Indonesian Journal of Medicine (2022), 07(03): 313-325
Masters Program in Public Health, Universitas Sebelas Maret

Meta-analysis

Meta-Analysis: The Effectiveness of Acupuncture in Reducing Pain and Improving Quality of Life in Patients with Low Back Pain

Frannesty Estu Winahyu[1)], Hanung Prasetya[2)], Bhisma Murti[1)]

[1)]Masters Program in Public Health, Universitas Sebelas Maret
[2)]Study Program of Acupuncture, Health Polytechnics, Ministry of Health Surakarta

ABSTRACT

Background: In Indonesia, low back pain is a common health problem that can interfere with a person's productivity in carrying out activities due to the manifestations of the pain it causes. Acupuncture therapy is one of the complementary treatments that is quite effective in reducing the intensity of low back pain. This study aims to estimate the effectiveness of acupuncture therapy to reduce pain and improve quality of life in patients with low back pain.
Subjects and Method: This study is a systematic review and meta-analysis with PICO, Population: Low back pain patients, Intervention: Acupuncture therapy, Comparison: No acupuncture therapy, Outcome: Pain reduction and quality of life improvement. It was measured using the Oswestry Disability Index. The article search process was carried out between 2006-2022 using 3 databases, including Google Scholar, PubMed, and Science Direct. The keywords used in the database search were “acupuncture” AND “oswestry disability index” AND “quality of life” AND “low back pain”. The inclusion criteria for full text articles using a Randomized Controlled Trial (RCT) study design by including the results of the study in the form of the number of respondents, the mean and standard deviation (SD) values, for articles using English and Indonesian. Articles that have met the requirements are analyzed using the RevMan 5.3 application.
Results: There are 9 articles that meet quantitative requirements and are divided into 2 categories according to independent variables with a Randomized Controlled Trial (RCT) study design originating from Spain, Australia, South Korea, Brazil, Germany and England, which were carried out in a meta-analysis in this study. Meta-analysis of 7 articles showed estimates that acupuncture therapy was effective in reducing pain in LBP patients. Patients experienced a decrease in pain 0.32 units higher than those who were not given acupuncture therapy (SMD = 0.32; 95% CI= -0.46 to -0.17; p <0.001). Meanwhile, a meta-analysis of 9 articles showed the estimation of the effect of effective acupuncture therapy on improving the quality of life in LBP patients. Patients experienced an improvement in quality of life 0.52 units higher than those who were not given acupuncture therapy (SMD = 0.52; 95% CI= 0.22 to 0.81; p= 0.006).
Conclusion: Acupuncture therapy is effective in reducing pain and improving the quality of life of LBP patients.

Keywords: acupuncture, low back pain, quality of life, oswestry disability index, meta-analysis

Correspondence:
Frannesty Estu Winahyu. Masters Program in Public Health, Universitas Sebelas Maret. Jl. Ir. Sutami 36A, Surakarta 57126, Central Java. Email: frannestyestuwinahyu@gmail.com. Mobile: +6285228783882.

Cite this as:
Winahyu FE, Prasetya H, Murti B (2022). Meta-Analysis: The Effectiveness of Acupuncture in Reducing Pain and Improving Quality of Life in Patients with Low Back Pain. Indones J Med. 07(03): 313-325. https://doi.-org/10.26911/theijmed.2022.07.03.08.

BACKGROUND

Health is a state of complete physical, mental and social well-being, not only free from disease and disability. To achieve health, efforts can be made with health promotion and disease prevention, especially the diseases that most attack the community. Health itself is a very important thing in social life, and if there are health problems, it will certainly affect a person's quality of life in carrying out their daily activities. One of the health problems that are often complained of in people's lives is pain (Depkes RI, 1999). Pain can interfere with a person's productivity in carrying out activities. Pain according to the International Association for the Study of Pain / IASP is a sensory and emotional experience of an individual that is unpleasant due to tissue damage (Kuntono, 2011).

In Indonesia, low back pain (LBP) is a very common health problem. The pain felt by someone who has LBP occurs in the lumbosacral area, can also be referred to other areas (Sulaeman et al., 2015). The case of low back pain itself is the largest contributor to global disability as measured by Years Lived With Disability (YLD), and ranks sixth out of the total cases measured by The Disability Adjusted Life Year (DALY) (Hoy, 2014).

Epidemiological data regarding LBP in Indonesia is 18% (Yankes, 2018), in a study conducted by (Safitri, 2010) the most frequent causes of low back pain are factors of sitting too long, wrong sitting posture, and excessive activity. Risk factors such as degenerative/age, inflammation, working irregularly with the wrong sitting position/static and non-ergonomic work attitude during work, trauma, gynecological disorders, metabolic disorders, lack of drinking water intake, body mass index (BMI), gender, smoking habits, injury or muscle tension, or it could be caused by more specific conditions that can affect the condition of the spine (Patrianingrum, 2015).

