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To Find the Effect of Segmental Breathing on Controlling the Vital after 6-Minute Walk Test Amongst the Post COVID Individual

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ABSTRACT: Your body needs more oxygen and creates more carbon dioxide while you exercise because your muscles are working harder. Your breathing must rise from 15 times per minute while at rest to 40 to 60 times per minute while exercising in order to meet this additional requirement. Additionally, your circulation quickens to ensure that the muscles have enough oxygen to continue working. Any type of effort results in some change in vital signs. Every person experiences some degree of variation in their vital signs following exertion, and this is seen as normal. However, if there is an irregularity or increased stress on the cardiovascular or respiratory systems, even after modest or moderate exercise, it is necessary to seek medical assistance. Anytime the vital signs change while under any kind of strain, they need to be stabilized in order to prevent any negative effects. Because it has been demonstrated that these breathing exercises are highly helpful. There are several types of breathing exercises such as deep breathing, diaphragmatic breathing, pursed lip breathing, etc. The objective of this study is to assess the effect of segmental breathing exercises on vitals after exertion. In the present study we took 100 subjects randomly from physiotherapy opd of saaii college of medical science and technology, chaubepur, kanpur. Method of data collection is random with study duration of 6 weeks. The paired samples t-test shows significant changes observed i.e., null hypothesis is rejected and alternate hypothesis is accepted and we observed that significant improvement along with effectiveness of segmental breathing on controlling vitals amongst post covid individuals.

KEYWORDS: Segmental breathing, 6MWT, Vitals, Blood pressure, Heart rate, Respiratory rate, SPO2, Covid.

I.INTRODUCTION

Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning. Household. Or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical fitness is a set of attributes that are either health-or skill -related. The degree to which people have these attributes can be measured with specific tests.[1]

Physical activity is commonly described by the following four dimensions; *frequency* – 'the number of events of physical activity during a specific time period', *duration* – 'time of participation in a single out of physical activity', *intensity* – 'physiological effort associated with participating in a special type of physical activity', type of activity, during exercise, two of the most important organs come into action: the heart and the lungs. The lungs bring oxygen into the body to provide energy and to remove carbon di oxide, the waste product created when you produce energy. The heart pumps oxygen to the muscles that are doing the exercise. Exercise induces stress on one's body by increasing heartrate and blood pressure, just to name a couple of resulting factors. The autonomic nervous system (ANS) influences the cardiovascular system through the sympathetic nervous system (SNS) and parasympathetic nervous system (PNS).

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Heart rate recovery (HRR) has been used to determine the health of the cardiovascular system post-exercise. An abnormal HRR has been shown to predict, or is strongly associated with, coronary artery disease, pre-hypertension, hypertension, and all-cause mortality. The respiratory rate or the number of breaths per minute is defined as the one breath to each movement of air in and out of the lungs. The normal breathing rate is about 12 to 20 beats per minute in an average adult. In the paediatric age group, it is defined by the age group.[2]

BP is proportional to blood flow and resistance. During exercise BP increase in a stepwise progression along with an increase in exercise intensity in order to meet oxygen demand to the active muscles through increase in cardiac output. When you exercise and your muscles work harder, your body uses more oxygen and produces more carbon dioxide. To cope with this extra demand, your breathing must increase from about 15 times a minute (12litres of air) when you are resting, up to about 40-60 times a minute (100litres of air) during exercise. Your circulation also speeds up to take the oxygen to the muscles so that they can keep moving.[3]

Six-minute walk test is one such activity that places some amount of stress on the cardiorespiratory system. It can also be used to test the exertion level. The six-minute walk test is an objective method, to measure the ability to perform daily living activities. It is more often performed, to evaluate the functional status, monitor therapy, or assess the prognosis in patients with cardiac and pulmonary diseases. In comparison to traditional pulmonary exercise test, 6MWT needs less technical support or equipment, making it a simple and in expensive method to measure functional capacity. The validity and the reliability of 6MWT was studied in different conditions, including obstructive lung diseases, interstitial lung diseases, pulmonary hypertension, heart failure and peripheral arterial diseases.[4,5,6,7,8,9,10,11,12,13]

