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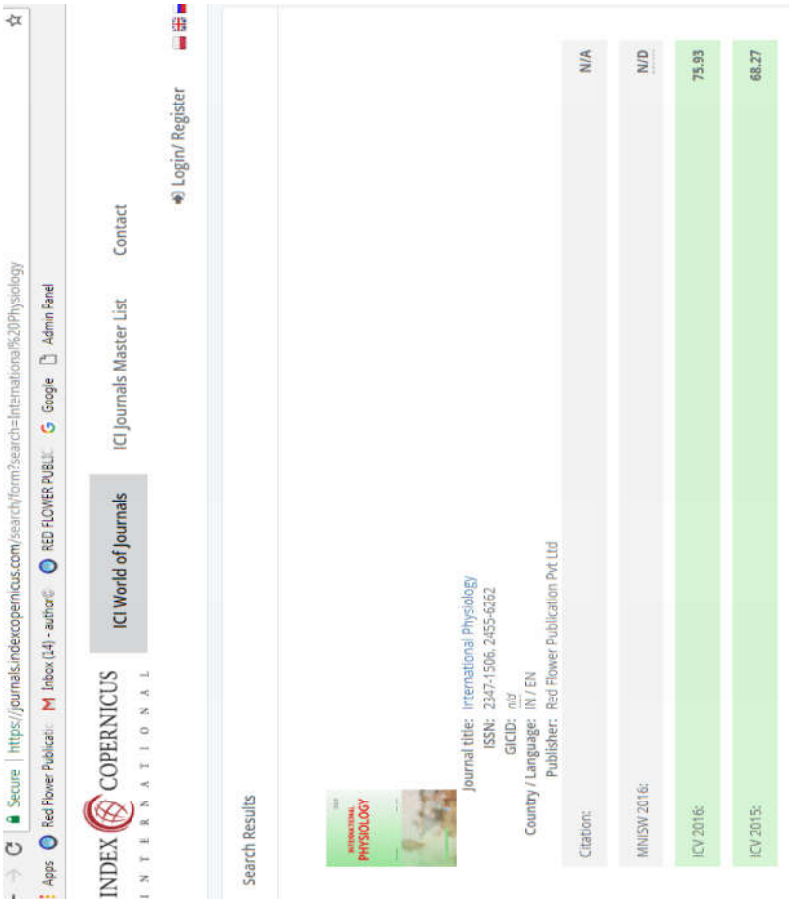

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Original Research Paper

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Effect of BMI on Visual Reaction Time in School Bus Drivers

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Abstract

The present study was carried out in the Department of Physiology, MGM Medical College, Indore. *Type of study*: cross-sectional study. *Sample size:* 100 School bus drivers. *Age group*: 20 to 50years, males. To find out the correlation between BMI and visual reaction time in school bus drivers. There s positive correlation between BMI and visual reaction time i.e. as BMI increases reaction time becomes longer (statistically not significant p>0.05). *Study Design:* Observational Study.

Keywords: BMI; Visual Reaction.

Introduction

The study of audio-visual reaction time spans more than a century and provided an indicator of the processing capabilities of the central nervous system and also a simple means of determining sensory- motor co-ordination. Reaction time is defined as an interval of time between the application of stimulus and the initiation of appropriate voluntary response under the condition that the subject has been instructed to respond as rapidly as possible [1].

Thus it indicates the time taken by an individual to react to external stimulus. It provides an indirect index of the integrity and processing ability of the central nervous system [1] and a simple, non-invasive means of determining sensory-motor co-ordination and performance of an individual [2].

Importance of audiovisual reaction time in drivers is that driver applying brakes in a fraction of second, quick maneuvering is must and it's life saving It determines the alertness of a person because how quickly a person responds to a stimulus depends on his reaction time and therefore it should be lesser in certain occupation e.g. drivers, sportsmen, pilots, military people doctors, nursing staff, security guards etc. Various factors influencing human reaction time are age, sex, BMI, left or right handedness, central versus peripheral vision, practice, fatigue, personality types, exercise and intelligence of the subject [6].

The present study was carried out keeping in view that the reaction time is an utmost important test for the drivers, especially school bus drivers who have great responsibility towards many children as road traffic accidents can be reduced by simply measuring the audio visual reaction time in drivers and taking measures accordingly.

Studies regarding relation of BMI and visual reaction time in school bus drivers are meager and that's why we have chosen this topic.

Objective

To find out the correlation between BMI and visual reaction time in school bus drivers.

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Materials and Methods

Site of Study:

The present study was carried out in the Department of Physiology, MGM Medical College, Indore.

Type of Study:

Cross-sectional study.

Sample size:

100 School bus drivers.

Age group:

20 to 50years, males.

Study was performed after taking permission from the ethics and scientific review committee MGM Medical College & M.Y. Hospital, Indore and permission letter from the Head of Department of Physiology MGM Medical College, Indore and from respective school authorities.

We had selected 100 school bus drivers of age group 20-50 years.

An informed written consent had been taken from these subjects after explaining the study procedure and a self-made questionnaire had been administered to every participant regarding their personal, present, past, family, socioeconomic and medical history in detail. Special information about the duration of bus driving, shift, duty hours, history of any addiction and history of any medicine which can affect central nervous regulation was obtained. Than after the assessment of related visual function test we had done choice reaction time test by reaction time analyzer.

Material:

The apparatus used in this study was reaction time apparatus, RTM-608 supplied by Medicaid system Chandigarh.

It is an electronic reaction time meter equipped with very sensitive quartz clock which has a resolution of .001 sec. and Accuracy of ±1digit.

It has two modes of providing stimulus- auditory stimulus(continuous sound on speaker of high, medium and low pitch) and Visual stimulus (soothing red, yellow and green lights) .

Only those participants were taken into the study that fulfilled our inclusion criteria.

Inclusion

1. School bus drivers of age group 20-50 years.
2. School bus drivers driving the vehicle for more than one year.
3. All subjects included were healthy males.
4. All subjects with no visual disturbances.
5. Individuals giving consent for test participation in the study.
6. Those who were not taking any sedative or hypnotic or anti-allergic medicine.

Exclusion:

1. Individuals of age group <20 and >50 years.
2. School bus drivers driving the vehicle for less than one year.
3. Individuals with visual disturbances.
4. Individuals taking any sedative or hypnotic or anti-allergic medicine.
5. Individuals not giving consent for test participation in the study.

These subjects were assessed for various physiological parameters mentioned below and a standardized protocol was followed while taking the measurements:

- Height
- Weight
- Pulse
- Blood pressure
- Clinical examination (general and systemic)
- Visual acuity (near vision and far vision)
- Color vision
- Visual reaction time (for red color, yellow color and green color).

Procedure:

Each subject was made familiar with the apparatus and procedure is explained.

For Visual Reaction Time:

Three practical trials were given each time before taking the observation. Before presenting a stimulus a ready signal or warning in the form of a verbal instruction READY was given. In visual reaction time task, the subjects sat to one side and examiner sat to other side of instrument. When examiner pressed switch, visual stimuli appear on screen which is in front of the subject. The instrument automatically starts counting the time. Subject had to react to three different colors of light i.e. red, green and yellow by pressing the respective key for the color as soon as that respective color is presented on the screen which

may be red, green or yellow. When subject pressed the key as a response to visual stimuli, instrument stops counting the time. This time was directly taken as visual reaction time. Three practical trials of visual stimuli were given to each subject and the best (i.e. the lowest) was taken as the visual reaction time of that subject.

Statistical Analysis:

Data thus obtained were compiled, tabulated and analyzed statistically, by using one way ANOVA test with the help of SPSS – 20 (Software Package used for Statistical Analysis) software.

Observation and Result

The table 1 shows the comparison of visual reaction time for color in relation to BMI in the drivers.

The mean visual reaction time for red color in the normal weight group was 0.88±0.31, in the overweight group it was 0.91±0.26 and in the obese group it was 1.23±0.00. this shows that as BMI increases visual reaction time for red color also increases but the results obtained were statistically not significant ($p>0.05$).

The mean visual reaction time for green color in the normal weight group was 0.84±0.32, in the overweight group it was 0.92±0.35 and in the obese group it was 1.03±0.00. It shows the same finding as for red color but the results obtained were statistically not significant ($p>0.05$).

The mean visual reaction time for yellow color in the normal weight group was 0.90±0.28, in the overweight group it was 1.15±1.66 and in the obese group it was 1.31±0.00.it shows that with increase in BMI reaction time increases but the values were found to be statistically not significant ($p > 0.05$).

Discussion

As shown in our study that overweight individuals react slower than those individuals having normal weight. Possible explanation for this could be obesity induced vascular diseases, secretions of adipose tissue like hormones, cytokines, and growth factors affecting brain health [4]. Different neurophysiological studies have shown influence of obesity and elevated body mass index on cognitive functions, memory deficits and executive dysfunction in young as well as middle aged individuals [5,6]. Therefore, the need for a healthy lifestyle, good eating habits and regular exercise undoubtedly requires emphasis all the more. As it is clear from above study that increase in BMI increases the reaction time and slows the reflex action which is a very important aspect in driving so we can advice drivers to maintain their physical health as it might affect the lives of so many children. Our findings match with the following study of: *Nikam et al. (2012)* [7] who showed the effect of age, gender, and body mass index (BMI) on audio visual reaction time in Indian population. They found that there was significant positive correlation between BMI and visual reaction time in both males and females irrespective of age group.

Conclusion

There is positive correlation between BMI and visual reaction time i.e. as BMI increases reaction time becomes longer (statistically not significant $p>0.05$).

Table 1: Comparison of mean visual reaction time for color in drivers in relation to BMI (N=100)

Color	BMI	N	Mean ± SD	F Value	P Value
Red color	Normal Weight	59	0.88 ± 0.31	0.794	0.455, NS
	Overweight	40	0.91 ± 0.26		
	Obese	1	1.23 ± 0.00		
Green color	Normal Weight	59	0.84 ± 0.32	0.816	0.445, NS
	Overweight	40	0.92 ± 0.35		
	Obese	1	1.03 ± 0.00		
Yellow color	Normal Weight	59	0.90 ± 0.28	0.685	0.507, NS
	Overweight	40	1.15 ± 1.66		
	Obese	1	1.31 ± 0.00		

One-Way ANOVA applied. p value < 0.05 was taken as statistically significant

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Original Research Paper

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Effect of Short-Term Yoga Practices on Pulmonary Function Tests in Medical Students

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Abstract

Yoga is one of the best ancient philosophies of life for the prevention and management of various psychosomatic ailments especially in the present scenario of stress whether physical or mental. Medical students are future doctors; and they should be fit physically and mentally in order to make others physically and mentally fit. Incorporating yoga in one's own life is an important step towards that. Keeping this objective in mind, the present study was conducted on medical students to make them aware what yoga is and to encourage them to incorporate yoga in their life. *Aim:* To study the effect of short term yoga practices on pulmonary function tests FVC, FEV_1, PEFR, and MEF 25-75%. *Material and Methods:* The study was conducted on healthy medical students of M.B.B.S. 1st year (21 males and 15 females) of age group 17-21 years in the department of physiology, M.G.M. Medical College, and M.Y. Hospital, Indore. After obtaining an informed consent; and satisfying the inclusion and exclusion criteria the pulmonary function tests were performed on Ganshorn Power-Cube LF8 Beta System before subjecting the students to yoga training. The parameters taken were FEV_1 and PEFR. Then the students were trained by experts from Yoga Center. The students performed the yoga practices in the morning for one hour, six days in a week, for four weeks under expert's observation. The yoga practices consisted of Prayer, Omkar recitation, asana, Pranayama, and breathing exercises. Pulmonary function parameters were also tested after four-week yoga session. Data thus collected before and after performing yoga were compiled, tabulated and analyzed by using students' 't' test. *Result:* There was significant improvement in FEV_1 and PEFR as denoted by p value of <.05. *Conclusion:* A Marked improvement can occur in various respiratory parameters after short-term yoga practices. By extending these results, we suggest that yoga practice may be applied as an alternative therapy or as an adjunct to conventional therapy for the prevention as well as management of respiratory diseases like bronchial asthma.

Keywords: Yoga; Pulmonary Function Tests; FVC; FEV_1; PEFR; MEF; Students' 't' Test.

Introduction

For centuries, Hindu devotees have talked about the miraculous effects of Yoga. In the last century, the world has woken up to Yoga and its many benefits. Today, we talk about how yoga helps us stay young and healthy. Ever since the dawn of the 21st century, the health industry has been growing in leaps and bounds. The markets are flooded with various health products of all brands and composition. Doctors around the world have echoed that Yoga can relieve a number of potential life threatening diseases and become a life saving tool. Yoga is an ancient Indian science and way of life which includes the practice of specific postures, regulated breathing, and meditation [1]. Thus yoga is not only curative but also a preventive and promotive science of health and wellbeing [2].

Respiratory functions are the major components of physical well being. Any derangement in respiratory functions can lead to physical disability. Air pollution and sedentary life styles may be one of the important factors for the decline in the respiratory performance. Therefore, pulmonary

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function assessment has achieved a lot of importance in recent years owing to a steep rise in air pollution. Pulmonary function tests have become an accepted part of respiratory system studies and screening programmes.

Medical students of today are the physicians of tomorrow and a good physician must be fit and mentally alert. Sound health and physical fitness are positively associated with good mental health and well being. That is why this study was done on medical students to make them aware and know what yoga is and how it is helpful in improving one's own health. Buffalo health study [3] concluded that pulmonary function is the long term predictor for overall survival rates in both genders and could be used as a tool in general health assessment. Spirometry is the most commonly used lung function test. Pulmonary function tests by simple spirometry if used routinely help us to assess the pulmonary status in health as well as in disease.

Material and Methods

Subjects

The study is based on the data collected on 36 (21 males and 15 females) young healthy medical students of Mahatma Gandhi Memorial Medical College, Indore, age ranging from 17-21 years who were interested in attending the yoga programme. After obtaining the informed consent and taking care of inclusion and exclusion criteria, initially 60 subjects recruited for the study, but due to some or other reasons 24 subjects could not complete the study.

Study Design

This was a prospective study with purposive sampling. The pulmonary function tests were performed on the subjects on the first (day 1) and the last day (28th day) of the yoga programme. The data thus obtained were compiled, tabulated, and analyzed by using Student's t-test.

Yoga Schedule

The students were briefed about the programme and made comfortable oriented for initial 2 days then the programme was administered. The students performed the yoga practices in the morning for one hour, six days in a week, for four weeks under expert's observation. The yoga practices consisted of Prayer, Omkar recitation, asana, Pranayama, and breathing exercises. The course started with prayer followed by Omkar recitation. After this the subjects performed various stretching exercises, asana, Pranayama, and meditation.

The set of asana and Pranayama included in the programme is as follows:

1. Prayer and Omkar recitation meditative postures - Padmasana/Sukhasana (Easy pose)
2. Loosening or stretching exercises–Warm ups: starting from the head working towards the toes. Neck rotation, shoulder rotation, arm rotation, elbow movements, wrist movements, finger movements, waist movements, knee rotation, ankle rotation, and toe movements.
3. Quick relaxation in Shavasana (Corpse Pose)
4. Asanas

Standing Yogic Postures

Tadasan

Tiryak Tadasan

Trikonasana

Pawanmuktasana

Katichakrasana

Padhastasana

Sitting Yogic Postures

Shshankasana

Padangusthan

Bhunamanasana

Janushirasana

Paschimuttanasana Utthit Padmasana

Surya Namaskar

5. Deep relaxation in Shavasana (Corpse Pose)
6. Pranayama (Breathing Exercises)
   - Kapalbhati (forceful exhalation)
   - Nadi shuddhi (alternate nostril breathing)
   - Bhramari (Honeybee sound during expiration)
7. Omkar recitation in Padmasana/Sukhasana (Easy Pose)

Measurement of Pulmonary function tests: After performing initial general examination with respiration rate, pulse rate, and blood pressure measurement; the pulmonary function tests were evaluated with the help of Ganshorn Power-Cube

LF8 Beta system. It was done in calm and comfortable environment in Pulmonary Function Test Laboratory in the Maharaja Yashwantrao Hospital, Indore. Spirometry is a physiological test that measures how an individual inhales or exhales volumes of air as a function of time. It includes measurement of tidal volume, inspiratory reserve volume, expiratory reserve volume, inspiratory capacity, and vital capacity. The three spirometric indices in the dynamic test are Forced Vital Capacity (FVC), Forced Expiratory Volume in first second (FEV_1) and the ratio of FEV_1/FVC. Test quality depends on achieving a maximal inhalation, nearly maximal effort during the initial few seconds of exhalation and a reasonable duration of exhalation. A plateau in the volume-time tracing of a minimum expiratory time of 6 seconds indicates a reasonable duration of exhalation. FVC and FEV1 were measured from a series of at least 3 forced expiratory curves that had an acceptable start of test and were free from artefacts; and were reproducible. The largest FVC and the largest FEV1 were taken after examining the data from all the usable curves, even if they do not come from the same curve.

Measures taken prior to the test procedure

- The study subjects undergoing the tests were well informed about the instrument and the technique of the test by demonstration of the procedure
- Anthropometric measurements like height and weight of each subject were measured before the test procedure.
- Due care was taken while measuring the height and weight of the subject following the protocol for their measurement.
- It was ensured that the subject is not wearing items of apparel that are tight or restrictive like: neck tie, tight shirt collar, tight belt etc.

Test Procedure

1. Pulmonary Functions of the subjects were evaluated on Computerized Ganshorn Power Cube LF8 Beta System.
2. Clean and new disposable mouth piece with filter was used for each subject.
3. Test was performed in sitting position.
4. Clear and simple instructions about the technique of the maneuver were given to the subject followed by demonstration.
5. Nose was closed with the nose clip during the maneuvers.
6. The subject was asked to perform the maneuver to his/her best ability.
7. The test was repeated three times to get reproducibility according to American Thoracic Society (ATS) criteria [4,5,6].
8. Coaching and motivation during the test helped the subject to give his/her best performance.

Precautions taken during the test procedure

- The subjects were instructed to assure the correct sitting posture with head slightly elevated and back straight.
- The nose clip was kept in position throughout the manoeuvre.
- Mouth piece was kept in the mouth with tight and close approximation of lips around the mouth piece to ensure airtight seal.
- The Subjects were instructed to exhale rapidly, forcibly, and completely like a 'blast' until no more air can be expelled while maintaining the upright position.
- Instructions were repeated as and when necessary.
- Manoeuvre was repeated three times on each subject with a pause of 5 minutes between each manoeuvre.

Statistical Analysis

The observations thus obtained were tabulated and analyzed using Student's t-test. The values data obtained before (first day) and after Yoga (last day) were compared by Student's t-test. Differences were considered significant with $p<0.05$.

Result

The values of various pulmonary function parameters before and after yoga course are given in table 1 and figure 1. At the end of the course, pulmonary function parameters showed variable response. Some showed an increase, some showed reduction, and some showed no change. The changes were also found gnederwise. The changes were statistically significant in some while not significant in others.

Tidal volume, inspiratory capacity, and slow vital capacity, FEV_1 and PEFR did show an increase

Table 1: Pulmonary Function Tests

S. No.	Pulmonary function test variables (liters)	Mean ± SD Before Yoga	Mean ± SD After Yoga	P Value	Significant (S) / Non Significant (NS)
1	Respiratory Rate/minute	16.86±2.153	14.472±1.275	0.000	S
2	Tidal Volume (TV)	0.438±0.165	0.525±0.193	0.010	S
3	Inspiratory Capacity (IC)	2.016±0.491	2.084±0.587	0.158	NS
4	Forced Vital Capacity (FVC)	3.353±0.755	3.378±0.745	0.363	NS
5	Forced Expiratory Volume in 1st second (L) (FEV_1)	3.052±0.642	3.102±0.650	0.036	S
6	FEV_1 /FVC %	91.47±5.223	92.22±5.281	0.152	NS
7	Slow Vital Capacity (SVC)	3.372±0.755	3.389±0.750	0.551	NS
8	MEF 25-75%	4.023=1.002	4.081±0.952	0.37	NS
9	Peak Expiratory Flow Rate (PEFR)	7.013±1.461	7.426±1.475	0.012	S

Mean with Standard Deviation and P value

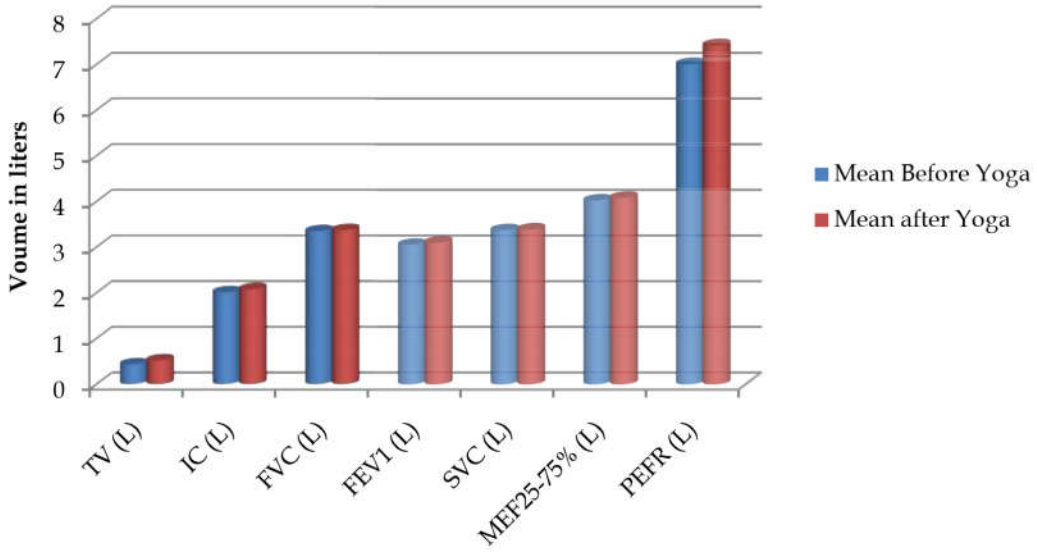

Fig. 1: Mean values of Pulmonary Function Tests before and after Yoga

while inspiratory reserve volume, expiratory reserves volume; Forced vital capacity did not show any significant change.

Discussion

The present study shows that measureable improvement in the various spirometric parameters occurs with 4-week yoga course which includes various asana and pranayama, and relaxation techniques (Shavasana and Meditation) [7]. At the end of the course tidal volume, inspiratory capacity, slow vital capacity, FEV_1 and PEFR showed remarkable improvement. A trend towards an increase in inspiratory capacity and slow vital capacity indicates that there could be a change in the compliance of the lung. An increase in expiratory parameters like FEV_1 and PEFR indicates a decrease in airway resistance [8]. The increase in Tidal Volume, FEV_1 and PEFR is statistically significant as indicated by $p < 0.05$. The other parameters also revealed an increase but not statistically significant as shown by $p > 0.05$. A significant improvement was also observed in general well being suggesting that the participants felt more interested in lives and perceived it as functioning smoothly and joyfully. Prior studies have also reported the beneficial effects of Yoga on pulmonary function parameters [9,10]. One of the previous studies also reported a significant improvement in various pulmonary function parameters after yoga with no such increase occurred after training in physiotherapy. In another previous study the beneficial effects of yoga were observed in college students [11]. The improvement in pulmonary function parameters was also observed after short-term yoga programme [12,13]. The effects of yoga on vital capacity was compared with the effect of exercise and revealed an improvement with yoga and not with exercise [14]. Yoga is also helpful in reducing

clinical symptoms, reduce the need for medication and increase the PEFR, FEV_1 and FVC in asthma patients [15-19].

Various respiratory patterns and maneuvers can provide striking influences on the autonomic nervous system and may exacerbate or reduce adverse responses to stressors [20,21]. For example, increased breathing rate is a typical response to stressful situations. Yoga is helpful in relieving stress by way of reducing breathing rate which decreases sympathetic activity and improves parasympathetic activity [22]. The increase in various lung function parameters indicate that a long term practice might improve it further, as has already been documented in literature.

In conclusion, Yogic practices even for short-term (four weeks) duration seem to be beneficial for the lung functions in health as well as diseased conditions. Further studies are needed to confirm the possible mechanism (s) responsible for such an effect.

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Original Research Paper

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A Comparative Study of Mean Visual Reaction time for Red Color in School Bus Drivers with Normal Population (Controls)

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Abstract

Background: Reaction time is the speed with which an individual can respond to a stimulus. Reaction time is very important aspect in occupation like driving, in which quicker level of response is one of the measure by which number of road traffic accidents can be reduced. Reaction time may be visual reaction time or auditory reaction time. *Objective:* To compare mean visual reaction time for red color in school bus drivers with normal population. *Study Design:* Cross-Sectional. *Materials and Methods:* The present was conducted on 100 healthy school bus drivers (study group) and 100 healthy normal people (control group) of age group 20-50 years as per inclusion criteria. After taking informed consent a self- made questionnaire was administered and a thorough clinical examination – general and systemic - was done along with routine visual function tests (visual acuity and color vision) of all the participants of both the groups. Participants from both the groups with normal visual function tests were assessed for visual reaction time test for red color with the help of audio-visual reaction time apparatus. Each participant was subjected to three test stimuli and reaction time was noted each time & the best result (out of the three) was taken for analysis. *Results:* Data thus obtained were compiled, tabulated and analyzed statistically by student t-test. *Conclusion:* The visual reaction time for red color was shorter in drivers as compared to controls which is statistically significant ($p<0.05$).

Keywords: Visual Acuity; Audio-Visual Reaction Time Apparatus; Visual Reaction Time; Student-t Test.

Introduction

Reaction time is defined as an interval of time between the application of stimulus and the initiation of appropriate voluntary response under the condition that the subject has been instructed to respond as rapidly as possible [1].

Thus it indicates the time taken by an individual to react to external stimulus [2]. In everyday life one has to respond almost instantaneously to many diverse situations. Many simple situations of reaction time are usually at our home itself e.g. response to a door bell, telephone ring or whistle of pressure cooker. One measure of information processing is reaction time and is used to judge the ability of a person to concentrate and coordinate.

Material & Method

The present study was carried out in the Department of Physiology, Mahatma Gandhi Memorial Medical College, Indore (M.P.). It is a type of cross-sectional study. Study was performed after taking permission from the Ethics and Scientific Review Committee M.G.M. Medical College M.Y. Hospital, Indore and permission letter from the Head of Department of Physiology, MGM Medical College, Indore and from respective school authorities.

The period of study was from March 2015 to February 2016.

Inclusion and Exclusion Criteria

Inclusion

1. School bus drivers of age group 20-50 years

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(cases) and non-bus drivers (controls) of same age group.

2. School bus drivers driving the vehicle for more than one year.
3. All subjects included were healthy males.
4. All subjects with no auditory or visual disturbances.
5. Individuals giving consent for test participation in the study.
6. Those who are not taking any sedative or hypnotic or anti-allergic medicine.
7. Individuals with history of addiction (only smoking or tobacco chewing).

Exclusion

1. Individuals of age group <20 and >50 years.
2. School bus drivers driving the vehicle for less than one year.
3. Individuals with auditory or visual disturbances.
4. Individuals taking any sedative or hypnotic or anti-allergic medicine.
5. Individuals not giving consent for test participation in the study.

These subjects were assessed for various physiological parameters mentioned below and a standardized protocol was followed while taking the measurements:

- Height
- Weight
- Pulse
- Blood pressure
- Clinical examination(general and systemic)
- Visual acuity (near vision and far vision)
- Color vision
- Hearing tests (Rinnie's and Weber's)
- Auditory reaction time (for high pitch, medium pitch and low pitch)
- Visual reaction time (for red color, yellow color and green color).

Reaction Time Test

Each subject will be made familiar with the apparatus and procedure is explained before doing the test. In our study we had used choice reaction time test.

Apparatus

The -608 audiovisual reaction timer was used in this study. Display has 3 different types of light and sound on either side. Three visual stimuli red, green and yellow color light and three auditory stimuli low, moderate and high pitch sound system with independent operation are provided. The operating channel on the "experimenter's side" consisted of red, green and yellow lights. Digital time display in middle, below which a press button "reset to zero" button and low moderate and high pitch sound buttons are provided. The subject's side has the same buttons as in experimenter's side i.e. three buttons for red, green and yellow lights and three buttons for low pitch, medium pitch and high pitch sound. buttons. A power on and off button is present on the side of the instrument. A ready signal in the form of red light is present on the subject's side.

For Visual Reaction Time

Three practical trials were given each time before taking the observation. Before presenting a stimulus a ready signal or warning in the form of a verbal instruction READY was given. In visual reaction time task, the subjects sat to one side and examiner sat to other side of instrument. When examiner press switch, visual stimuli appear on screen which is in front of the subjects. The instrument automatically starts counting the time. Subject had to react to three different colors of light i.e. red, green and yellow by pressing the respective key for the color as soon as that respective color is presented on the screen which may be red, green or yellow. When subject pressed the key as a response to visual stimuli, instrument stops counting the time. This time was directly taken as visual reaction time. Three practical trials of visual stimuli were given to each subject and the best (i.e. the lowest) was taken as the visual reaction time of that subject.

Statistical Analysis

Data thus obtained were compiled, tabulated and analyzed, by unpaired 't' test, Z test, One way ANOVA test with the help of SPSS—20 (Software Package used for Statistical Analysis) software for statistical analysis.

Observation & Results

The Table 1 shows the comparison of visual reaction time between the two groups – non-drivers and drivers for three colors – red, green and yellow.

The visual reaction time for red color in non-drivers group was 0.98±0.25 and in drivers group it was 0.89 ± 0.29. The visual reaction time to red color in

drivers was significantly lower in comparison to the non-drivers group ($p<0.05$).

Table 1: Comparison of mean visual reaction time to three colors – Red, Green and Yellow between the two groups (N=200)

Visual Reaction Time	Non-Drivers (n=100) [Mean±SD]	Drivers (n=100) [Mean±SD]	't' Value	P Value
Red color	0.98 ± 0.25	0.89 ± 0.29	-2.271, df=198	0.024*
Green color	0.94 ± 0.29	0.87 ± 0.33	-1.591, df=198	0.113, NS
Yellow color	0.97 ± 0.34	1.00 ± 1.07	0.317, df=198	0.752, NS

Unpaired 't' test applied. p value < 0.05 was taken as statistically significant

The visual reaction time for green color in non-drivers group was 0.94±0.29 and in drivers group it was 0.87±0.33. There was no statistically significant difference in the visual reaction time for green color between the two groups ($p > 0.05$).

The visual reaction time for yellow color in non-drivers group was 0.97±0.34 and in drivers group it was 1.00±1.07. There was no statistically significant difference in the visual reaction time for yellow color between the two groups ($p > 0.05$).

Discussion

The advantage of measuring visual reaction time in bus drivers is that we can reduce number of road traffic accidents by the assessment of audio-visual reaction time.

Table and Figure 1 shows the comparison of mean visual reaction time of red, green and yellow color between the two groups. The visual reaction time for red color in non-drivers group was 0.98±0.25 and in drivers group it was 0.89±0.29. The visual reaction time to red color in drivers was significantly shorter in comparison to the non-drivers group ($p<0.05$).

The visual reaction time for green color in non-drivers group was 0.94±0.29 and in drivers group it was 0.87±0.33. There was no statistically significant difference in the visual reaction time for green color between the two groups ($p > 0.05$).

The visual reaction time for yellow color in non-drivers group was 0.97±0.34 and in drivers group it

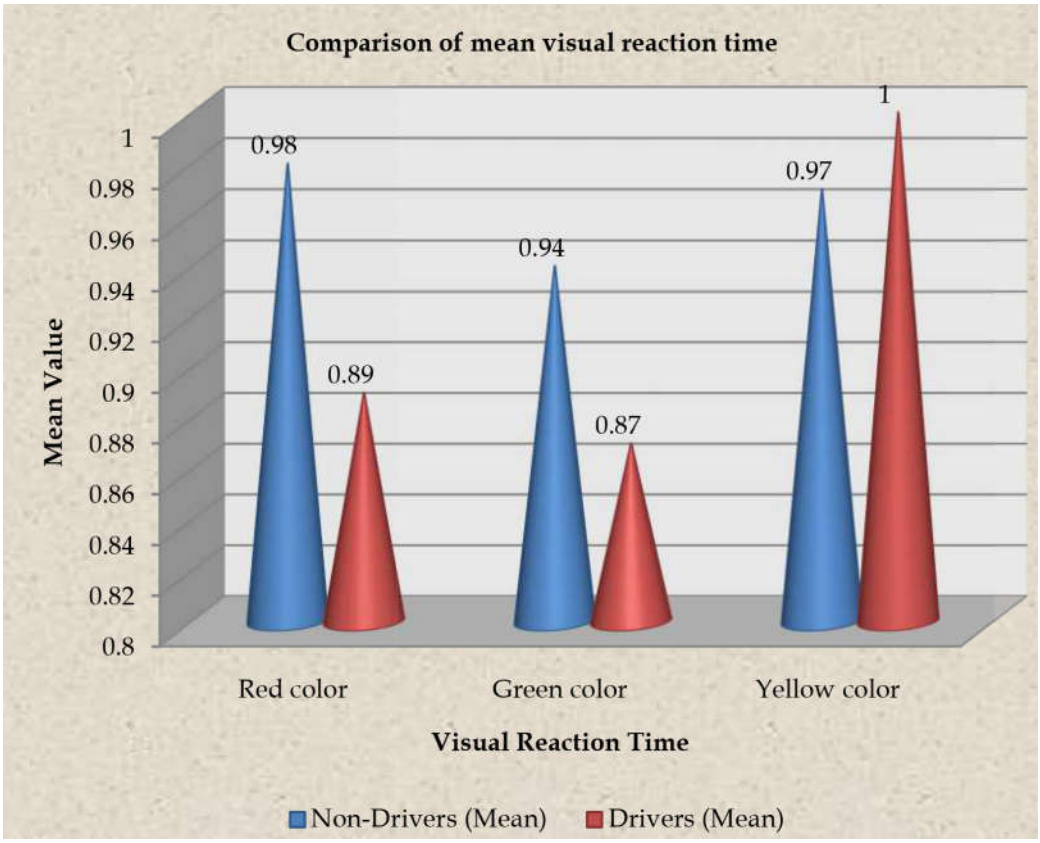

Fig. 1:

was 1.00±1.07. There was no statistically significant difference for the visual reaction time for yellow color between the two groups ($p > 0.05$). So the final result of our study for visual reaction time was that reaction time to red color was shorter in bus drivers then normal population and it is statistically significant ($p<0.05$).

For green color reaction time of school bus drivers was shorter than non-drivers but the data obtained were not statistically significant for both the colors ($p>0.05$). And for yellow color drivers having longer reaction time than the normal population but the data obtained were not significant ($p>0.05$).

Our findings for the visual reaction time for red color match with the following studies: of Shenvi & Balasubramanian, 1994. This can be explained on the basis of the Trichromatic theory of color vision. When Tomita & co-workers illuminated the retina with microelectrode penetration of a single cone, they found that 74% of units peaked in the Red spectrum, 16% in the Blue spectrum &only 10% in the Green spectrum .

Conclusion

On comparing visual reaction time of school bus drivers with normal population we have found that visual reaction time for red color of school bus drivers was shorter than normal population which was statistically significant ($p<0.05$). Also visual reaction time for green color of school bus drivers was shorter than normal population and for yellow color it was longer in drivers than normal population but the data obtained was not significant ($p>0.05$).

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Effect of Cardiac Autonomic Axis Maturation on Heart Rate Variability Indices in Pediatric Population: Gender Based Study

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Abstract

Background: The HRV is a sensitive index in establishing the underlying cardiovascular derangements within the age. The study of cardiovascular autonomic function and its maturation in the pediatric age group has gained importance as there are no much data in the literature. *Objectives:* To assess the gender based differences on HRV during the period of puberty, the age at cardiac autonomic axis maturates. *Material & Methods:* The study was done on 145 children of both the genders of urban population categorized in two groups as Group I (7-9 years, n=65) & Group II (10-12 years, n= 80). Basal 5 minutes ECG was recorded and the standard time domain indices (mean RR, SDNN, PNN50 and RMSSD) and frequency domain indices (TP, LF, HF, and LFnu, HFnu and LF/HF ratio) of HRV were calculated and analyzed. *Results:* Time domain and frequency domain indices were significantly ($p<0.01$) more in females than males in younger group I and less in females in group II. *Conclusion:* The study proposed that there are established gender differences in the autonomic axis maturation due to the onset of puberty in females (preferably adrenarche) may result in profound decrease in the HRV parameters. A similar finding was not seen in boys because of the natural delay in the onset of puberty in comparison to their female counterparts.

