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Short Term Effects Of Chandra Nadi Pranayama On Echocardiography Variables

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Abstract:

Background: Yoga is an ancient science, which originated in India. Pranayama has been assigned a very important role in yogic system of exercises. It is known that regular practice of breathing exercises (pranayama) increases parasympathetic tone, decreases sympathetic activity, and improves cardiovascular functions. **Aim:** The aim was to determine the effect of three weeks chandra nadi pranayama on Echocardiographic variables. **Methodology:** Thirty female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21 - 29 years (Mean ± SD: age 24.07±2.37 yrs, height 158.73±4.85 cm, body mass 55.60±8.97 kg) were selected. **Statistical analysis used:** Paired-samples t-test was used to compare the means of the pre-test and the post-test. The level of significance was set at 0.05. **Results:** No significant differences were found in Aortic Root Diameter, LA Dimension, LVD (Systolic), LCD (Diastolic), RVD (Diastolic), IVST, LVPWT, Sectional Shortening, EF Slope, DE Amplitude, Cusp Opening, AIV and PV Whereas significant differences were found in RVD (Diastolic), Ejection Fraction, MV and TV.

Key Words: cardiovascular disease (CVD), echocardiography, physical inactivity.

Introduction

Cardiovascular disease (CVD) is a major contributor to the global disease burden [1, 2]. Heart disease or CVD is a kind of illness that involve heart and/or blood vessels of people throughout the world. The UN, alarmed by the increasing burden of non-communicable diseases (NCDs) and high disease severity and case-fatality in low-income and middle-income countries compared with high-income countries, acknowledged in 2012 that the rising burden of NCDs was one of the major threats to sustainable development in the 21st century [3, 4, 5, 6, 7].

Research and epidemiological studies have concluded that 17.3 million people died from CVD in 2008. Of the entire death takes place due to CVD, 80% of the deaths are from low-middle income countries. It has been projected that by the year 2030, >23.3 million people will die annually from CVDs [8]. With the incidence of heart failure and valvular heart disease on the rise [9, 10], it has been speculated that the role of non-invasive cardiac imaging especially echocardiography and cardiovascular magnetic resonance imaging will

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become even more pivotal [11]. A significant proportion of this morbidity and mortality could be prevented through population based strategies, and by making cost-effective interventions accessible and affordable, both for people with established disease and for those at high risk of developing disease [12]. The extent to which one strategy should be emphasized over the other depends on achievable effectiveness, as well as cost-effectiveness and availability of resources [13, 14]. The debilitating and often fatal complications of cardiovascular disease (CVD) are usually seen in middle-aged or elderly men and women. However, atherosclerosis – the main pathological process leading to coronary artery disease, cerebral artery disease and peripheral artery disease – begins early in life and progresses gradually through adolescence and early adulthood [15, 16].

Cardiovascular disease is the leading cause of death for both men and women.[17] Lifestyle modifications are important factors in the treatment, prevention, and rehabilitation of cardiovascular disorders.[18] Yoga is one of the best lifestyle modifications and an ancient vedic science thought to have originated in India in 5000 BC which is being applied in the field of therapeutics [19, 20]. It includes practice of specific posture (asana), regulated breathing (Praṇayama) etc., Breath is the dynamic bridge between body and mind and Praṇayama is one of the most important yogic practices[21]. Pranayama is an ideal method for producing calmness and tranquillity [22]. The techniques or pranayama provides the method where by the flow of prana, in the nadis is regulated, activated and purified giving physical and mental stability [23]. In Pranayama one is aware that the act of breathing has four distinct stages. The four stages are:-

