Impact of Piranayamam (Yogic Aerobic Exercise) on Variability of Peak Expiratory Flow Rate in Healthy Individuals

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Abstract The Saiva siddhantha holy text Thirumanthiram explore about the Piranayamam under the chapter of Addanga yogam in the form of stanza which was written by Thirumoolar who is one of the siddha saint. Breathing is a process by which oxygen is taken inside and carbon dioxide is given out of the body. It is the process of gas exchange that occurs in alveoli by passive diffusion of gases between the alveoli and blood. The piranayamam is the aerobic exercise yogic practice which control and regularize the phenomena of breathing. The yogic practice enhances the deep inspiration and holding up breath, thus the waste expirates can be utilized to transmit the energy to the optimum level to the body. Peak Expiratory flow monitor is a simple hand held instrument which is the largest expiratory flow rate achiever with optimal forced effort from the position of maximal inspiration, expressed on litre/min. The objective is to find out the effect of Piranayamam in ventilatory function for utilizing waste expire. The 50 subjects were selected and explained the technique of using Peak expiratory flow meter, the tested group n=25 both male and female were selected and asked them to do regular pranayamam practice. The controlled group n=25 both gender was selected and asked them to do regular meditation practice in padmasana position. The PEFR values were recorded, Values are mean ± standard deviation of triplicate analysis (n=25 in control group male n=15, female n=10, n=25 in treated group male n=15 and n=10 female). The values were analysed for one way ANOVA using software Minitab (version 17) and comparison were done using Turkey method with 95% simultaneous confidence intervals The significant increase of PEFR recording as in male 568±43 and in Female 423±23 litre/minute was observed in the treated group who have practiced Piranayamam. It is concluded from this research the regular practice of piranayamam improves respiratory efficiency by opening of small air way of lungs to utilize optimal air from the lungs.

Keywords Addanka yogam; PEFR; Piranayamam

1. Introduction

The great siddha sage Thirumoolar has compiled and confined knowledge of eight path of yoga (Addangayogam). Among them, the 4th step Piranayamam is the breathing exercise or technique for controlling life force as well as increasing the vital capacity. Piranavayu is the principal Vayu among ten vayus, without this other kind of vayu cannot be independently exist to show the expression of life, If Piran departs from the body, the life become extinct and the mass of flesh and bones and mere stature of the figure is throw down. Hence Piranavayu is important for the existence of life in a human
body. Piranavayu is force akin to electricity which is tangible, piercing invisible, steadily moving and produces constant current to the organs of the body (Iyankar, 2005).

In the respiratory cycle, 21600 breathings are performed in one day among 7200 breathings are wasted away and the remaining 14400 breathings enter into the body. Therefore the present set up of breathing phenomena deficient cellular respiration occur due to underutilization of 7200 breathings. One act of breathing contains the phase of Poorakam-Inspiration, Rechakam-Expiration, Kumpakam-Pause or holding up of breath, thus in one second one expiration and one inspiration and two pauses will be found.

The yogic aerobic exercise performed by at kumpakam neither breath ‘out’ nor ‘in’, the chakras (plexus) of nerves that direct breathing notes as, Moolatharam -600, Swadhishthanam-6000, Manipooragam -6000, Anakatham-6000, Visudhi-1000, Aknai-1000, Mahameru-1000 are the definite numbers assigned to each of them as normal act, will work to produce and transmit the energy through the finest thread of nerve fibres that connect the brain with the spinal cord (Chidambara Thanupillai, 1991).

Peak expiratory flow rate (PEFR) is one of the important and simple parameter in assessing the lung function status in healthy individuals as well as diagnosis and monitoring tool in the treatment of lung diseases. PEFR is a reliable indicator of variability in airway caliber which shows specific pattern of variability in normal and diseased individuals due to susceptibility to increased bronchial responsiveness and influence of external factors (Malik et al., 1975).

1.1. Aim and Objectives

Various studies on PEFR in the healthy people have been carried out to explore the relationship between anthropometric measures, Circadian and diurnal variance study and combined suryanamaskaram and Pranayamam etc., but these researchers did not consider analyzing the utilization of waste expire air in the lungs. Therefore the purpose of present study is to find out the significant increase in ventilator function of healthy individuals, thus to establish the effect of piranayam practice in healthy male and female individuals on the variability of PEFR recordings.

2. Materials and Methods

This study was designed to enroll 50 non-smoking individuals in the age between 12-25 years models were fitted for male and female. The nature of the study was explained and informed consent was obtained from each subject prior to the preparation of the study. The age in completed years, standing height in nearest centimeter without shoes and body weight in Kg in minimum clothing were recorded for each subjects. The subjects were screened by detailed history and clinical examination to rule out chronic cough, asthma, COPD, any other respiratory diseases and cardiac diseases. Baseline pulmonary function test was carried out to exclude subtle restrictive or obstructive pulmonary dysfunction.

