

Biochemical Effects of Yoga



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Abstract

Aim: It is aimed to examine the experimental studies carried out in 2022 to explore the biochemical effects of yoga.

Methods: Science Direct, Web of Science, SCOPUS, Springer Link, Networked Digital Library of Theses & Dissertations, Ovid, CINAHL, Pubmed, Cochrane Library, Proquest databases were made by searching English articles published between January 2022 and January 2023. "Yoga, Biochemistry, Biological Effect of Yoga, Yoga With Change Of Biology" etc. words and combinations are used. The summaries of 251 studies that formed the universe published between January 1, 2022 and January 15, 2023 were systematically examined, and then 18 studies that were suitable for the purpose of the study and that caused biochemical changes in yoga formed the sample of the research.

Results: In the studies reviewed, it has been reported that yoga reduces blood CRP, LDL, triglyceride, cholesterol, fasting and postprandial blood sugar, IL-6, HBA1c, D-Dimer, oxidative stress markers, HOMA-IR and leukocyte counts. It has also been reported to increase HDL levels.

Conclusion: It can be stated that yoga improves biochemical parameters as well as spiritual well-being, and makes significant contributions to health with its cost-free and space-free practice.

Keywords: Yoga; Yoga effect; Complementary Medicine; Health

Introduction

Yoga is a form of therapy in Indian culture that helps to heal the soul and body through meditation. There are many studies examining the effects of yoga on health. The first article on yoga published in 1978 was written by Tandon. With the new information added to the literature as a result of research conducted today, the limits of the benefits of yoga to human health have not been determined yet. As research continues, new information emerges [1]. Yoga is an ancient mind-body practice that originated in India around 5000 BC. In the classical Indian language Sanskrit, the word "yoga" means "to subjugate" or "to unite", so the aim of yoga is the unification of mind, body, and spirit [2]. The holistic approach of yoga involves promoting mental and physical health through lifestyle guidelines [3].

Before yoga spread globally as a physical exercise system, it was conceived for the purpose of healing in improving health. It was believed that the beginning of healing started with improving the mental state of the person doing yoga [4]. Information

obtained from current studies accepts the relationship of stress with the immune system and other diseases [5]. Acute and chronic stress, mainly through the hypothalamic-pituitary-adrenal axis and sympathetic nervous system, increases the risk of developing diseases due to immune weakness [6].

Some physiological effects of yoga are

- Induces stress-induced autonomic nervous system balance
- Lowers heart rate and blood pressure
- Respiratory rate decreases and respiratory efficiency increases
- Increase in parameters such as tidal volume, vital capacity and breath-hold time.
- α waves increase in EEG. At various stages of meditation, β , δ , θ waves also increase
- Cardiovascular capacity is strengthened

• Improvement is observed in gastrointestinal function and endocrine functions. Weight balance improves.

- The excretory system functions are improved
- Musculoskeletal flexibility and capacity increase
- Posture improves
- Sleep improves
- The immune system is strengthened [7]

The aim of this article is to summarize clinical studies to understand the biochemical effects of yoga.

Materials and Methods

Type of Research

This study is a systematic review prepared according to the PRISMA checklist and Cochrane guideline (Higgins et al. (2019); Moher et al. (2009)).

Research Strategy

Table 1: Studies published between Jan 2022 and Jan 2023 and examining the effects of yoga on biochemical parameters were compiled.

No	Article name	Authors	Year	Aim	Link	Results
1	Association Of BMI And Lipid Profile In Overweight Young Adults After 3 Months Of Yoga Practice [20]	Jay Prakash Singh Rajput, Asha Gandhi, Sanjiv K Bansal, P.N Singh, Nimarpreet Kaur, Deepti Dwivedi	2022	The effect of yoga on lipid profile.	https://ejmcm.com/article_21104_b295982db002ccdba7ce-140d8c321791.pdf	Yoga therapy is useful for overcoming the complications of obesity and has been stated to maintain health by regulating other biochemical functions of the body. For this reason, it has been reported that yoga is a non-pharmacological and cost-effective treatment method.
2	The Reality Of Yoga Practice At Yoga Centers In Tuyen Quang City [21]	Tran Vu Phuong	2022	The effect of yoga on blood profile.	https://tckh.daihoctantrao.edu.vn/index.php/sjttu/article/view/829/794	The blood values of the personnel working in the institution where yoga training was given were evaluated. It has been stated that the blood parameters of the workers due to yoga are within normal limits.
3	Efficacy Of Yoga-Based Breathing Intervention In Covid-19 Positive, Post-Covid And Health Care Workers: A Randomized Clinical Trial [22]	Anand, A., Rain, M., Puri, GD, Bhalla, A., Avti, P., Subramaniam, B., ... & Khosla, R.	2022	Effectiveness of yoga-based respiratory interventions	https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-n-cov/resource/pt/covidwho-2002987	It was stated that the WBC count was high in the COVID-positive experimental (p<0.001) and control groups (p=0.003). It was stated that the white blood cell count (p=0.002) and D-dimer (p=0.002) decreased in the deeny group that recovered with COVID. It was reported that blood pressure relief and quality of life increased in the experimental group (p>0.05). It was stated that the COVID-positive experimental group showed low heart rate (p>0.05) and high frequency power (p=0.01).

