

Effects of yogic practice in certain cardio respiratory parameters on overweight postmenopausal women

Ram Kishore¹ and Rameswar Pal^{2*}

¹Yogamratam Seawa Sansthan, Wajeer Hasan Road, Lucknow, Uttar Pradesh, India and
²Department of Physiology, PDM Dental College & Research Institute, Sarai, Aurangabad, Bahadurgarh, Haryana, India

Abstract: *Objectives:* Aim of this study was to evaluate the effects of yogic practice in some cardiovascular and respiratory parameters of overweight females after menopause. *Background:* Non pharmacological management of cardiorespiratory efficiency on overweight postmenopausal women. *Materials and Methods:* A total of 15 overweight (BMI > 25 kg/m² and < 30 kg/m²) females after menopause (age 53.7 ± 1.04, Mean ± SEM) were participated in a 03 weeks of yoga program for 06 days a week for 1 hour daily. Blood pressure and heart rate was recorded using Omron BP monitor. Rate pressure product and double product was measured using standard formula. Respiratory rate and breath – hold time was recorded using standard protocol. Paired *t*-test was performed to find out any significant different between the data collected before and after yogic practice. *Results:* A significant decrement was noted in body weight (p<0.01) and body mass index (p<0.05) following yogic practice. Systolic (p< 0.001) and mean (p< 0.01) blood pressure was decreased significantly after yogic practice. RPP an index of myocardial oxygen consumption and double product an index of load on the heart was decreased significantly (p<0.001) following yogic practice. Resting heart rate and Respiratory rate was decreased significantly (p<0.001) following yogic practice. Breath-hold time was increased significantly (p<0.001) following yogic practice. *Conclusions:* This particular yogic package when practiced 03 weeks 06 days a week for 01 hour daily is beneficial for cardiovascular improvements of overweight females after menopause. In addition to that same package is also beneficial for the improvement of respiratory rate and breath – hold time. Apart from that, study is limited within a small no of subjects without any control group, which remains to be studied.

Keywords: Yoga, menopause, cardiac health.

Introduction

Menopause is the phase of cessation of a woman's reproductive ability. In Indian context it is considered that the median age of natural menopause is at 44 years [1]. Menopause is associated with some common symptoms such as hot flashes, night sweat, fatigue, pain, decreased libido, and mood changes [2-4]. These symptoms often persist for several years after menopause [5]. The incidence of cardiovascular and cerebrovascular diseases in women is low before the menopause but after the age of 50 years they become the leading cause of mortality and morbidity for women living in most developed countries [6-8]. The prevalence of cardiovascular disease increases with age in women, rising sharply after menopause [6-7]. Pharmacological treatment such as hormone replacement therapy can effectively reduce menopausal symptoms [9], but its safety has long been controversially

discussed [9-10]. Regular physical activity is associated with a reduced risk of cardiovascular disease in postmenopausal women [11]. Yogic practice is an alternative physical activity to manage common post menopausal symptoms, includes hot flashes, night sweat, fatigue, pain, decreased libido, and mood changes [12].

Regular yogic practices help in the constructive development of body and mind. Several studies have reported improvement in cardio respiratory, physical, physiological and psychological variables [13-14]. The regular yogic practice has the ability to provide the practitioner with better maximal work output, less psychological stress and reduced cardiovascular risks [15-16]. Earlier studies also reported that reduction of myocardial oxygen consumption and load on the heart

following yogic practice [17]. Studies showed that yogic practices improved body density, body weight, cardiovascular endurance, anaerobic power, consequent to reduced body circumferences and fat percentage [18]. Yogic practice has the ability to improve, cardiovascular, cardiorespiratory efficiency and physical health [19], also improve age related degenerative changes in energy expenditure and antioxidant redox status [20].

Participants of this study were overweight post menopausal women. Overweight mainly due to storage excesses energy, due to physical inactivity of the participants. Any type of physical activity appears difficult among overweight and or obese persons. Simple yoga postures and pranayamas are easy to adopt by physically active or inactive people and can be practiced at any time with empty stomach. In addition to that environmental barrier such as extreme cold, heat and rainy session restrict the outdoor physical activities like sports and other outdoor games. Yoga may be practiced in limited space at any environmental conditions. In light of the existing literature, the present study was designed to evaluate the comprehensive and cumulative effect of practicing yoga on certain cardiovascular and respiratory parameters of overweight female after menopause.

