Medica Hospitalia
Journal of Clinical Medicine
Med Hosp 2024; vol 11 (1) : 107–112

OPEN ACCESS

Original Article

Effect of Triamcinolone Trigger Point Injection on Changes in TNF-α Levels and Oswestry Disability Index (ODI) Scores Non-Specific Low Back Pain (LBP) Patients

Mohamad Fakih, Suryadi, Dodik Tugasworo, Dwi Pudjanarko, Amin Husni, Trianggoro Budisulistyo, Arinta Puspitawati

Neurology Department Faculty of Medicine, Diponegoro University/ Kariadi Hospital Semarang, Indonesia

p-ISSN: 2301-4369 e-ISSN: 2685-7898
https://doi.org/10.36408/mhjcm.v11i1.976

Accepted: June 14th, 2023
Approved: March 20th, 2024

Author Affiliation:
Neurology Department Faculty of Medicine, Diponegoro University / Kariadi Hospital Semarang, Indonesia

Author Correspondence:
Mohamad Fakih
Dr. Sutomo 16 street, Semarang, Central Java 50244, Indonesia

E-mail:
mohamad.fakih@unsoed.ac.id

Abstract

Background : Low back pain (LBP) is the most common musculoskeletal problem and a major cause of worldwide disability causing increased health costs and indirect costs associated with reduced or lost productivity. One of the therapeutic management of LBP is Triamcinolone trigger point injection. Until now, research on the effect of Triamcinolone trigger point injection on changes in TNF-α levels and Oswestry Disability Index (ODI) scores in Non-Specific LBP patients is still limited. The objectives of this study was to analyze the effect of Triamcinolone trigger point injection on changes in TNF-α levels and ODI scores before and after Triamcinolone trigger point injection in Non-Specific LBP patients.
Methods : This is a quasi-experimental analytic observational study with a pre and post-test group design approach. Subjects were diagnosed with Non-Specific LBP who had met the inclusion criteria (acute pain less than 3 months, patient age 30–55 years, moderate-severe pain intensity, had never received a Triamcinolone trigger point injection) with the exclusion criteria patients experiencing severe pain. not only caused by NPB. The study subjects were checked for TNF-α levels and ODI scores before and after the Triamcinolone trigger point injection. Then a paired T-test was carried out.
Results : During the study period September – November 2022 at the Neurology Outpatient Polyclinic, RSUP Dr. Kariadi Semarang obtained 32 subjects. There was a significant difference between changes in TNF-α levels before and after Triamcinolone trigger point injection (p=0.000). There was a significant difference in ODI scores before and after the Triamcinolone trigger point injection (p=0.000). There was no significant relationship between the risk factors for gender, occupation, BMI, physiotherapy, and changes in TNF-α levels with changes in the ODI score.
Conclusion : There is a significant difference in changes in TNF-α levels and ODI scores before and after Triamcinolone trigger point injection.

Keywords : TNF-α, ODI, Trigger Point Injection, Triamcinolone

INTRODUCTION

Low back pain (LBP) is felt in the lower back area, which can be local pain, radicular, or both. A systematic review conducted by Fatoye *et al* found the prevalence and incidence of LBP ranged from 1.4 – 20.0% and 0.024 – 7.0%.[1] Data from 2017 The Global Burden of Disease (GBD) study found the number of individuals with LBP in 1990 was 377.5 million, and increased to 577.0 million in 2017.[2]

Based on the pathophysiology of low back pain is divided into specific and non-specific low back pain. Specific low back pain is a symptom caused by a specific pathological mechanism, such as herniated nuclei cause (HNP), infection, osteoporosis, rheumatoid arthritis, fracture, or tumor. Non-specific low back pain (Non-specific low back pain) is a symptom without a clear cause, the diagnosis is based on the exclusion of specific pathology. The word "non-specific" indicates that there is no clear structure that causes pain. Non-specific low back pain includes diagnoses such as lumbago, myofascial syndromes, muscle spasms, mechanical LBP, back sprain, and back strain.[3]

