



Effect of Agnisara Kriya On Cardiopulmonary Variables and Anthropometric Measurements in Overweight Individuals: A Randomized Controlled Trial

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Abstract

Background: Overweight adversely affects the human body by increasing strain on the cardiovascular, respiratory, and musculoskeletal systems. Excess body fat can lead to elevated heart rate, high blood pressure, reduced lung efficiency, and breathing difficulty by chronic inflammation. It may also contribute to metabolic disease, reduced physical activity, joint stress, and decreased overall health and quality of life by affecting the mental and physical body of an individual. Agnisara Kriya is a traditional yogic practice involving rapid contraction and relaxation of the abdominal muscles during breath retention after exhalation. The practice is believed to stimulate abdominal organs, improve digestion, increase circulation, and enhance respiratory efficiency.

Previous studies have reported beneficial effects of yogic practices on gastric motility and metabolic health. However, there is no scientific evidence available regarding the specific effects of Agnisara Kriya on cardiopulmonary variables and anthropometric measurements among overweight individuals. Therefore, the present study aims to evaluate the effect of Agnisara Kriya on selected cardiopulmonary variables and anthropometric measurements in overweight individuals.

Materials and Methods: This randomized controlled study was conducted among 60 overweight individuals aged 18–30 years. Participants were randomly divided into two groups: an Agnisara Kriya group (n = 30) and a Control group (n = 30). The intervention group practiced Agnisara Kriya for a specified duration, seven days per week for 30 days, while the control group continued their routine activities without any intervention. Cardiopulmonary variables including pulse rate, blood pressure, and respiratory rate, along with anthropometric measurements such as Body Mass Index (BMI) and waist circumference, were assessed before and after the intervention using standardized instruments and procedures. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Results: After 30 days, participants who practiced Agnisara Kriya showed a significant increase in SBP (115 ± 3.41 to 123 ± 3.94 , $p < 0.001$) and a reduction in BMI (26.5 ± 1.53 to 26.4 ± 1.50 , $p < 0.001$). Waist circumference also decreased significantly (92.2 ± 2.82 to 90.8 ± 3.02 , $p < 0.001$) compared to the control group. No adverse effects or dropouts occurred during the study.

Conclusion: Four weeks of regular Agnisara Kriya practice resulted in significant reductions in BMI and waist circumference, suggesting beneficial effects on abdominal adiposity and weight regulation in overweight individuals. These effects may be mediated through repetitive abdominal contractions that stimulate gastrointestinal activity, improve abdominal muscle tone, enhance metabolic function, and promote autonomic regulation. On immediate effect there was increased systolic blood pressure soon after the practice of agnisara kriya. The observed changes indicate that Agnisara Kriya may support energy balance and central fat reduction through neurophysiological and metabolic mechanisms. Furthermore, the absence of adverse effects or participant dropouts highlights the safety and clinical feasibility of incorporating this yogic practice as a complementary intervention in overweight management.

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Keywords: Agnisara kriya, Cardiopulmonary variables (BP, PR, RR), Anthropometric measurements (WC, BMI), Overweight

1. Introduction

Yoga is a scientific and holistic system in India which has been practiced for thousands of years ^[1]. Yoga techniques not only include postures (asanas) but also breathing practices (pranayama), relaxation techniques, meditation and cleansing techniques called Shatkarma or shatkriya, which are a series of purifying hatha yoga practices that prepares oneself for the ultimate goal moksha (liberation). In Sanskrit, shatkarma means "six cleansing techniques." These are Neti, Dhauti, Nauli, Basti, Kapalabhati,

and Traṭaka [2].

dhautir bastis tatha neti naulikee tratakam tatha | kapalbhatihi ca etani satkarmani samacaret || (Sloka 12- Gheranda-Samhita, Part 1) [3].

Although several health benefits of Shatkriya are narrated in HathaYoga texts, there is a minimal studies of comprehensive literature on scientific studies in the subject matter. The shatkriyas are mainly designed to purify the physical body, to expel the toxins from the body for balancing tridoshas and to induce healing capacity towards higher practices of pranayama and meditation. From the available literature, we found the practice of yogic cleansing technique is safe, when practiced under the guidance of a trained teacher and has a potential role in health and disease. Dhauti which literally means "internal cleansing," has four categories: Antar dhauti (internal), Danta (teeth), Hrid (cardiac), and Moola shodhana (purification of anus). There are five further categories under which