Keywords: Autonomic Axis; Maturation; Heart Rate Variability; Gender.

Introduction

Autonomic control on cardiac function involvement is controversial [1]. Cardiovagal autonomic function is importantly related to baroreflex gain, which is in turn influenced by other mechanical and neural factors [2]. Baroreflex sensitivity is one of the early protective mechanism which is regulated by cranial nerves IX and X. Baroreceptors are stretch-sensitive receptors embedded in the barosensory vessel wall, and their response to pressure-induced stretch is importantly determined by the compliance of the vessel wall that too when there is any change in the blood pressure [3]. As there is change in the different endocrine secretion at different age the autonomic modulation and maturation occurs. In pediatric age group the influence of hormones on their autonomic regulation is very less. As the age advances and the children reach adolescent age group, the reproductive hormones play a vital role on cardiac autonomic and blood pressure regulation. Particularly in female age group the adrenal hormones produces much change in their cardiac axis regulation at the time of their puberty [7]. Cardiovagal autonomic function declines with age during the adult years, which is partly because of gradual impairment of baroreflex function. Time domain analysis of heart rate variability uses statistical methods to quantify the variation of the standard deviation or the differences between successive RR intervals [8]. Frequency domain analysis of heart rate variability enables us to calculate the respiratory dependent high frequency and the low frequency power. High frequency power is mediated by vagal activity, while low frequency power has been

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suggested to represent predominantly sympathetic modulation [10,11]. There are no much data in the literature about the cardiac autonomic function and its maturation in the pediatric age group, because it is this age, children are exposed to various physical and mental challenges which makes them to undergo enormous anxiety and stress along with their daily activities. This lacking of normative data on autonomic function and maturation and its gender differences potentiates the purpose of research in this field particularly in south Indian population.

Materials and Methods

The present study was conducted on 145 children of age 7to 12 years of urban population. The children were categorized in two groups as Group I (7-9 years, n=65) and Group II (10-12 years, n= 80) of both the genders. All were free of overt autonomic and systemic diseases like cardiovascular disease, Diabetes mellitus, Thyroid disorders and any previous syncopal attacks. No history of intake of any other medications. All subjects or relatives of the subject gave informed consent, and the local ethics committee approved the study. Written Informed consent and assent was obtained for recruiting the children by sending a consent form to parents through their children explaining them about the non invasiveness of the procedures done, the importance of the study and the benefits attained. The consent forms have been issued to the children in person through random selection in the respective age groups. The concerned teachers were informed in detail about the procedures done. They were requested to collect the consent forms which have been brought by the children after getting signed from their parents. The children were allowed to participate in this study only if they are free from any medical, surgical, congenital disorders. They do not have any previous history of syncopal and pre-syncopal attacks, epilepsy and any neurological illness. Preliminary systemic and neurological examinations were done prior to the study.

Parameters Recorded

Basal physiological parameters such as Heart rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) were recorded to show the variations among the children of both the age groups. The subjects were allowed to lie down on a couch in supine posture for 10 minutes and HR and BP were recorded along with Lead II ECG recording for five minutes with Bio-harness HRV monitoring system which is tied at the level of fourth intercostals space. HRV parameters like time domain & frequency domain indices were analyzed.

Statistical Analysis

Data were analyzed using Student t test and Mann Whitney U test according to the normality of the distribution of data for cross sectional comparison of two age groups. For all measurements, Mean with SD was calculated. All statistical procedures were performed using SPSS 19.0 version. The P value of <0.05 was considered to denote statistical significance.

Results

The standard deviation of normal to normal RR intervals (SDANN) which reflects the long term heart rate variability is found to be less in the older group though the statistical significant is marginally lost. However the standard deviation of the heart rates (Bpm) is found to be significantly more in the younger group though their heart rates are not significantly different. The root mean square of successive standard deviations of normal to normal intervals (RMSSD) is found to be more in the younger group as compared to older group. This is the powerful time domain parameter which reflects short term heart rate variability and in our study is found to be significantly different across the groups (p=0.0373). Similarly the other time domain indices like PNN50 and NN50 are significantly more in the younger group as compared to the older group and found to be significant (p= 0.0467) The Geometric indices i.e. RRTI (p=0.0422) and TINN (P=0.0218) are found to be significantly more in younger group as compared to the older group (Table 1).

Total power (TP) is significantly reduced in older age group when compared to younger age group. (p= 0.0017). The low frequency power (LF) is found to be more in the younger age group when compared to the older age group with significance of (p=0.0459). This is the power which indicates the sympathetic activity is statistically significant when comparing the younger and older age group. However, it is interpreted with caution rather than to superfluously conclude the high sympathetic activity in younger age group. The details of it are discussed in discussion section. The high frequency power (HF) is more in younger age with significant difference between two

groups (p=0.0002). When the absolute powers expressed in normalized units as LF nu and HF nu, they were not found to be significantly different. Though the LF/HF ratio found to be more in older age group there is no statistical significance (Table 2).

SDNN is found to be less in the older group and there is no significant difference. However, the standard deviation of the heart rates is found to be more in females though their heart rates are not significantly different. RMSSD is found to be more in females as compared to males and found to be significantly different across the groups (p=0.0359). Similarly the other time domain parameter like PNN50 is significantly more in females and found to be significant (p= 0.0258) and NN50 is also more in females with a significant difference of P=0.003. The Geometric indices i.e. RRTI (p=0.4831) and TINN (p=0.1754) are not found to be significantly between the genders (Table 3).

The Low frequency power is significantly more in females when compared to males (p=0.0338). The HF is also is significantly more in females when compared to males (p=0.0023). The total power TP is more in females when compared to males with a significant difference of p=0.0105. The LF: HF ratio is found to be increased in males when compared to females with no significant difference. The LFnu and HFnu are not found to be significantly different between males and females (Table 4).

The standard deviation of normal to normal RR intervals (SDNN) is found to be more or less equal in both males and females and there is no significant difference. There is only marginal difference in standard deviation of the heart rates

Table 1: Time domain statistical measures of HRV in two age groups of 7-9 years and 10-12 years

Variables	Group I (n=65) Mean ± SD	Group II (n=80) Mean ± SD	P – Value
Mean RR	0.6749±0.07696	0.6881 ±0.09865	0.529
SD RR	0.055±0.02146	0.05188±0.02836	0.0714
Mean HR	89.77±10.232	88.998±11.651	0.7354
SD HR	7.43±2.769	7.1598±4.237	0.0277
RMSSD	57.6292±26.265	48.14±25.584	0.0373
NN50	128.553±68.973	106.18±89.95	0.0183
PNN50	30.363±17.824	25.755±20.338	0.0467
RRINDEX	0.10927±0.09119	0.08733 ±0.03466	0.0422
TINN	288.23±96.531	255.775±109.45	0.0218

The p values < 0.05 was considered significant

Table 2: Frequency domain (Non-parametric) measures of HRV in two age groups of 7-9 years and 10-12 years

Variables	Group I (n=65) Mean ± SD	Group II (n=80) Mean ± SD	P – Value
LF	344.153±210.35	280.29±171.58	0.0459
HF	479.77±297.59	316.1625±218.093	0.0002
VLF	162.85±85.23	142.24±99.14	0.1874
TP	986.77±453.49	756.04±415.24	0.0017
LF:HF	1.0115±0.6561	1.14746 ±0.7443	0.3271
LF nu	46.10±14.196	48.98 ±14.343	0.2279
HF nu	53.92±14.27	51.42±14.68	0.3047

The p values < 0.05 was considered significant.

Table 3: Time domain statistical measures of HRV between males and females in 7-9 age groups

Variables	Males (n = 35) Mean ± SD	Females (n=30) Mean ± SD	P – Value
Mean RR	0.674±0.074	0.6724±0.08	0.6546
SD RR	0.051±0.02	0.06±0.022	0.0925
Mean HR	90.532±9.933	88.88±10.67	0.2719
SD HR	7.029±2.190	7.90±3.298	0.2042
RMSSD	49.262±20.556	61.21±23.37	0.0359
NN50	104.657±67.577	156.90±68.397	0.003
PNN50	25.011±17.717	35.713±17.536	0.0258
RRINDEX	0.116±0.120	0.1004±0.033	0.4831
TINN	270.3±102.16	304.5±98.079	0.1754

The p values < 0.05 was considered significant

Table 5: Time domain statistical measures of HRV between males and females in 10-12 age groups

Variables	Males (n = 35) Mean± SD	Females (n=30) Mean ± SD	P – value
LF	301.91±101.28	393.43±224.45	0.0338
HF	378.69±240.82	593.7±305.22	0.0023
VLF	167.6±84.89	157.3±81.83	0.6218
TP	844.28±413.25	1144.43±504.12	0.0105
LF:HF	1.072±0.548	0.9398±0.7662	0.119
LF nu	48.49±13.11	43.33±15.11	0.1454
HF nu	51.58±13.23	56.65±15.17	0.1548

The p values < 0.05 was considered significant.

Table 6: Frequency domain (Non-Parametric) measures of HRV between males and females in 10-12 age groups

Variables	Males (n = 40) Mean ± SD	Females (n=40) Mean ± SD	P – Value
LF	366.9±143.88	211.52±103.28	0.0001
HF	373.1±140.51	223.7±111.18	0.0001
VLF	156.22±77.35	125.25±53.77	0.0408
TP	896.23±436.05	543.9±308.34	0.0001
LF:HF	1.107±0.710	1.1872±0.7841	0.6615
LF nu	48.25±15.22	49.72±13.56	0.6507
HF nu	52.39±15.81	50.46±13.59	0.5589

The p values < 0.05 was considered significant.

(Bpm) between males and females. RMSSD is found to be more in males as compared to females which do not show any significant difference. PNN50 and NN50 are more in males with no significant difference. The Geometric indices i.e. RRTI is not found to be significantly different between the genders. TINN is significantly more in males than females (p= 0.036) (Table 5).

The Low frequency power, HF power and Total Power also significantly more in males when compared to females (p=0.0001). The LF: HF ratio is found to be increased in females when compared to males with no significant difference. The LFnu and Fun are not found to be significantly different between males and females (Table 6) .

Discussion

From the findings of our study, we would like to propose that the sympathetic output steadily increases by ageing. In addition to this normal phenomenon, we would like to put forward the exaggerated reduction in the HRV as a key tool in establishing the underlying latent and evolving cardiovascular derangements. Within the age,among the genders, there is a very high heterogeneity in the magnitude of HRV [8]. The HRV is a sensitive tool and index in establishing the underlying cardiovascular derangements [11]. Data mining in our study reveals the presence of high HRV in children with favorable body habitués in the same age group [21]. As per the data, the younger half of the study group i.e. 7-9 years did show statistical differences in many of the time domain parameters like RMSSD, NN50 and PNN50 are significantly higher in females. We would like to propose that there are established gender differences in the autonomic maturation and functioning right from the embryogenesis [5]. We believe in good hope that the sex hormones modulate and only widen these differences rather than initiating it. As there are no appreciable differences in the heart rates between the genders in old and young groups, we would like to state that the parasympathetic tone is equal in both the boys and girls. This excludes the major argument against the rule of inherent heart rate differences inducing HRV changes [12]. However, in the younger children group as reflected by the RMSSD, the girl children have more parasympathetic modulation of the heart rates in comparison with their male counterparts. Taking the understanding that there are other contributory components to the HRV, we would like to express the aforementioned conclusion with caution and analyzed the frequency domain parameters [15]. The frequency domain parameters in the 7-9 years group very clearly stated that the girl children had statistically significant higher values of HF than their male counterparts. This clearly states that, girl children in the 7-9 years group have more parasympathetic modulation than their male counterparts. Since there are no significant differences in body mass

index, waist circumference and WHR in both the genders in the younger age group we strongly admit that by removing all the confounders, the only factor among the plausible parameters inducing the HRV changes is the gender. In the older age group, the condition is totally reversed. The time domain parameters like RMSSD, PNN50 and NN50 though not statistically significant found to be higher in the male group in comparison with the females. The triangular index is higher in the male counterparts and found to be statistically significant. This compulses us to say in the older children group the males had higher HRV than the females. In addition the HF component is found to be significantly higher in the male group as compared to females. The total power (TP) is found to be extremely less in the female counterparts in the older children group and the statistical significance of this difference is extreme. Thus, with utmost clarity our study reflects that the parasympathetic modulation, but not the tone is lower in females than the male counterparts in the older children group. In the previous studies it is very clearly stated that the reduction in the HF component is well associated with underlying cardiovascular strain or stress [22]. The HRV parameters which partly reflect the sympathetic modulation is the LF power [10, 12]. The LF power also significantly reduced in females children. It is seen that the girls have lower LFnu in younger age group. Therefore in younger children resting sympathetic tone and modulation is higher in the males than females which is proved with the corroborative evidence of mean arterial pressure which is also higher in boys than girls. Interestingly, we observed high diastolic pressures in the females in the older age group. There is hardly any scientific documentation so far in this aspect. Thus we would like to appreciate and consider as an increase in the sympathetic modulation in girls rather than to merely conclude that boys & girls of this age group show equal sympathetic modulation. An immediate evidence for this statement would be a decrement in the male LFnu projecting as the reason for a higher sympathetic modulation in girls as age advances since LFnu of the girls changes drastically from 43.3 to 49.7 in the younger & older age groups respectively. Therefore, we would like to suggest that it is the absolute increment in the sympathetic modulation in the older girls and merely a decrement in the LFnu of males. We would like to propose that the decrease in HRV parameters is due to the onset of puberty in females preferably adrenarche. A similar finding is not seen in the boys because of the natural delay in the onset of puberty in comparison to their female counterparts [16,17]. The present understanding in the medical literature is that the females who have the vasodilator sex hormones are found to have lower vasomotor tone and vasoreactivity in comparison with their male counterparts [18]. However, in this study, in the older children age group the presence of high vasomotor tone in the females compulses us to state that the perimenarcheal period profoundly alters the vasomotor milieu. This reflects that basal sympathetic tone is higher in girls as compared to boys in the older age group. The literature says that the resting diastolic values reflect the vasomotor tone that is the resting sympathetic output [13]. The resting parasympathetic output can be studied by analyzing the resting heart rates [15]. We infer that girls in the older group have some undefined cardiovascular strain in comparison to their male counterparts. So, finally we would conclude that sympathetic tone and modulation is higher in older age group girls with decreased HRV parameters as compared to boys in that age group. The rise in the sympathetic tone and modulation needs an established mechanism for its explanation and we have proposed certain mechanisms like atherosclerosis in the vessels feeding the sensors, altered dynamics in the sensor transducing mechanisms by ageing, permissive and inhibitory role of other hormonal mediators, altered integrator activity, evolutionary remnant and external plausible psycho- social factors [5,10].

Conclusion

From our study we infer that Gender influences the cardiovascular autonomic modulation at rest as well as the autonomic reactivity to various challenges. In our study we conclude that girls of group I were found to have lower sympathetic reactivity and tone and higher parasympathetic modulation than boys. The onset of puberty in girls during the pre and perimenarcheal period definitely changes the cardiovascular autonomic milieu and found to have higher cardiovascular strain or stress [5,13, 20] with profound decrease in HRV parameters which is preferably due to adrenarche. Thus the underlying cardiovascular milieu explains the later onset of many cardiovascular morbidity and mortality. So, it becomes a very difficult task to consider HRV like other biological parameters and to evolve normative data though the very intention of the study was to get a yardstick in this highly unexplored domain. However, accepting and aware of the situation we proposed a normative data as created from our sample for reference purposes which would be refined in time taking the aforementioned scientific arguments into considerations as the study demands a huge sample size.

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Feedback from 1st MBBS Students regarding Teaching Methodology in Physiology Department, KBNIMS, Gulbarga

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Abstract

Background: Medical education is a powerful tool for building a knowledge based society. Teaching should be a two way process involving active participation from students as well. Medical Physiology is a subject which has to be understood and includes theory classes as well as practical demonstration in the first MBBS. It is very essential to create interest and seek attention of the students during the classes be it theory or practical. Earlier, classes were only taken using blackboard. Then gradually, OHP were being used along with blackboard. Now in 21st century with the use of powerpoint (PPT) along with black board for theory as well as practical creates interest and makes the subject easier to understand for the students. Hence the present study is conducted to analyze the student centred teaching and learning approach in theory classes and practical demonstrations. *Objective:* To understand the preference of teaching methods by the students and to make the learning easier. *Material and Methods:* The study was conducted in Department of physiology, KBNIMS, Gulbarga after obtaining the ethical clearance from IEC committee. The study included 100 students of first year MBBS. Questionnaires were given to the students that included 12 questions with multiple choice options. *Results:* Of the 100 students, 44% students favored power point presentation along with blackboard discussion, 40% preferred PPT, and only 3% preferred OHP presentation. *Conclusion:* Most students prefer PPT along with blackboard. Using this feedback, the student centred teaching and learning approach, the understanding of physiology can be made more interesting and easier.

Keywords: Blackboard; Powerpoint; OHP; Practicals.

Introduction

Medical education is a powerful tool for building a knowledge based society of 21st century. The quality of which depends upon the teaching learning methodology. With this belief, one of the important ways to strengthen the medical education is through the student's perception about teaching learning methodology [1].

Reviewing the teaching methodology and modifying them at regular intervals is must for improving the undergraduate teaching and also it bridges the gap between the teacher and student. Taking feedback from the students not only helps the students but also the faculty to identify the strengths and weaknesses of their teaching and evaluation methods [2,3]. Apart from theory classes learning approach of students in practicals also is equally important as their knowledge in practicals helps them in clinical approach towards patient. So inculcating various teaching and demonstration methods is also very important to enhance the knowledge in practicals as well.

With this background, the present study is conducted to analyze and study the student centred approach towards learning by taking feedback from the first MBBS students and based on that the knowledge could be imparted according to the students needs.

Materials and Methods

The study was conducted in Department of physiology, KBNIMS, Gulbarga after obtaining the

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ethical clearance from IEC committee. The study included 100 students of first year MBBS. Questionnaires were given to the students that included 12 questions with multiple choice options. The students were asked to tick the option that they considered the best. Later the data collected was analyzed.

Results

Hundred (100) questionnaires were distributed and all the questions were answered by the all the students. Of the available methods of teaching, 44% students preferred PPT along with blackboard, PPT alone was preferred by 40%, next to which blackboard was preferred 13%. Only 3% opted for OHP method of teaching as well.

Using flow charts and tables (Table 1-10) (Chart 1 & 2). for explanation in theory class was preferred by 93% and 90% respectively. Regarding explanation of diagram, 53% preferred PPT method and 28% preferred use of blackboard. 14% opted for both PPT and blackboard mode of explanation. Only 3% preferred OHP.

Regarding tutorials, only 52% opted for it to be conducted and remaining 48% were not willing. Preference of seminar at regular intervals to be conducted were opted by 73% of the students. Use of video clips to in theory class was preferred by 53% to be more interesting and 47% found it to be helpful in better understanding. In Theory classes, discussion of clinical cases, charts, graphs and diagrams helps in better understanding of the subject (98%) and 2% students finds it as not useful. Regarding practical demonstrations, 45% preferred need of small group demonstration following instruction. 29% preferred need of individual student supervision by the teacher after the instruction.16% preferred two way discussion following instruction and practical and only 10% opted for instructions followed by practicals.

Table 1: Preferred method for theory class

Preferred Method	Frequency	Percentage
Board	13	13
OHP	3	3
PPT	40	40
Combined PPT with board	44	44
Total	100	100

Table 2: Preference for interaction by asking questions

Preference	Frequency	Percentage
At the end of class	35	35
Between class	24	24
No	41	41
Total	100	100

Table 3: Preference for explanation by flow charts

Preference	Frequency	Percentage
Yes	93	93
No	7	7
Total	100	100

Table 4: Preference for explanation by using tables

Preference	Frequency	Percentage
Yes	90	90
No	10	10
Total	100	100

Table 5: Preferred method for diagram explanation

Preferred Method	Frequency	Percentage
Board	28	28
OHP	5	5
PPT	53	53
Both PPT and Board	14	14
Total	100	100

Table 6: Preference for tutorials

Preference	Frequency	Percentage
Yes	52	52
No	48	48
Total	100	100

Table 7: Preference for seminars

Preference	Frequency	Percentage
Yes	27	27
No	73	73
Total	100	100

Table 8: Use of video clips

	Frequency	Percentage
Helps in better understanding	47	47
More interesting	53	53
Total	100	100

Table 9: Discussion of clinical cases charts, graphs and diagrams

	Frequency	Percentage
Better understanding	98	98
Not very useful	2	2
Total	100	100

Table 10: Practical class preferred method

Preferred method	Frequency	Percentage
Instructions followed by practical	10	10
Instructions followed by small group demonstration	45	45
Instructions followed by practical and two way discussion	16	16
Instructions followed by practical with individual student supervision by teacher	29	29

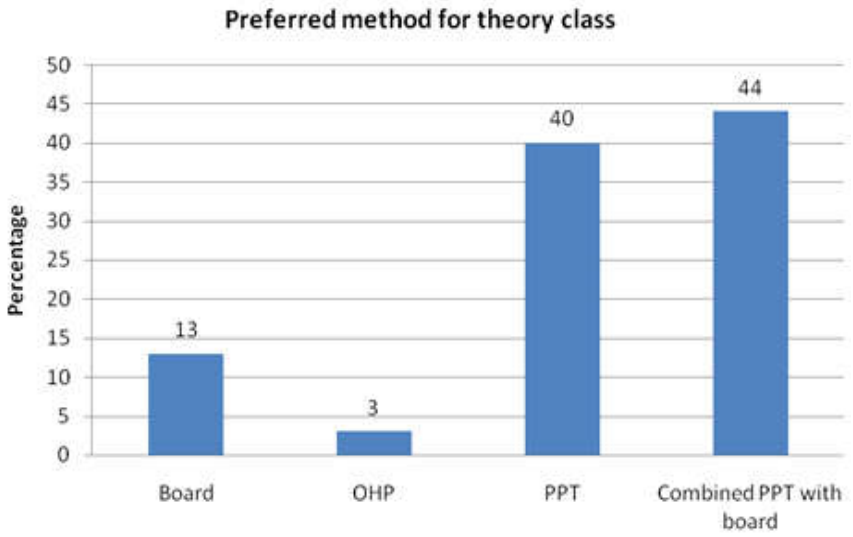

Chart 2:

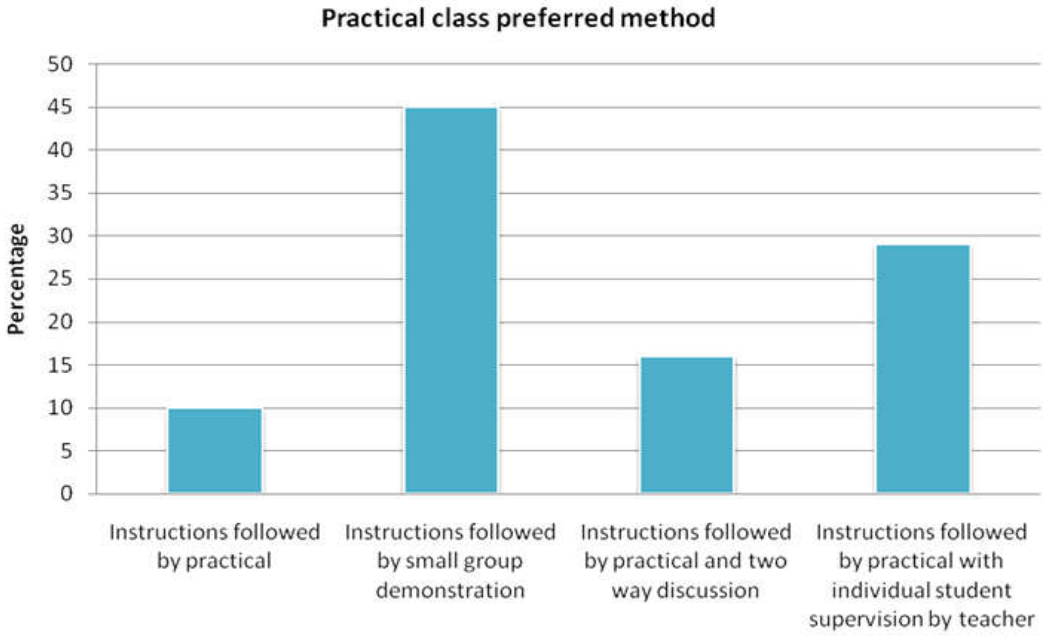

Chart 2:

Discussion

The medical professionals who are working for an academy or in a teaching hospital are not born teachers. To impart good teaching skills, Medical Council of India (MCI) has introduced Medical Education Training (MET) for the medical professionals [4].

In our study, 44% of the students preferred use of both powerpoint and blackboard and only 40% preferred only blackboard means of teaching and OHP by only 3%. In a study conducted by Shilpa S Gupta et al., they found that 58% students preferred blackboard use as a teaching aid followed by powerpoint 47% and 25% for the use of OHP [5]. In a

similar study conducted in D Y patil Medical College, Kolhapur, Maharashtra, found that 34% opted for Chalk and board as a teaching aid, followed by OHP (25%) and then use of powerpoint by only 11%. Muneshwar JN et al, conducted a similar study in which they found 90% students preferred use of audiovisual aids with complimentary use of chalk and board [6].

When they were given the option of combination teaching methods, most of the students preferred chalk and blackboard with power point presentation for better understanding of physiology lectures followed by chalk and blackboard with over head projection. Similar observations were reported in the earlier studies [7,8]. There are some drawbacks reported with the power point presentation like boredom & distraction [9] and also makes the student as passive observer than an active participant [10].

With the power point presentation, the content remains same but the transmitting forms of the lesson to the students differ with the conventional methods [11]. Still blackboard is used by many teachers, as their teaching skills can have great impact on the students and can create more interest in them. Blackboard also helps students learn how to draw diagrams in easy way and practice it for exams. With powerpoint method, on which diagrams are easy to understand, but students can find difficulty in drawing inspite of more clarity. Use of video clips, charts, graphs, animations, flow charts and clinical case discussion helps students understand physiology better. 52% preferred tutorial to be helpful whereas 48% students were not interested in tutorials. 28% students preferred tutorials as the teaching methodology in a study conducted by Shilpa S Gupta et al. A similar study conducted by Florence et al found 79% students preferred tutorials conducted once a week is very helpful in preparing for examinations. Our findings are similar with other studies. In our study, students who showed disinterest in tutorials may be due to hesitation towards answering on being questioned or may be due to inability to prepare in short time.

Regarding practicals, students were satisfied with the way of practical teaching that is instructions followed by small group teaching 45%. According to different literature survey findings among the educational methods applied in undergraduate medical education, lecture was still a preferred and established part of learning experience [12-17]. Lecture is considered as one the oldest method of teaching and learning in all types of education including medical science. Further Medical Council of India has considered lecture as one of prime method of teaching as per Sarkar et al. [18].

Conclusion

Teaching and learning are subjective process; therefore there are individual variations in feedback from students as well as the teaching methods adopted by the teachers. Therefore, depending upon the student's interest, and available resources, we should adopt the best possible method of teaching.

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Comparison of Lung Function Tests in Young Adults Involved in Gymnasium and Swimming

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Abstract

Background and Objectives: Now a day's people are involved in various activities for fitness. In literature, very few studies have been done to compare the various lung volumes of swimmers with those who are involved in gymnasium; hence the present study was taken up. *Method:* The present study was carried out in the department of physiology, M.G.M. Medical College and M Y Hospital, Indore with recruitment of 60 subjects. The subjects were categorized into 2 groups – one having those involved in gymnasium and other having swimmers - each of 30. All the subjects were involved in their respective exercise for a period of minimum two years. Various lung volumes and capacities were measured by spirometer and statistically analyzed. *Results:* It was observed that lung volumes of swimmers were greater than those who were involved in gymnasium and the difference was statistically significant. *Interpretation and Conclusion:* from the present study it can be concluded that swimming is better than exercise in gymnasium as far as lung functions are concerned.

Keywords: Gymnasium; Swimmers; Exercise; Lung Volumes.

Introduction

It is a well known fact that regular physical activity has salutary effects on lung functions [1,2,3].

Exercise increases the strength of body, keep the mind relaxed, improve circulation and stimulate respiratory system. In today's era, everyone is confused which exercise should be taken up for fitness and better health. Those who workout in gymnasium are less studied as far as lung functions are concerned hence we chose them as our participants and compared their lung functions with swimmers.

Aims and Objectives

The objective of the present study was to inquire and compare the lung functions of young swimmers with those who work out in gymnasium.

Methodology

This cross sectional study was carried out in department of physiology M.G.M. Medical College and M.Y. Hospital, Indore. Subjects were taken from Tarun Pushkar swimming pool and gymnasium of Nehru Stadium Indore. Purposive sampling was done to have a sample size of 60 participants.

Following instruments were used

- Electronic weighing machine for recording weight
- Stadiometer for recording height
- Sphygmomanometer for recording blood pressure
- Computerized spirometer made by Ganshorn Medizin Electronic (Gmbh) Germany which have inbuilt software with predicted values both for adults and children corrected to body surface

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area; and body temperature and pressure saturated with water vapour (B.T.P.S.).

Inclusion Criteria

- Those who gave consent for participation
- Not addicted to smoking, alcohol or tobacco
- Regular in swimming and Gymnasium for at least last 2 years

Exclusion Criteria

- History of any addiction
- History of any medical illness of long duration specially of respiratory illness
- History of any surgical procedure performed

For this study we divide 60 male volunteers in 2 groups

Group A: Thirty young adults of age group 18-30 yrs who were regular in the Gymnasium for at least 2 years.

Group 2: Thirty young adults of age group 18-30 yrs who were regular swimmers

After taking ethical committee clearance, an informed written consent was taken from all the participants. All the participants were interviewed to obtain information about exercise schedule, relevant personal, past and family history along with socioeconomic status as per Kuppuswamy's scale

In the Gymnasium following exercises are regularly performed -

- Warm up exercises
- Squatting
- Bench Press
- Rock and roll movement of the abdomen
- Row
- Pull up
- HIT (high intensity training) Cardio

Measurement of weight and height were done as per norms. Vital data were recorded and all the participants were examined clinically to rule out any physical illness.

Spirometry was done in PFT lab of M.Y Hospital, Indore after giving instructions about the whole procedure to each participant

Following lung function parameters were recorded

- Forced Vital capacity (FVC)
- Tidal Volume (TV)
- Inspiratory Vital Capacity (IVC)
- Inspiratory Reserve Volume (IRV)
- Expiratory Reserve Volume (ERV)
- Forced Expiratory Volume in first second (FEV_1)
- Peak Expiratory flow rate (PEF)
- Maximum Expiratory Flow Rate (MEF)

Observations

Obtained data were compiled, tabulated and statistically analyzed using unpaired student–t Test.

Results

Results thus obtained shows higher values of IVC, IRV, ERV, FVC, FEV_1 MEF25%, and MEF50% in swimmers as compare to those who were involved in gymnasium which are statistically significant with p value of <0.05 in all. The values for MEF 25-75%, MEF75-85%, and PEFR were also higher in swimmers as compare to those involved in gymnasium but statistically non significant with p value >0.05. The tidal volume and FEV_1/FVC% is higher in those engaged in gymnasium than swimmers but statistically non significant with p value >0.05 Table 2.

Table 1: Comparison of Anthropometric parameters in individuals engage in gymnasium and swimmers

Anthropometric Parameters	Gymnasium group (n=30) Mean ±S.D	Swimmers (n=30) Mean ±S.D
Age (yrs)	21.5 ±3.39	21.29 ±3.33
Height (cms)	172.47 ±5.78	176.59 ±5.69
Weight (Kg)	66.96 ±6.28	65.63 ±8.62
BSA in m^2	1.79 ±0.10305	1.80 ±0.12

Table 2: Comparison of Lung volumes in individuals engaged in gymnasium and swimmers

Lung volumes (Litres)	Gymnasium group (n=30) Mean ±S.D	Swimmers (n=30) Mean ±S.D	p Value	Remark
Inspiratory Vital Capacity (IVC)	3.69±0.42	4.47±0.49	0	Significant
IRV	1.74±0.39	2.20±0.46	0	Significant
ERV	1.22±0.30	1.67±0.31	0	Significant
Tidal volume	0.82±0.39	0.77±0.27	0.99	Non –Significant
Forced Vital Capacity (FVC)	3.71±0.30	4.61±0.48	0	Significant
FEV_1	3.32±0.29	4.16±0.41	0	Significant
FEV_1 /FVC %	87.56±5.66	83.81±7.02	0.52	Non –Significant
MEF25-75%	4.55±0.92	5.14±0.86	0.06	Non –Significant
MEF25%	2.34±0.42	2.97±0.76	0	Significant
MEF50%	5.35±1.21	5.85±0.97	0	Significant
MEF75-85%	7.13±2.18	7.67±1.42	0.68	Non –Significant
PEFR	7.73±2.00	8.27±1.23	0.61	Non –Significant

Discussion

Physical activity definitely increases lung volumes and capacities; and delays the age related changes in the lungs [4,5]. Among the various activities swimming is considered as one of the best exercise for lungs [6,7,8]. Due to easy availability of well equipped gyms more and more people are diverted towards gym. Muscles of exercising persons having high metabolism demand more nutrients and oxygen with liberation of more carbon dioxide which needs to be washed out thereby increasing the respiratory drive which in turn improves lung functions. Our study support the fact that swimmers have higher lung volumes as compared to individuals who workout in gymnasium.

The reasons behind this may be [9]

- Swimming required immersion in water hence during immersion greater pressure is developing in respiratory muscles including diaphragm while no such immersion is required in gymnasium
- Swimming is done in lying down position that is horizontal while position of exercise done in gymnasium is vertical
- During swimming outside pressure is higher as density of water is greater than air which is the external medium in gymnasium.
- Water have higher heat conductance as compared to air

When we compared FEV_1 as percentage of FVC, we found that swimmers have less value than the individuals exercising in gymnasium. The reason for this is that in swimming as well as in gymnasium, the training of muscles of shoulder girdle leads to an increase in the vital capacity by virtue of increased strength of the accessory muscles of inspiration. This is not accompanied by a corresponding increase in the forced expiratory volume in first second, hence the proportion of the forced vital capacity which these subjects can expire in first second tends to be relatively low in swimmers . These changes are less in gymnasium [10].

Conclusion

Although, every exercise is good for lungs; our study shows positive association between physical exercise and lung volumes which is more in case of swimmers than those who workout in gymnasium.

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Effects of Tobacco Smoking on Haematological Parameters: Haemoglobin and White Blood Cells

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Abstract

Background: It is very well established that tobacco smoking is one of the risk factors for various diseases like stroke, cardiovascular diseases, chronic obstructive pulmonary disease (COPD) and various types of cancers. Alterations in haematological parameters may be one of the causes for these diseases. *Aim:* The present study was undertaken to evaluate the relationship between tobacco smoking and haematological parameters like haemoglobin levels and levels of white blood cells. *Materials and Methods:* The study recruited a total of 60 adult men of whom 30 were chronic smokers and the other 30 were non-smokers. Blood sample drawn from each of these subjects was assessed for the following parameters: Haemoglobin (Hb) levels, total leucocyte count (TLC), differential count (DC) of neutrophils, eosinophils, lymphocytes and monocytes. The smoking status was confirmed by measuring serum cotinine levels of the subjects. *Statistical analysis:* The values were compared between smokers and non-smokers using unpaired student's t test. *Results:* There was a statistically significant increase in Hb levels (15.42±1.24 vs 14.40 ±1.10), DC of eosinophils (6.781±5.02 vs 4.47±3.64) and absolute eosinophil count (519.06±217.25 vs 346.56±104.42) among smokers when compared to non-smokers. Also increase in TLC, DC of neutrophils and decrease in DC of lymphocytes and monocytes were found which were statistically not significant. *Conclusion:* Hence it can be concluded that tobacco smoking leads to alterations in haematological parameters and may be responsible for development of certain diseases and smoking cessation programmes should be integrated with basic health care system.