The PEFR test is done using mini Wright’s Peak Flow Meter. This is a simple hand held instrument with mouth piece on one end scale on the other. A small plastic arrow moves when air is blown into the mouth piece, measuring the air flow speed. PEFR is the maximum flow rate generated during forceful exhalation, starting from full lung inflation. Peak flow rate primarily reflect large air way flow and depends on the voluntarily effort and muscular strength of the patient. Maximal airflow occurs during the effort dependant portion of the expiratory manoeuvre, so low values may be showed by a less than maximal effort rather than by airway obstruction. Nevertheless, the ease of measuring peak
flow rate with less expensive small portable device is mainly used mini Wright's Peak flow meter. Forced expiratory volume over one second (FEV₁) is a dynamic measure of flow used in formal spirometer; it represents a truer indication of air way obstruction than does peak flow rate. Although the peak flow rate usually correlate well with FEV₁, this correlation decreases when patients with Asthma as air flow diminishes. Clear instruction was given to both controlled and tested groups n=50 fifty subjects regarding the technique of using Peak Expiratory Flow Meter, in like that they have to breath in as deeply they can, blow into the mouth piece as quickly and as hard as they can and do not put their tongue in front of the mouth piece, do this three times, record the highest reading of the three, the reading can be taken early morning or early evening.

The tested group volunteers n=25, was demonstrated the practice of Piranayamam and also they were asked to perform the piranayamam in early morning on empty stomach or 15 minutes after tea is preferable after bath. The place should be spacious noise free with sufficient fresh air and light. Sit on a mat or comfortable seated area with legs crossed, Spine (back) erect and straight. Head straight, face looking forward (Pathmasanam). Sit quietly for one minute with very relaxed mind set and do not allow extra thoughts in your mind, think you are going to have fresh and pure energy by inhaling and send all impurities by exhaling. Eye lids closed with eye pointing towards the tip of the nose while the eyes will automatically concentrate on centre point of two eyebrows. The Breath easily and deeply as much as possible, very slowly and steadily without hurrying up, close the right nostril with right thump, now inhale through the left nostril for deep inspiration (Poorakam); then hold the breath for as long as comfortable (Kumpakam); during this phase, think that Piranan you have taken inside nourish the whole body from top to bottom by moving all over the body and nourishing all the organs and mind; then close the left nostril with the ring finger of right hand, open the right nostril, exhale slowly (Rechakam), exhaling period should be longer than inhaling period while think that all the impurities of your body and mind that were cleansed and let out of the body as waste expiates. After complete exhalation, Repeat the same the above three phases for 3-10 times based on your convenience, but last more than two minutes. After pranayama you have to sit in the same place for five minutes (Inhaling and Exhaling through single nostrils alternatively is quite confusing for the beginners. The instruction given to controlled group n=25 As to simply sit quietly with pathmasanam posture with their hands to the sides and palms facing up allow the weight of your body to drop deeper in to the earth. Once you relaxed enough, simply roll over to the side and push them self-backup. Once they ready to meditating, eye closed with eyes towards the point between eyebrow, then placed their head phones on your ears and listen the sound “Om” or your favorite spiritual chanting slogan.

3. Results and Discussion

The significant increase in Peak flow rate was observed because the regular practice of Piranayamam enhances the optimal using of lung spaces which are not used up in normal shallow breathing.

Therefore the increase reading of peak exploratory meter rate indicates the consequence of small airway opening in lungs.

3.1. Statistical Analysis

Values were analysed for One-way ANOVA using the software Minitab (Version 17) and comparisons were done using Turkey method with 95% simultaneous confidence intervals.

Values are mean ± standard deviation of triplicate analysis (n=25 in control group male n=15, female n=10, n=25 in treated group male n=15 and n=10 female).
Mean values in the same row with different alphabets are statistically significant (p <0.05).
Mean values in the same column with different numbers are statistically significant (p <0.05).

PEFR values measured before and after practice in control group were not statistically different, but in treated group in both male and female are significantly different, which indicates that the PEFR values were increased significantly (p <0.05) in both male and females due to piranayamam practice.

**Table 1**: Base line & after practice PEFR values

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Experimental group</th>
<th>PEFR value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before practice</td>
</tr>
<tr>
<td>1</td>
<td>Control group (Vm)</td>
<td>410.00 ± 40.00</td>
</tr>
<tr>
<td>2</td>
<td>Treatment group (Male) (Vp)</td>
<td>521.67 ± 54.34</td>
</tr>
<tr>
<td>3</td>
<td>Treatment group (Female) (Vp)</td>
<td>384.00 ± 23.19</td>
</tr>
</tbody>
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Body position has shown to affect lung volume and muscular bio mechanics. Hence, Lung function varied by the position of the body because the gravity exerts its influence on the human body and importantly on lung capacities to establishing normal oxygen transports. The highest lung volume observed in standing and upright sitting position, therefore the posture should be constant during PEFR readings. Besides, the PEFR value depends on age, sex, weight and height. PEFR values decrease with increase age but increase with increase height. Therefore the predicted value of PEFR calculated as follows: (Nunn and Gress, 1999)

**Predicted PEFR = Reading + (2.7*Height in cm) – (4.8* weight in Kg)**

The greater the elastic recoil of lungs and chest wall and the expiratory are at optimal part of the increase lung volume. This will produce increase intra thoracic pressure due to gravity pulls the abdominal contents, thus base of the lungs will not be compressed by weight of the heart and abdominal content. Hence alveoli will reopen, take more air and increase the lung volume which leading to higher elastic coil due to inspiratory muscle are able to expand and unrestricted thorax evenly and contraction of diaphragm (Leitha, 1968).