Efforts to reduce the impact of LBP in addition to conservative treatment as well as pharmacological treatment. However, because the use of painkillers continuously will have a dependency effect. In this case, not a few people who experience LBP make various efforts to manage pain with non-pharmacological treatments such as, Mc kenzie exercise (Putri et al., 2021), the use of kinesio tapping (Setiawan et al., 2021), complementary alternative therapies such as hypnotherapy (Prasetya et al., 2021), acupuncture or acupressure therapy (Nugraha et al., 2021), ultrasound therapy (Noer et al., 2021), TENS (Salsabil et al., 2022), laser therapy (Indana et al., 2021), and for relaxation, audio hypno-analgesia (Prasetya et al., 2021), aromatherapy and music therapy can also be given (Hasanah et al., 2021). Acupuncture therapy is one of the complementary treatments that is quite effective in the treatment of Low Back Pain and pain due to inflammation or pain (Susilo et al., 2021). Acupuncture therapy is quite safe for the body because it does not cause many side effects (Carolyn, 2014). In some literature, it is shown that non-pharmacological treatment provides clinically beneficial effects compared to other treatments. Acupuncture provides clinically relevant short-term effects by stimulating the hypothalamus and pituitary gland to release beta-endorphins and metencephalin, which are hormones that can manipulate pain perception in the brain (Comachio et al., 2015). Based on this, the aim of this study is to estimate the effect of acupuncture therapy on reducing pain and improving quality of life in cases of low back pain with a meta-analysis.

SUBJECTS AND METHOD

1. Study Design

This was a systematic review and meta-analysis. Search articles using databases, including Google Scholar, Pubmed, and Science Direct. The keywords used in searching the database were "acupuncture" AND "oswestry disability index" AND "quality of life" AND "low back pain"

2. Steps in Conducting Meta-Analysis

Meta-analysis was conducted through five steps, as follow:

a. Defining the research questions with PICO (Population, Intervention, Comparisson, Outcome) form.
b. Searching for primary study articles from various electronic databases such as Google Scholar, PubMed, Cochrane, Scopus and Science Direct as well as non-electronic.
c. Conducting screening and Critical Appraisal toward the primary studies articles.
d. Conducting data extraction and synthesizing the effect estimates into RevMan 5.3.
e. Interpreting and making conclusion.

3. Inclusion Criteria and Exclusion Criteria

The inclusion criteria used in this study were full-text articles using a Randomized Controlled Trial (RCT) study design. Bivariate analysis was used, including the results of the study in the form of the number of respondents, the mean value and the standard deviation (SD) value.

The exclusion criteria in this study were articles published before 2006, articles that did not use English and Indonesian, and previous studies that used meta-analysis.

4. Study Variables

The independen variables is Acupunture therapy and the dependen variable is Pain reduction and Improved Quality of Life.

5. Operational Definition of Variables

Acupuncture therapy is a method of therapy by inserting special therapeutic needles at acupuncture points on the body.

Pain reduction is a condition where there is a change in the condition of the degree of pain felt in certain body parts.

Improved Quality of Life is a condition where there is a change in the health condition that is complained of.

6. Study Instrument

This study is guided by the PRISMA flow diagram and assessment of the quality of research articles using the critical appraisal tools randomized controlled trial (RCT) published by CEBM University of Oxford.

The following are indicators in critical appraisal:

1. Was the sampling for the treatment carried out at random, which includes methods and methods?
2. Does the research use the same group?
3. Apart from the allocated treatments-/interventions, were the intervention groups the same?
4. Were all samples included in the study recorded? Were they analyzed in randomized groups?
5. Are objective measures or research participants applied a 'blinding' system to which interventions are being accepted? The study is ideal when using 'double blinded'?
6. How big is the effect of exposure?
7. How accurate is the estimate of the effect of the exposure given?

7. Data Analysis

The collected articles are processed using the Review Manager application (RevMan 5.3). Data processing is carried out using the continuous method. This method was used to analyze the effect size or standardized mean difference in bivariate data of two groups that had been controlled for

confounding factors by randomization. The results of the systematic study and meta-analysis are presented in the form of forest plots and funnel plots.

RESULTS

The article review process using a database based on PRISMA flowchart diagram can be seen in Figure 1. The initial search process in the database gave 3356 results, then through the process of deleting duplicate articles as many as 2554 articles with 587 articles filtered of which qualified for further full text review. The results of the articles were reviewed again and there were 9 articles that met the quantitative requirements and were divided into 2 categories according to the independent variables. The total articles obtained were 9 articles spread from 2 Asian continents, 4 from the European continent, 1 from the Australian continent and 2 from the South American continent, can be seen in Figure 2.

The total number of primary studies included in this meta-analysis was 9 articles from Spain, Germany, Australia, South Korea, Brazil, and England. The primary study for the provision of acupuncture therapy on the quality of life of LBP patients, used 9 randomized control trials from Spain, Germany, Australia, South Korea, Brazil, and England. While the estimation of the effect of acupuncture therapy on reducing pain in LBP patients used 7 randomized control trials from Spain, Australia, South Korea, Brazil, and England.