Keywords: Tobacco Smoking; Haemoglobib (Hb); White Blood Cells (WBCs).

Introduction

Tobacco use is the leading preventable cause of death accounting for more than 5 million annual deaths worldwide. The annual tobacco attributable death is expected to reach 8 million by 2030. Whereas in India a recent study on mortality associated with smoking, estimated that about 9 million people die due to smoking. Further for every ten deaths in adults, one death in India is related to smoking [1]. The morbidity associated with smoking is enormous. It is very well established that smoking is one of the risk factors for various diseases like stroke, chronic obstructive pulmonary disease (COPD), cardiovascular diseases such as hypertension and myocardial infarction, peripheral vascular disease,cancers of several organs, osteoporosis, and susceptibility to different types of infections [2]. Though mechanisms have been hypothesized in each of these diseases, alterations in haematological parameters may be responsible for development of certain diseases, especially occlusive vascular diseases. Many of the haematological reference values are significantly affected by both active and passive smoking [3,4].

With this background, the present study was planned to evaluate the relationship between tobacco smoking and haematological parameters like haemoglobin (Hb) and white blood cells.

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Materials and Methods

Following institutional ethics committee and research committee approvals, a total of 60 adult men in the age group of 30-50 years with 30 men being chronic smokers (defined as those with a history of minimum 20 pack years of smoking, study group) and other 30 being never smokers (controls) were recruited.A detailed history regarding current smoking status, number of cigarettes smoked per day and years of smoking was obtained by using a pre tested questionnaire.

Inclusion and Exclusion Criteria

Study group: This group consisted of 30 willing men of the age group of 30-50 years with a history of minimum 20 pack years of cigarette or beedi smoking [5]. A pack year is given by the formula ([number of cigarettes or beedis smoked per day X number of years]÷20)[6].To confirm smoking status, serum cotinine levels of all subjects were measured using the Qualisa ELISA kits and a value of more than 12.5 ng/ml was taken as cut off [7]. All men who were on medication or suffered from any ailment at the time of study including diabetes mellitus, COPD and hypertension were excluded.

Control group: Non-smoking men in the age group of 30 to 50 years, with no history of past or present tobacco use, not on any medication, not suffering from any disease at the time of study. The non-smoking status was confirmed by serum cotinine levels<12.5 ng/ml.

Collection of Blood Sample

Under aseptic precautions, 3 ml blood was drawn from antecubital vein and collected in EDTA bottles and sent for evaluation immediately. The serum cotinine, total leucocyte count (TLC), differential counts (DC) of neutrophils, lymphocytes, eosinophils and monocytes and haemoglobin (Hb) levels were measured on each of the samples drawn. Haemoglobin levels were estimated using automated haematology cell counter. The TLC and DC were done using automated analyser (Mindray BC 5300 5 parts differential analyser).

Statistical Analysis

The data collected was recorded using MS- Excel 2007 (Microsoft Corporation, Redmond, WA). The mean and standard deviation were calculated, the unpaired student's t test was performed to compare the means between cases and controls. A p value ≤ 0.05 was considered significant. All statistical analysis were performed with the help of SPSS (Statistical Package for Social Sciences) version 20.0 (IBM Corp., Armonk, NY).

Results

The mean age of the study group was 39.2 (± 8.2) years. The mean height was 164.7 (± 7.23) cm. The mean weight was 55.76 (±9.5) kilograms. It was observed that there was a statistically significant increase in Hb levels among chronic smokers when compared to non-smokers. (Table 1, Figure 1)

The DC of eosinophils and absolute eosinophil count were increased among smokers which were statistically significant (Table 1, Figure 2, Figure 3).

Total leucocyte count and neutrophil count were increased but were not statistically significant. Also lymphocyte count and monocyte count were decreased, but were not statistically significant (Table 1).

Table 1: Effect of tobacco smoking on Hb, DC of eosinophils, absolute eosinophil count, total leucocyte count and DC of neutrophils, lymphocytes and monocytes

Parameters	Smokers Mean ± SD	Non smokers Mean ± SD	p value
Haemoglobin in g%	15.42±1.24	14.40±1.10	0.001
DC of eosinophils in %	6.781±5.02	4.47±3.64	0.018
Absolute eosinophil count	519.06±217.25	346.56±104.42	0.012
Total leucocyte count	8234.37± 2688.52	7693.75± 1651.57	0.17
DC of neutrophils in %	58.06± 8.27	55.75± 8.79	0.14
DC of lymphocytes in %	33.22± 6.83	34± 6.1	0.32
DC of monocytes in %	3.5± 1.74	4± 1.4	0.10

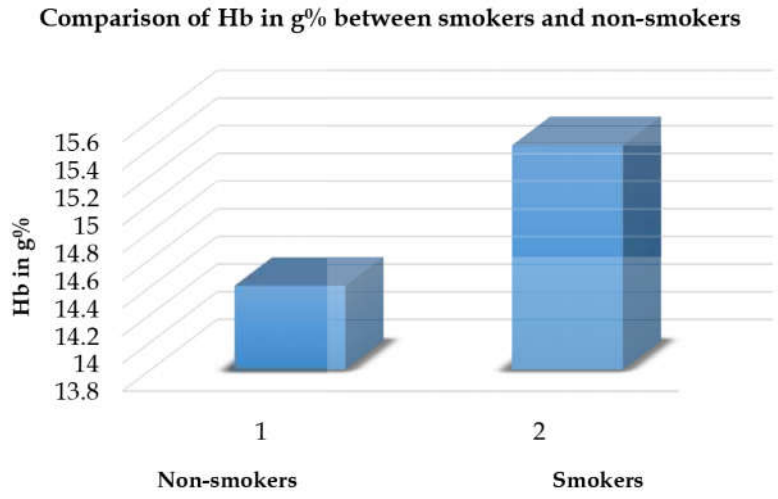

Fig. 1: Comparison of haemoglobin (Hb) levels between smokers and non-smokers

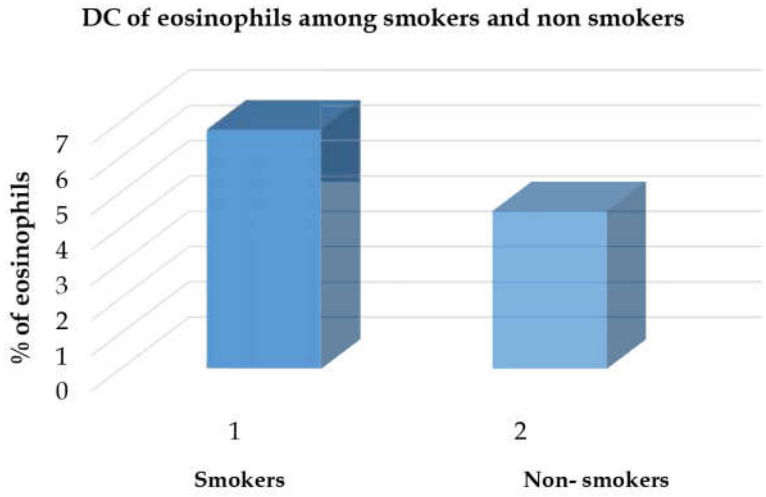

Fig. 2: DC of eosinophils among smokers and non smokers

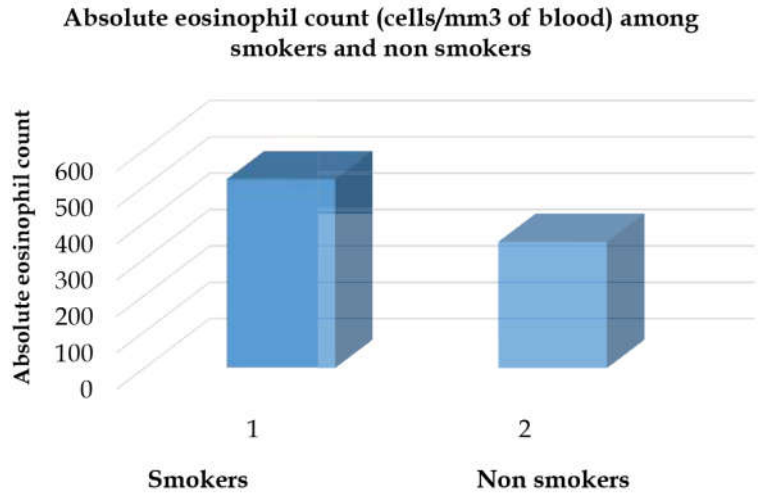

Fig. 3: Absolute eosinophil count (cells /mm^3 of blood) among smokers and non smokers

Discussion

Tobacco smoking has long been implicated as a factor responsible for various changes in haematological parameters. The present study was conducted to assess the effect of smoking on haematological parameters like Hb and white blood cells. Haemoglobin levels are affected by various factors. In our study we found an increase in haemoglobin levels among smokers when compared to non-smokers. Tobacco smoke contains various components which are detrimental to health. These include tar, nicotine, ammonia, carbon monoxide (CO), carbon dioxide, acrolein, formaldehyde, hydroxyquinone, acetone and cadmium [8]. Carbon monoxide present in tobacco smoke has very high affinity for Hb (nearly 200 times) as compared to that of oxygen and hence combines more readily with haemoglobin than oxygen to form carboxyhaemoglobin [9]. The reduced oxygen in blood causes increased production of red blood cells and also haemoglobin. This upward shift in haemoglobin distribution curve caused due to smoking will reduce the utility of haemoglobin level to detect anaemia and will have a masking effect on detection of anaemia [10]

The differential count of eosinophils and absolute eosinophil count were found to be significantly increased among smokers. This is in accordance with studies by Taylor et al. [11] and Halonen et al [12]. Van der Lende et al. [13] showed that eosinophilia, considered as a marker of allergy, was related to lower level of FEV1 (forced expiratory volume in first second). One of the studies considers eosinophilia as a risk factor for chronic airflow limitation among adults [14]. These findings suggest that chronic smokers are at an increased risk of developing compromised lung function status and airway diseases.

In the present study we also found an increase in total leucocyte count and differential count of neutrophils which were not statistically significant. The most probable reasons could be nicotine induced catecholamine release, inflammation of bronchioles and chronic tissue damage [15,16]. Lymphocyte count and monocyte count were found to be decreased (not significant). Decrease in lymphocyte count may be due to rise in neutrophil count.

In a study by Ernst et al. [17], a correlation was found between altered WBC count and the risk of myocardial infarction and stroke. The rheologic properties of blood are affected by WBCs. They participate in endothelial injury by adhering to the endothelium and damaging it with toxic oxygen compounds and proteolytic enzymes. All these changes in haematological parameters may be due to the toxic effects of solid and gaseous phases of tobacco smoke on the bone marrow as well as adaptive and immunologic reactions of body to long term active smoking [9]. These findings further emphasize the need to integrate effective smoking cessation interventions into basic health care system and to control second hand tobacco smoke exposure.

Conclusion

In the present study, chronic smokers were found to have higher Hb levels and eosinophil counts when compared to non-smokers. Though there were differences in other parameters like total leucocyte count, DC of neutrophils and lymphocytes, they were statistically insignificant. A larger study is advisable to confirm findings and also to correlate these findings with lung function status and serum cotinine status.

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A Study of Perceived Stress Levels in First Year Medical Students in South India

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Abstract

Introduction: Medical students during their course of education may experience stress when their curricular demands tends to exceed their resources to deal with them, and they have been also reported to suffer from higher perceived stress compared to the general population and students in other academic fields. Current study aims to assess the level of stress in first year medical students. *Objective:* To assess the perceived stress levels in first year medical students. *Method:* Across-sectional study was conducted among first year medical students of Al-Azhar medical college and super speciality hospital. Where, perceived stress scale -10 (PSS-10) was used for assessing the perceived stress levels. The data was entered in Microsoft excel and analyzed using SPSS version 16. *Results:* Of the 150 first year medical students,who took part, 109 were females and 41 were males. Most students reported PSS-10 mean score of 24.56 (SD 7.24) and scores ranging from 8-38. There was no difference between the mean stress levels of male students and female students $p>0.05$. *Conclusion:* The study reported that there is a higher level of stress among the medical student than compared to the general population. Also there is no difference in stress level between male or female students.

Keywords: First Year Medical Students; Perceived Stress; South India.

Introduction

Stress by definition is "a condition or feeling experienced when a person perceives that the demands placed on them exceed the resources the individual has available" [1].

Many Medical students may experience stress during their medical course, when their curricular demands tends to exceed their resources to deal with them [2], and they have been also reported to suffer from higher perceived stress compared to the general population and students in other academic fields [3-7]. Moffat et al. examined stress during the first year of medical school and found a significant increase in psychological morbidity as measured by the General Health Questionnaire GHQ-12, a screening instrument to detect psychological disorders in the general population and in primary care [2,8]. First year of the medical course is a very important phase of the medical course, Wolf TM et al. observed that Positive mood in the medical students decreased (joy, contentment, vigour, and affection) while negative mood increased (depression and hostility). End of the year first year students appear to be worse off psychosocially than when they entered [9]. So, it's very important to assess the level of stress in students experience during their first year of medical course. It was also found in other studies that the students generally used active coping strategies to cope with their stress in medical school [2].

Researches over past few decades have shown that medical students reported a high level of perceived stress and they apply individual approaches to cope with it, there are also studies regarding the effects of interventions such as stress reduction trainings, peer support programs, student focused curricula or wellness courses [10-13].There are many Studies conducted in Asian countries like Malaysia, Thailand, etc those have shown a high level of stress among the medical students [14-17].

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But, hardly any studies have been conducted in south Indiawith regards to stress levels in first year medical students. Current study aims to study the stress levels in the first year medical students in south India.

Material and Method

This cross-sectional study was conducted among first medical students Al-Azhar medical college and super speciality hospital. Studentsgave their consent and participated voluntarily. The approval to conduct this study was obtained from the ethical committee of the Al-Azhar medical college and super speciality hospital. Perceived Stress Scale (PSS 10) was used to assess the degree of perceived stress students experienced during their first year of MBBS course [17].

Items were designed to know how unpredictable, uncontrollable, and overloaded students would find their lives during the first year of their medical course. The scale also includes a number of direct queries about current levels of experienced stress.

Scoring

PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items.

Statistical Analysis

The data was entered in Microsoft excel and analyzed using SPSS version 16. The descriptive statistics such as frequency, proportion and mean and standard deviation was analyzed.

To check the association between stress score and other factors student t-test was used and P value less than 0.05 was considered significant.

Results

All the 150 students who had enrolled in study completed and returned the questionnaire. The mean age of the students was 18.83 years (SD=0.84) with a range of 17-21 years. Among the students 109 were female with mean age of 18.80 years (SD= 0.83) and 41 were males with mean age of 18.90 years (SD = 0.88) as shown in Chart No: 01 and Table 1.

Perceived Stress

The mean PSS-10 score of the study population was 24.56 (SD 7.24) and scores ranging from 8-38.

The mean PSS-10 score among the female students was 24.55 (SD 7.36) and the mean score for male studentswas 24.60 (SD 6.98) as shown in Chart No: 02. There was no difference between the mean stress levels of male students and female students' p-value = 0.9 as shown in Table 2.

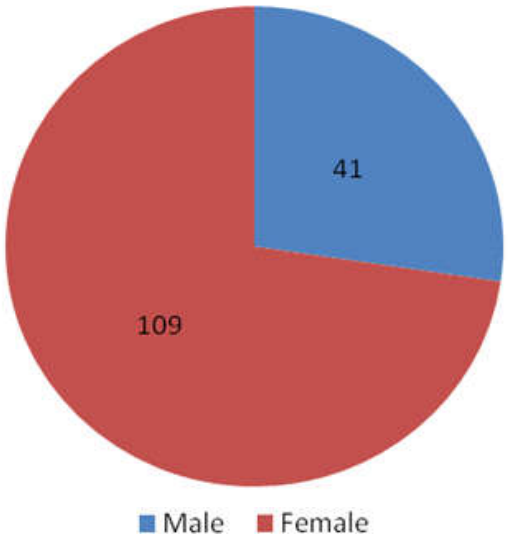

Chart 1: Showing the gender distribution

Table 1: Showing the number, age and the PSS-10 score of the first year medical students

	Total	Female	Male
n	150	109	41
Average age	18.83	18.80	18.90
SD	0.84	0.83	0.88
Average score	24.56	24.55	24.60
SD	7.24	7.36	6.98

Table 2: Showing the association between the gender and stress score

Gender	Mean score	S.D	p-value
Male	24.60	6.98	**0.9**
Female	24.55	7.36	
Total	24.56	7.24	

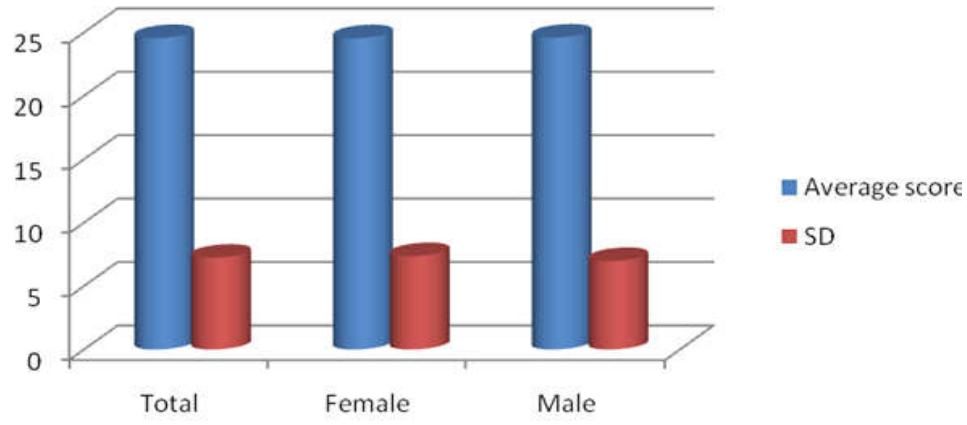

Chart 2: Showing the mean PSS-10 score and standard deviation of the students

Discussion

There have been many studies in medical colleges of many countries with respect to stress level in medical students.There are many studies have shown that very levels of stress and depression among medical students may also lead tosuicide [18, 19,20). But, there are hardly any study conducted in south India to assess the level of stress in first year medical college. The first year of a medical course is even the students tends to experience high level stress, which can affect their further education during the course [9].

The learning abilityand academic performance of the students especially among the medical students are affectedby stress and other factors like social, emotional, etc. In country like India family problems also play important factors [21,22,23]. In present study, perceived stress experienced by 150 first year medical studentswas evaluated. Students reported a higher level of perceived stress than the general population which was for male 12.1±5.9 and females 13.7±6.6. [17].

However, there were no significant differences in mean scores of stress between the sexes in the current study, which is similar lines with Cohen has reportedthat there was no significant difference in stress using PSS between male and female students. [17].

However, a recent study by Anbumalar C et al. had shown that girl students experience a significant level of higher stress than male [24]. However, that study included girls from different under graduate courses, not only medical. This study included only medical students.

Conclusion

The study reported that there is a higher level of stress among the medical student than compared to the general population. Also there is no difference in stress level between male or female students. However, a detailed study is required to identify the exact causes of the stress in first year medical students

Limitations

This study was able to show that that the first year medical students experienced significantly high level stress. But, was not able to isolate the exact causes for high level of stress, further studies should be designed and conducted to isolate the causes for the high level of stress experienced by the first year medical students.

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Study of Co-Morbid Depression and Glycemic Control in Type 2 Diabetes Mellitus

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Abstract

Background: Diabetes increases the risk of co morbid depression almost twice which increases diabetic complications leading to poor metabolic control and decreased quality of life. Depression exacerbates the progression of diabetes and hence screening and treatment of depression in diabetic individuals helps in improving the glycemic control and quality of life. *Aims and objectives:* Aim of this study is to determine the effects of metabolic control on depression and health related quality of life. *Materials and Methods:* Case-control study design with 110 diabetic individual more than 5 years duration and 110 good controlled diabetic individuals. Glycemic index (HbA_1C) is used for evaluating metabolic control. Hamilton's scale of depression and anxiety is applied along with hospital anxiety and depression scale {HADS}. Unpairedstudent 't' test is used to find the significance of values between the cases and controls. *Results:* The mean Hamilton's scoring for cases is 22.11±6.68 and for controls is 2.45±4.32. The difference is significant at $p<0.05$. The mean HADS score for cases is 11.51±4.5and for controls is 1.58±1.92. Its significant at $p<0.05$. *Conclusion:* This study found that the diabetes with poor glycemic control has more risk of co morbid depression and poor quality of life when compared togood glycemic controlled diabetics.

Keywords: Depression; Diabetes Mellitus; Glycaemic Index.

Introduction

Diabetes and depression are major disorders which affects the quality of life [1,2]. Individuals with chronic disease like diabetes mellitus (DM) usually coexist with anxiety and depression [1,2]. According to Centers for Disease Control and Prevention (2011), in adults 90% to 95% of newly diagnosed cases are type 2 diabetes [3,4]. Individuals with diabetes are more vulnerable to depression than individuals without diabetes [1-3].

Almost 20% of the uncontrolled hyperglycemic diabetic patients are suffering from depression [5,6]. Some studies showed the range for depression in diabetic individuals as 24% to 30% [2,7,8]. Some studies show that 15–24% of type 2 diabetes are prone for depression [7,8]. Longer the duration of diabetes higher the risk of depression [9]. Diabetic individuals with high HbA1c (Glycated Haemoglobin) levels have lower quality of life [9]. Women are affected more than men. Adolescents suffering from DM and depression have a higher incidence (10 fold) of suicidal ideations. Uncontrolled hyperglycemia causes great emotional, physiological and social problems in patients [10]. Hence, screening and treatment of depression in diabetic individuals helps in improving the glycemic control and quality of life.

Aim

The aim of this study was to assess the metabolic control (HbA_1C) and prevalence of anxiety and depression in diabetic using standardized rating scales of anxiety and depression.

Materials and Methods

It is a Hospital based case control study. Study was done in Sri ManakulaVinayagar Medical college hospital, Madagadipet, Puducherry.

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Sample Size: 220 diabetic individuals

Case -110 poorly controlled diabetic individuals.

Control- 110 well controlled diabetic individuals.

In 110 diagnosed diabetic patients,

They were assessed for

1. Sociodemographic profile,
2. Duration of illness and HbA_1C,
3. Hamilton rating scale for depression (HDRS),
4. Hamilton rating scale for anxiety (HARS) and
5. Hospital anxiety depression scale (HADS).

Inclusion Criteria

Diabetic individuals of more than 5 years duration

Patients of both the sexes were taken

Exclusion Criteria

Presence of any organic illness.

Any other major psychiatric illness, like schizophrenia and mental retardation.

Patient already on any psychotropic drug.

Results

Tables 1 and 2 show the sample population with gender distribution. Results (Table 3) show that many cases were in the mild category by HARS scale. There were significant differences in anxiety and stress levels (Table 4) between the controlled and uncontrolled diabetes groups. These correlate with HBA1C levels (Table 5) and comorbid depression.

Table 1: Age and gender distribution of sample population

Age in years	Male		Female	
	Case	Control	Case	Control
<30	6(12)	4(8)	4(6.66)	6(10)
31-50	16(32)	18(36)	20(36.66)	20(33.33)
>50	28(56)	28(56)	36(56.66)	34(56.66)
Total	50	50	60	60

Figures in parentheses indicate percentage

Table 2: Depression and gender distribution

	Male	Female	Total
>8 no depression	8 (15.38)	8(13.79)	16(14.54)
8-13 mild depression	14 (26.92)	10 (17.34)	24(21.81)
14-18 moderate depression	8 (15.38)	20 (34.48)	28(25.45)
19-22 severe depression	10 (19.32)	12 (20.68)	22(2)
23 and >23 very severe depression	12 (23.07)	8(13.79)	20(18.18)
	52	58	110

Figures in parentheses indicate percentage

Table 3: Hamilton Anxiety Rating Scale

HARS	Male	Female	Total
<17 mild	38(76)	36(6)	74(67.27)
18-24 moderate	6(12)	14(23.33)	20(18.18)
25 severe	6(12)	10(16.66)	16(14.54)
Total	50	60	110

Figures in parentheses indicate percentage

Table 4: Student't' Test

	Type	Mean	Std. Deviation	Significance
H scale D	Case	20.57	8.386	.012
	Control	2.19	4.010	.031
H scale A	Case	20.71	7.742	.002
	Control	2.09	4.166	.005
HADS	Case	10.66	5.128	.025
	Control	1.39	1.671	.017

Student 't' Test

Table 5: Correlation of Glycated Haemoglobin and Depression

		HbA1C	H scale D	H scale A	HADS	Duration
HbA1C	Pearson Correlation	1	.757**	.750**	.686**	.560**
	Sig. (2-tailed)		.000	.000	.000	.000

**Correlation significant at the 0.01 level (2-tailed)

Discussion

Depression and anxiety are most common psychiatric disorders worldwide. Individuals with diabetes mellitus usually coexist with anxiety and depression.People with diabetes suffer from depression at a higher level when compared to normal people. Both depression and diabetes are known to activate the hypothalamo-pitutary-adreno–cortical axis. Diabetes may enhance the risk of depression through increased sympatho – adrenal system activity or a dysregulation of the hypothalamic–pituitary axis. Moreover, biochemical changes related to depression such as hypercortisolemia, inflammation, and sympathetic nervous system activation mechanisms that impair insulin sensitivity and glucose metabolism may contribute to development of diabetes. Hyperglycemia causes great emotional, physiological and social problems in patients. Depression also exacerbates the progression of diabetes. Some direct relationship can be observed between mood/anxiety and glycemic control.

Conclusion

Only one-fourth of patients with depression were actually aware about their depressive status in this study. About 84% of the patients had comorbid depression and anxiety. This study found that the diabetes with poor glycemic control has more risk of co morbid depression and anxiety when compared to good glycemic controlled diabetics. There is direct relationship observed between mood/anxiety and glycemic control.

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Assessment of Left Ventricular Mass Index by Echocardiography in Prehypertensive Subjects

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Abstract

Introduction: High blood pressure is a strong risk factor for cardiovascular disease. The Joint National Committee on High Blood Pressure (JNC) identified a new category of blood pressure in adults termed pre-hypertension. Keeping BP below 120/80 mm Hg may provide important health benefits later in life. *Methods:* Total 201 subjects were selected from general population with the age between 18-70 years. Blood pressure was measured with mercury sphygmomanometer and prehypertension was classified according to JNC 7. 101 subjects were found to be prehypertensives and 100 were normotensives. Two-dimensionally guided M-mode echocardiography was performed by standard methods. *Results:* BMI and BSA were elevated in prehypertensives. HR, SBP, DBP, PP & MAP were significantly elevated ($p<0.001$) in prehypertensives compared to normotensives. A statistically significant difference was noted in LVIDd, LVIDs, PWT, LVM and LVMI between two groups in male populations whereas in female populations only LVM and LVMI were statistically significant. *Conclusion:* Such findings carry prognostic implication. Early diagnosis of prehypertension will help to take necessary preventive measures to reduce cardiac morbidity and mortality in later period.

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Introduction

Prehypertension (PHT) is a precursor of clinical hypertension and is closely related to cardiovascular diseases[1]. The term PHT was adopted in May 2003 by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High blood Pressure (JNC-7) [2]. According to JNC – 7, PHT is defined as the systolic BP between 120–139 and diastolic BP of 80 – 89 mm of Hg not only to emphasize the excess risk associated with BP in this range, but also to focus increased clinical and public health attention on prevention [2]. Individuals with PHT have a greater risk of developing hypertension later in their life and is associated with higher risk of cardiovascular disease (CVD) [3]. There is a continuous increase in mortality from both stroke and ischemic heart disease from BP of 115/75mmHg, with a twofold increase in cardiovascular death in those with 20mm Hg higher systolic pressure or a 10mmHg higher diastolic pressure, a level well within the range of PHT [4].

Increasing trend of PHT is a worldwide phenomenon [5]. PHT is more prevalent than hypertension [6]. In India, prevalence of PHT respectively, was significantly greater in South India (Trivandrum 31.9%) and West India (Mumbai: 29.1%) compared to North India (Moradabad: 24.5%) and East India (Kolkata: 22.4%) [7].

Left Ventricular Mass (LVM) increases with increase in blood pressure. It might be due to increase in the pressure load persistently. Increase in LVM might be physiological or pathological. Several factors which are associated with increased LVM have been identified, which include age, gender, blood pressure, body size, physical activity and blood

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viscosity [8]. However, neuro-humoral and genetic factors have also been implicated [9]. LVM progressively increases during aging [10], which is reported in normotensives, prehypertensive and hypertensives. The age associated LVM increment may be attributed to the physiological increase in body size and blood pressure [11] or to pathological hypertrophic changes which are caused by an increased overload. Obesity has been implicated as important determinants of LVM in most of the population based studies [12]. Such early morphological and sometimes functional changes in heart can be detected by 2 Dechocardiography.

In prehypertensive state, these changes are generally reversible if it is diagnosed in early state. The change can be reverted back to the normal LV structure and function by simple life style modification and low salt diet, DASH diet, and increase in physical activity, moderation of alcohol intake. Hence, early diagnosis can help in early institution of corrective measures and preventing long term complications.

Materials and Methods

The study was conducted in the department of physiology and cardiology simultaneously at SRMS – IMS, Bareilly (UP). The study was approved by institutional ethics committee and informed written consents were obtained from subjects. A total of 201 subjects were included in study whose age ranged from 18–70 years in which 101 asymptomatic Subjects attending the cardiology OPD accidently detected prehypertension were randomly taken who came for executive cardiac health check up. Both males and females were considered in the study. Study population has 49 normotensive male and 51 normotensive females. Prehypertensives groups have 54 males and 47 females.

Exclusion Criteria

Subjects with Diabetes mellitus (DM), obesity, respiratory disease, kidney disease, angina, thyroid disorder, & athletes were excluded from the study.

Subjects were assigned to two different groups. The anthropometric parameters as well as BP, Pulse were recorded. Subjects were briefed about the 2D – echo. Echocardiography was done in each subject to rule out any cardiac abnormality and to study the effect of prehypertension on the left ventricular structure and function using *Siemen's ACCUSON Model no.KT-LM170SDS* (Made in Germany).

Left ventricular mass (LVM) was calculated at end-diastole by using the American Society of Echocardiography (ASE) convention [13]. LV mass (ASE) = 0.8 (1.04 ([LVIDD + PWTD + IVSTD] 3-[LVIDD] 3))+ 0.6 g. Where, LVIDd = Left ventricular internal diameter in diastole, PWT = Posterior wall thickness in diastole, IVSTd = Interventricular septal thickness in diastole. LV mass index was measured as follows: LVM divided by body surface area (LVM/BSA, g/m^2). A second index was calculated by height (LVM/ht, g/m) or $height^{2.7}$ ($LVM/ht^{2.7}$, $g/m^{2.7}$) [14].

Statistical Analysis

Parameters were recorded and mean±SD was calculated using Microsoft Excel 2010 between the two groups. Unpaired t-test was used to find the significance of difference between the two groups.

Results

Table 1: Demographic Profile of Male Study Group

Variables	Normotensives (n=49) Mean±SD	Prehypertensives (n=54) Mean±SD	p - value
Age (yrs)	45.55±13.27	44.03±11.84	0.5
Height (metre)	1.73±0.05	1.72±0.05	0.3
Weight (Kg)	71.98±6.42	70.11±6.43	0.1
BMI (Kg/m2)	22..92±1.19	23.26±1.19	0.7
BSA (Kg/m2)	1.86±0.11	1.84±0.10	0.3

Table 2: Demographic Profile of Female Study Group

Variables	Normotensives (n=51) Mean±SD	Prehypertensives (n=47) Mean±SD	p - value
Age (yrs)	42.0±11.06	42.0±12.83	1
Height(metre)	1.55±0.04	1.54±0.06	0.3
Weight (Kg)	54.18±5.05	53.03±7.59	0.3
BMI (Kg/m2)	22.58±1.87	23.05±1.36	0.1
BSA (Kg/m2)	1.52±0.08	1.50±0.13	0.3

Table 3: Blood Pressure & Pulse profile of Male Study Group

Variables	Normotensive (n= 49) Mean±SD	Prehypertensive (n=54) Mean±SD	P-value
Pulse(beats/min)	76.55±5.10	83.94±6.06	<0.0001
SBP (mm of Hg)	115.44±3.60	131.12±4.52	<0.0001
DBP (mm of Hg)	74.90±3.19	84.99±2.26	<0.0001
PP (mm of Hg)	40.54±2.46	46.14±3.64	<0.0001
MAP (mm of Hg)	88.41±3.12	100.37±2.69	<0.0001

Table 4: Blood Pressure & Pulse profile of Female Study Group

Variables	Normotensives (n=51) Mean±SD	Prehypertensives (n=47) Mean±SD	P-value
Pulse (beats/min)	74.25±4.58	78.74±5.81	<0.0001
SBP (mm of Hg)	112.26±3.62	128.81±4.80	<0.0001
DBP (mm of Hg)	72.63±3.33	83.90±2.52	<0.0001
PP (mm of Hg)	39.63±2.10	44.91±3.37	<0.0001
MAP (mm of Hg)	85.54±3.28	98.86±3.07	<0.0001

Table 5a: Echocardiographic Parameters in the Male Study Group

Variables	Normotensives (n=49) Mean±SD	Prehypertensives (n=54) Mean±SD	P- value
LVIDd (mm)	40.10±4.99	42.68±4.35	<0.006
PWT (cm)	9.85±1.19	10.44±1.88	<0.06
IVSTd (mm)	10.61±1.52	11.16±1.59	<0.07
LVM (gm)	136.90±40.72	163.55±50.77	<0.004
LVMI (gm/$m^{2.7}$)	30.44±8.67	37.73±11.24	<0.0004
LVMI (gm/m^2)	73.42±20.93	88.93±26.31	<0.001
LVMI(Ht)	78.37±22.71	94.92±28.78	<0.001

Table 5b: Echocardiographic Parameters in the Female Study Group

Variables	Normotensives (n=51) Mean±SD	Prehypertensives (n=47) Mean±SD	P- value
LVIDd (mm)	38.18±4.22	39.17±4.89	0.2
PWT (cm)	9.31±1.06	9.66±1.47	0.1
IVSTd (mm)	9.96±1.11	10.43±1.54	0.08
LVM (gm)	142.84±23.88	150.25±19.77	0.09
LVMI(gm/$m^{2.7}$)	38.25±5.10	39.71±5.92	0.1
LVMI (gm/m^2)	88.85±11.80	92.91±8.29	0.05
LVMI (Ht)	90.79±7.31	91.37±10.10	0.7

Discussion

PHT is a major risk factor that doubles the risk of cardiovascular disease (CVD) independent of progression to overt hypertension globally. Individuals with prehypertension have a greater risk of developing hypertension later in their life. It has been further found that it causes various structural and functional abnormalities of the heart, especially alteration in Left Ventricular (LV) geometry. The most important means of preventing the prehypertension to hypertensive state which may lead to adverse cardio-vascular events is early identification, lifestyle and dietary modification before complications develop. BMI in the prehypertensives group are in overweight category at risk in both male and female subjects according to classification of weight by BMI in adult Asians (The Asia pacific perspective) [15]. Wang W J et al. [16] also stated a positive correlation between BMI and hypertension. They have an increase in intravascular volume and cardiac output to supply the increase in metabolic demands related to increased fatty tissue. The findings of their suggested need of monitoring the anthropometry of obese children as well as children of hypertensive parents. Monika et al. [17] reported 11% of the prehypertensive males were having BMI of 25 or more while it was 2% for prehypertensive females.

Although hypertension is a well-documented independent predictor of elevated LVMI [18,19], few studies have shown the relationship between PHT and structural changes in the LV.

Our study demonstrated a strong relationship between PHT and LVMI when compared to normal BP, even after adjustment for age, gender, race, and BMI.