The safety of 6MWT was explored in several populations. A study of 6MWT in elderly individuals and in patients with ischemic heart disease found the test to be safe, reliable and correlates with several other parameters. [14,15,16] Glossopharyngeal breathing is a form of positive pressure breathing technique that can be used to assist failing respiratory muscles. As an analogy to positive pressure breathing used by amphibians, it is called frog breathing. [17]

Segmental breathing may be defined as localized respiration consciously directed to one segment of the chest while the other segments remain relaxed. The term 'segmental' is not to be confused in meaning with anatomical segments of the lobes or of the lungs. The lungs are the essential organs of respiration. They are two in number and are divided into five lobes, two on the left and three on the right which are further divided into segments. It is not these anatomical segments with which we are concerned, but rather with four segmental areas of the chest. The purpose of this paper is to present a method of teaching patient show to breathe in specific areas of the chest, primarily in each of the five lobes of the lung. The enlargement of the chest in one segment at a time creates a greater are an into which the remaining lobe or portion of a lobe can expand from the nature of this action is derived the term, "segmental breathing." Utilization of segmental breathing exercises accomplishes many objectives, the most important of which is to promote the expansion or re-expansion of an anatomical segment, lobe or lung in order that a pleural space, which may be a potential danger space or pocket for the accumulation of fluid, may be obliterated. Other objectives of breathing exercises include; Improved aeration and expansibility, thus reducing the possibility of atelectasis, Stimulation of the cough reflex mechanism, thus preventing excessive accumulation of secretions in the bronchial tree, Development of normal motion within an operated area with a concomitant decrease of paradoxical breathing (deflation of a lung or portion of a lung during the phase of inspiration and the inflation of the lung during the phase of expiration), Prevention of panic response in the patient through development of a sense of confidence derived from a feeling of controlled breathing.[18]

Positive end-expiratory pressure (PEEP) is the positive pressure that will remain in the airways at the end of the respiratory cycle (end of exhalation) that is greater than the atmospheric pressure in mechanically ventilated patients.[19] An analogous term used for non-invasive ventilation is end positive airway pressure (EPAP) for patients receiving bilevel positive airway pressure (BPAP). Continuous positive airway pressure therapy (CPAP), although not an interchangeable term, works by delivering a constant pressure, which at the time of exhalation works in the same way as PEEP. PEEP can be a therapeutic parameter set in the ventilator (extrinsic PEEP), or a complication of mechanical ventilation with air trapping (auto-PEEP). Extrinsic PEEP can be used to increase oxygenation. By Henry's law, the solubility of a gas in a liquid is directly proportional to the pressure of that gas above the surface of the solution. This applies to mechanical or non-invasive ventilation in that increasing PEEP will increase the pressure in the system. This, in turn, increases the solubility of oxygen

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and its ability to content in the blood. Extrinsic PEEP also can be used to improve ventilation- perfusion (VQ) mismatches. The application of positive pressure inside the airways can open or "splint" airways that may otherwise be collapsed, decreasing atelectasis, improving alveolar ventilation, and, in turn, decreasing VQ mismatch.[20]

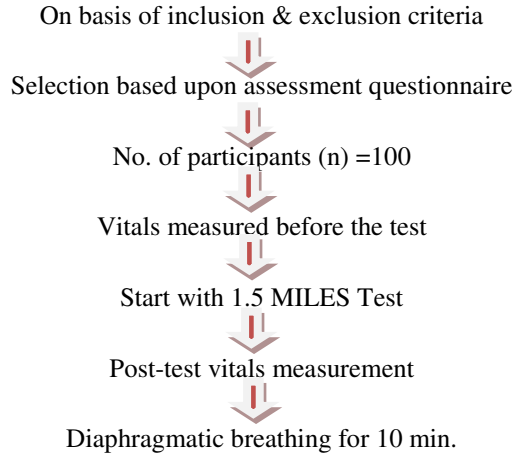
II.METHODOLOGY

This chapter deals with the methods used for the study. this includes the information on subject, inclusion criteria, exclusion criteria, protocol and procedures used in this study. source of data: physiotherapy opd of saaii college of medical science and technology, chaubepur, kanpur. method of data collection is random, sample size is 100 subjects, study duration is 6 weeks. In inclusion criteria subjects willing to participate in the study, both genders male and female can participate, normal weight, stable vitals, asymptomatic subject with no history of any cardiovascular, skeletal, neuromuscular disease and there is no use of tobacco, non-alcoholics and non-smokers in subjects. Exclusion criteria are if there is any difficulty in walking, vertigo, subject with normal BMI, any kind of neuromuscular, cardiovascular disease, asthma, pregnant females, individuals involved in regular exercise or sports.