Material and Methods

Female volunteers (n = 15) were randomly selected for this study within the age range of 48-60 (53.7 ± 4.04) years and height of 157.1 ± 7.39 cm (Mean ± SD) with no previous history of (1) cardiovascular vascular disease, (2) respiratory diseases. Another inclusion criterias are (1) the participants not under any medication, which suppress blood pressure, increase / decrease body weight. They also did not have any previous exposure to yogic exercises / practices. All participants were from northern India, and have the same pattern of food habits. Participants were well educated (at least graduation and above) and could be categorized as belonging to a middle income group. All of them were briefed on the purpose of the study and written consent of each individual was obtained, which was maintained privately by Yogamratam Sewa Sansthan, Wajeer Hasan Road, Lucknow. The trial is a single group longitudinal trial. Hatha yoga training was imparted by a qualified yoga instructor at

Yogamratam Sewa Sansthan, Wajeer Hasan Road, Lucknow. The training was a short term 3 weeks course consisting of one practical session (60 min) daily for 06 days in a week. The details of yoga protocol are presented in Table 1. The parameters were recorded before (day 0) and after completion of the training period (day 21).

Prayer:	Session: 02 min
Om Chanting:	Session: 02 min
Gayatri Mantra:	Session: 02 min
Yogic Sukshma Vyayam:	Session: 10 min
Surya Namakar:	Session: 12 min
Yogasana: 1. Shavasana, 2. Supt Pawan Muktasana, 3. Kandrassana, 4. Makarasana, 5. Shalabhasana, 6. Bhujangasana, 7. Mandukasana, 8. Ushtrasana, 9. Gomukhasana	Session: 10 min
Pranayama: 1. Kapal Bhati, 2. Mahabandh, 3. Laybadh Shvas-Prashwas, 4. Nadi-Shodhan, 5. Ujjayi & Bhramari Pranaya	Session: 15 min
Meditation:	Session: 05 min
Ajpa Jap Shanti Mantra:	Session: 02 min
Total Session:	60 min

Participants were asked to remove their heavy outer garments and shoes. The participant stands in the centre of the platform, weight distributed evenly to both feet. Body weight (BW) in kilograms was measured using an electronic weighing machine. The volunteer was asked to stand erect on the floor board of the anthropometer with his back to the vertical

backboard of the anthropometric rod. The arms hang freely by the sides of the trunk with palms facing the thighs. The standing body height in centimeters was measured using stadiometer from the sole of the feet to the vertex in erect body position. Body Mass Index (BMI) in kg/m^2 was calculated as the ratio of weight to height in meter squared. BP and HR was recorded using Omron automatic blood pressure monitor model HEM – 7111 (Omron Healthcare Singapore PTE LTD. Singapore, Japan). Pulse pressure (PP) was calculated as difference between systolic blood pressure (SBP) and diastolic blood pressure (DP). Mean blood pressure (MBP) was calculated as $\text{DP} + 1/3 \text{ PP}$. Rate pressure product (RPP) was calculated as $((\text{SP} \times \text{HR})/100)$ [17]. Double product was calculated as $\text{MP} \times \text{HR}$ [17]. Value of DoP was expressed as mmHg. bpm (beats per minute) [17]. Value of RPP was expressed as $\text{mmHg. bpm.}10^{-2}$ [17].

Participants were asked to lie down on a comfortably with eyes closed. After 10 minutes of resting, upward movements of abdomen was counted for 60 second. It was expressed as cycles/min. Volunteers were asked to sit erect, holding their breath as long as possible with the nose clipped, immediately following maximal inspiration using both nostrils. Due surveillance was maintained to avoid intermediate breathing by the volunteers. The period for which the breath was held was noted in the second (sec) using a stopwatch. Statistical analyses were done using Graph Pad Instat V3.0 for Microsoft and values

were expressed in Mean \pm Standard Error of Mean (SEM). Student's 't'-test for paired samples was performed. Statistical significance was set at $p \leq 0.05$