In standing position, the deep inspiration make diaphragm contracting efficiently and make abdominal muscle to be more capable of contraction while produce higher expiratory pressure. Even though the chair sitting position is next to standing position, the sitting posture taking less inspiration due to back of the chair may slightly restrict the chest expansion that leading to lower the lung volume (Jan et al., 2000; Devaraja et al., 1988). Strength of respiratory muscle depends on the respiratory function and chest expansion. Yoga practice decreased reaction time, indicating improvement of neuro-muscular system, thus, improves respiratory breathing capacity increasing forced expiratory lung volumes and chest wall expansion (Bhavanani et al., 2012). The study of Saxena T and Saxena M (2009) about various breathing exercises in Bronchial Asthma, found the forceful expiration beneficial to expel much trapped air in lung spaces. The increase PEFR reading indicates some degree of Broncho dilatation which is leading to better oxygenation of the alveoli. The reduction of sympathetic activity attained with pranayamam practice may allow Broncho dilatation, thus, breathing patterns may be improved and respiratory bronchioles may be widened and perfusion of large number of alveoli can be carried out oxygen effectively.

In male, abdominal breathing uses the diaphragm primarily and is coincide with the shape of the lungs and the capacity of the respiratory muscles. In female, chest breathing utilizes primarily intercostal
muscles, accessory breathing muscle, trapezeus, sclenes, pectoral and sternomastoid. It is less efficient, aerates less of the lungs, fatigue the neck and upper chest if used habitually and is associated with urgency and anxiety.

Piranayamam literally means expansion of life force, Piranan - “life force”, Ayamam - “Expansion”. It is not only the breathing exercise but also controls the life energy. The piranan is the basic vital element of this universe both in macrocosm and microcosm. The beneficial effect of piranayamam was reported in some aspect in the past with sound scientific basis. The science of Piranayamam deals with the control and excitement of this vital force which results in rhythmic respiration, calm and alert state of mind. Piranayamam strengthen the respiratory musculature, thus, the chest and lungs inflate and deflate to fullest possible extent which is an important physiological stimulus for the release of surfactant and prostaglandin to increase the alveolar spaces which makes efficient use of abdominal and diaphragmatic muscles and improves the respiratory apparatus (Smith et al., 1976). The powerful strokes of exhalation in quick succession with contraction of abdominal and diaphragmatic muscles train the subjects to make the fullest use of diaphragm and abdominal muscles in breathing and also help in cleaning up respiratory passage by removing the excess secretions from bronchial tree which allow space for more air.

A study of Bhargawa and Gogate (1982) reported that the Piranayamam improves respiratory breathing capacity by chest wall expansion and forced respiratory lung volumes and statistically showed significant increase breath holding time after Piranayama practice. The mechanism of Piranayamam increasing the depth of breathing than normal breathing. The lungs expand significantly and the wall of the alveoli is stretched maximum. The piranayamam stimulate the stretch receptors lies in the alveoli walls, thus, increase the surface area and enhance the air dissemination across the alveoli membrane which exchange oxygen and carbon dioxide across the thin wall of the alveoli and blood capillaries takes place more as they practice more time (Sodhi et al., 2009). Slow breathing like Piranayamam reduces the responses of chemo reflex to hypercapnia and hypoxia and also increases baroreflex sensitivity compared to normal breathing (Pramanik et al., 2009).

Piranayamam reduces dead space ventilation and work of breathing which detoxify lungs and respiratory tract, enhance the supply of oxygen and purifies blood and help to tone up muscles.

4. Conclusion

Piranayamam is the rhythm of nose breathing and deep abdominal predominance prevails throughout the whole process, is a systematic, controlled exercise of respiration that makes the lungs stronger, improve blood circulation and make the individual healthier. Because the piranic breathing makes the whole lungs effective in refreshes air, in contrast with shallow breathing which refreshes air only from the base of the lungs.

Hence, it is concluded from this research, the regular practice of piranayamam improves respiratory efficiency as seen in results highly significant respiratory parameters like PEFR value. When compared to control group (Vm) who receive meditation practice, the treated group (Vp) who receive piranayamam practice found to exhibit statistically significant increase in PEFR value in both male and female. Therefore, the given piranayamam practice may approached as non-drug therapy in air way obstructive respiratory disorders.

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