In prehypertensives males, there is a significant difference between the LVIDd, IVSTd, PWT, LVM and LVMI. Whereas in prehypertensives females, there is a significant difference between the LVM and LVMI (g/m2) whereas LVIDd, IVSTd, PWT shows an increased value but the difference is not significant. These parameters are the indices for the LVH. In addition, increase in salt intake and also a greater sympathetic activity are the mechanisms participating in the genesis of left ventricular hypertrophy. Elevated LVM is a well described independent risk factor for adverse CV events and is associated with development of depressed left ventricular (LV) systolic function, a precursor of heart failure. In case of prehypertensives, it may be due to early stage of hyperdynamic circulation & LV wall stress. Increased LV filling which was due to volume overload or elevated venous return, which was responsible for elevated SV but not disturbing normal systolic function. In the early stages of prehypertension, there occurs elevation of adrenergic tone typically characterized by hyperkinetic status [20].

Manios et al. [21] analyzed the impact of PHT on LVM. They found a statistically significant association between prehypertensives and LVM ($p = 0.03$) compared to normotensive patients after adjustment for baseline characteristics. Stabouli et al[22] shows that the prevalence of LVH was significantly higher in the prehypertensive compared to normotensive subjects, and was equal to that of the hypertensive subjects. Hypertension and prehypertension in children and adolescents were associated with pathologically elevated LVMI values. Our study supports this finding. Bajpai et al. [23] found that the LVM and LVMI were increased in case of prehypertensive males but were significantly increased in case of prehypertensive females. LVMI was also on the greater side. We were able to establish the importance of PHT category to the increased risk of developing future CVD. Left ventricular hypertrophy (LVH), measured by LVMI, and has been identified as the most powerful risk factor for future cardiovascular events causing morbidity and mortality [24].

Conclusion

Prehypertension is an intermediate stage between normal BP and hypertension. Prehypertension is more prevalent than hypertension. In conclusion, this data provides evidence of increased LVM and LVMI in prehypertensive patients. In prehypertensive state, these changes are generally reversible if it is diagnosed in early state. The person can be reverted back to the normal LV structure and function even by simple life style modification, low salt diet, DASH diet, and increase in physical activity, moderation of alcohol intake. Health care providers and health planners should be made aware of the large numbers of persons at increased risk for cardiovascular disease and steps should be taken to identify and treat modifiable risk factors in such persons. At the very least a proper diet and regular exercise should be recommended in these category of people.

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A Comparative Study of Sympathetic Activity in Normal and Obese Young Adults

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Abstract

Obesity among children, adolescents has emerged as one of the most serious public health concerns in 21st century together can increase the risk of cardiovascular diseases, insulin resistance and dyslipidemia. *Aims:* A comparative study between BMI & BP with CPT and Isometric handgrip dynamometer test for sympathetic activity. *Objective:* To study the sympathetic activity with normal weight young adults and obese young adults. *Material Methods:* A total of 100, of 50 normal weight and 50 obese medical and dental students in age group of 18-22 years. Each subjects Basal Blood pressure was recorded and evolution of sympathetic function test was done by using cold pressor test (CPT) and Isometric hand grip dynamometer test (IHD). Analysis of data was performed by SPSS 21. *Results:* Sympathetic activity test values between obese non obese students significant differences was observed this indicates deranged sympathetic activity in obese. *Conclusion:* Weight gain will cause sympathetic abnormality and prone to have hypertension & cardiovascular diseases.

Keywords: Cold Pressor Test; Isometric Handgrip Dynamometer; Obese.

Introduction

Obesity is a condition in which imbalance between energy intake and energy expenditure. It may have an adverse effect on health with continued rise in standards of living. Obesity is emerging as a global epidemic in both children and adults. This has been called "New world syndrome" and is a reflection of massive social, economic & cultural problems currently facing developing and developed countries [1]. Obesity can be quantified by using various anthropometric measurements and derivations. Body mass index (BMI) is such an important indicator of obesity. It has been observed that Asians are more prone to obesity – related disorders when compared with BMI – matched individual from others ethinicities [2-4]. Studies Literature suggest the ANS of obese individuals is chronically altered [5-6].

The cold pressor test (CPT) assesses the cardio vascular activity in response to any stress. An abnormal response to (CPT) cold Pressor test is a predictor to future hypertension [7]. Isometric handgrip is a classical sympathetic excitatory stimulus after used in autonomic testing [8].

The sympathetic Nervous system (SNS) plays an essential role in the regulation of metabolic and cardio vascular homeostasis. Low SNS activity has been suggested to be a risk factor for future weight gain and obesity development (Ravussin & Tatarranni 1996).

Materials and Methods

The present study was carried out on 100 Medical and Dental students of which 50 subjects BMI >30kg /m^2 were included in study group and 50 subjects were included in control group BMI 18-24.9 kg/m^2. The age group of 18-22 years leading a sedentary life style was included.

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Exclusion Criteria: Suffering from any clinical diseases likely to affect ANS. History of smoking / alcohol / drug abuse.

The present study was conducted at Malla Reddy Health city Suraram, Jeedimetla, Hyderabad. After obtaining the prerequisite approval from Institutional ethics committee. Written informed consent was taken from each participant after describing detail procedure and purpose of the study.

All recording were done in physiology laboratory between 11-1.00pm & 2.00 to 4.00pm.

Cold Pressor Test (CPT)

The subjects were asked to take rest for 10-15min and then the basal blood pressure (BP) was recorded in sitting position by Auscultatory method. The right and of the subject is immersed up to wrist in cold water at a temp of 1-4^{0}C for 1min. Blood pressure was recorded after 30 sec &1min of submersion of the hand [9,10].

Handgrip Dynamometer Test (1HD)

Basal Blood pressure (BP) values were recorded in the sitting position. The subjects were asked to perform maximal voluntary contraction (MVC) by gripping the handgrip dynamometer as hard as possible for few seconds & the maximum force exerted was noted. The subjects were made to perform isometric exercise at 30% of the maximal voluntary contraction to the point of fatigue for 5 min then Blood pressure was recorded [9,10].

Statistical Analysis

Data was analyzed by SPSS (statistical package of social science version 21) mean standard deviation used to summarize.

The results of study were expressed in mean standard deviation and study group were compared with the control group mean standard deviation (SD).

Significant value show as $p<0.05$, non Significant value show as $p>0.05$

Result

About 50 study (obese) and 50 control (normal weight) subjects (medical & dental students) Participated in this study.

Control group: Normal weight – subjects BMI is 18.5- to 24.9 kg/m^2.

Study group: Obese – BMI is – more than 30 kg/m^2.

The mean standard deviation BMI of cold presser test & Handgrip dynamometer study group was 30.03±3.42kg/m^2 and that of control group was 22.58±1.57kg/m^2. The difference between groups was statistically significant $p< 0.05$

Table 1: Cold pressor test (CPT). Mean SD basal systolic blood pressure in study group is 116.5± 13.35mmHg and control group is 113.96±10.66 mmHg and this was statistically non significant $p > 0.05$.

Table 1: Cold Pressor Test

Parameters	**Control (Normal)** Mean ± SD	**Study (Obese)** Mean ± SD	P- Value
BMI	22.58±1.57	30.03±3.42	<0.05
Basal SBP	113.96±10.66	116.5±13.35	>0.05
Basal DBP	69.3±6.45	77.14±7.69	<0.05
CPT after 30sec SBP	135.28±9.08	130.82±9.70	<0.05
CPT after 30sec DBP	83.62±6.52	86.28±8.07	>0.05
CPT after 1 min SBP	133.26±10.45	121.98±8.74	<0.05
CPT after 1 min DBP	82.4±8.17	84.08±7.10	>0.05

Note: CPT – Cold pressor test

Table 2: Isometric handgrip dynamometer

Parameters	**Control (Normal)** Mean ± SD	**Study (Obese)** Mean ± SD	P value
BMI	22.58±1.57	30.03±3.42	<0.05
Resting SBP	113.96±10.66	116.5±13.35	>0.05
Resting DBP	69.3±6.45	77.14±7.69	<0.05
1HD after 5 min SBP	108.22±8.78	117.2±9.02	<0.05
1HD after 5 min DBP	90.76±5.14	88.88±7.13	>0.05

NOTE: Isometric Hand grip Dynamometer

The mean SD of basal diastolic Blood pressure is in study group is 77.14±7.69 mmHg and control group is 69.3±6.45 mmHg and was statistically significant p<0.05.

Cold Pressure Test (CPT) after 30sec:

Mean SD SBP in study group is 130.82±9.70 mmHg in control group is 135.28±9.08 mmHg P<0.05 statistically significant.

Mean, SD Diastolic (DBP) is 86.28±8.07 mmHg in study group, in control group 83.62±6.52 mmHg .P> 0.05 which is not significant.

Cold Pressor Test after 1 min

Mean SD SBP in study group is 121.98±8.74 mmHg & in control group mean SD SBP 133.26±10.45 mm Hg. p<0.05 significant.

Mean SD DBP in study group 84.08±7.10 mmHg and in control DBP is 82.4±1.7 mmHg p>0.05 not significant.

Table 2 Isometric Handgrip dynamometer (IHD).

The mean SD BMI of study group is 30.03±3.42 kg/m^2 and in control group is 22.58 ±1.57Kg/m^2. p<0.05 is Significant.

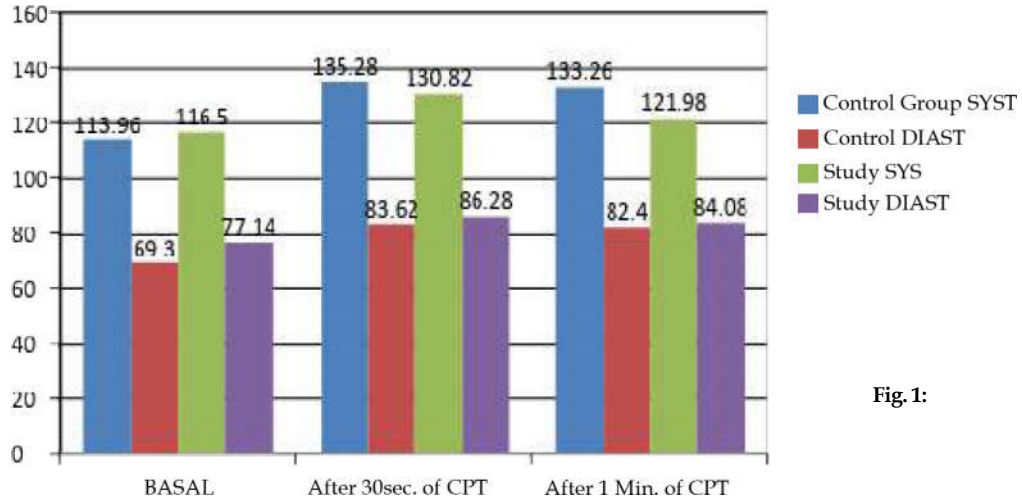

Fig. 1:

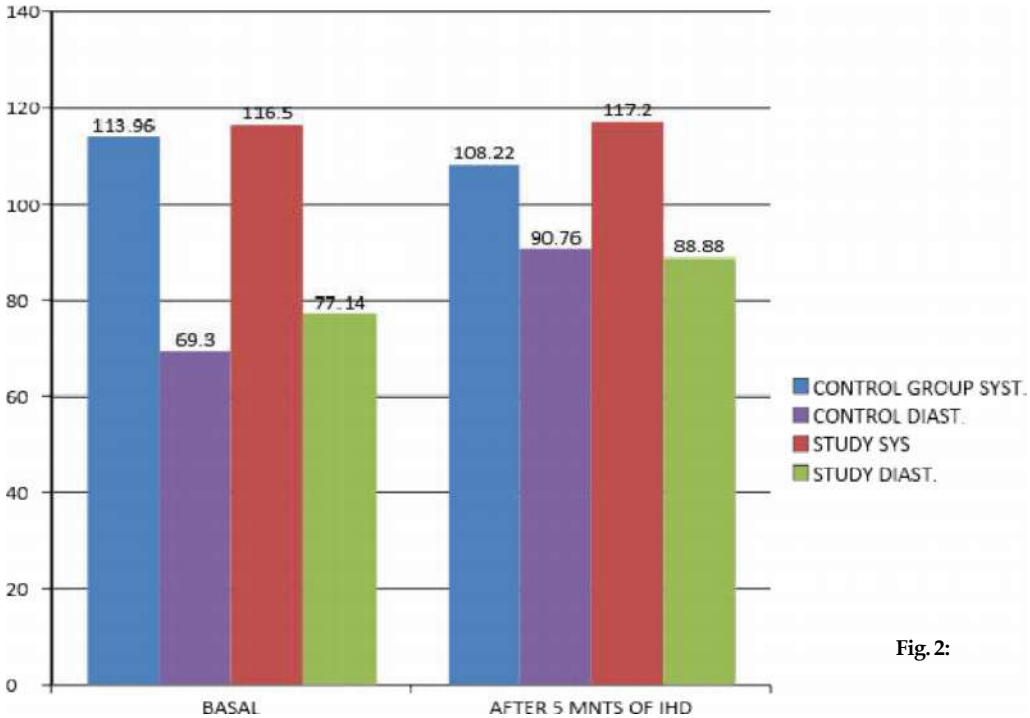

Fig. 2:

Basal SBP mean SD in study group is 116.5±13.35 mmHg and is control group is 113.96 ±10.66 mmHg p >0.05 not significant .

Basal DBP mean SD in study group is 77.14± 7.69 mmHg and control group 69.3±6.45 mmHg p <0.05 significant .

Handgrip Dynamometer after 5mins (IHD)

Mean SD SBP is 117.2±9.02 mmHg is study group in control group is 108.22±8.78 mmHg p <0.05 significant.

Mean SD DBP in study group is 88.88±7.13 mmHg and control group 90.76±5.14mmHg. p >0.05 not significant.

Discussion

Temperature affects the heart rate and blood pressure (BP). The cold pressor test used to assess a person's response to environmental stimuli. The changes in the BP after the cold pressor test helps in evaluating the cardiovascular autonomic activity to stress [11].

The present study the mean changes in systolic blood pressure & diastolic blood pressure between study group (obese) and control (normal weight) group were compared.

In obese CPT is impaired due to deceased sympathetic Nervous system activity. There was a reduced sympathetic responsiveness associated with thermo regulators demonstrated by abnormal heart rate variability on cold exposure [12].

30sec after cold pressor test raise in SBP in control group when compared to study group. where as in DBP raise is observed in study group compared to control group.

1min after CPT- raise in SBP is observed to control group, when compared to study group. DBP raised in study group but decreased in control group.

Increased in DBP after CPT in obese due to increased peripheral resistance.

Isometric exercise known to increase intramuscular pressure, decreasing active skeletal muscle blood flow and leading to accumulation of metabolites response for stimulating the metaboreflex [13,14,15].

In Handgrip dynamometer test after 5 min in control group decreased SBP was observed when compared with study group but DBP was raised in control group than study group.

Ewing et al. [16] have defined a raise of DBP of 15 mmHg or more as normal, 11-15 mmHg as border line and 10mmHg or less as abnormal, response to hand grip dynamometer test. Hence finding of our study suggested impaired Autonomic Nervous system function (both sympathetic & parasympathetic) in study group [1].

The literature mentions, in normal healthy persons sympathetic system gets activated leading to

1. Activation in cardiac sympathetic fibres causing increase in heart rate dependent increase in cardiac output and blood pressure.
2. Activation of peripheral sympathetic fibres to blood vessels causing, vasoconstriction and resultant increase in total peripheral resistance.

The obese group showed a decreased response to isometric handgrip exercise test indicating there is cardiac sympathetic activity instability [17].

The lower BP response in Obese group is more likely to be lower cardiac sympathetic activation or to a lower increase in peripheral vascular response to manoeuvres activating sympathetic system [18]. The derangements in sympathetic cardiovascular function in the form of prolonged QT interval, elevated baseline SBP, DBP and decrease in response to handgrip dynamometer exercise test in obese group points towards autonomic imbalance. This autonomic imbalance is a risk factor for CVD in obese Indians in later part of their life.

Conclusion

There was marked difference in sympathetic activity test observed in obese (BMI more than 30 kg/m^2) when compared to normal weight (BMI 18.24.9 kg/m^2) subjects. One of the predisposing factors to life style disease is stress. Medical students they are in stress during their education. CPT and IHD are non invasive, simple tests are used to screening for cardiovascular risk factors. Which helps to prevent the co morbid conditions in advance in obese.

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Study of Loss of Auditory Asymmetry in Presbyacusis

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Abstract

Introduction: Hearing loss is a social problem affecting worldwide resulting in significant health issues, communication difficulties, social withdrawal, isolation, dependence, frustration, and is strongly associated with, cognitive decline, depression and decreased quality of life [1]. Age related hearing loss (Presbycusis) [2] starts from 5th decade of life.The proposed mechanisms are lesions in the inner ear and cochlear nerve, and the loss of hair cells and spiral ganglion neurons (SGNs) [3]. In adults, the auditory function has asymmetries in right and left side resulting in right ear advantage over the left. Asymmetry at the cochlear level is called as peripheral right ear advantage and those involvingprocessing complex in brain is called central right ear advantage. In adults the cochlea of right ear is sensitive and it's affected more than left. *Aim:* Toevaluate theloss of auditory asymmetry and loss of right ear advantage in presbyacusis. *Methods:* 100 subjects aged more than 55 years (divided in to 55-60, 61-65, and >65) are taken in this study. All are subjected to a pure tone audiometric assessment followed by evaluation of their right ear advantage over their left. *Results:* The auditory thresholds of right and left ear in aged individuals showed significant loss of right ear advantage in age groups of 61-65 and>65. *Conclusion:* Elderly subjects of age group greater than 60 have severity in left earsensorineural hearing loss in all frequencies. The study showed that there is a significant loss of right ear advantage in subjects greater than 60 years.

Keywords: Presbyacusis; Sensorineural Hearing Loss; Right Ear Advantage.

Introduction

Presbyacusis, (in Greek prebys = aged, and akousis = hearing). presbyacusis, is a complex degenerative disease affecting ten million people worldwide.

Hearing loss associated with senescence may be profound, affecting cognitive, social, functional, and psychological well-being of the person. According to world health organization (1984), the term aged or elderly refers to persons aged 60 years or above. The auditory system degenerates before this elderly age. Age related hearing loss is slowly progressive, bilateral and symmetrical [1-3] and is associated with the cochlear degeneration [4,5,6]. Human brain has anatomical and functional asymmetries in both right and left cerebral hemispheres. The human left and right cerebral hemispheres are asymmetric [6,7,8].

Aim of the Study

1. To evaluate the loss of right ear advantage in aged individuals using pure tone audiometry.
2. To compare pure tone audiometric results between right ear and left ear in aged subjects between 55-70 years of age.

Objectives of the study

1. To record pure tone audiometry in all aged individuals (55-60, 61-65, and >66 years).
2. To record pure tone audiometry in right and left ear separately.

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3. To compare auditory acuity of both ears in aged individuals.
4. To analyze the loss of right ear advantage in aged individuals.

Materials and Methods

This study was performed in aged individuals greater than 60 years. They were divided into three age groups: 55-60, 61-65, and >65. A prepared questionnaire regarding hearing function, noise exposure, ear and hearing-related history, medical history, medication were used to analyze them.Pure tone audiometry was done in all age groups years after getting written informed consent from all participants or their guardians.An otoscopic examination was performed before all the tests to ensure that the ear canal was clear and that there were no obvious signs of middle ear infection or perforation in the tympanic membrane.After excluding subjects with apparent middle ear diseases after otoscopic examination, 100 subjects were included in this study.

Inclusion Criteria

1. Subjects aged 60 years or over.
2. No vestibular complaints and no history of otological surgery.

Exclusion Criteria

1. History of Outer and/or middle ear disease.
2. History of ototoxic drugs
3. Patients working in noisy environments without adequate auditory protection.
4. History of systemic diseases like diabetes and hypertension.

Audiological Tests

In all subjects nose, throat are completely examined and a detailed ear examination was performed to rule out external and middle ear abnormalities. Then Preliminary screening was done by tuning fork tests.

Tuning Fork Tests

These tests are done by three methods Rinne's, Weber's and Absolute bone conduction test using a tuning fork of frequency of 512 Hz and analysed as Air conduction and Bone conduction. Air conduction (AC) test is a measure of both conduction mechanism and cochlear function. Bone conduction is a measure of cochlear function [7].

Pure Tone Audiometry

An assessment of the hearings status using a pure tone audiometer (LABAT AUL 11036) is done. Ear phones are used to test hearing by air conduction and a small vibrator placed over the mastoid is used test hearing by bone conduction. All audiometers incorporate a calibration circuit, which allows the output sound level to be set at each frequency. The signals presented to the subject by an audiometer are characterized by its frequency, sound pressure level and wave form which are all controlled. The model has facilities for air and bone conduction with white noise masking and tone decay tests. The basic elements of the audiometer are patient tone generator, calibrator, switch, amplifier, attenuator switch and display [9].

Principle [9]:

An audiometer is an electronic device that produces pure tones, the intensity of which can be increased or decreased in 5-dB (Decibel) steps. Air conduction thresholds are measured for tones of 250, 500, 1000, 1500, 2000, 4000, 6000 and 8000 Hertz. Bone conduction thresholds are measured for 250, 500, 1000, 1500, 2000, 4000 Hertz. The amount of intensity that has to be raised above the normal level is a measure of the degree of hearing impairment at that frequency. It is charted in form of a graph called the "audiogram." The thresholds of bone conduction are a measure of the cochlear function. The difference in the thresholds of air and bone conduction (A-B gap) is a measure of a degree of conductive deafness. The audiometer is so calibrated that hearing of a normal person, both of air and bone conduction is at 0 dB and there is no A-B gap.

Sensorineural Hearing Loss: [9,1]

SNHL is indicated by raised air and bone conduction thresholds (both >25 dB) and the air bone gap does not exceed 10 dB.

Statistical Analysis

Pure tone thresholds were obtained from both ears separately by using LABAT AUL 11036. When a participant was unable to hear a tone, 5 dB above

the highest audiometer output level was recorded as the threshold. Data were presented as mean and standard deviation (SD) and evaluated with ANOVA (Analysis of variance). Statistical significance was assigned to P values of less than 0.01. A p value larger than 0.5 was considered as statistically insignificant.The data collected and analysed using epi-info (version 3.4.3) software package, SPSS and Excel software.

Results

Table 2, Figures 1 show the results in the right ear, Table 3 and Figure 2 show the results for left in all three groups. The auditory thresholds of right and left ear in aged individuals showed significant loss of right ear advantage in age groups of 61-65 and >65 suggestive of severity in left ear sensorineural hearing loss than the right ear. There was no effect of gender on the hearing thresholds of right and left ear in elderly subjects

Table 1: WHO Classification of hearing loss

WHO Classification (1980) of degree of hearing loss	
Normal	0-25 dB
Mild	26-40 dB
Moderate	41-55dB
Moderately severe	56-70dB
Severe	71-91dB
Profound	> 91 dB

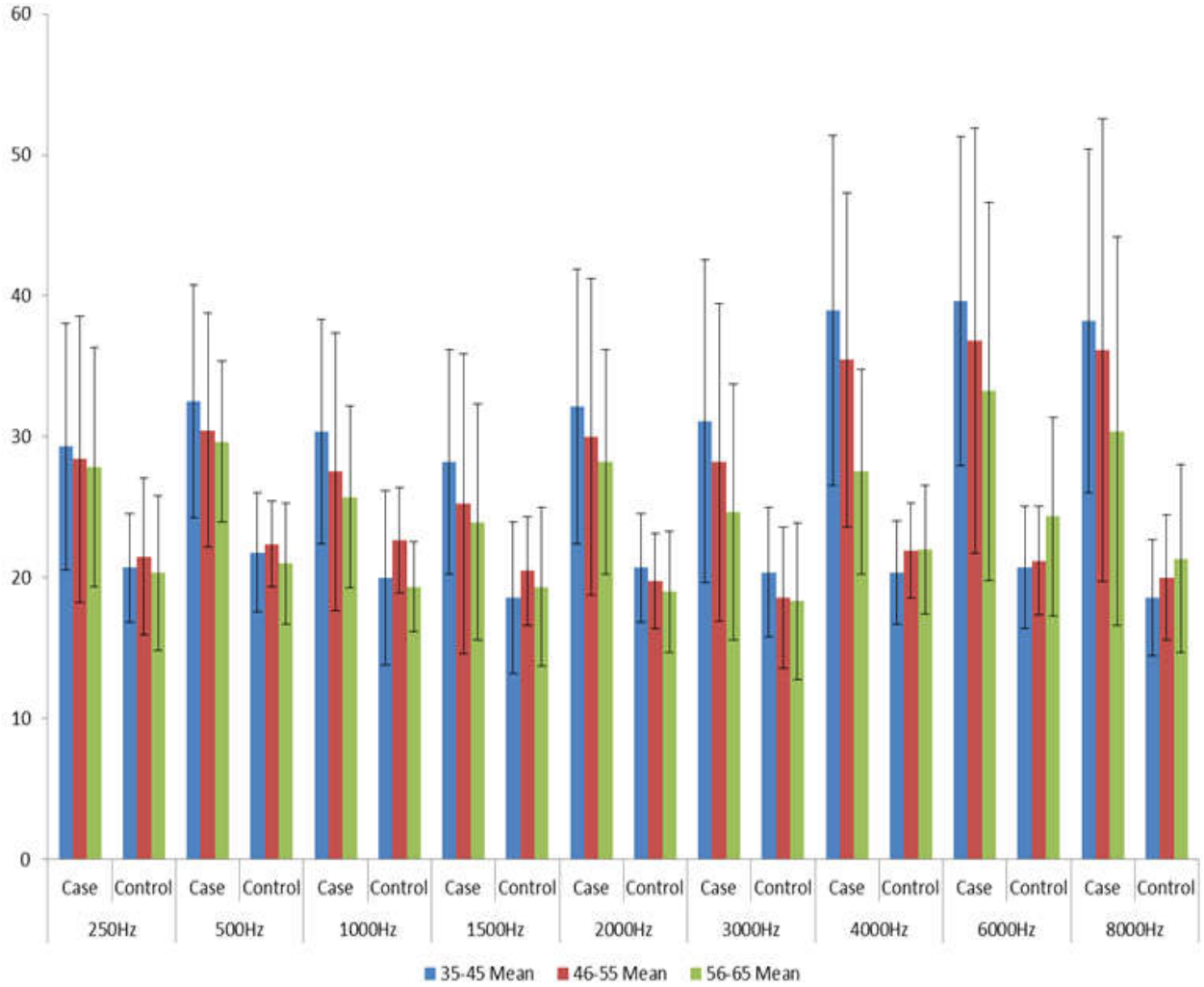

Chart 1: Right ear hearing threshold

Table 2: Right ear hearing threshold

Right	Group	Age class I Mean (dB)	I Std. Deviation	II Mean (dB)	II Std. Deviation	III Mean (dB)	III Std. Deviation	ANOVA p-value
250Hz	Case	32.86	8.93	27.05	8.40	32.50	7.78	0.072
	Control	22.14	3.78	22.14	4.35	22.33	4.17	0.989
500Hz	Case	35.36	6.34	30.00	7.56	33.93	7.89	0.085
	Control	22.14	4.26	23.33	2.89	23.67	4.42	0.525
1000Hz	Case	32.86	9.35	27.95	7.54	31.07	9.03	0.327
	Control	20.71	6.16	21.90	3.35	22.00	5.92	0.743
1500Hz	Case	27.50	9.15	25.91	8.82	27.86	7.77	0.769
	Control	20.71	6.16	22.14	3.73	19.67	6.67	0.401
2000Hz	Case	29.64	6.92	28.18	7.07	30.71	9.78	0.716
	Control	21.07	4.46	21.90	4.02	20.33	6.40	0.643
3000Hz	Case	27.14	5.45	26.36	6.60	27.86	6.39	0.902
	Control	19.29	3.85	22.14	3.73	19.00	6.87	0.112
4000Hz	Case	35.36	5.93	34.55	5.23	33.57	6.47	0.925
	Control	20.36	3.65	21.90	3.70	22.00	6.49	0.565
6000Hz	Case	36.07	7.80	39.09	8.61	42.86	9.19	0.452
	Control	20.71	4.32	20.48	3.50	20.67	7.04	0.989
8000Hz	Case	35.00	6.56	38.41	7.26	36.43	7.73	0.767
	Control	18.21	3.17	19.29	4.27	21.00	7.12	0.332

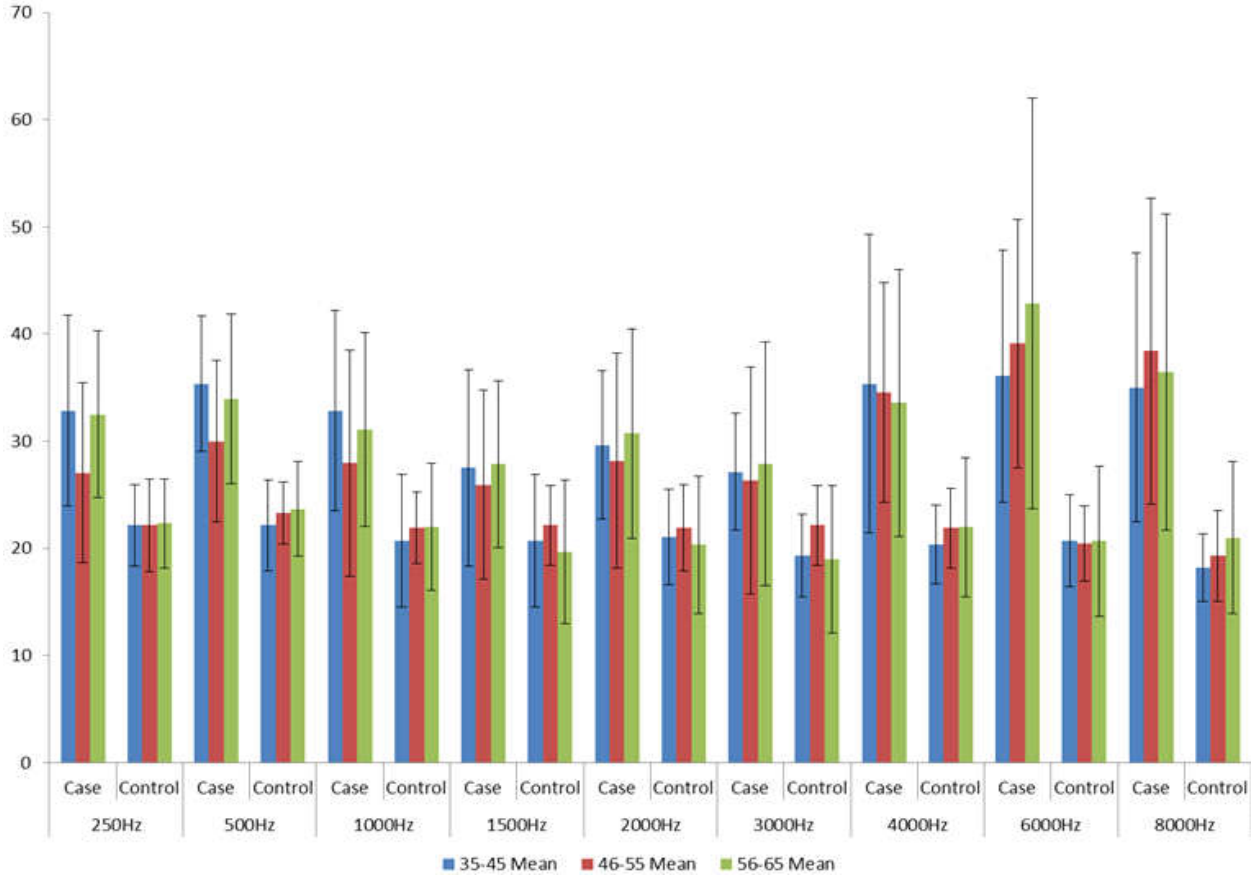

Chart 2: Left ear hearing threshold

Table 3: Left ear hearing threshold

Left	Group	Age class I Mean (dB)	I Std. Deviation	II Mean (dB)	II Std. Deviation	III Mean (dB)	III Std. Deviation	ANOVA p-value
250Hz	Case	29.29	8.74	28.41	7.16	27.86	8.48	0.920
	Control	20.71	3.85	21.48	5.55	20.33	5.50	0.792
500Hz	Case	32.50	8.26	30.45	8.30	29.64	5.71	0.594
	Control	21.79	4.21	22.38	3.01	21.00	4.31	0.562
1000Hz	Case	30.36	7.96	27.50	9.85	25.71	6.46	0.352
	Control	20.00	6.20	22.62	3.75	19.33	3.20	0.071
1500Hz	Case	28.21	7.99	25.23	7.63	23.93	8.36	0.462
	Control	18.57	5.35	20.48	3.84	19.33	5.63	0.513
2000Hz	Case	32.14	9.75	30.00	8.23	28.21	7.99	0.586
	Control	20.71	3.85	19.76	3.35	19.00	4.31	0.482
3000Hz	Case	31.07	6.47	28.18	7.29	24.64	9.09	0.296
	Control	20.36	4.58	18.57	5.04	18.33	5.56	0.500
4000Hz	Case	38.93	6.43	35.45	6.84	27.50	7.27	0.024
	Control	20.36	3.65	21.90	3.35	22.00	4.55	0.425
6000Hz	Case	39.64	7.68	36.82	7.08	33.21	6.39	0.469
	Control	20.71	4.32	21.19	3.84	24.33	7.04	0.115
8000Hz	Case	38.21	6.19	36.14	8.40	30.36	7.79	0.338
	Control	18.57	4.13	20.00	4.47	21.33	6.67	0.360

Conclusion

Elderly subjects of age group greater than 60 have severity in left ear sensorineural hearing loss when evaluated with a pure tone audiometer in all frequencies than the group less than 60 years showed right ear advantage. The study showed that there is a significant loss of right ear advantage in subjects greater than 60 years. On ageing, this right ear advantage is lost due to compromises in blood supply to cochlea resulting in severe left ear hearing impairment than right ear [10]. Further studies involving follow up of the control group over a period of years may improve our understanding of the pathology involved.

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Study of Pulmonary Function Tests in Young Adults Engaged in Gymnasium

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Abstract

Background and Objectives: As the latest modern and well equipped gymnasiums are coming up, more and more youngsters are diverting towards gymnasium. As the studies on pulmonary functions of individuals doing exercise in Gymnasium are less available, the present study was carried out to assess the pulmonary function. of young adults of 18-30 years of age group. *Method:* This study was carreid out in the department of physiology, M.G.M. Medical College, Indore with recruitment of 60 subjects. The subjects were categorized into 2 groups - study group and control group each of 30. Subjects of study group (n=30) were performing physical activity in Gymnasium for minimum two years and of control group (n=30) were M.B.B.S students not doing any regular exercise. Various lung volumes were measured by spirometer andstatistically analyzed. *Results:* It was observed that pulmonary functions of study group were greater than the control group though the difference was statistically not significant. *Interpretation and Conclusion:* Present study showsimportance of exercise in Gymnasium on lung functions.

Keywords: Gymnasium; Exercise; Pulmonary Functions.

Introduction

Exercise if performed regularly has beneficial effects on lung functions [1,2,]. In present days, people are more aware of their health hence there is increasing trend of exercise in modern gymnasium.Previously various authors have observed that persons engaged in any kind of routine physical activity have higher lung volumes along with better wellness including improvement in joint flexibility, muscle strength etc.in comparison to sedentary persons [3]. However, the lung functions of persons engaged in exercise in modern Gymnasium have been studied less so far; hence this study was taken up.

Aims and Objectives

In present study we measured the lung volumes of persons doing physical activity in Gymnasium and compare these values with pulmonary functions of young healthy adults of same age group with sedentary life style.

Methodology

Site of study – M.G.M. Medical college, Indore and Nehru stadium Gymnasium

Type of study – Cross Sectional Study

Sample size - Sixty participants

Type of sample: Purposive

Equipments Used:

Electronic weighing machine for recording weight

Stadiometer for recording height

Sphygmomanometer for recording blood pressure

Modern Computerized Pulmonary Function Test Machine for measuring lung functions

Modern Computerized Pulmonary function test machine manufactured by Ganshorn Medizin Electronic (Gmbh) Germany was used to measure the lung functions. The software used for measuring

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and interpretation has predicted values both for adults and children which are corrected to body surface area and body temperature and pressure saturated with water vapour (B.T.P.S.).