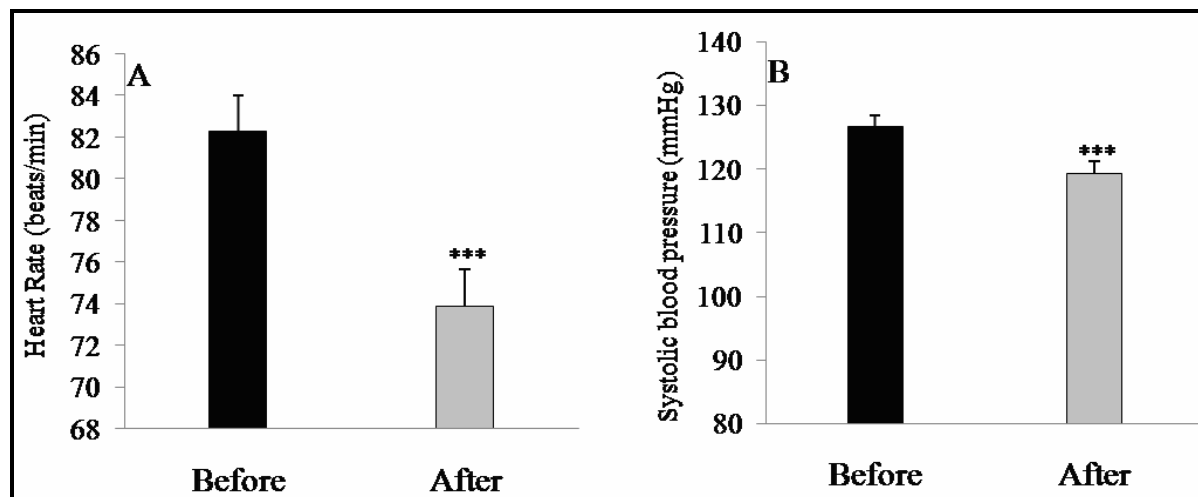
Results

A significant decrement in BW ($P < 0.01$) and BMI ($P < 0.05$) was noted following yogic practices, as shown in Table 2. Heart rate was decreased significantly ($P < 0.001$) following yogic practice, figure 1A. A significant decrement in SBP ($P < 0.001$) and MBP ($P < 0.01$) were noted following yogic practice, while DBP did not show any significant change, the results have been illustrated in figure 1B, 1C, and 1D. RPP and DoP was decreased significantly ($P < 0.001$) following yogic practice, as shown in figure 1E, and 1F. RR and BHT was decreased significantly ($P < 0.001$) following yogic practice, as illustrated in figure 2A, and 2B.

Parameters	Before Yoga	After Yoga	p - value
Body weight (kg)	68.4 \pm 1.92	65.4 \pm 1.81	$p < 0.01$
Body Mass Index (kg/m^2)	28.8 \pm 0.93	26.6 \pm 0.66	$p < 0.05$

Values are expressed as Mean \pm SEM.

Figure-1: Effect of yogic practice on cardiovascular parameters. Data expressed as Mean \pm Standard Error of Mean. A = Heart rate, B = Systolic blood pressure, C = Diastolic blood pressure, D = Mean blood pressure, E = Double product, F = Rate pressure product. ** = $P < 0.01$ and *** = $P < 0.001$.



