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Impact of yoga therapy on respiratory function and oxidative stress in middle aged subjects (A Pilot Study)

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Abstract
The objective of the study was to analyze the impact of yoga therapy in the Respiratory function and oxidative stress in the middle age group. The study is carried out in the department of Human consciousness and Yogic Sciences, Mangalore University, Dakshina Kannada District, Kranataka. 40 subjects with age group 45-60 years were selected for this study. The subjects suffering from breathlessness in the middle age group are included in the present study. The yoga therapy sessions were conducted regularly one hour except every Sundays. Case history was taken in the beginning of the study. Proper sequence of asanas, pranayamas and relaxation techniques was maintained during yogic practice session. The subjects were advised to systematize their good habits and were asked to take light easily digestible food. Subjects were asked to avoid excess curds, fried items and food containing excess of oils and fats. During yogic practice session individual concentration given to the subjects and mainly concentration given to the synchronization of breath along with the body movement. Parameters considered are: MVV (Maximum Voluntary Ventilation), PEFR (Peak Expiratory Flow Rate), Malondialdehyde (MDA). When results were compared with control group, experimental group shows significant changes, which clearly shows the effect of yogic practices.

Keywords: Malondialdehyde, MVV, Yogic Practices

Introduction
Yoga is the ancient science of right living and make a human capable to achieve his potential ability in his life. When we integrates yoga in our routine life it improves the quality of life in all the dimension of the life. It works on physical mental social and spiritual aspects of a person. According to yogic concept the base of all physical and physiological function, is the "prana". (Life force energy). Mechanism of breathing is associated with the concept of prana and it is the elementary factor for all the physiological and biochemical activities in our body.

Respiratory function
The cells of the body need energy for their chemical activity that maintains homeostasis. Most of this energy is derived from chemical reactions which can only take place in the presence of oxygen. The main waste product of these reactions is carbon dioxide. The respiratory system provides the route by which the supply of oxygen present in the atmospheric air gains entry to the body and it provides the route of excretion of carbon dioxide. Blood provides the transport system for these gases between the lungs and the cells of the body. Exchange of gases between the blood and the lungs is called external respiration and that between the blood and the cells internal respiration. Breathing is the function which receives the oxygen from the environment and expels toxic gases from our body. Each breath consists three parts, inspiration, expiration and pause. The main muscle groups which supporting the action of breathing are intercostal muscles and diaphragm.

Biochemical mechanisms and oxidative stress
Biochemical actions are related to communication within the body and cellular metabolisms. During the biochemical action there are some possibility of damaging the cell wall, but due to the activated antioxidant mechanism, there will be a repairing mechanism also happens to restore the balance. The important component in all the metabolic biochemical mechanism is Oxygen (O2). Whenever the cell produce the energy it creates an oxygen free molecule. The oxygen free radicals very well known as the "Reactive Oxygen Species" (ROS) [1]. These free radicals are toxic and capable to damage the cells and other molecular systems in our body.it is react with other molecules and causes the oxidative stress by that oxidative damage in the cellular protein, membrane etc.

But as early mentioned, our body has the mechanism of counter act to the oxidative stress. Our body produces the antioxidants to defend the situation so that the count of free radicals always in a balanced level. The reduction in the antioxidant mechanism causes the excessive oxidative stress that causes increased metabolic toxic level in our body. The excessive oxidative stress defined as "disturbance in the balance between the production of Reactive Oxygen Species and antioxidant mechanism in our body". In other words excessive oxidative stress reflects an imbalance between systemic manifestation of ROS and biological system's ability to readily detoxify the reactive intermediates or to repair the resulting damage [2].

As age increased there is a possibility of increasing in the free radicals and progressive reduction in the antioxidant mechanism. Also the middle aged group people badly

exposed to the stress and anxiety as well as occupational over load. All together it can cause decreased immune system and other lifestyle related diseases.

Objective

The objective of the study was to analyze the impact of yoga therapy in the Respiratory function and oxidative stress in the middle age group.