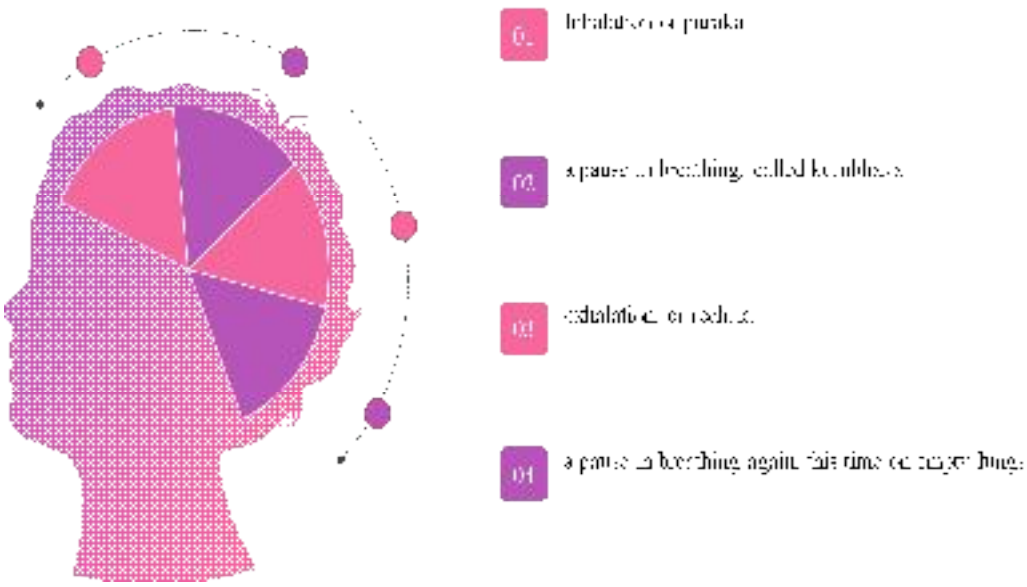

Figure-1. (a) Inhalation or puraka (b) a pause in breathing, called kumbhaka (c) exhalation, or rechaka (d) a pause in breathing again, this time on empty lungs.

Pranayama has been assigned a very important role in yogic system of exercises and is said to be much more important than yogasana for keeping a sound health [24]. With increased awareness and interest in health and natural remedies, yogic techniques including pranayamas are gaining importance and are becoming acceptable to scientific community [25].

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Methodology

Subjects:-

Thirty female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21 - 29 years (Mean ± SD: age 24.07±2.37 yrs, height 158.73±4.85 cm, body mass 55.60±8.97 kg) were selected. The details of average Age, Body Weight and Body Height of female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar (Punjab) are exhibited in **(Figure-1).**

