EFFECT OF ANCIENT TECHNIQUES OF YOGA ON PHYSIOLOGICAL PARAMETERS OF THE PATIENTS SUFFERING FROM ASTHMA AND HYPERTENTION

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Abstract

According to World Health Organization, an estimate of about 300 million people worldwide suffers from Asthma with 250,000 annual deaths attributed to disease. Asthma is a chronic respiratory disease characterized by tightening of muscles around the lungs and episodes of reversible breathing due to the obstruction of lung's airway. Hyper tension is another chronic cardio logical disease which is affecting millions of people all around the globe. Hypertension is characterized by the high blood pressure which has no specific symptom at the early stages which will elevate the blood flow in the arteries. Though there have been many developments over the last few decades in the health care sector the effective therapy of Hypertension and Asthma is still not a reality. The most common medication of these diseases is by usage of drugs which have their limitations in terms of Longevity of the usage, side effects, reliability of the treatment. Several studies have proved that most of the diseases can be treated by using Ancient practices of Yoga, in this context we have made an attempt to analyze the effect of Yoga on the various physiological parameters of the subjects suffering from Asthma and hypertension. The study was conducted on two groups (group-A, B which is a control group)with different age group, sex and ethnicity, The physiological parameters like Heart rate, body mass index (BMI), pulse rate, respiration rate, Blood pressure and %HbO_2 of both the groups were recorded and examined for every 15 successive days over a period of 60 days. The analyzed results have shown the gradual improvement and stability in the respective physiological parameters compared with group-B subjects, have shown the instability patterns in their parameters. The ancient therapy technique helps treat and prevent asthma and hypertension through mind and body activities.

Index Terms: Asthma, Hypertension, physiological parameters, yoga and spectral analysis.

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1. INTRODUCTION

Yoga is one of the primal techniques that was followed and practiced in India since ancient times. Its existence was estimated to be around 3,000 B.C. This ancient technique is a holistic approach to attend to the body, mind and soul. This best suits for the present way of life, filled with stress and strain, of tension and nervous irritability. This ancient technique of yoga helps treat and to reduce Asthma, Hypertension and considerable diseases. A survey released in December 2008 by the US National Centre for Complementary and Alternative Medicine[1] found that yoga was the sixth most commonly used alternative therapy in the United States during 2007, with 6.1 percent of the population participating.[2]Asthma is a chronic lung respiratory disease characterized by tightening of muscle around lungs and episodes of reversible breathing due to obstruction of lung's airway. Asthma is diagnosed by symptoms of airway obstruction or hyper responsiveness, partially reversible airflow. Asthma can be diagnosed through the pulmonary function test, or through the mechanism, usage of respiratory sensors estimate the changes in the respiratory levels and comparing with the normal values acquired. Medical history, physical examination, and laboratory test results of the subject also plays a major role in the diagnosis of Asthma. According to World Health Organisation, WHO, an estimate of about 300 million people across the globe suffer from Asthma with 250,000 annual deaths attributed to disease. Hypertension, a synonym of high blood pressure has no specific symptom at early stages of its cause and blood flow in the arteries gets elevated. Such a condition arises when blood pressure rises

above 140/90 mmHg. This Arterial Hypertension has about 91–95% of cases are categorized as primary hypertension, a high blood pressure with no obvious underlying medical cause.[3] The remaining 5–10% of cases is caused by other conditions that affect the kidneys, arteries, heart or endocrine system. In such a case heart undergoes the pressure of pumping the blood with excess force throughout the body through blood vessels. Hypertension cannot be detected at earlier period of time and so called as silent killer. If not detected at an early stage, it may lead to arterial cardiac and renal damage. Today, approximately 1 billion people worldwide have high blood pressure, and this number is expected to increase to 1.56 billion people by the year 2025. That translates to about 1 out of every 4 adults being afflicted with hypertension. Hypertension is prevalent in developing as well as in developed countries. Prolonged uncontrolled or inadequate treatment of hypertension is a major risk factor for the occurrence of heart attack, stroke, kidney failure and other cardiovascular diseases. 2004 data (on the percentage of the population by region suffering from hypertension) show alarming double-digit figures. With the steadily aging population across the globe and fast-paced lifestyles leading to unhealthy diets and lack of exercise, the increasing trend for the past 5 years is expected to continue.

