Journal of Medical and Health Studies (JMHS)
ISSN: 2710-1452
DOI: 10.32996/jmhs
Journal Homepage: www.al-kindipublisher.com/index.php/jmhs

JMHS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Meta-analysis of the Effectiveness of Acupuncture Treatment in Dry Eye Disease

Yücel Katı[1]✉ and Cemal Çevik[2]

[1]Lokman Hekim University, Institute of Health Sciences, Traditional and Complementary Medicine Doctorate Program, Ankara, Türkiye
[2]Lokman Hekim University, Faculty of Medicine, Department of Medical Biochemistry, Ankara, Türkiye
Corresponding Author: Cemal Çevik, **E-mail**: cemal.cevik@lokmanhekim.edu.tr

| ABSTRACT

In this research, it was aimed to evaluate effectiveness of acupuncture treatment in dry eye disease by using meta-analysis. In total, 10 researches with 11 samples were used in the study among evaluated 645 researches on acupuncture on academic databases. Female and male ratios, ages, Ocular Surface Disease Index (OSDI) and Schirmer I test (SIT) levels of patients in researches were recorded. In total, 349 patients were subjected to the study including 260 (74.50%) female and 89 male (25.50%) dry eye patients. Mean age was 50.46 with 22.37-60.71 range. Initial OSDI mean was 50.46 and final OSDI mean was 34.71 with -14.32 mean OSDI difference. SIT difference mean was 0.96 with 5.92 initial and 7.75 final mean values. Spearman's rho correlation analysis results showed that female frequency, male frequency and age were not significantly correlated with OSDI and SIT difference ($p>0.05$). Generalized Linear model (Logit) results showed that age had significant effect on OSDI difference (OR=-0.205; $p<0.05$), and effects of gender and age on SIT difference were statistically insignificant ($p>0.05$).Acupuncture provides important results in terms of stimulating the lacrimal glands in patients with dry eyes and allowing more tears to be produced. Although acupuncture method provides effective results for both genders, its effect is more in young individuals than in older individuals.

| KEYWORDS

Dry eye, acupuncture, treatment

| ARTICLE INFORMATION

ACCEPTED: 02 November 2024 **PUBLISHED:** 25 November 2024 **DOI:** 10.32996/jmhs.2024.5.4.16

1. Introduction

Dry eye disease is defined as insufficient tear production on the ocular surface of the eye and results from insufficient tear production or rapid evaporation (1-3). Dry eye, an important problem with increasing frequency in societies, can be examined in three types according to its causes. The first of these is dry eye due to water deficiency, the second is evaporative dry eye, and the third is mixed dry eye disease, which is both (4-6). Although many factors are shown as the causes of the disease, there are also individual factors such as environmental factors, vitamin deficiency, pregnancy, and menopause. Dry eye presents important symptoms in patients such as visual impairment, burning in the eye, redness, sensitivity to light, tenderness, and inability to sleep (7-9). Although treatment approaches focus on replacing the missing tears in the eye, it can be stated that there is no permanent definitive solution yet (9).

Acupuncture is a treatment method based on the principle of stimulating certain points on the skin by inserting needles into them and is currently used in the treatment of many gland or system disorders in the body, from pain control (10-12). Its basic mechanism is to ensure that the body or target organ shows the desired effect by sending nervous system signals, activating blood vessels, strengthening the immune system, helping to activate hormones or relaxing muscles (10-13). Although acupuncture has been the subject of much debate in the field of medicine in the past, it is currently included in the academic literature as a treatment

method that is used intensively and successful results are reported (14-23). Studies are ongoing today on the application and mechanisms of acupuncture, which is especially prominent in pain and addiction treatments.

Current treatment methods for dry eyes focus on replacing dryness, and studies that will increase the activation of the tear glands are quite limited. On the other hand, in recent years, studies have been conducted in the field, reporting the success of acupuncture treatment in dry eye patients. This study aimed to analyze the clinical studies conducted with acupuncture in dry eye disease through meta-analysis.

2. Methods

2.1. Model of the Research

The research was conducted on descriptive scanning and meta analysis methods. In this respect, studies on dry eye and acupuncture were first described, and further meta analysis methods were used.