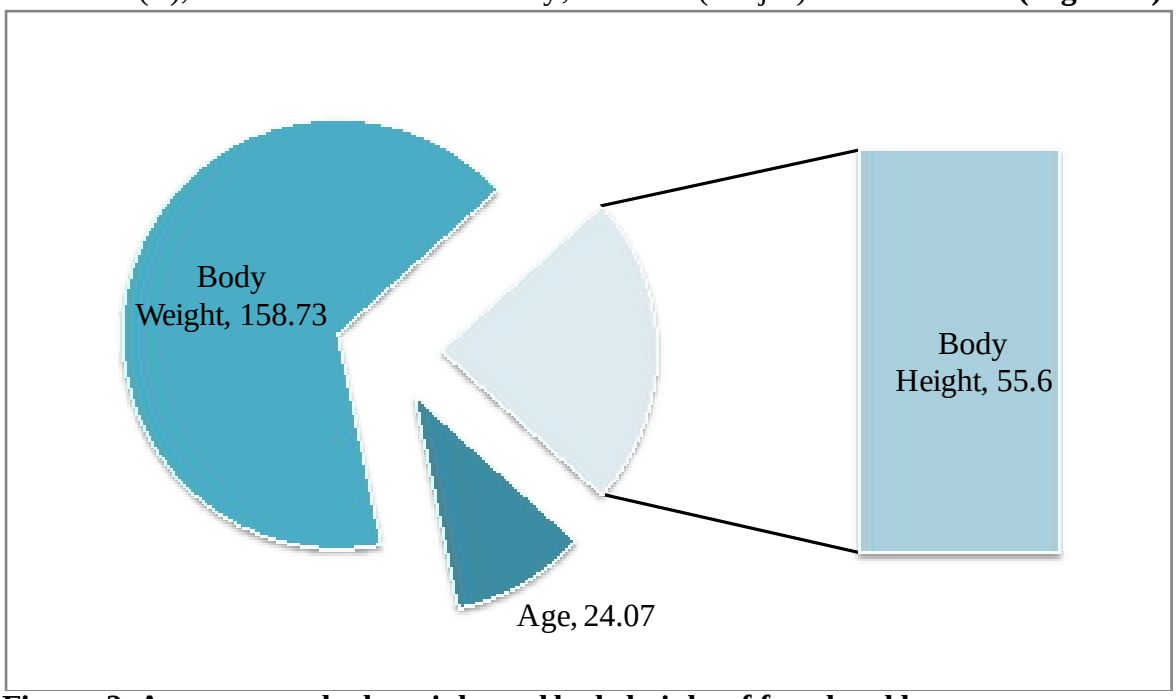

Figure-2. Average age, body weight and body height of female athletes.

Design:-

The present study was a longitudinal (observational research method) follow-up study where the participants were selected using a convenience sampling technique i.e., participants were selected based on their availability to take part in the trial. Participants were assessed in two separate sessions pre-and post.

Assessments:-

Baseline data of each participant for the Echocardiographic variables were measured in the laboratory of Health Centre, Guru Nanak Dev University, Amritsar (Punjab). Participants were evaluated two times throughout the study-pre-and post-test time.

Intervention:-

Thirty female participants of Department of Physical Education (T), Guru Nanak Dev University, Amritsar underwent chandra nadi pranayama for 3-weeks: repeat assessments were performed on experimental group. There were no dropouts in the study. The details of chandra nadi pranayama are provided in (**Table-1**).

Table-1. Three weeks chandra nadi pranayama.

3-Weeks Chandra Nadi Pranayama			
Weeks	**Schedule**	**Time**	**Duration**
1 st Week	Preliminary Yogic Exercises	5 Minute	20 Minute
	Practice of Chandra Nadi Pranayama	10 Minute	

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	(9 Rounds X 1 Set)		
	Relaxation Posture	5 Minute	
2nd Week	Preliminary Yogic Exercises	5 Minute	25 Minute
	Practice of Chandra Nadi Pranayama (9 Rounds X 2 Set)	15 Minute	
	Relaxation Posture	5 Minute	
3rd Week	Preliminary Yogic Exercises	5 Minute	30 Minute
	Practice of Chandra Nadi Pranayama (9 Rounds X 3 Set)	20 Minute	
	Relaxation Posture	5 Minute	

Statistical Analysis Used:-

The statistical analysis was performed using SPSS for Windows (Version 13.0, SPSS Inc, Chicago, IL). "Paired-samples *t*-test" was used to compare the means of the pre-test and the post-test. The level of significance was set at 0.05.

Results

The demographic and clinical characteristics of the Echocardiographic variables are presented in (**Table-2**).

Table-2. Descriptive statistics (mean & standard deviation) and paired sample t-test of echocardiographic variables i.e., aortic root diameter, LA dimension, LVD (systolic), LCD (diastolic), RVD (diastolic), IVST, LVPWT, sectional shortening, ejection fraction, EF slope, DE amplitude, cusp opening, MV, AIV, TV, PV of female participants of guru nanak dev university.