4	Impact of Yoga Therapy on Biochemical Deviations-Case Studies [23]	Ch. Renuka Devi N Jhansi Rani	2022	Investigation of the Effect of Yoga Therapy on Biochemical Deviations.	https://journalppw.com/index.php/jpsp/article/view/1466/761	Yoga therapy has shown good improvement in functional changes in MRKH syndrome, such as a 59.2% increase in prolactin hormone, which is normal during menarche, an increase in serum TSH by 39.1%, and a decrease in FSH and LH by 10.9% and 17.8%, respectively. specified. It was stated that it showed improvements in structural changes such as a 6.1% decrease in body weight, an increase in the length of the uterus by 113.8%, the width by 133.5% and the depth by 7.3%. It was stated that there was a 54.5% decrease in serum TSH for hyperthyroidism. It was stated that triglyceride levels decreased by 74.1% in hypertriglyceridemia.
5	Impact of an Integrated Yoga Therapy Protocol on Insulin Resistance and Glycemic Control in Patients with Type 2 Diabetes Mellitus [24]	Gowri, MM, Rajendran, J., Srinivasan, AR, Bhavanani, AB ve Meena, R.	2022	The Effect of Yoga on Insulin Resistance and Glycemic Control in Patients with Type 2 Diabetes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8798588/	The changes seen after yoga therapy are as follows. Reduction in fasting blood sugar (20 mg/dL) (P<0.001); reduction in postprandial blood sugar (33 mg/dL) (P<0.001); HbA1c (0.4% median P<0.001) reduction; homeostatic model assessment for insulin resistance (HOMA-IR) (1.2 ; P<0.001) reduction; cholesterol (13 mg/dL median , P=0.006) reduction; triacylglycerol (22 mg/dL median P=0.027) reduction; low-density lipoprotein (6 mg/dL median P=0.004) reduction; reductions in very low-density lipoprotein levels (4 mg/dL median; P= 0.032) have been reported.
6	Effectiveness of yoga practice on the glycemic status and body mass index in pre-diabetic individuals [25]	Anuradha Kili, Usha Rani Damerla.	2023	Effect of yoga on glycemic state	https://www.njppp.com/?m-no=121925	It has been reported that after 180 days of yoga practice, a significant decrease was observed in participants' body mass indexes and fasting blood sugar.
7	Yoga programme for type 2 diabetes prevention (YOGA-DP) among high-risk people in India: a multi-centre feasibility RCT [26]	K. Chattopadhyaya, P. Mishra, K. Singhb, K. Singhb, T. Harrisc, M. Hamerd, S.M. Greenfielde, N.K. Manjunathf, N. Tandong, S.A. Lewisa, S. Kinrah, D. Prabhakaran	2022	Effect of yoga on glycemic state	https://www.diabetesresearchclinicalpractice.com/action/showPdf?pii=S0168-8227%2822%2900269-8	It was reported that after 6 months of yoga practice, no significant decrease was observed in the body mass indexes and fasting blood sugars of the participants.