There are five further categories under which A Antar Dhauti is categorized: Vatsara (plavini), Varisara (sankhaprakshalana), Vahnisara (agnisara), and Bahiskrita (rectal cleaning) [4]. There are no scientific studies focusing on physiological effects and Scientific evidence on Agnisara kriya which is one of the cleansing technique practiced by rapidly inhaling and exhaling while simultaneously squeezing the abdomen, vahnisara dhauti (agnisara kriya)

enhances dormant agni or fire and sensitizes the digestive stimulation [5]. Gheranda Samhita has mentioned that main cause of illhealth is impurities in the body that creates disorders. Impurities does not imply waste matter, but physical, mental, emotional and social impurity, which affects overall development of an individual in every dimation(physical, mental, social, spiritual) where self-control and self-discipline should begin [6]. The three humours of the body are Vata (wind), Pitta (bile), and Kapha (mucus). They are referred as Tridoshas in hatha yoga. These three elements work best when they are in a healthy balance. ("Medhashleshmadhikah purva shatkarmani samachareth anyasthu nacharetani doshanam samabhavatah") A healthy balance of these three aids in body functions, but when there is an abundance of one and a scarcity of the other ailments develop as a result of overheating or a lack of heat in the body, which can lead to illnesses. Before starting Pranayama, any dosha imbalance should be addressed [7]. 1.5 obesity by 2030 and will account for 11% of the global burden. Overweight and obesity in teenagers are on the rise globally, particularly in emerging and recently industrialized nations and they have been connected to a higher death rate than underweight and normal weight. One of the main causes of illness and death among the overweight or obese is metabolic and cardiovascular disorders [8].

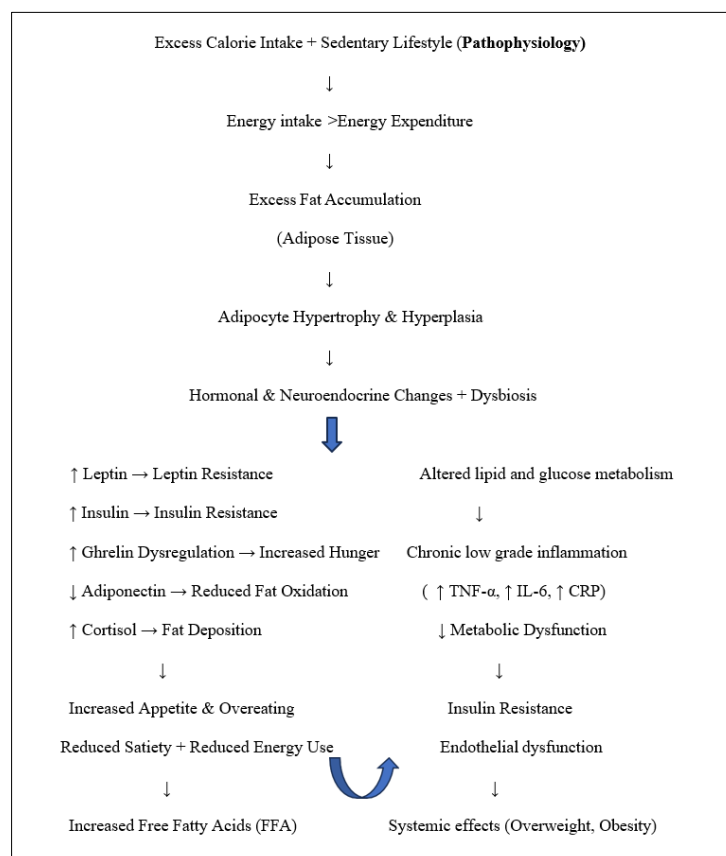


Fig 1

During routine periodic health checks, anthropometric measurements are used to track teenage growth. The data obtained are crucial for preventing a number of chronic conditions, including cardiovascular diseases (CVD), obesity, malnutrition, and/or a diet low in nutrients. Frequent behaviors that might negatively affect health include meal

skipping, snacking, overeating and unhappiness with one's body and weight [9].

Anthropometric measurements and indicators, such as Body mass index, Waist-to-hip ratio, and waist-to-height ratio, are used to assess children's and adolescents' weight status since research has demonstrated a substantial correlation between

these measurements and cardiovascular disease risk factors [10].

Cardiovascular functions are controlled by neural factors, temperature, hormones, etc. Of these, neural factors primarily concern the autonomic nervous system, which plays a major role in maintaining and regulating cardiac functions, e.g., systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR). Imbalances in these lead to cardiovascular disorders such as hypertension, ischemia, infarction, etc. So the cardio-pulmonary variables mainly helps in monitoring the cardiac output, causing the heart rate to gradually return to its initial resting level [11].

1.1. Agnisara Kriya

The first practice is dhauti in shatkarma, cleansing of the stomach and alimentary canal or digestive tract. There are four types of dhauti: antar dhauti, danta dhauti, hrid dhauti and moola shodhana. Antar dhauti contains Vatsara, Varisara, Vahnisara and Bahishkrita. In Agnisara kriya after exhaling, perform jalandhara bandha. While retaining the breath outside, the abdomen is rapidly expanded and

contracted for as long as possible without strain. At first, 3 rounds of 10 abdominal contractions and expansions is sufficient (Figure 1). In swana pranayama, the preparatory practice (Figure 2), straighten the arms and lean forward slightly, keeping the head erect. The eyes can be open or closed. Breathe in deeply. Then rounding the lips, breathe out completely through the mouth. Exhalation is through the mouth, not the nose. Exhale fully so that the lungs and abdomen feel completely empty. Open the mouth wide and extend the tongue outside. Begin panting like a dog, exhaling each time the navel is pulled in and inhaling each time the navel is pushed out, be careful not to strain. The abdomen can be expanded and contracted 10-20 times. Then relax the abdominal muscles and breathe in deeply and slowly. Normal breathing is then practised for a minute or up to a count of 10 to 12 breaths. This is one round.

