INTERNATIONAL PHYSIOLOGY

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International Physiology [IP]

ISSN:
2347-1506, 2455-6262

ICV 2015: 68.27

No historical ratings

Area: Technical science

Print version: yes

Electronic version: yes

The journal is indexed in:

INTERNATIONAL PHYSIOLOGY

VOLUME 5 NUMBER 2
JULY - DECEMBER 2017

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.1

Male Partner of the Couples with Unexplained Infertility Have Increased Blood Pressure as Compared to the Female Partner

Amit Kant Singh[a], Nishu Bala[b], Shikha Seth[c], Reena Rani Verma[d]

Abstract

Introduction: Arterial blood pressure, an important physiological parameter has great etiological significance in epidemiology of cardiovascular disease due to its association with age, height, weight, diet, stress, socio-economic status. Reactive Oxygen Species (ROS) are ubiquitous reactive derivatives of O2 metabolism found in the environment and in all biological systems. ROS are implicated in many intracellular signaling pathways leading to changes in gene transcription and protein synthesis and consequently in cell function. Within the cardiovascular system, ROS play a crucial physiological role in maintaining cardiac and vascular integrity and a pathophysiological role in cardiovascular dysfunction associated with several clinical conditions, including hypertension. ROS is generated by psychological and physical stress they are involved in the cardiovascular dysfunctions and also in the male and female infertility, therefore it is hypothesised that the blood pressure may be one of the cardiovascular parameter that may be affected in both the partners of the couples suffering with unexplained infertility. Therefore, this study was undertaken to assess the blood pressure in both partners of the couples with unexplained infertility and to compare the blood pressure in both the partners. *Materials and Methods:* The blood pressure was recorded using the standard auscultatory technique in both the partners of 50 couples with unexplained infertility and having all the investigations within normal limits. The data obtained was analyzed statistically using student's t- test. *Results***:** The mean age of the male partners was 33.1±7.4 years and female partners was 31.3±3.6 years. The significant increase in systolic blood pressure (SBP) and diastolic blood pressure (DBP) was observed in the male partners. *Conclusions*: The male partners of the couples with unexplained infertility have elevated blood pressure as compared to the female partners.

Keywords: Increased Blood Pressure; Male Partner; Unexplained Infertility.

Introduction

Arterial blood pressure, an important physiological parameter has great etiological significance in epidemiology of cardiovascular disease due to its association with age, height, weight, diet, stress, socio-economic status etc [1]. Familial aggregation of hypertension documents an important genetic component. Concordance of blood pressure is greater within families than in unrelated individuals, greater between monozygotic than between dizygotic twins and greater between biological than between adoptive siblings living in same household. About 70% of familial aggregation of blood pressure is attributed to shared genes rather than shared environment [2]. Hypertension has been reported to be generally associated with sympathetic overactivity [3]. But the sympathetic response of certain individuals from both normotensive and hypertensive population have been reported to be more pronounced. Previous studies of family history of patients with hypertension have shown a hereditary factor in 76-86% of cases [4].

Reactive Oxygen Species (ROS) are ubiquitous reactive derivatives of O2 metabolism found in the environment and in all biological systems. ROS are implicated in many intracellular signaling pathways leading to changes in gene transcription, protein synthesis and consequently in cell function. Within the cardiovascular system, ROS play a crucial physiological role in maintaining cardiac and vascular integrity and a pathophysiological role in cardiovascular dysfunction associated with several clinical conditions, including hypertension [5,6]. The

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Received on: October 28, 2017 **Accepted on:** December 08, 2017

most important ROS detectable within the vasculature include the superoxide anion ($\bullet O_2^-$), hydrogen peroxide (H_2O_2), hydroxyl radical ($\bullet OH$), and the reactive nitrogen species peroxynitrite ($ONOO^-$), which have been regarded as a nasty, life-threatening and destructive oxygen-derived toxicant. In healthy conditions, ROS are produced in a controlled manner at low concentrations and function as signalling molecules regulating vascular contraction-relaxation and cell growth [7].

Physiologically, ROS generation is tightly regulated by endogenous cellular antioxidants, which include superoxide dismutase (SOD), catalase, thioredoxin, glutathione, and antioxidant vitamins. In physiological conditions, the rate of ROS generation is counterbalanced by the rate of elimination. In contrast, under pathological conditions, such as hypertension, ROS are produced in concentrations that cannot be controlled by the usual protective antioxidant mechanisms employed by the cells, leading to a state of oxidative stress [6].

Indeed, when produced in excess, $\bullet O_2^-$ reacts with nitric oxide (NO) to produce a dramatic concentration of the toxic $ONOO^-$ which promotes a variety of negative effects on cellular function. These include alteration of transcription factors, kinases, protein synthesis, and redox-sensitive genes, which in turn influence endothelial function, increase vascular contractility, vascular smooth muscle cell growth and apoptosis, monocyte migration, lipid peroxidation, inflammation, and increased deposition of ECM proteins. These major processes are deeply involved in the pathogenesis and progression of vascular damage in cardiovascular disease [8,9].

As ROS is generated by psychological and physical stress. ROS are involved in the cardiovascular dysfunctions and also in the male and female infertility, therefore it is hypothesised that the blood pressure may be one of the cardiovascular parameter that may be affected in both the partners of the couples suffering with unexplained infertility.

Therefore, this study was undertaken to assess the blood pressure in both partners of the couples with unexplained infertility and to compare the blood pressure in both the partners.

Materials and Methods

The study was conducted in the Department of Physiology on the male and female partners of the couples diagnosed with unexplained inferility (having all the investigative reports within normal limits) referred from the outpatient department of the Department of Obstetrics and Gynecology, UPUMS, Saifai, Etawah.

After obtaining the informed written consent 50 couples were assessed during the study. The blood pressure was recorded using the standard auscultatory technique. The data obtained was analyzed statistically using student's t- test and p value of less than 0.05 was considered significant.

The study was approved by the institution ethical committee for research on humans.

Results

The mean age of the male partners was 33.1±7.4 years and female partners was 31.3±3.6 years. The blood pressures of both the partners are as given in Table 1. The significant increase in systolic blood pressure (SBP) and diastolic blood pressure (DBP) was observed in the male partners.

Table 1:

	Female Partners (N= 50)	Male Partners (N=50)
PULSE (per minute)	73.6 ± 7.3	85.7 ± 8.1
SBP (mm Hg)	102.5 ± 6.1	*134.3 ± 9.8
DBP (mm Hg)	74.9 ± 7.4	*89.2 ± 8.1

*P< 0.05, student's t- test.

Discussion

The increased SBP and DBP as observed in the study (Table 1) was due to the fact that estrogen affect mitochondrial function in vascular endothelium [10]. Estrogen affects mitochondrial function through increasing oxidative phosphorylation, while at the same time decreasing mitochondrial superoxide production [11,12,13]. Mitochondrial production of ROS plays a key role in oxidative stress, so one would predict that estrogen may also have an important impact on vascular oxidative stress [14].

In addition to the mitochondria, estrogen also suppresses ROS through other mechanisms. For example, estrogen treatment reduces angiotensin II induced free radical production in vascular smooth muscle cells and decreases NADPH stimulated superoxide production by mouse cerebral arteries [15]. Estrogen also suppresses stress increased NADPH oxidase activity and intracellular generation of ROS in human umbilical vein endothelial cells [16]. Furthermore, in vascular smooth muscle cells estrogen treatment increases protein levels of both manganese superoxide dismutase (SOD) and extracellular SOD by increasing transcription rate. There was no effect of estrogen on copper-zinc SOD, glutathione peroxidase, or catalase. Likewise, treatment of ovariectomized rats with estrogen increased levels of manganese SOD protein in cerebral blood vessels, but did not change levels of catalase or glutathione peroxidase [10].

The most prominent effects of estrogen on vascular reactivity are mediated through direct effects on endothelial function [17], but studies of very high concentrations of estrogen may show additional, non physiological effects. A plethora of studies in humans have clearly demonstrated that estrogen promotes vasodilation through an Enos dependent mechanism [17]. These include demonstration of an estrogen stimulated increase in plasma concentrations of NO, increase in reactive hyperemia after estrogen treatment, and changes through the menstrual cycle reflective of an estrogenic effect. Interestingly, age influences flow mediated vasodilation in women. In one study acute responses of postmenopausal women to estrogen (18 h after placement of a transdermal patch) declined with age [18].

Likewise, postmenopausal women receiving either acute estrogen (within 1 h of sublingual administration) or chronic estrogen (3 months oral administration) all demonstrated increases in flow mediated dilation, but this increase was significantly greater in women who were less than 5 years past menopause compared with women more than 5 years past menopause [19]. Furthermore, for women more than 5 years past menopause, flow mediated vasodilation increased significantly more in women who had received estrogen treatment in the past compared with those who had not. These findings support the idea that, in the absence of estrogen, endothelium dependent release of NO is reduced, and the ability of estrogen to increase this response is abrogated the longer an individual is without estrogen exposure. Whether this abrogation involves epigenetic regulation of estrogen receptors or other mechanisms remains to be determined [19].

In contrast to what is known about the effects of estrogen on arteries, information regarding estrogenic effects on veins is scant. This lack of information is somewhat surprising in light of the well known adverse side effect of venous thrombosis in women using estrogenic treatments. As is observed in arteries, acute application of 17β estradiol in vitro caused concentration dependent and endothelium dependent decrease in tone in rings of femoral veins derived from female pigs.

These endothelium dependent relaxations to 17β estradiol were mediated by NO, but potassium channel activation seemed to contribute to the relaxation only in veins derived from gonadally intact females [20].

Conclusion

As there is significant increase in SBP and DBP observed in the male partners of the couples with unexplained infertility. Thus it is concluded that male partners have elevated blood pressure as compared to the female partners in couples with unexplained infertility .

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.2

Variability of Heart Rate and Blood Pressure in Medical Students after Different Degrees of Excercise

Anithalakshmi[a], **Leena S. Hiremath**[b]

Abstract

Background: Effect of exercise on heart rate and blood pressure which is important for clinical studies and also importance of exercise for controlling blood pressure in routine lifestyle. *Objectives of the Study:* To study change in heart rate and blood pressure in medical students after different degrees of excercise. *Material and Methods:* The retrospective study done by using records of 150 healthy medical students of 2015-16 batch divided into 50 each group for mild, moderate, severe excercise respectively, studying at the Vijayanagar Institute of Medical Sciences belonging to both the sexes volunteered for the study. The study was conducted at the department of Physiology during the month of November 16. *Results:* Table and graph showing mild, moderate exercise will increase slightly heart rate and blood pressure, severe exercise will increase more. *Conclusion:* The study depicts the variation of heart rate and blood pressure for different degrees of exercise among the students in VIMS, Bellary. Also to create awareness about exercise in our routine life style to maintain normal blood pressure.

Keywords: Heart Rate; Blood Pressure; Exercise; First Year MBBS Students.

Introduction

It is generally agreed that during dynamic exercise there is an increase in systolic blood pressure and heart rate, while diastolic blood pressure changes little [1]. The absence of a reflex bradycardia in response to the rise in systolic or mean arterial pressure is attributable partly to a reduction in baroreflex sensitivity. There [1] is less agreement about the changes in blood pressure following exercise [1]; some investigators have observed a slow return of blood pressure to the pre-exercise levels [1]. It has been well established that the magnitude of neural and hemodynamic responses during exercise is directly related to exercise intensity [2,3]. Thus, it is possible that different exercise intensities have also distinct effects on cardiovascular changes after exercise [4].

Because blood pressure and heart rate responses after exercise influenced by grades of excercise. Therefore, the goal of the present investigation was to study the effect of different exercise intensities on post-exercise blood pressure, heart rate variation in humans.

Aims and Objectives

To study heart rate and blood pressure in medical students after different degrees of excercise.

Material and Methods

The retrospective study done by using practical record books of 150 healthy medical students of 2015-16 batch divided into 50 each group for mild, moderate, severe excercise respectively, studying at the Vijayanagar Institute of Medical Sciences. The study was conducted at the department of Physiology during the month of November 16.

Statistical Analysis

The data analysis was carried out using the Statistics (SPSS). Statistically there is difference in mean values between groups was assessed using paired t-test.

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Received on: April 15, 2017 **Accepted on:** April 22, 2017

Results

1. Table and graph showing Heart rate variation before and after exercise in first year medical students of VIMS, Ballari, Karnataka, India.

   Study conducted during 9 am to 12pm in dept of physiology lab, one reading randomly and asked subject to do exercise then immediately after exercise readings are noted.

2. Table and graph showing Blood pressure variation before and after exercise in first year medical students of VIMS, Ballari, Karnataka, India.

Table 1:

Exercise	Before	After
Mild	76±2	84±2
Moderate	78±4	84±2
Severe	80±2	90±2

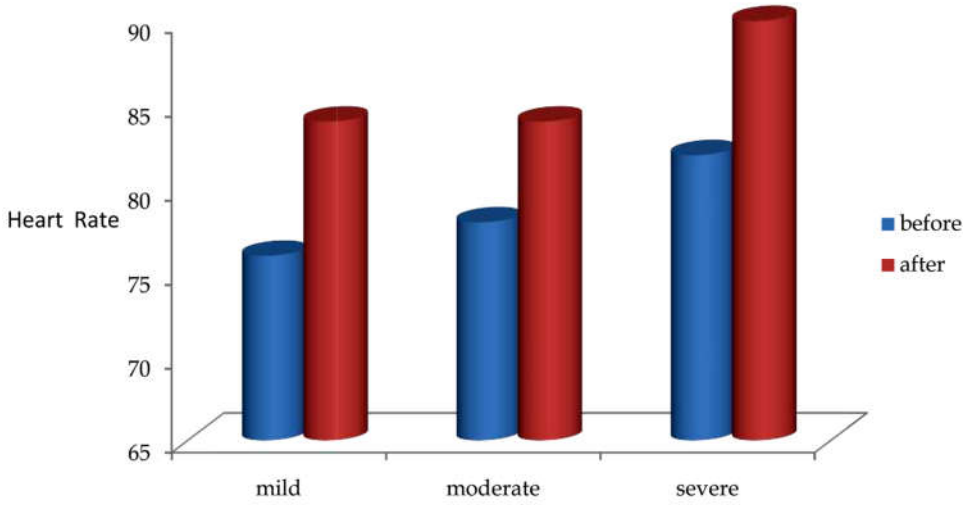
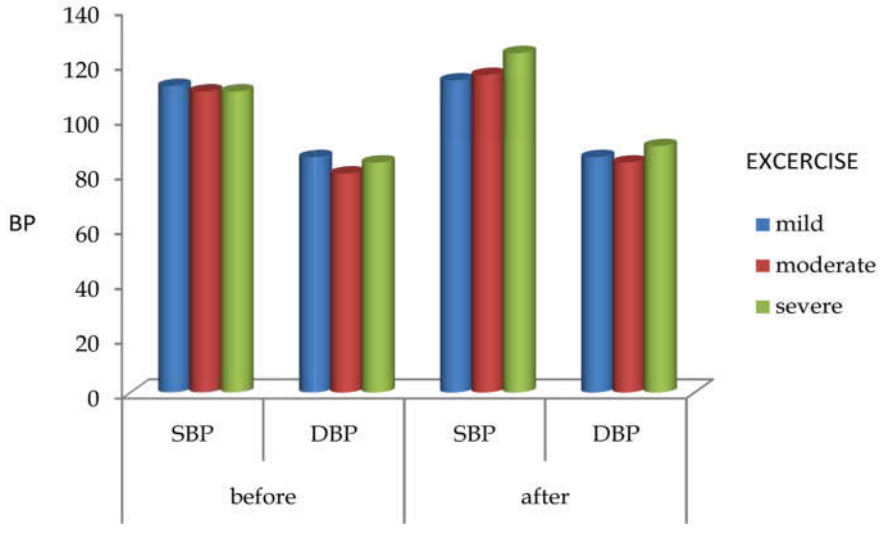


Table 2:

Exercise	Before SBP	DBP	After SBP	DBP
Mild	112±2	86±4	114±2	86±2
Moderate	110±4	80±2	116±4	84±4
Severe	110±2	84±4	124±2	90±2



Discussion

In mild to moderate exercise,in humans anticipation of physical activity inhibits vagal nerve impulses to the heart and increases sympathetic discharge. The result is an increase in heart rate and myocardial contractility. The tachycardia and enhanced contractility increase cardiac output [5]. When cardiac stimulation occurs, the sympathetic nervous system also changes vascular resistance in the periphery. Sympathetic-mediated vasoconstriction increases vascular resistance and thereby diverts blood away from the skin, kidneys, splanchnic regions, and inactive muscle. This increased vascular resistance persists throughout the period of exercise [5]. Cardiac output and blood flow to active muscles increase with progressive increases in the intensity of exercise [5].

Effect of excercise on systemic arterial BP varies with the intensity(degrees) of execrcise. Systolic BP increases in linearity with the severity of exercise at all ages and may increase upto 200 mm Hg. increases due to increased sympathetic activity in response to exercise. In mild to moderate excercise, diastolic BP, shows either no change or slighty increases. In severe exercise, it increases due to vasoconstriction [6]. During dynamic exercise the degree of increase in heart rate,cardiac output, stroke volume, oxygen extraction and blood pressure depends on severity of exercise and amount of muscles mass involved [7]. Heart rate, rate pressure product, and systolic and mean blood pressures increased significantly during exercise and the increases were greater with higher exercise intensities. Diastolic blood pressure did not change during exercise of any intensity [4].

Conclusion

The present study has a significant implication regarding exercise effect on blood pressure and heart rate with respect to different degrees of exercise. Mild to Moderate exercise causes slight changes in heart rate and Blood pressure when compare to severe exercise.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.3

Study of Heart Rate and Blood Pressure Response to Isometric Leg Press Exercise Test in Obese Young Male Adults

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Abstract

Background and Objectives: Assessment of Cardiovascular sympathetic activity in obese and Normal young adults by recording Heart rate and blood pressure. The study was done to assess the effect of isometric Leg press exercise test on Heart rate Blood pressure (SBP & DBP) levels in obese and normal young adults. *Methods:* The study was carried out on 80 medical students with in age group of 18-22 years, divided in to two groups, 40 Obese (BMI >25kg/m2) and 40 Normal healthy adults (BMI 18.5-22.5kg/m2). Baseline ECG was taken for 5 minutes in lead II using power lab multichannel polygraph instrument to record Heart rate in both the groups. Baseline Blood pressure was recorded in both of them. They were asked to perform isometric leg press exercise at 40% of their maximal voluntary contraction using Back leg lift dynamometer till the point of fatigue. Immediately after exercise test Heart rate and Blood pressure were measured to compare the response. *Results:* Baseline recording showed statistically significant higher Heart rate and Blood pressure level in obese group when compared to normal group ($p<0.05$). There was significant difference in Heart rate and BP between the two groups. The response to exercise test varied among the groups. The normal group showed significant rise in Heart rate and blood pressure ($p<0.05$) than obese group. *Conclusion:* From this study we conclude that, there is a positive association between obesity and blood pressure level. There is autonomicdys function with increased sympathetic activity, which is an important determinant of elevated blood pressure in obesity. Also higher value of resting heart rate in obese individuals is due to attenuated parasympathetic vagal tone in them. Sympathetic system could be targeted in the treatment of obesity associated hypertension.

Keywords: Obesity; Isometric Leg Press Exercise Test; Blood Pressure.

Introduction

Maintaining an adequate body weight is a major determinant of the survival and fitness of mammals including human beings. It is important to emphasize that many individuals, whether lean or obese maintain their body weight within small limits during long periods of time. Inhuman adults, there are mechanisms that tend to maintain a balance between energy intake and energy expenditure. There is preponderant evidence for the existence of control of adipose tissue mass with signals, which act on hypothalamic receptors with effect on the autonomic nervous system [1]. Obesity is becoming a global condition in both children and adults. It is an abnormal or excessive fat accumulation which occurs due to increased consumption of calories and/ or decreased physical activity. It is associated with number of cardiovascular diseases such as, Hypertension, Sleep apnea and Coronary heart disease [2]. Obesity has been proposed as a risk factor for hypertension and sudden death. In India prevalence of obesity is increasing in children and adolescents as reflected in various studies [3]. Exercise is an important activity in daily life. Depending on the type of physical exercise carried out, its influence on heart rate and blood pressure response varies.

As per previous studies, isometric leg press exercise testing provides much more clinical information about sympathetic activity, but neglected because of potential risk. It causesless risk to the subjects if monitored properly. Following isometric exercise test protocol, in normal healthy subjects there will be increase in Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP) and Mean arterial pressure (MAP). Blood pressure is regulated by the autonomic nervous system [4]. Obesity is associated with increased sympathetic activity and is the leading risk factor for development

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Received on: November 01, 2017 **Accepted on:** December 08, 2017

of hypertension [5]. There is a significant relation between obesity and hypertension. It is important to know that the effect of exercise training might decrease body mass index which could be reflected with improvement in their cardio respiratory fitness. Data on exercise and its effects on the cardiovascular system and long-term survival are still limited in spite of vast knowledge on exercise. The responsibility for conducting research lies with government, private health agencies, universities, and medical colleges. Cardiovascular response to physical exercise is influenced by many factors such as Age, sex, type of activity carried on prior training status. Training, in particular is considered to reduce both adrenergic and pressure response to exercise. However, not much information is available on sympathetic cardiovascular functions in obese young adults. Hence, the present study is under taken to assess and compare the cardiovascular responses to isometric Leg press exercise test in obese and normal weight medical students. Present study is conducted to assessment of cardiovascular sympathetic activity in obese and normal young adults by recording Heart rate and Blood pressure.