Aortic Root Diameter						
Group	**Number**	**Mean**	**Standard Deviation**	**Standard Error of the Mean**	**t-value**	***p*-value**
Experiment (Pre-test)	15	2.74	0.33	0.08	1.87	0.08
Experimental (Post-test)	15	2.72	0.32	0.08		
LA Dimension						
Experiment (Pre-test)	15	2.65	0.28	0.07	1.46	0.16
Experimental (Post-test)	15	2.66	0.26	0.06		
LVD (Systolic)						
Experiment (Pre-test)	15	3.15	0.11	0.03	0.00	0.99
Experimental (Post-test)	15	3.15	0.13	0.03		
LCD (Diastolic)						
Experiment (Pre-test)	15	4.06	0.16	0.04	0.26	0.79
Experimental (Post-test)	15	4.06	0.19	0.05		
RVD (Diastolic)						
Experiment (Pre-test)	15	2.86	0.06	0.01	2.64	0.01*
Experimental (Post-test)	15	2.83	0.06	0.01		
IVST						
Experiment (Pre-test)	15	0.85	0.05	0.01	0.00	0.99
Experimental (Post-test)	15	0.85	0.05	0.01		

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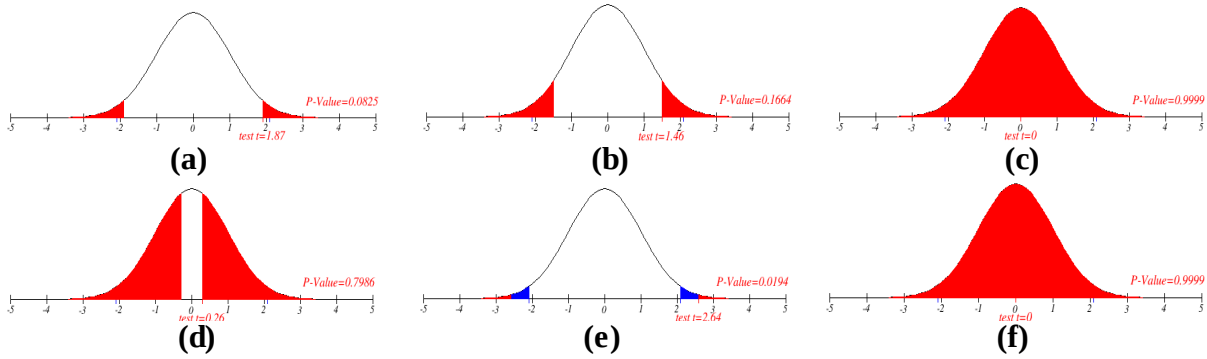
LVPWT						
Experiment (Pre-test)	15	0.82	0.05	0.01	0.00	0.99
Experimental (Post-test)	15	0.82	0.04	0.01		
Sectional Shortening						
Experiment (Pre-test)	15	0.64	0.05	0.01	1.73	0.10
Experimental (Post-test)	15	0.66	0.04	0.01		
Ejection Fraction						
Experiment (Pre-test)	15	61.73	1.67	0.43	3.21	0.00*
Experimental (Post-test)	15	62.47	1.41	0.36		
EF Slope						
Experiment (Pre-test)	15	81.60	3.38	0.87	1.71	0.10
Experimental (Post-test)	15	82.87	3.46	0.89		
DE Amplitude						
Experiment (Pre-test)	15	1.38	2.10	0.54	1.01	0.32
Experimental (Post-test)	15	0.83	0.06	0.01		
Cusp Opening						
Experiment (Pre-test)	15	1.86	0.07	0.01	0.56	0.58
Experimental (Post-test)	15	1.87	0.05	0.01		
MV						
Experiment (Pre-test)	15	109.87	4.32	1.12	7.40	0.00*
Experimental (Post-test)	15	112.80	4.43	1.14		
AIV						
Experiment (Pre-test)	15	94.93	2.60	0.67	0.42	0.68
Experimental (Post-test)	15	94.47	2.61	0.67		
TV						
Experiment (Pre-test)	15	43.73	5.42	1.40	2.59	0.02*
Experimental (Post-test)	15	45.80	5.44	1.40		
PV						
Experiment (Pre-test)	15	69.07	3.26	0.84	0.30	0.76
Experimental (Post-test)	15	69.33	3.72	0.96		

No significant differences were found in Aortic Root Diameter, LA Dimension, LVD (Systolic), LCD (Diastolic), RVD (Diastolic), IVST, LVPWT, Sectional Shortening, EF Slope, DE Amplitude, Cusp Opening, AIV and PV Whereas significant differences were found in RVD (Diastolic), Ejection Fraction, MV and TV.