Inclusion Criteria

- Non smoker with no addiction (alcohol or tobacco)
- Engaged in exercise in Gymnasium for at least past 2 years

Exclusion Criteria

- Smokers with history of addiction
- History of any medical illness of long duration especially - respiratory illness
- History of any surgical procedure performed

This study was carried on 60 male volunteers classified into 2 groups.

Group 1: Consistsof 30 young adults (18-30 yrs) performing exercise regularly in the Gymnasium for the past 2 years.

Group 2: Consists of 30 healthy medical students, having sedentary lifestyle acted as age matched controls. After taking ethical committee clearance, an informed written consent was taken from all the participants.

All the participants were subjected to self made questionnaire to obtain information regarding relevant personal (according to Kuppuswamy's scale), past and family history with specific exercise history.

The participants of study group were engaged in the following exercises in the Gymnasium -

- Warm up exercises
- Sit ups
- Push ups
- Rock and roll movement of the abdomen
- Lying on the back, raising the legs straight and touch the floor on the back of the head
- A combination of short sprints, backward and side to side running.
- Body conditioning- Weight training, gradual, giving importance to particular muscle group. Weight training is not direct lifting of weights; it is indirect through the media of pulling etc.

Height and weight were recorded using standard protocol. Vital data - pulse and blood pressure were recorded and all the participants were examined clinically to rule out any physical illness.

Following Lung Function Parameters were Recorded

- Forced Vital capacity (FVC)
- Tidal Volume(TV)
- Inspiratory Vital Capacity (IVC)
- Inspiratory Reserve Volume (IRV)
- Expiratory Reserve Volume (ERV)
- Forced Expiratory Volume in first second (FEV_1)
- Peak Expiratory flow rate (PEF)
- Maximum Expiratory Flow Rate (MEF)

Observations

Data thus obtained were compiled, tabulated and statistically analyzed using unpaired student 't' Test.

Results

The anthropometric measurements of the two groups are shown in Table 1 the two groups did not differ significantly on these parameters except for the weight and Body surface area.

Table 2 shows the values obtained for various lung volumes and capacities

The FVC (3.71±0.30 L) and TV (0.86±0.37 L). IVC (3.69±0.42L), IRV (1.74±0.39L), and FEV1 (3.32±0.29 L/second) PEFR (7.60±1.67 L/second), MEF between 25-75% of vital capacity (MEF 25-75%, 4.54±0.87 L/second), MEF at 50% of vital capacity (MEF 50, 5.26±1.13 L/second), Maximum Expiratory Flow rate between 75-85% of vital capacity(MEF 75-85%, 7.10±1.84 L/second)in study group were higher than the control group (FVC, 3.61±0.27 L; TV, 0.69±0.16 L; IVC, 3.46±0.27 L; IRV, 1.6±0.33 L; and FEV1, 3.31±0.26 L/second), PEF, 7.10±1.59; MEF 25-75%, 4.30±0.87; MEF 50%, 5.16±1.17; MEF 75-85%, 6.37±1.71, although difference was not significant statistically ($p > 0.05$, Table 2).

The values of FEV1 as percentage of FVC (91.2 ± 5.53%), ERV(1.32±0.35L), and MEF at 25 % of vital capacity (MEF 25%, 2.46 L/second) were higher in control group than the study group. The values of FEV_1/FVC% 87.56±6.68% ; ERV, 1.22±0.30 L; and MEF 25%, 2.30±0.78), were lower in the study group; although the difference was not significant statistically (Table 2).

Table 1: Comparison of Anthropometric parameters in study and control group

Anthropometric parameter	Study group (n=30) Mean ±S.D	Control group (n=30) Mean ±S.D	p Value	Remark
Age (yrs)	21.5 ±3.39	21.4 ±3.20	0.907	Non-Significant
Height (cms)	172.47 ±5.78	169.9 ±6.09	0.1	Non –Significant
Weight (Kg)	66.96 ±6.28	59.73 ±8.73	.001	Significant
BSA in m^2	1.79 ±0.10305	1.68 ±0.13559	0.001	Significant

Table 2: Comparison of Lung volumes in study and control group

Lung volumes (Litres)	Study group (n=30) Mean ±S.D	Control group (n=30) Mean ±S.D	p Value	Remark
I V C	3.69±0.42	3.46±0.27	0.18	Non –Significant
IRV	1.74±0.39	1.6±0.33	0.61	Non –Significant
ERV	1.22±0.30	1.32±0.35	0.8	Non –Significant
Tidal volume	0.86±0.37	0.69±0.16	0.39	Non –Significant
F V C	3.71±0.30	3.61±0.27	0.84	Non –Significant
FEV_1	3.32±0.29	3.31±0.26	1	Non –Significant
FEV_1 /FVC %	87.56±6.68	91.2±5.53	0.11	Non –Significant
MEF25-75%	4.55±0.92	4.54±0.87	1	Non –Significant
MEF25%	2.34±0.42	2.46±0.60	0.89	Non –Significant
MEF50%	5.35±1.21	5.26±1.13	0.8	Non –Significant
MEF75-85%	7.13±2.18	7.10±1.84	1	Non –Significant
PEFR	7.73±2.00	7.60±1.67	0.41	Non –Significant

Discussion

Among the various parameters affecting lung volumes like age, sex, weight and race exercise is one of the important modifying parameter [4,5,6].

Exercising people have increase metabolic demand which in turn stimulate respiration thus increasing oxygen supply to the active tissues. Our study shows that regular physical activityhas a alleviatory effect on lung functions;

It is of interest that, Individuals engaged in Gymnasium had higher values of FVC, IVC, IRV, TV, FEV_1, MEF25-75%, MEF50%, MEF75-85% and PEFR than the control group; though the differences are statistically insignificant.

The possible explanation for their greater ventilator function is that with repeated continue exercise, Alveolar ventilation is increased. These increases lung volumes both at rest and during exercise. The activities performed in Gymnasium like push-ups and sit-ups required squatting and this leads to increase in intra-abdominal pressure which in turn pushes the diaphragm up. This increases the contractility of diaphragm which is an important muscle of respiration and thus increases expiratory volumes. While performing exercise for chest expansion which causes horizontal movement of rib cage and for shoulder which cause vertical movement of ribcage ultimately causes increase expansion of chest cavity thus increase the inspiratoty volumes. This Regular activity during exercise leads to the improve functioning of respiratory muscles [7,8,10].

When we compared FEV_1 as percentage of FVC we found that individual exercising in Gymnasium have less value than the control group. The reason for this is that the training of muscles of shoulder girdle leads to an increase in the vital capacity by reason of the increased strength of the accessory muscles of inspiration. The change is not accompanied by a corresponding increase in the forced expiratory volume, so the proportion of the forced vital capacity, which these subjects can expire in first second, tends to be relatively low [11].

The ERV and MEF was insignificantly ($p > 0.05$) higher in control group than study group. It indicate that these are not influenced by exercise in gymnasium [12-16]. Further longitudinal studies are required to confirm these findings.

Conclusions

Exercise in Gymnasium is a mixture of modern and traditional pattern which involved almost every group of muscles. Hence on the basis of above discussion, we can conclude that the exercise done in the gymnesium has beneficial effects on pulmonary functions in the young male adults.

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Declaration of Interest

The authors report no conflict of interest.

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Frequency Distribution of ABO and RH Blood Groups among Medical students of KRIMS, Karwar

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Abstract

Background: The knowledge of blood group distribution is important for clinical studies, for reliable geographical information and blood bank management. *Aims and Objectives*: To determine the blood group and study frequency distribution of ABO and Rh blood groups among medical students. *Materials and Methods*: Our study aimed to find out the frequency distribution of ABO and Rh blood groups among the students of Karwar medical college. For this study 299 (161 males and 138 females) medical students were included. Blood was collected by finger prick method. A drop of monoclonal anti-A, anti-B and anti – D was added to a drop of RBC suspension prepared from finger prick blood and normal saline on clean glass slides and mixed well. Results of agglutination were recorded immediately. The data was expressed as percentages. *Results:* This Study shows most frequently occurring blood group was O with 41.14% followed by B, A and AB. The frequency of B was 27.09%, A was 25.75% and AB was 6.02%. The Rh-positive percentage was 94.65% and that of Rh-negative was 5.35%. In Rh-positive blood group distribution, 'O' had maximum frequency of 39.13%, followed by 'B' 26.42%, 'A' 23.41% & 'AB' 5.69 %. In Rh-negative 'A' blood group had maximum frequency of 2.34%, followed by 'O' 2.01%, 'B' 0.68%, 'AB' 0.33%. *Conclusion*: It can be concluded that among ABO system, O blood group frequency is more common in both sexes than other blood groups and AB being the least. Rh-positive blood group distribution frequency is more common than Rh-negative.

Keywords: ABO Blood Group; Rh Typing; Frequency Distribution; Medical Student.

Introduction

The membranes of human red cells contain a variety of blood group antigens, which are also called agglutinogens. The most important and best known of these are the A and B antigens, but there are many more. The A and B antigens are inherited as Mendelian dominants, and individuals are divided in to four major blood types on this basis. Type A individuals have the A antigen, type B have the B, type AB have both, and type O have neither. Aside from the antigens of the ABO system, those of the Rh system are of the greatest clinical importance. The Rh factor, named for the rhesus monkey because it was first studied using the blood of this animal, is a system composed primarily of the C, D and E antigens, although it actually contains many more. Unlike the ABO antigens, the system has not been detected in tissues other than the red cells. D is by far the most antigenic component, and the term Rh-positive as it is generally used means that the individual has agglutinogen D. The D protein is not glycosylated and its function is unknown. The Rh-negative individual has no D antigen and forms the anti-D agglutinin when injected with D positive cells [1].

ABO and Rh blood groups are the most important blood groups despite the long list of several other blood groups discovered. All human populations share the same blood group systems and they differ in the frequencies of specific types. The frequency distribution of ABO and Rh groups varies markedly in different races, ethnic groups, and socio-economic groups in different part of the world [2-3].

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Knowledge of frequency distribution of blood group is essential for clinical studies and it provides access to safe supply of blood which will help significantly in reducing the preventable deaths. Therefore, it is essential to have statistics on the frequency distribution of these blood groups in any given population.

The frequency distribution of ABO and Rh blood groups vary from one population to another. In this regard, present cross sectional study was conducted to find out the ABO and Rh blood group frequency distribution among medical students of KRIMS, Karwar.

Methodology

This study was conducted on medical students who volunteered to take part in the study, in the Department of Physiology at Karwar Institute of Medical Sciences (KRIMS), Karwar. The Institutional ethical committee clearance was obtained and informed consent was taken from volunteers. All the students included in the study were 18 to 22 years of age group, healthy and were apparently free from diseases.

Total of 299 medical students, volunteered to participate in the study. Out of 299 students, 161 were males and 138 females. The ABO blood grouping and Rh typing was determined by glass slide method, after collecting blood samples by finger prick method under aseptic precautions. Blood samples were collected from one of the middle three fingers and three separate glass slides marked as A, B and D were used to detect A, B, AB, O group and whether they belonged to Rh-positive or Rh-negative. Commercially available standard anti sera – anti A, anti B and anti D were used for the agglutination test for detection of blood group. Glass slides marked as A, B and D was used to mix suspended RBCs with monoclonal anti-A, anti-B and anti-D anti sera. Separate applicator sticks were used to mix blood drop with anti sera for three glass slides to avoid false results. The mixture observed for agglutination, both macroscopically and microscopically for confirmation and carefully compared with the control.

The glass slide method of blood group determination is based on antigen antibody agglutination. The antigen present on the membrane surface of RBC agglutinates with the agglutinins present in the antisera. Hence, blood group was determined based on agglutination with the corresponding anti sera. If agglutination was observed in the blood drop on slide marked A, then it belongs to A blood group, agglutination in blood drop slide B, B group, agglutination in both A and B drops, AB group and if there was no agglutination in both A and B drops, then O group. Similarly, agglutination in blood drop on glass slide marked D was considered as Rh-positive and no agglutination as Rh negative. The data was expressed as percentages

Statistical Analysis

The data was analyzed and final results were listed according to frequency distribution of ABO and Rh blood groups. Data was expressed in percentages.

Results

The study was conducted on healthy 299 medical students. Out of 299 students, 161 were males and 138 females. The frequency distribution of the ABO blood group is shown in Table 1. The ABO blood group frequency distribution of the medical students showed that blood group 'O' was most common which showed highest frequency 123 (41.14%), followed by 'B' 81 (27.09%), 'A' 77 (25.75%), & 'AB' 18 (6.02%) as shown in Table 1. The frequency distribution of the Rh blood group is shown in Table 2. It shows that frequency of Rh-positive is highest 283 (94.65%) and Rh-negative being lowest 16 (5.35%). The distribution of the ABO and Rh blood group is shown in Table 3. The gender wise distribution of the ABO and Rh blood group is shown in Table 4. Among most frequently occurring 'O' group, males were 69 (56.1%) & females 54 (43.9%) while among least frequent 'AB' blood group, females were 10 (55.6%) & males 8 (44.4%). In Rh positive blood group distribution, 'O' blood group had maximum frequency of 117 (41.4%), followed by 'B' 79 (27.91%), 'A' 70 (24.73%) & 'AB' 17 (6 %). In Rh Negative blood group distribution, 'A' blood group had maximum frequency of 7 (43.8%), followed by 'O' 6 (37.5%), 'B' 2 (12.5%), 'AB' 1 (6.2%). Among Rh positive males & females same blood group distribution was there i.e. 'O', 'B', 'A'& 'AB. In Rh negative males 'A' blood group had maximum frequency followed by 'O' with equal distribution in 'A' & 'AB', while in females 'A' blood group had maximum frequency followed by 'O' and 'B' while there was no single female from blood group 'AB'.

Table 1: Distribution of ABO Blood Group System among medical Students

S. No	Blood Group	Subjects	Percentage
1	A	77	25.75
2	B	81	27.09
3	AB	18	6.02
4	O	123	41.14

Table 2: Showing Distribution of Rh group among Medical Students

S. No	Blood Group	Subjects	Percentage
1	Rh Positive	283	94.65
2	Rh Negative	16	5.35
3	Total	299	100

Table 3: Showing distribution of ABO and RH blood groups among medical students

S. No	Blood Group	Subjects	Percentage
1	A Positive	70	23.41
2	B Positive	79	26.42
3	AB Positive	17	5.69
4	O Positive	117	39.13
5	A Negative	7	2.34
6	B Negative	2	0.68
7	AB Negative	1	0.33
8	O Negative	6	2.01
9	Total	299	100

Table 4: Showing gender wise distribution of ABO and RH blood groups among medical Students

ABO	Males (n=161)			Females (n=138)			Total (n=299)		
	Rh Pos.	Rh Neg	Total	Rh Pos.	Rh Neg.	Total	Rh Pos.	Rh Neg.	Total
A	37	4	41	33	3	36	70	7	77
B	42	1	43	37	1	38	79	2	81
AB	7	1	8	10	0	10	17	1	18
O	66	3	69	51	3	54	117	6	123
Total	152	9	161	131	7	138	283	16	299

Discussion

Blood group distribution knowledge is important because of access to safe and sufficient blood supply. This helps in reducing many preventable deaths. This knowledge is also important for clinical studies and geographical information. Even in modern medicine, the blood group system is important because of the relation between different blood groups with different diseases and environment.

In the current study the distribution of blood group O was the highest and the commonest with 41.14% followed by B, A and AB. The frequency of B was 27.09%, A was 25.75% and AB was 6.02% as shown in Table 1. Our study findings are in agreement with previous studies. The same prevalence O>B>A>AB has been reported by many research studies, Hemlatha [4], Hussain et al. [5], Swamy GG et al. [6], Thenmozhi S et al. [7], Mahaptra B, Mishra N [8], Kohli PG et al. [9], Sasekala M, Saikumar P [10], and Manjit Kaur et al. [11]. Contrary to our study prevalence of blood groups was found in other studies, SK Mishra et al. [12], Singh et al. [13], Ajay Kumar et al.[14], Tulika C et al. [15], Sidhu S et al. [16], Patil SV et al. [17], Roy B Banerjee et al. [18], and Abhishekh B et al. [19] .

Our study further confirmed that Rh-positive has the highest percentage frequency while Rh-negative has the lowest percentage frequency. The total Rh-positive percentage was 94.65% and that of Rh-negative was observed to be 5.35%. In Rh-Positive blood group distribution, 'O' blood group had maximum frequency of 39.13, followed by 'B' 26.42%, 'A' 23.41% & 'AB' 5.69%. In Rh-negative blood group distribution, 'A' blood group had maximum frequency of 2.34%, followed by 'O' 2.01%, 'B' 0.68%,

'AB' 0.33%. These findings are similar to previous studies conducted by Hemlatha [4], Parmanik T, Parmanik S [20], and Khan MN et al. [21], etc. There were no gender wise differences in the frequency distribution of ABO and Rh blood group systems as shown in Table 4, but in Rh negative males 'A' blood group had maximum frequency followed by 'O' with equal distribution in 'A' & 'AB', while in females 'A' blood group had maximum frequency followed by 'O' and 'B' while there was no single female from blood group 'AB'.

The distribution of ABO blood group varies regionally, ethnically and from one population to another. Every transfusion centre must have a statistical record of frequency of blood group system in their population.

Our study findings are consistent with observations of many previous and current studies conducted in India and around the world on frequency distribution of major blood groups that was reporting 'O' blood group as the most common and the of Rh-positive factor frequency more than Rh–negative.

Conclusion

This study highlights the frequency distribution of ABO and Rh-blood group among medical students and from our study it can be concluded that blood group O was observed to be more common in both sexes among the medical students studied whereas AB blood group was observed to be the least. Rh-positive blood group was most common in both sexes than Rh negative. Everyone must know their blood group. This knowledge helps to save lives during medical emergency when a transfusion is required. Printing blood group information of individuals on identity cards driving licenses etc will be of tremendous use in case when urgent transfusion is required. Knowledge of blood group and routine practice of blood typing and cross matching may reduce complications caused by the mismatched transfusion reactions.

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A Comparative Study of Cardiovascular Changes during Three Trimesters of Pregnancy with Nonpregnant Controls

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Abstract

Introduction: The physiological changes during pregnancy facilitate the adaptation of the cardiovascular system to the increased metabolic needs of the mother enabling adequate delivery of oxygenated blood to the peripheral tissues and to the fetus. The present study was designed to compare the cardiovascular changes at different trimesters of pregnancy with the nonpregnant women. *Materials and Methods:* It is a cross sectional study conducted in the Department of Physiology after institutional clearance and consent from all the participants,150 pregnant women in the age group of 20-35yrs who were attending the OPD of OBG were recruited and divided into 3 subgroups comprising 50 women in first, second and third trimesters of pregnancy. The control group was comprising of another apparently healthy age matched 50 non-pregnant women. The anthropometric, Blood pressure and ECG were recordedduring morning hours. *Statistical Analysis:* The data were expressed as Mean±SD. Z test was used for comparison between control and study groups andwithin the study group. 'p' value of 0.05 or less was considered as statistically significant. *Result:* There was a significant increase in the pulse rate of the subjects in the 1st, 2nd and 3rd trimesters of pregnancy when compared to the control group (p=0.0001) and a significant decrease in SBP in the 1st and 2nd trimester of pregnancy compared to control group (p=0.0146 and 0.0001 respectively). The MAP was significantly decreased in the 2nd trimester of pregnancy compared to control group (p=0.0003) whereas, the decline was insignificant 1st and 3rd trimesters of pregnancy (p=0.596 and 0.638 respectively). *Discussion:* The pregnancy induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of mother & fetus. The overall decrease in vascular tone in response to an unknown endocrine stimulus represents the very first adaptive change in cardiovascular system giving rise to both an increased vascular capacity and a decreased filling state.

Keywords: Pregnancy; BP Responses; ECG Changes; Trimesters.

Introduction

Pregnancy is considered to be the most beautiful and enriching experience in the life of a woman. It is characterized by profound changes in the function of virtually every regulatory system in the human body. In pregnant women, large number of local and systemic changes are known to occur. These changes will continue throughout pregnancy [1] especially cardiovascular changes such as increase in heart rate, cardiac output and intravascular volume. The physiological changes during pregnancy facilitate the adaptation of the cardiovascular system to the increased metabolic needs of the mother enabling adequate delivery of oxygenated blood to the peripheral tissues and to the fetus [2]. In the absence of these adaptations, incidence of gestational complications such as fetal growth restriction and pregnancy induced hypertension are known to increase.

In normal pregnancy, functional systolic murmurs are quite common. They are heard over the precordium. It is of great importance to document the presence or absence of the systolic murmur and to identify it as innocent or pathologic [3]. Heart diseases contribute significantly to

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maternal mortality throughout the world. Although heart diseases rarely occur during pregnancy, it is a fact that greater number of women with known or potential heart diseases are becoming pregnant [7]. Hemodynamic changes during pregnancy play a major role in the induction of arrhythmias. The increased incidence of arrhythmias during pregnancy is also reported [4].

The anatomical, physiological and biochemical adaptations to pregnancy are profound. Many of these changes begin soon after fertilization and continue throughout gestation. During pregnancy and puerperium, there are remarkable changes in the heart and circulation. The most important changes in cardiac function occur in the first eight weeks of pregnancy [5].

During pregnancy, a great deal of new maternal tissue is synthesized, especially in the uterus and the breasts. These areas show an increase in the size of the vascular bed. The blood volume increases during pregnancy to fill the enlarged vascular bed. There is also redistribution of blood. Both plasma volume and red cell mass increase in proportion to the duration of gestation to about 1000ml and 250ml respectively above non-pregnant values. The total increase in blood volume is about 25-30%. But, the percentage increase of plasma is almost 50% while that of red cells is only 18%. This shows that there is a much greater increase in plasma than in cells, which is a fundamental feature of pregnancy [6].

The demands for an increased flow of blood during pregnancy are met mainly by increasing the cardiac output. In an average non-pregnant woman, cardiac output is about 4.5 liter per minute. At the eighth month of pregnancy, this rises to about 5.5L. The cardiac output rises to a peak in the middle of pregnancy and thereafter slowly declines thereafter though it still remains 1 L/min above the non-pregnant values [7]. The decline in cardiac output in late pregnancy might be due to postural changes. In the supine position, the large uterus often impedes cardiac venous return. It can decrease to about 20% less in supine position as compared to the lateral recumbent position [5].

In normal pregnancy, the blood pressure in first few months is similar to that of non-pregnant woman. In the middle three months, however, the blood pressure tends to fall on an average by about 3-5 mm Hg. But sometimes the blood pressure drop may be of the order of 20-30 mm Hg, though the patients seem not to suffer at all from this. In the last three months of pregnancy, the blood pressure slowly rises again until it comes back to the normal non-pregnant level [8]. With this background, the present study was designed to compare the cardiovascular changes atdifferent trimesters of pregnancy with the nonpregnant women.

Materials and Methods

It is a cross sectional study conducted in the Department of Physiology, Shimoga institute of Medical Sciences, Sagar Road, Shivamogga. The study was undertaken to determine the ECG and blood pressure changes in 1st, 2nd& 3rd trimesters of pregnancy. The observations were compared with age matched healthy non-pregnant women.

One hundred fifty pregnant women in the age group of 20-35yrs who were attending the OPD of OBG were included in the study group. The study group was in turn divided into 3 subgroups. Each sub group was comprising of 50 women in first, second and third trimesters of pregnancy. The control group was comprising of another apparently healthy age matched 50 non-pregnant women.

The nature and purpose of the study were explained to the subjects who had volunteered for the study. From each participant an informed consent was obtained. A proforma was used to record the relevant information from each selected individual who had fulfilled inclusion criteria. The subjects who had exclusion criteria were dropped from the study. A thorough physical & systemic examination of each subject was done (in particular,cardiovascular and respiratory system). Recordings were taken during morning hours between 9 am to 12 Noon.

Apparently healthy subjects of Indian origin were included in the study. The apparent health status of the subject was determined through thorough clinical examination and history taking.

Subjects with history or clinical signs of cardiovascular diseases, acute respiratory infection in the previous three months, history of diabetes mellitus, hypertension, history of tobacco consumption in any form, history of alcohol intake, any endocrine disorders, obesity and with moderate to severe anemia were excluded.

Statistical Analysis

The results were expressed as Mean±SD for continuous data and number and percentages for

categorial data. Z test was used for comparison between control and study groups and Z test was used for comparison within the study group. Categorial data was analyzed by Chi- square test. A 'p' value of 0.05 or less was considered as statistically significant.

Results

In the present study, we have recorded the anthropometric, physiological & ECG parameters in control and study groups.The mean values of age, height, weight, body mass index and body surface area were shown in Table 1. In our study, there was no much change in all the anthropometric parameters of the subjects between study and control groups.

There was a significant increase in the pulse rate of the subjects in the 1st, 2nd and 3rd trimesters of pregnancy when compared to the control group (p=0.0001, Table 2, 3, & 4). Our study revealed a significant decrease in SBP in the 1st and 2nd trimester of pregnancy compared to control group (p=0.0146 and 0.0001 respectively, Table 2, 3, & 4) but there was no significant difference in SBP at 3rd trimesters of pregnancy as compared to controls (p=0.17, Table-2,3, & 4). DBP was shown to be significantly decreased in the 2nd trimester of pregnancy compared to control group (p=0.0001) whereas, the decline was insignificant 1st and 3rd trimesters of pregnancy (p=0.378 and 0.441 respectively, Table 2, 3, & 4). The pulse pressure did not show any significant variation at any trimester of pregnancy as compared to controls.

The mean arterial blood pressure (MAP) was shown to be significantly decreased in the 2nd trimester of pregnancy compared to control group (p=0.0003) whereas, the decline was insignificant 1st and 3rd trimesters of pregnancy (p=0.596 and 0.638 respectively, Table 2, 3, & 4).

Table 1:Mean±SD and Range of Age andAnthropometric Parameters of subjects in Control andStudy Groups

Parameters	Control Mean ± SD	1st Trimester Mean ± SD	2nd Trimester Mean ± SD	3rd Trimester Mean± SD
Age (yrs)	26 + 3.43	25.12 ± 3.37	24.12±4.02	24.58 ± 3.47
Height (cms)	152.2 ± 0.06	154.4 ± 0.05	153.2±0.06	153.6± 0.06
Weight (kg)	52.38 ± 3.71	52.2 ± 7.00	55.22±6.53	59.60 ± 9.19
BMI (kg/m^2)	21.63 ± 2.12	21.75 ± 3.00	23.81±2.46	25.96 ± 3.42
BSA (Sq m)	1.48 ± 0.06	1.48 ± 0.10	1.53±0.45	1.53 ± 0.14

Table 2: Mean ± SD and Range of Physiological Parameters of subjects in Control and Study groups

Parameters	Control Mean± SD	1st trimester Mean ± SD	2nd trimester Mean ± SD	3rd trimester Mean ± SD
PR(beats/min)	76.32 ± 4.12	82.28 ± 7.84	87.82 ± 8.70	95.12 ± 6.88
SBP (mm Hg)	118.66±4.40	115.60 ± 7.67	109.56 ± 5.68	117.56±7.94
DBP (mm Hg)	74.32 ± 4.75	73.36 ± 5.97	66.52± 5.68	75.60 ± 7.41
PP (mm Hg)	44.34 ± 5.47	42.44 ± 7.81	43.20 ± 5.33	42.44 ± 8.33
MAP (mm Hg)	88.94 ± 5.72	88.32 ± 5.80	80.90 ± 4.19	89.45 ± 7.26

Table 3: Test of Significance for Physiological Parameters Using Z Statistics between Control and Study groups

Parameters	Control & 1st trimester Z-Value	Control & 1st trimester P-Value	Control & 2nd trimester Z-Value	Control & 2nd trimester P-Value	Control & 3rd trimester Z-Value	Control & 3rd trimester P-Value
PR (beats/min)	4.75	0.0001***	4.37	0.0001***	5.25	0.0001***
SBP (mm Hg)	2.44	0.0146*	3.01	0.0001***	1.38	0.17
DBP (mm Hg)	0.88	0.378	3.09	0.0001***	0.77	0.441
PP (mm Hg)	1.40	0.161	1.75	0.080	1.34	0.180
MAP (mmHg)	0.53	0.596	2.59	0.0003*	0.47	0.638

p>0.05: Not Significant, *p: <0.05: Significant, ** p: <0.01: Highly significant, *** p: <0.001: Very highly significant

Table 4: Test of Significance for Physiological Parameters Using Z Statistics within the subgroups of Study group

Parameters	1st& 2nd trimesters		1st& 3rdtrimesters		2nd& 3rd trimesters	
	Z-Value	P-Value	Z-Value	P-Value	Z-Value	P-Value
PR (beats/min)	3.34	0.0001***	7.75	0.0001***	4.1	0.0001***
SBP (mm Hg)	4.47	0.0001***	1.45	0.147	7.04	0.0001***
DBP (mm Hg)	6.47	0.0001***	2.11	0.034*	10.09	0.0001***
PP (mm Hg)	0.56	0.575	0.0	1	0.71	0.477
MAP (mm Hg)	7.33	0.0001***	1.12	0.262	10.21	0.0001***

p>0.05: Not Significant, *p: <0.05: Significant, ** p: <0.01: Highly significant, *** p: <0.001: Very highly significant.

Discussion

Pregnancy is a normal physiological process. It induces widespread circulatory adaptations in the mothers. The pregnancy induced changes in the cardiovascular system develop primarily to meet the increased metabolic demands of mother & fetus.

Both structural and functional changes are known to occur in the heart and vessels due to pregnancy. Ventricular dimensions, heart rate, cardiac output, vascular compliance and capacitance will increase whereas peripheral resistance and blood pressure decrease during pregnancy. Many of these changes are induced by gestational hormonal milieu which influences vessel structure, basal tone and reactivity via receptors for chorionic gonadotropin, estradiol and progesterone located in vascular endothelium and smooth muscle [9].

Despite the increased work load on the heart during gestation, the healthy pregnant women have no impairment of cardiac reserve. An understanding of these changes and the mechanism involved would be helpful in deciding on the optimal management of pregnant women with preexisting cardiovascular diseases as well as potentially useful in the prevention of gestational complications associated with inadequate maternal hemodynamic adaptation [10].

Electrocardiography is one of basic tools in the investigation of cardiovascular diseases. The electrocardiogram during normal pregnancy may show wide variation from the normal accepted. These variations may be due to the changed spatial arrangement of the chest organs as well as changed electrical properties of the myocardium. These changes are in turn due to sympathetic and hormonal modulation of cardiac electrical activity during pregnancy [11,12].

There was a significant increase in the pulse rate of the subjects in the 1st, 2nd and 3rd trimesters of pregnancy when compared to the control group. Our study revealed a significant decrease in SBP in the 2nd trimester of pregnancy compared to control group and also when compared to 1st and 3rd trimesters of pregnancy.DBP was shown to be significantly decreased in the 2nd trimester of pregnancy compared to control group and also when compared to 1st and 3rd trimesters of pregnancy.

In the normal course of pregnancy, the blood pressure during the first few months is similar to that of pre-pregnant women. During the middle 3 months of gestation, the blood pressure tends to fall by an average of 3-5mm Hg. Sometimes, the drop may be up to 20-30 mm Hg [11]. The blood pressure both SBP and DBP tend to fall in early pregnancy reach nadir in the second trimester of pregnancy and return towards pre-pregnant level at term. Fall in blood pressure is due to fall in systemic vascular resistance. The overall decrease in vascular tone in response to a yet unknown endocrine stimulus represents the very first adaptive change in cardiovascular system giving rise to both an increased vascular capacity and a decreased filling state. In early pregnancy, an overall decrease in vascular tone leading to a systemic vasodilatation and rise in arterial compliance. The arterial blood pressure and vascular resistance tend to normalize during the 3rd trimester of pregnancy [12].The present study is in agreement with the findings of studies [13,14].

Conclusion

The increase in heart rate may have been triggered to maintain the cardiac output in a state of relative hypovolemia. The increase in heart rate was due to a decrease in vagal baroreflex as well as a decrease in parasympathetic tone. The increase in heart rate mainly during third trimester of pregnancy compensates for the fall in the stroke volume resulting from caval compression.

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The Effect of Anticholinergic Drug on Thermoregulation in Paediatric Patients

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Abstract

Introduction and Objectives: Delayed discharge of paediatric patients due to post-surgical fever is frequently observed in patients anaesthetized with Ketamine and Glycopyrrolate. Hence the present study was done to evaluate and compare the body temperature of paediatric patients with and without pre-anaesthetic medication with Glycopyrrolate. *Material and Methods:* A randomised, double blind prospective study was done on 40 paediatric patients of age 1 – 8 years posted for lower abdominal surgeries. The patients were randomly allocated into two groups, Group I – Glycopyrrolate group, receiving 0.005mg/Kg i.v. glycopyrrolate and Group II – Placebo group, receiving the equivalent volume of normal saline .Both groups were treated with ketamine – 3mg/kg with caudal block after 30 mins of premedication. *Inclusion criteria* - paediatric patients of age 1-8 years posted for lower abdominal surgeries. *Exclusion criteria* – patients with fever, Upper respiratory tract infection, Bilateral Surgeries, Syndromic child, history of increased oral secretions, surgeries more than 1hr duration were excluded. The tympanic temperature of all the patients were recorded pre-operatively for baseline body temperature and at 0, 30, 60, 90 mins post – operatively. The intra-operative quantity of oral secretions in both the groups was measured using VAS score. *Result:* The body temperature was significantly higher in Glycopyrrolate group than placebo group at 30, 60, 90 mins post – operatively. The salivation was significantly less in glycopyrrolate group than placebo group. *Conclusion:* The routine use of Glycopyrrolate as pre-anaesthetic adjunct with Ketamine should be considered after weighing the risk of post-operative hyperthermia.

Keywords: Anticholinergic Drug; Glycopyrrolate; Ketamine; Salivation; Temperature.

Introduction

Sedating a child for surgical procedures has always been a challenge [1]. Ketamine, a dissociative agent allowing potent sedation, analgesia and amnesia during painful procedures with minimal respiratory depression is generally used [1]. Hypersalivation and increased oral secretions is one of the most common adverse effect of Ketamine [2]. Hence, Ketamine is always used with an adjunctive anti-cholinergic drug such as Glycopyrrolate to limit excessive secretions [2]. There are many studies with controversial findings about role of anticholinergic drugs when used as an adjunct with Ketamine in suppressing oral secretions [1]. But it has always been used routinely. Delayed discharge of paediatric patients due to post- surgical fever is frequently observed in patients anaesthetized with Ketamine and Glycopyrrolate. Hence, the present study was done to evaluate the risk of hyperthermia in patients given anticholinergic drug (Glycopyrrolate) as adjunct with Ketamine.

Material & Methods

The present study is a randomised double- blind prospective study done in 40 paediatric patients of age group 1 – 8 yrs who were posted for lower abdominal surgeries requiring sedation and analgesia at the Department of Anaesthesia in a

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Rural Medical College. Written informed consent was taken from parents and guardians of all patients after explaining the process and procedure of study in detail. The study was approved by local ethical committee. *Inclusion criteria*- pediatric patients of age 1-8 years posted for lower abdominal surgeries. *Exclusion criteria* – patients with fever, Upper respiratory tract infection, Bilateral Surgeries, Syndromic child, history of increased oral secretions, Surgeries more than 1hr duration were excluded The patient was randomly allocated in two groups –

Group I – Glycopyrrolate group-(20 patients) – Given 0.005mg/Kg Glycopyrrolate

Group II – Placebo group-(20 patients) –Given Equivalent quantity of normal saline

Rossmax RA600 infrared ear thermometer was used to measure the tympanic temperature. As tympanic membrane thermometry is reliable, accurate, easy to use and quick [3]. Baseline tympanic temperature was recorded preoperatively in both the groups.

