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Effect of Bhramari and Nadi Shodhana pranayama on lipid profile levels in diabetic women

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Abstract
"The mind is the lord of the senses, but the breath is the lord of the mind."
— Yogi Swatmarama, The Hatha Yoga Pradipika

Introduction: A major global health issue is diabetes mellitus, a chronic metabolic illness marked by high blood sugar levels. Millions of people worldwide are impacted by its constantly rising prevalence. Cardiovascular conditions, particularly dyslipidemia, are a major factor in raising the risk of heart-related problems, among other diabetes complications. Diabetes is acknowledged by the World Health Organization as a serious worldwide health issue. According to the assessment, the number of persons who have diabetes has been rising gradually over time and has reached worrying proportions. Type 2 diabetes, which affects the majority of cases, is frequently associated with weight, inactivity, and bad eating habits. The management of diabetes and its related problems has drawn attention to complementary and alternative medicines in recent years. Yoga, a long-standing Indian tradition, has drawn a lot of attention among these treatments due to its possible health advantages. The potential effects of some yoga pranayama techniques, including Bhramari and Nadi Shodhana pranayama, on metabolic markers, particularly lipid profiles in people with diabetes, have been investigated.
Objectives: This study's major objective is to compare the biochemical variable lipid profile of diabetic women who practice yoga to those who do not. Pranayama has indirect effects on lipid levels that contribute to improving cardiovascular outcomes.
Materials and Methods: Thirty women with type-2 diabetes from the Anna Nagar neighborhood of Chennai took part in the study. The yoga group and the control group each received an equal number of these participants. The experimental group was given Bharamari and Nadi Shodhana practice for 12 weeks
Conclusion: The results advocate that the HDL and LDL of diabetic women have significant change due to the practice of Bhramari and Nadi Shodhana pranayama.

Keywords: Bhramari, Nadi Shodhana, Pranayama, Lipid profile, Biochemical, cardiovascular

Introduction
One condition has come to the fore of global concern in a world coping with a growing health crisis, marked by a relentless climb in non-communicable diseases: diabetes mellitus. Diabetes, a long-term metabolic illness characterized by high blood glucose levels, has become an epidemic that affects millions of people worldwide. Because of its extensive effects on health, wellness, and healthcare systems, researchers are looking for holistic and complementary methods of managing and preventing it. Among these strategies, the age-old art of yoga has become a compelling subject for investigation, showing promise for both prevention and treatment. As the concepts and practices of yoga, which were established over thousands of years in the Indian subcontinent, are evaluated through the perspective of modern medicine, the intersection of yoga and diabetes creates a captivating narrative of tradition meeting modern science. This investigation of the connections between yoga and diabetes dives into the theoretical foundations, empirical data, and personal accounts that highlight the possible advantages of yoga in the control of diabetes. It reveals the physiological pathways by which yoga may affect insulin sensitivity, blood glucose control, and problems related to diabetes. The scientific community is beginning to recognize the importance of and acceptability of pranayamas. According to the Chhandogya Upanishad, Vayu is an outward matrix (gross energy) and Prana is an internal matrix (subtle energy).

The subtle body (Pranamaya kosha), which is made up of Chakras and Nadis, is said to nurture the gross body (Annamaya kosha). These Nadis carry the prana, which activates the chakras, nourishes numerous systems and organs, and has an impact on all physiological processes taking place within the human body. Bhramari and Nadi Shodhana pranayama practices are believed to regulate the autonomic nervous system, reduce stress, and promote relaxation, which, in turn, may positively impact lipid metabolism in individuals with diabetes.

Aims and Objectives

The main goal of this study is to determine the impact of consistent practice of Bhramari and Nadi Shodhana pranayama on lipid indicators like low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) in women with diabetes. The purpose of the study is to ascertain whether prolonged sustained pranayama practice results in more notable and durable lipid profile improvements. In order to guarantee a representative sample, a cohort of diabetic women who satisfy the study's inclusion requirements were sought out. To provide a baseline for analyzing changes, pre-tests of each participant's lipid profiles were completed before they started practicing pranayama. In order to better understand the possible advantages of these practices in the management of diabetes, this study is intended to thoroughly explore the impact of Bhramari and Nadi Shodhana pranayama on the lipid profiles of diabetic women.