Naabhigranthim meruprishthe shatavaaram cha kaarayet;

Agnisaaramiyam dhautiryoginaam yogasiddhidada. [19]

Udaraamayajam tvaktvaa jatharaagnim vivardhayet;

Eshaa dhautih paraa gopyaa devaanaamapi durlabhaa;

Kevalam dhautimaatrena devadeham bhaveddhruvam [20, 12].

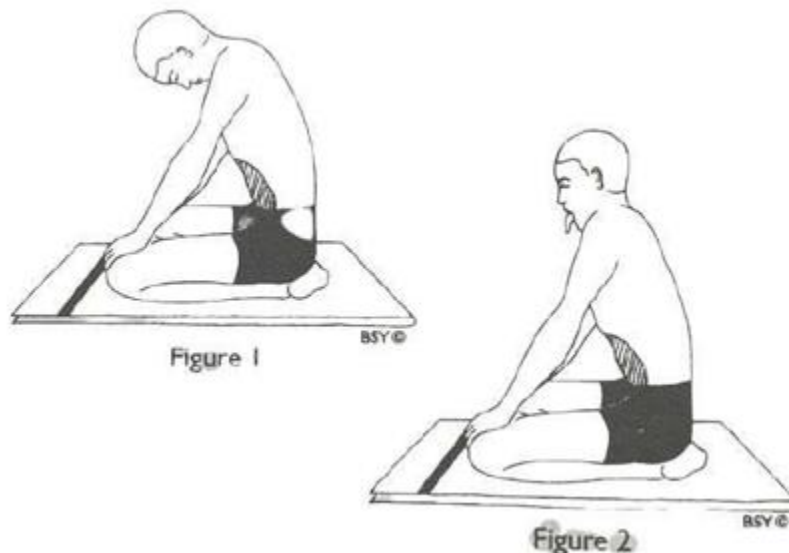


Fig 2

1.2. Aim and Objective

Aim: To study the effect of Agnisara Kriya on cardiopulmonary variables and anthropometric measurements in overweight individuals.

Objectives: To assess the effect of Agnisara Kriya on

- Blood pressure, Pulse rate, and Respiratory rate (Immediate effect pre-post).
- Body mass index, Waist circumference (30 days pre-post)

2. Research Gap

There are no scientific evidence on effect of Agnisara kriya on cardiopulmonary variables and anthropometric measurements in overweight individuals. There are only two direct scientific evidence on agnisara kriya, of which one focused on obesity in students and analysed gastric motility by using electrogastrogram and other evidence focused to analyse the blood flow in superior mesenteric artery. Other then these two scientific evidence, on review I found scientific evidence related to shatkarma and its physiological effects related articles, combined effect of agnisara kriya with

asana protocol or kriyas. specific article related to agnisara kriya were less, and this is the area to focus more on dhautis to find out individual effects of different types of dhauti to explore new scientific evidence.

3. Methodology

3.1. Study Design and Setting

The study was conducted on participants who provided signed informed consent and met the predefined inclusion and diagnostic criteria. A total of 60 eligible subjects were recruited and randomly assigned into two groups using the lottery method: Study Group A (n = 30) and Control Group B (n = 30).

Baseline (pre-assessment) – including the Blood pressure, Pulse rate and Respiratory rate were recorded as cardiopulmonary variables and Body mass index, Waist circumference were recorded on empty bowel for all participants. Group-A received Agnisara kriya intervention, each participant practiced 3 rounds, 10-50 abdominal contractions on empty bowel in the early morning. Group-B served as the control group and did not receive any

intervention. Intervention was administered daily for 30 days. Following the intervention period, post assessments (Blood pressure, Pulse rate, Respiratory rate, Body mass index and Waist circumference) were recorded for both groups. All participants were informed in detail about the study procedures, and written informed consent (refer to Annexure 1) was obtained prior to their enrollment.

3.2. Study Area

Alva's Education Foundation, Moodbidri

3.3. Study Population and Period

Approximately 140 individuals aged 18–30 years were screened for eligibility. The total study duration was one month, encompassing the screening process, baseline assessments, a 30-day intervention (administered daily), post-intervention assessments, and data analysis. The intervention itself lasted for 30 consecutive days within this period.

3.4. Criteria for Diagnosis

Subjects with BMI between 25-29.9 kg/m² are recruited for the study ^[23].