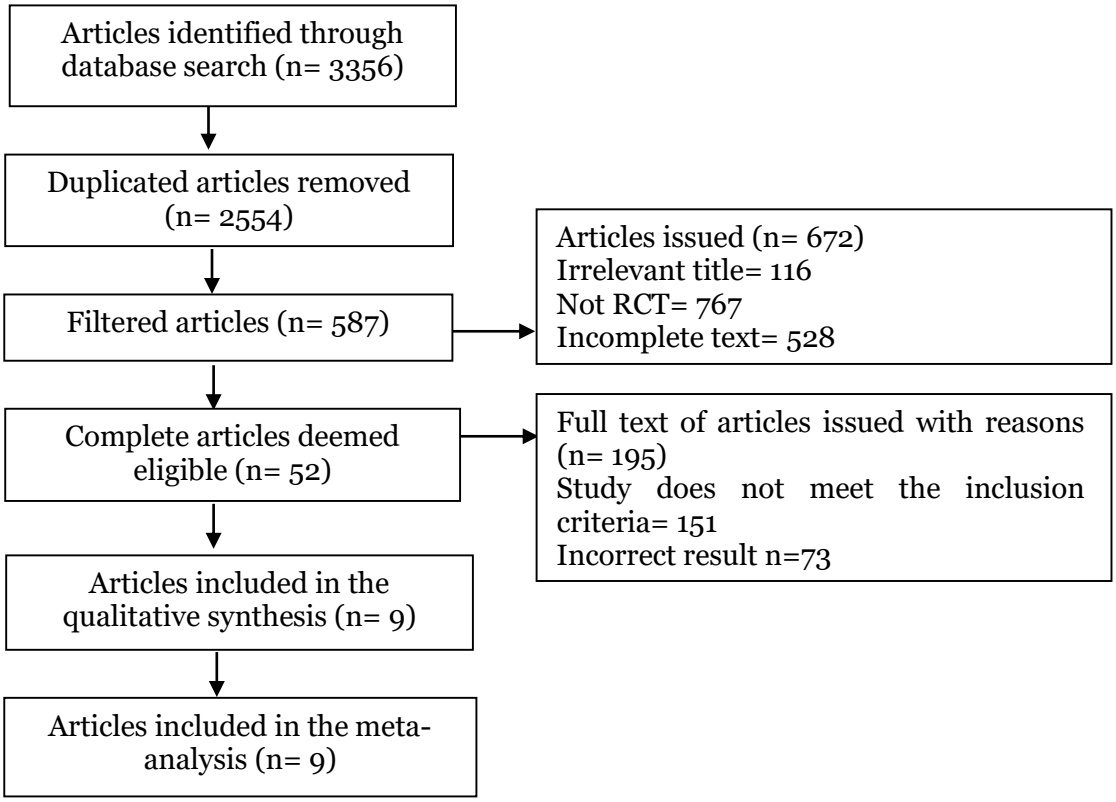

Figure 1. PRISMA Flow Diagram

Table 1. Summary aource of primary studies included in the meta-analysis

Author (Year)	Title	Country	Study Design	Sample	P Population	I Intervention	C Comparison	O Outcome	Acupuncture		Non Acupuncture	
									Mean	SD	Mean	SD
Cho et al. (2013)	Acupuncture for Chronic Low back pain	South Korea	RCT	116	Patients with chronic low back pain	Acupuncture	No treatment	Pain reduction and quality of life	28.23	10.54	24.17	10.5
Cohen et al. (2017)	Acupuncture For Analgesia In The Emergency Department: A Multicentre, Randomised, Equivalence And Non Inferiority Trial	Australia	RCT	162	Patients with acute low back pain, migraine, or ankle sprain, and with pain.	Acupuncture	No treatment	Pain Reduction and Quality of Life	49.9	30.4	41.5	28.23
Comachio et al. (2020)	Effectiveness of Manual and electrical acupunc-ture for chronic non-specific low back pain: a randomized controlled trial	Brazil	RCT	66	Chronic non-specific LBP patients were randomized into MA and EA.	Acupuncture	No treatment	Pain Reduction and Quality of Life	70.4	26.5	62.7	26.01
Hasegawa et al. (2013)	Acupuncture for acute non-specific low back pain: A randomised, controlled, double-blind, placebo trial	Brazil	RCT	80	Outpatients aged 18-65 years with complaints of acute low back pain	Acupuncture	No treatment	Pain Reduction and Quality of Life	69.01	22.9	63.4	22.6
Shin et al. (2013)	Effects of motion style acupuncture treatment in acute low back pain patients with severe disability: Multicenter, randomized,controlled, comparative effective-ness trial	South Korea	RCT	93	Patients aged between 20 and 60 years with aLBP of less than 4 weeks dura-tion, with no radiating pain to the limbs.	Acupuncture	No treatment	Pain Reduction and Quality of Life	4.91	2.94	6.84	1.9