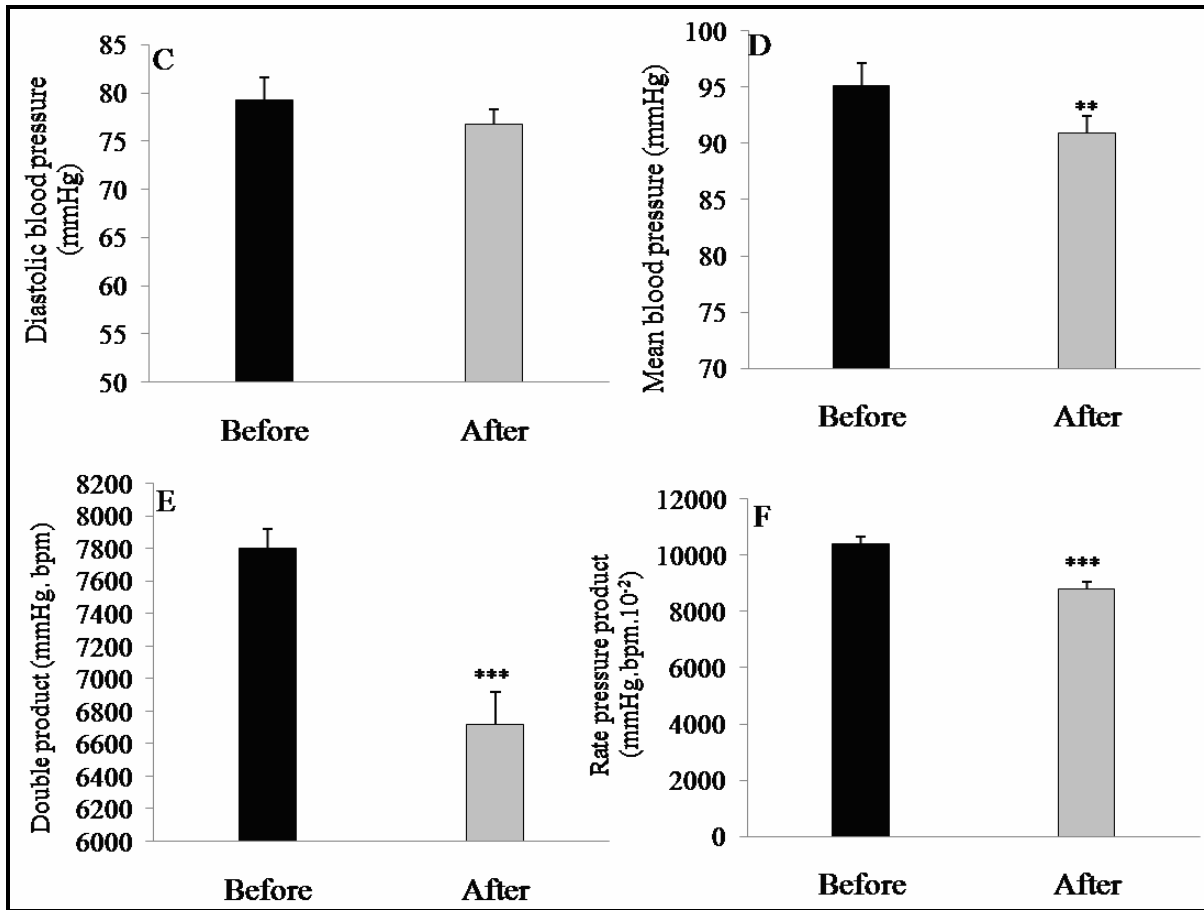
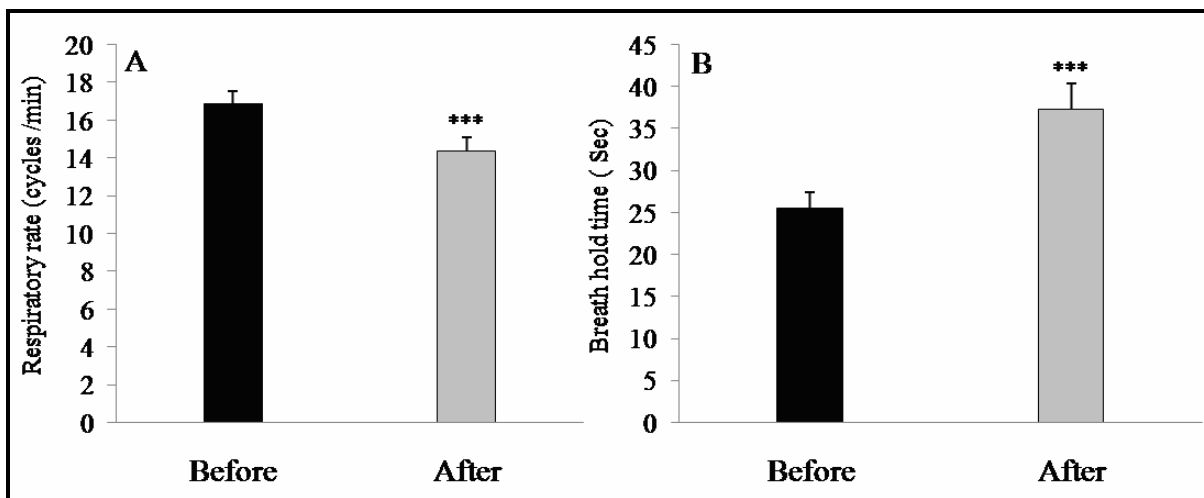


Figure-2: Effect of yogic practice on respiratory parameters. Data expressed as Mean ± Standard Error of Mean. A = Respiratory rate, B = Breath – hold time. *** = P<0.001.