3.5. Inclusion Criteria

1. Age group between 18 - 30 years will be enrolled for the study.
2. Gender- Males and Females
3. Those fulfilling the diagnostic criteria
4. Those willing to participate in the study

3.6. Exclusion Criteria

1. Subjects with any pre- diagnosed clinical illness or hospitalization in the past 1 year.
2. Subjects taking psychological drugs, tobacco, alcohol and smoking.
3. Subjects practicing meditation or any yogic practices in the past 6 months

3.7. Ethical Considerations

The study's purpose and the participants' rights as research subjects were explained to them. Informed consent form was in English format and everyone were able to read and understand the information given in the form. Each subject received enough time to read the information sheet and have all their enquiry. It was explained to them that they have the right to leave the study at any moment and that they have to be willing to take part voluntarily. By signing an informed consent form, each subject indicated their willingness to take part in the study. The institution's ethical committee has given the approval for the project with the ethical clearance registration certificate no. ACNYS/IECHS/2023/83 dated 14/05/2024 (format enclosed in Annexure 2).

3.7.1. CTRI Registration Number

CTRI/2026/01/101545

3.8. Illustration of Study Plan

A total of 140 individuals were assessed for eligibility for the study, and of these, 60 individuals were randomized into 2 groups (study + Control), n = 30 each.

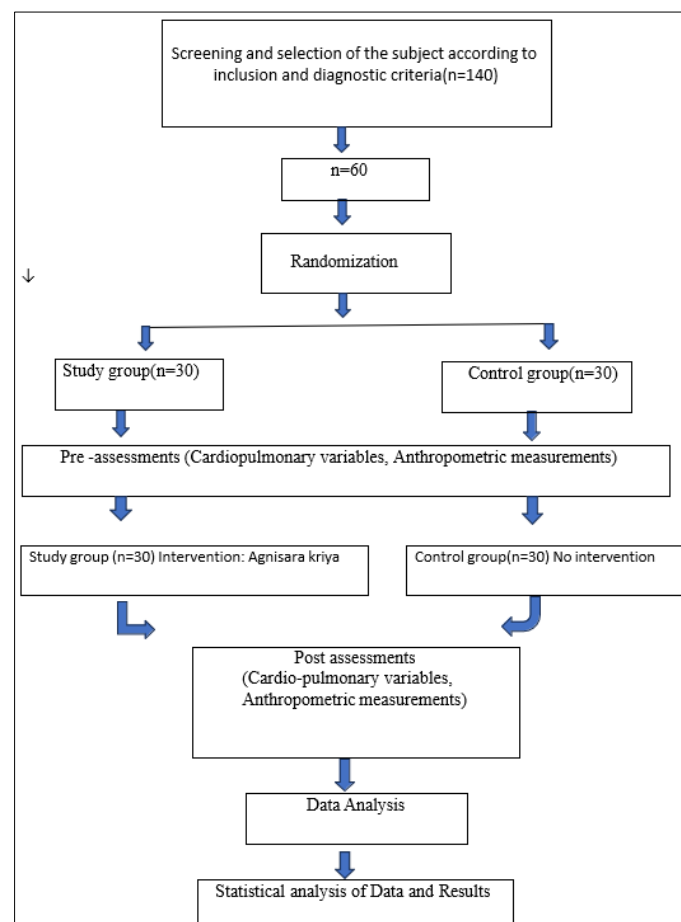


Fig 3: Subject Recruitment Flow Diagram

3.9. Intervention

The intervention will be instructed and demonstrated

Procedure:

1. Asking the subjects to sit in any comfortable meditative posture.
2. Keeping the spine straight. Placing the hands on the knees. Relaxing the whole body especially the abdomen.
3. The classical practice is performed while practicing external kumbhaka and Jalandhara bandha. Before agnisara practice, preparatory practice (swana pranayama) is done.
4. External kumbhaka is practiced by breathing out through the nose, air remains in the lungs. When one exhales through the mouth and contracts the abdomen, however the diaphragm in between the abdomen and the lungs moves up and expels the air as fully as possible. The diaphragm should be used to expel the air and thereafter the breath should be retained outside, and no more air is taken.
5. A small amount of air, called residual volume, always remains otherwise the lungs would collapse. Even so, it should feel as if all the air is exhaled. After exhaling Jalandhara bandha is performed. While retaining the breath outside, the abdomen is expanded rapidly and contracted for as long as possible without strain.
6. Releasing Jalandhara bandha and asking the subject to take slow, deep breath in. This is one round and has to relax until the breath returns to normal before commencing the next round.

At first 3 rounds of 10 abdominal contractions (each round) and expansions is sufficient. With regular practice, up to 50 abdominal movements may be practiced ^[24].

3.10. Assessments

3.10.1. Cardio-Pulmonary Variables

Autonomic variables like Blood pressure, Pulse rate, Respiratory rate, will be taken in both the groups with the help of Diamond sphygmomanometer for blood pressure ^[25], and pulse rate will be taken manually by pressing on the radial aspect of the wrist ^[26], and respiratory rate will be noted by counting the number breaths for one minute by counting the how many times the chest rises while at rest ^[27]. Pre-post assessment of cardiopulmonary variables will be taken immediately after the practice of Agnisara kriya.