2.2. Data Set

Secondary data sources were used to collect research data. For this purpose, relevant keywords were searched from academic databases such as Web of Science, Scopus, and Pubmed. Due to the diversity of acupuncture applications, all acupuncture treatment studies related to dry eye were evaluated.

In total, 10 researches with 11 samples were used in the study (14-23) among evaluated 645 researches on acupuncture on academic databases. Female and male ratios, ages, Ocular Surface Disease Index (OSDI) and Schirmer I test (SIT) levels of patients in researches were recorded.

2.3. Statistical Analysis

Research data descriptions were given with means and frequencies. Spearman's rho correlation analysis was used to determine the relationship between OSDI-SIT differences and gender-age parameters. Due to linearization deviations (24-26), Generalized Linear Model (Logit) was used for the effects of gender and age on OSDI-SIT differences. SPSS 25.0 for Windows was used for analysis at 95% Confidence Interval and 0.05 significance level.

3. Results

In total, 349 patients were subjected to the study, including 260 (74.50%) female and 89 male (25.50%) dry eye patients. Mean age was 50.46 with 22.37-60.71 range. Initial OSDI mean was 50.46 and the final OSDI mean was 34.71 with -14.32 mean OSDI difference. SIT difference mean was 0.96 with 5.92 initial and 7.75 final mean values (Table 1).

Table 1. Baseline characteristics of dry eye patients and OSDI-SIT scores with research outcomes

Article	**Females**	**Males**	**Age**	**OSDI initial**	**OSDI final**	**OSDI difference**	**SIT initial**	**SIT final**	**SIT difference**
14	28	2	22.37	36.29	25.68	-10.61	5.77	8.73	2.96
15	38	22	44.16	34.50	18.36	-16.14	4.37	9.25	4.88
16	6	3	23.67	40.65	27.38	-13.27	6.67	4.78	-1.89
17	20	4	54.00	80.00	70.00	-10.00	10.00	11.00	1.00
18	24	6	51.87	46.62	28.56	-18.06	2.68	4.18	1.50
19	53	22	47.95	50.05	33.90	-16.15	4.49	5.95	1.46
20	23	4	42.04	49.75	29.64	-20.11			0.00
21a	8	7	32.40	57.10	43.50	-13.60	4.10	15.90	11.80
21b	9	6	36.30	60.80	45.50	-15.30	5.30	4.10	-1.20
22	37	13	58.92			0.00	10.90		-10.90

23	14	0	60.71	48.83	24.55	-24.28	4.93	5.89	0.96
		Mean	43.13	50.46	34.71	-14.32	5.92	7.75	0.96

OSDI: Ocular Surface Disease Index, SIT: Schirmer I test.

Spearman's rho correlation analysis results showed that female frequency, male frequency and age were not significantly correlated with OSDI and SIT difference (p>0.05) (Table 2).

Table 2. Spearman's rho correlation between OSDI-SIT differences and gender with ages

	OSDI difference		**SIT difference**	
	r	**p**	**r**	**p**
Females	-0.224	0.533	0.433	0.244
Males	-0.067	0.853	0.479	0.192
Age	-0.491	0.150	-0.167	0.668

OSDI: Ocular Surface Disease Index, SIT: Schirmer I test.

Generalized Linear model (Logit) results showed that age had a significant effect on OSDI difference (OR=-0.205; p<0.05). On the other hand, the effects of gender and age on SIT differences were statistically insignificant (p>0.05) (Table 3).

Table 3. Generalized Linear model (Logit) for effects of gender age on OSDI and SIT differences

Parameter	**OR**	**Std. Error**	**95% Wald Confidence Interval**		**Hypothesis Test**		
			Lower	**Upper**	**Wald X^2**	**df**	**p**
OSDI							
(Intercept)	-8.070	3.801	-15.521	-0.619	4.507	1	0.034
Females	0.033	0.123	-0.208	0.273	0.071	1	0.790
Males	0.016	0.224	-0.422	0.455	0.005	1	0.941
Age	-0.205	0.090	-0.382	-0.029	5.223	1	0.022
(Scale)	10.939	4.892	4.553	26.282			
SIT							
(Intercept)	3.701	4.163	-4.458	11.860	0.790	1	0.374
Females	-0.090	0.138	-0.359	0.180	0.424	1	0.515
Males	0.245	0.254	-0.253	0.743	0.932	1	0.334
Age	-0.031	0.098	-0.223	0.161	0.100	1	0.752
(Scale)	13.035	6.145	5.174	32.837			

OSDI: Ocular Surface Disease Index, SIT: Schirmer I test.

