ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 9 | September - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

" THE EFFECT OF LEFT NOSTRIL BREATHING (LNB) AND RIGHT NOSTRIL BREATHING (RNB) ON CARDIOVASCULAR PARAMETERS" : A SYSTEMATIC REVIEW

Physiology

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ABSTRACT

Hypertension is an important and growing public health challenge worldwide. If we believe in the principle of old is gold, then yoga is most effective and widely believe to reduced Blood pressure (BP) and pulse rate (PR). Hypertension has been reported to be generally associated with sympathetic over activity. It is found that mean pulse rate /min, systolic blood pressure (SBP) and diastolic blood pressure (DBP) decreases significantly just after 5 minutes of Left nostril breathing (LNB) exercise. In the yogic system of breathing the left nostril dominance correspond to 'ida' svara with parasympathetic activation and right nostril corresponds to 'Pingala Nadi' with sympathetic activation. Therefore, this review showed pranayama breathing through right nostril (RNB) results in increased sympathetic activity were as left nostril breathing (LNB) reduced it. A systematic review has been conducted on various studies in pubmed and manual search as a source.

This review showed that LNB and RNB exercise have effect on cardiovascular parameter in normal healthy young human being. The review also emphasizes on future thrust in area of research on effect of breathing exercise LNB, RNB on cardiovascular parameters.

KEYWORDS

Yogic breathing , LNB, RNB, SBP, DBP, Pranayama.

INTRODUCTION

The focus of this research paper is to evaluate independent effect of yogic breathing exercise, Left nostril breathing (LNB) exercise and Right nostril breathing (RNB) exercise on cardiovascular parameters. Currently, there is developing interest in using alternative and complementary therapies to manage chronic ailments and debilitating diseases. Among alternative and complimentary therapies, yoga is widely used to improve quality of life. The yoga sutras compiled by Indian philosopher Maharishi Patanjali includes Ashtanga yoga which has eight limbs/components: Yama (form of moral imperatives), Niyama (virtuous habit and behavior), Asana (postures), Pranayama (control of breath), Pratyahara (withdrawal of senses), Dharana (concentration and introspective focus), Dhyana (profound meditation), Samadhi (state of trance/meditative consciousness).(1) pranayama has long been reported to improve health and reduced the effect of stress and strain on the body.(2)(3)(4) Many stress induced disorders occurs due to autonomic imbalance.(5) As cardiovascular system is primarily under the control of ANS.(6)

The nasal cycle is an ultradian rhythm with a periodicity of about 2-8 hours, during which the right and left nares are alternately patent. Hypothalamus is the center for the effect of the ANS on the nasal mucosa and the nasal cycle. The nasal cycle consist of alternating phases of congestion and decongestion of nasal tissue based on predominance of parasympathetic or sympathetic tone.(7)

Normally, the heart rate is more during inspiration due to decrease vagal activity and less during expiration due to increase vagal activity the phenomenon called physiological sinus arrhythmia.(8) Hypertension is an important and growing public health challenge worldwide. If we believe in the principle of old is gold, then yoga is most effective and widely believed to reduced blood pressure (BP); and pulse rate.(9) Hypertension has been reported to be generally associated with sympathetic overactivity. It is found that SBP, DBP,MPR/min. decreases significantly just after 5 minutes of LNB exercise and breathing through RNB results in increase sympathetic activity. Where as LNB reduced it. There are few review articles on various types of yoga including pranayama are available, to the best of authors knowledge there is no known review article on effect of LNB and RNB exercise.

Therefore, the current review paper aims to summarize the effect of independent LNB and RNB on various physiological parameters, to evaluate safety issue in clinical population and collect published primary scientific evidence on the benefits of LNB and RNB.

METHODS

This paper is a systematic review of primary research of LNB and RNB on cardiovascular parameters. The search included English language literature from 1998 to 2019. The following database were used: pubmed ,web of science, Google scholar, and manual search as a source, using following terms: Left nostril breathing, Right nostril breathing, ANB, UNB, different type of pranayama. A separate search was conducted for each of these terms.