3.10.2. Anthropometric Measurements

Subjects are asked to remove their shoes and asked to remain at the centre of the platform motionless to measure the Weight(kgs) with help of electronic weighing machine and Height (centimetres) by measuring tape, with the help of Weight and height Body mass index is measured ^[28]. Waist circumference mid will be measured in the horizontal plane midway between the lowest rib and the iliac crest using measuring tape ^[29].

Pre-post assessment of anthropometric measurements will be taken after 1 month of intervention.

3.11. Data Extraction

The data was collected using 2 broad outcome variables. The assessments were done on the first day (baseline data) and at

the end of the intervention i.e., 30days (post data). The data was collected and organized in Microsoft Excel sheets.

3.11.1. Data Analysis

The data was analyzed using Jamovi2.6.44 for statistical analysis and graphs were generated using MS Excel 2026. The data were represented in mean $\pm$ standard deviation. The data were tested for normality using the Shapiro–Wilk test on paired differences.

Accordingly, appropriate tests were applied:

Paired-t test, Independent -t test

Wilcoxon Signed-Rank test for non-normally distributed within-group data, and Mann–Whitney U test for between-group post-intervention

4. Sample Size Estimation

Sample size was estimated using G*Power software (version 3.1), a medium effect size (Cohen's $d = 0.5$), α error probability of 0.05, and power ($1-\beta$) of 0.80, the required sample size was calculated. A total of 60 participants (30 per group) were recruited for the study.

5. Results

The collected data were entered and analyzed using Jamovi 2.6.44. Descriptive statistics (mean $\pm$ standard deviation) were calculated for all variables. The Shapiro–Wilk test was applied to check normality. Depending on the distribution, para- metric (paired t-test) and non-parametric (Wilcoxon signed-rank test, Mann–Whitney U test) analyses were performed to compare within-group and between-group differences.

Table 1: Demographic Profile of the Participants

Characteristics	Study group	Control group
N	30	30
Male	28	28
Female	02	02
Age- Mean $\pm$ SD	23.8 $\pm$ 2.48	23.8 $\pm$ 2.24

Table 2 shows the demographic characteristics of the study and control groups. Each group comprised 30 participants, with not a equal distribution of males and females. The mean age of participants in the study group was 23.8 ± 2.48 years, and in the control group was 23.8 ± 2.24 years, indicating that both groups were comparable in age but not in gender distribution.

A statistically significant increase was observed in SBP from 115 ± 3.41 mmHg to 123 ± 3.94 mmHg ($p < 0.001$). Pulse rate significantly decreased from $80 \pm$

4.43 beats/min to 78 ± 4.45 beats/min ($p = 0.038$). BMI showed a significant reduction from 26.5 ± 1.53 kg/m² to 26.4 ± 1.5 kg/m² ($p < 0.001$).

Similarly, waist circumference significantly decreased from 92.2 ± 2.82 cm to 90.8 ± 3.02 cm ($p < 0.001$).

In contrast, DBP changed from 79.6 ± 2.94 mmHg to 79 ± 6.64 mmHg ($p = 0.664$), and respiratory rate changed from 16.9 ± 0.86 breaths/min to 16.8 ± 1.88 breaths/min ($p = 0.324$), both of which were statistically non-significant.

These findings indicate that the intervention was effective in improving certain cardiopulmonary and anthropometric parameters within the group.

Table 2: Within group comparison of pre and post intervention data for both groups

Group	Variable	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	Test Statistic	p-value
Group A (Study)	SBP (mmHg)	115 $\pm$ 3.41	123 $\pm$ 3.94	-8.46	<0.001
Group A (Study)	DBP (mmHg)	79.6 $\pm$ 2.94	79 $\pm$ 6.64	0.439	0.664
Group A (Study)	Pulse rate	80 $\pm$ 4.43	78 $\pm$ 4.45	1.84	0.038
Group A (Study)	Respiratory rate	16.9 $\pm$ 0.86	16.8 $\pm$ 1.88	0.46	0.324
Group A (Study)	Body mass index	26.5 $\pm$ 1.53	26.4 $\pm$ 1.50	4.75	<0.001
Group A (Study)	Waist circumference (cm)	92.2 $\pm$ 2.82	90.8 $\pm$ 3.02	9.79	<0.001
Group B (Control)	SBP (mmHg)	116 $\pm$ 2.97	115 $\pm$ 3.38	1.53	0.06
Group B (Control)	DBP (mmHg)	79.8 $\pm$ 3.03	81 $\pm$ 3.47	-1.53	0.08
Group B (Control)	Pulse rate	79.9 $\pm$ 4.50	78 $\pm$ 4.45	1.84	0.07
Group B (Control)	Respiratory rate	16.9 $\pm$ 0.86	16.8 $\pm$ 1.88	0.46	0.64
Group B (Control)	Body mass index	26.7 $\pm$ 1.55	26.7 $\pm$ 1.55	0.00	1.00
Group B (Control)	Waist circumference (cm)	92.2 $\pm$ 2.82	92.2 $\pm$ 2.77	0.00	1.00

In the control group, systolic blood pressure (SBP) decreased slightly from 116 $\pm$ 2.97 mmHg to 115 $\pm$ 3.38 mmHg with a test statistic of 1.53 and a p-value = 0.06, indicating that the reduction was not statistically significant.