8	Anthropometric, biochemical and clinical parameters in climacteric yoga practitioners [27]	Souza, LCE ve Lima, AA	2022	Effect of yoga on glycemic state and blood lipid levels.	https://www.tandfonline.com/doi/full/10.1080/13697137.2021.1965115?casa_token=wlchsHVvnfAAAA-A%3AjW-dinL8WPddTXPiDW4pve-bWZLmvWZKBQCY5Ewy8PGFv6fh-fAJOlzwhkX_wgJ22XMwep4idltNl-fjg	It was stated that yoga practitioners had significantly lower fasting blood sugar, lower weight, lower body mass index, lower waist circumference, lower body fat and blood lipid percentage than other groups.
9	Effect of a 6-month yoga intervention on heart rate variability among pre-diabetics [28]	Neha Saboo, Sudhanshu Kacker	2022	Evaluation of the effect of 6-month yoga practice in patients with pre-diabetes.	file:///C:/Users/gdogu/Downloads/6784-Article%20Text-29106-1-10-20221021.pdf	It has been reported to cause a significant decrease in blood sugar and HBA1C measured after 6 months of Yoga.
10	Add on Hypoglycemic effect of customized Yoga module in diabetes mellitus: A case report [29]	K. K. Resmi, M. B. Kavita, Gurubasavaraj Yalagachin	2022	The effect of yoga to diabetes mellitus	https://www.ayucare.org/temp/JAyurvedaCaseRep54163-5482271_151342.pdf	It has been stated that there is a significant decrease in fasting and postprandial blood sugar.
11	Effect of om chanting and yoga nidra on blood pressure and lipid profile in hypertension – A randomized controlled trial [30]	K.Anjana R.Archana, J.K.Mukkadan	2022	Effect of yoga on blood lipid levels.	https://www.sciencedirect.com/science/article/pii/S0975947622001164	After 2 months of yoga practice, it was reported that there was a significant decrease in blood pressure, lipid profile ($p < 0.05$), systolic and diastolic blood pressure, LDL ($p < 0.001$), and a significant increase in HDL levels in the experimental group.
12	The effect of eight weeks of aerobic-yoga training on serum Irisin level, lipid profile and body composition of obese women [31]	Ameneh Pourrahim Ghouroghchi, Nayyer Ghayyem Alaei, Sajjad Anoushiravani	2022	Effect of yoga on blood irisin and lipids levels.	https://jme.guilan.ac.ir/article_5908.html?lang=en	After eight weeks of aerobic yoga training, serum irisin levels ($P < 0.0001$) and HDL ($P = 0.003$) were significantly increased, LDL ($P < 0.001$), VLDL ($P < 0.0001$), TG ($P = 0.027$) and cholesterol ($P = 0.002$) stated that it decreased significantly after 8 weeks of aerobic-yoga training when compared.
13	Impact of Yoga on Global Cardiovascular Risk as an Add-On to a Regular Exercise Regimen in Patients With Hypertension [32]	Pandey, A., Pandey, A., Pandey, A. S., Bonsignore, A., Auclair, A., & Poirier, P.	2022	Effect of yoga on cardiovascular risk parameters.	https://www.sciencedirect.com/science/article/pii/S0828282X22008923?casa_token=n-f51Sg16GAcAAAAA:w5RPos9h1vo-05ViyMrPXU6kUvorEusENsMe0iiV-3FaX3doCzk_s3qfmvN9sAzp7ZLDWZ-cNmOX1qx	It was determined that there was a significant decrease in blood lipid, glucose and hs-CRP levels.
14	Effectiveness Of Yoga Versus Exercise on Lipid Profile, BMI, And Blood Pressure Among Patients with Type II Diabetes Mellitus - A Community Based Randomised Control Trial [33]	Kulkarni, R., & Walvekar, P.	2022	The Effect of Yoga on bloods lipid levels in Patients with Type 2 Diabetes	https://njcmindia.com/index.php/file/article/view/2431	It has been shown that yoga has significant effects on blood cholesterol ($p = 0.001$), LDL ($p = 0.006$) and VLDL ($p = 0.000$) values.
15	Yoga as a Preventive Intervention for Cardiovascular Diseases and Associated Comorbidities: Open-Label Single Arm Study [34]	Sharma, K., Basu-Ray, I., Sayal, N., Vora, A., Bammidi, S., Tyagi, R., ... & Anand, A.	2022	Investigation of the effect of yoga on cardiovascular diseases	https://www.frontiersin.org/articles/10.3389/fpubh.2022.843134/full?utm_source=Email_to_authors_&utm_medium=Email&utm_content=T1_11.5e1_author&utm_campaign=Email_publication&field=&journalName=Frontiers_in_Public_Health&id=843134	It has been reported that serum levels of low-density lipoprotein (LDL), total cholesterol (TC) and high-density lipoprotein (HDL) decrease significantly with 30-day yoga practice.