OSDI differences were higher in low ages, and effect of acupuncture on dry eyes was decreasing by old ages (Figure 1).

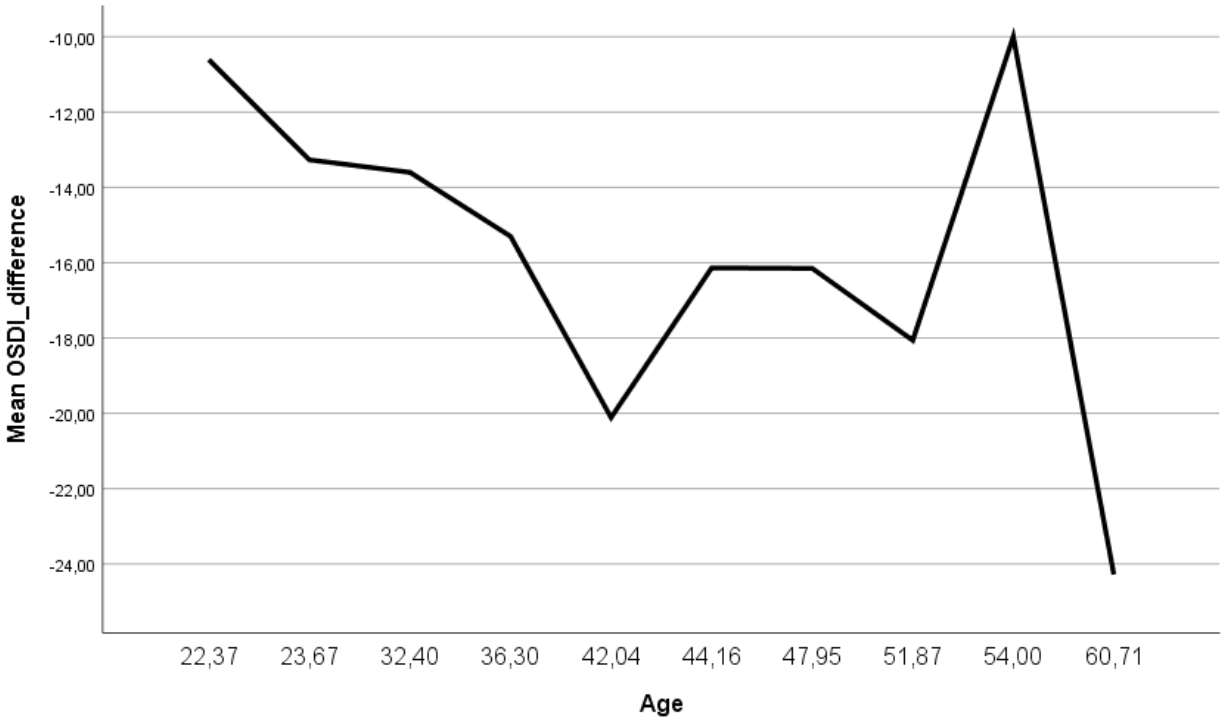

Figure 1. OSDI difference changes according to patient ages

4. Discussion

In this study, studies on dry eye treatment with acupuncture were examined, a total of 11 samples from 10 clinical studies were evaluated, and the effectiveness of acupuncture treatment on dry eye disease was analyzed in different genders and ages. According to the results obtained, the acupuncture method in dry eye patients was effective in all age groups and both genders.

Although there are many studies on acupuncture in the literature, the majority of them are in the form of systematic reviews or meta-analyses (14-22). However, the data on dry eye treatment in these meta-analyses are quite limited. The number of clinical studies is quite limited compared to meta-analyses or systematic reviews (14-22). However, these meta-analyses only looked at effectiveness, and there were not enough studies conducted to determine which gender and age range it is more effective for.

The results obtained from the correlation analysis in our study show that acupuncture treatment can be used effectively for all ages and genders. The regression analysis results show that the effect of acupuncture is less in older ages than in younger ages. This situation is not actually meaningless or ineffective in older ages. It just shows that it is more effective in younger ages. In this respect, the results obtained reveal that more attention and session density may be needed in the treatment of dry eyes with acupuncture, especially in older individuals.