Both the groups were given caudal block in lateral position with 0.5ml/kg of equal amount of 1% lignocaine with 0.25%bupivacaine after giving i.v. ketamine 3mg/kg after 30 min of premedication in operation theatre. Oxygen was given by face mask at 5L/min. ECG, SPO_2, HR & BP were monitored. The researcher who recorded the data and the patients were blinded. The quantity of saliva produced was assessed during surgery by VAS score from 0 to 100, 0-means no secretion, 100 means very high secretions. Incidence of any desaturation, bronchospasm, conversion to General anesthesia with ET tube were noted in both groups. After surgery, tympanic temperature was measured immediately (0 min) and at 30, 60 & 90 mins postoperatively. The statistical analysis was done using 2-sided unpaired t test.

Results

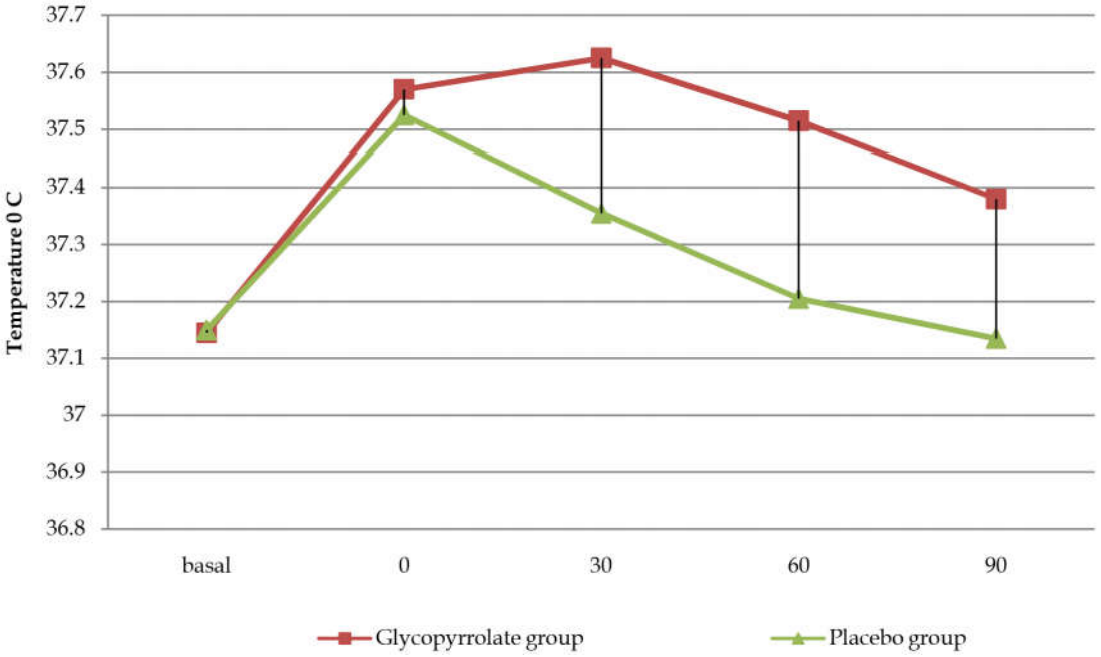
The mean ± S.D. of age, weight, duration of surgery and basal body temperature did not show any statistically significant difference in both the groups Table 1. Table 2 shows data regarding body temperatures at 0, 30, 60, 90 mins after procedure in both the groups. The basal and immediate postoperative (0min) temperature did not show any statistically significant difference in both the groups. But the temperatures recorded at 30, 60, 90 mins post-operatively is significantly increased in Group 1 receiving Glycopyrrolate than in group II receiving Normal saline i.e. Placebo. The temperature of the patients in placebo group reached the basal body temperature by 90 min whereas temperature continued to be increased in patients of glycopyrrolate group even at 90 mins. The salivation was significantly less in glycopyrrolate group as compared to placebo group.

Table 1: Comparison of Age, weight, duration of surgery and basal body temperature in both the groups

Characteristic	Glycopyrrolate Group (Mean±SD)	Placebo Group (Mean±SD)	P Value	Significance
Age (years)	3.9 ± 2.1	3.7 ± 1.85	0.750	Not significant
Weight (kg)	15.20 ± 3.81	14.50 ± 3.75	0.561	Not Significant
Duration of surgery (mins)	43.15 ± 9.84	40 ± 10.76	0.340	Not Significant
Basal body temperature (^{0}c)	37.14 ± 0.12	37.15 ± 0.11	0.893	Not Significant

Table 2: Comparison of body temperature at 30, 60, 90 mins post-operatively and salivation VAS score in both the groups

		Glycopyrrolate Group (Mean±SD)	Placebo Group (Mean±SD)	P Value	Significance
Temperature in ^{0}C -	0 min	37.57 ± 0.195	37.525 ± 0.129	0.395	Not Significant
Postoperatively	30 min	37.625 ± 0.171	37.355 ± 0.119	0.0001	Highly Significant
	60 min	37.515 ± 0.169	37.205 ± 0.119	0.0001	Highly Significant
	90 min	37.380 ± 0.154	37.135 ± 0.093	0.0001	Highly Significant
Salivation VAS score		11.50 ± 9.33	40.50 ± 17.31	0.0001	Highly Significant



Graph 1: Line – diagram of basal body temperature and temperature at 30, 60,90 mins post-operatively in both the groups

Discussion

The VAS score of oral secretions was significantly decreased in Glycopyrrolate group as compared to placebo group. Moreover, the VAS score of 5 patients in Placebo group was more than 60 out of which 2 suffered from desaturation and bronchospasm. They required a treatment of i.v. Hydrocortisone and nebulisation. In a similar study by *Payman Asadi et al.*, concluded that salivation was significantly decreased by anticholinergic drug (Atropine) when used as an adjunct to Ketamine but without causing any adverse effect on the success rate and duration of procedure [1]. Hence, use of an antisialogouge in the pre-operative medication is often recommended to decrease the likelihood of coughing and laryngospam due to Ketamine induced salivary secretions [4].

The basal body temperature and immediate post-operative temperature in both the groups did not show any statistically significant difference. But the post-operative body temperature recorded at 30, 60 and 90 mins was significantly increased in Glycopyrrolate group as compared to placebo group. *Kyung Woo Kim et al.*, in his study too observed that the amount of salivation was significantly less in Glycopyrrolate group as compared to Control group and that the paediatric patients are at a increased risk of fever. He further concluded that the routine premedication with anticholinergic drug should not be considered in paediatric patients [2].

The anticholinergic drugs inhibit muscarinic acetylcholine receptors, exerting antimuscarinic actions such as dry mouth hence used as an adjunct with ketamine which has increased salivation as a side effect [5].

The eccrine sweat glands play an important role in heat loss mechanism for thermoregulation. Hence they are said to be responsible for thermal sweating. In children, the thermoregulation is mainly dependent on sweating [6].Hence its suppression causes less heat loss which may be the reason of increase in body temperature in children post-operatively when an anticholinergic adjunct is used with Ketamine. The body temperature of the patients in Placebo group reached the basal body temperature by 90 mins post-operatively but the body temperature in Glycopyrrolate group continued to remain high even at 90 mins post-operatively. The temperatue of 4 patients in Glycopyrrolate group was observed to be more than 37.8^0C suggesting, they may be suffering from fever.

Conclusion

The routine use of Glycopyrrolate as pre-anaesthetic adjunct with Ketamine should be considered after weighing the risk of post-operative hyperthermia, if used and intra-operative increase in salivation, if not used in paediatric patients.

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Study of Lung Function Parameters among Young Healthy Adults with Special Reference to Influence of Weight in Normal BMI Category

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Abstract

Context: Young adults are exposed to air pollution and are vulnerable to its effects especially on respiratory diseases. Hence they should undergo regular screening for lung function parameters. *Aims:* To study of lung function parameters among young healthy adults. *Settings and design:* Cross sectional study carried out at GR Medical College. *Methods and Material:* 185 youngsters aged 17-22 years of age of both sexes were studied. All individuals were healthy and free from any lung disease. Weight and lung function parameters were measured. *Statistical analysis:* Student's t test was used to compare means. *Results:* FVC, FEV1, FEV.5/FVC% and FEV1/FVC% increased with weight significantly for males but not for females. FEV.5, MVV did not increase significantly with weight for both sexes. PEFR increased significantly with weight for females but not for males. FVC, FEV1, FEV1/FVC%, MVV and PEFR increased significantly with age for both sexes. FEV.5 increased significantly with age for females but not for males. *Conclusion:* Lung function parameters enhanced significantly with age and weight mostly in males while in females their changes were not significant.

Keywords: Body Surface Area; Physical Exercise; Lung Function Parameters; FEV-5.

Introduction

Population of today is exposed to the ill effects of air pollution not only in the developed countries but also in the developing countries like India. This serious problem of air pollution has arisen as a result of development taking place all over the world. Todays young generation is exposed to this air pollution since their childhood. Air pollution is not only affects respiratory system but also can lead to increased incidence of diabetes and cardiovascular diseases [1].

The important system target of air pollution is respiratory system. The major respiratory diseaes attributed to air pollution are asthma and allergic bronchitis and other respiratory problems including cancer of the lung. It affects the quality of life, hampers the healthy growht and development of childen and adolescents [2].

With the modern development, and with easy access to vehicles, increased sedentary life style, physical activity of all ages and both sexes has drastically reduced. Children are found to be more inclined towards TV watching, video games, internet chatting rather than preferring to play outdoors. Schools are giving more importance to academics rather than sports. Parents do not have time for their own children as both of them working and families are mostly nuclear. At the same time consumption of junk foods, energy rich drinks has increased and the people have forgotten the traditional healthy diet. All these factors coupled with air pollution is hampering the lung funciton of the young adults as they are going through all such insults [3].

Hence all young adults should undergo the screening for pulmonary funciton tests to make them aware of healthy life style. Lung function testing by spirometry is considered as a diagnostic

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tool. It is also used to monitor the disease course. Forced vital capacity (FVC) and forced expiratory volume (FEV1) are the lung function parameters which can be used to predict the health of the lungs [4].

Hence present study was carried out to study the lung function parameters among young healthy adults.

Methods

Study Design: Present study was Institution based cross sectional study.

Settings: Present study was carried out at Department of Physiology, GR Medical College.

Study Period: The study was carried out for a period of six months from July 2017 to December 2017.

Study Population: Present study consisted of study of lung function parameters among young healthy adults

Sample Size: 185 healthy young adults were studied.

Inclusion Criteria

1. Age between 17 to 22 years
2. Free from any diseases
3. Willing to participate in the present study

Exclusion Criteria

1. Age less than 17 years and more than 22 years
2. Found suffering from any lung diseases
3. Not willing to participate in the present study

Methodology

One eighty five youngsters between 17 and 22 years of age and belong to both sexes were considered as sample for the present study. All the sampled individuals were healthy and free from any lung disease. Weight was taken by a standard weighing scale and at the time of weighing each and every individual was wearing minimum outfit without shoes or chappals.

Before the test every subject of 185 (81 girls and 104 boys) were thoroughly examined with special emphasis on respiratory system. Subject who gave history of major lung problem or suffering from any kind of respiratory disease viz. pneumonia, tuberculosis etc was not included in the sample size.

All subjects underwent lung function parameter testing like forced vital capacity (FVC), forced expiratory volume at five seconds (FEV-.5), forced expiratory volume at one second (FEV-1), maximum voluntary ventilation (MVV), and peak expiratory flow rate (PEFR). All these values were expressed in litres. Subjects were classified into different weight bands for comparison of lung function parameters.

Statistical Analysis

The data was expressed as mean values with two standard deviation.

Results

Table 1 shows weight-wise comparison of mean values of FVC, FEV.5 and FEV1. FVC increased gradually for both sexes but this increase was statistically significant for males and not for females. FEV.5 increased from 2.27 ltrs (36-45 kg) for males to 2.78 ltrs (76-85 kg) but this small increase was not statistically significant. FEV1 increased from 2.64 ltrs (36-45 kg) for males to 3.59 ltrs (76-85 kg) significantly. But for females this increase was not statistically significant both for FEV.5 and FEV1.

Table 2 shows weight-wise comparison of mean values of ratios. The FEV.5 and FVC ratio decreased significantly for males from 84.63% (36-45 kg) to 67.33% (76-85 kg). FEV1 and FVC ratio also decreased significantly for males from 98.54% (36-45 kg) to 87% (76-85 kg). But for females the differences of these ratios across weight band were not found to be statistically significant.

Table 3 shows weight-wise comparison of mean values of MVV. The changes in the MVV values across weight band were not found to be statistically significant for both males as well as females.

Table 4 shows weight-wise comparison of mean values of PEFR. As the weight increased the PEFR increased from 7.31 ltrs/sec (36-45 kg) for males to 7.73 ltrs/sec (76-85 kg) but this difference was statistically not significant. But for females the PEFR increased from 4.7 ltrs/sec (36-45 kg) to 6.85 ltrs/sec (76-85 kg) and this increase was found to be statistically significant.

Table 5 shows age-wise comparison of mean values of FVC, FEV.5 and FEV1. The values of FVC increased with increase in age significantly for both

Table 1: Weight-wise comparison of mean values of FVC, FEV.5 and FEV1

Number of subjects		No. of groups	FVC (ltrs)	FEV.5 (ltrs)	FEV1 (ltrs)
Total number	Sub-group (number)	(wt. in kg)			
31 (A)	Male (11)	(36-45)	2.67±0.36	2.27±0.40	2.64±0.36
	Female (20)	(36-45)	2.22±0.32	1.68±0.77	2.14±0.27
85 (B)	Male (43)	(46-55)	3.32±0.39	2.53±0.28	3.15±0.34
	Female (42)	(46-55)	2.26±0.32	1.69±0.26	2.16±0.31
55 (C)	Male (38)	(56-65)	3.55±0.33	2.60±0.31	3.31±0.34
	Female (17)	(56-65)	2.39±0.35	1.87±0.28	2.37±0.48
11 (D)	Male (09)	(66-75)	3.76±0.48	2.83±0.46	3.42±0.42
	Female (02)	(66-75)	2.64±0.25	2.14±0.33	2.55±0.38
03 (E)	Male (03)	(76-85)	4.11±0.34	2.78±0.23	3.59±0.33
	Female (00)	(76-85)	-	-	-
	T value for males (between A & E)		6.1972	2.0768	4.1065
	P value for males		0.0001	0.0600	0.0015
	T value for females (between A & D)		1.5939	1.5745	1.5313
	P value for females		0.1266	0.1311	0.1414

Table 2: Weight-wise comparison of mean values of ratios

Number of subjects		No. of groups (wt. in kg)	FEV.5/FVC%	FEV1/FVC%
Total number	Sub-group (number)			
31 (A)	Male (11)	(36-45)	84.63±10.64	98.54±3.07
	Female (20)	(36-45)	75.9±12.04	96.40±4.44
85 (B)	Male (43)	(46-55)	76.39±9.66	95.00±5.90
	Female (42)	(46-55)	74.83±9.43	95.88±6.50
55 (C)	Male (38)	(56-65)	72.93±7.54	92.61±4.86
	Female (17)	(56-65)	78.11±8.41	95.64±4.40
11 (D)	Male (09)	(66-75)	72.11±5.98	90.88±6.64
	Female (02)	(66-75)	80.50±4.94	96.00±5.65
03 (E)	Male (03)	(76-85)	67.33±7.50	87±1.00
	Female (00)	(76-85)	-	-
	T value for males (between A & E)		2.6080	6.2559
	P value for males		0.0229	0.0001
	T value for females (between A & D)		0.5262	0.1196
	P value for females		0.6045	0.9060

Table 3: Weight-wise comparison of mean values of MVV

Number of subjects		No. of groups (wt. in kg)	MVV ltrs/ min
Total number	Sub-group (number)		
31 (A)	Male (11)	(36-45)	140.54±25.16
	Female (20)	(36-45)	89.46±16.85
85 (B)	Male (43)	(46-55)	149.81±18.26
	Female (42)	(46-55)	90.09±19.98
55 (C)	Male (38)	(56-65)	149.21±19.55
	Female (17)	(56-65)	102.64±14.41
11 (D)	Male (09)	(66-75)	151.66±28.18
	Female (02)	(66-75)	78±31.11
03 (E)	Male (03)	(76-85)	145.00±9.84
	Female (00)	(76-85)	-
	T value for males (between A & E)		0.2937
	P value for males		0.7740
	T value for females (between A & D)		0.8664
	P value for females		0.3966

Table 4: Weight-wise comparison of mean values of PEFR

Number of subjects		No. of groups (wt. in kg)	PEFR
Total number	Sub-group (number)		ltrs/sec
31 (A)	Male (11)	(36-45)	7.31±1.90
	Female (20)	(36-45)	4.70±1.24
85 (B)	Male (43)	(46-55)	8.44±1.17
	Female (42)	(46-55)	4.72±1.26
55 (C)	Male (38)	(56-65)	8.35±1.40
	Female (17)	(56-65)	5.42±1.45
11 (D)	Male (09)	(66-75)	8.87±1.01
	Female (02)	(66-75)	6.85±0.63
03 (E)	Male (03)	(76-85)	7.73±0.73
	Female (00)	(76-85)	-
	T value for males (between A & E)		0.3664
	P value for males		0.7204
	T value for females (between A & D)		2.3826
	P value for females		0.0272

Table 5: Age-wise comparison of mean values of FVC, FEV.5 and FEV1

Number of subjects		Age in yrs	FVC	FEV.5	FEV1
Total number	Sub-group (number)		(ltrs)	(ltrs)	(ltrs)
15	Male (06)	17	1.32±0.37	2.46±0.24	3.07±0.21
	Female (09)		1.94±0.19	1.53±0.28	1.88±0.23
48	Male (17)	18	3.15±0.52	2.43±0.38	2.98±0.45
	Female (31)		2.37±0.41	1.77±2.31	2.31±0.46
54	Male (29)	19	3.47±0.50	2.59±0.35	3.24±0.40
	Female (25)		2.30±0.23	1.78±0.22	2.22±0.21
41	Male (26)	20	3.42±0.46	2.58±0.36	3.22±0.39
	Female (15)		2.33±0.25	1.74±0.29	2.19±0.26
22	Male (21)	21	3.42±0.46	2.54±0.28	3.18±0.38
	Female (01)		1.98	1.36	1.84
05	Male (05)	22	3.62±0.37	2.95±0.31	3.60±0.33
	Female (00)		-	-	-
	T value for males (between A & E)		10.2657	2.9605	3.2417
	P value for males		0.0001	0.0159	0.0101
	T value for females (between A & D)		4.0216	1.7390	2.9467
	P value for females		0.0006	0.0960	0.0075

the sexes. The values of FEV.5 increase with age for males significantly but not for females. the values of FEV1 increased with increase in age significantly for both the sexes.

Table 6 shows age-wise comparison of mean values of ratios. The FEV.5/FVC ratio increased with age in males but this increase was statistically not significant. Similar observation applied to females in this case. The FEV1/FVC ratio increased significantly with age in males but not in females.

Table 7 shows age-wise comparison of mean values of MVV. The MVV values increased significantly with age for males but not for females. in the both the sexes there was increased in MVV values but more pronounced in males than females.

Table 8 shows age-wise comparison of mean values of PEFR. The PEFR values increased significantly with age for males from 8.15 ltrs/sec at age 17 to 10.1 ltrs/sec at age 22 years. In females the value was 4.21 ltrs/sec at age 17 which increased to 5.19 at age 20 years but this increase was statistically not significant.

Table 6: Age-wise comparison of mean values of ratios

Number of subjects		Age in yrs	FEV.5/	FEV1/
Total number	Sub-group (number)		FVC%	FVC%
15	Male (06)	17	73.66±6.31	92.33±5.46
	Female (09)		78.11±11.67	95.77±5.49
48	Male (17)	18	77.35±10.70	94.52±7.62
	Female (31)		74.96±10.51	96.61±3.97
54	Male (29)	19	74.00±9.36	93.51±5.47
	Female (25)		77.20±6.63	96.60±3.53
41	Male (26)	20	75.73±10.93	94.11±5.20
	Female (15)		75.00±12.20	93.93±9.83
22	Male (21)	21	74.40±7.80	92.92±5.37
	Female (01)		68.00	92.00
05	Male (05)	22	80.80±3.63	99.20±1.30
	Female (00)		-	-
	T value for males (between A & E)		2.2293	2.7267
	P value for males		0.0528	0.0234
	T value for females (between A & D)		0.6142	0.8061
	P value for females		0.5454	0.4288

Table 7: Age-wise comparison of mean values of MVV

Number of subjects		Age in yrs	MVV ltrs/ min
Total number	Sub-group (number)		
15	Male (06)	17	138.83±11.54
	Female (09)		78.11±17.43
48	Male (17)	18	149.11±25.54
	Female (31)		91.16±18.35
54	Male (29)	19	149.03±14.29
	Female (25)		97.44±17.05
41	Male (26)	20	148.07±23.95
	Female (15)		94.73±21.57
22	Male (21)	21	146.33±18.88
	Female (01)		87.00
05	Male (05)	22	169.00±14.71
	Female (00)		-
	T value for males (between A & E)		3.8196
	P value for males		0.0041
	T value for females (between A & D)		1.9549
	P value for females		0.0634

Table 8: Age-wise comparison of mean values of PEFR

Number of subjects		Age in yrs	PEFR (ltrs/sec)
Total number	Sub-group (number)		
15	Male (06)	17	8.15±0.654
	Female (09)		4.21±1.46
48	Male (17)	18	7.91±1.62
	Female (31)		4.75±1.43
54	Male (29)	19	8.09±1.03
	Female (25)		5.30±1.07
41	Male (26)	20	8.39±1.66
	Female (15)		5.19±1.27
22	Male (21)	21	8.41±1.07
	Female (01)		2.80
05	Male (05)	22	10.1±1.24
	Female (00)		-
	T value for males (between A & E)		3.3556
	P value for males		0.0084
	T value for females (between A & D)		1.7317
	P value for females		0.0973

Discussion

FVC, FEV1, FEV.5/FVC% and FEV1/FVC% increased with weight significantly for males but not for females. FEV.5, MVV did not increase significantly with weight for both sexes. PEFR increased significantly with weight for females but not for males. FVC, FEV1, FEV1/FVC%, MVV and PEFR increased significantly with age for both sexes. FEV.5 increased significantly with age for females but not for males.

Boskabady MH et al. [5] noted that as age increased the each lung function decreased. FEV1 and FCV in both the sexes was found to be having highest correlation. As height increased there was increase in the values of lung function parameters. FVC was most commonly correlated with height among all other parameters.

Memon MA et al. [6] found that as the age increased there was decrease in the vital capacity and deterioration of the lung function parameters. This finding is in contrast with the present study. This is due to the fact that the age group studied by author was wide and our age group was narrow limited to 17-22 years only. They also noted that all parameters of the lung function tests were positively correlated with height.

Tabatabaie SS et al. [7] also reported a positive correlation between PEFR with age which was statistically significant. We also found that for males with increase in age there was increase in PEFR but not for females. they compared the value with height while we used weight for correlation in the present study.

Bae JY et al. [8] observed that the weight was one of the important factors which affected pulmonary function in both boys and girls. We also found that FVC, FEV1, FEV.5/FVC%, FEV1/FVC%, correlated well with increase in weight for males but not for females. this predilection towards males may be due to the fact that muscle mass increases more strongly in males in this age range of 17-22 years compared to girls which in turn has an influence on the overall lung functions. Hence the author concluded that children and adolescents needs to be exposed to exercises to enhance their strength of the muscles which will definitely improve the lung function.

Bhatti U et al. [9] found that mean vital capacity increased with increase in height. This association, the authors attributed to the more available surface area in heighted persons compared to less heighted persons. Thus authors concluded that even though the persons belong to same age and ethnic groups, their vital capacity may remain different due to difference in the height. We did not consider height in the present study.

Budhiraja S et al. [10] noted that age, height and weight were positively correlated with parameters of the lung function tests and this was found to be true not only for boys but also for girls. We also observed similar findings of association of age and weight with lung function parameters. The authors found that these parameters were more significant for boys compared to girls. We also found that most of the lung parameters were significantly associated in boys rather than girls.

Key Messages

Regular screening of young adults will help to identify initiation of respiratory diseases among them and help prevent further progression with proper counseling and life style modification.

Conclusion

Thus we conclude that most of the lung parameters especially vital capacity of the lungs for persons within normal BMI range increase with age in younger adults and also with weight.

We therefore recommend more amount of sports and exercise as well as yoga to be practiced at these younger age to have improved lung functions and hence proper health for life.

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Lipid Profile and Lipid Peroxide Level Changes in Practitioners of Anapanasati Meditation

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Abstract

Aim: The aim of present study was to study the effect of Anapanasati meditation on lipid profile and lipid peroxide levels among short term meditators (practicing meditation for less than 6 months), long term meditators(practicing meditation for 6months to 5 yrs) and nonmeditators. *Method:* The study included 30 short term, 30 long term meditators & 30 non meditators.To assess lipid profile & lipid peroxide levels 6ml of blood was venous blood was collected with asceptic precaution. Serum total cholesterol, HDL,LDL, triglycerides were estimated by their respective reagents Lipid peroxide level was estimated by measuring serum malondialdehyde (MDA) levels .One way ANOVA was used for simultaneous multiple group comparison followed by Post-hoc Tukey's test for group-wise comparisons. *Results & Conclusion:* On analysis of results, it was found that there was significant decrease in total cholesterol ($p<0.001$) and LDL-cholesterol ($p<0.001$), along with significant increase in HDL-cholesterol ($p<0.01$) in long term meditator and short term meditators when compared to non meditators. And similar significant difference was found between long term meditators and short term meditators. *Results:* showed that there was significant reduction in triglycerides ($p<0.001$) in long term meditators compared to short term mediators and non-meditators. On analysis of results of lipid peroxidation it was found that there was highly significant ($p<0.001$) reduction in the level of lipid peroxides in long term meditators and short term meditators compared to non meditators. And also there was highly significant ($p< 0.001$) reduction in the level of lipid peroxides in long term meditators compared to short term meditators. It was concluded that meditation improves lipid profile anddereaseslipid peroxide levels. Improvement continues further by increasing the duration of meditation.

Keywords: Meditation; Lipid Profile; Lipid Peroxides.

Introduction

Modern man is the victim of stress and stress related disorders. As stress is unavoidable, these days a simple, inexpensive yet powerful age-old technique, meditation is being increasingly used and studied [1-5]. Although much research work has been done on meditation most of them are on diseased condition and on few specific types of meditations like-Trancedental meditation [3], Rajayoga meditation [5], and OM meditation [6]. Other forms of meditation are not extensively studied. Most of the studies on meditation are on diseased states [3,6]. There are less studies to see effect on healthy individuals. And also most studies are on yoga where meditation will be coupled with practice of set of asanas and pranayamas [9]. There are less studies to see effect of meditation alone without incorporating asanas and pranayamas.In Anapanasati meditation, meditator sits in comfortable sitting posture, with eyes closed, legs crossed and arms clasped. Meditator consciously concentrates on his breath. So it is simple form of meditation on breath [7,8].

Hence, present study is undertaken to study the effect of Anapanasati meditation on lipid profile and lipid peroxides among healthy meditators and to compare the above parameters with that of non meditators, with a strong hope that early precaution can be taken to handle stress, by practicing

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meditation to reduce the incidence of stress-related diseases of mind and body by bringing ancient technique- meditation to modern clinic.

Objectives

- To study the effect of Anapanasati meditation on lipid profile (Serum total cholesterol, triglycerides, HDL, LDL) and lipid peroxides (malondialdehyde -MDA levels).
- To study the relation between effect of Anapanasati meditation on above mentioned parameters and duration of practice of meditation.
- To compare all the parameters between short term meditators, long term meditate and nonmeditators.

Methodology

The present study was conducted in Department of Physiology, JJM Medical College. It was carried out from April 2011 to March 2012. The study was undertaken to study the effect of Anapanasati Meditation on lipid profile and lipid peroxides among short term meditators and long term meditators and to compare with that of non meditators.

Study group

In this study, 60 meditators were taken from Karnataka Pyramid Dyana Prachara Trust®. Davangere Branch. This group was divided into 30 each based on duration of practice Anapanasati meditation. Short term meditators: meditating for 6 months to 5 years Long term meditators: meditating for more than 5 years.

Control group

Thirty normal age & sex matched subjects from general population who were not exposed to any meditation or relaxation technique were included and were labelled as nonmeditators. Dietary habits and physical exercise were matched between study and control groups.

Inclusion Criteria

- Healthy males and females in the age group of 45 to 60 years.
- Short term meditators were those who had been practicing meditation from 6 months to 5 years.
- Long term meditators were those who had been practicing meditation for more than 5 years.
- Age and sex matched healthy individuals not exposed to any meditation or relaxation technique were included as controls.

Exclusion Criteria

- Age below 45 years and above 60 years.
- Presence of obesity, hypertension, diabetes mellitus, ischemic heart disease, congestive heart failure.
- Chronic smokers and chronic alcoholics.

Method

Meditators practice Anapanasati meditation, in the meditation centre regularly for 1 hour everyday between 6.A.M. to 7A.M.

Process of meditation: ANA means-breath in, PANA means-breath out, SATI means-to be with. ANAPANASATI means – BE WITH THE BREATH [8-11]. A quiet place is chosen.,any comfortable sitting position can be taken. Spine should be comfortable as possible, hands should be clasped, legs should be crossed and eyes should be closed.

Notice your breath .....Inhale slowly ……Exhale slowly …….Let your breath sink in and out ….Your breath is a rhythm of calm .....Follow your breath .....Be still ….Be your breath. Be still….be still….be still

The nature of test was explained to them and informed consent was obtained. The procedure was in accordance with the ethical standards of committee of the institute. Collection of data was done between 9.00 am to 12.00 pm. Sufficient time was given (15 min) for the subjects to mentally and physically relax before doing the test. Abriefhistory, general physical examination and clinical examination of all the systems were done to exclude medical problems and to prevent confounding of results.

Recording of Anthropometrical Parameters, like height, weight, BMI (Body mass index) were measured using standard instruments.

To assess lipid profile & lipid peroxide levels 6ml of blood was venous blood was collected with asceptic precaution. Serum total cholesterol, HDL, LDL, triglycerides were estimated by their respective

reagents from Biochemistry lab JJMMC Davangere. Lipid peroxide level was estimated by measuring serum malondialdehyde (MDA) levels using: Nadiger et al method in the same lab.

Statistical Analysis

Theresultswere expressed as Mean± Standard deviation for continuous data , and Number and Percentage for discrete data. One way ANOVA was used for simultaneous multiple group comparison followed by Post-hoc Tukey's test for group-wise comparisons. Categorical data was analysed by Chi-square test.

SPSS version 16 software was used for all the analysis.

1. p Value > 0.05 is taken as ' not Significant' .
2. p Value < 0.05 is taken as 'Significant' .
3. p Value < 0.001 is taken as 'Highly Significant'

Results

Analysis of the basic characteristics of 90 subjects, showed no statisticallysignificant difference in age, sexdistribution, BMI, physical activity, diet. when values of all three group were compared. None of them were smokers or consumed alcohol (Table 1,2). Sedentary: No physical exercise; Non sedentary: Regular physical exercise every day.

Analysis of Lipid profile

On analysis of results, it was found that there was significant decrease in total cholesterol ($p<0.001$) and LDL-cholesterol ($p<0.001$), along with significant increase in HDL-cholesterol ($p<0.01$) in long term meditator and short term meditators when compared to non meditators. And similar significant difference was found between long term meditators and short term meditators.

Table 1: Comparisonof Lipid profile between Long term, Short term and Non meditators

Groups		TC(mg/dl)	HDL-C (mg/dl)	LDL-C (mg/dl)	TG(mg/dl)
Long term		155.6 ± 7.6	55.5 ± 5.4	80.6 ± 8.8	114.6 ± 11.2
Short term		181.8 ± 13.9	49.4 ± 4.9	102.5 ± 16.7	149.7 ± 20.4
Non – med.		220.6 ± 35.5	45.2 ± 7.5	144.6 ± 39.8	153.7 ± 14.4
Anova	F	63.84	21.81	49.15	55.61
	P	<0.001	<0.001	<0.001	<0.001
Groupwise comparisons	*1 – 2*	**	*	*	**
(P - values)	*1 – 3*	**	*	**	**
	2 – 3	**	*	**	*0.58, NS*

All the values are expressed as Mean ± SD
Multiple group comparision: **One way ANOVA , F-Test**
Groupwisecomparision: **Post – hoc Tukey's test**
* p< 0.05 S-Significant,** P < 0.001 HS- Highly Significant,P >0.05 NS- Not Significant

Table 2: Comparisonof Lipid peroxides between Long term, Short term and Non meditators

Groups		Lipid Peroxide(mg/dl)
Long term		1.82 ± 0.46
Short term		2.46 ± 0.30
Non – med.		3.02 ± 0.53
Anova	F	57.25
	P	<0.001
Groupwise comparisons (P - values)	1 – 2	**
	1 – 3	**
	2 – 3	**

All the values are expressed as Mean ± SD
Multiple group comparision: **One way ANOVA , F-Test**
Groupwisecomparision: **Post – hoc Tukey's test**
* p< 0.05 S-Significant,** P < 0.001 HS- Highly Significant,P >0.05 NS- Not Significant

Results showed that there was significant reduction in triglycerides ($p<0.001$) in long term meditators compared to short term mediators and non-meditators. There was no significant decrease in triglycerides in short term meditators compared to non meditators. ($p>0.05$)

On analysis of results of lipid peroxidation it was found that there was highly significant ($p<0.001$) reduction in the level of lipid peroxides in long term meditators and short term meditators compared to non meditators. And also there was highly significant ($p< 0.001$) reduction in the level of lipid peroxides in long term meditators compared to short term meditators.

Discussion

Improvement in lipid profile with increase in duration of meditation in our study is consistent with studies done by Vyas R et al. [5], Sayyed A et al. [9], Subramanian S et al. [12]. The improvement in the lipid profile parameters after meditation could be due to increased hepatic lipase and lipoprotein lipase at cellular levels, which affects the metabolism of lipoprotein and thus increase uptake of triglycerides by adipose tissues [9].

Meditation is believed to gradually diminish sympathetic dominance, resulting in better balance between the sympathetic and the parasympathetic [1]. By modifying the state of anxiety, meditation reduces stress induced sympathetic overactivity [5]. which inturn improves lipid profile.Meditation is described as a wakeful hypometabolic state [6]. Metabolic effects of meditation include a decreased adreno-cortical activity and long term decreased cortical activity and long term decreased cortisol secretion and decreased thyroid – stimulating hormone. This may be a another cause of decrease in serum total cholesterol,triglycerides and LDL cholesterol observed in our study. Improvement in lipid profile may be mediated through interaction between autonomic nervous system and endocrine system. There is shift in autonomic balance towards relative parasympathetic predominance and reduction in secretion of stress hormones like epinephrine, nor-epinephrine and cortisol.

In present study there was no significant decrease in triglycerides in short term meditators, but the decrease was significant in long term meditators compared to nonmeditators. This emphasizes the effect of duration of meditation. Improvement in long meditators is due to further alteration in physiological process involved. Similar to present study, in study done by Syyed et al. [9] there was no significant decrease in triglycerides values after Sudarshankriya yoga Change in other lipid profile parameters was similar to present study. Our study results on lipid peroxide levels is consistent with studies done by Schneider RH et al. [13], Yadav RK et al. [14], Agte et al. [15], Kim DH et al. [16].

Meditation reduces stress by producing relaxation response - a self induced reduction in activity of sympathetic nervous system, the opposite of hyperactivity of central nervous system associated with stresss response.Psychological stress has been shown to increase oxidative stress with increase in production of reactive oxygen species (ROS) and are implicated in etiology of stress related disorders . Meditation decreases production of ROS and increases antioxidant levels. So there will be decrease in oxidative stress shifting the balance between oxidant-anti oxidant equilibrium in favour of antioxidants [13-16].

Hence there will be decreased lipid peroxidation and hence decreased formation of malondialdehyde formation, which is a marker of lipid peroxidation.