The following **inclusion criteria** were used: primary research; on LNB, RNB, ANB.

Studies were **excluded:** if not primary research; if LNB , RNB was not the sole intervention and if results were reported of multiple interventions instead only of LNB, RNB.

This review paper aimed to collect published primary scientific evidence on the benefits of this specific yogic breathing technique, so studies involving only ANB is not includes in the review paper.

Different studies have used various terms for LNB, RNB and certain physiological parameters to maintain consistency, more accepted, or whenever possible, standard terms are used through out this paper. eg: LNB, RNB has been described as uninostril breathing (UNB), Chandra Nadi (CN), Surya Nadi (SN) in different studies.

Table 1: Summary of primary studies examining the effect of left nostril and right nostril breathing.

Sr. No	Study	Sample Size	Study Design	Age (Yrs)	Prior Yoga Practice	Intervention Dosage	Outcome Parameters	Results	Salient Features
1.	Gopal Krushna Pal et al [10] (2014)	N=30(RNB group) N=30(LNB group) N=25(Control group)	Case Control Study	17-21	None	RNB,LNB 1hr everyday for 6 weeks	HRV,SBP,DBP, MAP,RPP	Post LNB=↓ LF-HF & Hfnu TP ↑ RNB=LF HF ↑ LNB=RMSSD,SD NN, NN50,PNN50 ↑ RNB=↓TP, Hfnu, time domain indices of HRV & ↑ BHR & SBP,DBP, MAP ↑&↓ in LNB, RPP ↑ in LNB &↓ in RNB	BR= 6 /min equal duration for inhalation & exhalation no pause.

2	Anshuman Naik et al[11] (2011)	N=30 LNB Group baseline record same as control	Case control study	Hypertensive Patient	None	LNB=5min	Pulse Rate, SBP, DBP	LNB=PR, SBP,DBP ↓	
3	Ashwini Dhandayutham et al [12]	N= 60 M	Cross sectional descriptive study	20 -40 yrs	None	RNB = 20 min LNB = 20 min BN = 10 min	ECG, R-R Interval	R – R interval ↑ in LNB & in RNB ↓ & BN	10 mins rest between RNB and LNB
4	Ananda Bhavanani et al [13]	N=20 13 – Female, 7 – males	Cross over Study	12-Hypertensive, Hyperthyroidism, Type 2 diabetes mellitus, Polycystic ovary syndrome, sinusitis. 8 Are Normal health status 34.10± 13.62	Yes thrice in a week for 3 months	Right UNB(SN), Left UNB(CN), ANB(SB), ANB(CB), (NS), (NB) (Placebo) On each 6 days they perform 9 rounds of any one of the six technique selected by randomization of both subject.	HR,BP, RT	CB, CN =↓ HR, RPP,SP(CB) NS= ↓ RPP, PP ↓ SP & ↑ DP, SB = ↓ DP,MP,SP(Insignificant rise in HR, RPP) SB & SN=↑ HR, BP Parameters.	Right Handed Subject . 5 -6/min.
5	Nidhi Jain et al[14]	40 subject RNB= Male= N-10, Female= N-10 LNB= Male= N-10, Female= N-10	Self controlled study	17- 22 yrs	None	RNB, LNB= for 15 min (acute exposure) & 8 weeks training.	PR, HR, SBP, DBP, PEFR, GSR.	RNB= after 15 min↓PR,SBP,DBP& after 8 wks also,HR↓ LNB=Male- after 15 min & after 8 wks ↓RR,HR,SBP,DBP. Female- RR alone fell after 15 min RNB &after 8 wks RR,DBP ↓ GSR= not change significantly in male &female.	
6	Tapas Pramanik et al.[15]	N= 39 For Bhastrika Pranayama.	Crossover Study	25-40 yrs	None	Bhastrika Pranayama (breathing from both nostril) For= 5min.(RR-6/min)5 min for= following oral intake of hyoscine-N-butylbromide 20 mg (parasympathetic blocker drug).	SBP, DBP, HR.	Bhastrika pranayamic breathing= ↓SBP, DBP,HR Following oral intake= no significant alteration in HR, BP.	Inhalation for 4 sec &exhalation for 6 sec.
7	K Upadhyay Dhungel et al.[16]	N= 36 volunteers F= 4 M=32	Self controlled study	24.67±2.35	_	ANB= 15 min for 4 weeks	RR,PR, SBP, DBP, PEFR, Pulse pressure(mmhg)	ANB=↓ PR,RR,SBP,DBP, & ↑in PP, PEFR ↓PR,RR,DBP significantly & ↓ SBP was insignificant	
8	Anant Narayan Sinha et al.[17]	N = 25	Self controlled study	18 – 22 yrs	_	PNS assessments were done in the basal condition after rest of 10 min. then performed 5 min ANB &PNSassessment again ANB= 5 min.& 15 min daily for 6weeks after that assessed forPNS again at the basal condition &performing for 5 min.	Expiration: Inspiration ratio (E:I ratio)& orthostatic tolerance test (30:15 ratio) at basal level HR – from R-R interval of ECG.	E:I ratio, 30:15 ratio ↑after 5 min but statistically not significant after 6 weeks statistically ↑	
10	Raghuraj et al.19	N= 12	Crossover study	25.6±3.1	19.7±12.8 months	15 min ANB, 1 min kapalbhati. Either session on two separate days.	HRV	ANB= NO changes. Kapalbhati ↑ sympathetic activity.	_
11	Shreya Ghiya et al.[20]	N= 20	Crossover study	22.3±2.9	None	30 min ANB PB (normal breathing @5/min	MAP, HRV before & after	ANB & PB= ↑ in TP,↑ in LF,↑ in HF	BR= 5/min.