III.PROCEDURE

Subjects were selected based upon the inclusion & exclusion criteria. They were explained in detail about the type & nature of study before participation. Consent was taken by each subject before participating in the study by signing a consent form that contained all the information necessary for them about the study. Procedure was explained in detail and all the necessary precautions were taken to avoid any inconvenience. Subject preparation was carefully done. They were asked to not to indulge in any kind of vigorous activity prior to the test or to take any heavy meal up to 1 hour by the test. All the subject was made sure to be properly hydrated, wore comfortable clothing & comfortable footwear. Before starting the test, necessary assessment was done and vitals (BP, HR, RR, SPO2) were measured. All the necessary data such as Age, Sex, Height, Weight and BMI were also documented.

The subjects were asked to perform 1.5 miles test and participants were asked to walk back & forth along this pathway at their own best pace but not to run or race. We encouraged the participants with statements like "You are doing well" or "Keep walking, you are half way done". Subjects were allowed to stop and rest during the test but instructed to resume walking as soon as they were able to do. After completion of 1.5 Miles test, dyspnea, SBP, DBP, HR, RR, SPO2 were measured. Immediately after the vitals measurement, Segmental breathing exercise was performed for 10 min. After this, again vitals were measured and the difference in vitals was measured to see breathing exercise was better to control the vitals after exertion.



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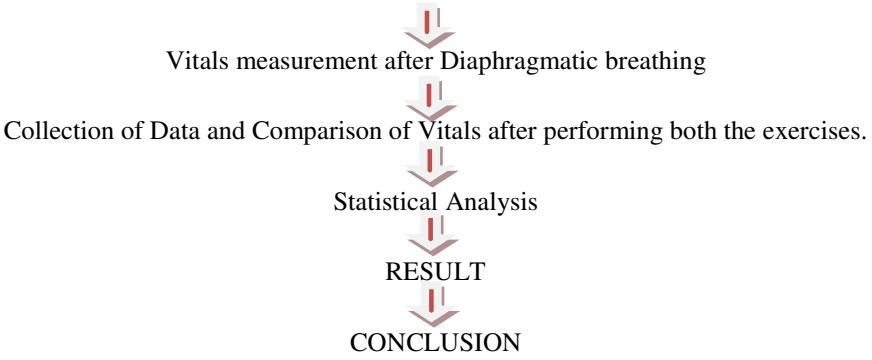

***Flowchart 1**: represent the whole protocol of present study.*

IV.ANALYSIS

Data analysis was done using IBM SPSS statistics (software package used for statistical analysis 2019 version - 26). Descriptive statistical analysis was done to determine the demographic characteristics of the subjects recruited in the study; paired sample t-test used in the analysis of this study. P – value used in the study to test hypothesis, which help in deciding whether to reject or accept the Null hypothesis. The p – value is probability of obtaining a test value that is at least extreme is the actual calculated value, if the null hypothesis is true. A commonly used value for the p – value is 0.05.

Table 1: Showing descriptive data of SEGMENTAL BREATHING

	N	Minimum	Maximum	Mean	Std. Deviation
participants age	100	19	75	37.70	16.835
participants height	100	139	173	155.87	9.045
participants weight	100	49	89	62.93	9.209
participants body mass index	100	22	33	26.36	2.782

The descriptive data of Segmental Breathing shows average age for participants was 37.70 years and the average weight was 62.93 Kg. The participants had an average height of 155.87 cm and correspondingly the average BMI was calculated to be 26.36. This reflects that average participant were in the over-weight category.