Limitations of the study

The most important limitation of the study is that the majority of studies on acupuncture focus on literature reviews or conceptual studies, and therefore, the number of studies to be compared is small. In fact, this situation also contributes to the prominence of the study.

Another important limitation of the study is that there is a great deal of diversity in acupuncture-related practices, so it is not possible to make inferences about which type of acupuncture has what effect. In addition, due to the unique demographic and clinical information collection method of each clinical practice, demographic data was limited to age and gender.

Contribution to literature and clinical applications

The most important contribution of the study to the literature is that, unlike studies on dry eyes, it reveals the effects of demographic variables on a large sample. In this respect, the results of the study reveal that acupuncture is effective for all age

groups and both genders. The contribution of the study to clinical practice is that, especially in the elderly, the effectiveness of acupuncture treatment is relatively limited compared to the young, and it may be beneficial to provide additional support sessions or supplements.

5. Conclusion

According to the research results, acupuncture provides important results in terms of stimulating the lacrimal glands in patients with dry eyes and allowing more tears to be produced. Although the acupuncture method provides effective results for both genders, its effect is more in young individuals than in older individuals.

The reasons for the results obtained in the research can be expanded with cross-comparisons on a multi-center and large sample. In addition, conducting further studies on the effects and mechanisms of action of different types of acupuncture can provide effective results in achieving the highest efficiency in dry eyes, which is an important health problem for individuals.

Conflict of Interest and Source of Funding: Authors decelerate no conflicts of interest.
Ethical Statement: Since the nature of the research relies on public data, no ethical approval is applicable, and informed consent is not applicable.
Funding: The author funded the research.
Authors' contributions: Authors equally contributed to the research.
Patient consent for publication: Since data are public, no patient consent is applicable.
Acknowledgements: We thank Kadir Yılmaz for statistical support.