Materials and methods

Venue: The study is carried out in the department of Human consciousness and Yogic Sciences, Mangalore University, Dakshina Kannada District, Kranataka. Institutional Human Ethical committee of Mangalore University has approved this study.

Selection of subjects

We included total number of 40 subjects who expressed their interest to participate in this study voluntarily age in between 45 to 60 years, including male and female. Total number of subjects divided in to experimental group and control group which consisting twenty subjects each. Written consent form has been obtained from the participating subjects.

Inclusion criteria

The subjects with suffering from breathlessness in the middle age group are included in the present study.

Application of Yoga therapy

The yoga therapy sessions were conducted at the department of Human consciousness and Yogic Sciences for regularly one hour except every Sundays. Case history was taken in the beginning of the study. The experimental project intended to understand the variation on pulmonary function and oxidative stress level in the subjects as the result of introducing yogic practices.

Proper instructions were given to the subjects regarding the practice, basics of yoga, its relevance and importance. The asanas were introduced gradually. On the first day three asanas, one pranayama and yoganidra were taught and one new asana was taught for every next day. Gradually all Pranayama were taught and subjects were asked to take five breathing properly in the final position of the asanas. Subjects also advised to keep concentrating on the practice. Proper sequence of asanas, pranayamas and relaxation techniques was maintained during yogic practice session. The subjects were advised to systematize their good habits and were asked to take light easily digestible food. Subjects were asked to avoid excess curds, fried items and food containing excess of oils and fats. During yogic practice session individual concentration given to the subjects and mainly concentration given to the synchronization of breath along with the body movement.

Parameters

The primary instrument used in respiratory function testing is the spirometer. It is designed to measure changes in volume and can only measure lung volume compartments that exchange gas with the atmosphere. The below mentioned pulmonary functions are assessed by using the Helios 401 spirometer.

MVV: (Maximum Voluntary Ventilation): MVV is a measure of the maximum amount of air that can be inhaled and exhaled within one minute.

PEFR: (Peak Expiratory Flow Rate): (PEFR) is a person's maximum speed of expiration, as measured with a peak flow meter, a small, hand-held device used to monitor a person's ability to breathe out air. It measures the airflow through the bronchi and thus the degree of obstruction in the airways

Malondialdehyde (MDA).

Malondialdehyde is a naturally occurring product of lipid peroxidation and prostaglandin biosynthesis that is mutagenic and carcinogenic. It reacts with DNA to form adducts to deoxyguanosine and deoxyadenosine. The assessment of MDA is done by following the method of TBA-TCA method.

Following Yogic practices were administered for the subjects of experimental group.

Swastikasana, Vajrasana, Suta vajrasana, Simhasana, Tadasana, Trikonasana, Parsvakonasana, Parsvottanasana, Prasaritha Padottanasana, Paschimottanasana, Purvottanasana, Pavanamuktasana, Bhujangasana, Shalabhasana, Dhanurasana, Ustrasana, Bharadvajasana, Janusirshasana, Baddha Konasana, Viparitakarani, Uttanapadasana

Pranayama

Ujjayi, Anuloma Viloma, Bhastrika, Bhramari.

Relaxation

Yoganidra/Savasana 1, Savasana 2

Statistical analysis

The data collected for spirometer recordings and blood tests were analyzed using Student paired‘t’ test. The level of significance, ‘p’ is considered as 0.05 to decide the significance of the result. The difference is considered statistically significant if $p < 0.05$ and non-significant if $p > 0.05$. The difference is considered highly significant if $p < 0.01$. The obtained values for spirometer readings and blood tests by statistical procedures are tabulated below.