2. DATA ACQUISITOIN SYSTEM

We have designed and developed a data acquisition system to acquire the Physiological signals such as ECG and Respiratory signals. ECG stands for Electro Cardio Gram, gives the electrical activity of the heart, and it is recorded by using an ECG amplifier through the 12 lead systems. In our project we have developed a signal conditioning circuit for ECG with an instrumentation amplifier having gain of 1036, and the frequencies limited to 0.01-150 Hz. The ECG signal was acquired by using Ag/Agcl electrodes from the subjects in lead-II configuration. The respiratory signal gives diagnostic information regarding the respiratory system. We have used a thermister sensor whose resistance changes with temperature of the air when it is placed near the nostrils. Since the temperature of the exhaled air is more than the temperature of the inhaled air the resistance offered by the thermister sensor varies during breathing. We have developed a signal conditioning circuit for the Respiratory signal, acquired from the thermister sensor. In figure.1 the two physiological signals (ECG and Respiratory) are acquired simultaneously from the two signal conditioning boards and are given to a Renesas microcontroller. The microcontroller contains an ADC, which will convert the two analog signals in to digital. Since the maximum frequency content of the ECG signal is 150 Hz we have sampled the two signals with the 400 Hz and are fed to the PC through Max 232 port.
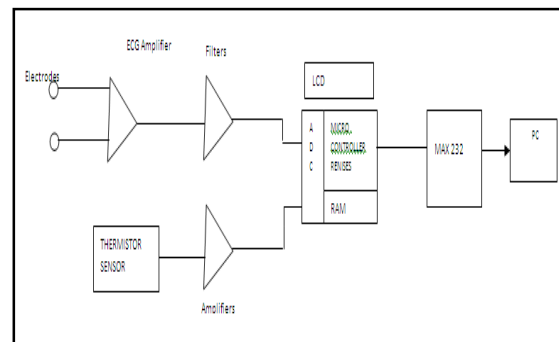

Fig-1. Block diagram of the Data acquisition system

The other parameters such as Pulse rate, %Hbo2, and BMI were recorded by using Physiopack data acquisition system. The subjects were asked to perform the ways of breathing such as normal ventilation, hyper ventilation and hypo ventilation during which the physiological signals such as ECG, Pulse, respiratory signal and Blood Pressure, were recorded. The artifacts due to the disturbances with recording are eliminated using various signal processing techniques in the MATLAB R2009b, and the heart rate, pulse rate, respiratory rate were determined by using various peak detection techniques.
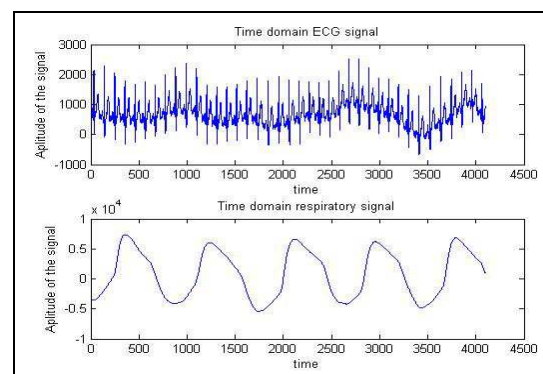

Fig-2. ECG and Respiratory waveforms

3. MATERIALS AND METHODS

The study was conducted on two groups, of people consists 25 subjects, suffering from asthma and Hypertension who have been instructed with integrated ancient methodology of yoga techniques under the regular supervision for about 45 minutes a day and the other group (control group) consists of 25 people with the same disorders but not been instructed with the practice of Yoga. To compare and analyse the results effectively we have taken the same number of subjects, suffering from same complications and are not given any yoga techniques to analyse the stability in physiological parameters and its changes.