16	The effect of yoga practice on lipid profiles in patients with chronic heart failure [35]	T.M. Babkina, G.S. Smyrnova, L.A. Mykhailenko, T.M. Kozarenko, M.V. Globa, V.V. Kundina	2022	Effect of yoga on blood lipids levels with in patients with chronic heart failure	http://lib.inmeds.com.ua:8080/bitstream/lib/4096/1/77-82.pdf	This study reported a significant reduction in TC, TG, and LDL-C levels.
17	Effects of yoga on cardiometabolic risks and fetomaternal outcomes are associated with serum nitric oxide in gestational hypertension: a randomized control [36]	Kuzhanthai-velu Karthiga, Gopal Krushna Pal, Papa Dasari, Nivedita Nanda, SubramanianVelkumary, Palanivel Chinnakali, Manoharan Renugasundari1 & K.T. Harichandrakumar	2022	Investigation of the effect of yoga on nitric oxide level	https://link.springer.com/content/pdf/10.1038/s41598-022-15216-4.pdf	It has been reported that a significant decrease in interleukin 6 ($\beta = -0.194$, $p = 0.022$) was observed after yoga practice.
18	Long-Term Yogic Intervention Improves Symptomatic Scale and Quality of Life by Reducing Inflammatory Cytokines and Oxidative Stress in Breast Cancer Patients Undergoing Chemotherapy and/or Radiotherapy: A Randomized Control Study [37]	Mayank Jain, Archana Mishra, Vishnu Yadav, Hari Shyam, Shailendra Kumar, Satyendra K. Mishra, Pooja Ramakant	2023	Investigation of the effects of yoga on oxidative stress.	https://www.cureus.com/articles/130314-long-term-yogic-intervention-improves-symptomatic-scale-and-quality-of-life-by-reducing-inflammatory-cytokines-and-oxidative-stress-in-breast-cancer-patients-undergoing-chemotherapy-and-or-radiotherapy-a-randomized-control-study	It has been reported that Long-Term Yoga practice improves symptomatic scale and quality of life by reducing inflammatory cytokines and oxidative stress in breast cancer patients undergoing chemotherapy and/or radiotherapy.

It is stated that yoga therapy improves one's soul and body. It will lead to changes in some biochemical parameters of physical and mental well-being. The aim of the study is to determine whether yoga causes changes in biochemical parameters, if so, what these changes are and what effects they cause. Science Direct, Web of Science, SCOPUS, Springer Link, Networked Digital Library of Theses & Dissertations, Ovid, CINAHL, Pubmed, Cochrane Library, Proquest databases were made by scanning English articles published between January 2022 since January 2023. "Yoga, Biochemistry, Biological Effect of Yoga, Yoga With Change Of Biology" etc. words and combinations are used. The summaries of 251 studies, which were published between 1 Jan 2022 and 15 Jan 2023, were systematically examined, and then 18 studies that were suitable for the purpose of the study and that caused biochemical changes in yoga formed the sample of the research (Table 1). Although all searches were done by a single reviewer, full-text review and data abstraction were done in duplicate. While scanning the articles, clinical studies on the effect of yoga on biochemical parameters were included. The effects of other therapy models on biochemical parameters are not included.

Inclusion criteria

- Full text accessible

- In the field of Yoga
- About biochemistry effect of Yoga therapy
- Studies published in the Science Direct, Web of Science, SCOPUS, Springer Link, Networked Digital Library of Theses & Dissertations, Ovid, CINAHL, Pubmed, Cochrane Library, Proquest database center between January 2022 since January 2023 were included.

1.1. In this study, PICOS

- (P: Population): People who do and do not do yoga
- (I: Intervention): People who practice yoga
- (C: Comparison): People who do not practice yoga
- (O: Outcomes): The results of doing yoga in biochemical parameters.
- (S: Study design): Experimental yoga studies were included.

Limitation of the Study

Reviews that were not included in the Science Direct, Web of Science, SCOPUS, Springer Link, Networked Digital Library of Theses & Dissertations, Ovid, CINAHL, Pubmed, Cochrane Library,

Proquest database and were not registered in the system could not be reached. The limitations of the study are research on the effects of yoga therapy on biochemical parameters, accessing the same compilations with different keywords, and the low number of accessed articles. Other meditation studies are not included.