Materials and Procedures

Below, a detailed description of the people, variables, training techniques, and statistical techniques is given. For recruitment, marketing and public announcements at various diabetic clinics were employed. Before collecting any data, study participants who matched the inclusion criteria gave their informed consent. A total of 30 participants were included in the study, and they were divided into two groups: the experimental group, which included type 2 diabetes on oral allopathic medication who also learned yoga, and the control group, which included diabetics simply taking allopathic medication. Both Low-density Lipoprotein (LDL) and High-density Lipoprotein (HDL) were measured using conventional blood sample procedures. The Experimental group received instruction and practice in pranayama practices like Bhramari and Nadi Shodhana five days per week for a period of 12 weeks, and 60 minutes each session.

Statistical Procedure

The data gathered from the experimental and control groups before and after the experiment, focusing on Lipid parameters like low-density lipoprotein and high-density lipoprotein, were evaluated to see if there were any statistically significant differences. This investigation made use of the F-ratio analysis of variance.

Results

Among all the subjects before the practice of Bhramari and Nadi Shodhana pranayama, the pre-test mean values of the control group and the experimental group for High-density lipoprotein of is 42.47 and 42.37 mg/dl and Low-density lipoprotein is 111.27 and 110.2 mg/dl. The post-test mean values of the control group and experimental group for high-density lipoprotein are 42.46 and 44.33 mg/dl and low-density lipoprotein is 113.77 and 103.85 respectively. The outlined research hypothesis is approved as a result. The corrected post-test means of the high-density lipoprotein and low-density lipoprotein tests are inferred to have a significant difference from one another.

Analysis of data

The results of the analysis of covariance on the lipid parameters like LDL and HDL test results from the pre and post tests were collated and are shown in tables.

Table 1: Analysis of Co-Variance of the Pre Test and Post Test Means of the Control Group and Experimental Group on high-density lipoprotein test

Group	Control	Experimental	Source of variance	Sum of squares	df	Mean square	'F' Ratio
Pre-test Mean	42.47	42.37	Between	115.680	1	115.680	2.15* S
SD	10.12	9.88	Within	2666.255	28	95.223	
Post-test Mean	42.45	46.79	Between	0.102	1	0.102	0.483 NS
SD	10.39	9.63	Within	2947.803	28	105.279	
Adjusted Post-test mean	42.46	44.33	Between	271.93	1	271.93	2.57* S
			Within	28496.2	28	296.630	

S – Significant
NS – Not Significant

Table- 1 result shows that the pre-test mean score on the control group is 42.47, the experimental group is 42.37. Therefore, it is observed that the obtained 'F' value is 3.15 for the Pre-Test mean score. Therefore, the framed research hypothesis is accepted. It is inferred that there is a significant difference between the pre-test means of the high-density lipoprotein test. Also, the Post-test mean score on the control group is 42.45, experimental group is 46.79. Therefore, it is evident that the obtained 'F' value is 0.483 for Post-Test mean score. Therefore, the framed research hypothesis is rejected. Further, the above table taking into consideration of the adjusted post-test mean score on the control group is 42.46, experimental group is 44.33 Therefore, it is evident that the obtained 'F' value is 2.57. Therefore, the framed research hypothesis is accepted. It is inferred that there is a significant difference between the adjusted post-test means of the high-density lipoprotein test.

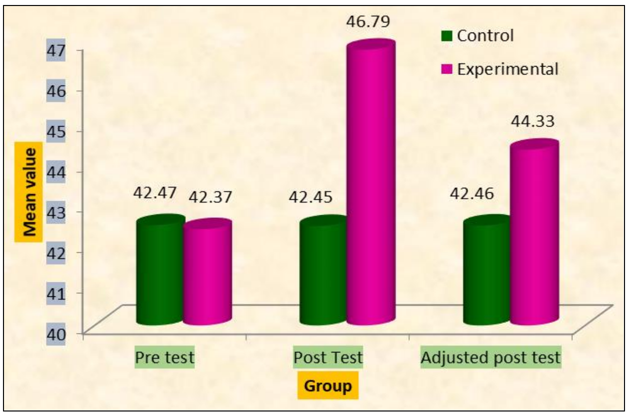

Fig 1: Graph shows the Pre -Test and Post- Test Means of the Control Group and Experimental Group on the high-density lipoprotein test

Table 2: Analysis of Co-Variance of the Pre Test and Post Test Means of the Control Group and Experimental Group on low-density lipoprotein test

Group	Control	Experimental	Source of variance	Sum of squares	df	Mean square	'F' Ratio
Pre Test Mean	111.27	110.2	Between	1135.905	1	1135.905	3.806 S
SD	16.15	17.96	Within	8356.624	28	298.451	
Post test Mean	116.27	97.69	Between	187.500	1	187.500	0.643 NS
SD	17.95	17.10	Within	8165.867	28	291.638	
Adjusted Post test mean	113.77	103.85	Between	168.960	1	168.960	2.988 S
			Within	8357.36	28	365.714	