Thomas et al., (2006)	Randomised controlled trial of a short course of traditional acupuncture compared with usual care for persistent non-specific low back pain	The UK	RCT	121	Participants aged 18-65 with non-specific lower back	Acupuncture	No treatment	Pain Reduction and Quality of Life	1.43	1.1	1.53	0.9
Vas et al. (2012)	Acupuncture in patients with acute low back pain: A multicentre randomised controlled clinical trial	Spain	RCT	138	pain for 4-52 weeks.	Acupuncture	No treatment	Pain Reduction and Quality of Life	5.29	2.9	6.5	4.1
Witt et al. (2006)	Pragmatic Randomized Trial Evaluating the Clinical and Economic Effectiveness of Acupuncture for Chronic Low back pain	Germany	RCT	101	Patients with non-specific complaints of low back pain for more than 6 months	Acupuncture	No treatment	Quality of Life	43.3	10.3	34.6	9.6
Haake et al. (2007)	German Acupuncture Trials (GERAC) for Chronic Low back pain	Germany	RCT	174	Patients with complaints of acute low back pain	Acupuncture	No treatment	Quality of Life	46.6	12.3	31.5	6.9

Table 2. Research quality assesment of rct The Effectiveness of Acupucture in Reducing Pain and Improving Quality of Life in Patients with Low Back Pain

No.	Questions of Checklist	Cho et al. (2013)	Cohen et al. (2017)	Comachio et al. (2020)	Hasegawa et al. (2013)	Shin et al. (2013)	Thomas et al., (2006)	Vas et al. (2012)	Witt et al. (2006)	Haake et al (2007)
1.	Does this study address a clear research focus?	1	1	1	1	1	1	1	1	1
2.	Is the Randomized Controlled Trial research method appropriate to answer the research question?	1	1	1	1	1	1	1	1	1
3.	Are there enough subjects in the study to establish that the findings did not occur by chance?	1	1	0	1	0	1	0	1	0
4.	Were subjects randomly allocated to the experimental and control groups?	1	1	1	1	1	1	1	1	1
5.	Are inclusion/exclusion criteria used?	1	0	0	1	1	0	1	0	1
6.	Were the two groups comparable at the start of the study?	0	1	1	1	1	1	1	0	1
7.	Were objective and unbiased outcome criteria used?	1	1	1	1	1	1	0	1	1
8.	Are objective and validated measurement methods used in measuring the results?	1	1	1	0	1	1	1	1	1
9.	Is effect size practically relevant?	1	1	1	1	1	1	1	1	1
10.	How precise is the estimate of the effect? Is there a confidence interval?	1	1	1	1	1	1	1	1	1
11.	Could there be confounding factors that have not been taken into account?	0	0	1	0	1	0	1	0	0
12.	Are the results applicable to your research?	1	1	1	1	1	1	1	1	1
	Total	10	10	10	10	11	10	10	9	10

Answer: 1=Yes, 0=No.

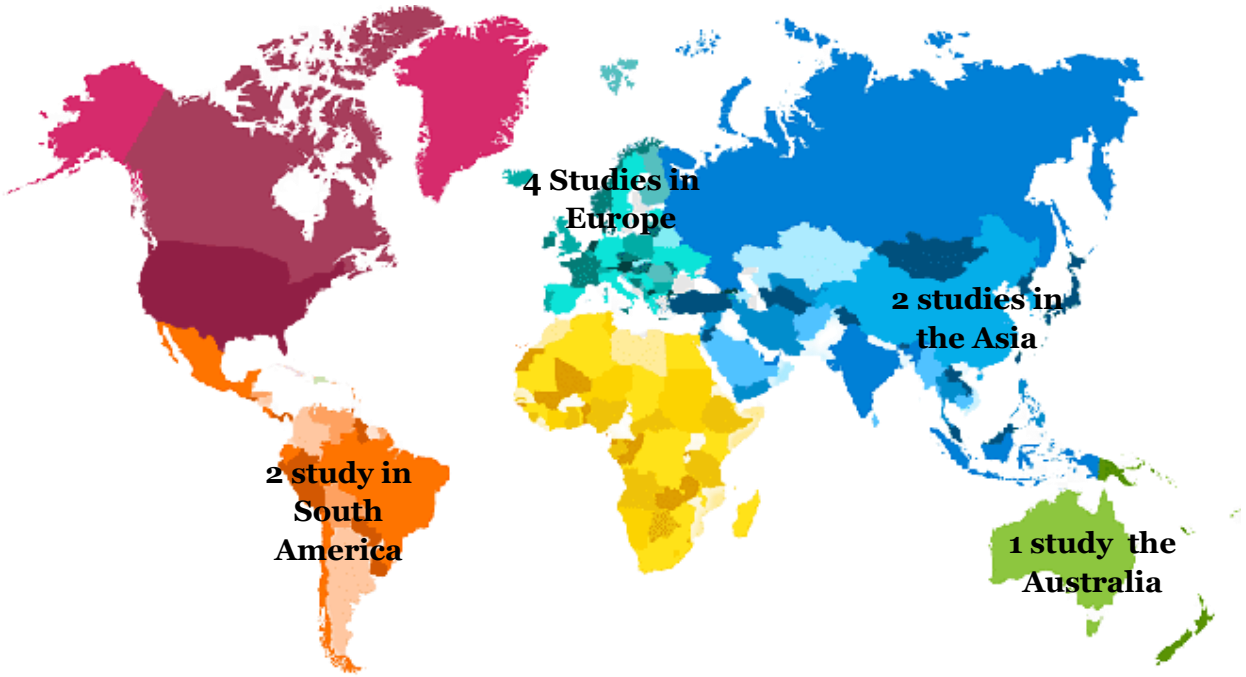

Figure 2. Map of the research locations the effectiveness of acupuncture in reducing pain and improving quality of life in patients with low back pain