Non-specific low back pain is the main cause of increased morbidity, disability, and limited body activity.[4] LBP is a musculoskeletal condition that leads to limited activity with social and medical problems such as increased health costs and indirect costs related to reduced or lost productivity.[5]

The primary function of TNF-α is to regulate the activity and gene expression of matrix metalloproteinase (MMP), decrease the synthesis of collagen and proteoglycan, trigger inflammatory responses, and promote the production of other cytokines such as IL-1, IL-6, IL-8, and prostaglandin E2. It also aids in cell migration and improves endothelial cell permeability. The TNF-α released during the inflammatory process triggered by herniated intervertebral discs plays a role in causing mechanical and thermal hyperalgesia.[6]

One of the therapeutic management of LBP is the injection of corticosteroid trigger points. Triamcinolone is a synthetic corticosteroid that acts as an anti-inflammatory. Triamcinolone forms used are Triamcinolone Acetonide (TA) and Triamcinolone Hexacetonide (TH). Triamcinolone Acetonide inhibits proinflammatory cytokines and stimulates the release of anti-inflammatory cytokines. Triamcinolone Acetonide can suppress Tumor Necrosis Factor (TNF) Alpha, which is a pro-inflammatory cytokine. An important anti-inflammatory mechanism of Triamcinolone Acetonide is mediated by the inhibition of Nuclear Factor Kappa-B (NF-kappa-B), which causes decreased expression of the protein Tumor Necrosis Factor (TNF) Alpha.[7,8]

Until now, research on the effect of Triamcinolone trigger point injection on changes in TNF-α levels and Oswestry Disability Index (ODI) scores in non-specific low back pain (LBP) patients is still limited. The purpose of this study was to analyze the effect of Triamcinolone trigger point injection on changes in TNF-α levels and Oswestry Disability Index (ODI) scores before and after Triamcinolone trigger point injection in Non-Specific Low Back Pain (LIP) patients.

METHODS

This research is a quasi-experimental analytic observational study with a pre and post-test group design approach. The research was conducted at the Neurology Outpatient Polyclinic at RSUP Dr. Kariadi Semarang from September to November 2022. Inclusion criteria for this study were non-specific low back pain patients with acute pain less than 3 months, patients aged 30 – 55 years, moderate to severe pain intensity with a single trigger point, and patients who had never received Triamcinolone trigger point injection. Exclusion criteria in this study were patients experiencing pain that was not only caused by low back pain (known from history and physical examination).

The triamcinolone injection used in this study was 10 mg. The injection was carried out at the location of the trigger point using a 24 G needle with an injection perpendicular to the center of the active trigger point at one trigger point. In this study, the determination of trigger points was based on pressing the index finger of one doctor examining in the area suspected of having a trigger point and comparing it to the opposite side of the lower back.

Serum TNF-α level is an important inflammatory biomarker when inflammation occurs and is also found in inflammatory conditions such as LBP. Measurement with Elisa Kit (Enzym-linked Immunosorbent).

The ODI is a questionnaire used by health care providers to measure LBP outcomes, divided into 10 sections to assess limitations in various daily activities. Each section has a scale of 0–5, with 5 indicating the most severe disability. Calculated by dividing the total score by the normal total score, then multiplied by 100 and shown as a percentage. Improvement is marked by a decrease in the ODI score of> 10 points.

Data analysis using the "SPSS for Windows version 26" program. The first stage is a descriptive statistical stage to determine the basic characteristics of research subjects' gender, BMI, occupation, physiotherapy, ODI score, and TNF-α levels. The second stage is the Shapiro-Wilk normality test. Then a comparative test of TNF-α levels and ODI scores were carried out before and after injection of Triamcinolone trigger point by paired T-test and logistic regression test was performed to determine the relationship between changes in TNF-α levels, body mass index (BMI), gender, occupation and physiotherapy alone or together with changes in the Oswestry Disability Index (ODI) score of

Non-Specific low back pain (NPB) patients.

