

Research Article

***Kapalbhati* changes cardiovascular parameters**

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ABSTRACT

Background and Objectives: *Kapalbhati* is among one of the cleansing act (*shatkarma*) in yogic philosophy. It is one of the popular *Pranayama* which has several benefits. It is highly recommended for those who have to do great deal of study and need a clean, clear mind. This study was conducted among nursing students at Janaki medical college, Janakpur, Nepal.

Material and Methods: This analytical study was conducted among PCL Nursing students of Janaki Medical College, Janakpurdham, Nepal. Total 40 nursing student who gave consent and performed *Kapalbhati* correctly were included in the study. A detailed demographic profile with a structured questionnaire and observational checklist was filled for data collection. HR, SBP, DBP were the cardiac parameters taken. Those parameters were taken before, during, immediately after and after 1 minute, 2 minutes, 3 minutes and 5 minutes *Pranayama*. The data were entered in SPSS and Statistical analysis was done using version 20.

Results: As in usual exercises, the HR, SBP and DBP increases significantly during *Kapalbhati* session but immediate post effect was surprisingly significantly fall in those parameters when compared with the value during exercises. The basal (pre-*Kapalbhati*) mean HR, SBP and DBP were 88.25 ± 9.02 , 111.43 ± 11.28 and 73.9 ± 7.70 which increases upto 133.58 ± 35.70 , 89.63 ± 23.31 and 118.55 ± 19.08 respectively during exercises and fall immediately after exercises value being 114.48 ± 21.94 , 76.43 ± 15.34 and 88.6 ± 17.25 respectively.

Conclusion: There is no significant difference between pre and post value of HR, SBP and DBP as in other study. There is significant rise between Pre-value and during-value of all parameters and significant fall of all parameters if compared between during-value and post-value.

Key Words: *Pranayama*, *yoga*, *Kapalbhati*, Fast breathing exercises, Cardiovascular

INTRODUCTION

Modern medicine has almost conquered the infectious disease and is at the verge of winning HIV AIDs too, but it is facing big load

of diseases related to diet and lifestyle. Due to rapid and vast urbanization modern man is the victim of stress and stress related a disorder with high morbidity that threatens to disrupt life. Yoga and Yogic practices are

showing a good hope for such problems and gaining popularity day by day due to sound scientific basis [1-2]. Research regarding yogic practices, its benefits [2], theoretical basis of its benefits [2-3] are available in literature. Among them, *Pranayama* is gaining popularity day by day as it involves manipulation of breath and is a dynamic bridge between body and mind [2-4]. It is popular as it involves manipulation of breath with minimal body movements resulting maximal physical and mental relaxation by altering autonomic activity [1-2, 4-7].

Psychosocial stresses of current human life precipitates various cardiovascular and other disorders by distorting basic neuro-endocrine mechanism [8, 9]. The harmful effects of these stresses on bodily systems. *Pranayama* exerts profound psychosomatic and physiological effects on pulmonary, cardiovascular and intellectual higher centre functions by enhancing the adaptive mechanisms of body that can restore the equilibrium. So, *Kapalbhati* is highly recommended for those who have to do great deal of study and need a clean, clear mind [8, 9]. Therefore, the present study was focussed to find out the effects of *Kapalbhati Pranayama* on heart rate and blood pressure of nursing students.

MATERIAL AND METHODS

This analytical study was conducted by Department of Physiology JMCTH, Janakpur Nepal and Think Tank Foundation, Jorpati Nepal. The study was conducted in a temperature controlled, noise and light reduced peace place. PCL Nursing students of Janaki Medical College, Janakpur, Nepal who gave consent were included in the study. The health of the participants was assessed by history and clinical examination.

Participants who were clinically healthy and performing *Kapalbhati Pranayama* in the approved manner were included in this study. Total sample size was 40. A detailed demographic profile of the participants like age, sex, Body Mass Index (BMI), marital status etc were collected. A structured questionnaire and observational checklist was prepared. The data collection was performed by the members of this research group and was cross checked by one another for any missed information.