1. The Effect of Acupuncture on Pain Reduction

	Akupunktur			Non Akupunktur				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI
Vas 2012	5.29	2.9	68	6.5	4.1	70	17.9%	-0.34 [-0.67, -0.00]
Thomas 2006	1.43	1.1	62	1.53	0.9	59	15.9%	-0.10 [-0.46, 0.26]
Shin 2013	4.91	2.94	48	6.84	1.9	45	11.4%	-0.77 [-1.19, -0.35]
Hasegawa 2013	2.49	2.4	40	4.18	2.52	40	9.9%	-0.68 [-1.13, -0.23]
Comachio 2020	3.7	2.7	33	4.1	2.6	33	8.7%	-0.15 [-0.63, 0.33]
Cohen 2017	1.9	2.3	91	2.2	2.2	71	21.0%	-0.13 [-0.44, 0.18]
Cho 2013	2.79	2.44	57	3.52	2.53	59	15.1%	-0.29 [-0.66, 0.07]
Total (95% CI)			399			377	100.0%	-0.32 [-0.46, -0.17]

Heterogeneity: Chi² = 10.17, df = 6 (P = 0.12); I² = 41%
Test for overall effect: Z = 4.35 (P < 0.0001)

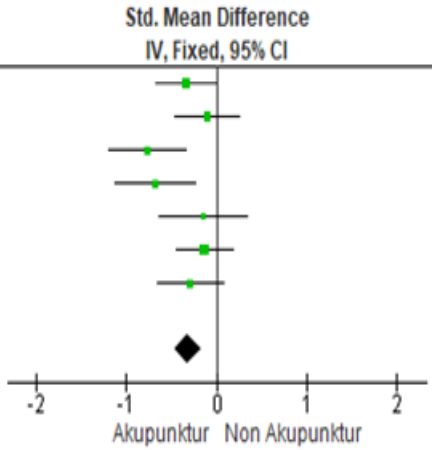

Figure 3. Forest Plot The Effect of Acupuncture on Pain Reduction

a. Forest Plot

Forest plot Figure 3 shows the effect of acupuncture therapy on reducing pain in patients with low back pain. LBP patients receiving manual acupuncture therapy had an average pain reduction of 0.32 units higher than those not receiving acupuncture, and the effect was statistically significant (SMD = 0.32; 95% CI = -0.46 to -0.17; $p < 0.001$).

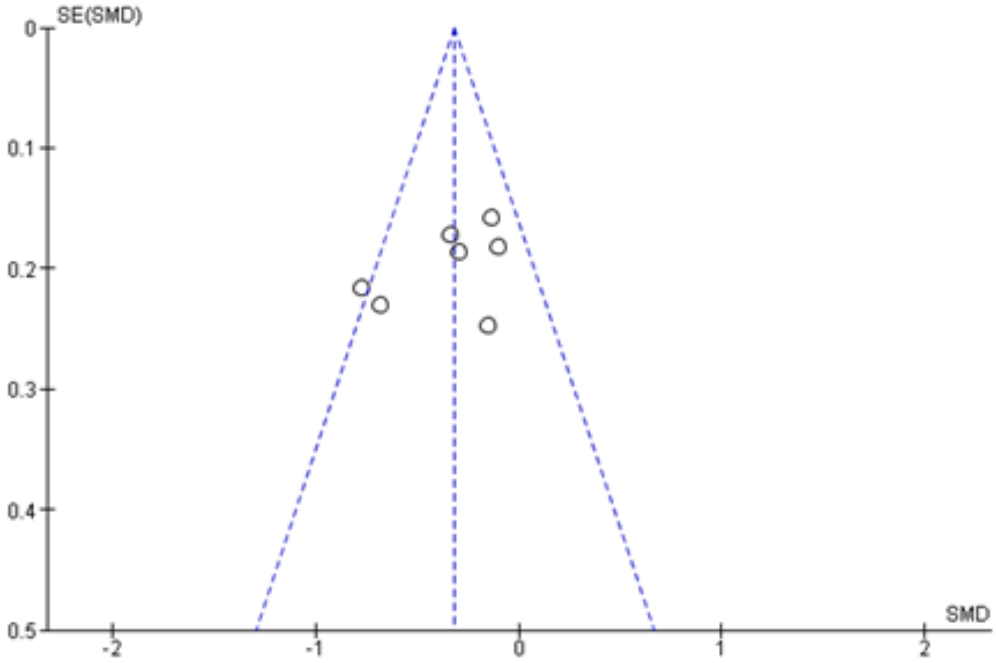

Figure 4. Funnel plot Forest Plot The Effect of Acupuncture on Pain Reduction

b. Funnel plot

The funnel plot in Figure 4.4 shows the asymmetric distribution of the estimated effect between studies in the meta-analysis. The distribution of estimated effects of acupuncture therapy on pain reduction in LBP patients is more on the right of the vertical line of the mean estimated effect than on the left.