12	Bhavanani [21]	N= 16 F=11, M= 5	Crossover study	31.06±8.96	≥ 2 months	27 rounds ANB (Rt nostril initiated), NS (Lt nostril initiated ANB)	HR, BP, ART, (Auditory reaction time)VRT (visual reaction time)	ANB=↑HR,↑SBP, ↑DBP,↓ ART,↓ VRT NS= ↓HR, ↓ SBP,DBP,ART ↑, VRT↑	BR-= 5-6/min Right hand dominant for all subjects.
13	Sharma et al. [22]	60- F= with premenstrual syndrome (3 groups) + 30 –F= age matched control.	Randomized control study.	18-40	_	3 menstrual cycle Group A- control. Group B – ANB 8-10 min, Group C = yogic asanas control.	BR,HR, BP, GSR, T, EMG	GroupA=↓SBP,GSR,BR,T. Group B= (ANB): ↓HR,SBP,DBP,EMG,GSR,BR,T. Group C= ↓ SBP,DBP,EMG,GSR,BR ↓T.	Inspiration:hold:expiration ratio. 2:8:4
14	Jain S.[23]	N= 60 M Pre-hypertensive obese.	Self controlled study	17-25	-	ANB 15 min 6 weeks.	HR, BP, CO, SV CI,SVI,SPR,SVR	↓ all CV parameters.	
15	Singh et al. [24]	Study= 15 M Control= 15 M	Randomized controlled study	18-24	-	6 weeks ANB 30 min/day	HR, BP, VC	↓ HR, ↓SBP&VC	With breath hold 1-2sec
16	Dhanvijay et al.[25]	N= 60	Self controlled study	17-25	-	ANB 15 min for 12 weeks	PR,BP,BR,PEFR	↓SBP,DBP, ↑PEFR	
17	Raghuraj et al.[26]	N= 21 M	Randomized controlled study	18-25	Practice between 3 &48 month	30 min,40 min RNB,LMB,ANB,BAW ,control 5 separate days for each session	Before/during & after the session HRV,BR,BP,skin conductance finger , plethysmograph amplitude (FPA)	ANB:↓BR,HR,SBP&DBP (after practice) ↑HRV in during practice:(↑LF, LF/HF, ↓HF),↑ skin conductance ↓FPA	Right hand dominant; 3 months yoga training + 1 month breathing practice.
18	Anupkumar Dadarao Dhanvijay et al.[27]	N= 60 M & F ANB & control	Self controlled study	17- 22	No prior practice	15 min daily 12- weeks ANB	HR, SBP, DBP& PFTR	ANB= ↓ HR,↓SBP,DBP&PFTR.	