Discussion

The present study was designed to determine the impact 3 weeks of yogic practice on cardiac health and certain respiratory parameters of overweight postmenopausal women. The major

findings of the present study was that a 3 weeks of yogic practice significantly improved BW, BMI, HR, SBP, MBP, DoP, RPP, RR and BHT compared with baseline values in overweight postmenopausal women.

BW and BMI were decreased significantly following yogic practice. Participants of this study were sedentary housewives and they did not participate any physical and or mental exercises during week days and in weekend. So, the primary cause of overweight as well as obesity was the chronic storage of excess energy. Any type of physical activity such as yoga, exercise, weekend family exercise have the ability to increase energy consumption and might decrease chronic storage of excesses energy leads to decrease obesity as well as overweight. In the present study when participants goes through yogic practice it may increase their energy expenditure, thereafter decreased BW and BMI. There are conflicting reports in body weight changes after yogic exercises in literature – some reporting decrease, while others reporting an increase [21-22].

In our study, DBP did not show any significant change, while SBP, MBP, HR, DoP and RPP reduced significantly. From this observation, it could be stated that this particular module of yogic training could improve the cardiac health by reducing BP, HR, load on the heart and myocardial oxygen consumption. It has been reported that the practice of yogic exercises like asanas and pranayama for 6 months reduced sympathetic activity, thus shifting the equilibrium towards parasympathodominance; which could, in turn, be helpful in controlling undue stress-induced sympathetic over-activation [23]. Yogic practices have also reported to control BP in hypertensive patients [13]. In this study, participants were mild hypertensive, which has been indicated by the base line values of SBP only, which may be due to stress-induced sympathetic over-activation. Following 3 weeks of yogic practice stress induced over activation was decreased and participants go towards parasympathodominance, which was reflected in decreased BP.

It has been reported that the yogic practice improves the overall respiratory functions [21, 24]. Yogic breathing maneuvers have considerable beneficial effects on respiratory efficacy [24]. During its practice, the lungs and chest inflate and deflate to the maximum possible extent; and the muscles are made to work to the maximal extent. Significantly longer breath-hold

time after yoga training by the participants in this study indicated that, yogic breathing maneuvers helped respiratory muscles to delay the onset of fatigue. The participants also could possibly inhale more amount of air to the lungs, thus making a greater amount of oxygen available to the system, which could help in holding the breath for a longer duration and decreased RR. Another possibility could be that the participants in this study practiced breath-hold (Kumbhaka) during the yogic breathing maneuvers which might be responsible for the significant improvement in breath hold time after yoga training, by the altered chemoreceptor sensitivity of the subject, resulting in the increased time to reach the breaking point.

Some limitations of the present study are the relatively small sample size, and the study has been completed without any control group, which have an added advantage to establish and expand this study. However the overweight is a chronic condition and thus long - term treatment and follow –up will is required. Last one, we did not monitor diet during this study, although the participants were from north Indian population and have the same pattern of food habits.

Conclusion

The findings of this study demonstrate that this particular yogic practice is suitable for the management of cardiovascular and respiratory efficiency on overweight postmenopausal women. These particular yogic practices may be effective in controlling blood pressure, heart rate, load on the heart and myocardial oxygen consumption on overweight postmenopausal women. Future investigations with large sample adding control group and or conventional exercise group are demanded to establish and expands the results of the present study.