Thus the funnel plot indicates that there is publication bias. Because the distribution of the estimated effects lies to the right of the vertical mean more than the left. So the publication bias reduces the effect of acupuncture therapy on pain reduction (underestimate).

2. The Effect of Acupuncture on Quality of Life

	Acupuncture			Non Acupuncture				Std. Mean Difference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year
Witt 2006	43.3	10.3	51	34.6	9.6	50	10.9%	0.87 [0.46, 1.28]	2006
Thomas 2006	67.8	24.1	62	59.5	23.4	59	11.4%	0.35 [-0.01, 0.71]	2006
Haake 2007	46.6	12.3	87	31.5	6.9	87	11.6%	1.51 [1.17, 1.85]	2007
Vas 2012	75.6	37.4	68	63.3	57.4	70	11.7%	0.25 [-0.08, 0.59]	2012
Shin 2013	80.83	13.58	48	73.23	20.24	40	10.7%	0.45 [0.02, 0.87]	2013
Hasegawa 2013	69.01	22.9	40	63.4	22.6	40	10.5%	0.24 [-0.20, 0.68]	2013
Cho 2013	28.23	10.54	57	24.17	10.5	59	11.3%	0.38 [0.02, 0.75]	2013
Cohen 2017	49.9	30.4	91	41.5	28.23	71	11.9%	0.28 [-0.03, 0.60]	2017
Comachio 2020	70.4	26.5	33	62.7	26.01	33	10.0%	0.29 [-0.20, 0.78]	2020
Total (95% CI)			**537**			**509**	**100.0%**	**0.52 [0.22, 0.81]**	

Heterogeneity: Tau² = 0.17; Chi² = 44.18, df = 8 (P < 0.00001); I² = 82%
Test for overall effect: Z = 3.43 (P = 0.0006)

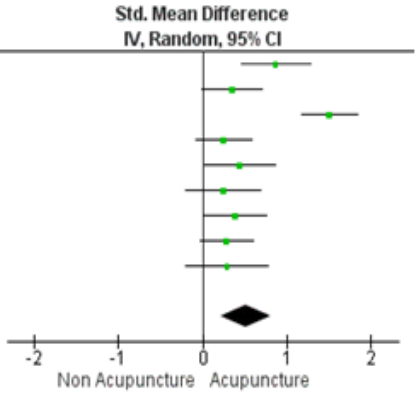

Figure 5. Forest plot the effect of acupuncture on quality of life

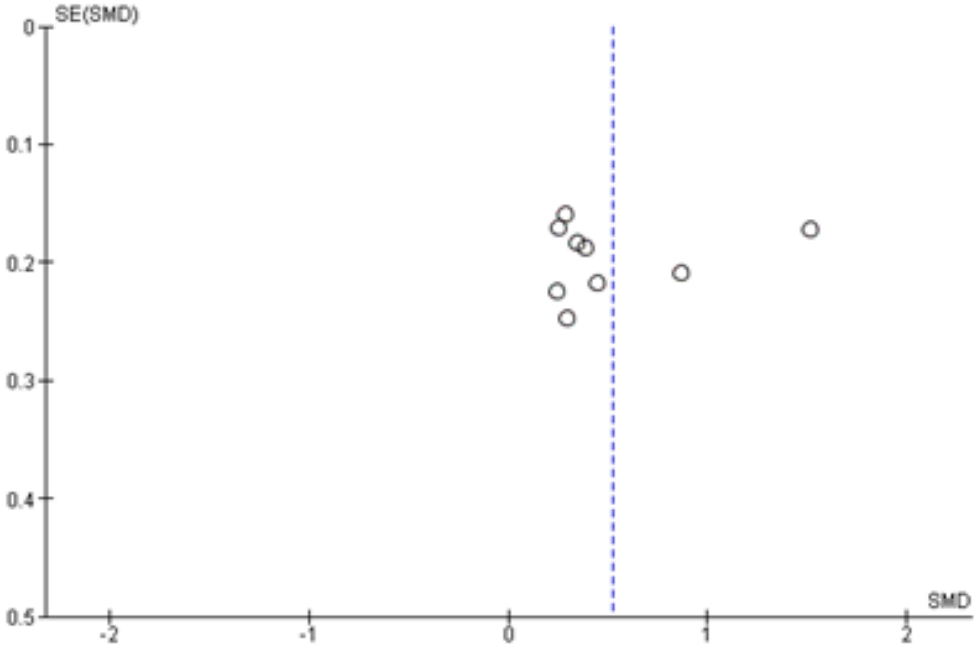

Figure 6. Funnel plot forest plot the effect of acupuncture on quality of life

a. Forest Plot

Forest plot Figure 4.5 shows the effect of acupuncture therapy on improving the quality of life of patients with low back pain. LBP patients receiving manual acupuncture treatment had an average quality of life 0.52 units higher than those not receiving acupuncture, and the effect was statistically significant; (SMD = 0.52; 95% CI = 0.22 to 0.81; p = 0.006).

b. Funnel Plot

The funnel plot in Figure 4.4 shows the asymmetric distribution of the estimated effect between studies in the meta-analysis. The distribution of the estimated effect of acupuncture therapy on the quality of life of LBP patients is more on the left of the vertical line of the mean estimated effect than on the right.