The confounding variables in this study consist of body mass index, gender, occupation, and physiotherapy. This research has received Ethical Clearance approval from the Research Ethics Commission at RSUP Dr. Kariadi with the number 1148/EC/KEPK-RSDK/2022.

RESULTS

The research was conducted from September to November 2022 at the Neurology Outpatient Polyclinic, RSUP Dr. Kariadi Semarang. During the study period, 84 subjects with acute non-specific low back pain (NPB) were observed, with 28 subjects with mild pain intensity so they did not receive Triamcinolone trigger point injections and 56 subjects receiving Triamcinolone trigger point injections with moderate to severe pain intensity, with 24 subjects of whom had more than one trigger point, and 32 subjects had moderate-to-severe pain intensity with VAS 6.34 ± 1.001 and had a single trigger point that met the inclusion criteria who were injected with Triamcinolone trigger points who participated in and completed the study. No subjects were excluded during the study and no research subjects were dropped out.

Based on Table 1, shows that research subjects who experienced Non-Specific low back pain were more common in women as many as 25 subjects (78.1%) compared to men as many as 7 subjects (21.9%). Research subjects with risky jobs have 17 subjects (53.1%) more than jobs that are not at risk, there are 15 subjects (46.9%). The study subjects who experienced Non-Specific low back pain were more obese as many as 18 subjects (56.3%) compared to those who were not obese as many as 14 subjects (43.7%).

Based on Table 2, shows that the mean TNF α level before injection of the Triamcinolone trigger point was 108.84 and the mean TNF α level after injection of the Triamcinolone trigger point was 45.24 which showed that with Triamcinolone trigger point injection there was a change in TNF α levels. After the paired T-test was carried

TABLE 1
Characteristics of research subjects

Variable		Frequency	Percentage (%)	Means (SD)	*p*
Gender	Man	7	21.9		0.468
	Woman	25	78.1		
Female	Risky	17	53.1		0.814
	No risk	15	46.9		
BMI	Obesity	18	56.3		0.468
	Not obese	14	43.7		
Physiotherapy	Physiotherapy	13	40.6		0.422
	Not Physiotherapy	19	59.4		
TNF α levels before injection trigger point				108.84 (136.19)	0.557
ODI score before injection trigger point				31.44 (5.33)	0.939

*P Test homogeneity (sig p>0.05)

TABLE 2
Changes in TNF-α levels, ODI, and VAS scores before and after Triamcinolone trigger point injection

Variable	Means (SD)			t	*p*
	Before	After	Change		
TNF α levels	108.84 (136.19)	45.24 (67.41)	64.44 (102.08)	4.136	0.000
ODI score	31.44 (5.33)	20.75 (5.68)	10.66 (5.84)	10.354	0.000
VAS	6.38 (1.04)	4.53 (1.13)	1.84 (1.11)	9.39	0.000

*P test paired T-test (sig p<0.05)

TABLE 3
Relationship between the location of the Trigger point injection and changes in VAS, changes in ODI scores, and changes in TNF-α levels

Variable		Trigger point injection location		P	r
		Lumbar paravertebral region	Gluteus region		
VAS changes	Still	4	4	0.703	0.073
	Down	14	10		
ODI Score Change	Getting better	11	10	0.712	0.107
	Not getting better	7	4		
Change TNF levels-α	Go on	3	4	0.669	0.141
	Down	15	10		

*P contingency coefficient test (sig p<0.05)

TABLE 4
Relationship between gender, occupation, BMI, and physiotherapy, and changes in TNF-α levels with changes in ODI scores

Variable		ODI score changes				P	B
		Getting better		Not getting better			
		n	%	n	%		
Gender	Man	5	15.6	2	6.2	0.235	1.791
	Woman	16	50.0	9	28.2		
Work	Risky	11	34.4	6	18.7	0.859	-.179
	No risk	10	31.3	5	15.6		
BMI	Obesity	16	50.0	2	6.2	0.080	3.306
	Not obese	5	15.6	9	28.2		
Physiotherapy	Physiotherapy	6	18.8	7	21.9	0.091	-1.990
	Not Physiotherapy	15	46.8	4	12.5		
Change TNF-α	Go on	4	12.5	3	9.4	0.750	-.418
	Down	17	53.1	8	25.0		

P Logistic Regression Test (sig p<0.05)

out, the results were obtained p = 0.000.