Materials and Methods

Healthy young adults in the age group of 18-22 years were selected. The young adults were screened for their age, history of hypertension, history of any cardiac or pulmonary disease, smoking and alcohol. Clinical examination was done on all the subjects to rule out systemic disorders. The height and weight of each participant was recorded. Body mass index was calculated by the formula [6].

Body mass index = Weight in kilograms/ Height in meters square

Method of selection of Subgroups - 40 young adults in the age group of 18-22years with BMI >25kg/m2 Constitutes the Obese group (OG). 40 age and sex matched medical young adults with BMI 18.5-22.5kg/m^2 constitutes the control group (CG). This sample size was estimated enough to detect clinically relevant difference.

Obese Group

Inclusion Criteria: BMI (Body Mass Index) >25kg/m^2

Normotensive, Non-smokers, Non-alcoholic, Non-tobacco chewers.

Exclusion Criteria: BMI < 25kg/m^2, Age above 22 years or below 18 years, Hypertensive subjects, Smokers, Alcoholics, Tobacco chewers, History of acute / chronic illness

Normal Group

Inclusion Criteria: BMI 18.5-22.5 kg/m^2, Age group 18-22 years, Normotensives, Non-smokers, Non alcoholics, Non Tobacco chewers.

Exclusion Criteria: BMI < 18.5 or >22.5 kg/m^2, Age group above 22 years or below 18 years, Hypertensive subject, Smokers, Alcoholics, Tobacco chewers, History of acute / chronic illness.

Method of Data Collection: The Exercise testing was performed in the normal room temperature with bright light. The subjects were made to relax for 5 minutes before recordings. BP was recorded by Mercury Sphygmomanometer and Stethoscope. HR was recorded by using Power lab ECG instrument. Isometric exercise was performed by Back leg lift dynamometer. The subjects were instructed not to hold their breath during the exercise test to avoid performing the Valsalva manoeuver. The parameters heart rate, Blood pressure, (systolic and diastolic), Maximum Voluntary Contraction were recorded.

Statistical Analysis: The values expressed in mean and standard deviation of all the cardiovascular parameters -Heart Rate, Systolic Blood Pressure, Diastolic Blood Pressure for both groups. Independent sample 't' test procedure compares means of two groups of subjects. Students 't' test was applied using SPSS for windows (version18) at 5% level of significance to test the significance of changes in cardiovascular parameters stated above. The 'p' value less than 0.05 ($p<0.05$) was considered statistically significant.

Results

Before Exercise Test

The present study included 80 subjects (40 obese and 40 normal weight group) in the age group of 18-22 years. The characteristics of the two groups are shown in Table 1. The mean value of body mass index was higher in obese group when compared to normal group as shown in Table 1. The mean value of baseline heart rate (HR) was higher in obese group when compared to normal group as shown in Table 2.

The mean value of systolic blood pressure (SPB) and diastolic blood pressure (DBP) and mean arterial pressure of obese group was more when compared to

normal group before exercise test as shown in Table 3. These differences were statistically significant. There was a positive association between body mass index and systolic and diastolic blood pressure.

After Exercise Test

The Mean of heart rate, response to isometric leg press exercise test in obese group and normal group were statistically significant. The increase in heart rate after isometric Leg press exercise test was lower in obese group when compared to normal group (Table 2). The increase in systolic blood pressure and diastolic blood pressure and mean arterial pressure to isometric leg press exercise test was lower in obese group when compared to normal group (Table 3). The difference was statistically significant. After 5 minutes of exercise test the systolic and diastolic blood pressure returned to pre-exercise test (Table 4). This indicates increase in heart rate and blood pressure was due to exercise test in both groups.

Table 1: Characteristics of the two groups

	Obese	Normal weight
Number of Subjects	40	40
Age	18±1.07	18.43±0.63
Sex	Male	Male
BMI	29.37±3.25Kg/m^2	20.64±2.12 kg/m^2

*'p value<0.05, statistically significant

Tabl 2: Mean ± S.D. values of Heart rate pre and post exercise test in obese and normal group

	Groups	Mean ± S.D.	P values
Heart rate (pre)	Obese	82.2±2.84	0.000*
	Normal	76.7±2.90	
Heart rate (post)	Obese	83.3±2.83	0.029*
	Normal	77.72±2.96	

Table 3: Mean SBP, DBP pre and post exercise test and 5min after exercise test in obese and normal weight group

	Group	Mean ± S.D.	P value
SBP (pre)	Obese	126.1±4.02	0.000*
	Normal	115.5±5.61	
DBP (pre)	Obese	80.00±3.38	0.000*
	Normal	70.30±2.33	
SBP (post)	Obese	131.8±3.78	0.000*
	Normal	123.3±5.77	
DBP (post)	Obese	86.2±2.78	0.046*
	Normal	77.90±2.59	
MAP(pre)	Obese	95.36±2.46	0.000*
	Normal	85.36±2.67	
MAP (post)	Obese	101.4±2.40	0.000*
	Normal	93.03±2.54	
SBP (after 5 min)	Obese	124.80±8.71	0.000*
	Normal	113.06±9.68	
DBP (after 5 min)	Obese	79.33±4.85	0.00*
	Normal	69.33±5.64	

*p value<0.05, statistically significant

Discussion

The present study reveals, the Mean value of body mass index (BMI) of obese group (OG) was significantly higher when compared to normal group. Also Mean value of Resting Heart rate was significantly higher in OG than NG. The mean values of resting systolic blood pressure, diastolic blood pressure were significantly higher in obese group when compared to normal group. The higher values of Resting SBP, DBP had a significant positive correlation with BMI. The results of our study are consistent with K. Sri Nageshwari et al [3], who have observed increased blood pressure level in obese children. In obesity, increased cardiac output

observed with weight gain is due to extra blood flow required for the extra adipose tissue. Sustained and prolonged hemodynamic burden is required to induce structural changes in left ventricle as in case of long standing obesity [2]. Factors linking obesity to increase in HR and BP includes the increment in total blood volume and cardiac output that is caused by increased metabolic demands induced by excess body weight , increased sympathetic activity, endothelial dysfunction, insulin resistance and substances released from adipocytes (IL- 6, TNF.)

Characteristically obese subjects have increased sympathetic nerve activity, increased insulin levels, increased activity of Renin Angiotensin aldosterone system [7]. It can be hypothesized that higher Resting SBP,DBP in obese could be due to higher vasoconstrictor tone and/or increase in cardiac output due to increased load on heart, as a consequence of increased body mass index. Part of increased cardiac output observed with weight gain is due to additional blood flow required for the extra adipose tissue. Sympathetic activation contributes to higher blood pressure level in obese group and Higher Resting Heart rate could be due to attenuation of parasympathetic vagal tone in obese individuals. Sympathetic activation increases blood pressure and causes sodium and water retention in obesity. Activation of Renin-angiotensin- aldosterone axis causes retention of the fluid leading to increased blood volume. Renal sympathetic nerve mediates sodium retention and hypertension in obesity.

Mechanism of sympathetic activation and high blood pressure levels in obesity:

1. Renal afferent nerves, stimulated by increased intra renal pressure and subsequent activation of renal mechanoreceptors, leading to renin-angiotensin- aldosterone system activation.
2. Hyperinsulinemia,
3. Fatty acids,
4. Angiotensin II,
5. Hyperleptinemia

The discovery of leptin represents the major breakthrough in obesity research. Leptin is an adipocyte derived hormone that acts on hypothalamus to regulate appetite and energy expenditure. Now it is clear that white fat depots are not inert lumps but are actually endocrine tissues that secrete not only Leptin, but also other hormones like adipokines that affect fat metabolism. In addition, to these advances, there has also been a revolution in our understanding of neuroendocrine mechanisms regulating appetite, metabolism, and adiposity since the discovery of leptin just 15 years ago. If these advances soon translate into safe and effective pharmacological treatment of obesity, this would also greatly impact the management of obesity induced hypertension [5].

Evaluation of circulatory changes during sustained isometric muscle contractions is a useful method to assess cardiac function. During isometric exercise test, the literature mentions, in a normal healthy person sympathetic system gets activated leading to, activation of cardiac sympathetic fibres causes increase in heart rate dependent increase in cardiac output and blood pressure and activation of peripheral sympathetic fibres to blood vessels causing, vasoconstriction and resultant increase in total peripheral resistance.

Obese group had statistically significant increased baseline HR, SBP, DBP, before application of any type of stimulus due to increased vasoconstrictor tone at rest. Following isometric leg press exercise test, the obese group showed lower increase in Blood pressure response, when compared to normal group. This difference was statistically significant. There was significant difference in heart rate response to isometric leg press exercise test between the two groups.

The Obese group revealed a decreased response to isometric leg press exercise test indicating presence of instability/dysfunction of cardiac sympathetic activity [3]. The lower heart rate and blood pressure response in obese group is majorly attributed to lower cardiac sympathetic activation or to a lower increase in peripheral vascular response to maneuvers activating sympathetic system [8]. The derangements in sympathetic cardiovascular function in the form of elevated baseline HR, SBP, DBP and decrease in response to back –leg lift dynamometer exercise test in obese group points towards autonomic instability/ dysfunction. Thus, in obese ANS is affected which may be the cause of various cardiovascular complications.

The single most important role of Sympathetic nervous system (SNS) is maintenance of adequate blood pressure to maintain the functioning of vital organs. This is achieved principally by sympathetic control of cardiac output and blood vessels. The importance of SNS in the control of cardiovascular system should not be overlooked, as any nonspecific stimulation or antagonism of SNS intended to produce metabolic effects will also have significant cardiovascular effects that could be undesirable.

Obesity is recognized as a major, worldwide, health problem. Excess weight is a major cause of increased

blood pressure in most patients with essential hypertension. Being overweight or obese increases the risk for cardiovascular disease through multiple mechanisms, including diabetes, dyslipidemia, atherosclerosis, renal disease, and hypertension. From the present study we conclude that, there is a positive association between blood pressure level, and obesity.

Autonomic instability, in the form of enhanced basal peripheral vasoconstrictor tone, decreased cardiac sympathetic activation following exercise make the obese subjects more prone to cardiovascular diseases. Obese young adults with higher blood pressure level are at increased risk of cardiac diseases and hypertension in later part of their life. Sympathetic system could be targeted in the treatment of obesity associated hypertension.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.4

Does Present Lifestyle Affect the Health Status among Productive Workforce and Menopausal Women?

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Abstract

Introduction: Women are exposed to plethora of health complaints during reproductive life, pre-menopause and menopause due to altered lifestyle, dietary pattern, hormonal changes and their socio-demographic profile. The urban and rural women experience problems related to neurological, psychological and other endocrinal manifestations during these stages. The present study was designed to find out the relation between socio demographic, menstrual pattern, dietary influence and lifestyle determinants on health status of productive, peri-menopausal and menopausal women. *Materials and Methods:* This cross-sectional community based comparative study was conducted in the rural and urban field practice area of a Medical College in Karnataka. Health status of women in productive age, peri-menopausal and menopausal life was collected. Association between socio demographic factors, dietary factors and lifestyle determinants was analyzed among the study participants. *Results:* We found that backache and abdominal pain are the predominant symptoms among both rural and urban women of productive age group. Younger women had more abdominal pain when compared with peri-menopausal women who complained more of knee and back pain. ($p<0.05$), younger the age at menarche, lesser the frequency of abdominal and back pain ($p<0.05$), those who were practicing contraceptive method had fibroid uterus as a predominant comorbid feature and minor ailments were seen among those without any contraception ($p<0.05$). Those who were on vegetarian diet had minor ailments when compared with those on non vegetarian diet who showed more incidence of fibroid uterus among them ($p<0.05$). *Conclusion:* The quality of health status of reproductive and menopausal women is affected by their socio demographic factors, hormonal changes, menstrual pattern, dietary intake and lifestyle.

Keywords: Diet; Lifestyle; Menopause; Peri-Menopause; Productive Women.

Introduction

Women play variety of significant roles in development of family, society, community and nation. They are different from men physically and physiologically. Menstruation is a natural phenomenon occurring in females wherein they undergo periodic reproductive changes. The beginning of menstruation in a woman's life is called menarche and the end of menstruation is called menopause.

This phenomenon is crucial in a woman's life not only because it facilitates child bearing but also because it acts like a protective shield against a lot of diseases[1,2]. Women during their reproductive age experience discomforts related to menstrual cycle, pattern and other features of premenstrual syndrome due to the systemic actions of the fluctuations in hormones [2].

According to WHO, peri-menopause is the period 2-8 years before menopause and the one-year period after final menses, resulting from the loss of ovarian follicular activity [3,4]. Peri-menopause can start at early 30 to mid 40 years age group which is associated with intense biological variability as a result of hormonal and clinical changes [5,6].

Once a female undergoes menopause which can be seen in the age group of 45-55 years, she is vulnerable to a plethora of diseases and lifestyle discomfort [7]. The occurrence of these diseases is majorly influenced by the lifestyle of the female during her productive phase and socio-demographic profile. The lifestyle of urban and rural women vary vastly, due to different activities, stress levels and socio-environmental factors influencing it [8,9].

These two different populations are facing different peri and post-menopausal problems. Peri-menopausal complaints may be related to

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Received on: September 19, 2017 **Accepted on:** October 13, 2017

neurological, psychological and other endocrinal manifestations. Post menopausal problems range from something as harmless as mild insomnia, osteoporosis, urinary incontinence, sexual dysfunction to something as fatal as coronary heart disease [10,11].

Studies have shown that dietary pattern of peri-menopausal and post-menopausal women have significant effect on the morbidity features of menopausal syndrome. Vegetarian diet with more fiber, minerals and phytochemicals will have lesser calories, saturated fat and cholesterol compared to non vegetarian diet. Asian vegetarian postmen opausal women showed significantly lower spine or hip bone mineral density abnormalities and those consuming soy isoflavones had beneficial effect on bone health in postmenopausal women [12,13].

Added to that, it has been observed that women are attaining premature menopause in their life due to multiple factors which are attributed to genetic disorders, autoimmune diseases, enzyme defects, life style changes etc [14].

It is clear that women spend about 1/3rd of their life in this stage. A clear understanding of peri and post-menopausal problems, its patho-physiology and its effects on the health of a person is needed. This will help us deal with it better, manage it effectively and add more quality years to the lives of the human resource of our country. Hence the present study was designed to find out the relation between socio demographic, menstrual pattern, dietary influence and lifestyle determinants on health status of productive, peri and post-menopausal women.

Materials and Methods

This cross-sectional community based comparative study was conducted in the rural and urban field practice area of a Medical College in Karnataka during November 2016-February 2017. Ethical approval was obtained for this study from the Institutional Ethics review committee. Females aged 30-60 years residing in rural and urban areas in and around field practice area of the Medical College and those women visiting the attached rural and urban health centers with minor ailments who were willing to participate in the study were included. Convenient purposive sampling method was employed. Women less than 30 years of age, with known history of any non communicable diseases, unnatural menopause, on any medications, physical and mental disability or pregnant were excluded.

Their age, socio-demographic profile, literacy status, occupation, general physical examination, vital signs, complete systemic examination were done. Their personal, drug, diet and family history were taken. Obstetric history which included age at menarche, last menstrual period, menstrual pattern, peri/menopausal symptoms, contraception, fertility, sexual history and lifestyle pattern were recorded.

A pretested specific structured questionnaire on their health status, peri-menopausal and menopausal symptoms was administered to the study participants. Based on their responses, history and clinical examination they were classified as productive group, peri-menopausal and menopausal groups.

Statistical Analysis

Association between demographic factors, dietary factors and lifestyle determinants was analyzed among productive age, peri and post-menopausal rural and urban women using SPSS Version 22. Chi squared test was used to find the association of study and outcome variables and $p< 0.05$ was considered as significant.

Results

Table 1 shows the age group and residential status of women included in the study. 33 women were from rural area and 33 from urban area. (n=66)

Table 2 shows the socio-demographic and lifestyle factors like residence, literacy status, occupation and reproductive life among affecting health status among the study participants. Backache and abdominal pain are the predominant symptoms among both rural and urban women of productive age group. These women having different occupation did present with variation in these symptoms. Women with contraception had almost all the symptoms without any specific preference. There was no statistical difference seen with respect to their literacy status and number of children influencing their symptoms.

When the effect of age at menarche with their health complaints was analyzed, we observed that younger the age at menarche, lesser the frequency of abdominal and back pain ($p=0.045$). Those who had regular menstrual pattern had more abdominal pain when compared with those with irregular pattern having knee pain ($p=0.000$).

Figure 1 shows that younger women had more abdominal pain when compared with peri-

menopausal women who complained more of knee and back pain (p=0.021).

Figure 2 reveals that women in their reproductive age group had more abdominal pain, where as those who attained menopause had knee pain (p=0.000).

When effect of diet on these symptoms was studied, the results revealed that those who were on vegetarian diet had more of backache and non vegetarian women complained more of abdominal pain in reproductive age group (p=0.000) (Figure 3).

Table 1: Age group and residential status of study group (N=66)

Age group (Years)	Study Group	Rural	Urban	Total
30-39	Productive group	10	12	22
40-49	Pre-menopausal group	11	11	22
50-59	Menopausal group	12	10	22
Total		33	33	66

Table 2: Sociodemographic and lifestyle parameters affecting health status of the participants (N=66)

	Backache	Abdominal pain	Knee pain	Weakness	Headache	P value
Residence						
Rural	8(24.2%)	9(27.3%)	7(21.2%)	6(18.2%)	2(6.1%)	0.919
Urban	10(30.3%)	10(30.3%)	6(18.2%)	4(12.1%)	3(9.1%)	
Literacy status						
Literate	13(31.0%)	15(35.7%)	6(14.3%)	5(11.9%)	2(4.8%)	0.186
Illiterate	5(20.8%)	4(16.7%)	7(29.2%)	5(20.8%)	3(12.5%)	
Occupation						
Beedi rolling	3(42.9%)	2(28.6%)	1(14.3%)	-	1(14.3%)	0.091
Farming	3(30.0%)	-	3(30.0%)	3(30.0%)		
Coolie	3(21.4%)	1(7.1%)	4(28.6%)	3(21.4%)	3(21.4%)	
Housewife	5(22.7%)	9(40.9%)	5(22.7%)	3(13.6%)	-	
Others	4(30.8%)	7(53.8%)	-	1(7.7%)	1(7.7%)	
Age at Menarche						
<12 Years			1(25.0%)	3(75.0%)		***0.045****
12 Years	4(20.0%)	5(25.0%)	4(20.0%)	5(25.0%)	2(10.0%)	
13 Years	7(30.4%)	7(30.4%)	5(21.7%)	1(4.3%)	3(13.0%)	
>13 Years	7(36.8%)	7(36.8%)	3(15.8%)	1(5.3%)		
Menstrual Pattern						
Regular	9(28.1%)	11(34.4%)	1(3.1%)	7(21.9%)	4(12.5%)	***0.000****
Irregular	9(29.0%)	8(25.8%)	11(35.5%)	2(6.5%)	1(3.2%)	
Contraception						
Done	8(22.2%)	10(27.8%)	8(22.2%)	7(19.4%)	3(8.3%)	0.729
Not done	10(33.3%)	9(30.0%)	5(16.7%)	3(10.0%)	2(6.7%)	
No of children						
Less than 2	4(26.7%)	5(33.3%)	2(13.3%)	2(13.3%)	1(6.7%)	0.367
2	7(29.2%)	9(37.5%)	9(37.5%)	3(12.5%)	3(12.5%)	
More than 2	7(26.9%)	4(15.4%)	9(34.6%)	5(19.2%)	1(3.8%)	

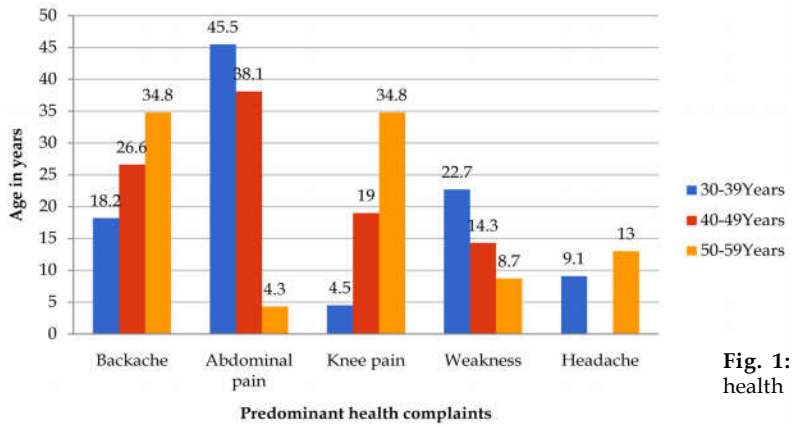

Fig. 1: Age wise distribution of health complaints

Table 3: Socio-demographic and menstrual factors affecting co morbidity among study population (N=66)