RESULTS

Several studies have evaluated the combined effect of LNB and RNB and ANB on cardiovascular parameter.This review includes 18 randomized controlled studies. The year of publication and authors, study design, sample size, age of participants, previous yoga experience, interventional dosage, outcome measures, results and salient findings for each study are reported in Table no 1.

Of the 18 studies reviewed, the increased in sympathetic activity following RNB exercise and increased parasympathetic activity following LNB exercise. Only one study showed that there was no change in sympathetic activity following RNB exercise.

Fifteen studies had healthy persons as a subject, two studies included hypertensive patients as a subject. One study included pre-hypertensive obese patient as a subject. One study included females suffering from premenstrual syndrome.

Participants characteristics=Participants age range from 17-40 years. 4 studies included subjects with prior yoga/ breathing exercise experience. There experience range from 2 month to 48 months. Most of the study not mentioning properly whether they was used only male or only female subject for study.

LNB Technique (chandranuloma viloma)= Breathing is done through left nostril alone. by closing the right nostril, both inhalation and exhalation should be done trough left nostril (LN).

RNB Technique (suryanuloma viloma)= Procedure similar to chandranuloma viloma (LNB) breathing is done through right nostril alone by closing the left nostril.

LNB and RNB involves breathing through one nostril at a time.(while manually closing the opposite nostril) while seated in a cross- legged/ lotus position or any comfortable erect spine posture.

Intervention dosage= In this review some studies reported acute effect of LNB, RNB and ANB after a single session with 5 min to 8 weeks. And some studied reported multiple sessions with frequency ranging from 2 time per day to 9-27 rounds per session.

LNB, RNB and cardiovascular system = Bhavanani et al. found that 27 rounds of RN initiated ANB is associated with increased HR and BP while 27 round of LN initiated ANB is associated with decreased HR and BP. Gopal Krishna pal et al. found that RNB for 1 hrs every day for 6 weeks, is associated with increased HRV, DBP, SBP, MAP and for LNB all decreases. Anshuman Naik et al. found that LNB exercise for 5 min only in hypertensive patient is associated with decrease PR, SBP, DBP. Nidhi Jain et al. found that RNB, LNB exercise for 15 min and 8 weeks associated with no change in PR, HR, SBP, DBP.

DISCUSSION

This systematic review aimed to summarize the effect of LNB and RNB, which is one of the many yogic practices. The studies summarized here recruited non-practitioners and yoga practitioners. Study duration ranged from a single session to 48 months of LNB, RNB and ANB. As a mentioned in the results and table 1, most studies reported a positive impact of LNB, RNB and ANB on cardiovascular parameters . many studies used self- controlled or crossover method to evaluate the LNB, RNB and ANB. Self- controlled and crossover studies can present clinically and statistically significant result even with a smaller sample size. Out of 18 studies Nidhi Jain et al. found that RNB, LNB exercise for 15 min and 8 weeks there is no change in PR, HR, SBP, DBP. Anshuman Naik et al. found that LNB exercise for 5 min only in hypertensive patient is associated with decreased PR, SBP and DBP.

CONCLUSION

In this review 18 randomized controlled trials evaluated the effect of LNB and RNB on cardiovascular parameters and cardiopulmonary system. Most of the studies included healthy subject aged 17 to 40 years. There is a high level of evidence of the effect of LNB, RNB on cardiovascular functioning, as studies have shown that regular practice of ANB is associated with decreased blood pressure and heart rate. And

LNB exercise associated with decreased blood pressure , heart rate and RNB exercise increases blood pressure and heart rate. More trials are required to evaluate the effect of LNB and RNB.

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