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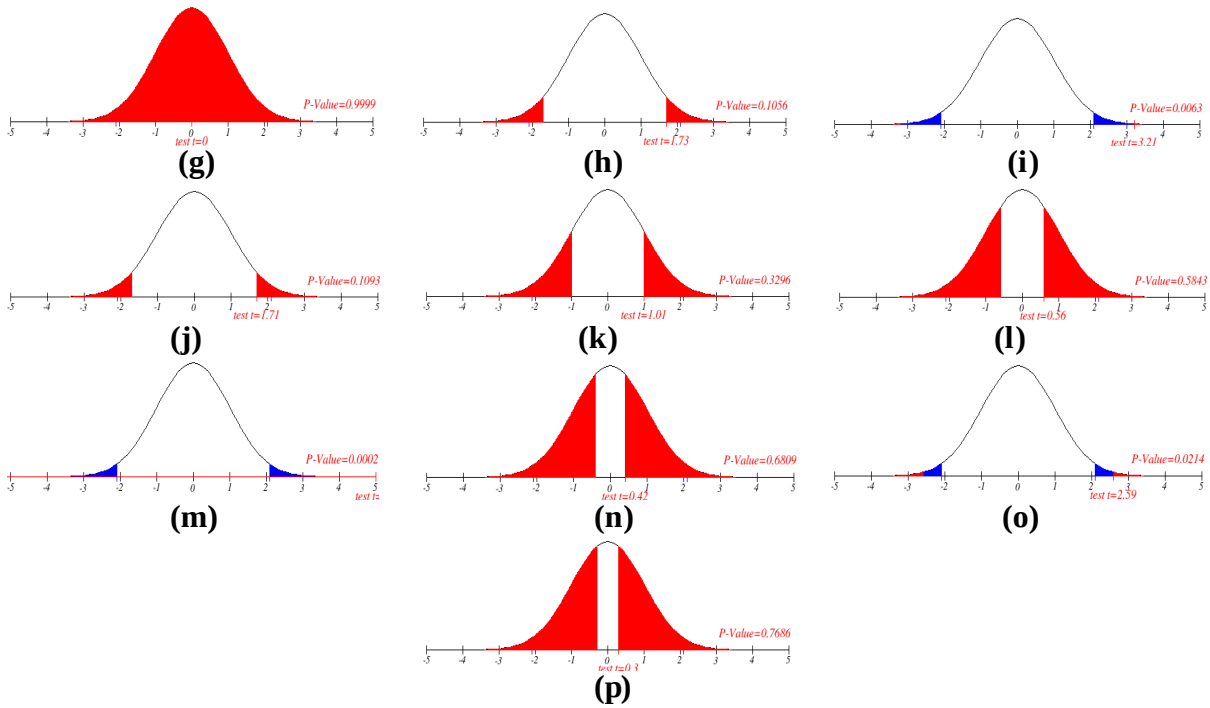

Figure-3. t-test and p-value of echocardiographic variables i.e., (a) aortic root diameter, (b) LA dimension, (c) LVD (systolic), (d) LCD (diastolic), (e) RVD (diastolic), (f) IVST, (h) LVPWT, (h) sectional shortening, (i) ejection fraction, (j) EF slope, (k) DE amplitude, (l) cusp opening, (m) MV, (n) AIV, (0) TV, (p) PV of female participants of guru nanak dev university.

Discussion

Cardiovascular diseases (CVD) constitute major disorders like ischaemic heart disease (IHD), hypertension (HTN) and stroke. CVD is the most common cause of death in developed countries in adult men and women. In India approximately 46.9 million cases of CVD were reported in the year 2010. The mortality is 1.2 million per year[26]. IHD is likely to be the most common cause of death worldwide by 2020 [27].

