Is the cross-sectional representative of the defined population?	1	1	1	1	1	1	1
6	Was the follow-up done in sufficient time?	1	1	1	1	1	1	1
7	Are objective and unbiased outcome criteria used?	1	1	1	1	1	1	1
8	What is the confidence interval measurement method provided?	0	0	0	0	0	0	0
9	Are effect sizes practically relevant?	1	1	1	1	1	1	1
10	Is there a belief intervention provided?	1	1	1	1	1	1	1
11	Have confounding factors been taken into account?	1	1	1	1	1	1	1
12	Do the results apply to your research?	1	1	1	1	1	1	1
	Total	11	11	11	11	11	11	11

Answer: 1 Yes, 0=No

DISCUSSION

1. The relationship between work duration and low back pain

The results of the meta-analysis showed that there was a significant effect between work duration and the risk of low back pain in office workers.

This is in line with Tanzil et al. (2019) which states that low back results of 5 years of service having an increase of 2.89 times more risk of experiencing low back pain than those who work <5 years. Other studies have shown that working in front of a computer while sitting causes low back pain.

The longer the working period of a worker, the higher the risk of occupational diseases. Repetitive work activities over a long period of time can burden the same muscles and soft tissues over a long period of time (Susanti, 2015). In this meta-analysis, the risk factor for tenure is the period of time for office employees who work in a workplace, which is calculated from starting work by dividing into 2 groups, tenure <5 years and 5 years.

Yang et al. (2017) showed that length of work 40 years increased the risk of low back pain in workers (OR= 1.19; 95% CI= 0.99 to 1.43).

3. The relationship between sitting position and low back pain

The results of the meta-analysis show that there is an effect of working attitude in a sitting position on the risk of employees experiencing low back pain.

Bontrup et al. (2019) stated that there is a relationship between sitting attitude and low back pain. Liira et al. (1996) found that body position affects the magnitude of the load on the lumbar spine, and the magnitude of the load increases significantly when sitting compared to standing upright and lying down with good support.

It has been postulated that persistently awkward sitting postures (lordosis/too arched, or kyphosis/too stooped) can result in higher intradiscal pressures and may compromise spinal postural health (Pynt et al., 2002; Lis et al., 2007; Cho et al., 2015).

Dynamic sitting behavior is considered to have beneficial biological and physiological effects, because postural variations can reduce spinal load and spinal shrinkage, prevent muscle fatigue through alternating motor unit activation, and inhibit damage to the posterior aspect of the annulus pulposus through low-strength dynamic movements (van Deursen et al., 2000; van Dieën et al., 2001; Callaghan and McGill, 2001; Davis and Kotowski, 2014).

Currently, various studies have been developed on the creation of technology to improve more dynamic sitting behavior among office employees (Goossens et al., 2012; Davis and Kotowski, 2014).

AUTHOR CONTRIBUTION

Herawati Prianggi is the lead researcher who selects topics, searches, and collects research articles. Bhisma Murti and Hanung Prasetya analyzed the data and interpreted the results of the meta-analysis data synthesis.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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