	Fibroid uterus	Anemia	Ovarian cyst	Carcinoma endometrium	Others	p value
Age						
30-39Years	6 (27.3%)	6 (27.3%)	4 (18.2%)	1 (4.5%)	5 (22.7%)	0.124
40-49Years	10(47.6%)	1(4.8%)	1(4.8%)	-	9(42.5%)	
50-59Years	5(21.7%)	2(8.7%)	3(13.0%)	11(47.8%)		
Residence						
Rural	11(33.3%)	6(18.2%)	3(9.1%)	1(3.0%)	12(36.4%)	0.75
Urban	10(30.3%)	3(9.1%)	5(15.2%)	2(6.1%)	13(39.4%)	
Literacy status						
Literate	11(26.2%)	4(9.5%)	7(16.7%)	3(7.1%)	17(40.5%)	0.167
Illiterate	10(41.7%)	5(20.8%)	1(4.2%)		8(33.3%)	
Occupation						
Beedi rolling		1(14.3%)	2(28.6%)	1(14.3%)	3(42.9%)	0.169
Farming	3(30.0%)	3(30.0%)	1(10.0%)		3(30.0%)	
Coolie	9(64.3%)				5(35.7%)	
Housewife	7(31.8%)	3(13.6%)	2(9.1%)	2(9.1%)	8(36.4%)	
Others	2(15.4%)	2(15.4%)	3(23.1%)		6(46.2%)	
Age at menarche						
less than 12yrs	2(50.0%)	-	-	-	2(50.0%)	0.439
12 yrs	9(45.0%)	2(10.0%)		1(5.0%)	8(40.0%)	
13yrs	6(26.1%)	5(21.7%)	4(17.4%)		8(34.8%)	
more than 13yrs	4(21.1%)	2(10.5%)	4(21.1%)	2(10.5%)	7(36.8%)	
Menstrual Status						
Menstruating	13(34.2%)	7(18.4%)	4(10.5%)	1(2.6%)	13(34.2%)	0.576
Menopause	8(28.6%)	2(7.1%)	4(14.3%)	2(7.1%)	12(42.9%)	
Menstrual Pattern						
Regular	5(15.6%)	7(21.9%)	4(12.5%)	2(6.3%)	14(43.8%)	***0.033****
Irregular	16(51.6%)	2(6.5%)	4(12.9%)	1(3.2%)	8(25.8%)	
No. of Children						
Less than 2	4(26.7%)	3(20.0%)	1(6.7%)		7(46.7%)	0.79
2	7(29.2%)	3(12.5%)	5(20.8%)	1(4.2%)	8(33.3%)	
More than 2	9(34.6%)	3(11.5%)	2(7.7%)	2(7.7%)	10(38.5%)	
Contraception						
Done	17(47.2%)	4(11.1%)	5(13.9%)	1(2.8%)	9(25.0%)	***0.033****
Not done	4(13.3%)	5(16.7%)	3(10.0%)	2(6.7%)	16(53.3%)	

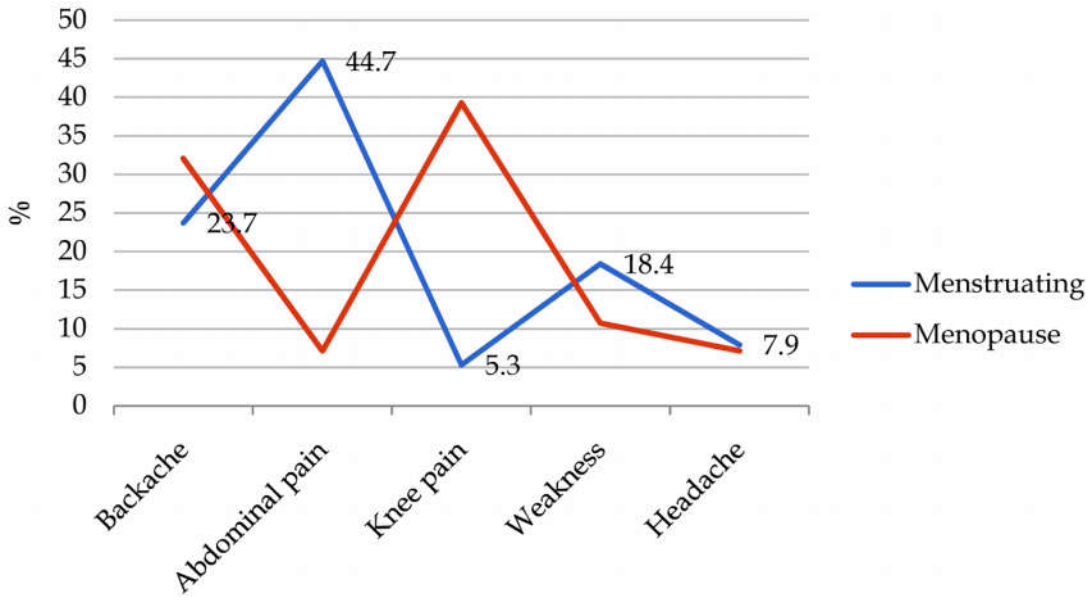

Fig. 2: Distribution of health complaints based on menstrual status

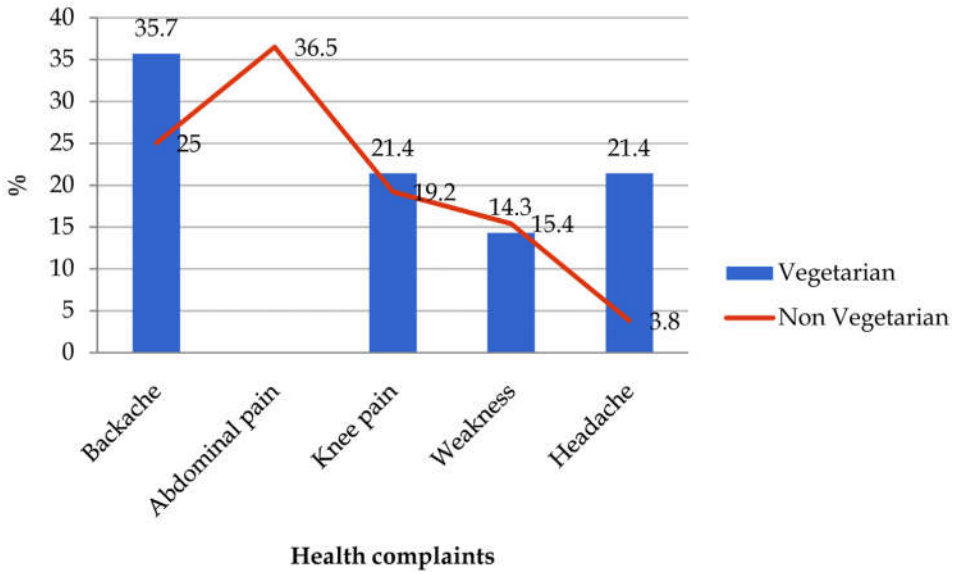

Fig. 3: Distribution of health complaints based on dietary pattern

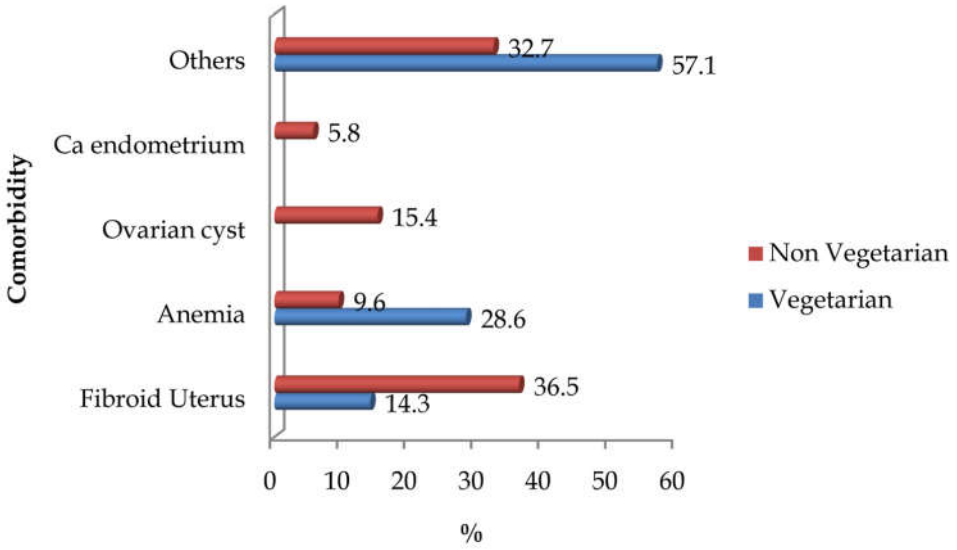

Fig. 4: Distribution of co morbidity among women with health complaints based on their dietary pattern

Table 3 shows the socio-demographic and menstrual factors affecting co morbidity among productive and menopausal women. The common co morbidity was fibroid uterus, anemia, ovarian cyst and carcinoma endometrium. Fibroid uterus and anemia were seen commonly among younger and middle aged productive women, whereas carcinoma endometrium among menopausal women. Fibroid was seen as a predominant disease among both rural and urban women irrespective of their literacy status.

Women with regular menstrual pattern in reproductive group had minor diseases like anemia and ovarian cyst where as those with irregular pattern suffered from fibroid uterus (51%) (p=0.033).

There was a significant difference in the distribution of co morbidity among productive women with health complaints based on their contraception status. Those who were practicing contraceptive method had fibroid uterus as a predominant co morbid feature and minor ailments were seen among those without any contraception (p=0.033).

No significant effect was seen with respect to age at menarche and occupation on co morbidity among these women.

Figure 4 shows the effect of diet on distribution of comorbidity among women with health complaints. Those who were on vegetarian diet had minor

ailments when compared with those on non vegetarian diet who showed more incidence of fibroid uterus among them (p=0.043).

Discussion

This study showed the relation between socio-demographic and lifestyle determinants on health status among productive age, peri and post menopausal rural and urban women. All women undergo menopause between the ages 45-50 yrs. During which their ovaries stop producing estrogen while the adrenals and fat tissue continue to produce the hormone [15]. Ovaries are the major organ producing the hormone so there is a drastic drop in the estrogen levels in the blood levels. This transition is usually accompanied by unpleasant to highly incapacitating state resulting in postmenopausal syndrome [16].

Different health issues were seen among rural and urban women like backache and abdominal pain, knee pain, weakness, headache which is in accordance with the study done on 209 women at coastal areas of Karnataka by Nayak G et al [17]. Similar observations were made at Malaysia by Dhillon HK[18]. There were differences in premenstrual symptoms, place of residence, literacy status, occupation as seen in a study in Kolkata [19].

In our study, younger women had more abdominal pain when compared with older women who complained more of knee and back pain. This is in accordance with the Chingford Study that examined the natural history, role of risk factors and incidence of knee osteoarthritis. It was found that in comparison to controls, obese women had a significantly increased risk of incident knee osteophytes and osteoarthritis [20].

We observed that younger the age at menarche, lesser the frequency of abdominal and back pain. A study was conducted to find the relation between precocious puberty and use of oral contraceptive pills with the incidence of pelvic pain and persistent pelvic joint instability.The study revealed that women with the above said conditions differed from the controls by a significantly lower age at menarche leading to the finding that precocious puberty is associated with a fibrous dysplasia which resembles that seen in some persistent pelvic joint instability patients. Precocious puberty is also known to be associated with hypothalamic dysfunction [21].

We found that women in their reproductive age group had more abdominal pain, where as those who attained menopause had knee pain. A pilot study was conducted to determine the effects of a weight loss and walking programme on obese post menopausal women with knee pain. It revealed that an intervention like this improves measures of physical functioning and pain due to knee osteoarthritis. Among obese women, functional improvement correlated with weight loss, encouraging continued emphasis on weight loss for managing knee osteoarthritis [22].

A study was conducted among 480 University students in Turkey, to find the patterns of menstrual cycles, analyzed for association with age of menarche, prevalence of menstrual irregularity, dysmenorrhea, prolonged menstrual bleeding, and effect of menstrual disorders, on social activities and school attendance among the female students. It was found that the prevalence of menstrual irregularity, prolonged menstrual bleeding and dysmenorrhea were 31.2%, 5.3% and 89.5%, respectively. It was concluded that the prevalence of dysmenorrhea and menstrual irregularity was high and most adolescents have inappropriate and insufficient information about menstrual problems [23].

Our results revealed that those who were on vegetarian diet had more of backache and non vegetarian women complained more of abdominal pain among the productive group. Effect of diet on endometriosis and dysmenorrhea showed some relation between disease and low intake of vegetable and fruit and high intake of vegetarian polyunsaturated fat, ham, beef and other red meat. Intake of fish oil seemed to have a positive effect on pain symptoms [24].

Fibroid uterus and anemia were seen commonly among younger and middle aged productive women, whereas carcinoma endometrium among older menopausal women. Silverberg SG et al, observed that fibroid was seen as a predominant disease among both rural and urban women irrespective of their literacy status. They observed higher incidences of nulliparity, obesity, and features associated with endometrial carcinoma in the patients not receiving oral contraceptives or receiving combined agents, suggesting that the group receiving sequential may not represent the same constitutionally predisposed population. No significant effect was seen with respect to age at menarche, occupation and menstrual status on co morbidity among these women [25].

We found that women with regular menstrual pattern had minor diseases like anemia and ovarian where as those with irregular pattern suffered from fibroid uterus. Amanti L et al, observed that the length

of menstrual cycle was associated with myoma and a higher likelihood of was seen among those having irregular short menstrual cycles. This may be due to estrogen dependence of uterine leiomyomas [26].

It was observed in our study that, those who were practicing contraceptive method had fibroid uterus as a predominant co morbid feature and minor ailments were seen among those without any contraception. Scholes Det al, in their study was to establish a relationship between the use of oral contraceptive pills during later reproductive life and risk of fracture across menopausal transition among 1,204 case women and 2,275 control women found that adjusted fracture risk did not differ between cases and controls. It did not show an association between fractures near the menopausal transition and oral contraceptive use in the decade before menopause or after age 38 [27].

Those who were on vegetarian diet had minor ailments when compared with those on non vegetarian diet who showed more incidence of fibroid uterus among them in our study. In a study to find out the role of diet in the development of co morbidities in obese individuals and also to find an association between inflammation and diet, concluded that the best diet for protecting against the metabolic derangements associated with obesity and metabolic syndrome would be high in fibre-rich cereals, fruits, vegetables, fish, virgin olive oil and nuts; moderate in wine; and low in meat, processed meat foods and trans-fatty acids. Several procoagulant proteins such as plasminogen activator inhibitor type 1, tissue factor, factor VII and also inducible nitric oxide synthase show higher expression in adipose tissue of obese people in comparison to lean. This over expression could explain at least a part of the atherogenic and cardiovascular risk associated with obesity. Overweight and obesity are associated with an increased risk of developing the common features of the metabolic syndrome. Studies suggest that chronically elevated local or systemic concentrations of adipokynes contribute to the development of complications associated with obesity and metabolic syndrome [28].

It is noticed that women who follow a non vegetarian diet experience more of these symptoms and gynaecological disturbances than women following a vegetarian diet. The possible reason for this might be that a high fat and a low fiber diet causes rise in estrogen levels. Therefore their transition from pre menopause to menopause is more intense as there is a drastic drop in the levels of estrogen [12,13].

In a study conducted between Greek and Mayan women, Mayan women did not experience hot flushes and other postmenopausal symptoms at all whereas it was a common occurrence among the Greek women. The major difference among these groups is diet. The Mayan diet consists of corn,beans, vegetables and very little meat and no dairy products. But the Greek diet consists of legumes, dairy products and a lot of meat [29,30].

This study reinforced the idea that vegetarian diet helps in the control of post-menopausal symptoms. This idea has been adopted by many women to help control their symptoms and many have reported success stories. More sample size with different settings correlating with laboratory investigations form the future scope of this study.

Conclusions

Various factors affect the health status of women among productive age group, peri-menopausal and postmenopausal stage. This study identified such factors among different socio demographic classes. This will be useful in sensitizing women on physiological changes during different phases of life, different types of diseases that they can be exposed to and advocating the active lifestyle. Once the problems have been identified, it will help women not only deal with the problem effectively but also take appropriate measures to prevent it.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.5

Correlation of Mid Upper Arm Circumference, Mid Upper Arm Area, Tricep Skin Fold Thickness with Hand Grip Strength in Cricket Players: A Cross-Sectional Study

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Abstract

Background: Hand grip strength and mid upper arm circumference, mid upper arm area, tricep skin fold thickness has been an indicator for determining strength. *Objectives:* The purpose of study was to found out for correlation of mid upper arm circumference, mid upper arm area, tricep skin fold thickness with hand grip strength in cricket players. *Material and Methods:* Total 30 healthy cricket (15-25 years), from district sport academy, regularly practicing from last 3 years at university level and who don't have any abnormality of upper arm or any neurological problem, history of fracture of hand were included. Measurement of hand grip strength with help of Sahens hand grip digital dynamometer was done. Mean of three reading was taken as final reading. Mid upper arm area calculated by formula (Mid upper arm circumference)^2/4p. Mid Upper Arm Circumference measured by measuring tape. Tricep skin fold thickness is measured by harpendence calliper. Pearson correlation coefficient established a correlation of mid upper arm circumference, mid upper arm area, tricep skin fold thickness with hand grip strength. *Result:* It was also found that ,statistically there was positive correlation observed between hand grip strength with mid upper arm circumference, mid upper arm area and highly significant negative correlation between hand grip strength with tricep skin fold thickness in cricket players. *Conclusion:* Proper training for maintaining mid upper arm circumference, mid upper arm area, tricep skin fold thickness and hand grip strength will increase in hand grip strength. It will further lead to better strength and performance in cricket activities like bowling, fielding etc.

Keywords: Anthropometry; Dynamometry; Handgrip Strength; Harpendence Calliper; Mid Upper Arm Area; Mid Upper Arm Circumference; Tricep Skin Fold Thickness.

Introduction

A sport is a worldwide phenomenon. It has become an interesting aspect for human amusement and a cultural phenomenon of great magnitude and complexity. It has got mass participation, as it attracts people either for recreation, physical fitness or for profession. Sports are organized at competitive levels since ancient times but now competition in sports has achieved the highest level. Hundreds of young aspirants are devoting time and energy for achieving success in these events. Amongst sports, cricket is more popular as it is a great fun and people of all ages can enjoy it. Many studies have shown that specific anthropometric characteristics are significantly associated with success in sports [1]. Therefore, understanding the body composition of top-level athletes and then competitive weights for the athletes, has been done for decades and is considered an essential part of the total management process [2]. Scientists all over the world are looking for a standard formula that can improve the performance of elite players and discover talents as efficiently as possible [3]. Since each sport has its own specific demands, every athlete should have specific anthropometrical characteristics and body composition figures for his or her own sports discipline. Anthropometric dimensions like mid upper arm area, mid upper arm circumference, tricep skin fold thickness and hand grip strength play an important role in cricket and football. Many scientist have done a research on anthropometric parameters of cricket players and hand grip strength in them [4,5].

Contemporary sport science is designed to improve the performance of elite players and to discover talents as precisely as possible. Percentage of lean body mass

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Received on: August 28, 2017 **Accepted on:** September 14, 2017

is different in cricket and football. we can evaluate demand of each sport by doing comparison of it. We can plan training programmes for improvement of these parameters.

Hand grip strength has been an indicator for determining strength since 1880. It is referred as the muscular strength and force that they can generate with their hands. It is the result of forceful flexion of all finger joints, thumbs, wrists with maximum voluntary force that the subject is able to exert under normal bio kinetic conditions [6,7]. There are 35 muscles involved in movement of the forearm and hand, with many of these involved in gripping activities. During gripping activities, muscles of the flexor mechanism in the hand and forearm create grip strength while the extensors of the forearm stabilize the wrist [8]. According to German Sports Scientist Weinick J [9] the characteristic structure of the hand is related to its function as a grasping tool. Grasping ability is made possible by the fact that the thumb can be opposed to the fingers. The fingers and the thumb act as a versatile pair of pliers. They need the palm of the hand as a flat base, on which the object grasped can be held. Extensor digitorum increases the joint compression and enhances the joint stability.

Hand grip strength is a physiological variable that is affected by a number of factors including age, gender, body size, weight, height, muscle strength, fatigue, time of the day, age, nutritional status, restricted motion, percentage of body fat & lean body mass . Strong correlations between hand grip strength various anthropometric traits were reported [10,11]. Correlation of dominant and non-dominant hand grip strength and Mid upper arm area, mid upper arm circumference, tricep skin fold thickness in cricket players were studied. This study offers the opportunity to enhance, update and clarify the understanding of the relationships between isometric hand grip strength and anthropometric dimensions. If simple techniques like measurement of mid upper arm circumference, tricep skin fold thickness will help in guiding about hand grip strength, it will become very easier for coach to direct the player. So that, we can plan training programmes to increase hand grip which will lead to better performance of cricketers players.