Yoga is an ancient science, which originated in India.[28] Yoga includes diverse practices such as physical postures (asanas), regulated breathing (pranayama), meditation and lectures on philosophical aspects of yoga.[29] Pranayama has been assigned a very important role in yogic system of exercises and is said to be much more important than yog asanas for keeping a sound health.[30]. It is known that regular practice of breathing exercises (pranayama) increases parasympathetic tone, decreases sympathetic activity, improves cardio-vascular and respiratory functions, decreases the effect of stress and strain on the body and improves physical and mental health.[31] Yogis are capable of controlling their autonomic functions.[32] Different types of breathing exercises alter autonomic balance for good by either decreasing sympathetic or increasing parasympathetic activity.[33, 34]. Yoga, an ancient Indian culture has the potential of relieving stress, enhance health and improve fitness [35] by improving cardiorespiratory function, lipid profile [35], sleep [36], increasing strength [37] and reducing blood pressure (BP) [38] and blood sugar level [39].

The current study exhibits an intervening attempt to determine the effect of three weeks chandra nadi pranayama on Echocardiographic variables. No significant differences

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were found in Aortic Root Diameter, LA Dimension, LVD (Systolic), LCD (Diastolic), RVD (Diastolic), IVST, LVPWT, Sectional Shortening, EF Slope, DE Amplitude, Cusp Opening, AIV and PV. Among the ventricular systolic function indices, there was no significant change in PEP, LVET and UT within-yoga and within-exercise group. Increased resting HR is an independent CV risk factor [40] and is associated with higher mortality and morbidity [41, 42]. Higher resting HR has been attributed to sympathetic overactivity, impaired myocardial oxygen delivery, elevation in BP and increased arterial stiffness [43, 44, 45]. Whereas significant differences were found in RVD (Diastolic), Ejection Fraction, MV and TV. (Nagarathna Raghuram et al., 2014) Ejection Fraction (EF) improves with exercises and stress management programs but does not showed any group differences [46].

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References:

[1]. Moran AE, Forouzanfar MH, Roth G, (2014). The global burden of ischemic heart disease in 1990 and 2010: the Global Burden of Disease 2010 study. Circulation.129:1493–501.

[2]. Ambrosy AP, Fonarow GC, Butler J, (2014). The global health and economic burden of hospitalizations for heart failure: lessons learned from hospitalized heart failure registries. J Am Coll Cardiol. 63:1123–33.

[3]. Ralston J, Reddy KS, Fuster V, Narula J. (2016). Cardiovascular diseases on the global agenda: the United Nations high level meeting, Sustainable Development Goals, and the way forward. Glob Heart. 11: 375-379

[4]. Joshi P, Islam S, Pais P. (2007). Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. JAMA. 297: 286-294

[5]. Xavier D, Pais P, Devereaux PJ. (2008). Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. Lancet. 2008; 371: 1435-1442.

[6]. Yusuf S, Rangarajan S, Teo K. (2014). Cardiovascular risk and events in 17 low-, middle-, and high-income countries. N Engl J Med. 2014; 371: 818-827.

[7]. Clark H. (2013). NCDs: a challenge to sustainable human development. Lancet. 381: 510-511.

[8]. Capewell, S, Ford, E., Croft, J., Critchley, J., Greenlund, K., Labarthe, D. (2010). Cardiovascular risk factor trends and potential for reducing coronary heart disease mortality in the United States of America. Bulletin of the World Health Organization. 88: 120-130.

[9]. Schiller NB, Shah PM, Crawford M, DeMaria A, Devereux R, Feigenbaum H, Gutgesell H, Reichek N, Sahn D, Schnittger I. (1989). Recommendations for quantitation of the left ventricle by two-dimensional echocardiography. American Society of Echocardiography Committee on Standards, Subcommittee on Quantitation of Two-Dimensional Echocardiograms. J Am Soc Echocardiogr. 2:358–367.