3.1. Techniques of Yoga

The following techniques of yoga were instructed to practice by the subjects daily depending upon the diseased condition of the subjects under the supervision of a YOGA expert.

Asthma:
- Sukasana
- Savasana
- Ardha matsyendrasana
- Pavanamuktasana
- Anuloma viloma

Hypertension:
- Sukasana
- Bidalasana
- Ardha matsyendrasana
- Pavanamuktasana
- Anuloma viloma

The physiological parameters Heart rate, respiratory rate were recorded of the both groups A and B in various modes of ventilation such normal, hypo, and hyper ventilation prior to the Yoga practice by using the data acquisition system that we have developed, the other physiological parameters Body mass index (BMI), pulse rate, Spo2, and Blood pressure were recorded by using Physiopack data acquisition system. The Procedure is repeated for every 15 days over a period of 60 days and the results were analysed by using various statistical methods, the results obtained are expressed in terms of Mean ± SD.

4. RESULTS AND DISCUSSIONS

The following figures(Figure.3, 4, 5) have shown the changes in the ECG and Pulse signal during different ventilation methods such as Normal, Hyper ventilation, and Hypoventilation. It is clearly evident that the heart rate and pulse rate of the subjects increases during hyperventilation and decreases during hypoventilation, which will be helpful in prognosis of various cardiological as well as respiratory disorders.
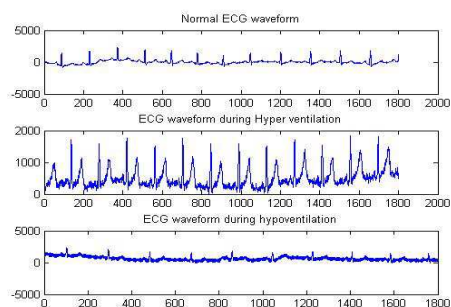

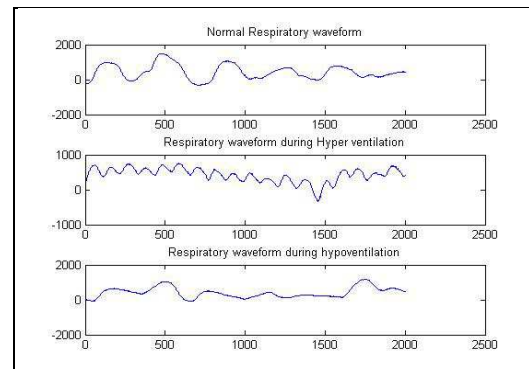**Fig-.3.** Variation of ECG waveforms for different ventilation techniques

Fig-4. Variation of Respiratory waveforms for different ventilation techniques.

The statistical analysis have proved that approximately there will be 9% of increase in heart rate and pulse rate during hyperventilation, and 4% of decline rate in the heart rate and pulse rate during hypoventilation.We have acquired and analyzed the physiological parameters of the subjects in Group-A and Group-B of asthma and hypertension respectively. The statistical analysis shown in the Table-1, which indicates that the physiological parameters of group-A subjects remains same for the period of 30 days, and have shown significant improvement in the next 30 days of the yoga practice where as the parameters of the group-B remains unchanged for 60 days. It is also evident that there is approximately 10% improvement in each of the parameters of group-A subjects, apart from this the variation of these parameters (SD) also have shown greater stability when compared to that of the group-B subjects. Time interval-related cardiovascular changes for the asthma patients show following results. Data is given as the mean±SD of all the parameters.
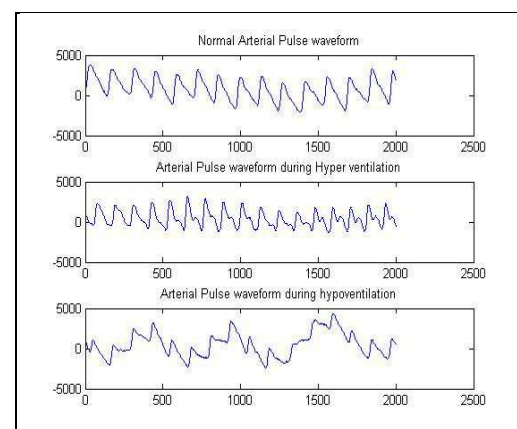