Normally a person starts taking part in a game or event without proper guidance. It is thus a sheer chance that his choice of the sport may be suitable to his inherent capabilities. Therefore the failure to become a champion in most of the cases is inevitable. Thus there is an urgent need to provide counselling to those endowed with such suitable characteristics that form the basis of performance in a game or event. This may be one of the most important factors that can help in raising the standard of sports in most of the countries. In Japan however the system of selection keeping physique in view has been adopted in more than one thousand schools and was administered to some three hundred thousand subjects from the kindergartens to the universities. Physical fitness is required in the promotion of national programme of physical training. However, physique is not the exclusive factor for selection. The other factors which determine performance also need due consideration. With this in view it is desirable to focus attention of those who are connected with sports in one way or the other for improving selection procedures particularly in childhood. "Catch them young" should be the aim. The selection of talent in this way will help utilizing the time and energy of the coaches and the athletes in a more effective manner. It will also be useful in improving the methods of training for children and give a new look to the system. The poor performance of Indian athletes and sportsmen at the international competitions has been of great concern, especially to the coaches, physical educationists and sport scientists. Efforts have been made to improve the standards of our sportsmen since long, however little success has so far been achieved in this respect.

There is paucity of literature in India, to check the correlation of anthropometric parameters , with HGS (hand grip strength). Hence, I felt the need to do this study, in which we have found out correlation of hand grip strength and anthropometric parameters.

Material and Methods

Normal 30 healthy cricket players playing cricket from last 3 years still playing at university level, state level or national level with age group between 15- 25 years who were practicing in daily cricket and football practice for 2-3 hours for 6 days a week were included in the study. Subjects suffering from disease or injury or any treatment and surgery that affect upper extremity strength were excluded. Ambidextrous subject using both hands with equal ease were also excluded from study. The present study was approved by the Ethical Committee.

- + Suggestive significance $0.05 < P < 0.10$.
- Moderately significant $0.01 < P \leq 0.05$.
- **Highly significant $P \leq 0.01$.
- Not significant $P > 0.05$.

All the statistical calculations were performed using the software SPSS for windows (statistical

package for social sciences) version 19.0. Pearson correlation coefficient established a correlation of anthropometric parameters like mid upper arm circumference, mid upper arm area, tricep kin fold thickness with hand grip strength.

$r > 0.7$ = highly positive correlation.

$0.4 < r < 0.7$ = moderately positive correlation.

$0.4 < r$ = low positive correlation.

The hand grip dynamometry used in study was of the Digital Hand Grip (DHD-3). (Product of SAEHAN Corporation Company, South Korea) (Figure 1,2). It is type of Electronic hand grip dynamometry. Instrument Reliability- Digital handheld dynamometer used for in the study had been proved reliable by Faria in his study [12]. Specifically about Sehan's HGD, good validity and reliability is stated by Reis 2010 [13].

A standard testing position as approved by American Society of Hand Therapist (ASHT) was used (Innes [14] 1999, Mathiowetz [15] 1985). How to use the hand grip dynamometry was demonstrated to all subjects [14,16-18].

Measurements were taken for all subjects around midday i.e. 11.00 hours to 12.30 hours, as it is proved to be significantly stronger at these times [19]. Johanson [20] (1983) found a significant difference between the volume of verbal command and isometric contractions, where increased volume resulted in increased strength. Hence, same tone and volume of instructions were given in this study each time a test was conducted.

To get the maximum reliability of data collected, every subject was asked to squeeze the dynamometer for three times. Mean of these three trials were taken as the readings [21]. Innes [14] recommended a 60 seconds rest period between trails on isometric tests. It was recommended that a 3 seconds grip was usually sufficient to register a maximum reading hence 3 seconds is taken for length of contraction time in this study [22].

Mid Upper Arm Circumference (Figure 3,4) is measured by measuring tape.The arm was relaxed and hanging by the side, and the circumference taken at the level of the mid-point between the acromion (bony point of shoulder) and the olecranon (bony point of elbow). Conventionally maximum muscle girth is maximally present at 5 inches above and 4 inches below elbow joint and 9 inches above and 6 inches below knee joint in lower limbs. When recording, tape haven't kept too tight or too loose, is lying flat on the skin, and was horizontal. Reading with 1mm accuracy was noted.

Mid Upper Arm Area [23-25] is calculated by formula,

Mid upper arm area = (Mid upper arm circumference)^2 /4π = (MUAC)^2 /12.57.

We measured the tricep skin fold thickness at standard sites using skin fold calliper on the right side. This harpendence calliper is scientifically developed and calibrated. The instrument has springs which exert a certain pressure on skin fold which measure the thickness in mm..

We Grasped the skin and underlying layer of fat with finger and holded it with the fingers of left hand. A fold of skin and subcutaneous tissue was picked up firmly between the thumb and fore finger 1-2 cm above the marked cross and pulled away from the underlying muscle. The jaws of the calliper were placed on either side of the cross below the fingers at a depth of approximately 1 cm. The surface of the calliper jaws were held parallel to the plane of the skin fold.

The skin fold was held firmly throughout the application of the calliper and the reading was taken once the needle became steady. The skin fold thickness was measured using a validated skin calliper to the nearest 0.2 mm.

While holding the calliper in the right hand place the jaws of calliper should be about one fourth inch from the finger of left hand, which continues to hold the fold of skin. For Tricep Skin fold Thickness (Figure 5, 6) subject was asked to stand with the arm hanging by the sides and The midpoint between the acromion process and the lateral condyle of the was marked. The measurement was taken on the posterior aspect of the arm over the bulk of the triceps at the level marked [26].

Result

- There is highly significant positive correlation observed between MUAC and dominant and non dominant handgrip strength in Cricket players ($P < 0.01$).
- There is low positive correlation observed between MUAA and dominant and non dominant handgrip strength in cricket players.
- There is low negative correlation observed between Ts and dominant handgrip strength in Cricket players and There is highly significant negative correlation observed between Ts and non dominant handgrip strength in Cricket players ($P < 0.01$).

Table 1: Correlation of Hand grip strength & mid upper arm circumference, mid upper arm area, and tricep skin fold thickness in Cricket players

	MUAC		MUAA		Ts	
	DM	NDM	DM	NDM	DM	NDM
Correlation Coefficient (r)	0.48	0.45	0.09	0.13	-0.31	-0.37
t test	2.92	2.70	0.48	0.68	-1.73	-2.09
P value	P < 0.01	P < 0.01	P < 0.01	P < 0.01	P>0.05	P<0.01

DM : Dominant hand, NDM : Non dominant hand

Fig. 1: Sahen's HGD Front View

Fig. 2: HGS Measurement DM Hand (Front View)

Fig. 3: Measuring Tape

Fig. 4: MUAC Measurement

Fig. 5: Harpendens Skinfold Caliper

Fig. 6: Ts Measurement

Disscussion

Our results shows that dominant and non dominant hand grip strength (DM and NDM HGS) continued to be increased with increase in MUAC in cricketers. For DM hands, in cricketers r=0.48, t=2.92, For NDM hands, in cricketers r=0.45, t=2.70, (Table 1), Mid upper arm circumference cover bulk of muscle tissue. So more muscle tissue will lead to more number of muscle fibers. More muscle fibers will lead to exert more force on hand grip strength. So it may lead to high hand grip strength readings. This may cause positive correlation of hand grip strength and MUAC.

Similar result with our finding i.e. HGS is positively correlated with MUAC is shown by Koley S (2009, for rt hand r= 0.513 and for lt hand r= 0.547) in Indian cricket players [27]. MUAC should be increase with specific training, specific exercises. Duration of exercise, diet habits should take into consideration. Daily follow up should be done by coach. As increase in MUAC will lead to increase in hand grip strength. More hand grip strength will give better performance for cricket players.

Our results also shows that dominant and non dominant hand grip strength (DM and NDM HGS) continued to be increased with increase in mid upper arm area (MUAA) in cricketers. For dominant hand, in cricketers r=0.09, t=0.48, For non dominant hand, in cricketers r=0.13, t=0.68, (Table 1).

Similar result with our finding i.e.mid upper arm area is positively correlated with hand grip strength, in Indian cricket players shown by author like Koley S (2009, for rt hand r= -0.493 and for lt hand r= -0.481) [27]. As per, Klausen K (1990) the maximal force or tension produced by a muscle depends on the cross-sectional area of all the muscle fibers within the muscle i.e. the physiological cross-sectional area. Thus, a muscle with a large cross-sectional area is able to produce greater maximal force than a muscle with a small cross-sectional area [28]. This may lead to positive co-relation of mid upper arm area and hand grip strength in our cricket player. More mid upper arm area values can be achieved by proper healthy diet, regular and planned exercise, appropriate type and duration of exercise. Proper training of players should held under observation of coach. Follow up and changes as per requirement of player's physique should be done time to time.

Our results shows that dominant and non dominant hand grip strength (DM and NDM HGS) continued to be decreased with increase in tricep skin fold thickness in cricketers. For DM hands, in cricketers r= -0.31, t=-1.73, For NDM hands, in cricketers r=-0.37, t=-0.29, (Table 1).

Dissimilar result with our finding i.e.tricepskin fold thickness is positively correlated with hand grip strength in Indian cricket players, is observed by other author like Koley S (2009, for rt hand r= 0.278 and for lt hand r= 0.210) [27]. Particular amount of fat (essential fat) is required for sportsman to do various activities in sport. But excess amount of this fat will lead to an unfavorable condition. If this excess fat cover much area of muscle mass then less space remained for muscle tissue in that area. So less muscle tissue lead to less muscle fiber which lead to less force exertion on hand grip dynamometer which cause low reading of hand grip strength. This may be reason for negative correlation of hand grip strength and tricepskin fold thickness. Tricepskin fold thickness should be maintain within normal range to get proper hand grip strength. Better hand grip strength lead to better performance of cricket players. So proper and specific training, different methodologies, diet plans, nutrition factors, practicing hours, specific exercises of upper arm should be considered and a appropriate plan of guideline given to the player to maintain tricep skin fold thickness. The coach should take daily follow up of all above factors to get better performance.

Conclusion

There is need to improve physical fitness parameter to enhance players performance. Hand grip strength has relatively high heritability and importance of genetic factor seems to be of equal size. We can use this phenotypic information when looking for genes important for physical function in second half of life. Hand grip strength training programmes should be planned. Talent identification programmes, scientific training programmes should be held at various level such as school, college, university, state. Coach should

consider all factors affecting it i.e. nutrition, motivation, practicing hours, economical condition, type of exercise. He should give proper guideline to player and arrange proper training programmes. All anthropometric parameters like mid upper arm circumference, mid upper arm area, tricep skin fold thickness, hand grip strength should be assessed by coach periodically.

There is need to improve physical fitness parameter to enhance players performance. Body fat, muscle mass training and hand grip strength training should be implemented at junior level to build whole body mass and to counter asymmetric load placed on the body through the nature of game. Hand grip strength training programmes should be planned at various level such as school, college, university, state. Through this we can give a specific sport prescription to player while selecting a sport. In Japan, they have already implemented this sport prescription method at earlier stages which help person to choose a game. So it should be considered in India as it will be helpful for the performance of the player our purpose of "Right Sport For Right Person" should be served.

Source of Funding: Self
Conflict of Intrest: Nil

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.6

A Randomized Control Study on Effect of 12 Weeks Yoga Therapy in Type 2 Diabetes Mellitus Patients with Distal Polyneuropathy

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Abstract

Background: Yoga asana practices were documented for therapeutic use in diabetes mellitus Type 2 patients. The progress and complications of diabetes could be reduce by prescribing yoga therapy. *Material and Method:* The randomized control study of Type 2 Diabetes Mellitus patients with polyneuropathy was done by making study and control group. The index tests applied for analysis of distal polyneuropathy were Visual Pain Analogue Score, Diabetic Neuropathy Symptom (DNS) score and Diabetic Neuropathy Examination (DNE) scores. All patients' anthropometric, biochemical, cardiac and index test score data were collected before and after study in both groups. The study group had performed various yoga asanas and Bhastrika pranayama for 60 minutes every alternate day for 12 weeks. The control group was taking regular medication without any yoga therapy. Data were analysed in MedCalc Software by application of student t test. *Results:* The study group DNS & DNE Score before yoga 2.3±1.0 and 3.2±1.9 respectively were significantly improve after yoga intervention to 0.6±1.1 and 1.9±1.7 respectively ($p < 0.0001$). The pain score was also improved after yoga therapy in study group from 5.5±1.7 to 1.4±1.6 ($p<0.05$). The control group, without yoga intervention did not show any significant change in index score after 12 weeks of regular medication. *Conclusions:* This study showed regular yoga therapy in diabetic prescription can improve pain and neuropathy condition in polyneuropathy patients of Type 2 Diabetes Mellitus.

Keywords: Yoga; Pranayama; Bhastrika; Distal Polyneuropathy; Diabetes Mellitus Type 2; Painful Neuropathy.

Introduction

The yoga word derived from Sanskrit word "yug", meaning was: referring to the discipline of aligning the mind and body for spiritual goals [1].The yoga practice for healthy life style as alternative medicine was popular in India since long time. Now it was not uncommon that western countries, National Center for Complementary and Integrative Health (NCCIH), also giving identification to yoga as mind and body medicine [2]. The population doing yoga as health prospectus were 300 Million worldwide and out of them 36 Millions in USA [3,4]. The 25% regular yoga practitioners were use yoga asana as alternative medicine during disease condition for treatment [5]. The yoga practice was documented for improvement in audio visual reaction time in health individual [6]. The yoga was also found to promote Hand Grip Strength and Reaction Time during Examination Stress [7], this parameter suggests yoga was promoting autonomic and somatic nervous system function in healthy individual. The prayanama, breathing yoga practice, were documented for helping respiratory function and cardiovascular parameter with improvement on nerve conduction [8].

India had 2nd largest diabetic population in the world [9]. The modified life style had put on extra stress on individual and they are prone for non communicable disease as diabetes mellitus Type 2 and its associated complications [10]. Presence of symptoms and sign of peripheral nerve dysfunction that occur in diabetes mellitus Type 2 without any other aetiology of peripheral neuropathy is called diabetic neuropathy [11]. Diabetic neuropathy was the most common complication leading to morbidity & mortality [12]. Prevalence of diabetic neuropathy was average 30% in Indian population and out of this 45% patient had symptom of painful neuropathy

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Received on: June 16, 2017 **Accepted on:** July 20, 2017

[13]. Distal polyneuropathy was the most common syndrome of diabetes and it was precursor of foot ulceration, 50 to 70% cases out of this polyneuropathy required amputation [14]. The proven disease modifying treatment approach had good glycemic control. Life style modification like diet therapy, aerobic exercise & yoga therapy could help for early glycemic control and less occurrence of morbid complication.

Present study has been done to evaluate effect of addition of 12 weeks yoga therapy to standard medical care in patients of type II DM with distal polyneuropathy on anthropometric parameters, clinical outcome & glycemic control. The screening of all OPD patients of known Diabetes Mellitus with Nerve Conduction Velocity (NCV) was not feasible to perform for analysis of Distal Polyneuropathy. Thus we used index test for analysis polyneuropathy by Diabetic Neuropathy Symptom (DNS) score [15] and Diabetic Neuropathy Examination (DNE) scores [16]. This index score system was fast and sensitive for diagnosis and follow up of diabetes polyneuropathy. The electrodiagnostic studies were not mandatory for clinical diagnosis of diabetic neuropathy [17].

Materials and Methods

The randomized controlled study was executed for 12 weeks, matching-group, pursue in known cases of diabetic distal polyneuropathy adults aged 40-65 years from 2013 to 2015.

The ethical clearance of study had obtained from Ethical Review Board, Gujarat Research and Medical Institute. Total 180 patients from diabetic clinic of medicine department of Rajasthan hospital were randomly selected for study. The application of exclusion, inclusion criteria as following and written consent 76 patients were totally agreed for study.

Inclusion Criteria

Type II Diabetes Mellitus patients with presence of one or more of following signs and symptoms in distal limbs.

- Numbness or feeling of walking on cotton wool.
- Tingling or Pins and needle sensations
- Cramping of calves and foot muscles
- Decrease or absence of ankle jerk
- Decrease or absence of vibration sense at great toe

Exclusion Criteria

- Disabling Polyneuropathy
- Evidence of target organ damage
- Alcoholic or drug induced neuropathy
- Physical condition hindering yoga practice
- Patient doing regular Yoga Exercise

Study Design

The written informed consent was provided by all patients after elucidating whole study design. Seventy six patients were randomly divided in two even groups, Study Group and Control Group. The baseline parameters, as following, were recorded on enrolment of patient in study.

Parameter Studied

- Anthropometry: Body Weight, Height, Waist Circumference
- Biochemical Profile: Fasting Blood Sugar, HbA_1C
- Cardiac Profile: Heart Rate, Mean Blood Pressure
- Diabetic Neuropathy Symptom (DNS) score [15] [Annexure – I], Diabetic Neuropathy Examination (DNE) scores [16] [Annexure – II] and Visual Pain Analogue Score [18].

The index test DNS score, DNE Score and Pain score were validated. The DNS score between 1to 4 confirm polyneuropathy and DNE score > 3 confirm clinically polyneuropathy in Type 2 Diabetes Mellitus patients.

The study groups were treated with 12 weeks yoga therapy and standard medication prescribed by physician, where the control group patients prescribed standard medication prescribed by physician and restriction of any yoga practice during study. Method of Yoga therapy season of one hour had (a) 5 minutes of preparatory practices, (b) 20 minutes static posture - Sarvangasana, Halasana, Ardhamatsyendrasana and Paschimottansana following (c) 20 minutes of Bhastrika breathing yoga: 20 cycles of Deep breathing, 20 cycles of normal breathing following 40 cycles of rapid breathing, and (d)15 minutes of Shavasana [19]. The yoga was done with at least two hour fasting before session. The yoga therapy session was done three times in a week for 12 weeks at Rajasthan Hospital at 5 pm to 6 pm. All patients of both groups baseline parameters were repeated after 12 weeks on follow up.

All data were collected and analysed by MedCalc Softwear (Version 17.6). The significance level was

set at 0.05 for comparison of mean value. The data was evaluated by student's t test.

Results

During 12 weeks on Yoga therapy 13 patients out of 38 from study group had cease for study. The 12 patients of control group not come up to appear for follow-up. The total study group sample size was remaining 25 and for matching control group only 22 patients were kept for data analysis. The patients' characteristic baseline data were mentioned in Table 1. The patient diabetic neuropathy were confirmed by Diabetic Neuropathy Symptom (DNS) score [Annexure – I] and Diabetic Neuropathy Examination (DNE) scores [Annexure – II] with blood profile of Glycated Hemoglobin. The distribution of age, duration of diabetes mellitus and duration of polyneuropathy were comparable in both groups (Table 1).

The Diabetic Neuropathy Symptom (DNS) score (0.6±1.1) and Pain Score (1.4±1.6) after yoga intervention of study group had significant ($p < 0.0001$) improvement from yoga. The clinical Diabetic Neuropathy Examination (DNE) scores (1.9 ± 1.7) was also improved significantly due to yoga in study group. Though biochemical parameter Fasting Blood Sugar and HbA1c did not affected significantly by yoga in this study. The cardiology parameters – Heart rate and Mean Blood Pressure were also remaining statistically not significant after yoga study ($p > 0.05$).

The control group had no significant improvement after only medication of 12 weeks in DNS score, Pain Score and DNE scores ($p>0.05$). The control group had consumed only standard medication for distal

Table 1: Patient Characteristic

Characteristic	Study Group	Control Group
Sample Size (n)	25	22
Gender (Male : Female)	11:14	10:12
Age (years) (Mean ± SD)	52.2 ± 9.3	52.4 ± 9.1
Duration of Type 2 DM (Mean ± SD)	6.3 ± 4.5	5.9 ± 4.2
Painful Neuropathy (n)	17	18
Polyneuropathy Duration Years (Mean ± SD)	5.5 ± 6.8	6.9 ± 5.9

Table 2: Comparison of mean value of Study group parameters before and after yoga intervention with standard medication.

Parameter	Study Group (n=25)		
	Baseline	After 12 weeks	p value
Body Weight (Kg)	60.3 ± 9.3	60.2 ± 9.5	0.97
Waist Circumference (cm)	88.6 ± 9.5	87.7 ± 9.3	0.73
Fasting Blood Glucose (mg/dl)	128.0 ± 50.8	127.0 ± 46.9	0.94
HbA_{1c} (%)	7.5 ± 2.2	7.8 ± 1.4	0.567
DNS Score	2.3 ± 1.0	0.6 ± 1.1	< 0.0001*
Pain Score	5.5 ± 1.7	1.4 ± 1.6	< 0.0001*
DNE Score	3.2 ± 1.9	1.9 ± 1.7	0.014*
Heart Rate (bpm)	78.48 ± 15.93	74.88 ± 9.49	0.336
Mean Blood Pressure (mmHg)	94.87 ± 10.18	89.70 ± 9.61	0.071

(*$p < 0.05$, Significant difference in student's t test)

Table 3: Comparison of mean value of control group parameters before and after standard medication without yoga.