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References

1. Ringa V. Menopause and treatments. *Qual Life Res* 2000; 9(6):695-707. doi:10.1023/A:1008913605129.
2. Greene JG, Constructing a standard climacteric scale. *Maturitas* 1998; 29(1):25-31.
3. Joffe H, Soares CN, Cohen LS. Assessment and treatment of hot flushes and menopausal mood disturbance. *Psychiatr Clin North Am* 2003; 26(3):563-580.
4. Warren MP. Missed symptoms of menopause. *Int J Clin Pract* 2007; 61(12): 2041-2050.
5. Politi MC, Schleinitz MD, Col NF. Revisiting the duration of vasomotor symptoms of menopause: a meta-analysis. *J Gen Intern Med* 2008; 23(9):1507-1513.
6. Eaker ED, Chesebro JH, Sacks FM, Wenger NK, Whisnant JP, Winston M. Cardiovascular disease in women. *Circulation* 1993; 88:1999-2009.
7. Kannel W, Hjortland MC, McNamara PM, Gordon T. Menopause and risk of cardiovascular disease: the Framingham Study. *Ann Intern Med* 1976; 85:447-452.
8. Manolio TA, Furberg CD, Shemanski L, Psaty BM, O'Leary DH, Tracy RP, Bush TL. Associations of postmenopausal estrogen use with cardiovascular disease and its risk factors in older women. *Circulation* 1993; 88:2163-2171.
9. Santen RJ, Allred DC, Ardoin SP et al. Postmenopausal hormone therapy: an endocrine society scientific statement. *J Clin Endocrinol Metab* 2010; 95(7): s1-s66.
10. Rossouw JE, Anderson GL, Prentice RL et al. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the women's health initiative randomized controlled trial. *JAMA* 2002; 288(3):321-333.
11. Powell KE, Thompson P D, Caspersen CJ, Kendrick JS. Physical activity and the incidence of coronary heart disease. *Annu Rev Public Health* 1987; 8:253-287.
12. Cramer H, Lauche R, Langhorst J, Dobos G. Effectiveness of Yoga for Menopausal Symptoms: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Evid Based Complement Alternat Med* 2012; Article ID 863905, 1 – 11. doi:10.1155/2012/863905.
13. Murugesan R, Govindarajulu N, Bera TK. Effect of selected yogic practices on the management of hypertension. *Indian J Physiol Pharmacol* 2000; 44:207-210.
14. Sinha B, Ray US, Pathak A, Selvamurthy W. Energy cost and cardiorespiratory changes during the practice of suryanamaskar. *Indian J Physiol Pharmacol* 2004; 48:184-190.
15. Raju PS, Prasad KV, Venkata RY, Murthy KJ, Reddy MV. Influence of intensive yoga training on physiological changes in 6 adult women: a case report. *J Altern Complement Med* 1997; 3:291-295.
16. Ray US, Mukhopadhyaya S, Purkayastha SS, Asnani V, Tomer OS, Prashad R, et al. Effect of yogic exercises on physical and mental health of young fellowship course trainees. *Indian J Physiol Pharmacol* 2001; 45:37-53.
17. Madanmohan, Kaviraja U, Bhavanani AB, Vijayalakshmi P, Surendiran A. Effects of slow and fast pranayams on reaction time and cardiorespiratory variables. *Indian J Physiol Pharmacol* 2005; 49:313-318.
18. Bera TK, Rajapurkar MV. Body composition, cardiovascular endurance and anaerobic power of yogic practitioner. *Indian J Physiol Pharmacol* 1993; 37:225-228.
19. Pal R, Saha M. Role of Yogic Practice on Physical Health: a review. *Indian Journal of Applied Research* 2013; 3 (4):34-36.
20. Pal R, Singh SN, Halder K, Tomer OS, Mishra AB, Saha M. Effect of yogic practices on age related changes in oxygen metabolism and antioxidant-redox status. *J Exp Integr Med* 2013; 3(4):305-312. doi:10.5455/jeim.060613.or.079.
21. Selvamurthy W, Ray US, Hegde KS, Sharma RP. Physiological responses to cold (10 degrees C) in men after six months' practice of yoga exercises. *Int J Biometerol* 1988; 32:188-93.
22. Telles S, Naveen VK, Balkrishna A, Kumar S. Short term health impact of yoga a diet change program on obesity. *Med Sci Monit* 2010; 16: 35-40.
23. Selvamurthy W, Sridharan K, Ray US, Tiwary RS, Hegde KS, Radhakrishan U, Sinha KC. A new physiological approach to control essential hypertension. *Indian J Physiol Pharmacol* 1998; 42:205-213.
24. Halder K, Chatterjee A, Kain TC, Pal R, Tomer OS, Saha M. Improvement in Ventilatory Function through Yogic Practices. *Al Ameen J Med Sci* 2012; 5 (2):197-202.

*All correspondences to: Mr. Rameswar Pal, Department of Physiology, PDM Dental College & Research Institute, Sarai, Aurangabad, Bahadurgarh-124507, Haryana, India. E-mail ID: physioramupal@gmail.com