Procedure of *Kapalbhati* Pranayam

Kapalbhati involves abdominal muscle contractions with active forceful exhalation and natural passive inhalation. Exhalation and inhalation together constitute one stroke. While performing *Kapalbhati*, body should be steady. There should be no movement of head, shoulders, facial muscles, back and legs. Excess force and jerk should be avoided [4]. The *Pranayama* session was performed before meals. The subjects were told not to perform *Kapalbhati* for an uncomfortably long period in each round.

Supervised training of *Kapalbhati Pranayama* was given to the participants prior to the study. A confirmation of empty stomach was noted with gap of 4 hours fasting. The Basal (Pre) readings were taken for each participant in the morning hours between 8.00 A.M and 10.00 A.M. They were instructed to sit on flat surface folding their legs, spine was kept straight and eyes were closed. Comfortable sitting posture (Sukhasana) position was maintained in sitting position on Right palm on right knee and Left palm on left knee. They performed *Kapalbhati* for 2-3 minutes (min. 100 strokes).

The participants in Padmasana position started the *Kapalbhati Pranayama* and readings for the BP and HR were noted in the mid of *Pranayama* after minimum 100 strokes. The continuation of *Pranayama* was carried and further immediate BP and HR were noted after the end of *Pranayama*. HR was measured for 15 sec and converted. Digital recording was also taken. The participants were instructed to take rest. All variables were measured again after 1 min, 2 min, 3 min and 5 min intervals respectively. For validity and reconfirmation heart rate was noted manually by pulse count method and BP and HR were measured by digital sphygmomanometer, Trust Check Expert, Automatic upper arm blood pressure monitor (Model no : HL888HC) manufactured by Health and Life Co., LTD , New Taipei City, Taiwan by other researchers to avoid the instrumental errors. The data were entered and analyzed using SPSS statistical software.

RESULTS

The mean age of participants were 20.03 ± 2.07 years. The other demographic details of the subjects are shown in following table 1. Table 2 to 4 compares the cardiac parameters/variables of the subjects’ Pre-, During- and Post-*Kapalbhati*. Cardiac parameters i.e. SBP, DBP and HR – all increases significantly during *Kapalbhati* at p, 0.05 [table 3]. If we compare the pre-*Kapalbhati* data with the post-*Kapalbhati* data only the increase was insignificant at p value-0.05 [table 2]. The fall in parameters value was seen when readings during-*Kapalbhati* and post-*Kapalbhati* data was compared and the fall was significant at p value- 0.05 [table 4].

Table 1: Demographic details of the subjects

Variables	Mean ± SD
Age (years)	20.03±2.07
Weight (Kg)	50.60±9.35
Height (m)	1.57±0.07
BMI (kg/m ²)	20.34±2.89

BMI, body mass index; SD, standard deviation

Table 2: Comparison of mean of variables for Pre and Post-*Kapalbhati*

Variables	Pre	Post (immed)
SBP (mm of Hg)	111.43±11.28	114.48±21.94 ^{ns}
DBP (mm of Hg)	73.90±7.70	76.43±15.34 ^{ns}
HR (Beats/min)	88.25±9.02	88.60±17.25 ^{ns}

SBP, Systolic blood pressure; DBP, Diastolic blood pressure; HR, heart rate; ns, non significant at p value 0.05

Table 3: Comparison of mean of variables for Pre-, During -*Kapalbhati*

Variables	Pre	During
SBP (mm of Hg)	111.43±11.28	133.58± 35.70*
DBP (mm of Hg)	73.90±7.70	89.63±23.31*
HR (Beats/min)	88.25±9.02	118.55±19.08*

SBP, Systolic blood pressure; DBP, Diastolic blood pressure; HR, heart rate; *, significant at p value 0.05

Table 4: Comparison of mean of variables for Pre-, During -*Kapalbhati*

Variables	During	Post (immed)
SBP (mm of Hg)	133.58± 35.70	114.48±21.94*
DBP (mm of Hg)	89.63±23.31	76.43±15.34*
HR (Beats/min)	118.55±19.08	88.60±17.25*

SBP, Systolic blood pressure; DBP, Diastolic blood pressure; HR, heart rate; *, significant at p value 0.05

Figure 1, 2, 3 and table 5 compares the SBP, DBP and HR of subjects’ Pre-, during-, post-, and after 1, 2, 3 and 5 minutes after *Kapalbhati* exercise.