Table 2: Showing statistical data of SEGMENTAL BREATHING

	Mean	Std. Deviation	t - value	df	p - value
SBP	14.620	19.932	7.335	99	.000
DBP	12.310	7.215	17.062	99	.000
HR	40.400	10.230	39.493	99	.000
RR	11.560	5.505	20.998	99	.000
SPO2	3.190	3.512	9.082	99	.000

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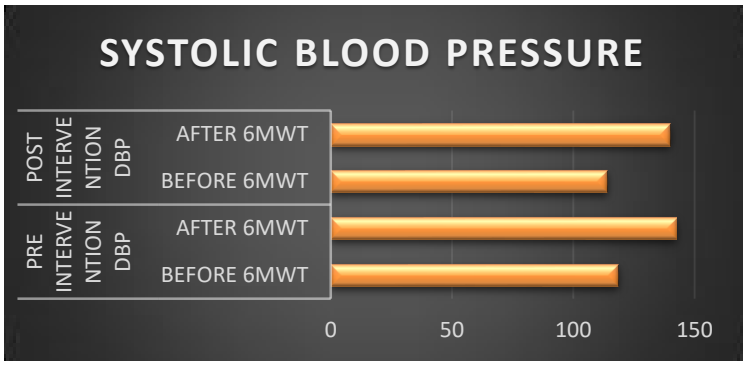
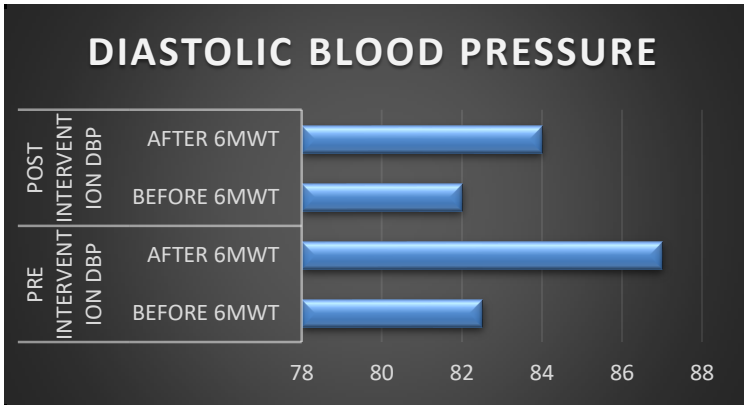
The table 2 shows the statistical data of Segmental breathing, while analysing the group Segmental breathing data it has been found that Segmental breathing was significant in improving the vitals sign. There is improvement in systolic blood pressure with Mean (+SD) of 14.620 (+19.932) and t – value was 7.335 with p – value of .000, diastolic blood pressure with Mean (+SD) of 12.310 (+7.215) and t – value was 17.062 with p – value of .000, heart rate with Mean (+SD) of 40.400 (+10.230) and t – value was 39.493 with p – value of .000, There is improvement in respiratory rate with Mean (+SD) of 11.560 (+5.505) and t – value was 20.998 with p – value of .000, There is improvement in SPO2 with Mean (+SD) of 3.190 (+3.512) and t – value was 9.082 with p – value of .000. so, the table two shows Segmental breathing was significant at the 95% confidence level.

V.RESULT

The 95% confidence level of paired samples t - test shows significant improvement i.e., null hypothesis is rejected and alternate hypothesis is accepted and we statistically observed improvement along with effectiveness of Segmental breathing on vitals in over weight individuals.



Graph – 1: shows the systolic blood pressure distribution of all the study subjects of Segmental breathing group. A finding shows that SBP with Means (+SD) of 14.620 (19.932) and t – value was 7.335 with p – value of .000 for Segmental Breathing, which was statistically significant.



Graph – 2: shows the Diastolic blood pressure distribution of all the study subjects of Segmental breathing group. A finding shows that DBP with Means (+SD) of 12.310 (7.215) and t – value was 17.062 with p – value of .000 for Segmental Breathing, which was statistically significant.