Thus the funnel plot indicates that there is publication bias. Because the distribution of estimated effects lies to the left of the mean vertical line which is more than on the right. So the publication bias reduces the effect of acupuncture therapy on quality of life (underestimate).

DISCUSSION

This research is a systematic review and meta-analysis on the theme of the effect of acupuncture therapy on pain reduction and quality of life. The independent variable analyzed was acupuncture therapy. Acupuncture therapy is one of the complementary treatments that is quite effective in the treatment of low back pain. Acupuncture therapy is quite safe for the body because it does not cause many side effects (Carolyn, 2014). The number of the best and accessible relevant research is still small and also has data access problems (data duplication). Statistical results are often reported in percent and bivariate analysis, where confounding factors (confounding factors) are not controlled by the researcher.

1. The Effect of Acupuncture Therapy on Pain Reduction in Low back Pain Patients

A total of 7 research articles randomized control trial as a source of meta-analysis of the effect of acupuncture therapy on reducing pain in LBP patients. This study showed that the results of the analysis of

acupuncture therapy reduced pain by 0.32 times in LBP patients compared to patients who were not given acupuncture therapy, and the results were statistically significant (SMD = 0.32; 95% CI = -0.46 to -0.17; p <0.001). The heterogeneity of the research data shows I^2= 41% so that the distribution of the data is declared homogeneous (fixed effect model).

Giving acupuncture therapy reduces pain in LBP patients, these results are in accordance with the hypothesis. According to the study (Armstrong et al., 2017), the results of this study of samples with chronic pain after MPS applied to standard acupuncture pain protocols reflected a statistically significant reduction of (b= 3.09; 95% CI= 2.72 to 3.46; p= 0.001). The positive results in this study could have significant and positive implications for patients suffering from chronic back pain.

Another study by (Cohen et al., 2017) as many as 162 patients assessed between January 2010 and December 2011 showed that the effectiveness of acupuncture in providing acute analgesia for patients with complaints of LBP was comparable to pharmacotherapy. Acupuncture is a safe and acceptable form of analgesia.

According to (Michael, 2012), that there are some changes in brain activity after acupuncture therapy. Administration of acupuncture can reduce delta and theta waves has been recorded by means of an electroencephalogram during acupuncture. The decrease in these waves causes a relaxed body condition. Giving acupuncture therapy stimulates the body to release endorphins, these hormones cause the body to feel comfortable, thereby reducing the pain level of low back pain patients.

The most well-known theories related to this are the gate control theory and the endorphin theory, which provides a statement that there is a door that blocks the pathway of nerve movement which is interpreted as pain. The endorphin theory states that substances such as morphine are released in the body under acupuncture treatment.

Giving acupuncture is effective in reducing the patient's pain level, this is because the process of implementing acupuncture is carried out at the meridian point that corresponds to the disease experienced by the patient. In this study, there were also patients who did not experience a decrease in pain levels, from severe pain after being given therapy at a severe level, this was due to psychological factors of patients who were anxious and tense. This condition increases the patient's adrenaline, inhibits the work of endorphins, so that the effect of acupuncture therapy is not optimal.

2. The Effect of Acupuncture Therapy on the Quality of Life of Low Back Pain Patients

A total of 9 research articles randomized control trial as a source of meta-analysis of the effect of acupuncture therapy on the quality of life of LBP patients. This study showed that the results of the analysis of acupuncture therapy improved quality of life 0.52 times in LBP patients compared to patients who were not given acupuncture therapy, and the results were statistically significant (SMD= 0.52; 95% CI= 0.22 to 0.81; p= 0.006). The heterogeneity of the research data shows I^2= 82% so that the distribution of the data is declared heterogeneous (random effect model).

Giving acupuncture therapy improves quality of life in LBP patients, these results are in accordance with the hypothesis. According to a study (Comachio et al., 2020) patients with chronic low back pain, who were given acupuncture therapy showed a significant improvement in sleep patterns, daily activities, and analgesic consumption

compared to those not given acupuncture therapy.

Another study by (Haake et al., 2008) conducted a study for 6 months and measurements were made at the 3rd and 6th months, giving the results that acupuncture therapy in low back pain patients can improve the quality of life both physically and mentally compared to not given therapy. acupuncture. Patients experienced reduced anxiety, good sleep patterns, and no longer taking pain medication.

The results of this study are also supported by the opinion of the American College of Physicians in 2020, acupuncture is one of the therapies without drugs that is recommended for low back pain. Acupuncture performed two to three times a week has been shown to be beneficial in reducing to eliminate complaints of low back pain and reducing the use of drugs so as to improve the quality of life of patients with low back pain.

Acupuncture therapy can help relax the body so that this relaxation can provide a sense of comfort. In a perfectly relaxed state, all cells in the body will experience reproduction, natural healing takes place, the body's hormone production is balanced and the mind is refreshed, so that it can improve the quality of life.