References

1. Clayton, J. A. (2018). Dry eye. *New England Journal of Medicine*, *378*(23), 2212-2223.
2. Smith, J. A. (2007). The epidemiology of dry eye disease. *Acta Ophthalmologica Scandinavica*, *85*.
3. McGinnigle, S., Naroo, S. A., & Eperjesi, F. (2012). Evaluation of dry eye. *Survey of ophthalmology*, *57*(4), 293-316.
4. Bron, A. J. (2001). Diagnosis of dry eye. *Survey of ophthalmology*, *45*, S221-S226.
5. Khanal, S., Tomlinson, A., McFadyen, A., Diaper, C., & Ramaesh, K. (2008). Dry eye diagnosis. *Investigative ophthalmology & visual science*, *49*(4), 1407-1414.
6. Lemp, M. A., & Foulks, G. N. (2007). The definition and classification of dry eye disease. *Ocul Surf*, *5*(2), 75-92.
7. Lemp, M. A. (2008). Management of dry eye disease. *Am J Manag Care*, *14*(3 Suppl), S88-S101.
8. Baudouin, C. (2001). The pathology of dry eye. *Survey of ophthalmology*, *45*, S211-S220.
9. Calonge, M. (2001). The treatment of dry eye. *Survey of ophthalmology*, *45*, S227-S239.
10. Vickers, A., Wilson, P., & Kleijnen, J. (2002). Acupuncture. *Quality & safety in health care*, *11*(1), 92.
11. Kaptchuk, T. J. (2002). Acupuncture: theory, efficacy, and practice. *Annals of internal medicine*, *136*(5), 374-383.
12. Chon, T. Y., & Lee, M. C. (2013, October). Acupuncture. In *Mayo Clinic Proceedings* (Vol. 88, No. 10, pp. 1141-1146). Elsevier.
13. Ernst, E. (2006). Acupuncture–a critical analysis. Journal of internal medicine, 259(2), 125-137.
14. Tang, N., Tang, L., Lyu, J., Jiang, X., Li, Y., Ding, C., & Xiang, S. (2024). Effect of Acupuncture on Tear Proteomics in Patients with Video Display Terminal-Related Dry Eye. *Journal of proteome research*, *23*(6), 2206–2218. https://doi.org/10.1021/acs.jproteome.4c00134
15. Zhang, X., Zhang, B., Peng, S., Zhang, G., Ma, J., & Zhu, W. (2022). Effectiveness of acupuncture at acupoint BL1 (Jingming) in comparison with artificial tears for moderate to severe dry eye disease: a randomized controlled trial. *Trials*, *23*(1), 605. https://doi.org/10.1186/s13063-022-06486-4
16. Lee, J. H., Han, K., Kim, T. H., Kim, A. R., Kwon, O., Kim, J. H., Kim, J. E., Lee, S., Shin, M. S., Jung, S. Y., Park, H. J., & Lee, S. (2021). Acupuncture for dry eye syndrome after refractive surgery: A randomized controlled pilot trial. *Integrative medicine research*, *10*(1), 100456. https://doi.org/10.1016/j.imr.2020.100456
17. Dhaliwal, D. K., Zhou, S., Samudre, S. S., Lo, N. J., & Rhee, M. K. (2019). Acupuncture and dry eye: current perspectives. A double-blinded randomized controlled trial and review of the literature. *Clinical ophthalmology (Auckland, N.Z.)*, *13*, 731–740. https://doi.org/10.2147/OPTH.S175321
18. Hu, W. L., Yu, H. J., Pan, L. Y., Wu, P. C., Pan, C. C., Kuo, C. E., Tseng, Y. J., & Hung, Y. C. (2021). Laser Acupuncture Improves Tear Film Stability in Patients with Dry Eye Disease: A Two-Center Randomized-Controlled Trial. *Journal of alternative and complementary medicine (New York, N.Y.)*, *27*(7), 579–587. https://doi.org/10.1089/acm.2020.0524
19. Kim, T. H., Kang, J. W., Kim, K. H., Kang, K. W., Shin, M. S., Jung, S. Y., Kim, A. R., Jung, H. J., Choi, J. B., Hong, K. E., Lee, S. D., & Choi, S. M. (2012). Acupuncture for the treatment of dry eye: a multicenter randomised controlled trial with active comparison intervention (artificial teardrops). *PloS one*, *7*(5), e36638. https://doi.org/10.1371/journal.pone.0036638
20. Duan, H., Zhou, Y., Ma, B., Liu, R., Yang, T., Chu, H., Huo, Z., & Qi, H. (2024). Effect of Acupuncture Treatment on the Ocular Pain, Mental State and Ocular Surface Characteristics of Patients with Dry Eye Disease: A Non-Randomized Pilot Study. *Clinical ophthalmology (Auckland, N.Z.)*, *18*, 2751–2764. https://doi.org/10.2147/OPTH.S476573
21. Song, J. H., & Park, S. Y. (2024). Biodegradable microneedle acupuncture has equivalent efficacy to traditional intradermal acupuncture for dry eye disease: A pilot single-blinded, randomized controlled trial. *Medicine*, *103*(2), e36864. https://doi.org/10.1097/MD.0000000000036864

22. Tong, L., Htoon, H. M., Hou, A., Acharya, R. U., Tan, J. H., Wei, Q. P., & Lim, P. (2018). Acupuncture and herbal formulation compared with artificial tears alone: evaluation of dry eye symptoms and associated tests in randomised clinical trial. *BMJ open ophthalmology*, *3*(1), e000150. https://doi.org/10.1136/bmjophth-2018-000150
23. Liu, Q., Liu, J., Ren, C., Cai, W., Wei, Q., Song, Y., & Yu, J. (2017). Proteomic analysis of tears following acupuncture treatment for menopausal dry eye disease by two-dimensional nano-liquid chromatography coupled with tandem mass spectrometry. *International journal of nanomedicine*, *12*, 1663–1671. https://doi.org/10.2147/IJN.S126968
24. Yılmaz, K, and Turanlı, M. (2022). A Multi-Disciplinary Investigation on Minimizing Linearization Deviations In Different Regression Models. *Change & Shaping The Future,* IV.ASC-2022/Fall Congress ISBN 978-625-8048-99-5.
25. Yılmaz K, Turanlı M. A Multi-disciplinary Investigation of Linearization Deviations in Different Regression Models. *Asian Journal of Probability and Statistics.* 2023 Apr 29;22(3):15-9.
26. Yilmaz K. (2023). *Farklı Regresyon Modellerinde Lineerizasyon Sapmalarının Minimize Edilmesine Yönelik Model Önerisi.* Istanbul Commerce University Science Institute Statistics-Master thesis.