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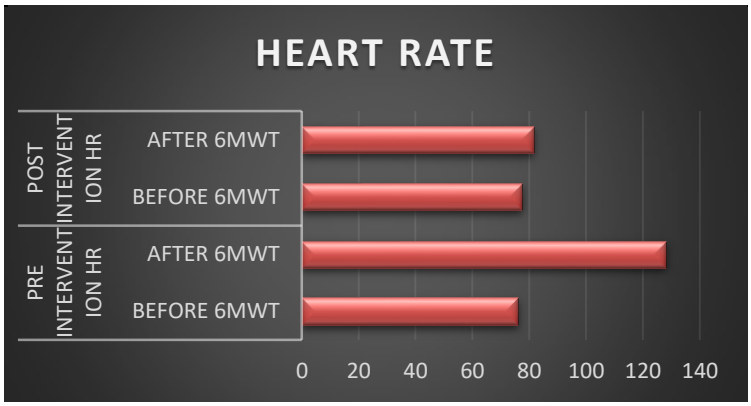
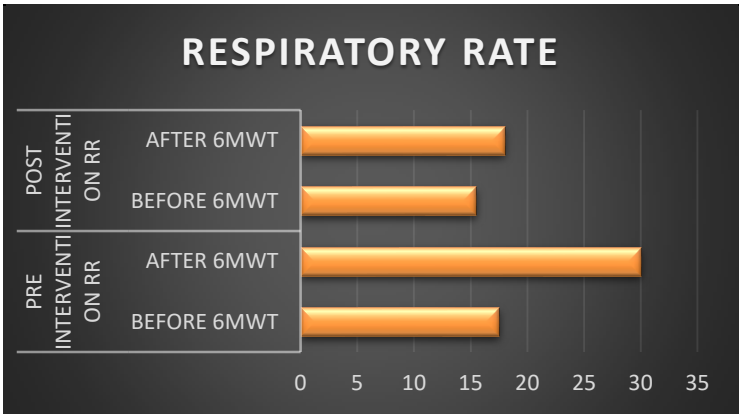


Graph – 3: shows the Heart Rate distribution of all the study subjects of Segmental breathing group. A finding shows that HR with Means (+SD) of 40.400 (10.230) and t – value was 39.493 with p – value of .000 for Segmental Breathing, which was statistically significant.



Graph – 4: shows the Respiratory Rate distribution of all the study subjects of Segmental breathing group. A finding shows that HR with Means (+SD) of 11.560 (5.505) and t – value was 20.998 with p – value of .000 for Segmental Breathing, which was statistically significant.

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Graph – 5: shows the Respiratory Rate distribution of all the study subjects of Segmental breathing group. A finding shows that HR with Means (+SD) of 3.190 (3.512) and t – value was 9.082 with p – value of .000. for Segmental Breathing, which was statistically significant.

VI.CONCLUSION

Hence, we concluded that, based on the results of this study and previous research, null hypothesis is rejected and alternate hypothesis is accepted. As per the result, it has been concluded that Segmental Breathing can used to control the vitals in over-weight patients.

VII.DISCUSSION

The present study was done to determine the efficacy of Diaphragmatic breathing on vitals. The study was done on over-weighted individuals. The pre and post effect of Diaphragmatic breathing is taken with the help of stethoscope, sphygmomanometer and pulse-oximeter. There is total 100 subjects were recruited according to inclusion and exclusion criteria. Those who satisfied the criteria were allowed to perform the study. All total 100 subjects were successfully completed the study. All the subjects were taken from Hallet hospital, Kanpur.

The data collected from the study represents that null hypothesis is rejected and alternate hypothesis is accepted, which means treatment protocol i.e., Diaphragmatic breathing were effective in lowering the vitals in over-weight subjects.

2010, A. Sarkar et al concluded from this study that segmental breathing exercises play an important role in early re-expansion of lungs and hence should be an integral part in early rehabilitation.[21]

2023, NR Samosir et al in their study concluded that Regular and long-term participation exercises especially focusing on segmental breathing and thoracic expansion can help to improve pulmonary ventilation function in individuals who have recovered from COVID - 19. Exercise can help to increase lung capacity, improve breathing mechanics, reduce muscle tension, and promote bronchodilation. It can also help to boost overall physical and mental health, which can have a positive impact on respiratory function.[22]

2022, W Sumbul et al in their study concluded that after analyzing the result, it can be concluded that segmental breathing is effective on vitals. There has been significant improvement in after segmental breathing post 2nd 6MWT and also there is significant decrease in rate of perceive exertion by Borg scale.[23]

The current study is very unique, so we can do a lot in future. This study was conducted for a short period of time and with small sample size; future research involving long time period and larger sample size and comparing of two different intervention is also possible. The result of this study will help the physiotherapist to choose whether which intervention is best for lowering the vitals in overweight subjects.

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