Table 1: Experimental Group

Experimental group						
S.no	Parameter	Mean+/-SD		t-value	p value	Significance
		pre	Post			
1	MDA	17.77+/- 5.43	13.71+/-12.64	1.8228	0.0420	S
2	PEFR	1.7782+/-0.8040	2.96+/-0.9262829	-3.6725	0.00236	HS
3	MVV	44.7235+/-17.9172	65.3529+/-15.5279	-4.9417	0.000157	HS

Table 2: Control Group

Control group						
S. no	Parameter	Mean+/-SD		t-value	p value	Significance
		pre	Post			
1	MDA	16.98+/-5.37	17.46+/-6.30	-0.3127	0.7578	NS
2	PEFR	2.458+/-0.8224	1.95+/-0.2955	1.7805	0.1281	NS
3	MVV	45.6+/-14.9097	41.8+/-11.7983	1.6221	0.1625	NS

Graphical Diagram of PEFR and MDA

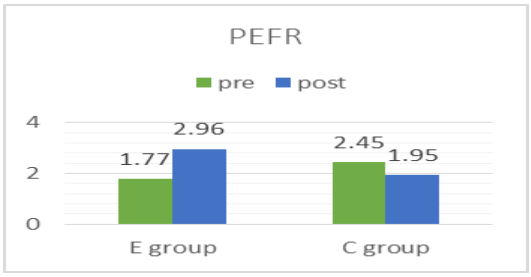

Fig 1

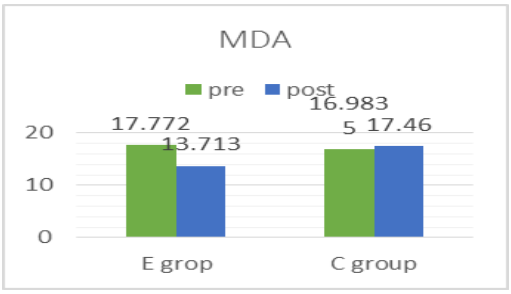

Fig 2

Discussion

As the aim of this study is to assess the impact of yoga therapy on pulmonary function and oxidative stress. There are three variables in the pulmonary mechanism that can impact entire respiratory mechanism. The improvement in the selected parameters can represent the improvements in below explained variables [3]

a. Elasticity

Elasticity of the lungs can be described as the ability of the lung to return to its normal shape after each breath. When the elasticity reduced, it reflects as decrees in total lung capacity. The present study has observed by assenting the MVV, there is a improvements in the endurance of the breathing capacity. The practice of "Bhastrika" pranayama may helped to improve the lung capacity and endurance.

b. Airway resistance

When the flow of the air through the respiratory passages resisted, it causes insufficient supply of oxygen and reduces the efficiency of removing the toxic materials through the air. The reason for airway resistance are varies person to person. In most of the case chronic bronchitis is the elementary factor for the breathless ness. The PEFR represents the reduction in the airway resistance in the experimental group.

c. Lung Compliances

This is the measure of how much effort require to inflate the alveoli. The healthy lung is very complaint and inflates the alveoli with very little effort. Both MVV (p=0.000157) and PEFR (p=0.00236) are indicates improvement in the lung Compliances

d. Oxidative stress

The significant reduction in the MDA (p=0.0420) p=>0.05 also indicates the improvements in the biochemical mechanism that finally reduced the oxidative stress. As already mention the excessive oxidative stress is responsible for many degenerative mechanisms in our body. As age increases the balance between oxidants and antioxidants may affects. The significant decrease in the MDA (Malondialdehyde) is shows that the three months of yoga therapy could make significant impact on decreased the level of Oxygen free Radicals and expelled good amount of toxic particles from the body.

Role of Yoga

Improvements in all the parameters shows that properly sequenced and progressive method of yoga therapy application improved respiratory mechanism as well as reduction in the oxidative stress. The study is more relevant especially middle aged people are becoming the majority of the total population. Based on the observation the present study suggests that regular practice of yoga can improve the respiratory function and improves the immunity so that it can be consider as a solution for many lifestyle associated diseases in preventive aspects.

Conclusion

Yoga is the system of practice which amalgamation of physical and physiological activities. The significant difference in the respiratory function and reduction in the oxidative stress are the evidence that three months yoga therapy application could made a total improvements in the physical physiological and biochemical activities in the body in middle aged subjects. The study is very much relevant for the middle aged group of people to improve their health so that that it may helpful to reduce the risk of getting lifestyle related diseases.

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