Based on Table 2, shows that the mean ODI score before the Triamcinolone trigger point injection was 31.44 and the mean ODI score after the Triamcinolone trigger point injection was 20.75, which shows that with Triamcinolone trigger point injection there was an improvement in the disability ODI score . After the paired T-test was carried out, the results were obtained p = 0.000.

Based on Table 3, shows that there is no relationship between the location of trigger point injection with changes in VAS, ODI score, and TNF-α levels, the results obtained are changes in VAS (p = 0.703), changes in ODI scores (p = 0.712), and changes in TNF-α levels (p = 0.669).

Based on Table 4, shows that there is no significant relationship between gender, occupation, BMI, and physiotherapy with changes in ODI scores. Gender (p=0.235), occupation (p=0.859), BMI (p=0.080), physiotherapy (p=0.091), and changes in TNF-α levels (p=0.750).

DISCUSSION

Research in determining trigger points, research conducted by Seyed Reza Saeidian *et al* in patients who have trigger points with the character of pain that arises after applying pressure of 2 kg/cm^2 on the area suspected of having a trigger point and comparing it with the

opposite side.[9] Research conducted by Bina Eftekharsadat in determining trigger points using a digital algometer (Wagner Instruments, Greenwich, CT, USA) to assess Pressure-pain threshold (PPT) at trigger points.[10–12] In this study did not use this tool, because the tool is not available in the hospital where the research is taking place, it is also very difficult to get the tool so it has the potential to affect research results.

In this study, changes in TNF-α levels were obtained, before and after injection of Triamcinolone trigger points. Changes in TNF-α levels were found in 10 subjects with normal range levels and 15 subjects with decreasing TNF-α levels, so a total of 25 subjects experienced changes in TNF-α levels with Triamcinolone trigger point injection. In this study, Triamcinolone trigger point injection was enough to show a statistical change in the initial decrease in TNF-α levels. This is to the study of Judith A Strong *et al* which stated that low back pain in patients is reduced by injection of corticosteroid trigger points. This is due to glial cell activation, macrophage infiltration, increased proinflammatory cytokines, and activation of inflammatory signaling pathways by lowering TNF-α levels. can reduce pain.[13] However, Andrade *et al*.'s study with a randomized clinical trial of TNF-α antagonists in radiculopathy patients failed to show a positive effect, because these trials tended to involve patients with chronic low back pain.[14] Triamcinolone is a steroidal anti-inflammatory drug, which has a tissue distribution that when injected has general anti-inflammatory effects, inhibiting type I inflammation (characterized by high levels of oxidative metabolites and proinflammatory cytokines) and enhancing type II inflammatory processes (tissue remodeling) and wound repair).[15] Risbud and Shapiro have investigated the relationship between cytokines and the development of pain. low back, where the association of low back pain begins with injury and is then followed by the release of TNF-α.[16] Triamcinolone Acetonide inhibits proinflammatory cytokines and stimulates the release of anti-inflammatory cytokines. Triamcinolone Acetonide can suppress Tumor Necrosis Factor (TNF) Alpha, which is a pro-inflammatory cytokine. An important anti-inflammatory mechanism of Triamcinolone Acetonide is mediated by the inhibition of Nuclear Factor Kappa-B (NF-kappa-B), which causes decreased expression of the protein Tumor Necrosis Factor (TNF) Alpha.[7,8]