S – Significant
NS – Not Significant

The 2 results proved that the pre-test mean score of the control group is 111.27, the experimental group is 110.2. Therefore, it is observed that the obtained 'F' value is 3.806 for the Pre-Test mean score. Therefore the framed research hypothesis is accepted. It is inferred that there is a significant difference between the pre-test means of the low-density lipoprotein test. Also, the Post-test mean score on the control group is 116.27, experimental group is 97.69. Therefore, it is evident that the obtained 'F' value is 0.643 for the Post-Test mean score. Therefore, the framed research hypothesis is rejected. Further, the above table taking into consideration of the adjusted post-test mean score on the control group is 113.77, experimental group is 103.85. Therefore, it is evident that the obtained 'F' value is 2.988. Therefore, the framed research hypothesis is accepted. It is inferred that there is a significant difference between the adjusted post-test means of the low-density lipoprotein test.

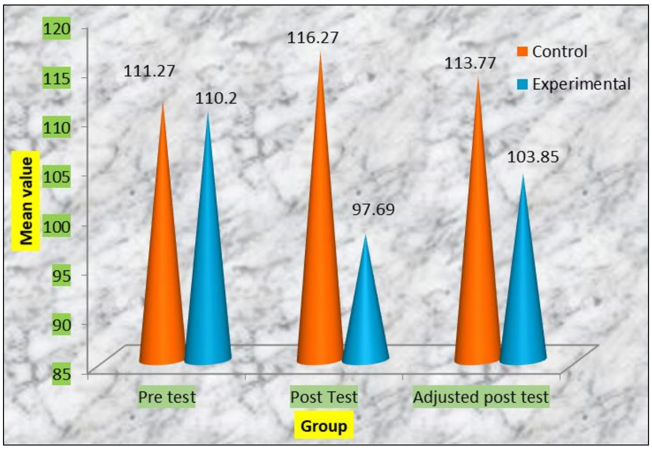

Fig 2: Graph shows the Pre-Test and Post Test Means of the Control Group and Experimental Group on low-density lipoprotein test

Discussion on findings

The findings of the present study demonstrate that there is a significant difference between the pre-test means of the high-density lipoprotein test, according to the researcher's discussion of the extensive literature. Despite the fact that the framed study hypothesis is disproven. These results, however, demonstrate that the statistical analysis established a statistically significant difference between the corrected post-test means of the high-density lipoprotein test. It performs a variety of tasks, including assisting in cell growth in your body. Cholesterol is bound to proteins known as lipoproteins and transported through the bloodstream. A stroke or heart disease may occur from this. According to research, those with normal HDL cholesterol levels have a lower risk of developing coronary artery disease. A quick test can be used by your doctor to determine your cholesterol levels. The low-density lipoprotein test pre-test means differ significantly from each other, according to further statistical analysis of the results. The corrected post-test means of the low-density lipoprotein test are inferred to have a significant difference. Contradictory findings are likely the result of a dearth of high-quality data as well as the fact that the lipid profile was generally not assessed as a primary endpoint in the research. Exercise can lower low-density lipoproteins, although it probably affects triglycerides the most. Additionally, it significantly improves high-density lipoproteins, which is another wonderful benefit. Additionally, the differences in the numbers of individuals who finished the intervention and dropout samples at the end of the trial could have an impact on the precise findings. When seeking to ascertain whether resistance training can in fact favorably alter lipid and lipoprotein profiles, the sheer diversity of the many techniques of application presents itself as a source of challenges.

It is generally known that chronic stress causes prolonged cortisol elevation, which causes central obesity and insulin resistance. It decreases peripheral glucose absorption while increasing gluconeogenesis. Stress may also reduce the amount of glucose absorbed and insulin secreted by releasing endorphins and growth hormones. Additionally, higher cortisol is linked to dyslipidemia and high blood pressure. Yoga has been demonstrated to lower sympathetic hormone and cortisol levels. By lowering sympathetic tone and raising parasympathetic activity, pranayama aids in stress management.

Conclusion

The current study offers the necessary scientific foundation and validates a few of the beneficial effects of training in Bhramari and Nadi Shodhana pranayama. Desired modifications were evident in the examined parameters, and they were. Those who practiced pranayama for three months showed a significant drop in LDL and a rise in HDL. Certain cardiovascular risk factors, including as obesity, hypertension, and dyslipidemia, as well as stress-related mental problems and respiratory disorders, can benefit from pranayamas like Bhramari and Nadi Shodhana.

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