Table 5: Comparison of cardiac parameters Pre-, during-, post-, and after 1, 2, 3 and 5 minutes after *Kapalbhati*

Variables	Pre	During	Post (immed)	After 1 min	After 2 min	After 3 min	After 5 min
SBP (mm of Hg)	111.43 +11.28	133.58 + 35.70	114.48 +21.94	105.68 +12.86	110.1 +17.38	105.85 +10.72	107.48 +9.12
DBP (mm of Hg)	73.90 +7.70	89.63+ 23.31	76.43 + 15.34	70.18 +9.42	73.85+15.95	70.23 +9.61	70.43+9.19
HR (Beats/min)	88.25 +9.02	118.55 +19.08	88.6+17.25	88.03+10.16	85.36 +11.32	86.08 +12.24	85.31 +12.98

Figure 1: comparison of heart rate (HR) Pre-, during-, post-, after 1, 2, 3 and 5 minutes

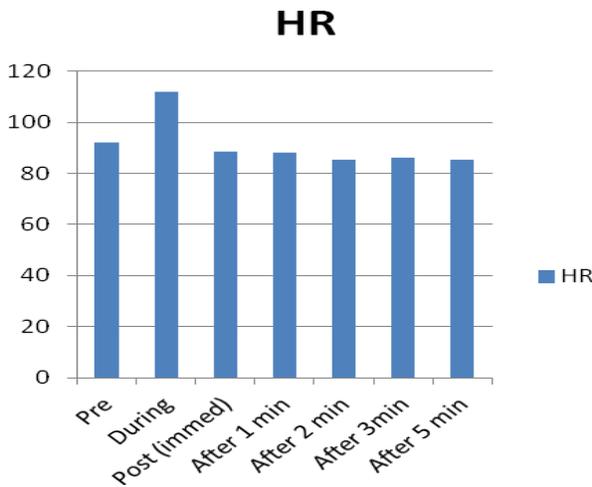


Figure 3: Comparison of Diastolic blood pressure (DBP) Pre-, during-, post-, after 1, 2, 3 and 5 minutes

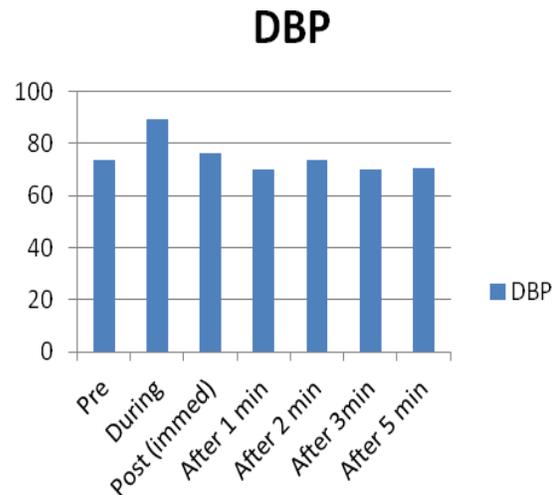
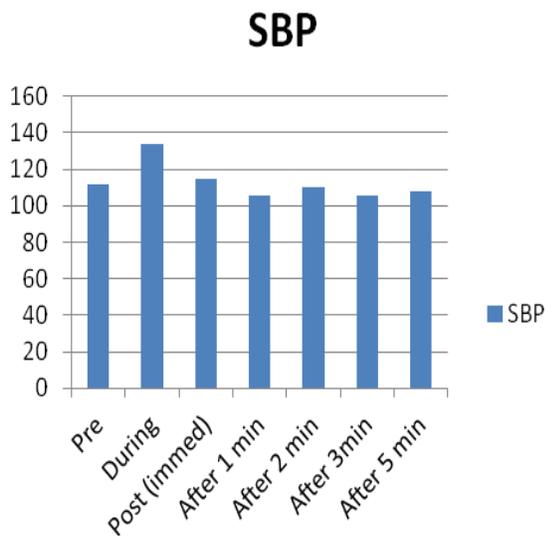


Figure 2: Comparison of systolic blood pressure (SBP) Pre-, during-, post-, after 1, 2, 3 and 5 minutes



DISCUSSION

There are several study on pranayama regarding the positive effect on cardio-respiratory parameters [1-2, 8]. The effect of slow breathing exercises is well studied but very little has been focused on effect of fast breathing exercise like *Kapalbhati* [12-17].