Of the 32 subjects, a disability assessment was carried out with an ODI score before the Triamcinolone trigger point injection, then on day 30 a disability assessment was carried out with an ODI score after the Triamcinolone trigger point injection. Based on comparative test data on changes in ODI scores before and after Triamcinolone trigger point injections using the paired T-test, the results obtained were $p < 0.05$, so there was a significant decrease in ODI scores in patients before and after Triamcinolone trigger point injections. This is consistent with a study conducted by Bina Eftekharsadat *et al* showing that corticosteroid trigger point injections significantly reduced the ODI score of low back pain patients in the second week.[12] This is also in line with research conducted by Bahar Dernek *et al* which showed that in low back pain patients evaluated in the first month and third month it was found that the ODI score decreased after injection of Triamcinolone trigger point. to 32 patients for each group. After treatment with Triamcinolone trigger point injection, pain scores were reduced in the Triamcinolone trigger point injection group compared to the control group.[13]

There was no significant relationship between the location of trigger point injection and changes in VAS, ODI score, and TNF-α levels. The results showed changes in VAS ($p = 0.703$), changes in ODI scores ($p = 0.712$), and changes in TNF-α levels ($p = 0.669$). This is in contrast to a study conducted by Paul *et al*, which found that acute LBP patients experience changes in the structure and function of the back muscles which can be influenced by various biological and/or psychosocial influences. Biologics are associated with nociceptive pain, and afferent pain is associated with tissue injury. Intramuscular injection of hypertonic saline induces deep muscle pain and the appearance of musculoskeletal pain lasting 3 to 10 minutes. Changes in back muscle function during low back pain involving disturbed spinal posture control.

There is no significant relationship between changes in TNF-α and gender, occupation, BMI, and physiotherapy with changes in ODI scores. Gender ($p=0.235$), occupation ($p=0.859$), BMI ($p=0.080$), physiotherapy ($p=0.091$), and changes in TNF-α levels ($p=0.750$). Research by Park, *et al* found that the average TNF-α concentration was significantly higher in subjects who experienced chronic LBP intensity than in acute LBP. TNF-α is associated with pain quality and ODI.[19] A study by Uçeyleret *et al* found that there were two-fold higher levels of TNF-α in patients with LBP compared to healthy controls. In addition to its correlation with pain quality, TNF α has a positive correlation with ODI. Wanget *et al*' s study conducted a prospective comparative longitudinal study and found that there were much higher levels of TNF-α in the LBP patient group than in the control group.[20] Quieroz *et al*.'s study examined the relationship between TNF-α and ODI, which was positively correlated with disability due to LBP.[21]

RESEARCH LIMITATIONS

This study has limitations, namely, it does not take into account the measurability in determining trigger points in patients with non-specific low back pain and does not take into account the type and dose of painkillers consumed by patients before and during the study.

CONCLUSION

There was a significant difference between TNF-α levels before and after the Triamcinolone trigger point injection. There was a significant difference between the ODI score before and after the Triamcinolone trigger point injection. There was no significant relationship between age and location of trigger point injection with changes in pain intensity, TNF-α levels, and Oswestry Disability Index (ODI) scores. There was no significant relationship between changes in TNF-α levels, gender, occupation, BMI, and physiotherapy with changes in ODI scores after Triamcinolone trigger point injection.