[10]. Sahn DJ, DeMaria A, Kisslo J, Weyman A. (1978). Recommendations regarding quantitation in M-mode echocardiography: Results of a survey of echocardiographic measurements. Circulation. 58:1072–1083.

ISSN:0971-1260

Vol-22-Issue-10-November-2019

[11]. Lang RM, Bierig M, Devereux RB, Flachskampf FA, Foster E, Pellikka PA, Picard, MH, Roman MJ, Seward J, Shanewise JS, Solomon SD, Spencer KT, St John Sutton M, Stewart WJ. (2005). Recommendations for chamber quantification: A report from the American Society of Echocardiography's guidelines and standards committee and the Chamber Quantification Writing Group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology. J Am Soc Echocardiogr. 18:1440–1463.
[12]. Lopez AD. (2006). Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet. 367(9524):1747–57.
[13]. Preventing chronic disease: a vital investment. Geneva, World Health Organization, 2005.
[14]. Manuel DG. (2006). Revisiting Rose: strategies for reducing coronary heart disease. BMJ. 332:659–662.
[15]. Berenson GS. (1989). Risk factors in early life as predictors of adult heart disease: the Bogalusa Heart Study. Am J Med Sci. 298(3):141–151.
[16]. Mendis S. (2005). for the Pathobiological Determinants of Atherosclerosis in Youth (PBDAY) Research group. Atherosclerosis in children and young adults: An overview of the World Health Organization (WHO) and International Society and Federation of Cardiology Study on Pathobiological Determinants of Atherosclerosis in Youth study (1985–1995). Prevention and Control. 1:3–15.
[17]. Chaddha A. Slow breathing and cardiovascular disease. Int J Yoga. 2015;8:142–3.
[18]. Muralikrishnan K, Balakrishnan B, Balasubramanian K, Visnegarawla F. Measurement of the effect of Isha Yoga on cardiac autonomic nervous system using short-term heart rate variability. J Ayurveda Integr Med. 2012;3:91–6.
[19]. Ankad RB, Herur A, Patil S, Shashikala GV, Chinagudi S. Effect of short-term pranayama and meditation on cardiovascular functions in healthy individuals. Heart Views. 2011;12:58–62.
[20]. Singh S, Kyizom T, Singh KP, Tandon OP, Madhu SV. Influence of pranayamas and yoga-asanas on serum insulin, blood glucose and lipid profile in type 2 diabetes. Indian J Clin Biochem. 2008;23:365–8.
[21]. Mooventhan A, Khode V. Effect of Bhramari pranayama and OM chanting on pulmonary function in healthy individuals: A prospective randomized control trial. Int J Yoga. 2014;7:104–10.
[22]. Moadel AB, Shah C, Wylie-Rosett J, Harris MS, Patel SR., & Hall CB. (2007). Randomized controlled trial of yoga among a multiethnic sample of breast cancer patients: Effects on quality of life. J Clin Oncol. 25:4387-95.
[23]. Nagarathna Raghuram, V. R., Parachuri, M., Swarnagowri, S., Babu, Ritu Chaku, R., Kulkarni, Bhagavan Bhuyan, H.B., Nagendra., & H. R. (2014). Yoga based cardiac rehabilitation after coronary artery bypass surgery: Oneyear results on LVEF, lipid profile and psychological states – A randomized controlled study. Indian Heart Journal, 66(5), 490–502.
[24]. S Dutta Ray. (1998). Yogic Exercises - Physiologic and Psychic Process. New Delhi: Jaypee Brothers Medical Publishers.
[25]. Udupa K, Madanmohan, Bhavanani AB, Vijayalakshmi P, Krishnamurthy N. (2003). Effect of Pranayama training on cardiac function in normal young volunteers. Indian J Physiol Pharmacol 47:27-33.