Diastolic blood pressure (DBP) increased marginally from 79.8 $\pm$ 3.03 mmHg to 81 $\pm$ 3.47 mmHg with a test statistic of -1.53 and a p-value = 0.08, which was also statistically non-significant.

Pulse rate showed a mild reduction from 79.9 $\pm$ 4.5 beats/min to 78 $\pm$ 4.45 beats/min with a test statistic of 1.84 and a p-value = 0.07. Since the p-value was greater than 0.05, the

change was not statistically significant. Respiratory rate changed minimally from 16.9 $\pm$ 0.86 breaths/min to 16.8 $\pm$ 1.88 breaths/min with a test statistic of 0.46 and a p-value = 0.64, indicating no significant difference.

Anthropometric variables, including body mass index (BMI) and waist circumference, remained unchanged during the study period. BMI remained at

26.7 $\pm$ 1.55 kg/m² before and after intervention with a p-value = 1, while waist circumference remained at approximately 92.2 cm with a p-value = 1. These findings indicate complete absence of statistically significant change.

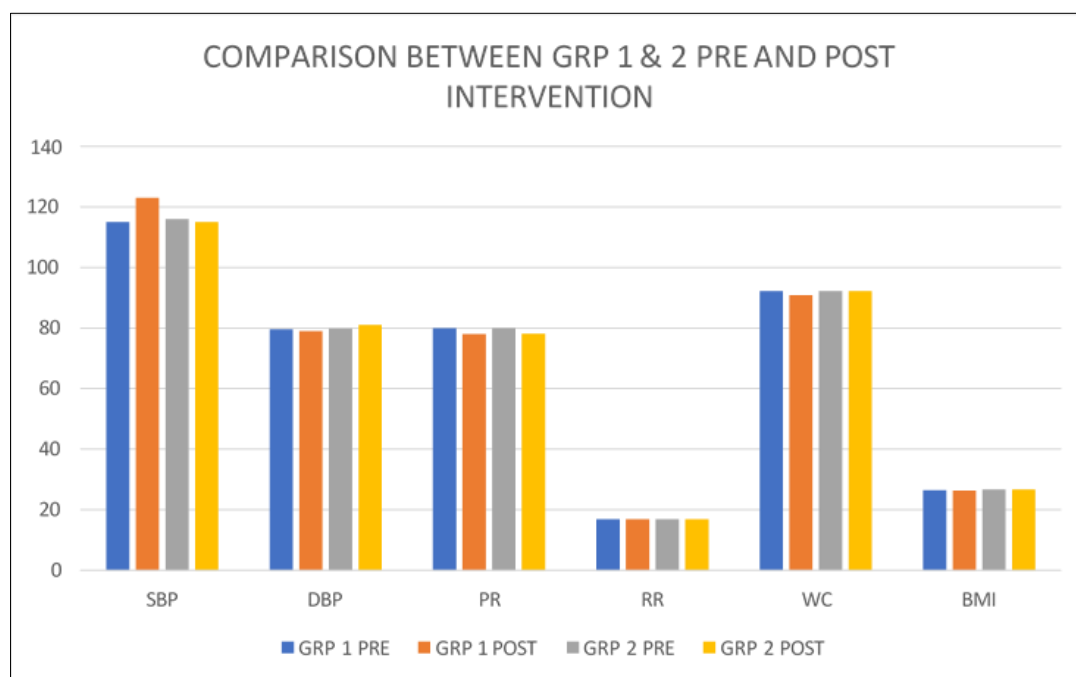


Fig 4: Comparison of Pre and Post-Intervention Mean $\pm$ SD Values for Cardiopulmonary variables and Anthropometric measurements in Both Groups.

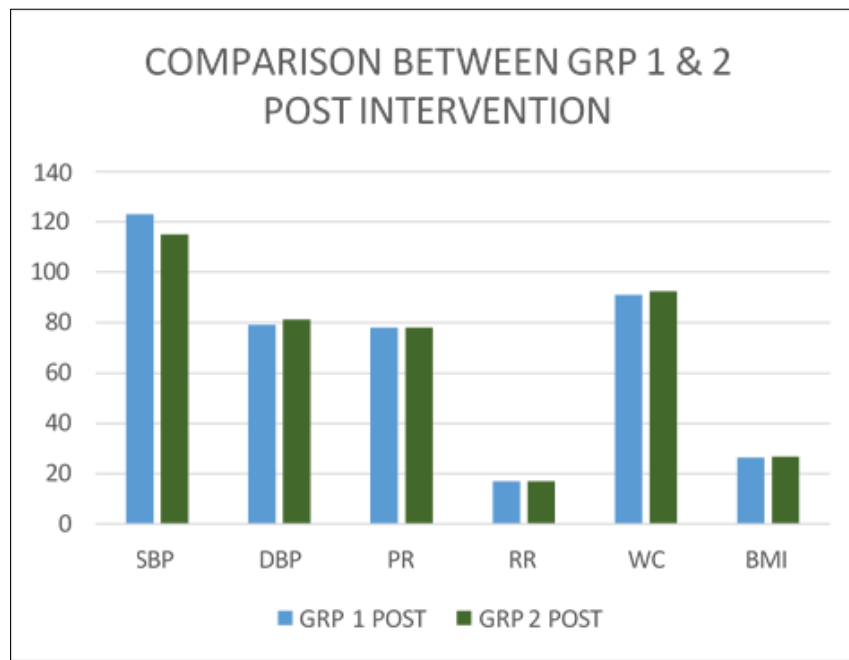


Fig 5: Post-intervention Comparison between Groups.