Kapalbhati Pranayama has been described as a miraculous yogic breathing exercise, proposed by ancient Indian sages thousands years ago, for complete body fitness [7, 13-14]. Chavhan 2013, explains importance of *Kapalbhati* by mentioning to affects even those diseases which are impossible to be cured by medicines like cancer, diabetes, asthma. Numerous patients have gained

healthy and happy life by adopting it, in their daily life [13].

Our study revealed that there is significant rise between Pre-value and during-value of all parameters and significant fall of all parameters if compared between during-value and post-value. But there is no significant difference between pre and post value of HR, SBP and DBP as in other study [15, 17]. The results of the study indicated that unlike most yoga breathing exercises, *Kapalbhati* is initially energizing rather than calming; cleansing and heating, rather than cooling. This shows that the effect of *Kapalbhati* is not similar to that of effect of simple exercise. Further study regarding the mechanism of such output needs to be done.

The results of one of the study on effect of *Kapalbhati* on heart rate variability showed a significant increase in low frequency (LF) power and LF/HF ratio while high frequency (HF) power was significantly lower following *Kapalbhati*. The results suggest that *Kapalbhati* modifies the autonomic status by increasing sympathetic activity with reduced vagal activity [16].

Bal BS (2015) reported that university level girls subjected to 4-week training of *Kapalbhati Pranayama* brought difference in Maximal Oxygen Consumption (VO_2max), Blood Pressure, Blood Sugar, blood lipid and bone integrity. The differences was significant in but the difference was insignificant in variables like Maximal Oxygen Consumption (VO_2max), Blood Pressure, Blood Sugar but insignificant in Blood Lipid and Bone Integrity [14]. *Kapalbhati Pranayama* helps to detoxify lungs and respiratory tracts, boosts the supply of oxygen and purifies blood and helps to tone up the abdominal muscles [11]. It is also helpful in

improves concentration span [8, 9,], positive attitude [13] relaxing effect [18], reducing abdominal fat represented by waist and hip circumference, abdominal skin fold thickness [12, 19].

Most of the yoga breathing practices i.e. *Pranayama* emphasize muscular control during inhalation [7]. *Kapalbhati* reverses this pattern: here it is the exhalation that is active, and the inhalation passive. And unlike most yoga breathing exercises, *Kapalbhati* is initially energizing rather than calming; cleansing and heating, rather than cooling. So, instead of taking this as *Pranayama* (breathing exercises) it is thought to be an important part of Shatkarma (among 6 techniques of cleansing body) of yogic system [7]. In one of the study on effect of *kapalbhati* on EEG topography analysis, the results suggest a relative increase of slower EEG frequencies and relaxation on a subjective level as the after effect of KB exercise [18]. This above study also justifies *Kapalbhati* as a cleansing mechanism (Shatkarma) as described to be said in yogic text [8]. As per those text, the word *Kapalbhati* is made up of two words: *Kapal* meaning 'skull' (here skull includes all the organs under the skull too) and *Bhati* meaning 'shining, illuminating'. Due to the process, the organs under the skull mainly the brain and brain stem get positively affected and provide better functioning [8].

Kapalbhati Pranayama involves abdominal muscle contractions with forceful exhalation and natural inhalation. It is a form of abdomino-respiratory-autonomic exercise. Due to this, respiratory, abdominal and

gastrointestinal receptors get stimulated. Also, afferents, centers in brain-stem and cortex and efferent and effectors get stimulated. This leads to synchronous stimulation of autonomic nervous system, hypothalamus, pineal gland and other associated brain structures. Because of this there is synchronous increase in autonomic nervous system, pineal gland, hypothalamus and other central nervous system discharge to all parts of the body including endocrine and metabolic processes. This can be one of the explanations responsible for the effect of *Kapalbhati* [12].

CONCLUSION

There is no significant difference between pre and post value of HR, SBP and DBP as in other study. There is significant rise between Pre-value and during-value of all parameters and significant fall of all parameters if compared between during-value and post-value. This shows that the effect of *Kapalbhati* is not similar to that of effect of simple exercise. Few studies has speculated and hypothesized some mechanism but further study regarding the mechanism of such output needs to be done.

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