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Vol-22-Issue-10-November-2019

[26]. Park K. Park's Textbook of Preventive and Social Medicine. 22nd Ed, Ch6:337-343.
[27]. Longo, Fauci, Kasper, Hausen, Jameson, Loscazo. Harrison's Principles of Internal Medicine. 18th Ed, Ch 241:1983-92
[28]. Vivekananda Kendra. (2005). Chennai: Vivekananda Kendra Prakashana Trust. Yoga-the science of holistic living.
[29]. Nagendra HR. (2005). Bangalore: Swami Vivekananda Yoga Prakashan. Yoga its basis and application.
[30]. Ray S Dutta. (1998). New Delhi: Jaypee Brothers Medical Publishers. Yogic Exercises - Physiologic and Psychic Process.
[31]. Bhargava R, Gogate MG, Mascarenhas JF. Autonomic response to breath holding and its variations following *Pranayama*. Indian J Physiol Pharmacol. 1994;38:133–7.
[32]. Chinna GS. The voluntary control of autonomic responses in yogis. Proc Int Union Physiol Sci. 1974;10:103–4.
[33]. Pal GK, Velkumary S, Madanmohan Effect of short- term practice of breathing exercises on autonomic functions in normal human volunteers. Indian J Med Res. 2004;120:115–21.
[34]. Telles S, Nagarathna R, Nagendra HR. Breathing through a particular nostril can alter metabolism and autonomic activities. Indian J Physiol Pharmacol. 1994;38:133–7.
[35]. Wenger, M. A., & Bagchi, B. K. (1961). Studies of autonomic functions in practitioners of yoga in India. Behavioral Science. 6: 312-323
[36]. Chodzinski Jennifer. (2000). The Effect of Rhythmic Breathing on Blood Pressure in Hypertensive Adults. Journal of Undergraduate Research. 1(6).
[37]. Chadha S, Radhakrishnan S, Ramachandran K, Kaul U, Gopinath N. (1990). Coronary heart disease in Urban Health. Indian J Med Res. 72:424- 30.
[38]. Gadegbeku CA, Dhandayuthapani A, Sadler ZE, Egan BM. (2002). Raising lipids acutely reduces baroreflex sensitivity. American Journal of Hypertension 15: 479–85
[39]. Virginia Grupp. (2006). Practicing Yoga, Preventing Disease PRF 810 Research Enhancement and Performance Enhancement, December 1.
[40]. M.T. Cooney, E. Vartiainen, T. Laatikainen. (2010). Elevated resting heart rate is an independent risk factor for cardiovascular disease in healthy men and women Am Heart J, 159 (4) pp. 612-619.
[41]. M.W. Gilman, W.B. Kannel, A. Belanger. (1993). Influence of heart rate on mortality among persons with hypertension: the Framingham Study Am Heart J, 125 (4) pp. 1148-1154.
[42]. A. Reunanen, J. Karjalainen, P. Ristola. (2000). Heart rate and mortality J Intern Med, 247 (2) pp. 231-239.
[43]. R.L. Verrier, A. (2009). Tan Heart rate, autonomic markers and cardiac mortality Heart Rhythm, 6 (Suppl. (11)) pp. S68-S75.
[44]. B.J. Park, H.R. Lee, J.Y. Shim. (2010). Association between resting heart rate and arterial stiffness in Korean adults Arch Cardiovasc Dis, 103 (4) pp. 246-252.
[45]. J.K. Koskela, A. Tahvanainen, A. Harring. (2013). Association of resting heart rate with cardiovascular function: a cross-sectional study in 522 Finnish subjects BMC Cardiovasc Disord, 13 p. 102.
[46]. Nagarathna Raghuram, V. R., Parachuri, M., Swarnagowri, S., Babu, Ritu Chaku, R., Kulkarni, Bhagavan Bhuyan, H.B., Nagendra., & H. R. (2014). Yoga based cardiac rehabilitation after coronary artery bypass surgery: Oneyear results on LVEF, lipid profile

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