Parameter	Control Group (N=22)		
	Baseline	After 12 weeks	P value
Body Weight (Kg)	62.4 ± 10.4	62.7 ± 10.6	0.92
Waist Circumference (cm)	90.0 ± 8.5	90.7 ± 7.3	0.75
Fasting Blood Glucose (mg/dl)	137.5 ± 67.3	156.4 ± 85.0	0.387
HbA_{1c} (%)	7.6 ± 2.6	8.9 ± 2.0	0.053
DNS Score	2.4 ± 0.9	2.1 ± 1.2	0.364
Pain Score	5.4 ± 1.8	5.1 ± 2.3	0.609
DNE Score	4.1 ± 1.9	4.3 ± 2.0	0.718
Heart Rate (bpm)	75.63 ± 12.04	74.58 ± 9.08	0.729
Mean Blood Pressure (mmHg)	93.96 ± 10.7	91.11 ± 7.09	0.272

Annexure – I: DNS score

1. Are you suffering of unsteadiness in walking?

   Need for visual control, increase in the dark, walk like a drunk man, lack of contact with floor.

2. Do you have a burning, aching pain or tenderness at your legs or feet?

   Occurring at rest or at night, not related to exercise, exclude claudication intermittens.

3. Do you have prickling sensations at your legs and feet?

   Occurring at rest or at night, distal > proximal, stocking glove distribution

4. Do you have places of numbness on your legs or feet?

   Distal > proximal, stocking glove distribution

The questions should be answered 'Yes' (positive: 1 point) if a symptom occurred more times a week during the last 2 weeks or 'No' (negative: no point) if it did not

Maximum Score = 4

1-4 = Polyneuropathy (PNP) Present

0 = Polyneuropathy (PNP) Present

Annexure – II: DNE scoring

Muscle strength:

1. Quadriceps femoris: extension of the knee
2. Tibialis anterior: dorsiflexion of the foot

Reflex:

3. Triceps surae (Ankle Jerk)

Sensation: index finger:

4. Sensitivity to pinpricks

Sensation: big toe:

5. Sensitivity to pinpricks,
6. Sensitivity to touch,
7. Vibration perception,
8. Sensitivity to joint position

Only the right leg and foot are tested.

Scoring from 0 to 2:

0 = Normal

1 = Mild/ moderate deficit; Muscle strength: Medical Research Council (MRC) scale 3–4; Reflex: decreased but present; Sensation: decreased but present

2 = severely disturbed/ absent; Muscle strength: MRC scale 0–2; Reflex: absent; Sensation: absent

Maximum score: 16 points

A score of > 3 indicates presence of polyneuropathy.

polyneuropathy, which had no statistically significant ($p>0.05$) outcome. The poor glycemic control, HbA1c (8.9±2.0) in control group was reflected after 12 weeks.

The anthropometric data body weight and waist circumference had no significant difference in study ($p >0.70$) and control ($p > 0.75$) group after 12 weeks regime. The cardiac parameters like mean blood pressure (MBP) and heart rate had also no significant ($p >0.05$) change after 12 week yoga intervention or medication.

Discussion

The prevalence of type 2 Diabetes Mellitus (NIDDM) with irregular medication or late diagnosis leads to polyneuropathy in patients. The hyperglycaemia induces oxidative stress which leads to endonurial microangiopathy and hypoxia. These changes made genesis of pain, delay nerve conduction and demyelination to degeneration of nerve fibre [20]. The clinical diagnosis of diabetic polyneuropathy was easy and reliable on DNS and DNE score system [15,16]. The reliability of DNS and DNE score leads us to choose this test instead of NeuropathySymptom Score (NSS) [15]. The San Luis Valley Diabetes Study proved inadequate glycaemic control and insulin insensitivity were autonomously promoting polyneuropathy in chronic NIDDM patients [21]. This study had found no improvement in chronic polyneuropathy and no control of blood sugar level with regular standard medication (Table 2).

Malhotra V (2002) had found yoga asanas improve previously altered nerve conduction velocity in Type 2 Diabetes Mellitus [22]. Malhotra V found that yoga asanas can improve glycemic control by regular yoga practice in diabetis mellitus type 2. The yoga will improve insulin sensitivity and glucose utilization by tissue which reduce extra glysemic load on tissue and reduce generation of free oxidative radicals [23], so neuritis induced polyneuropathy will be improved by yoga.

The six month yoga practice was documented by Chimkode SM (2015) for control of blood sugar level in type 2 Diabetes Mellitus [24], but this study was focused on effect of 12 weeks yoga training on diabetic polyneuropathy patients. The study group did not show any significant change in Blood glucose level or Glycated Hemoglobin (Table 2) after 12 weeks of yoga exercise.

Garfinkel MS (1998) documented role of yoga as alternative medicine to reduce pain due to Median nerve compression in Carpal Tunnel Syndrome [25]. Pain score in this study had also significant improvement after yoga intervention with medication in study group (Table 2) as compared to control group (Table 3). This study support Garfinkel MS (1998) results.

The painful polyneuropathy, developed in 45% patients of diabetes neuropathy, was limiting factor for daily activity of individual as reported by Bansal Dipika (2014) [13]. This morbid condition was corrected by yoga intervention with medication in diabetic patients (Table 2). The pain score was improved in study group from 5.5±1.7 to 1.4±1.6 as per visual pain analogue scale ($p < 0.0001$). The control group did not show significant change in pain score with only medical intervention (Table 3). The long term use of medication may help in symptomatic relief from pain but if we add yoga therapy in same prescription, it will augment outcome of therapy.

Conclusion

This study had confirmed the role of yoga therapy in diabetes mellitus type 2 patients with distal systemic neuropathy. DNS Score, DNE Score and Pain Score reduce significantly in patients after 12 weeks yoga therapy. This suggests that prescription of yoga therapy as alternative medicine with regular medical therapy had benefit to patient health than only medical therapy.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.7

Respiratory Symptoms among Hairdressers: A Case Control Study

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Abstract

Background: Hairdressing is a widespread occupation. Hairdressers are typically exposed to a cocktail of chemicals. Workplace exposure to various chemicals, which may be absorbed or inhaled, can affect airways directly or cause bronchial mucosal inflammation. *Aims and Objectives*: To assess prevalence of respiratory symptoms among hairdressers and to compare with matched control group. *Materials and Methods*: This study was based on a questionnaire. The questionnaire sought information about respiratory symptoms. We interviewed 100 male hairdressers and 100 office workers who served as matched controls drawn from a random sample of the general population. We used a validated questionnaire for occupational respiratory disease and compared the prevalence of work-related respiratory symptoms in both groups. *Results:* Almost half of the hair dressers reported work related respiratory symptoms. Cough (36%), breathlessness (31%) and wheezing (26%). The hairdressers reported signiûcantly more runny eyes and runny or blocked nose from exposure to hair dyes and other chemicals used in a hairdressing salon, compared with the office workers. *Conclusion*: Hairdressing work is associated with a high frequency of work related respiratory symptoms. The same trend was not found among the office workers. Prevalence of symptoms during exposure to other types of general pollutants was similar in the two groups.

Keywords: Hairdresser; Cough; Breathlessness; Wheezing; Occupational.

Introduction

Hairdressers are exposed to a variety of irritative and allergenic substances which can cause airway symptoms and diseases related to occupation [1-3]. Hair lacquers and permanent wave solutions can irritate airways and worsen the symptoms of people with reactive airways or asthma [4].

Hairdressers are exposed to cocktail of chemicals found in hair spray, setting lotion, hair coloring agents etc that are known to have effects on their respiratory symptoms [5-7]. Hairdressers are exposed to low air concentrations of numerous chemicals in cosmetic products which may cause bronchoconstriction, airway inflammation and airway obstruction. Increased prevalence of respiratory symptoms, hand dermatitis and occupational asthma have been observed in hairdressers [5-8].

An association between the occupational exposure of hairdressers and chronic bronchitis, asthma, asthma-like symptoms, allergy, and other respiratory illnesses were observed in several studies [9-11]. Workplace exposure to various chemicals, which may be absorbed or inhaled, can affect airways directly or cause bronchial mucosal inflammation [12].

Little is known about the prevalence of different types of airway symptom caused by these highly reactive, low molecular weight chemicals present in hairdressing salons. Such knowledge would be important in preventing chemical hazards in these work places [8].

There are limited studies conducted in our country on prevalence of respiratory symptoms in this group of workers. The purpose of this study was to examine the self reported prevalence of respiratory symptoms among hairdressers and to compare with unexposed control group.

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Received on: May 02, 2017 **Accepted on:** May 13, 2017

Materials and Methods

The present study was a case control analytical type of observational study done in Bidar Institute of Medical Sciences, Bidar, Karnataka, India. Ethical committee approval was obtained from the ethical committee of BRIMS, Bidar where study was carried out. The participants were non- smoking 100 hairdressers who had been working in different salons of Bidar city for at least a period of 3 years.

A similar number of age and sex matched persons were randomly selected from office workers as controls who were not occupationally exposed to hairdressing environment at work place. Strict inclusion criteria was followed which included - age group of 25 to 40 years, non-smokers. The informed consent was taken after the detailed procedure and purpose of the study was explained. A thorough history taking & clinical examination was carried out and the vital data was recorded.

The selection of studied hairdressers was based on the following criteria: minimum of 3 consecutive years of full-time hairdressing experience. Those with history of chronic respiratory disorders, atopy, not taking medication for allergy or respiratory disease, cardiovascular disorders, systemic diseases affecting respiratory system and smokers were excluded from the study. A thorough history taking & clinical examination was carried out to rule out the exclusion criteria and the vital data was recorded.

A standardized questionnaire was used to collect information about the presence of respiratory symptoms, smoking habits and medical history of atopy. The hairdressers were also asked about the frequency of different hairdressing activities. Data were collected during the same period of the year. The present study focuses on respiratory symptoms. The following respiratory symptoms were chosen from the data collected in the questionnaire: cough in the morning, cough during the day or night, sputum, wheezing, wheezing with dyspnoea, symptoms suggestive of non-specific mucosal hyperresponsiveness (MHR), defined in this study as the presence of one or more of the following symptoms: fit of coughing, sneezing or runny nose, eye symptoms, and acute breathlessness.

Statistical Analysis

The qualitative data obtained were analyzed using two tailed 'p' value of 0.05 with a confidence interval of 95% was the criterion for statistical significance.

Results

The recorded anthropometric data in hairdressers and control groups did not show any statistical significance as shown in Table 1. Respiratory symptoms were common among the hairdressers than controls. Sneezing was the most common complaint among the hairdressers. The prevalence of respiratory symptoms was: cough 35%, breathlessness 28%, phlegm 21%, wheezing 9%, sneezing 37%, runny nose 28% and self-reported itchy eyes 27%, all of which were significantly higher among the hairdressers than the controls with 2 tailed 'p' value <0.001 as shown in Table 2.

Table 1: Anthropometric Data

Parameters	Hairdressers Mean ± SD	Controls Mean ± SD	P value
Age(yr)	35.30 ± 2.10	36.22 ± 2.16	P=0.0571
Height(cm)	169.33 ± 2.44	168.19 ± 4.24	P=0.1445
Weight(kg)	6.35 ± 6.48	68.66 ± 22.14	P=0.8505
BMI (kg/m^2)	24.15± 40.26	24.09± 42.26	P=0.9948

P>0.05- Not significant, P<0.05- Significant, P<0.001- Highly significant

Table 2: Respiratory Symptoms in Hairdressers and controls

Respiratory Symptoms	Hairdressers %	Controls %	P value
Cough	33	7	<0.001
Breathlessness	26	6	<0.001
Phlegm	21	4	<0.001
Wheezing	9	2	<0.001
Sneezing	37	15	<0.001
Runny nose	25	12	<0.001
Itchy eyes	27	11	<0.001

Discussion

Hairdressing is a very common occupation worldwide. Respiratory morbidities impose an enormous burden on the society. Hairdressers are exposed to varieties of chemical agents with potential to irritate and sensitize the airways. Hairdressers are exposed to chemicals that are known to affect the respiratory system. Several studies done on hairdressers have shown an increased risk for occupational asthma [3,8,13-14]. Some studies conducted on hairdressers have shown an increased frequency of respiratory diseases [15-19].

In our present study we noted the impact of hairdressing occupation on their respiratory health. We found prevalence of significantly higher work exposure induced respiratory symptoms in hairdressers than in office workers drawn from general population. All of the hairdressers in our study reported that they did not have any respiratory symptoms before starting work as hairdressers.

We observed that respiratory symptoms were common among the hairdressers than controls. Sneezing was the most common complaint among the hairdressers. The prevalence of respiratory symptoms was: cough 35%, breathlessness 28%, phlegm 21%, wheezing 9%, sneezing 37%, runny nose 28% and self-reported itchy eyes 27%, all of which were significantly higher among the hairdressers with 2 tailed 'p' value <0.001 compared to controls.

Increased prevalence of respiratory symptoms in hairdressers compared to office workers signify the harmful effect of exposure to a cocktail of irritative and allergenic chemicals at work place. From this study the exact cause of increased prevalence of respiratory symptoms due to inhalation of irritative and allergenic chemicals is not clear. But some studies conducted show that hairdressers are extensively exposed to low air concentrations of numerous chemicals in cosmetic products that may cause bronchoconstriction and airway obstruction [20]. Increased prevalence of upper and lower respiratory tract symptoms [21-22] and occupational asthma [23]. Studies conducted by Adeyeye O.O et al, in female hairdressers have shown increased prevalence of respiratory symptoms in female hairdressers compared to control group [24]. It has also been shown that hairdressing work is associated with increased occurrence of different health problems [25-26]. The results from our study are in agreement with other studies which have found increased respiratory symptom prevalence in hairdressers [2-3,8,17,27] .

The hairdressers did not use any preventive measures at work. No one used face mask at work while mixing chemicals while only one used hand gloves. Most of the hairdressers were lacking adequate knowledge on the health hazards of their occupation.

Conclusion

The present study shows a high frequency of work-exposure-related respiratory symptoms in hairdressers. Many of the hairdressers lack adequate knowledge on the hazards of their occupation and as well as the preventive strategies to reduce risks. Adequate attention should be given to appropriate education about potential hazards and preventive strategies and there is need for further research into potential health hazards in this group of workers.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.8

Correlation of Body Mass Index and Intraocular Pressure in Same Age Group

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Abstract

Introduction: Obesity is the one of most worried non communicable diseases. Changing life style, changing food habits, stressful life are risk factors for obesity. Obesity is risk factor for many diseases like hypertension, ischemic heart diseases, stroke and diabetes mellitus. Obesity also increases risk of raised intraocular pressure and glaucoma. *Objective*: To study correlation between body mass index and intraocular pressure in same age group subjects. *Materials and Method*: Study included healthy male and female subjects of same age between 45 years to 55 years. Total 150 healthy subjects were included in study and were divided into three groups according the body mass index. Group I- Body Mass Index (BMI): 18 to 24.9 Kg/m^2, Group II-Body Mass Index (BMI) 25 to 29.9 Kg/$m^2$and Group III- Body Mass Index (BMI): 30 and > 30 Kg/m^2. Intraocular Pressure (IOP) was measured in right eye and left eye separately using Perkin's tonometer between 10 am to 11 am to avoid diurnal variations. *Statistical Analysis*: A nonparametric test, Kruskal-Wallis test, was used to compare groups. In addition, Pearson correlation test was used to find out the correlations between parameters. SPSS 18.0 statistical package was used for statistical analysis. *P* values of less than 0.05 were considered to be statistically significant. *Result:* Our study showed statistically significant increase in intraocular pressure with increase in Body Mass Index (BMI) in all three groups. *Conclusion:* There is significant increase in intraocular pressure with increase in Body Mass Index (BMI) in all three groups. Raised Intraocular Pressure (IOP) is risk factor for glaucoma so obese patient should have regular eye check up and regular trained exercise to avoid complications like glaucoma.

Keywords: BMI; Intraocular Pressure; Glaucoma.

Introduction

Obesity is the one of most worried non communicable diseases. Changing life style, changing food habits, stressful life are risk factors for obesity. Obesity is risk factor for many diseases like hypertension, stroke & diabetes mellitus. Obesity also increases risk of raised intraocular pressure which is risk factor for glaucoma. The mean intraocular pressure (IOP) varies between 10 and 21 mm Hg (mean 16±2.5). Any abnormalities in the IOP results in dysfunction of the eye and affects the vision [1]. IOP is affected by various systemic parameters like age, sex, body mass index and blood pressure. Many Indian studies [2-6] and foreign studies [7,8] have shown positive correlation between body mass index and IOP. So this study was conducted to study correlation between body mass index and intraocular pressure in same age group subjects.

Materials and Methods

Study was conducted at Ophthalmology department, Navodaya Medical College and Hospital after getting Institutional ethical clearance and written consent from all participants individually. Study included healthy male and female subjects of same age between 45 years to 55 years. Subjects taking treatment for any systemic and ocular disease, subjects with any surgery, smokers and alcoholics were excluded.

Total 150 healthy subjects were included in study. Height in meters and weight in kilograms measured in light clothing without shoes. BMI was calculated using Quetelet's index i.e weight in Kg / Height in m^2. Subjects were divided according to BMI. Each group included 50 participants. Group I: BMI -18 to 24.9 Kg/m^2, Group II: BMI- 25 to 29.9 Kg/m^2, and

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Received on: August 16, 2017 **Accepted on:** September 01, 2017

Group III: BMI - 30 and > 30 Kg/m^2. IOP was measured for right eye and left eye separately using Perkin's tonometer between 10 am to 11am to avoid diurnal variations.

Average of three readings was taken. As IOP in right eye and left eye was same for all subjects, values of right eye were taken for statistical analysis.

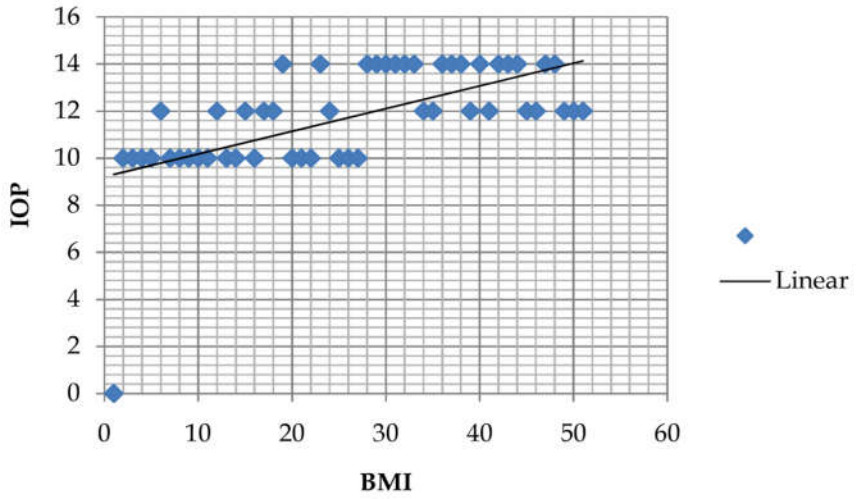
Statistical Analysis

A nonparametric test, Kruskal-Wallis test, was used to compare groups. In addition, Pearson correlation test was used to find out the correlations between parameters. SPSS 18.0 statistical package was used for statistical analysis. *P* values of less than 0.05 were considered to be significant.