Agnisara kriya group showed increase in Systolic blood pressure in immediate effect, mild reduction in Body mass index and Waist circumference after practicing agnisara kriya compare to the control group. The results highlight the superior efficacy of Agnisara kriya in increasing Systolic blood pressure, reduction(mild) in Body mass index and Waist circumference. With increased number of strokes (agnisara kriya), duration of intervention, and inclusion of more number of subjects in future research (Overweight/Obesity) will help in reduction of Body mass index, Waist circumference.

6. Discussion

The present randomized controlled trial investigated the effect of Agnisara kriya on Cardiopulmonary variables and Anthropometric measurements in Overweight individuals. The findings revealed that 30 days of regular Agnisara kriya practice resulted in a significant increase in Systolic blood pressure, as well as a minor reduction in Body mass index, Waist circumference scores, compared to the control group. These results demonstrate the impact of Agnisara kriya on cardiovascular system regulation and reduction in Anthropometric measurement scores (Waist circumference, Body mass index).

6.1. Agnisara Kriya and Cardiopulmonary Variables

In Agnisara kriya practice, the strong rhythmic inward-and-outward abdominal flapping creates alternating positive and negative intra-abdominal pressure with increased venous return will increase stroke volume (the amount of blood pumped with each heartbeat), leading to a transient rise in systolic blood pressure. This acts as an external mechanical pump, stimulating local blood flow (Superior mesenteric artery) for digestive optimization despite the basic physiological responses of the nervous system. Agnisara kriya's specific manipulation of breath and muscle tone creates a localized vasodilatory effect by increasing the

diameter of the superior mesenteric artery, splanchnic circulation and peak systolic blood flow and overall blood flow of the splanchnic, superior mesenteric artery. It achieves this through a parasympathetic response via the vagus nerve, overriding the normal sympathetic constriction that usually occurs during physical exercise, ensuring adequate blood supply to support gastrointestinal function. Sympathetic overriding depends on performing agnisara kriya properly with breath control, abdominal muscle tone with flapping movements [30].

6.2. Agnisara kriya and Overweight

The present study was designed to determine the impact of a 30 days practice of Agnisara kriya on Cardiopulmonary variables and Anthropometric measurements in Overweight individuals. Primary finding of the study was Body mass index, Waist circumference which tend to reduce after the intervention when compared with baseline values in individuals with Overweight. Yoga intervention which included Agnisara (rigorous movement of the abdominal muscles), when practiced showed positive results over time in systolic blood pressure, body mass index, and waist circumference scores. The practice of fast breathing with the flapping causes shallow respiration which decreases the tidal volume and increases breathing thus Oxygen consumption is also increased due to increased breathing work [31].

The Vagus nerve is modulated by respiration. It is suppressed during inhalation and facilitated during exhalation [32]. Therefore, this particular intervention which has continuous bouts of exhalation causes stimulation of the vagus nerve, and these Vagal reflex control circuits causes vasodilation in abdominal muscles, gastric motility [33]. The effects of accelerated or voluntary hyperventilation breathing techniques accelerated breathing like agnisara kriya causes autonomic reactivity [34]. Therefore the practice of Agnisara Kriya appears to shift the overall basal autonomic balance to the parasympathetic direction [35]. The possible reasons for the

positive improvement in systolic blood pressure, body mass index and waist circumference, gastric motility, in the present study Agnisara Kriya involve exhalation followed by forceful contraction of abdominal muscles, it is a form of the abdomen-respiratory-autonomic exercise stimulating respiratory, abdominal, gastrointestinal receptors also, afferent centers in the brain stem and cortex and efferents and effectors leading to synchronous stimulation of the Autonomic nervous system, hypothalamus, Pineal gland, and other associated brain structures [36]. However, as far as I am aware, no study to date has investigated the effect of Agnisara Kriya alone on the cardiopulmonary variables and anthropometric measurements on overweight individuals. Thus this study closes an important gap in assessing the effectiveness of Agnisara kriya on the cardiopulmonary + anthropometric variables in overweight individuals.

During the intervention period dietary restriction were followed to bring better results. Subjects are asked to not have simple sugars, high sodium, fried, oily foods, meat. Subjects are asked to have complex carbohydrates to prevent excess hunger, eventually which will help in reduced food intake daily.