Long term Transcedental [13] and Zen meditators [16] have been showed to diminish oxidative stress seen by a reduction in lipid peroxidation and biphoton emission. Glutathione level and activity of antioxidant enzymes have been facilitated in yoga and Sudarshankriya practitioners [15]. Possibly the same mechanism is responsible for results of present study. To summarize, our study shows that Anapanasati meditation confers significant improvement on lipid profile and decreases lipid peroxidation. Benefits continued to improve further with long term meditation.

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Study of Anthropometric Parameters as Predictors of Diabetes Mellitus

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Abstract

Introduction: Diabetes is a group of metabolic disorders in which there is high blood sugar level over a prolonged period and which leads to many complications such as cardiovascular disease, neuropathy, nephropathy, retinopathy etc. Causes of diabetes vary depending on genetic makeup, family history, ethnicity, health and environmental factors. There is alarming increase in the incidence and prevalence of diabetes mellitus in Asian Indians. Obesity and fat distribution are well established risk factors for Non Insulin Dependent Diabetes Mellitus. Anthropometry is the technique used to express the form and dimensions of the body. Obesity is the main cause of alteration in the anthropometric measurements. *Materials and Methods:* In our study we measured anthropometric parameters such as body mass index, waist circumference, hip circumference, waist to hip ratio in normal and diabetic subjects. *Results:* We observed that BMI has a risk factor of 4.5 and 14.5 in male and female respectively. WC has risk factor of 8.38 and 12.86 in males and females respectively. HC has a risk factor of 11.32 and12.28 in males and females respectively with $p<0.05$, where as WHR has a risk factor of 16.5 and 18.1 in males and females. *Conclusion:* Irrespective of age or measure used, women always had higher prevalence of overweight and obesity than men. BMI with WHR and WC can be used as extremely useful predictor of Diabetes Mellitus.

Keywords: Diabetes Mellitus; Body Mass Index; Waist Circumference; Hip Circumference; Waist to Hip Ratio.

Anthropometry is a technique used to express the form and dimensions of the body such as height, weight, breadth, girth and distance between anatomical points, which vary with ethnicity, sex, age, diet, physical activity and habits of an individual [1]

Obesity is a chronic metabolic change characterized by excess of body fat and which is the main cause of alteration in the anthropometric measurements [2,3]. Obesity is associated with cardiovascular abnormalities, pulmonary dysfunctions, gastrointestinal diseases, Genitourinary diseases, musculoskeletal diseases, cancer, endocrine and metabolic diseases [2]. Insulin resistance and hyper insulinemia are characteristic features of human obesity [3].

Diabetes mellitus is a syndrome of impaired carbohydrate, fat and protein metabolism [4]. It is a clinical condition characterized by increased blood glucose level (hyperglycemia) due to insufficient or inefficient (incompetent) insulin [5].

There is alarming increase in incidence and prevalence of diabetes mellitus in Asian Indians [6]. Obesity is the predisposing factor for 80% of Non insulin dependent diabetes mellitus (NIDDM) [7]. Obesity and fat distribution are well established risk factors for type II diabetes [8]. The evidence linking obesity and central adiposity with diabetes mellitus is strong and consistent [9-12].

BMI is recommended by WHO as the most useful measure of obesity [13]. It is however a crude index that does not take into account, the distribution of body fat, resulting in variability in different individuals and populations [14]. Several simple anthropometric indices of body compositions such as waist circumference, waist to hip ratio (WHR), waist to height ratio (WHTR) predict the incidence of disease. Risk thresholds for their measures have been

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proposed, but these have been derived mainly in European or North American populations [15,16]. It is not clear whether these thresholds are applicable in developing countries where the burden from obesity and diabetes is high.

The aim of the present study was to compare the anthropometric parameters as predictors of incidence of diabetes mellitus. India is a developing country with 55% overall prevalence of obesity among woman between 25–64 yrs of age. The prevalence of diabetes and its adverse health effects has risen most rapidly in South India, which is becoming the "diabetes capital" having a higher number of people with diabetes than any other part of the country with estimates ranging from 19.4 million in 1995 to 32.7 millions in 2000. This number is expected to rise to reach 57.2 millions by 2025 [6]. The prevalence of diabetes mellitus is progressively increasing in India and has been observed that obesity is one of the main reason for diabetes

Materials and Methods

The present study was undertaken to correlate the anthropometry study and the diabetes both in normal and diabetic subjects. We also aimed to determine possible risk thresholds for these indices in population of Karimnagar, Telangana. At the outpatient department (OPD) of medicine, Prathima Institute of Medical Sciences, Karimnagar. 200 patients attending with the history suggestive of diabetes mellitus were selected randomly and considered as study group. Similar number of age and sex matched healthy attendants of non-diabetic patients were randomly selected and taken as controls. Informed written consent was taken for all patients and controls. Participants were divided into five age groups.

21-30 years - Group A, 31- 40 years - Group B, 41-50 years Group C, 51-60 years Group D and 61 and above - Group E.

Baseline Medical Examinations

A. Medical history was obtained.

B. Blood pressure was measured as per WHO guidelines using a standard mercury sphygmomanometer.

C. Anthropometric measurements were recorded.

1. Body weight: Body weight was measured (to the nearest 0.5 Kg) with subject wearing light clothing without shoes, standing motionless on the weighing scale and with the weight distributed equally on both legs.

2. Height: Height was measured in cms (to the nearest 0.5cm) with the subject standing in an erect position against a vertical scale and with the head positioned so that the top of the external auditory meatus was level with the inferior margin of the bony orbit (Frankfurt's plane).

3. Waist Circumference (WC): In standing position, a point midway between highest point of iliac crest and lower margin of the ribs is marked on both lateral sides. After exhaling, using a flexible, non-elastic measuring tape, waist circumference in cms is measured at the marked point level.

4. Hip Circumference (HC): HC was measured at the level of greater trochanter, by measuring to nearest mm, at the point where buttocks extended maximum, when viewed from the side in standing position using a flexible non-elastic tape.

5. Waist to Hip Ratio (WHR): WHR was calculated to the nearest 0.1 cm.

$$\text{WHR} = \frac{\text{Waist Circumfere nce}}{\text{Hip Circumfere nce}}$$

6. Body Mass Index (BMI):

$$\text{BMI} = \frac{\text{Weight in kilograms}}{\text{Height in meters X Height in meters}}$$

D. Blood sugar estimation: Blood samples were obtained after 12 hours overnight fast and 2 hours after a 74g oral glucose load.

Results

Higher % incidence of DM in both males (29.2%) and females (28.6%) observed in age group D (Table 1).

26.5% diabetic subjects had BMI above normal but 7% NDM also had increased BMI (Table 2a).

In males the values were of significant ($p=0.0013$) in the group of males who had BMI more than 35 kg/m^2, whereas in females it was significant ($p=0.004$, 0.003, 0.001) in group of females who had BMI 26 to more than 35kg/m^2. This indicates that females with higher BMI have more relative risk of developing diabetes mellitus (Table 2b).

Diabetic males of age groups A, B, C had shown significant increase ($p<0.05$) in WC when

compared with diabetic females. Diabetic females of age groups D,E had shown significant increase ($p<0.05$) in WC when compared with diabetic males (Table 3).

As age advances diabetic females had shown significant increase in HC when compared with diabetic males (Table 4).

Diabetic females had significant increase ($p<0.05$) in WHR when compared with diabetic males (Table 5).

Relative risk of diabetes with BMI, WC, HC and WHR is more in females than in males (Table 6).

Statistical Analysis

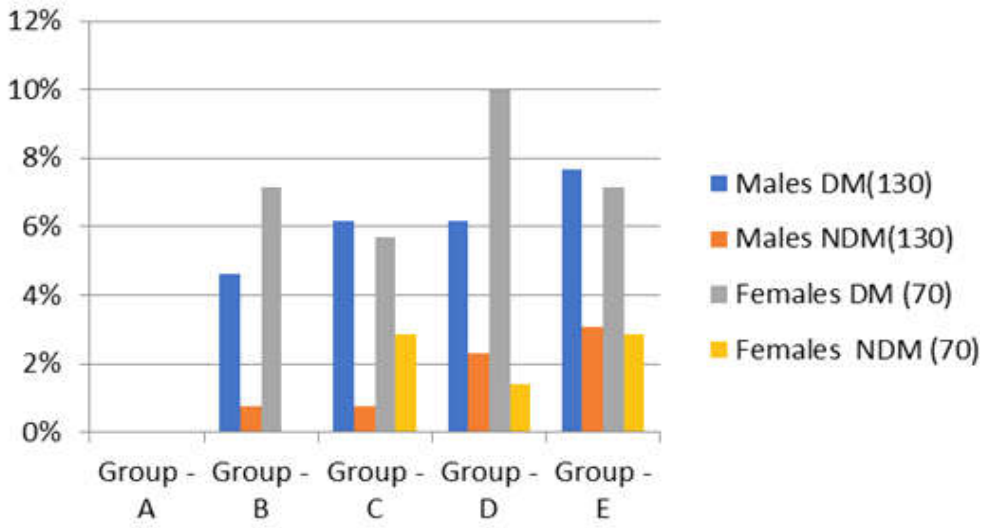
Results were recorded. Percentage, mean, standard deviation were calculated. p value <0.05 was considered as statistically significant. Data were analyzed using SPSS v.23.0.

Table 1: Age, sex wise distribution of diabetic and non-diabetic males and females

Age groups (years)	Males (Total=260)		Females (Total=140)	
	DM (130)	NDM (130)	DM (70)	NDM (70)
21-30 yrs (A)	10 (7.7%)	10 (7.7%)	5 (7.14%)	5 (7.14%)
31-40 yrs (B)	22 (16.92%)	22 (16.92%)	15 (21.42%)	15 (21.42%)
41-50 yrs (C)	30 (23.07%)	30 (23.07%)	15 (21.42%)	15 (21.42%)
51-60 yrs (D)	38 (29.23%)	38 (29.23%)	20 (28.6%)	20 (28.6%)
60 and above (E)	30 (23.07%)	30 (23.07%)	15 (21.42%)	15 (21.42%)
Total	130 (100%)	130 (100%)	70 (100%)	70 (100%)

Table 2a: Diabetic and non-diabetic males and females above normal limit of BMI in different age groups

Age groups	Males		Females		Total	
	DM(130)	NDM(130)	DM (70)	NDM (70)	DM(200)	NDM(200)
Group - A	0(0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0(0.00%)	0 (0.00%)
Group - B	6(4.61%)	1(0.76%)	5 (7.14%)	0 (0.00%)	11(5.5%)	1(0.5%)
Group - C	8(6.15%)	1(0.76%)	4 (5.71%)	2 (2.85%)	12(6%)	3(1.5%)
Group - D	8(6.15%)	3(2.30%)	7 (10%)	1 (1.42%)	15(7.5%)	4(2%)
Group - E	10(7.69%)	4(3.076%)	5 (7.14%)	2 (2.85%)	15(7.5%)	6(3%)
Total	32(24.61%)	9(6.92%)	21 (30%)	5 (7.14%)	53(26.5%)	14(7%)



Graph 1:

Table 2b: Risk of DM associated with BMI increase

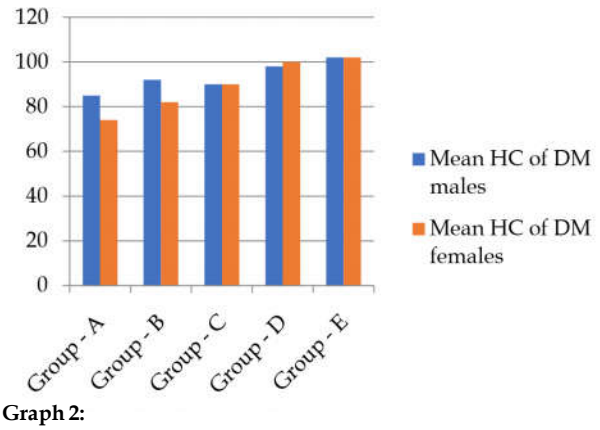
BMI (Kg/m²)	Males - 130			Females - 70		
	No. of DM	Relative risk	p-value	No. of DM	Relative risk	p-value
< 24.99	98(75.38%)	1.0	0.2090	49 (70%)	1.0	0.4207
25-29.99	22(16.92%)	1.29	0.0548	13 (18.6%)	9.14	0.0047
30-34.99	7(5.4%)	3.10	0.0351	7 (10%)	10.36	0.0033
> 35	3(2.31%)	4.50	0.0013	1(1.42%)	14.50	0.0012

Table 3: Comparison of WC of diabetic males and females

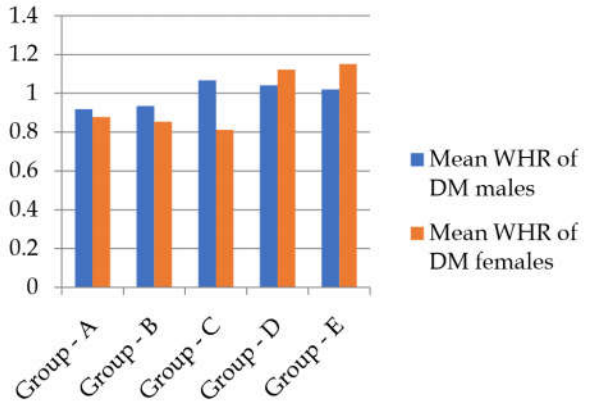
Age groups	Mean, SD, %, WC of DM males	Mean, SD, %, WC of DM females	p-value
Group - A	78±2.66 (40%)	65±2.00 (40%)	<0.0228
Group - B	86±2.61 (45.45%)	70±1.80 (33.33%)	<0.001
Group - C	96±2.59 (59.99%)	72±2.10 (80%)	<0.001
Group - D	102±2.30 (52.63%)	112±9.6 (75%)	<0.001
Group - E	104±2.97 (73.33%)	118±12.82 (93.33%)	<0.001

Table 4: Comparison of HC of DM males and females

Age groups	Mean, SD, %, HC of DM males	Mean, SD, %, HC of DM females	p-value
Group - A	85±0.66(40%)	74±1.1 (40%)	0.0228
Group - B	92±1.30(36.36%)	82±1.30 (46.60%)	<0.080
Group - C	90±0.74(59.99%)	90±1.33 (66%)	<0.500
Group - D	98±1.31(55.26%)	100±1.83 (60%)	<0.001
Group - E	102±2.22(76.66%)	102±2.13 (66.66%)	<0.500



Graph 2:



Graph 3:

Table 5: Comparison of WHR of diabetic males and females

Age groups	Males Mean, SD, %, WHR of DM	Females Mean, SD, %, WHR of DM	p-value
Group - A	0.9176±0.019 (60%)	0.8783 ± 0.0234 (40%)	P<0.022
Group - B	0.9347±0.0162 (54.54%)	0.8536±0.0176 (40%)	P<0.001
Group - C	1.0666±0.0210 (66.66%)	0.8111±0.0124 (86.66%)	P<0.001
Group - D	1.0408±0.0103 (73.68%)	1.1213±0.0847 (65%)	P<0.001
Group - E	1.0198±0.0078 (80%)	1.1514±0.1001 (86.66%)	P<0.001

Table 6: Calculated relative risk of diabetes with BMI, WC, HC, WHR in males and females

Risk factors	Males			Females - 70		
	Mean ± SD	Relative risk	p-value	Mean ± SD	Relative risk	p-value
BMI (Kg/m²)	44±2.00	4.5	0.0013	42±2.330	14.5	0.0012
WC (cms)	93.2±1.47	8.38	< 0.001	87.6±9.900	12.86	0.0139
HC (cms)	93.4±2.46	11.32	0.0047	89.6±1.684	12.28	0.0032
WHR	0.9959±0.2593	16.5	0.002	0.96314±0.0657	18.1	0.0031

Table 7: Comparison of various anthropometric parameters in DM, NDM males and females

Variables	Males		Females	
	Mean ± SD of DM	Mean ± SD of NDM	Mean ± SD of DM	Mean ± SD of NDM
Age (yrs)	56.00±10.90	45.4±16.60	52.00±11.00	42.7±13.70
Height	164.2±6.40	160.0±5.80	154.2±6.53	151.4±6.70
Weight (Kg)	65.8±10.10	60.0±13.0	60.9±10.27	52.7±4.00
BMI(Kg/m^2)	24.5±3.60	22.2±4.0	25.6±4.11	22.04±9.20
WC (cms)	93.2±1.47	80.7±0.32	87.6±1.684	85.0±2.84
HC (cms)	93.4±2.46	8.70±0.32	89.6±1.684	85.0±2.84
WHR	0.9959±0.2593	0.9225±0.1021	0.96314±0.0657	0.7831±0.0431

Discussion

In the comparative study of anthropometric parameters as determinants of diabetes mellitus, we had mean body weight of all subjects. By correlation between the height and weight 28.2% diabetic subjects were over weight and 71.8% had normal weight. (Table 7). In various Indian studies over weight ranges from 1.8% as in Ramachandra et al. [17] 7.4% as in Mukhyaprana et al. study to as high as 28% as in Tripati et al. study [18].

BMI increased (above 25kg/m^2) significantly ($p<0.05$) with advancement of age Table 2a). BMI of diabetic subjects are more positively correlated with age than non-diabetic subjects. Similar observation have been made by Shah et al. [19]. Our observations indicate that the BMI alone is an imperfect indicator of Diabetes Mellitus. In Indian context similar observations are very common [20].

Although BMI is one of the predictor for Diabetes mellitus, the effect of BMI in developing diabetes mellitus was different in males and females, females having greater risk factor than the males as shown above (Table 2b). Studies of diabetes mellitus and BMI in Korea by Eun Ju Sung et al. [21] and Colditz Ga et al. showed that the incidence of diabetes mellitus began to increase when the BMI exceeded 22 Kg/m^2 [12].

Waist circumference highly correlates with abdominal fat and is used as a marker for abdominal obesity and diabetes mellitus [22]. In our study, in females relative risk for WC and BMI were 12.86 and 14.5 respectively (Table 4) and WC is a better predictor of relative risk of diabetes in males than in females. Recent studies have reported that abdominal obesity increases the risk of diabetes between the male and female independently of BMI [22].

The percentage and relative risk factor was slightly higher in females with 12.28 and mean HC if 89.6 ±1.68cm and in males with a relative risk of 11.32 and mean HC if 93.4+2.46cm (Table 4 & 6)

It has been observed central obesity is an important risk factor for development of metabolic syndromes like diabetes mellitus. Though BMI measures the overall obesity with good relationship to fat content, it neglects body fat distribution. The WHR is good parameter to study the central obesity [14]. Therefore it is an important risk factor of diabetes mellitus to be considered even in thin and normal people as per BMI.

Relative risk factor for WHR in males is 16.5 and in females it is 18.1 (Table 6) where as the relative risk factor for WC in males is 8.38 and females it is 12.86. Thus the WHR is a better predictor of obesity and diabetes mellitus. Sayeed et al. [23] reported that prevalence of diabetes increases significantly with increase in BMI and WHR. Welborn TA et al reported WHR as being superior to other indices of obesity in determining risk of diabetes [14].

Summary and Conclusion

The main aim of the present study is to assess which of the anthropometric parameters is the best predictor of Diabetes Mellitus. The parameters considered were BMI, WC, HC, WHR.

Calculated relative risk of diabetes with BMI, WC, HC and WHR is more in females than in males, where as WHR has a risk factor of 16.5 and 18.1 in males and females.

Irrespective of age or measure used, women always had higher prevalence of overweight and obesity than men. It is observed that the WHR is better parameter in assessing the obesity and correlation with diabetes. The present shows that comparison of anthropometric parameters between the diabetic and the healthy controls showed that BMI, WC, HC, and WHR were higher in diabetics than the normal healthy subjects.

To conclude, the BMI with WHR and WC can be used as extremely useful predictor of Diabetes Mellitus.

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Association of Metabolic Syndrome Parameters with Exercise Capacity and Cardiovascular Parameters

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Abstract

Context: Understanding the relationship of cardiovascular correlates of exercise parameters to metabolic syndrome parameters is especially important because cardiovascular endurance is a strong predictor of future morbidity and mortality in patients with diabetes. *Aims:* To examine the association of metabolic syndrome parameters with exercise capacity and cardiovascular parameters *Settings and design:* Present cross sectional study was conducted at Department of Physiology Gandhi Medical College, Bhopal. *Methods and Material:* 33 cases of diabetes mellitus type-II suffering from metabolic syndrome were studied and compared with age and sex matched 27 type-II diabetic subjects not suffering from metabolic syndrome. *Statistical Analysis:* All values were expressed as mean±standard deviation. Comparisons of means between the two groups were done using a student 't' test. *Results:* 55% patients were found to have metabolic syndrome. Mean anthropometric measurements were higher in metabolic syndrome group. All the biochemical parameters except HDL cholesterol were significantly higher in metabolic syndrome group. Resting pulse rate, pulse pressure, double product were significantly higher in metabolic syndrome group. Three minute exercise test mean values of maximum heart rate, pulse-pressure, double-product, Heart rate reserve were on higher side in metabolic syndrome group. Mean values of Vo_2Max, exercise capacity and recovery heart rate, were on lower side in patients of metabolic syndrome group. *Conclusion:* Regular physical activity and higher level of cardio-respiratory fitness are associated with reduced risk of coronary heart disease.

Keywords: Metabolic Syndrome; Diabetes; Exercise; Physical Activity.

Introduction

Diabetes increases the risk of heart diseases and stroke causing 50% deaths in the people with diabetes. Because of the severe pathologies complicating the clinical course of diabetes, one can easily speculate on huge economic and psychosocial impact of diabetes on individuals, families and health care systems. Patients with type-2 diabetes are at increased risk of coronary heart disease and stroke, which are the most common cause of death and disability and excess health care cost in diabetics. It is estimated that the large majority (~75%) of patients with type-2 diabetes or impaired glucose tolerance have the metabolic syndrome [1].

Metabolic syndrome is the constellation of risk factors acting synergistically and one or all of which may share a common etiology [2].

Aggregation of cardiovascular risk factors including hyperinsulinemia, systemic hypertension elevated serum cholesterol and triglyceride level, reduced HDL cholesterol as well as glucose tolerance comprised the syndrome. There fore identifying the metabolic abnormalities to prevent morbidity and mortality in type-2 diabetic patients due to cardiovascular disease is urgent need [3].

Clinical and observational studies have shown that exercise capacity is strong predictor of cardiovascular and overall mortality. Patients of type-2 diabetes mellitus often complaint of fatigue and reduced exercise capacity, the cause of reduced exercise

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capacity in type-2 diabetes mellitus is unknown, cardiac autonomic dysfunction may play an important role [4].

Reduced heart rate recovery immediately after exercise is an important indicator of cardiac autonomic dysfunction. Higher level of blood pressure in diabetes patients with reduced exercise capacity may be a contributor to reduced myocardial function [5].

Wei M et al. [1], Cheng YJ et al. [2], Regensteiner JG et al. [3], Fanz ZY et al. [4] studied cardiovascular exercise performance in type-2 diabetic patients and reported impaired cardio-vascular response and reduced aerobic capacity in these patients.

Understanding the relationship of cardiovascular correlates of exercise parameters to metabolic syndrome parameters is especially important because cardiovascular endurance is a strong predictor of future morbidity and mortality in men and women with diabetes mellitus. Present work aimed to examine the association of metabolic syndrome parameters with exercise capacity and cardiovascular exercise parameters.

Methods

Study set-up

The present study was conducted in Department of Physiology Gandhi Medical College, and Associated Hamidia Hospital, Bhopal. The Biochemical investigations were done in the department of Biochemistry of the Institution.

Study Design

It was cross section study in which 33 cases of diabetes mellitus type-II suffering from metabolic syndrome were studied and compared with age and sex matched 27 type-II diabetic subjects not suffering from metabolic syndrome.

Sample Size

A total of 60 type-II diabetic subjects were studies.

Study Protocol

The study comprised of type-II diabetes mellitus patients aged 40-50 years attending medical OPD Department of Medicine in Gandhi Medical College and Associated Hamidia Hospital, Bhopal.

Inclusion Criteria

- All the patients with diabetes type-2 proved by recent blood glucose studies.
- Fasting plasma glucose and lipid-profile estimated prior to exercise testing to categories into metabolic syndrome groups & non-metabolic syndrome group.
- All the cases should be free from chronic complication of diabetes and any other endocrinal and metabolic disorder.

Exclusion Criteria

- Type-II diabetic patient with past history of cerebro-vascular accidents.
- Patients with evidence of orthopedic impairment
- Patient with abnormal finding in resting ECG as well as clinical examination
- Chronic Alcoholic's

Patients were grouped in two categories based on the criteria of metabolic syndrome according to International Diabetic Federation (2005):

1. Metabolic syndrome group (33)
2. Non Metabolic syndrome group (27)

Methodology

All the patients selected for study were subjected to a detailed history taking by mean of planned-questionnaires. History of present and past illness was taken and family history especially of non-communicable disease, congestive heart failure was recorded. History of any medication was also taken. Users of all type of tobacco products were included in the study. Physical inactivity was measured by asking both work related and leisure time activities.

Patients underwent careful systemic clinical examination for the clinical evidence of existence of any such disease that may affect exercise-capacity.

Parameters Recorded

⊙ *Physical Characteristics*

⊙ Anthropometric measurement

- Weight (kg)
- Height (Cm)

- Body-mass index (kglm2)
- Waist circumference (cm)
- Hip Circumference (cm)
- Wais-Hip ratio

⊙ ***Cardiovascular Parameters***

- Parameter recorded to asses cardio-vascular fitness-

⊙ ***Pre-exercise evaluation-***

- Heart rate (beats per min)
- Blood- Pressure (mm of Hg)
- Double-product (mm of Hg X beats per min)
- Target Heart rate (beats per min)
- Heart-rate-reserve (beats)
- Resting Electrocardiogram

⊙ ***Exercise test-***

- Queens college step test

⊙ ***Post exercise Evaluation***

- Maximum Heart rate achieved (beats per min)
- Heart rate reserve (beats)
- Heart rate at 1 min of recovery
- Recovery Heart rate (beats per min)
- Peak blood pressure (mm of Hg)
- Peak double-product
- Age and Sex adjusted Vo2 max-absolute (L/ min), relative (L/M^2 /Min, Ml/Kg/Min)
- Exercise capacity (METs achieved)

Statistical Analysis

All values were expressed as mean±standard deviation. Comparisons of means between the two groups were done using a student 't' test,

Results

Table 1 shows classification of study population based on existence of metabolic syndrome. Based on international diabetic federation (2005) 55% patients were found to have metabolic syndrome. Remaining 45% diabetic patients could not be classified in this category.

Table 2 shows mean values of anthropometric parameter in type-II diabetic patients. The mean values of anthropometric data showed no gender difference in both the groups. The mean values of anthropometric measurements were higher in metabolic syndrome group as compared to non metabolic syndrome group.

Table 3 shows comparison of anthropometric parameter in type-II diabetic patients. An attempt has been made to compare anthropometric parameters of type-II diabetics patients with metabolic syndrome with those patients who were not having metabolic syndrome it was observed that all the measured anthropometric parameters were significantly ($p=<0.001$) higher in metabolic syndrome group.

Table 4 shows mean values of biochemical parameters in type-II diabetic patients. It is evident from the mean values that measured biochemical parameters were also on higher site in women as compared to men dyslipidemia was not observed in non metabolic syndrome group.

Table 1: Classification of study population based on existence of metabolic syndrome (N=60)

Groups	Male		Female	
	Number	%	Number	%
Metabolic syndrome group	19	50	14	64
Non Metabolic syndrome group	19	50	8	36

Table 2: Mean values of anthropometric parameter in type-II diabetic patients

Variables	Metabolic syndrome group		Non Metabolic syndrome group	
	Male (N = 19)	Female (N = 14)	Male (N = 19)	Female (N = 8)
Age (Years)	45.9±2.86	45.9±3.71	44.4±3.44	45.3±2.71
BMI (Kg/M^2)	27.15±2.8	27.72±3.07	26.66±1.06	24.43±2.48
Waist Circumference (Cm)	94.26±4.88	98.28±7.12	87.47±5.02	86±8.84
Waist Hip Ratio	0.98±0.04	0.96±0.10	0.856±0.04	0.847±0.07

Table 3: Comparison of anthropometric parameter in type-II diabetic patients

Variables	Metabolic Syndrome Overall (n=38)	Non-Metabolic Syndrome Overall (n=22)	't' Value	P Value
Age (Years)	45.9±3.19	44.6±3.21	1.5	NS
BMI (Kg/M²)	27.39±3.91	23.89±1.6	5.5	< 0.001
Waist Circumference (Cm)	95.97±6.1	87.03±6.25	5.49	< 0.001
Waist Hip Ratio	0.97±0.08	0.85±0.05	7.17	< 0.001

Table 4: Mean values of biochemical parameters in type-II diabetic patients

Variables	Metabolic Syndrome Groups		Non-Metabolic Syndrome Groups	
	Men (n=19)	Women (n=14)	Men (n=19)	Women (n=8)
Fasting Serum Glucose (mg/dl)	156±18.2	172±25.4	136±8.84	138±16.1
Total Cholesterol (mg/dl)	257.8±33.6	291.5±62	192±12.84	194.4±1.41
Serum Triglyceride (mg/dl)	183±28.81	191±26.8	135±10.9	124±9.4
LDL Cholesterol (mg/dl)	186±28.2	216±60	121±12.4	115±13.3
VLDL Cholesterol (mg/dl)	33.9±3.44	37.1±6.6	27.0±2.18	24.8±1.88
HDL Cholesterol (mg/dl)	35.0±2	37.0±4.3	44.0±2.5	55.0±1.8

Table 5 shows comparison of biochemical parameters in type-II diabetic patients. Data revealed that all the biochemical parameters measured except HDL cholesterol were significantly higher ($p < 0.001$) in metabolic syndrome group. HDL cholesterol was significantly low ($p < 0.001$) in this group.

Table 6 shows mean values of pre-exercise cardiovascular parameters of type-II diabetic patients. Mean values of measured pre-exerci se cardiovascular parameters were also higher in women patients of metabolic syndrome groups as compared to men. Heart rate reserve at rest was significantly less in patients of metabolic syndrome group as compared to non- metabolic syndrome group. No abnormality in resting electrocardiogram was detected in both the groups.

Table 7 shows comparison of pre-exercise cardiovascular parameters of type-ii diabetic patients. It was observed that resting pulse rate, pulse pressure, double product were significantly higher ($p = < 0.001$) in metabolic syndrome group patients reflecting autonomic dysfunction.

Table 8 shows mean values of post exercise cardiovascular parameters of type-II diabetic patients. After performing three minute exercise test the mean values of maximum heart rate, pulse- pressure, double-product, Heart rate reserve were on higher site in patients of metabolic syndrome group. Mean values of Vo_2Max, exercise capacity and recovery heart rate, were on lower site in patients of metabolic syndrome group as compared to non-metabolic syndrome group.

Table 9 shows comparison of post exercise cardiovascular parameters of type-II diabetic patients. After performing 3 min. exercise test the maximum heart rate achieved was significantly ($p<0.001$) higher in diabetic subjects having metabolic syndrome as compared to the subjects of non-metabolic syndrome group. The absolute Vo_2Max which represents physiological ceiling for the ability of cardiovascular system and oxygen transport system to delivered oxygen to contracting muscle, both the absolute and related Vo_2Max were significantly ($p<0.001$) less in metabolic syndrome group. Exercise capacity measured in term of METs was also found less metabolic syndrome group as to compare to non-metabolic syndrome group.

Table 5: Comparison of biochemical parameters in type-II diabetic patients

Variables	Metabolic Syndrome Overall (n=38)	Non-Metabolic Syndrome Overall (n=22)	't' Value	P Value
Fasting Serum Glucose (mg/dl)	162.67±22.54	136.70±11.22	5.3	< 0.001
Total Cholesterol (mg/dl)	271.87±49.65	192.7±12.7	7.92	< 0.001
Serum Triglyceride (mg/dl)	186.85±27.85	131.85±11.5	9.49	< 0.001
LDL Cholesterol (mg/dl)	198.9±46.27	118.8±12.52	8.5	< 0.001
VLDL Cholesterol (mg/dl)	35.3±5.18	26.32±2.35	8.4	< 0.001
HDL Cholesterol (mg/dl)	35.75±3.27	47.51±5.28	10.37	< 0.001

Table 6: Mean values of pre-exercise cardiovascular parameters of type-II diabetic patients

Variables	Metabolic Syndrome Groups		Non-Metabolic Syndrome Groups	
	Men (n=19)	Women (n=14)	Men (n=19)	Women (n=8)
Pulse Rate (Beats/Min)	82.0±8.3	86.0±8.2	74.0±10.4	76.75±7.77
SBP (mm of Hg)	141.8±1.61	142.3±1.72	122.4±9.90	123.5±12.19
DBP (mm of Hg)	91.58±1.95	91.0±1.51	80.74±6.96	79.25±7.85
DP (mm of Hg)	50.0±2.0	51.0±1.0	42.0±4.0	44.0±5.0
DP (Pulse Rate x SBP)	11632±1241	12242±1242	9094±1680	9515±1730
Heart rate reserve(Beats)	92.05±9.54	87.78±10.84	102.0±11.0	98.0±8.0

Table 7: Comparison of pre-exercise cardiovascular parameters of type-II diabetic patients

Variables	Metabolic Syndrome Overall (n=38)	Non-Metabolic Syndrome Overall (n=22)	't' Value	P Value
Pulse Rate (Beats/Min)	83.69±8.9	74.8±9.36	3.91	< 0.001
SBP (mm of Hg)	142±1.65	122.66±10.9	10.7	< 0.001
DBP (mm of Hg)	91.33±1.78	80.29±7.11	8.42	< 0.001
DP (mm of Hg)	50.66±1.78	42.37±4.43	9.65	< 0.001
DP (Pulse Rate x SBP)	11890±1259	9218±1672	6.93	< 0.001
Heart rate reserve (Beats)	90.24±10.17	101.0±10.0	4.21	<0.001

Table 8: Mean values of post exercise cardiovascular parameters of type-II diabetic patients

Variables	Metabolic Syndrome Groups		Non-Metabolic Syndrome Groups	
	Men (n=19) I	Women (n=14) II	Men (n=19) III	Women (n=8) IV
Maximum Heart Rate (Beast/Min)	151.3±7.18	148.3±3.72	133.1±6.23	128.8±3.84
SBP (mm of Hg)	199±6.7	202±10.6	176±12.6	177±16.3
DBP (mm of Hg)	100±3.17	103±5.75	101±7.61	96.8±7.09
PP (mm of Hg)	98.21±5.76	99.42±9.7	75.26±9.59	80.25±14.59
Double – Product	30084.84±2362.97	30025.71±1848.04	23475.79±2214.43	22809±2403.11
Heart Rate Reserve (Beats)	69.26±2.13	62.29±5.96	59.05±3.90	52±4
Heart rate at 1 min. of recovery	135.79±9.70	131.57±5.88	112.63±8.30	109.50±7.31
Recovery heart rate	15.47±3.12	16.71±3.56	20.42±2.36	19.25±3.54
Vo_2Max				
L/Min	3.43±0.11	2.56±0.15	3.88±0.21	2.71±0.12
$L/M^2/Min$	2.14±0.04	1.68±0.11	2.29±0.09	1.75±0.11
Ml/Kg/Min	47.80+3.02	38.42±0.59	55.45±2.62	42.03±0.71
Exercise capacity (METs) achieved	13.66±0.86	10.98±0.17	15.84±0.75	12.01±0.20

Table 9: Comparison of post exercise cardiovascular parameters of type-II diabetic patients

Variables	Metabolic Syndrome Overall (n=38)	Non-Metabolic Syndrome Overall (n=22)	't' Value	P Value
Maximum Heart Rate (Beast/Min)	150±5.9	131.77±5.9	117	< 0.001
SBP (mm of Hg)	200.25±3.6	176.91±30.45	4.1	< 0.001
DBP (mm of Hg)	101.51±4.55	99.77±7.59	1.07	NS
PP (mm of Hg)	98.72±7.59	76.74±11.24	8.85	< 0.001
Double – Product	30059±2130	23278±2246	11.7	< 0.001
Heart Rate Reserve (Beast/Min)	66.3±5.41	56.9±5.06	6.77	< 0.001
Heart rate at 1 min. of recovery	134±8.46	111.70±8.01	10.22	< 0.001
Recovery heart rate	16±3.32	20.07±2.74	5.08	< 0.001
Vo_2Max				
L/Min	3.06±0.46	3.53±0.58	4.8	< 0.001
$L/M^2/Min$	1.95±0.24	2.13±0.27	4.08	< 0.001
Ml/Kg/Min	43.82±5.24	51.47±6.62	5.52	< 0.001
Exercise capacity (METs) achieved	12.52±1.50	14.71±1.89	5.51	< 0.001

Discussion

The present study analyzed the association between resting heart rate and presence of metabolic syndrome in type-II diabetic patients. Diabetic patients with metabolic syndrome exhibited significant ($p < 0.001$) higher mean values of resting pulse (83.69±8.9 beats per min) pulse pressure (50.66±1.78 mm of Hg) double-product (11890±1259 mm of Hg X beats per min) and lower value of heart rate reserve (90.24±10.17 beats) as compared to non metabolic syndrome group. The women showed higher mean values as compared to men.