Table 1: Statistical analysis of group I

Group	Participants	Gender F/M	BMI (Kg/m^2) (Mean ± SD)	IOP mmHg (Mean ± SD)	R value	P value	Significance
I	50	20/30	23.01±1.24	11.96±1.69	0.818	P<0.01	Significant

Significant positive correlation between BMI and IOP, with r = 0.818 and p < 0.01



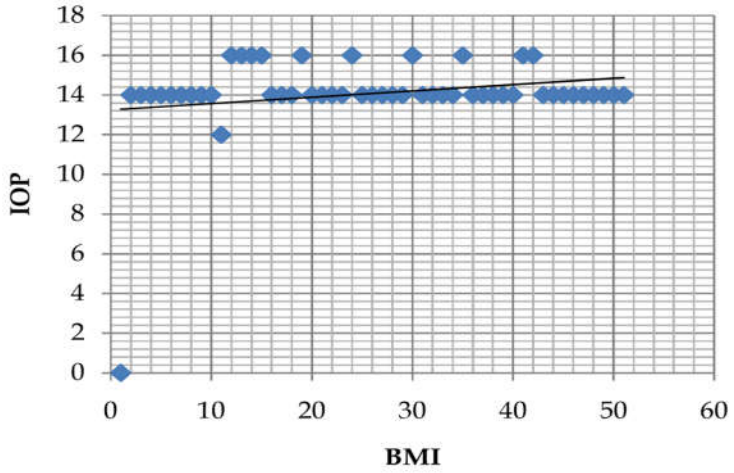
Graph 1: Correlation of BMI and IOP in Group I

In Group I mean BMI was 23.01±1.24 Kg/m^2, mean IOP was 11.96±1.69 mmHg

Table 2: Statistical analysis of group II

Group	Participants	Gender F/M	BMI (Kg/m^2) (Mean ± SD)	IOP mmHg (Mean± SD)	R value	P value	Significance
II	50	29/21	26.53±1.308	14.36±0.875	r =0.556	P<0.01	Significant

Significant positive correlation between BMI and IOP, with r = 0.556 and p < 0.01



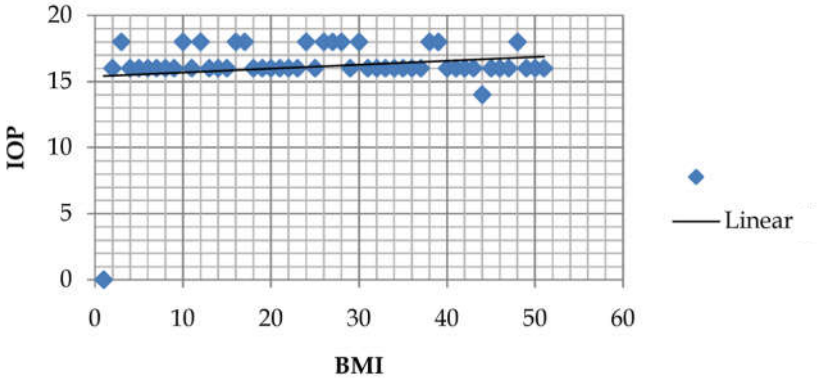
Graph 2: Correlation of BMI and IOP in group II

In group II mean BMI was 26.53±1.308 Kg/m^2, mean IOP was 14.36±0.875 mmHg

Table 3: Statistical analysis of group III

Group	Participants	Gender F/M	BMI (Kg/m²) (Mean ± SD	IOP mmHg (Mean± SD)	r value	P value	Significance
III	50	25/25	32.42±1.59	16.48±0.953	r =0.750	P < 0.01	Significant

Significant positive correlation between BMI and IOP, with r = 0.750 and p < 0.01



Graph 3: Correlation of BMI and IOP in group III

In group III mean BMI was 32.42±1.59 Kg/m² and mean IOP was 16.48±0.953 mmHg

Result

In all three groups there is significant increase in IOP with increase in BMI.

Discussion: In all three groups there is significant positive correlation between BMI and IOP like many studies in India [2-6] and other countries [7-8]. In obese person excess fat deposition is responsible for many complications. Along with increased risk for hypertension and diabetes mellitus it is also risk factor affecting vision. Hypertension and diabetes mellitus are also well known risk factors for ocular hypertension [9-13]. Excess fat also gets deposited in intraocular tissue. It leads to compression of episcleral vein and obstructs aqueous humour outflow [14]. In obese person blood viscosity is also increased due to increased red cell mass, Hb and haematocrit value. This further increases resistance in episcleral vein [15]. These factors are responsible for raised intra ocular pressure in obese person. It is also important to note that regular trained exercise for 2 to 3 months decreases both BMI and IOP [16,17].

Conclusion

As BMI increases, IOP also increases. Raised IOP is risk factor for glaucoma which can lead to dreadful complication blindness. So it is very essential that overweight and obese individual should undergo regular ophthalmic check up. They should also follow protocol for regular exercise and change in diet for losing weight. These simple measures can help to prevent complications such as glaucoma and blindness.

Acknowledgement

My sincere thanks to all participants for their kind co-operation. I am thankful to Professor and Head of Physiology department, Navodaya Medical college, Raichur and also to Professor and Head Ophthalmology department, Navodaya Medical college and Hospital, Raichur for their valuable guidance.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.9

A Study of Correlation between ECG and Echocardiography Findings in Left Ventricular Hypertrophy Secondary to Systemic Hypertension

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Abstract

Context: In clinical practice, left ventricular hypertrophy is best detected by echocardiography because its sensitivity exceeds that of the electrocardiography at the usual level of specificity. However, the greater availability, lower cost and relative simplicity of operation, the ECG continue to support its much wider use as a diagnostic instrument for this purpose. *Aims:* To study the correlation between ECG and Echocardiography findings in left ventricular hypertrophy secondary to systemic hypertension. *Settings and Design:* A hospital based cross sectional diagnostic evaluation study. Department of Physiology, Lt. BRKM Government Medical College. *Methods and Material:* The present study was conducted for a period of two years among 60 randomly selected patients from medical inpatient wards of this tertiary centre. Echocardiography was taken as gold standard to evaluation the performance of ECG. *Statistical Analysis:* Sensitivity, specificity, positive predictive value and negative predictive value were calculated for ECG to study its effectiveness. *Results:* Cornell voltage criteria (RavL + SV_3) has given significantly better sensitivity of 44% (p=0.042) compared to Sokolow-Lyon voltage criteria ($SLV=SV_1+RV_6$) which gave 26% sensitivity. Although Sokolow-Lyon voltage criteria have shown specificity of 100% compared to 90% of Cornell voltage criteria, difference was statistically not significant (p > 0.05). Cornell voltage criteria had a better correlation with LVM and LVMI compared to Sokolow-Lyon voltage criteria. *Conclusion:* Cornell voltage criteria are better than Sokolow-Lyon voltage criteria. It can be easily applicable in clinical practice in cases where echocardiography is not available.

Keywords: Clinical Practice; Echocardiography; ECG; Sensitivity.

Introduction

Hypertension is vastly an asymptomatic chronic disorder [1]. It is the commonest cardiovascular disorder, posing a major public health challenge to population in socio-economic and epidemiological transition. It is one of the major risk factors for cardiovascular mortality, which accounts for 20-50% of all deaths. There is also a direct relation between cardiovascular risk and blood pressure: the higher the blood pressure, the higher the risk of both stroke and coronary events [2].

Currently hypertension is staged as normal, pre-hypertension or hypertension based on the average of two or more readings taken at two or more visits. Isolated systolic hypertension is defined as a systolic blood pressure of 140 mmHg or more and a diastolic blood pressure of less than 90 mmHg [3].

Hypertension is typically associated with concentric hypertrophy of the ventricles. Grossman in 1975 proposed that the hypertrophic response was evoked by increased wall stress, the result of an increased intra-ventricular pressure. The pressure overload causes myocytes to grow wider and to thicken and according to the Laplace law, the increased wall thickness and even normalize the increased wall stress [4].

According to Devereux et al the increase in left ventricular mass represents a common final pathology towards the adverse effect on the cardiovascular system and higher vulnerability to complication [4].

ECG changes result from abnormal thickening of the left ventricular free wall or ventricular septum, left ventricular chamber dilatation or increased left ventricular wall tension. Echocardiography provides direct information concerning left ventricular wall

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Received on: July 17, 2017 **Accepted on:** August 17, 2017

thickness and chamber size [5-7]. In clinical practice, left ventricular hypertrophy is best detected by echocardiography because its sensitivity exceeds that of the electrocardiography at the usual level of specificity. However, the greater availability, lower cost and relative simplicity of operation, the ECG continue to support its much wider use as a diagnostic instrument for this purpose [8].

Hence present study was carried out to study the correlation between ECG and Echocardiography findings in left ventricular hypertrophy secondary to systemic hypertension.

Material and Methods

The present hospital based cross sectional diagnostic evaluation study was conducted for a period of two years at Department of Physiology, Lt. B. R. K. M. Government Medical College, Jagdalpur, Chhattisgarh, India for a period of two years among 60 randomly selected patients from medical inpatient wards of this tertiary centre. Echocardiography was taken as gold standard to evaluation the performance of ECG. Before the start of the study, Institutional Ethics Committee Permission was taken. Also the individual patient consent was taken.

The study was conducted at Department of Physiology from June 2015 to November 2016. The patients admitted in the General Medicine Wards during the study period were listed and a total of 60 eligible patients were selected randomly who showed the echocardiography evidence of left ventricular hypertrophy. The patients showing any evidence of multiple diseases or its complications, not willing patients and patients not able to participate in the study were excluded after careful discussion about the patient.

All patients underwent blood pressure measurement, 12 lead ECG and echocardiography. The idea was to evaluate the diagnostic efficacy of ECG and hence echocardiography was taken as gold standard for comparing the findings of ECG against echocardiography.

Blood pressure was classified using JNC VII criteria of classification [3].

ECG Criteria for Left Ventricular Hypertrophy

The electrocardiograph is a sophisticated galvanometer, a sensitive electromagnet, which can detect and record changes in electromagnetic potential. Cardiac hypertrophy result in changes at the cellular, tissue and volume conductor levels, all of which contribute to the electrocardiographic changes characteristics of left ventricular hypertrophy [9]. There are 12 standard electrocardiographic leads which may be physiologically divided into two groups [9].

1. The frontal plane leads – It includes leads I, II and III and leads AVR, AVL and AVF.
2. The horizontal plane leads – It includes leads V_1 to V_6.

Principle

The S wave of a right oriented lead and the R wave of a left oriented lead represent, in effect, the resultant and dominant right to left QRS vector of ventricular depolarization. These deflections constitute an indirect representation of free left wall activation. This is due to domination of free left ventricular wall activation over free right ventricular wall activation. So hypertrophy of the free wall of the left ventricle will be expressed by an increase in the depth of the S wave in the leads V_1 and V_2 and an increase in the height if the R wave in leads V_5 and V_6. [9]

Sokolow – Lyon Index: [10] $SV1 + (RV_5 \text{ or } RV_6) > 3.5$ mV

Or

RavL > 1.1 mV

Cornell Voltage Criteria: [1,11]

$SV_3 + RavL \geq 2.8$ mV (males)

$SV_3 + RavL \geq 2.0$ mV (females)

Echocardiographic Criteria for Left Ventricular Hypertrophy

Principle

Left ventricular dimensions usually are measured from two dimensional guided M mode echocardiograms of the left ventricle at the papillary muscle level, using the parasternal short axis view. Left ventricle dimensions measured from this view consists of thickness of the left ventricle posterior wall (PWT), thickness of inter-ventricular septum (IVST), left ventricular internal diastolic diameter (LVID) and left ventricular internal systolic diameter (LVIS). The values of IVST, LVID and PWT are used for Teichholz formula.

There is another formula known as relative wall thickness (RWT) which differentiates concentric LVH (due to hypertension) from eccentric LVH (due to overload) [12].

A. Cubed (Teichholz) Formula [12]

LV mass (g) = $\{(IVST + LVID + PWT)^3 - LVID^3\} X 1.05$.

Left ventricular hypertrophy is said to be present if LV mass is ≥ 163 gm in females or ≥ 224 gm in males [13].

Left ventricular mass index (LVMI) = LV mass / BSA.

Left ventricular hypertrophy is said to be present if LVMI is ≥ 96 gm in females or ≥ 116 gm in males [13].

B. Relative wall thickness (RWT) = PWT + IVST / LVID

RWT ≥ 0.45 indicates concentric hypertrophy [14].

Normal values of echocardiographic parameters for left ventricle are as follows [13].

PWT = 0.6 to 1 cm, IVST = 0.6 to 1 cm, LVID = 4.2 cm to 5.3 cm

Statistical Analysis

Sensitivity, specificity, positive predictive value and negative predictive value were calculated for ECG to study its effectiveness.

Results

Table 1 shows the characteristics of the patients. The various characteristics like mean values of age, weight, height, BMI, SBP, DBP were studied and compared between males and females. It was found that weight and height was significantly more in males than females. DBP was more in females and this difference was slightly significant. But age, BMI and SBP were similar among the males and females.

Table 2 shows echocardiographic findings among the study subjects. All parameters like PWT, IVST, LVID, LV mass and RWT were found to be similar among males and females. Only one parameter i.e. LVMI was significantly more among females compared to males. ($p < 0.05$).

Table 3 shows the diagnostic accuracy of Sokolow-Lyon voltage criteria. Overall it gave only 26% of sensitivity but had 100% specificity.

The overall positive predictive value was 100% which means that the patients diagnosed using these criteria surely have left ventricular hypertrophy. The sensitivity ranged from 11.11% for regular treatment to 34.08% for irregular treatment. But the specificity remained at 100% for all parameters.

Table 4 shows that there was poor correlation of Sokolow-Lyon criteria with that of LVM (0.202) and that of LVMI (0.189). Both were statistically not significant also ($p > 0.05$). Thus these criteria did not correlate well with echocardiography findings. There was slight variation in correlation in terms of gender, BMI, treatment history and duration of hypertension. But again this was not found to be statistically significant.

Table 5 shows the diagnostic accuracy of Cornell voltage criteria. Overall it gave a better sensitivity of 44% and the specificity was also 90%. This was also found to be statistically significant ($p < 0.05$). There was slight variation in sensitivity on the basis of gender, BMI, treatment history and duration of hypertension, but they were not found to be statistically significant.

Overall positive predictive value was 95.65% which means that the patients diagnosed using these criteria surely have left ventricular hypertrophy.

Table 6 shows that there was very good correlation of Cornell criteria with echocardiographic findings like LVM (0.55) and LVMI (0.45). Both were statistically significant ($p < 0.05$). Thus these criteria correlated well with echocardiography findings.

Table 1: Characteristics of the patients

Characteristic	Male		Female		T test	P value	Interpretation
	Mean	SD	Mean	SD			
Age (years)	62.68	10.75	60.27	11.8	1.1695	0.2446	Not significant
Weight (kg)	69.21	4.17	63.11	2.8	9.4071	0.0001	Significant
Height (cm)	166.71	2.67	157.05	2.85	19.1605	0.0001	Significant
BMI (kg/m^2)	24.94	1.45	24.65	1.38	1.1222	0.2641	Not significant
SBP (mmHg)	167.0	21.39	160.33	17.27	1.8793	0.0627	Not significant
DBP (mmHg)	86.5	15.34	91.44	10.37	2.0666	0.0410	Significant

BMI = Body Mass Index, SBP= Systolic Blood Pressure, DBP = Diastolic Blood Pressure

Table 2: Echocardiographic findings among the study subjects

Echocardiographic findings	Male		Female		T test	P value	Interpretation
	Mean	SD	Mean	SD			
PWT (cm)	1.33	0.16	1.29	0.29	0.8937	0.3733	Not significant
IVST (cm)	1.33	0.26	1.28	0.32	0.9393	0.3495	Not Significant
LVID (cm)	4.49	0.35	4.5	0.13	0.2075	0.8360	Not Significant
LV mass (gm)	293.6	78.35	285.37	110.82	0.4695	0.6394	Not significant
LVMI (gm/m²)	142.99	29.9	168.05	63.67	2.7596	0.0067	Significant
RWT	0.59	0.15	0.57	0.13	0.7805	0.4367	Not Significant

Table 3: Diagnostic accuracy of Sokolow-Lyon voltage criteria on the basis of gender, BMI, treatment history and duration of hypertension

Determinants	Sensitivity	Specificity	Positive predictive value	Negative predictive value	P value
Total	26	100	100	21.28	0.099
Male	28.12	100	100	28.12	0.166
Female	22.22	100	100	6.67	0.99
BMI > 25	19.05	100	100	32	0.55
BMI < 25	31.03	100	100	9.09	0.99
Irregular treatment	34.38	100	100	12.5	0.53
Regular treatment	11.11	100	100	30.43	0.99
Hypertensive of > 5 years	30	100	100	16	0.55
Hypertensive of < 5 years	20	100	100	27.27	0.54

Table 4: Correlation between Sokolow-Lyon voltage criteria and LVM & LVMI on the basis of gender, BMI, treatment history and duration of hypertension

Determinants	Correlation coefficient (r) with LVM			Correlation coefficient (r) with LVMI		
	r	p value	95% C.I.	r	p value	95% C.I.
Total	0.202	0.507	-0.392 to 0.671	0.189	0.535	-0.403 to 0.670
Male	0.218	0.571	-0.521 to 0.77	0.205	0.596	-0.531 to 0.765
Female	0.633	0.367	-0.837 to 0.991	0.844	0.156	-0.620 to 0.996
BMI > 25	0.028	0.971	0.958 to 0.963	0.009	0.990	-0.96 to 0.96
BMI > 25	0.390	0.298	-0.369 to 0.837	0.466	0.205	-0.286 to 0.863
Irregular treatment	0.292	0.382	-0.372 to 0.759	0.256	0.447	-0.406 to 0.741
Regular treatment	0.121	0.423	-0.267 to 0.238	0.112	0.512	-0.282 to 0.212
Hypertensive > 5 years	0.268	0.484	-0.481 to 0.795	0.274	0.474	-0.476 to 0.793
Hypertensive < 5 years	0.25	0.74	-0.076 to 0.935	0.240	0.659	-0.980 to 0.922

Table 5: Diagnostic accuracy of Cornell voltage criteria on the basis of gender, BMI, treatment history and duration of hypertension

Determinants	Sensitivity	Specificity	Positive predictive value	Negative predictive value	P value
Total	44	90	95.65	24.32	0.042
Male	40.63	88.89	92.86	29.63	0.13
Female	50	100	100	10	0.99
BMI > 25	28.57	87.5	85.71	31.82	0.634
BMI < 25	55.17	100	100	13.33	0.225
Irregular treatment	53.13	66.67	94.44	11.76	0.602
Regular treatment	27.78	100	100	35	0.27
Hypertensive of > 5 years	53.33	100	100	22.22	0.105
Hypertensive of < 5 years	30	100	100	30	0.28

Table 6: Correlation between Cornell voltage criteria and LVM & LVMI on the basis of gender, BMI, treatment history and duration of hypertension

Determinants	Correlation coefficient (r) with LVM			Correlation coefficient (r) with LVMI		
	r	p value	95% C.I.	r	p value	95% C.I.
Total	0.55	0.007	0.171 to 0.790	0.45	0.033	0.04 to 0.735
Male	0.433	0.138	0.154 to 0.794	0.5	0.075	-0.057 to 0.828
Female	0.309	0.0418	-0.446 to 0.807	0.483	0/186	-0.265 to 0.918
BMI > 25	0.416	0.411	-0.596 to 0.917	0.054	0.918	-0.792 to 0.829

BMI < 25	0.563	0.023	0.092 to 0.828	0.497	0.049	0.002 to 0.796
Irregular treatment	0.587	0.013	0.148 to 0.832	0.512	0.035	0.042 to 0.797
Regular treatment	0.922	0.025	0.215 to 0.995	0.994	0.004	0.922 to 0.999
Hypertensive > 5 years	0.425	0.1	-0.089 to 0.760	0.396	0.128	-0.123 to 0.745
Hypertensive < 5 years	0.863	0.026	0.171 to 0.984	0.615	0.193	-0.391 to 0.951

Discussion

In the present study, 60 hypertensive patients were studied. They were examined by taking their presenting complaints, past history of hypertension and treatment history. The routine investigations were done. 12 lead ECG and echocardiography was done and findings were noted.

An attempt was made to correlate the routine 12 lead ECG findings in cases of left ventricular hypertrophy, with that of echocardiographic findings, taking echocardiographic measurements as guidelines for left ventricular hypertrophy.

Although there are various criteria of ECG for the diagnosis of left ventricular hypertrophy, the voltage criteria are commonly used and had been selected for comparison with the echocardiographic measurements in the present study.

According to Sokolow-Lyon voltage criteria, it was found that overall the sensitivity of the ECG was 26% and specificity was 100%. The sensitivity was more in males compared to females. It was also observed that as obesity increased, the sensitivity decreased. Sensitivity was also affected by the regularity of the treatment. Sensitivity was also more among those with duration of hypertension of more than five years. The correlation coefficient of these criteria with LVM was 0.202 and with LVMI was 0.189.

Casale PN et al reported similar findings with sensitivity of 22% and specificity of 100% with Sokolow-Lyon voltage criteria [11]. Holt JH Jr et al found a sensitivity of 29% and a specificity of 100%. They also noted a correlation coefficient with LVM of 0.46 [15].

Reichek N et al found that the sensitivity was 21% but the specificity was little less of 95%. The correlation with LVM was poor [16]. Prakash O et al noted more sensitivity of 34% but a lesser specificity of 88%. Their correlation with LVMI was 0.076 [17]. Levy D et al observed an overall sensitivity of only 6.9% but the specificity was 98.8% [18].

As per Cornell voltage criteria we found that overall sensitivity was 44% and the specificity was 90%. The correlation with LVM was 0.55 and with that of LVMI was 0.45. The sensitivity was more in case of females compared to males. As the obesity increased, the sensitivity decreased. Patients having history of irregular treatment, showed a higher sensitivity than those on regular treatment. As the duration of hypertension increased, sensitivity also increased.

Similar findings were reported by various studies. Casale PN et al found a sensitivity of 42% and a specificity of 96% using Cornell voltage criteria [11]. Sobolev AV et al observed that the amplitude parameters of ECG provide the sensitivity of 58.8% and a specificity of 94.6% [19].

Pannarale G et al reported that the sensitivity and specificity of Cornell voltage criteria was 54.5% and 82% respectively [20]. Schillaci G et al observed that the sensitivity of electrocardiographic criteria of left ventricular hypertrophy varied between 9% and 33% and the specificity was generally more than or equal to 90%. The Cornell voltage criteria showed the closest association with echocardiographic left ventricular mass. (r = 0.48) [21].