AUTHORS CONTRIBUTION

Frannesty Estu Winahyu is the main researcher who selects the topic, searches for and collects study data. Hanung Prasetya and Bhisma Murti played a role in analyzing data reviewing study documents.

FUNDING AND SPONSORSHIP

This study is self-funded.

ACKNOWLEDGEMENT

We are very grateful to database providers PubMed, Google Scholar, and ScienceDirect.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

REFERENCES

Armstrong K, Gokal R, Chevalier A, Todorsky W, Lim M (2017). Microcurrent point stimulation applied to lower back acupuncture points for the treatment of nonspecific neck pain. J Altern Complement Med. 23(4):295-299. Doi:10.1089/acm.2016.0313.

Cohen MM, Smit DV, Andrianopoulos N (2017). Acupuncture for analgesia in the emergency department: A multicentre, randomised, equivalence and non-inferiority trial. Med J Aust. 206(11):494-499. Doi:10.5694/mja16-.00771.

Comachio J, Oliveira Magalhães M, Nogueira Burke T (2015). Efficacy of acupuncture and electroacupuncture in patients with nonspecific low back pain: Study protocol for a randomized controlled trial. Trials. 16(1):1-7. Doi:-10.1186/s13063-015-0850-7.

Ditjen Yankes (2018). Petunjuk teknis sistem antrian online (Online queuing system technical manual). Jakarta: Kemenkes RI.

Depkes RI (1999). Rencana pembangunan kesehatan menuju indonesia sehat 2010 (Health development plan towards healthy Indonesia 2010). Jakarta:http://library.poltekkespalembang.ac.id/gigi/index.php?p=show_detail&id=584.

Haake M, Muller HH, Schade-Brittinger C, Basler HD, Schafer H, Maier C, Endres HG (2008). German acupuncture trials for chronic low back pain. Arch. Intern. Med. 168 (9):10-10. Doi: 10.1001/archinte.167.17.1892

Hasanah U, Murti B, Prasetya H (2021). The effectiveness of aromatherapy and music therapy to reduce pain during

stage-1 of birth delivery: A Meta-Analysis. J Matern Child Health. 6(3): 295-306. Doi:10.26911/thejmch.202-1.06.03.04.

Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, Williams G, et al. (2014). The global burden of low back pain: Estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis. 73(6):968-974. Doi:10.1136/annrheumdis-2013-204428.

Indana AZ, Rahardjo SS, Prasetya H (2021). Meta-analysis the effectiveness of isometric relaxation and laser therapy in reducing myofascial pain syndrome on musculus upper trapezius. J Epidemiol Public Heal. 6(2): 245-255. Doi:10.26911/jepublichealth.2021.06.02.11.

Kuntono HP (2011). Nyeri secara umum dan osteoarthritis lutut dari aspek fisioterapi. Surakarta: Muhammadiyah University Press.

Noer A, Rahardjo SS, Prasetya H (2021). Meta analysis the effect of acupunctur therapy and ultrasound therapy to reduce pain caused by carpal tunnel syndrome. Indones J Med. 6(4):399-411. Doi:10.26911/theijmed.2021.06.-04.06.

Nugraha NA, Murti B, Prasetya H (2021). Meta analysis the effectiveness of acupuncture vs sham acupuncture on low back pain. Indones J Med. 6(3): 336-346. Doi:10.26911/theijmed.202-1.06.03.11

Patrianingrum M, Ezra O, Eri S (2015). Prevalensi dan faktor risiko nyeri punggung bawah di lingkungan kerja anestesiologi rumah sakit dr. hasan sadikin bandung. J. Anestesi Perioperatif. 3(1): 47–56.

Putri SADMM, Kristiyanto A, Prasetya H (2021). Meta-analysis the effectiveness of mckenzie exercise to reduce pain in patients with non-specific low back pain. J Epidemiol Public Heal. 6(1):33-41. Doi:10.26911/jepublichealth.2021-.06.01.04.

Prasetya H, Kusumawati HN, Wardiyatmi W (2021). The effectiveness of hypnotherapy in reducing pain in patients with cervical cancer. Indones J Med. 6(2):152-158. Doi:10.26911/theijmed.-2021.06.02.04.

Safitri D (2010). Hubungan antara kepercayaan diri dengan penyesuaian sosial mahasiswa di fakultas psikologi UIN Maulana Malik Ibrahim malang (The relationship between self-confidence and social adjustment of students at the psychology faculty of UIN Maulana Malik Ibrahim Malang*)*. Skripsi (tidak diterbitkan): Fakultas Psikologi Universitas Islam Negeri (UIN) Maulana Malik Ibrahim Malang

Susilo FE, Kristiyanto A, Prasetya H (2021). Meta analysis the effect of acupuncture therapy on pain reduction in osteoarthritis patients. Indones J Med. 6(1):95-103. Doi:10.26911/theijmed.2021.06.01.1.

Setiawan C, Tamtomo DG, Prasetya H (2021). The effect of kinesio taping on the reduction of pain in pati with carpal tunnel syndrome: Meta Analysis. Indones J Med. 6(1):104-111. Doi:10.26911/theijmed.2021.06.0-1.11.