Resting heart rate can be used as a crude estimate of sympathetic tone. Mensink GB et al. [5] and Greenland P et al. [6] evaluated resting heart rate as predictor of increased cardiovascular morbidity. They reported that higher resting heart rate was associated with sympathetic over activity, various cardiovascular risk factors including hypertension, higher fasting blood glucose and mortality, even after an adjustment for other risk factor.

There are multiple lines of emerging evidence which suggested that resting heart rate associated with the presence and/or potential to develop cardiovascular disease.

Diaz A et al. [7] recognized resting heart rate as risk factor for cardiovascular disease.

Wilson PW et al. [8] reported relatively strong association between resting heart rate and metabolic syndrome suggesting a shared pathophysiological pathway.

Jidong S et al. [9] studied 248 subjects having metabolic syndrome and 1184 subjects not having metabolic syndrome they reported significantly ($p<0.01$) higher resting heart rate (64±10bpm) in patients of metabolic syndrome group as compared to subjects not having metabolic syndrome (62±9.0bpm).

Rogowski O et al. [10] studied a sample of 7706 individuals full-filling the criteria of metabolic syndrome. The participants were divided into quintiles of resting heart rate the prevalence of metabolic syndrome was found to be 62% and 52% for men and women respectively in 1st quintile resting heart rate 21.1% and 13.3% in 5th quintile of resting heart rate.

Sympathetic over activity and parasympathetic under activity might underlie the aforementioned observations.

In present study resting heart rate showed a significant ($p< 0.001$) negative correlation with BMI, serum glucose, total cholesterol, triglyceride, systolic blood pressure, double product, heart rate reserve and heart rate recovery.

In the present study diabetic patients with metabolic syndrome exhibited higher pre-exercise pulse pressure (50.66±1.78 mm of Hg), double product (11890±1259 mm of Hg X beats per min) as well as post exercise pulse pressure (98.72±7.59 mm of Hg) double product (30059±2130 mm of Hg X beats per min) as compared to patients of non-metabolic syndrome groups.

Mule G et al. [11] studied relationship metabolic syndrome with pulse pressure in patients with essential hypertension and suggested that increased pulse pressure at rest is mainly associated with arterial wall stiffness.

In the present study Vo_2Max and exercise capacity was measure by Queens's college step test.

Vo_2Max is a measure of functional limit of cardio respiratory system and single most valid measure of maximum exercise capacity.

The Vo_2Max relative to body mass evaluates the ability of an individual to perform exhaustive work i.e., their aerobic performance.

The major finding from present study revealed that subjects with higher BMI and metabolic syndrome had reduced Vo_2max (43.82±5.24 ml/kg/min) as compared to subject not having metabolic syndrome (51.47±6.62 ml/kg/min).

In the present study exercise capacity expressed as METs achieved in patients of metabolic syndrome group was (12.52±1.50) significantly ($p < 0.001$) less as compared to non-metabolic syndrome group (14.71±1.89). Significant negative correlation was found between peak exercise capacity BMI (r-0.43) waist circumference (r –0.439), S. Glucose (r-0.549) total cholesterol (r-0.554), triglyceride (r-0.482), LDL cholesterol (r-0.524), and a positive correlation was found with heart rate reserve at peak (r-0.689).

Ugur-Altun B et al. [12] demonstrated a negative correlation between insulin resistance & peak exercise capacity. In diabetic patients glycosylation may impair the function of a number of protein and vascular or endothelial dysfunction may be a plausible paucity and metabolic disturbances associated with poor diabetes control.

Fang ZY et al. [4] studied determinants of exercise capacity in 17 patients with type –II diabetes, they concluded that reduced exercise capacity with type-II diabetes is associated with diabetes control, sub clinical left ventricle dysfunction and impaired heart rate recovery, They found exercise capacity negatively associated with age, BMI, duration of disease,

glycosylated hemoglobin, history of hypertension and negative co-relation with heart rate recovery.

Reduced heart rate recovery immediately after exercise is an important indicator of cardiac autonomic dysfunction and contributes to cardiovascular mortality and morbidity.

In the present study diabetic patients with metabolic syndrome showed delayed heart rate recovery (16±3.2bpm) as compared to normal heart rate recovery (20.07±2.74bpm) in non-metabolic syndrome group.

Vanninen et al. [13] studied effect of metabolic control and autonomic function in newly diagnosed type-II obese patients. The persistence hyperglycemia in diabetes may weaken parasympathetic control and enhance sympathetic activity.

Jidong S [9] studied the association of delayed heart rate recovery with metabolic syndrome, They reported lower heart rate recovery (10.3±11.6/ min.) and higher resting heart rate (64.3±10.3/ min.) as compared to subjects not having metabolic syndrome (13.6±9.7/min., 61.6±9.1/min.) The metabolic syndrome parameters were associated with delayed recovery.

During exercise sympathetic stimulation increases markedly, where as vagal tone is withdrawn, thus increasing heart rate, myocardial contractility cardiac output distribution and myocardial oxygen utilization during recovery from exercise, vagal influence waxes and adrenergic tone wanes. Recovery of heart rate after exercise is a function of vagal reactivation.

The cardiovascular risk association with metabolic syndrome may be mediated by failure of vagal reactivation is addition to sympathetic over-activity.

The diabetic patients with metabolic syndrome exhibited significant ($p<0.001$) higher mean values of heart rate reserve (90.24±10.17 beats) as compared to non-metabolic syndrome group. The women showed lower mean value as compared to men.

Salvadori et al. [14] studied oxygen uptake and cardiac performance in obese and normal subjects during exercise and reported reduced cardiac performance during progressive work rate exercise in obese subjects.

Cheng YJ et al. [2] examined the relationship of heart rate reserve and cardiovascular mortality in 27,459 healthy subjects, They reported that among younger men (20-39 years) heart rate reserve was only factor associated with cardiovascular disease mortality (instantaneous relative risk (RR) and 95% CI for heart rate reserve 0.6, 0.5-0.9 for CVD mortality by 10 beats per min increment) where as only cardio-respiratory function and BMI were associated with all cause mortality among older men, heart rate reserve was inversely associated with cardiovascular disease and all cause mortality.

Conclusion

From the observations of present study it is concluded that regular physical activity and higher level of cardio respiratory fitness are associated with reduced risk of coronary heart disease low physical fitness has been associated with increased clustering of metabolic abnormalities associated with metabolic syndrome in type-II diabetic patients.

Key messages

Regular exercise can improve cardia functions even in patients with type II diabetes. Hence they should be encouraged to improve their quality of life.

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Effects of Different Phases of Menstrual Cycle on Short Term HRV in Young Women

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Abstract

Introduction: Menstrual cycle is characterized by an intense activity of endogenous sex hormones. Autonomic nervous system (ANS) maintains the internal milieu of the body. Among the various organ systems that are influenced by the ANS, the cardiovascular system has a major role in the maintenance of homeostasis. Internal and external influences such as physical activity, food intake, pregnancy, menstruation are immediately balanced by specific adaptation mechanisms influenced by the ANS. Cyclical phases in menstrual cycle bring about changes in the stress levels which has a major influence on cardiovascular derangements which can be best studied by HRV. *Aim of the study:* To study the effects of different phases of menstrual cycle on short-term Heart rate variability in young adult women. *Materials and Methods:* 126 female students of age group 17-22 years have been included in the study from 2016-2017. A detailed questionnaire regarding their menstrual history was taken. After 5 minutes of supine rest, a five-minutes lead II ECG was recorded and digitized @ 256 Hz sampling rate and a vertical resolution of 10bits by NVQUIRE© software and two-channel digital polygraph hardware by INCO, Ambala. Throughout the procedure Taskforce recommendations for HRV was followed. *Results:* As expected, an increased sympathetic tone and decreased parasympathetic tone was found in the luteal phase when compared to the follicular phase, as shown by decreased RMSSD and HF indices and increased low-frequency (LF) values (p= 0.05). *Conclusion:* From the study, it can be concluded that exists a sympathovagal imbalance which is depicted by increased sympathetic activity in luteal phase than proliferative phase, and vice versa in the proliferative phase.

Keywords: Menstrual Phases; Sympatho-Vagal Imbalance; Parasympathetic Activity; HRV.

Introduction

Heart Rate Variability is a highly sensitive, non-invasive tool to measure the variations in beat to beat intervals or in the instantaneous heart rate (HR) [1,2]. Endogenous sex hormones and its levels in young females vary with different age groups, socioeconomic status, and lifestyle habits. In women, Heart Rate Variability (HRV) is influenced by many factors, including sex hormones, menstrual cycle, menopause, hormone replacement therapy, and with basic physical anthropometric differences like body mass index (BMI) & WHR [3]. In addition, the combined differences of age, BMI, and menstrual cycle in young women, showed that age was an essential predictor of HRV, followed by BMI and menstrual cycle [3]. Menstrual cycle has three phases: the menstrual phase, follicular phase, and the luteal phase. Two main hormones i.e. estrogen and progesterone plays a vital role in establishing a normal hormonal homeostatic milieu during the entire menstrual cycle [4]. The follicular phase is also called as the proliferative phase because endometrial growth is the primary outcome of proliferative phase and is mediated by increase in estrogens levels. The primary outcome of secretory phase is the maturation of the endometrium. Decreasing levels of estrogens halt endometrial

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growth [3,4]. Through the influence of a rise in follicle stimulating hormone (FSH) during the first days of the cycle; a few ovarian follicles are stimulated [4]. The luteal phase is also called as the secretory phase. An important role is played by the corpus luteum, the solid body formed in an ovary after the egg has been released from the ovary into the fallopian tube which secretes progesterone. Peak progesterone production is noted in mid-luteal phase i.e one week after ovulation. In the luteal phase of menstrual cycle, premenstrual syndrome (PMS) also describes various ranges of emotional, behavioral, physical and mental changes which can alter the entire homeostatic milieu. These changes bring about a greater impact on designing the Hypothalamo-pituitary axis (HPO) [5]. Beat-to-beat variability in the heart's rhythm is mainly caused by the autonomic nervous system's modulation of intrinsic cardiac pacemakers [6]. Literature shows Sympathetic activity is significantly higher in the luteal phase than in the follicular phase. However, others have reported the menstrual cycle were not significantly associated with changes in autonomic nervous activity. Repeated cyclical blood loss in menstruation and variations in the estrogen and progesterone levels during menstrual cycle could affect the cardiac autonomic function [7]. There exists a cyclical variation of HRV along with menstrual cycle and many literature studies lack in substantiating the physiological role of endogenous sex hormones due to the influence of many plausible factors which can have an impact on Hypothalamo pituitary axis. These factors still remains to be clarified. So, this study was designed to assess whether any relationship exists between the short term HRV and different phases of menstrual cycle in young women. This study was designed to assess the changes in linear features of HRV during different phases of menstrual cycle in adolescent young normal female subjects .

Materials and Methods

A total of 126 healthy young female aged 17-22 years (with normal Menstrual Cycle of 30± 3 days, regular for at least 6 months prior to this study) studying MBBS in Aarupadai veedu medical college and hospital were selected for this study. The subjects are instructed to come to the electrophysiology department during each of three different phases. Day 1-5 during Menstrual phase (Phase-I), day 9 - 12 during the follicular phase (Phase- II) & day 19-21 during the luteal phase (Phase-III). The study was initiated after obtaining approval institute research and Ethics Committee.

Inclusion Criteria

Young, healthy female volunteers between 17-22 years.

Exclusion Criteria

Irregular menstrual cycles, preexisting cardiovascular diseases, Diabetes mellitus, Thyroid disorders, taking oral contraceptives

Thorough menstrual history was taken about menstrual regularity and total duration of cycle.

The examination was carried out at same time of the day to avoid diurnal variation.

Basal Parameters like Age, BMI, WHR, Resting Pulse Rate and blood Pressure were recorded according to the protocol provided, to select the healthy subject for study. After 5 minutes of supine rest a five-minute lead II ECG was recorded during three phases and digitized @ 256 Hz sampling rate and a vertical resolution of 10bits by NVQUIRE© software and two-channel digital polygraph hardware by INCO, Ambala. Throughout the procedure Taskforce recommendations on HRV is followed. Then offline measurements of RR tachogram across the phases done and analyzed using HRV analysis software version 1.1,biosignal analysis group, kuoppio, Finland.

Statistical Analysis

The data collected (Basal parameters, SBP, DBP, HRV parameters) were analyzed using IBM SPSS 20 and tested for normal distribution using Shapiro-Wilk test. Differences between the two phases (follicula and luteal) for all experimental parameters, including HRV indices, were determined by the Student's paired t-test. $p < 0.05$ was taken as statistically significant.

Table 1: Base-line values (Mean±SD) of different parameters in the subjects

Parameter	Females (N=126)
Age(years)	18.4±.90
BMI(Kg/m²)	20.83±1.33
WHR(WC/HC)	.83±.01
Resting SBP(mmHg)	114.68±4.18
Resting DBP(mmHg)	75.16±3.83
Resting Pulse Rate (min.)	74.80±3.12

Table 2: Comparison of Time domain measures of HRV in the two phases (follicular and luteal) of menstrual cycle

Variables	Follicular phase(n=126)	Luteal phase(n=126)	P value
Mean HR	74.80±3.12	76.59 ±0.09	0.647
SDNN	41.09±0.02146	34.29±0.02836	0.0373
RMSSD	39.55±10.26	31.71±25.584	0.0387
NN50	127.55±67.97	105.18±88.95	0.0183
PNN50	31.36±18.82	25.75±19.33	0.0467
RRINDEX	0.20±0.08	0.17 ±0.034	0.0422
TINN	275.23±96.53	263.775±109.45	0.0258

Table 3: Comparison of Frequency domain (Non-parametric) measures of HRV in the two phases (follicular and luteal) of menstrual cycle

Variables	Follicular phase(n=126)	Luteal phase(n=126)	P value
LF (%)	27.5±12.5	35.12±17.58	0.0459
HF (%)	57.6±22.35	47.1625±28.093	0.034
VLF (%)	14.9±16.42	17.72±19.14	0.1874
LF:HF	0.478±0.24	0.825 ±0.6443	0.3271
LF nu	32.3±14.196	31.58 ±17.343	0.2279
HF nu	67.7±14.27	68.42±16.68	0.3047

p value of <0.05 is considered to be significant

Discussion

The first clinical study supporting this hypothesis has been reported by Sato et al. (1995) [8] who investigated the fluctuations of ANS activities during the follicular phase (day 7- 10 of last bleeding) and in luteal phase (3- 7 days prior to next bleeding) in 20 college students and reported increased LF nu and decreased HF nu in luteal phase and obviously LF/ HF ratio was significantly increased in luteal phase indicating predominant sympathetic activity during this phase [8,9]. In our present study, the time domain indices of HRV reflecting parasympathetic modulation like RMSSD and pNN50 are decreased in luteal phases of menstrual cycle when compared with follicular phase. Many literature searches in HRV depicts that there is a significant influence of endocrine sex hormones on maturation of autonomic nervous system. It remains to be established what sort of influence might induce the improvement in neural autonomic control at adolescence. Genetic morphology, hormonal status, and changes in physical activity are possible factors which influences on the menstrual cycle. The SDNN linearly decreases as a function of increased HR as it has been reported suggesting a greater incidence of arrhythmias in the luteal phase than in the follicular phase in women with regular menses [10,11]. Because sympathetic stimulation has an arrhythmic effect, these data support increased sympathetic activity in the luteal phase [12,13]. Our findings are similar to previous studies in which increased sympathetic activity in the luteal phase when compared to other phases and found a greater increase in parasympathetic activity in the follicular phase [14,15]. Inconsistent findings in many literature regarding the interaction between the menstrual cycle and HRV may be due to the differences in the sample size, age, method used to evaluate HRV and various phase studied [16]. It should also be noted that maturation of certain somatic nervous system functions also occurs at puberty. Taking the understanding that there are other contributory components which has an impact on HRV, we analyzed the frequency domain parameters.

By comparing the frequency domain indices, it was observed that a significant increase in LF% during luteal phase of menstrual cycle. The High frequency power (HF) which is a marker of vagal modulation has significantly decreased in our study population in luteal phase depicting the fall in vagal modulation of heart. This interesting finding can be attributed to the fluctuations in the levels of estrogen to progesterone ratio after ovulation which can alter the entire vasomotor milieu. Though not significant there was a slight increase in LF:HF ratio which warrants scientific explanation. Thus we conclude with maximum caution that in our study, young adolescent female population presented with overall lower heart rate variability expressed in terms of spectral components of HRVduring their different phases of menstrual cycle [12]. The rise in the sympathetic tone and modulation needs an established mechanism for its explanation in terms of endogenous sex hormonal roles in the blood vessels feeding the sensors, and its

altered dynamics in the sensor transducing mechanisms, permissive and inhibitory role of other hormonal mediators, altered integrator activity and external plausible psycho- social factors .The major limitation of this study was that serum endogenous sex hormone levels were not measured during the different cyclical phases. Thus, our findings could not be attributed to specific hormonal levels pertaining to the phases studied [15]. The possible existence and extent of inhibitory influences of pituitary and ovarian hormones on cardiac autonomic control can be well attributed by measuring their levels and correlation with HRV parameters. In view of the results obtained in the present age group, further studies should be conducted for at least four phases of menstrual cycle viz. early follicular, mid follicular, ovulatory and mid luteal phases and correlation should be determined by investigating the combined influence of age, BMI between the HRV indices and the sex hormones with a larger sample size.

Conclusion

In this study, the lower SDNN and RMSSD during the mid-luteal phase in comparison to the follicular phase could have resulted from enhanced sympathetic activity during the luteal phase. In reference to the same, there was significant higher parasympathetic modulation observed in follicular phase. These findings suggest that the variations in the hormonal status during follicular and luteal phases could contribute to the autonomic modulation of the heart which can be predicted by HRV.

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Conflict of Interest: None declared

Ethical Approval: The study was approved by the institutional ethics committee.

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Effect of Meditation on Cardiovascular and Respiratory Parameters

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Abstract

Aim: The aim of present study was to study the effect of Anapanasati meditation on cardiovascular and respiratory parameters among short term meditators (practicing meditation for less than 6 months), long term meditators (practicing meditation for 6months to 5 yrs) and nonmeditators. *Method:* The study included 30 short term, 30 long term meditators & 30 non meditators. Systolic blood pressure & diastolic blood pressure were recorded using diamond sphygmomanometer, Heart rate was measured using 108 Cardiodart ECG mahine. Pulmonary function tests: FVC, FEV1, FEV1/FVC, FEF 25-75%, PEFR were measured using Helios 401 medspiror (spirolyser)- A. computerised spirometer. One way ANOVA was used for simultaneous multiple group comparison followed by Post-hoc Tukey's test for group-wise comparisons. *Results & Conclusion*: On analysis of results, it was found that there was statistically significant decrease in heart rate, systolic blood pressure & diastolic blood pressure in long term meditators when compared to short meditators and nonmeditators ($p < 0.001$). There was also statistically significant decrease in heart rate in short term meditator when compared to nonmeditators ($p < 0.01$). There was statistically significant increase in both actual and % predicted values of FVC, FEV1, FEV1/FVC in long term meditators and short term meditators compared to non meditators ($p < 0.001$). There was also statistically significant increase in both values of FVC, FEV1, FEV1/FVC in long term meditators when compared to short term meditators ($p < 0.001$). Long term meditators showed highly statistically significant increase in both actual and % predicted values of $FEF_{25-75\%}$, PEFR when compared to short term meditators and non meditators ($p < 0.001$). Study concludes that meditation provides significant improvement on cardiovascular and respiratory parameters. Improvement continues further by increasing the duration of meditation.

Keywords: Meditation; Cardiovascular Parameters; Pulmonary Function Tests.

Introduction

Modern man is the victim of stress and stress related disorders. As stress is unavoidable, these days a simple, inexpensive yet powerful age-old technique, meditation is being increasingly used and studied [1-5]. Documented scientific evidences strongly indicates that meditation has promotive, preventive as well as curative potential as a non-pharmaco therapeutic and safe modality. It can be used as an effective life style adjunct to medical treatment to improve quality of life of the patients [1,3]. Although much research work has been done on meditation most of them are on diseased condition and on few specific types of meditations like-Trancedental meditation [3], Rajayoga meditation [5] and OM meditation [6]. Other forms of meditation are not extensively studied.

Most of the studies on meditation are on diseased states [3,6]. There are less studies to see effect on healthy individuals. And also most studies are on yoga where meditation will be coupled with practice of set of asanas and pranayamas [9]. There are less studies to see effect of meditation alone without

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incorporating asanas and pranayamas.In Anapanasati meditation, meditator sits in comfortable sitting posture, with eyes closed, legs crossed and arms clasped. Meditator consciously concentrates on his breath. So it is simple form of meditation on breath [7,8]. Hence, present study is undertaken to study the effect of Anapanasati meditation oncardiorespiratory parameters among healthy meditators and to compare the above parameters with that of non meditators, with a strong hope that early precaution can be taken to reduce the incidence of stress-related diseases of mind and body by bringing ancient technique-meditation to modern clinic.

Objectives

- To assess the following parameters in meditators (long term and short term) and nonmeditators.
- Cardiovascular parameters - systolic blood pressure, diastolic blood pressure and heart rate.
- Respiratory parameters- FVC, FEV_1, FEV_1/FVC, $FEF_{25-75\%}$, PEFR.
- To study the relation between effect of Anapanasati meditation on above mentioned parameters and duration of practice of meditation.
- To compare all the parameters between short term meditators, long term meditators and nonmeditators.

Methodology

The present study was conducted in Department of Physiology, JJM Medical College. It was carried out from April 2011 to March 2012. The study was undertaken to study the effect of Anapanasati Meditation on lipid profile and lipid peroxides among short term meditators and long term meditators and to compare with that of non meditators.

Study Group

In this study, 60 meditators were taken from Karnataka Pyramid DyanaPrachara Trust ®. Davangere Branch. This group was divided into 30 each based on duration of practice Anapanasati meditation. Short term meditators: meditating for 6 months to 5 years Long term meditators: meditating for more than 5 years.

Control Group

Thirty normal age & sex matched subjects from general population who were not exposed to any meditation or relaxation technique were included and were labelled as nonmeditators. Dietary habits and physical exercise were matched between study and control groups.

Inclusion Criteria

- Healthy males and females in the age group of 45 to 60 years.
- Short term meditators were those who had been practicing meditation from 6 months to 5 years.
- Long term meditators were those who had been practicing meditation for more than 5 years.
- Age and sex matched healthy individuals not exposed to any meditation or relaxation technique were included as controls.

Exclusion Criteria

- Age below 45 years and above 60 years.
- Presence of obesity, hypertension, diabetes mellitus, ischemic heart disease, congestive heart failure.
- Chronic smokers and chronic alcoholics.

Method

Meditators practice Anapanasati meditation, in the meditation centre regularly for 1 hour everyday between 6.A.M. to 7A.M. ANA means-breath in, PANA means-breath out, SATI means-to be with. ANAPANASATI means–BE WITH THE BREATH [8,9]. A quiet place is chosen., any comfortable sitting position can be taken. Hands should be clasped, legs should be crossed and eyes should be closed.

Notice your breath …..Inhale slowly ……Exhale slowly …….Let your breath sink in and out ….Your breath is a rhythm of calm …..Follow your breath …..Be still ….Be your breath. Be still….be still….be still

The nature of test was explained to them and informed consent was obtained. The procedure was in accordance with the ethical standards of committee of the institute. Collection of data was done between 9.00 am to 12.00 pm. Sufficient time was given (15 min) for the subjects to mentally and physically relax before doing the test. Abriefhistory, general physical examination and clinical examination of all the systems were done to exclude medical problems and to prevent confounding of results.

Recording of Anthropometrical Parameters, like height, weight, BMI (Body mass index)- calculated as Weight (kg)/Height^2 (m).

Recording of Cardiovascular parameters

- Blood pressure was recorded using mercury Sphygmomanometer (Diamond) in supine position in the right upper limb by auscultatory method. Similarly three readings were taken at interval of 15 minute and average of three readings was calculated.
- In the same resting condition, an electrocardiogram was recoded in Lead II (using CARDIART 108T, J8A,14901) and the average R-R interval of ten complexes was taken and the heartrate (HR=1500/ R-R interval) was calculated.

Pulmonary Function Tests

Pulmonary Function tests were carried out using a computerized spirometer, HELIOS 401 MEDSPIROR (SPIROLYSER). The subject was motivated prior to the initiation of manoeuvre. He was made sit on a stool, then place the mouth piece firmly in his mouth. He was instructed to take a full breath through nostrils, then close the nose with nose clip and then close lips around the mouth piece and blow out as hard and fast as possible and was followed by a maximum forced deep inspiration. and expiration once begins should be continued without a pause. A minimum exhalation time of 6 seconds was applied to obtain maximal FVC (Forced Vital Capacity) results. A minimum of three acceptable Forced Vital Capacity (FVC) manoeuvreswere obtained. The PFT with the best manoeuvre was selected.

Statistical Analysis

The results were expressed as Mean±Standard deviation for continuous data , and Number and Percentage for discrete data. One way ANOVA was used for simultaneous multiple group comparison followed by Post-hoc Tukey's test for group-wise comparisons. Categorical data was analysed by Chi-square test.

SPSS version 16 software was used for all the analysis.

1. p Value > 0.05 is taken as ' not Significant' .
2. p Value < 0.05 is taken as 'Significant' .
3. p Value < 0.001 is taken as 'Highly Significant'

Results

Analysis of the basic characteristics of 90 subjects, showed no statisticallysignificant difference in age, sex distribution, BMI, physical activity, diet. when values of all three group were compared (Table 1,2). None of them were smokers or consumed alcohol.On analysis of results, it was found that there was statistically significant decrease in heart rate, systolic blood pressure & diastolic blood pressure in long term meditators when compared to short meditators and nonmeditators ($p < 0.001$). There was also statistically significant decrease in heart rate in short term meditator when compared to nonmeditators ($p < 0.01$) (Table 3).

Table 1: Comparison of AGE and Physical characteristics of Long term, Short term and Non meditators

Groups	Age (yrs)	Ht(mts)	Wt(Kgs)	BMI (kg/ m^2)
Long term med.	52.8± 4.9	1.67± 0.05	64.5± 7.3	23.0± 2.3
Short term med.	51.5± 4.4	1.64± 0.05	62.9± 4.8	23.4± 1.6
Non – med.	52.9± 5.0	1.65± 0.07	65.2± 7.1	23.7± 2.0
Anova				
F	0.85	1.64	0.99	0.92
P	0.43 NS	0.20 NS	0.38 NS	0.40 NS
Groupwise comparisons (P - values)				
1 – 2	NS	NS	NS	NS
1 – 3	NS	NS	NS	NS
2 – 3	NS	NS	NS	NS

All the values are expressed as Mean ± SD
Multiple group comparision: One way ANOVA , F-Test
Groupwisecomparision: Post – hoc Tukey's test
* p < 0.05 S-Significant, ** p < .001 HS- highly significant p > 0.05 NS Not Significant

There was statistically significant increase in both actual and % predicted values of FVC, FEV1, FEV1/FVC in long term meditators and short term meditators compared to non meditators (p <0.001) There was also statistically significant increase in both values of FVC, FEV1, FEV1/FVC in long term meditators when compared to short term meditators (p <0.001) (Table 4).

Long term meditators showed highly statistically significant increase in both actual and % predicted values of $FEF_{25-75\%,}$ PEFR when compared to short term meditators and non meditators (p <0.001). There was

Table 2: Comparison of Gender distribution, Physical activity & diet between Long term, Short term and Non meditators

Variables	Long term Meditators n (%)	Short term Meditators n (%)	Non meditatorsn (%)	P
Gender				
Male	15 (50)	15 (50)	15 (50)	0.43
Female	15 (50)	15 (50)	15 (50.7)	
Physical exercise				
Sedentary	24 (80)	24 (80)	20 (83.3)	0.98
Non – sedentary	6 (20)	6 (20)	5 (16.7)	
Diet				
Veg	19 (63.3)	17 (56.7)	15 (50)	0.56
Mixed	11 (36.7)	13 (43.3)	15 (50)	

p > 0.05 NS Not Significant

Table 3: Comparison of Cardiovascular parameters between Long term, Short term and Non meditators

Group	HR(bpm) Mean± SD	SBP(mm Hg) Mean± SD	DBP(mm Hg) Mean± SD
Long term med.	66.0± 3.9	110.1± 4.2	70.1± 2.5
Short term med.	81.5± 4.9	126.8± 6.9	78.1± 5.0
Non – med.	86.0±5.4	131.4± 6.2	82.5± 6.3
Anova			
F	140.4	110.2	50.4
P	<0.001	<0.001	<0.001
Groupwise comparisons (P - values)			
1 – 2	**	**	**
1 – 3	**	**	**
2 – 3	0.01*	0.01*	0.01*

All the values are expressed as Mean ± SD
Multiple group comparision: One way ANOVA , F-Test
Groupwisecomparision: Post – hoc Tukey's test
* p < 0.05 S-Significant, ** p < .001 HS- highly significant p > 0.05 NS Not Significant

Table 4: Comparison of FVC, FEV_1 and FEV_1/FVC between Long term, Short term and Non meditators

Group	FVC(L)		FEV 1(L)		FEV 1 / FVC	
	Actual	Pred. (%)	Actual	Pred (%)	Actual	Pred (%)
Long term med.	3.65± 0.31	105.7± 6.9	3.63± 0.35	125.5± 6.1	99.7± 7.7	118.7± 8.9
Short term med.	3.17± 0.51	91.8± 4.1	2.64± 0.38	90.0± 3.0	83.6± 4.1	98.2± 5.0
Non – med.	2.58± 0.34	77.7± 6.3	1.86± 0.32	67.1± 5.5	72.3± 8.8	86.7± 9.1
Anova						
F	54.45	169.37	191.63	1029.0	110.57	127.42
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Group wise comparisons (P - values)						
1 – 2	**	**	**	**	**	**
1 – 3	**	**	**	**	**	**
2 – 3	**	**	**	**	**	**

All the values are expressed as Mean ± SD
Multiple group comparision: **One way ANOVA , F-Test**
Groupwisecomparision: **Post – hoc Tukey's test**
* p < 0.05 S-Significant ** p < .001 HS- highly significant, p > 0.05 NS Not Significant

Table 5: Comparison of $FEF_{25-75\%}$, PEFR between Long term, Short term and Non meditators

Group	FEF 25 – 75 %(L/sec)		PEFR(L/sec)	
	Actual	Pred. (%)	Actual	Pred. (%)
Long term med.	5.01± 0.51	118.7± 8.5	10.73± 1.07	119.6± 8.5
Short term med.	3.80± 048	91.2± 6.9	8.04± 0.65	92.7± 6.6
Non – med.	3.71± 0.41	88.5± 7.7	7.73± 0.98	88.3± 10.7
Anova				
F	70.97	142.0	96.8	111.91
P	<0.001	<0.001	<0.001	<0.001
Groupwise comparisons (P - values)				
1 – 2	**	**	**	**
1 – 3	**	**	**	**
2 – 3	0.73 NS	0.37 NS	0.42 NS	0.13 NS

All the values are expressed as Mean ± SD
Multiple group comparision: One way ANOVA , F-Test
Groupwisecomparision: Post – hoc Tukey's test
* $p < 0.05$ S-Significant, ** $p < .001$ HS- highly significant, $p > 0.05$ NS Not Significant

increase in both values of $FEF_{25-75\%}$ in short term meditators when compared to non meditators, but the increase was not statistically significant p (>0.05) (Table 5).

Discussion

Cardiovascular parameters Meditation is described as wakefulhypometabolic state by Herbert Benson [4,9]. Meditation produces relaxation response - a self induced reduction in activity of sympathetic nervous system. It is opposite of the hyperactivity of nervous system associated with fight- flight response [2]. The above results could be due to hypometabolic state obtained by meditation [9].

In meditation, d slowly a new balance between the sympathetic and parasympathetic systems is achieved. So meditation brings greater autonomic stability [10]. Shift in the balance towards parasympathetic system will lead to decrease in heart rate and blood pressure [5].

During meditation, the eye are closed so that one of the most powerful sensory input is cut off which may otherwise provoke the thought process. The subject shifts his attention on breathing process. Thus his awareness turns inward and gets diverted from external objects. The analytical activity of the cortex is not given scope and thus anxiety or tension as well as psychological accompaniments are reduced. The meditator experience complete relaxation [11]. This could be another reason for above results.

Meditation produces specific neural activation patterns involving decreased limbic and arousal in brain [12]. During stress there is activation of hypothalamic- pituitary- adrenocartical (HPA) axis which leads to secretion of several hormones, including adrenalin, cortisol [13]. Studies have shown reduction in hormonal levels like adrenalin, cortisol, lactate, dopamine with practice of meditation [14]. Decrease in release stress-related hormones could also be another reason for reduction in heart rate, systolic and diastolic blood pressure in our study.

Increasing the duration of meditation further causes improvement in physiological process involved . This improvement has been seen in our study, as long meditators (more than 5 years) have maximum reduction in the heart rate and blood pressure.

Pulmonary Function Test

Our study is consistent with following studies Vyas R et al. [5], Biju B et al. [15], Sayyed A et al. [16] With practice of meditation for few weeks the bulbopontine complex is adjusted to new pattern of breathing which is slower than its basal rhythm [15]. Which prolong the phase of inspiration and expiration by stretching lungs to their fullest extent.

During slow breathing the duration of inspiration and expiration, in turn the tidal volume will increase, increasing vital capacity. This could be one of the reason for increase in the pulmonary function test parameters in our study and also during meditation there will be greater relaxation of respiratory muscles induced by supraspinal mechanisms which

increases expiratory reserve volume contributing to rise in vital capacity. Relaxation of respiratory muscles could also be another reason for improvement in lung function test in our study [5,16].

Lung inflation to near total lung capacity, as it occurs in meditation is a major physiological stimulus for release of surfactant into alveolar spaces which increases lung compliance. The elastin and collagenfibers elongate to a greater extent, thus increasing the compliance of lung. Release of prostaglandins during lung inflation decreases bronchial smooth muscle tone. Meditation, by its relaxing effects, reduces the blood levels of adrenalin and nor-adrenalin and increases levels of opiod neuropeptides, thereby withdraws the bronchoconstrictor effect and modulates the bronchial smooth muscle tone [17]. This could be one more reason increase in respiratory functions in our study especially $FEF_{25-75\%}$ and PEFR. Improvement in these parameters in long term meditators indicate continued alteration of the physiological processes involved and emphasize the effect of duration of meditation.

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Erratum

Article Titled **"Correlation between Body Mass Index (BMI), Skinfold Thickness and Speed and Power of Adolescent Cricket bowlers: A Cross Sectional Study Protocol"**

Vidushi Gupta[1], Vandana Esht[2], Asir John Samuel[2], Senthil P. Kumar[3]

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The original published version of this Article contained errors in name of authors mentioned. Name of co-author **Asir John Samuel** was wrongly added and after removing the name of **Asir John Samuel** correct article and author name to be readed as

Correlation between Body Mass Index (BMI), Skinfold Thickness and Speed and Power of Adolescent Cricket bowlers: A Cross Sectional Study Protocol

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