Subjects who were following dietary guidelines helped in getting better results after the intervention compare to the subjects who were not following the dietary guidelines, and subjects who were not willing to follow the dietary guidelines were excluded before starting the intervention, subjects who were following dietary guidelines but not upto the mark, got results with minimal changes in the variables.

The present study showed statistical significance mainly in systolic blood pressure (115 ± 3.41) to (123 ± 3.94), $p < .001$. Body mass index (26.5 ± 1.53) to (26.4 ± 1.5), $p < .001$ and Waist circumference (92.2 ± 2.82) to (90.8 ± 3.02), $p < .001$. Further studies with more sample size, strict dietary restriction, increased strokes and rounds in agnisara kriya is needed to bring strong reduction in body mass index, waist circumference in overweight/obese individuals.

6.3. Limitations

- The present study has a very small sample size.
- Overweight is a chronic condition and thus long-term treatment and follow-up are required.
- A future study with a larger number of participants is necessary.
- This study cannot be generalized to the population.
- Present study include more of male subjects, few females, so further study need to be done by including more number of females.
- Female subjects were approached for the study, due to dropouts, irregularity of practice ended in getting only 2 subjects.
- Subjects with multiple co-morbidities were excluded in the present study.
- Females with dysmenorrhea, PMOS, Hypothyroidism, Infertility, were excluded as it was the first study on anthropometric, cardiopulmonary variables.
- More sample size with strict dietary restriction during intervention is needed to bring better results in reducing waist circumference, body mass index compare to the present study.

6.4. Strength of The Study

- To our best knowledge, this is the first study done to evaluate the efficacy of Agnisara kriya on Cardiopulmonary variables and Anthropometric measurements in Overweight individuals.
- This study will help in preventing metabolic diseases, helps in preventing from turning overweight to obesity in the population.

6.5. Directions for Future Research

- More specific objective assessment tools can be employed with a larger sample size.
- The study can be done on all the age groups to assess the efficacy of the intervention.

7. Conclusion

The present study concludes that Agnisara kriya can be used as an alternative therapy to reduce waist circumference, body mass index in overweight individuals. Further, it can also be beneficial for reducing the risk factors associated with obesity like cardiovascular diseases, atherosclerosis, diabetes, hypertension, and depression. The practice of Agnisara Kriya can be employed in hospitals and health care facilities along with conventional treatment.

8. Summary

The study on the effect of Agnisara Kriya on cardiopulmonary variables and anthropometric measurements in overweight individuals aimed to evaluate whether regular practice of this yogic cleansing technique could improve physiological and body composition parameters in overweight individuals. Agnisara Kriya, a traditional yogic shatkarma practice involving rapid abdominal movements with breath retention, is believed to stimulate abdominal organs, improve metabolism, and enhance autonomic balance. In this study, overweight participants practiced Agnisara Kriya regularly for a specific intervention period under supervision. The outcome variables included cardiopulmonary parameters such as systolic blood pressure, diastolic blood pressure, pulse rate, and respiratory rate, along with anthropometric measurements including body mass index and waist circumference.

The study adopted a randomized controlled design involving 60 participants aged 18 to 30 years who were overweight individuals. Participants were randomly allocated into two groups one performing Agnisara kriya and the other serving as a control. Agnisara kriya was practiced 3 rounds, 10 abdominal contractions, 7 days per week for a period of 30 days (on empty bowel), under guided supervision. Pre-post data were collected on empty bowel to analyze the pre-post changes in the data, waist circumference, body mass index (anthropometry) blood pressure, pulse rate, respiratory rate (cardiopulmonary variables) data were collected. Statistical analysis was performed by using jamovi 2.6.44, applying appropriate parametric and non-parametric tests. Intervention group showed significant reduction in waist circumference, body mass index scores and increase in systolic blood pressure compared to the control group. These outcomes reflected enhanced autonomic reactivity and balance resulting from agnisara kriya.

From the yogic perspective, the findings support classical

references in the Gheranda Samhita, which describe Agnisara as fire (agni), element (sara) digestive fire. Physiologically-Agnisara kriya massages and tones all the abdominal organs. It promotes the correct secretion of digestive juices and allows optimum assimilation of nutrients from food. It prevents and removes disorders of the digestive system such as constipation, indigestion, hyperacidity, hypoacidity, irritable bowel syndrome, pitta imbalance and flatulence. This practice balances the abdominal organs.

The improvement in reducing body mass index, waist circumference and increased systolic blood pressure highlights the potential of agnisara kriya in reducing anthropometric scores and increased systolic blood pressure. The intervention was found to be safe, inexpensive, and easy to practice, with no reported adverse events or dropouts. Nevertheless, the study acknowledges certain limitations—such as its short duration, limited sample size, and the exclusion of assessment like lipid profile, body roundedness index, body shape index that could further explain the mechanisms involved.

In summary, this study establishes that regular practice of Agnisara kriya will enhance reduction in body mass index, increased blood pressure in immediate practice, indicating improved autonomic reactivity and mind-body integration. The routine practice of agnisara kriya will enhance reduction in adiposity, preventing overall diseases of the abdomen and promoting overall well-being of an individual.

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