REFERENCES

1. Fatoye F, Gebrye T OI. Real-world incidence and prevalence of low back pain using routinely collected data. Rheumatol Int. 2019;39:619–626.
2. Wu A, March L, Zheng X, Huang J *et al*. Global low back pain prevalence and years lived with disability from 1990 to 2017: estimates from the Global Burden of Disease Study 2017. Ann Transl Med. 2020;8(6):299.
3. Urits I, Burshtein A, Sharma M, Testa L *et al*. Low Back Pain, a Comprehensive Review: Pathophysiology, Diagnosis, and Treatment. Curr Pain Headache Rep. 2019;23:23.
4. Gorth DJ, Shapiro IM RM V. Transgenic mice overexpressing human TNF-α experience early onset spontaneous intervertebral disc herniation in the absence of overt degeneration. Cell Death Dis. 2018;10(1):7. https://doi.org/10.1038/s41419-018-1246x
5. WHO. International classification of functioning, disability and health: ICF. In Geneva, Switzerland; 2001.
6. Liu X-G, Hou H-W LY-L. Expression levels of IL-17 and TNF-α in degenerated lumbar intervertebral discs and their correlation. Exp Ther Med. 2016;11(6):2333-2340. https://doi.org/10.3892/etm.2016.3250
7. Sungkar A, Widyatmoko D, Yarso KY WB. The effect of duration of wound skin tissue on MDA, TNF-α, IL-6, Caspase 3, VEGF levels, and granulation tissue thickness in the white rat (Rattus novergicus). Bali MedJournal. 2020;9(3):918–923.
8. Siebelt M, Korthagen N, Wei W, Groen H, Bastiaansen-Jenniskens Y, Müller C *et al*. Triamcinolone acetonide activates an antiinflammatory and folate receptor-positive macrophage that prevents osteophytosis in vivo. Arthritis Res Ther. 2015;17:352.
9. Saeidian SR, Pipelzadeh MR, Rasras S, Zeinali M. Effect of trigger point injection on lumbosacral radiculopathy source. Anesthesiol Pain Med. 2014;4(4):1–4.
10. Asiri F, Tedla J, Alshahrani M, Ahmed I, Reddy R GK. Effects of patient-specific three-dimensional lumbar traction on pain and functional disability in patients with lumbar intervertebral disc prolapse. Niger J Clin Pr. 2020;23(4):498–502.
11. Sciotti VM, Mittak VL, DiMarco L, Ford LM, Plezbert J, Santipadri E *et al*. Clinical precision of myofascial trigger point location in the trapezius muscle. Pain. 2001;93(3):259–.
12. Eftekharsadat B, Fasaie N, Golalizadeh D, Babaei-Ghazani A, Jahanjou F, Eslampoor Y, *et al*. Comparison of efficacy of corticosteroid injection versus extracorporeal shock wave therapy on inferior trigger points in the quadratus lumborum muscle: a randomized clinical trial. BMC Musculoskeletal Disorder. 2020;21(1):1–11.
13. Strong JA, Xie W, Bataille FJ, Zhang JM. Preclinical studies of low back pain. Mol Pain. 2013;9(1):1–9.
14. Andrade P, Visser-Vandewalle V, Hoffmann C, Steinbusch HW DM, Preclinical HG. Role of TNF-alpha during central sensitization. Neurol Sci. 2011;32:757–771.
15. Knezevic NN, Jovanovic F, Voronov D, Candido KD. Do corticosteroids still have a place in the treatment of chronic pain? Front Pharmacol. 2018;9(NOV).
16. Risbud, MV, and Shapiro IM. Role of cytokines in intervertebral disc degeneration: pain and disc content. Nat Rev Rheumatol. 2014;10, 44–56.
17. Bahar Dernek, Levent Adiyeke , Tahir Mutlu Duymus , Akın Gokcedag , Fatma Nur Kesiktas CA. Efficacy of Trigger Point Injections in Patients with Lumbar Disc Hernia without Indication for Surgery. Asian Spine J. 2018;12(2):232–237.
18. Hodges PW, Danneels L. Changes in structure and function of the back muscles in low back pain: Different time points, observations, and mechanisms. J Orthop Sports Phys Ther. 2019;49(6):464–76.
19. Quan M, Park SE, Lin Z, Hong MW, Park SY, Kim YY. Steroid treatment can inhibit nuclear localization of members of the NF-κB pathway in human disc cells stimulated with TNF-α. Eur J Orthop Surg Traumatol. 2015;25(977):43–51.
20. Khan AN, Jacobsen HE, Khan J, Filippi CG, Levine M, Lehman RA, *et al*. Inflammatory biomarkers of low back pain and disc degeneration: a review. Ann NY Acad Sci. 2017;1410(1):68–84.
21. De Queiroz BZ, Pereira DS, Lopes RA *et al*. Association Between the Plasma Levels of Mediators of Inflammation With Pain and Disability in the Elderly With Acute Low Back Pain: Data From the Back Complaints in the Elders (BACE)-Brazil Study. Spine J. 2016;41(3):197–203. https://doi.org/10.1097/BRS.0000000000001214