Fig-5. Variation of Pulse waveforms for different ventilation techniques

5. CONCLUSION

The practice of Yoga have shown considerable improvement in the physiological parameters because of the change in physical, mental, and behavioral patterns which will affect the autonomic changes. Psycho physiological benefits may be achieved through pranayama, increasing the patient's control over daily stress and aids in reducing the factors of autonomic stimulation. An ancient technique stabilizes autonomic balance with a tendency of parasympathetic dominance rather than stress-induced sympathetic dominance. Though the improvement in the parameters achieved through continuous practice of Yoga for 60 days have been 10%, long term practice can be immensely useful to treat these chronic disorders.

S.No	Variable	Subject	Group	Before yoga	After 15 days	After 30 days	After 60 days
1	Heart Rate(beats/min)	Asthma	A	96.10±11.2	95.10±10.12	93.11±8.37	89.85±3.31
			B	95.35±12.2	95.01±11.2	96.12±10.93	95.22±10.93
		Hypertension	A	103±6.10	102.1±6.20	100.86±7.22	94.12±3.89
			B	105.5±5.47	105.1±5.17	104.63±3.33	103.11±6.33
2	Pulse Rate	Asthma	A	95.06±9.01	94.03±8.78	92.88±6.08	88.12±4.55
			B	95.87±8.65	94.41±7.12	94.16±8.72	95.01±6.52
		Hypertension	A	102±9.03	101.9±8.79	98.29±6.79	92.01±4.07
			B	101±10.01	102.12±9.13	103.32±8.33	102.87±8.10
3	SBP(mmHg)/ DBP(mmHg)	Asthma	A	133±9.22 /84±6.7	132.1±9.01 /82.02±5.8	130.01±8.91 /81.21±4.18	126.91±7.01 /80.31±3.21
			B	133±10.92 /82±5.78	132.5±9.92 /81.5±4.78	132.15±7.22 /83.40±5.08	131.22±5.28 /83.23±4.88
		Hypertension	A	148±8.17 /104±3.72	146±7.41 /102.9±2.64	141.66±7.02 /99.3±4.14	134.86±5.31 /93.11±2.04
			B	145±6.12 /102±5.19	144±5.09 /102.08±4.29	145±4.11 /101.18±5.21	144±3.89 /100.42±4.75
4	BMI(Kg/m²)	Asthma	A	28.61±1.09	27.43±2.01	26.59±3.19	25.14±1.03
			B	27.47±2.16	27.59±3.16	27.14±2.71	27.19±2.88
		Hypertension	A	29.07±1.20	28.53±1.81	28.09±2.15	26.10±1.22
			B	28.12±2.15	27.09±1.45	28.11±2.77	28.29±1.41
5	Respiratory rate	Asthma	A	28.71±2.09	27.89±1.40	25.19±2.10	24.75±1.43
			B	28.10±3.45	27.13±2.44	27.24±2.23	27.89±2.45
		Hypertension	A	22.13±3.5	22.01±2.59	21.30±2.16	20.42±1.77
			B	23.14±2.56	22.18±1.98	22.31±1.37	23.81±1.98
6	SpO₂	Asthma	A	91.46±2.23	91.81±2.83	92.09±2.25	93.88±2.16
			B	92.16±2.45	92.22±2.10	92.26±2.06	92.29±2.18
		Hypertension	A	94.03±1.45	94.30±1.86	94.58±1.22	94.78±1.02
			B	94.19±1.39	94.08±2.46	94.02±1.77	94.01±1.89

Tab1: Statistical Analysis of Physiological parameters
SD-Standard deviation, SBP-systolic blood pressure, DBP-Diastolic blood pressure, A- Group- A, B-Group B.

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BIOGRAPHIES

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