Ethical Aspect of Research

Ethical permission was not obtained because reviews were open to access were used in this systematic review. Reviews were selected by the researchers considering the PRISMA checklist.

Analysis of data

The data were evaluated using the data summary form prepared by the researchers. The data summary form includes the author, consultant, purpose of the study, duration of yoga therapy, sample size, research type/method, data collection tools, and results of the studies. Data summary forms were evaluated independently by the researchers and filled with consensus.

Results

Yoga, Biochemistry, Biological Effect of Yoga, Yoga With Change Of Biology etc. all.

Discussion

There are many sources in the literature on the effects of yoga meditation on both spiritual and blood biochemical markers. The aim of this study is to collect the most recent researches conducted in 2022 and later, experimentally, pre-test and post-test measurements on yoga. Yoga can be considered as a form of applied treatment that has come from the past to the present and aims to heal with meditation and the serenity of the soul. As a result of the development of the scientific world, the dissemination of new up-to-date information and the directing of researches with existing resources, we have reached the knowledge of situations that can cause diseases today. All researchers and medical doctors know this, that the biggest disease-causing factor is stress. In today's lifestyles, it has become almost impossible to sit and rest, listen to our own inner voice while resting, and stop and take a short break. However, giving ourselves a "Time Break" is necessary and necessary for health.

Today, with many situations such as sitting down, controlling robotic or automatic systems, and changing lifestyles, we quickly adapt to the sedentary order. As a result, increased high-fat diets, high-sugar foods, continuous and unlimited energy taken without consuming led to the observation of tremendous changes in blood parameters. The most obvious examples of this are increased fasting and postprandial blood values, increased blood LDL, cholesterol and triglyceride levels, decreased HDL levels, and increased waist circumference. These cause cardiovascular diseases, heart diseases, hypertension, type 2 diabetes, hepatic steatosis and cancer [8-15]. Eating disorders are one of the most common disorders today. It can be stated that the biggest reason for this is the lack of mental well-being. Mental well-being is an

important infrastructure for the prevention of eating disorders. Since yoga is known to contribute to mental well-being, it can both treat eating disorders and prevent weight gain and other related diseases.

Long-term high blood cholesterol, triglyceride and LDL levels can lead to plaque formation in the vessels, resulting plaque rupture and vascular damage. It has been stated that yoga leads to a decrease in blood lipid levels in studies 1, 5, 8, 11, 12, 13, 14, 15, and 16 in the table. It has been observed that this situation has improved as a result of training given from 8 weeks to 6 months, those who did not have yoga before in their lives, had high blood lipid levels. The same is true for blood sugar. In the studies 5, 6, 7, 9, 10, 13 in the table, it has been reported that it lowers blood sugar, especially fasting blood sugar. In addition, excessive blood sugar due to increased insulin after meals can also damage vessels and tissues. The absence of a sudden rise in postprandial blood sugar indicates that insulin is produced adequately and in its molecular form without damage. This result actually explains the pancreatic condition and reveals its curative and regulatory effect.

In the light of the information in the table, in the study no. 4, hormones affect the regulation of the levels, in the publication no. 13 it decreased the level of C-reactive protein, in the study no. 17 it reduced IL-6, which is an indicator of inflammation, and in the study no. 18 it was found that the largest cognitive, cardiovascular diseases and oncogenic diseases. It has been shown to be effective in reducing oxidative stress, which we know to cause diseases.

Conclusion

With the information obtained from the studies shown above, we can mention that mental well-being actually plays a key role in the prevention of many diseases. Because we know that oxidative stress causes neurocognitive disorders [16-19]. It would be little information to limit mental well-being biochemically to only oxidative stress. Increased cortisol synthesis, stress-related scars and hair loss are just a few of them.

Our aim in this study has shown that yoga, which is used to provide spiritual well-being, serves this purpose and improves biochemical parameters. Maybe other meditation practices may show the same effects. The main issue explained here is that stopping and resting in the intensity of life and taking time for oneself will be beneficial in correcting the deteriorated homeostasis. Yoga is a method whose principles have been determined here, has been practiced for thousands of years and there is no evidence that it is harmful.

Limitations of the Study

The study is limited to the information obtained as a result of the search with keywords. Studies conducted in languages other than English and whose full text could not be reached were not included. The research was examined on biochemical parameters, not specific to the disease.

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