Overall we observed that the Cornell voltage criteria ($RavL + SV_3$) has given better sensitivity of 44% ($p = 0.042$) compared to Sokolow-Lyon voltage criteria ($SLV = SV_1 + RV_6$) which had given the 26% sensitivity. This difference was statistically found to be significant ($p < 0.05$). Although the Sokolow-Lyon voltage criteria has shown absolute specificity of 100% compared to 90% as given by Cornell voltage criteria, but the difference was not found to be statistically significant ($p > 0.05$). Cornell voltage criteria had a better correlation with LVM and LVMI compared to Sokolow-Lyon voltage criteria. Similar findings were reported by Casale PN et al [11].

Conclusion

The Cornell voltage criteria showed better sensitivity and more correlation with echocardiographic findings than Sokolow-Lyon voltage criteria of ECG. So it can be concluded that Cornell voltage criteria of ECG improves the sensitivity of the ECG for detection of Left Ventricular Hypertrophy and it can be easily applicable in clinical practice to diagnose Left ventricular hypertrophy in case, where echocardiography is not available.

Key Messages

Where echocardiography is not available, Cornell voltage criteria should be used.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.10

FVC in Smokers in Relation to BMI: A Comparative Study with Non Smokers

L.K. Sudeer Kumar

Abstract

Introduction: Forced vital capacity (FVC) is the maximum volume of air that can be expired, when a subject tries as forcefully and rapidly as possible, after a maximal inspiration to total lung capacity. A maneuver performed similarly beginning at residual volume and inspiring as forcefully as possible is called forced inspiratory vital capacity. *Methodology:* The tests are done by selecting chronic smokers of different age group from 30-70 years from out patient, and impatient from the department of TB & chest diseases, medical college. Control groups are selected from patient who does not smoke. The instrument used was a portable small-computerized spirometer called "Compact Vitalograph". *Results:* In smokers with overweight the mean is 61.14 and the standard deviation is 22.93. When this values are tested using chi-square test, it is found that there is significant difference, according to the chi-square test the P value is less than 0.05. *Conclusion:* The effect of smoking on FVC is more affected in overweight group of subjects than the normal weight group of subjects.

Keywords: Forced Vital Capacity; Compact Vitalograph; Overweight.

Introduction

Evaluation of pulmonary function dates back to the 17th century. John Hutchinson wrote in 1846 that, Borelli is the earliest physiologist (1679) who established an experimental enquiry into the quantity of air received by a single inspiration. In 1800 Humphrey Davy used his Mercurial Air Holding Machine; and a Hydrogen dilution technique to measure his own residual volume. Then Hutchinson in 1846 devised the spirometer and described and measured vital capacity [1]. In his treatise entitled 'On the capacity of the lungs and on Respiratory Functions' he defined the functional subdivisions of lung volume. He defined the vital capacity as the greatest voluntary expiration following the deepest inspiration. He also reported the result of vital capacity measurements in more than 1700 "healthy cases". He related these values to the age, height and weight of his subjects and thus established a basis of predicting normal values. The simplicity and rapidity with which vital capacity could be measured led to an abundance of subsequent reports with tables of normal standards and formula for prediction. Reports were published by Peabody and Wentworth (1917), LundsGaard and Van Slyke (1918) Dreyer (1919), West (1920), Hewlett and Jackson (1922), Myers (1923) etc. They related vital capacity to various physical parameters like body surface area, height, body weight, chest circumferences, sitting height etc [2,3].

Forced vital capacity (FVC) is the maximum volume of air that can be expired, when a subject tries as forcefully and rapidly as possible, after a maximal inspiration to total lung capacity. A maneuver performed similarly beginning at residual volume and inspiring as forcefully as possible is called forced inspiratory vital capacity [4]. Both maneuvers are often performed in sequence to provide a continuous flow-volume loop. Both are recorded in liters, BTPS. FVC normally equals the slow vital capacity (SVC), within 5% of each other. They can differ substantially in subjects with severe airway obstruction. The FVC can be lower than the SVC in subjects who have obstructive disease if forced expiration causes bronchiolar

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Received on: September 25, 2017 **Accepted on:** October 05, 2017

collapse. The FVC can ne reduced in emphysema, because of mucus plugging and bronchiolar constriction (chronic bronchitis, chronic or acute asthma, bronchiectiasis, and cystic fibrosis), and in subjects with large airway obstruction (tumours). Decreased FVC is a common feature of restrictive diseases, resulting from increase in fibrotic tissue (pulmonary fibrosis), vascular congestion (pneumonia or pulmonary edema), space occupying lesions, neuromuscular disorders and chest deformities. Normal values — Males > -4.0L, Females > -3.0L. These values provide an indirect measure of the flow resistive properties of the lung [5,6].

Methodology

The study was conducted at department of TB &chest diseases, medical college. Tests were carried out in the laboratory and these tests were done in chronic smokers who attend in the smoker's clinic at morning hours. Here pulmonary function test are done using spirometry. The tests done are FVC, FEV1, FEF, FEV1/FVC and FEF 25-75%. These studies were done to find out the effects of smoking on lung function tests by comparing smokers with non-smokers in relation to body mass index. The tests are done by selecting chronic smokers of different age group from 30-70 years from out patient, and impatient from the department of TB & chest diseases, medical college. Control groups are selected from patient who does not smoke. The instrument used was a portable small-computerized spirometer called "Compact Vitalograph". Here mouthpiece is attached to resistant pneumatochograph, which contains parallel rows of resistant wire. Airflow through these procedures a pressure gradient across the resistant element, which is converted to electrical, signal and measured by the computer system. Results were displayed on the screen. This can be printed on an electro sensitive paper for a permanent record. The test was done in 100 subjects and another 100 as control. The subjects were chronic smokers and then they are divided into two groups as

A. Chronic smokers with normal body weight (50 numbers).
B. Chronic smokers with overweight/Obesity (50 numbers).

The control arenon smokers and also they were divided into two groups:-

A. Nonsmokers with normal weight (50 numbers).
B. Nonsmokers with overweight/Obesity (50 Numbers). The control was selected from the college campus.

Results

As per the Table 1 non-smokers with normal weight is having mean FVC of 77.11 with a standard deviation of 16.63 and non-smokers with over weight the mean is 79.12 and standard deviation is 15.26. This values are tested using chi-square test and it is found that the difference actually observed does not have significance since the p value is more than 0.05.

In smokers, the smokers with normal weight the mean is 64.12 and the standard deviation is 20.47. In smokers with overweight the mean is 61.14 and the standard deviation is 22.93. When this values are tested using chi-square test, it is found that there is significant difference, according to the chi-square test the P value is less than 0.05 and it shows that the effect of smoking on FVC is more affected in overweight group of subjects than the normal weight group of subjects.

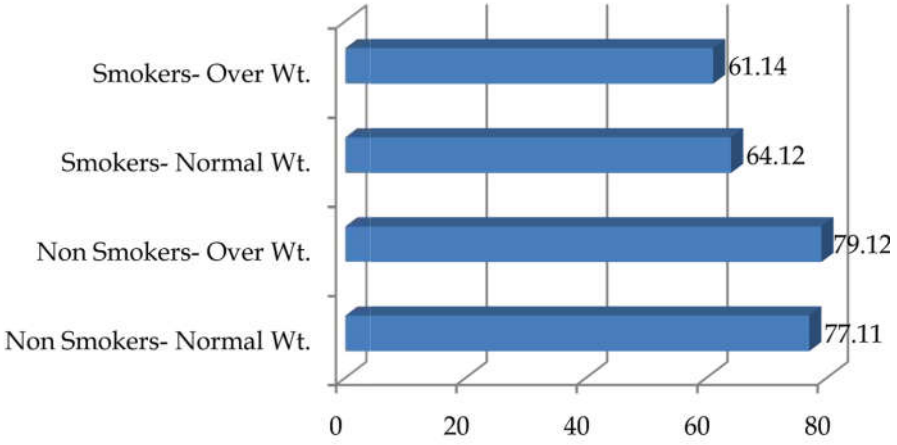

Fig. 1: Comparison of FVC

Table 1: Comparison of FVC in relation to BMI

Category	Mean	Std Deviation 1
Non Smokers- Normal Wt.	77.11	16.63
Non Smokers- Over Wt.	79.12	15.26
Smokers- Normal Wt.	64.12	20.476
Smokers- Over Wt.	61.14	22.93

Discussion

Cigarette smoking is addictive; smoking nearly always begins in adolescence for psychosocial reasons and then it becomes a regular habit. Some says that nicotine present in the cigarette conferring some advantage to the smoker's mood; but later it adversely affects every organ system of the body. Most often it will affect respiratory system first with a variety of respiratory diseases. Cigarette smoking causes increased sputum production followed by airflow limitation. If this person continues smoking it leads to decreased effort tolerance and ultimately causes chronic bronchitis and emphysema. The toxic effect is because cigarette smoke contains polycyclic aromatic hydrocarbons and nitrosamines, which are potent carcinogens and mutagens. It causes release of enzyme from macrophages, which are capable of destroying elastin, leading to lung damage. Like nicotine, obesity/over weight is another major factor, which adversely affects health by affecting each organ system of the body. The cause of obesity is nutritional abundance or sedentary life style. Obesity affects pulmonary system by reducing pulmonary compliance, rise airway resistance and reduces small airway caliber which in turn leads to increased work of breathing, increased minute volume, decreased total lung capacity, decreased functional residual capacity, and is associated with sleep apnea syndrome. Obesity is the adiposity, which can be measured by the method called body mass index (BMI) [7,8].

The normal BMI is 18.5 to 24.9. Obesity is not directly related to respiratory diseases, but it reduces pulmonary compliance and decreases the caliber of the small airways, which in turn increases the risk of respiratory diseases in smokers. The pathological changes in the respiratory system are slow and only a minor proportion of smokers show progressive deterioration, and the knowledge of natural history is insufficient to identify those individuals who are at risk. Smokers at risk can be identified only by doing pulmonary function tests (PET) [9]. Investigations and laboratory assessments are important adjuncts to confirm variable airflow obstruction. Although there is a wide range of different methods to assess the level of airflow obstruction, pulmonary function tests (spirometry) is the only test widely used, because it is the simplest, easiest and most reliable test. Pulmonary function tests are used to differentiate obstructive pulmonary diseases from restrictive pulmonary diseases, to make an objective assessment of severity of disease, and also to monitor response to treatment. Spirometry shows different types of readings; but only 5 values are taken. They are FVC, FEV1, FEF, FEV1/ FVC and FEF25- 75%. PFT changes in obesity and smoking In this spirometric study, only 5 measurements were taken and analysed, i.e.:- FVC, FEV1, FEF, FEV1/FVC and FEF 25-75%. The spirometric evaluation was done in chronic smokers with normal weight and over weight and was compared with non-smokers.

The statistical analysis of the present study showed that there was significant reduction of FVC in over weight smokers when compared to normal weight smokers. The reduction of FVC observed in over weight smokers is statistically significant.

Conclusion

Effect of smoking on FVC is more affected in overweight group of subjects than the normal weight group of subjects.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.11

A Study on Effects of TSH Suppression Therapy in Hypothyroidism

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Abstract

Background: Thyroid disease is one of the most common endocrine problems managed by general physicians in the endocrinology practice. Hypothyroidism as a clinical syndrome was recognized even later than hyperthyroidism and at first its cause was equally obscure. Common causes of Hypothyroidism are Iodine deficiency, Auto immunity like Atrophic Thyroiditis, Hashimoto's thyroiditis, Drug Induced Hypothyroidism. *Methods:* The study comprised of 40 subjects, classified into 2 groups each, with 20 subjects. Group I – 20 (Healthy individuals) controls aged between 20–45 years with euthyroid status. Group II- 20 Hypothyroid subjects with suppressed levels of TSH aged between 20 to 45 years. The parameter like T3, T4, TSH, Ca^{+2}, Po_4^{-3}, ALP, PTH and 25-OH Vit- Dmeasured. *Results:* The mean value of TSH was 2.42±1.08 in controls and 0.15±0.00 was in hypothyroid treated, the mean value of T4 was 98.45±21.92 in controls and 139.65±37.90 was in hypothyroid treated, the mean value of T3 was 1.25±0.33 in controls and1.36±0.48 was in hypothyroid treated.The mean value of mean bone mineral area in lumbar spine, femur neck and radius & ulna were 47.53±3.80, 4.47±0.35 and 4.50±0.45 respectively. The mean value of bone mineral area in lumbar spine is less compared to controls. Themean values bone mineral density of lumbar spine, femur neck, and radius & ulna were 39.47+5.07, 3.23+0.54 and 2.89+0.43 respectively. *Conclusion:* The patients on long term treatment of drugs likelevothyroxine, in spite of treating hypothyroidism there is aloss of bone mineral density although not with a higherfracture rate due to suppression of TSH levels.

Keywords: TSH; T3; T4; Hypothyroidism; Thyroid; Bone Sensity.

Introduction

The name 'thyroid' was introduced by Thomas warton in1656. It is derived from the Greek thyreos, a shield. Thehuman thyroid gland begins to develop about 4 weeks afterconception when the embryo is 3.5 to 4.0 mm long. Duringthe first 10-12 weeks foetal growth and development takes place without the need for thyroid hormones. After 12weeks small amounts of thyroid hormones are formed and from 20-22 weeks foetal TSH secretion and Thyroid hormone secretion increase steadily till the end of pregnancy. Thyroid hormones are required particularly for normal foetal bone formation and for normal development ofcentral nervous system[1].

Hypothyroidism, also called underactive thyroid or low thyroid, is a common disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormone [3]. It can cause a number of symptoms, such as poor ability to tolerate cold, a feeling of tiredness, constipation, depression, and weight gain [2]. In hyperthyroid patients giving radioactive iodine therapy can eventually develop hypothyroidism.

Spontaneous atrophic hypothyroidism, thyroid failure following orsurgical treatment of hyperthyroidism and hypothyroidism of Hashimoto's thyroiditis account for over 90% of cases inthose parts of the world which are not iodine deficient. The prevalence of primary hypothyroidism is 10/1000 butincreases to 50/1000 if patients with sub-clinical hypothyroidism. It is more common in women in the age between 20-45 years than men. The ratio of female to male is approximately 6:1.The life time prevalence for an individual is higher perhaps as high as 9% for women and 1% for men with mean age at diagnosis around 60 years.The common symptoms of hypothyroidism are tiredness, weight gain, cold intolerance, goiter, puffy eyes, dry coarseskin, muscle weakness, constipation,

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Received on: November 01, 2017 **Accepted on:** December 08, 2017

menorrhagia, psychosis, peri-orbital edema, slow relaxing reflexes, poorlibido, poor memory etc. The diagnosis is based on signsand symptoms and is confirmed by measuring serum TSH, T4 and T3 levels by RIA techniques.The increase in TSH secretion in these patients is accompanied by hypertrophy and hyperplasia of the thyrotrophs which is sufficiently intense to cause enlargement of pituitary. Measuring of serum T3 are notindicated in evaluating patients with hypothyroidism [3]. Hypothyroidism should be treated with levothyroxine, which is available as 25,50 and 100µg tablets. It starts slowly and a dose of 50 µg per day and should be given for 3 weeks, increasing thereafter to 100 µg/day for a further 3 weeks and finally to 150 µg/day [3]. After initiation oftherapy in patients with hypothyroidism. Serum TSH concentrations fall slowly as serum T4 concentration rise. The correct does of thyroxine is that which restores serum TSH to normal. Patients taking thyroxin have a low serum TSH concentration and feel better than when the concentration is normal [3].

The mechanism of action as well as the clinical effects ofthyroid hormones on bone has been of interest for morethan a century. With the appearance of new treatment modalities for thyroid function disorders, the accompanying alterations in bone metabolism appeared to be rare. In endocrinology practice it is a regularprocedure to screen out the hypothyroid patients for bonechanges by densitometry. The bone fragility is determined not only by bone quantity but bone quality as well [4]. The development of non-invasive techniques for diagnosingbone loss and the availability of second and third generation assays for TSH led to a better understanding ofthe consequences of thyroid hormone over treatment withrespect to bone loss. However the consequences of over treatment were not fully appreciated until the late 1980'swhen Ross and colleagues reported significant reductionsin radial bone mineral density in pre menopausal women receiving suppressive doses of L-thyroxine [5]. Bone density is a medical term referring to the amount of matter per cubic centimetre of bones. A scanner used to measure bone density is dual energy X-ray absorptiometry or bone densitometry. It is an enhanced form of X-raytechnology that is used to measure bone loss. DEXA ismost often performed on the lower spine and hips. DEXAis most often used to diagnose osteoporosis a condition thatoften affects women after menopause osteoporosis involvesa gradual loss of calcium, as well as structural changes causing the bones to become thinner, more fragile & morelikely to break DEXA test can also assess an individuals risk for developing fractures. The most common sites tomeasure with DEXA are the spine, the hip and the distalforearm. BMD results are calculated as the bone mineral content divided by the area of bone measured. In lumbosacral spine measurements are generally made at the L1, L2, L3 & L4 vertebra & then averaged together for atotal spine score. At the hip, measurements are made at the femoral neck, greater trochanter, intertrochanteric area and wards triangle and then averaged. Results are generally scored by two measures the T-score and the z-Score. T-score: this number shows the amount of bone we have compared with a young adult of same gender with peak bone mass.

Normal T-score isgreater than-1, Osteopenia T-score is between 1 to 2.5 and Osteoporosis T-score less than-2.5.T-score is used to estimate our risk of developing of a fracture. Z-score reflects the amount of bone we hav ecompared with other people in ourage group and of the same size and gender. The benefits of DEXA is a simple, quick & non-invasive procedure. No anaesthesia is required. The amount of radiation used is extremely small. It is the most accurate method available for the diagnosis of osteoporosis. The risks is slight chance of cancer from excessive exposure to radiation.

No complication sare expected with the DEXA procedure. DEXA test can not predict who will experience a fracture but can provide indications of relative risk. Moreover, the DEXA, have better precision and reproducibility and can do cument differences better than the older techniques [6].

The present study undertaken for foll owing objectives to assess the bone mineral content, bone mineral density and osteoporotic changes in hypothyroidism with suppressed levels of TSH by using DEXA scan and to assess themetabolic bone disease by parameters like serum T3, T4, TSH, Ca^{+2}, Po_4^{-3}, ALP, PTH and 25-OH Vit- Dmeasured.

Materials and Methods

The present study is carried out in Department of Endocrinology of Sri Venkateswara Institute of medical sciences, Tirupati. The study comprised of 40 subjects, classified into 2 groups each, with 20 subjects, Group I iscomposed with 20 healthy individuals considered as controls aged between 20–45 years and Group IIcomposed with 20 Hypothyroid subjects. The Hypothyroidism with suppressed levels of TSH isdiagnosed by

endocrinologist on the basis of clinical history, clinical examination and biochemical levels of T3, T4, TSH, BMD & metabolic bone disease work up likeCa^{+2}, Po_4^{-3}, ALP, PTH and 25-OH Vit- Dis carried out for these patients.

Data of these patients is compared with age matched controls. Results were statistically analysed by applying student 'T' test.

Results

The levels of T4 and TSH were shown significant change between controls and treated groups (Table 1).

The results of serum cholesterol, Ca^{+2}, Po_4^{-3}, ALP, PTH, 25-OH Vit- Dand DEXA results were summarised following tables (Table 2,3,4,5,6).

Table 1: Comparison of TSH, T4 and T3 levels of serumin controls and subjects

	Controls Mean ± SD	Subjects Mean ± SD	t	p
TSH	2.42 ± 1.08	0.15 ± 0.02	9.39	<0.001
T4	98.45 ± 21.92	139.65 ± 37.90	4.20	<0.001
T3	1.25 ± 0.33	1.36 ± 0.48	0.84	0.40

Table 2: Comparison of serum calcium, phosphorus, Alkaline Phosphatase and cholesterol in controls and subjects

	Controls Mean ± SD	Subjects Mean ± SD	T	p
Ca^{+2}	10.02 ± 0.38	9.92 ± 0.33	0.88	0.37
Po_4^{-3}	3.48 ± 0.56	3.51 ± 6.68	0.15	0.88
ALP	75.3 ± 14.06	89.1 ± 33.93	1.68	0.10
Total Cholesterol	165.8 ± 19.24	181.0 ± 35.6	1.70	0.09
PTH	38.5 ± 10.71	28.94 ± 21.17	1.80	0.07
Vit D_3	17.5 ± 11.46	19.24 ± 11.12	0.47	0.64

Table 3: Comparison of Bone Mineral Area of Lumbar spine,Femur neck, Radius & Ulna in controls and subjects

	Controls Mean ± SD	Subjects Mean ± SD	T	p
Lumbar spine	51.21 ± 3.56	47.53 ± 3.80	3.16	0.003
Femur neck	4.44 ± 0.56	4.47 ± 0.35	0.20	0.84
Radius & Ulna	4.50 ± 0.41	4.50 ± 0.45	0.00	1.00

Table 4: Comparison of Bone mineral content of lumbarspine, femur neck, Radius and ulna in controls and subjects

	Controls Mean ± SD	Subjects Mean ± SD	T	p
Lumbar spine	54.95 ± 6.09	39.47 ± 5.07	8.73	<0.001
Femur neck	3.93 ± 0.57	3.23 ± 0.54	3.98	0.84
Radius & Ulna	3.23 ± 0.36	2.89 ± 0.43	2.71	1.00

Table 4: Comparison of bone mineral density of lumbar spine, femur neck, Radius & Ulna in controls and subjects.

	Controls Mean ± SD	Subjects Mean ± SD	T	p
Lumbar spine	1.07 ± 0.08	0.83 ± 0.08	9.48	<0.001
Femur neck	0.89 ± 0.10	0.72 ± 0.10	5.73	<0.001
Radius & Ulna	0.72 ± 0.05	0.64 ± 0.07	4.25	<0.001

Table 6: Comparison of 'T'-Score of Lumbar spine, Femur neck and Radius & ulna from BMD of controls and subjects

	Controls Mean ± SD	Subjects Mean ± SD	T	p
Lumbar spine	0.25 ± 0.71	-1.98 ± 0.73	9.73	<0.001
Femur neck	0.37 ± 0.91	-1.19 ± 0.94	5.33	<0.001
Radius & Ulna	0.72 ± 0.86	-0.73 ± 1.28	3.68	<0.001

Discussion

The present study is to find out the effect of TSH suppression therapy on TSH, T4 and T3 levels in hypothyroidism. Hypothyroidism is diagnosed on the basis of serum TSH, T4 andT3 levels. Serum TSH, T4,T3 levels are compared between controls and subjects. Only TSH & T4 are found to be significant, but not T3 in this study. The negative feedback effect of thyroid hormones on TSH secretion may be exerted in partat the hypothalamic level, but it must be mainly on the pituitary, since T4 and T3 block the increase in TSHsecretion produced by TRH. Infusion of T3 as well as T4 reduces TSH, and there is a measurable decline in the level of TSH within 1 hour. Similar results are found by Leese G.P. et al [7]. TSH levels are less than 0.15 suggestingTSH suppression therapy.

The serum Cholesterol levels are compared between controls and hypothyroid subjects. The serum Cholesterol levels are higher in hypothyroid subjects but not significant statistically because the subjects are under treatment. Thyroid hormones lower circulating cholesterol levels. The decrease in plasma cholesterol concentration is due to increased formation of LDL receptors in the liver, resultingin increased hepatic removal of cholesterol from the circulation. In hypothyroidism there is a decreased formation of LDL receptors, resulting in increased plasma cholesterol concentration [8]. Bone changes reflect on serum calcium, phosphorus and alkaline phosphatase levels and these chemical changes regulate the secretion of PTH & 25-OH Vit Dby feedback mechanism. These hormones act on the bone andcause osteogenesis & osteoporosis. So in this study serumcalcium level is decreased in hypothyroid subjects. SerumALP and phosphorus levels are high in hypothyroid subjects though these are not significant statistically. The serum PTH is decreased & 25-OH Vit-D is increased in hypothyroid subjects when compared to controls. Thenvalues are not significant statistically. The similar results are found by Stall GM et al [9].

The major effect of PTH is to maintain normal ionized serum calcium concentration. PTH stimulates the bonereabsorption releasing calcium into ECF. When PTH is increased more calcium is reabsorbed in distal nephron whereas when PTH is decreased less calcium is reabsorbedand urinary calcium excretion rises. The reabsorption of phosphate which occurs in proximal tubule is controlled by PTH. PTH decreases proximal tubular reabsorption ofphosphate so that increased urinary excretion of phosphateoccurs. Sustained elevation in PTH thus results in hypophosphatemia in addition to hypocalcemia[10]. 25-OHincreases intestinal phosphorus absorption by increasing the active transport of phosphorus. So, in this study, the PTH decreases the serum calcium along withincrease in serum phosphorus of hypothyroid subjects. 25OH3, Vit-D also increases serum phosphorus. The serumALP is the commonly used bone formation marker becausethere is a relationship between increases in serum ALP andincreases in osteoblastic activity. 25-OH3Vit-D increasesALP enzyme activity in osteoblast like cells. Mineral and hormonal changes described above may cause bonechanges. Almost all hypothyroid patients of this studycomplain of knee joint pain and backache. This initiatesfurther investigation of bone changes. Bone mineral area of lumbar spine, femur neck, radius & ulna are compared between controls and subjects. The Bone mineral area of lumber spine is less compared tocontrols & it is significant statistically. The change is notmuch found in femur neck and radius & ulna, and is notsignificant statistically. Bone mineral content & Bonemineral density of lumbar spine, femur neck, radius & ulnaare compared between controls and subjects. The BMC & BMD of all these areas are less compared to controls is significant statistically. The similar results were found by Sijanovic S. et al [11]. The decrease in bone turnover in hypothyroidism explains the reduced responsiveness of bone to PTH, 25-OH, Vit-D and to calcitonin in affected patients. So, in this study the BMC & BMD decreases inhypothyroid subjects which are on treatment for above 2yrs. The T4 & T3 supplementation with TSH suppression has nodirect effect on bone metabolism. Administration of T4 in myxedema patients causes a marked diuresis with loss of calcium that may cause of hypocalcemia. In hypothyroid patients there is a positive balance of phosphate this is dueto metabolism of creatinine phosphate in muscle. Hyperthyroidism may produce vitamin D deficiency.Thyroid hormones stimulate metabolic process increases the demand of coefficient enzymes and vitamins. So inhyperthyroidism demand is greater than synthesis, Vit – Ddeficiency occurs where as in hypothyroidism there is anincrease in Vit-D. The 25-OH, Vit-Dalso increases theintestinal absorption of phosphorus. The PTH decreases in this study. This may be due to theeffect of decreased T4 action on secreting cells ofparathyroid gland. The cell membranes of both the osteoblasts and the osteocytes have receptor proteins forbinding PTH. PTH increases the calcium permeability ofthe bone fluid. Side of the osteocytic membrane, thusallowing calcium ions to diffuse into the membrane cellsfrom the bone fluid. On the other side of the membrane the calcium ions

transfer in the ECF [12]. Inhypoparathyroidism, osteoblastic activity decreases leads toosteoporosis. In osteoporosis the mineral and mass ratio isconstant, bone mass decreases. In this condition there is adecrease in bone formation or increase in bonereabsorption. T-score of lumbar spine, femur neck, radius & ulna are compared between controls and subjects. The T-Score ofall these areas are less compared to controls & is significantstatistically. The BMD decreases so the T-Score alsodecreases because the T-score is dependent on the subjects BMD when compared to that of healthy 30 yr old of same sex and ethnicity. Stall GM, et al [9] studied accelerated boneloss in hypothyroid patients over treated with L-Thyroxine of 361 women enrolled in a 2 year calcium supplementtrial, 18 received thyroxin for hypothyroidism. Of these, 10were considered overtreated, because they had low TSH levels. Rates of loss of bone mineral density from theradius, spine, and hip during 1.9+/-0.6 years were measuredby single & dual – Photon absorptiometry. Theyconcluded that thyroxine treated women with low TSH levels lose bone mineral from the spine more rapidly thando women without known thyroid disease. These patientsare therefore at increased risk for osteoporosis. Theabsence of detectable biochemical changes in women withlow TSH levels may result from their relatively modest degree of over treatment [9].

Ribot, C. et al, studied Bone mineral density and thyroidhormone therapy. The results suggested that in the case of primaryhypothyroidism even appropriate thyroid replacementtherapy could lead during the first year of treatment to asignificant reduction in vertebral & femoral BMD. However, the fact that an increased fracture rate has notbeen documented in long term treated patients, and the results of their cross-sectional study, suggested that this bone mass reduction could be transient and reversible dueto new bone formation at the end of the resorptive sequence [13]. Ongphiphadhanakul B, et al, studied effect of TSHsuppressive doses of levothyroxine on bone mineral densityin Thai women. In this study stated that TSH suppressive doses of thyroid hormone should only beprescribed when appropriate and no longer than necessaryto minimize this adverse effect of excessive doses of thyroid hormone on bone [14].

Salerno et al studied the effect of long term L-thyroxinetreatment on bone mineral density in young adults withcongenital hypothyroidism. They concluded that the careful monitoring of serumthyroid – stimulating hormone and adjustment of 1 thyroxinedosage avoided the significant deleterious effects of prolonged 1-thyroxine replacement therapy on bonetissue in adolescents and young adults with congenital hypothyroidism treated from the neonatal period[15]. Stepan JJ & Limanova Z studied biochemical assessment of bone loss in patients on long term thyroid hormone treatment. To test conditions under which thyroid hormone might be deleterious to bone, they studied a group of 58patients who had undergone thyroidectomy because ofthyroid cancer 1 to 21 years previously and were treatedwith steady doses of exogenous thyroid hormone. Vertebral bone density (BMD Z – score) was significantly reduced and biochemical indices of bone resorption and of osteoblastic activity as well as the calculated prevalence of boneresorption relative to osteoblastic activity (HBP) were significantly increased in thyroid hormone treated post menopausal women but not in men and pre menopausal women. The HBP as well as the biochemical indices of bone remodeling were significantly negatively correlated with serum TSH levels. In treated patients, BMD Z-scorewas significantly dependent on the HBP, menopausal state, duration of treatment and serum TSH levels. Theyconcluded that the further increase in bone resorption bythyroid hormone is predisposed by menopausal changes inbone turn over. The simultaneous evaluation ofbiochemical indices of bone resorption and formation improves the assessment of bone loss in patients treated with thyroid hormone in a suppressive dose [16]. The patients on long term treatment of drugs likelevothyroxine, inspite of treating hypothyroidism there is aloss of bone mineral density although not with a higher fracture rate due to suppression of TSH levels.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.12

Study of Intraocular Pressure (IOP) Changes in Relation Blood Pressure

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Abstract

Background: IOP is one of the vital factors whose maintenance within normal limit is essential for serve its normal function. IOP is influenced by various factors like smoking, alcohol, hypertension, sex hormones, pregnancy, medications etc. This study is undertaken to find out the effect of hypertension on IOP changes. *Methodology*: A total number of 200 people with age group of 40 to 60 were included in the study. They were divided into two groups of each 100 normotensive and hypertensive. IOP was recorded in all individuals and was compared between two groups by using student t test. A P- value of <0.05 was taken as a statistically significant. *Results*: Our study showed that there was a significant increase in IOP in hypertensive patients compared to normotensive patients. *Conclusion*: There is a positive correlation between IOP changes in relation to blood pressure. So it needs to undergo regular eye check up for those patients with hypertension for early detection of glaucoma which is second leading cause of blindness.

Keywords: IOP; Blood Pressure.

Introduction

Intraocular pressure (IOP) is one of the vital factors, whose maintenance within normal limits is essential for the eye to serve its function [1]. The average normal IOP is about 15mm Hg (12 to 20 mm Hg) [2].

IOP is influenced by various factors like exercises, fluid intake, medications alcohol, smoking, hypertension, sex hormones and pregnancy [3]. Elevated IOP causes a mechanical stress situation leading to damage of neurons in retina and their axons resulting in progressive loss of visual field and blindness [4].

Changes in IOP are directly and significantly associated with changes in systemic blood pressure with the age. Increase in IOP leads to glaucoma. Glaucoma is second only to cataract as leading cause of blindness [5].

Population based study have revealed prevalence of glaucoma in India to be 11.9 million and 60.5 million in the world by the year 2010out of which approximately half are undiagnosed [6,7]. The people with hypertension have more chance to develop glaucoma than with normotensive patients. So control of IOP within the normal range is necessary.

There are lot of causes for glaucomatous optic nerve damage among them raised IOP is one risk factor that can be modified by medical and surgical intervention [8-12]. So if ocular hypertension detected early and treated in time, its progression to irreversible blindness can be prevented.

This study is under taken to find out relationship between IOP changes and blood pressure.

Aims and Objectives

Study the correlation between systemic blood pressure and intra ocular pressure.

Material and Methods

our study included total 200 patients with age group of between 40 to 60 years. They were divided into two groups of each 100 normotensive and hypertensive. Recent classification for blood pressure

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Received on: June 26, 2017 **Accepted on:** July 07, 2017

is as follows, normotensive – systolic blood pressure <120mmHg and diastolic <80mmHg, prehypertensive – systolic blood pressure 120-139mmHg and diastolic 80 – 89mmHg, hypertensive – systolic blood pressure > 140mmHg and diastolic blood pressure >90mmHg. Patients with history of ocular trauma, ocular surgeries, refractive errors, medical and surgical illness, smoking, diabetes, family history of glaucoma and on medications like beta blockers, diuretics and hormonal replacement therapy were excluded from the study.

IOP is measured in each eye using GoldmannApplanation tonometer, average of three reading taken.All the recordings were taken in the morning hours between 10.30 AM to 12.20 PM to maintain constancy of testing and to prevent anydiurnal variations in IOP. Blood pressure is measured in right arm supine position by using manual sphygmomanometer, average of three reading were taken. Analysis was done using the SPSS software package. Results on continuous measurements are presented as Mean±SD and results on categoricalmeasurements are presented as %. Significance was assessed at 5% level of significance. Student t test (two tailed, independent) was used to find the significance of study parameters between two groups.

Results

Among total number of 100 normotensive patients 42 males and 58 females, and in 100 hypertensive patients 48 males 52 female (Table 1). The mean systolic blood pressure (SBP) 116.85±.8mmHg and diastolic blood pressure (DBP) 72.25±.0mmHg in normotensive group and mean systolic blood pressure 1487±.6mmHg and diastolic blood pressure 88.17±.2mmHg in hypertensive group (Table 2).

The mean IOP in normotensive group was 13.212±.41mmHg and in hypertensive group was 17.722±.68mmHg. The mean IOP was found to increase with increase in blood pressure this difference was statistically significant (p<0.001).

Table 1:

	Males	Females	Total
Normotensive	42	58	100
Hypertensive	48	52	100

Table 2:

Variables	Normotensive Mean ± SD#	Hypertensive Mean± SD	P value
Age (years)	48.682±.54	49.422±.15	0.14
Weight (kg)	57.007±.42	55.707±.40	0.221
SBP (mmHg)	116.85±.8mmHg	1487±.6mmHg	<0.001
DBP (mmHg)	72.25±.0mmHg	88.17±.2mmHg	<0.001
IOP (mmHg)	13.212±.41mmHg	17.722±.68mm Hg.	<0.001

- standard deviation (SD)

Discussion

The IOP is widely regarded as the most important modifiable risk factor which is associated with the development of glaucomatous optic neuropathy [8-12]. So the factors that influence the IOP and its measurement are of great relevance in understaning pathogenesis of disease.

Our study showed there is positive correlation between increased in IOP in relation increase in systolic and diastolic blood pressure. The Beaver Dam Eye Study showed there is positive relation between raise in IOP in relation to rise in systolic and diastolic blood pressure [13]. Other study which shows similar positive correlation between IOP systemic blood pressure are Leske MC et al The long island glaucoma case control study showed that association between IOP and systemic blood pressure [14]. Foster PJ et al The Tajongpagar study concluded that IOP estimates are related to systemic blood preesure and corneal thickness [15]. Seddon JM et al Retrospective case control study showed that ocular hypertensive patients have history of systemic hypertension more frequently than ocular normotenive patients [16]. Mcloed SD et al this study indicates that changes in

intraocular pressure over time are associated with changes in systolic blood pressure and that intraocular pressure does not necessarily increase with age [17]. Hennnis A et al Population based cohort study showed that increased risk of elevated IOP in populations with high prevalences of diabetes and hypertension [18].

The role of hypertension in development and progression of glaucoma and pathophysiological basis for relationship between blood pressure and IOP remains not known. It has been proposed that positive correlation between blood pressure and IOP is related to increased blood pressure leading to increased aqueous humour ultrafiltration by means of increased ciliary arterial pressure, and thus an increase in IOP [19,20]. Role of common physiological factor such as age related increase in sympathetic tone also have been proposed conversely.

Conclusion

There is a positive correlation between IOP changes in relation to blood pressure. IOP is the only modifiable risk factorthat can be used to prevent progressiveglacomatous optic neuropathy. So it needs to undergo regular eye check up for those patients with hypertension for early detection of glaucoma which is second leading cause of blindness.

Acknowledgement

My sincere thanks to all the patients who participated in this study and professor and HOD Department of physiology and professor and HOD Department of ophthalmology, Bidar Institute of Medical Sciences, Bidar, Karnataka.

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STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS
"International Physiology" (See Rule 8)

1. Place of Publication	:	Delhi
2. Periodicity of Publication	:	Quarterly
3. Printer's Name	:	**Asharfi Lal**
Nationality	:	Indian
Address	:	3/258-259, Trilok Puri, Delhi-91
4. Publisher's Name	:	**Asharfi Lal**
Nationality	:	Indian
Address	:	3/258-259, Trilok Puri, Delhi-91
5. Editor's Name	:	**Asharfi Lal**
Nationality	:	Indian
Address	:	3/258-259, Trilok Puri, Delhi-91
6. Name & Address of Individuals	:	**Asharfi Lal**
who own the newspaper and particulars of shareholders holding more than one per cent of the total capital	:	3/258-259, Trilok Puri, Delhi-91

I Asharfi Lal, hereby declare that the particulars given above are true to the best of my knowledge and belief.

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(Asharfi Lal)

Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.13

Comparative Study of Visual and Auditory Reaction Time on the Basis of Gender in First Year Medical Students

Kiran Buge[a], Sunita Nighute[b], Shiva Kumar[a]

Abstract

Introduction: RT (Reaction time) **is** defined as the interval of time between the presentation of the stimulus and appearance of appropriate voluntary response in the subject. Human RT works through nervous system that recognizes the stimulus. Neurons relay this impulse to brain which travels to spinal cord and reaches person's hand and fingers. RT in response to a situation can significantly influence our life due to its practical implications. Fast RTs can give rewards (e.g. in sports), whereas slow RT can lead to grave consequences (e.g. driving and road safety matters). Factors that can affect the human RT include age, gender, left or right hand, central versus peripheral vision, practice, fatigue, fasting, exercise etc. Hence present study was conducted, which was aimed to compare VRT (visual reaction time) and ART (auditory reaction time) on the basis of gender in first year medical student. *Material and Methods*: Study was conducted in 120 medical students (60 male 60 female). Visual Reaction time and auditory reaction time were recorded by using Reaction time apparatus Anand Agencies Pune. It works on 230 volts AC. The instrument is specially designed to measure reaction time in seconds. It has Inbuilt digital chronoscope present on examiners side which measures the reaction time in seconds. Data was analyzed by unpaired "t" test. We found both ART and VRT in male were statistically significant than in female ($p<0.05$). *Conclusion:* Thus our study showed Males have shorter reaction time than females. Males react faster than females in response to changes in external environment.

Keywords: Auditory Reaction Time; Male; Female; Reaction Time; Visual Reaction Time.

Introduction

The ability of animal to cope up with environmental changes for their survival and existence depends upon the responses given by animal. Quickness of response depends on the integrity of cell communication, sensory perception, central processing and motor response.

Reaction time (RT) is a measure of quickness with which an organism responds to some sort of stimulus. RT is defined as the interval of time between the presentation of stimulus and appearance of appropriate voluntary response in the subject [1,2]. Human RT works through nervous system that recognizes the stimulus. Neurons relay this impulse to brain which travels to spinal cord and reaches person's hand and fingers. The motor neurons then tell the hands and fingers how to react. Reaction time is an indirect index of processing of central nervous system and also a simple means of determining sensory and motor performance [3].

RT in response to a situation can significantly influence our life due to its practical implications. Fast RT can yield rewards (e.g. in sports) whereas slow RT can lead to grave consequences (e.g. driving and road safety matters). Factors that can affect the average human RT include age, sex, left or right hand, central versus peripheral vision, practice, fatigue, fasting, breathing cycle, personality types, exercise, and intelligence of subject [4-7]. So we have chosen factor gender for this study.

There are three basic types of reaction time experiments [8]

1. Simple reaction time experiments: involve presenting a uniform stimulus and requiring a uniform response. Thus in simple reaction time

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Received on: April 06, 2017 **Accepted on:** May 09, 2017

tasks only one stimulus is presented which commands a single response. (e.g. spot the dot and react to sound; both measure simple reaction time).

2. Choice reaction time (Disjunctive reaction time) experiments: involve presentation of multiple stimuli each calling for a specific response. Thus in choice reaction time tasks several (minimum two) stimuli are presented and the subject is required to respond correspondingly (e.g. pressing a key in response to the appearance of a particular light on a screen). In choice reaction time tasks, subject has to discriminate between various stimuli and make a choice amongst responses which require differentiation.
3. Associative reaction time experiments: involve responding in the form of verbal association to a stimulus which can be either verbal or pictorial. Many believe that overall males have a quicker reaction time than females. The present study was undertaken to confirm whether or not this claim is true.

Thus, this study was conducted to scientifically contribute to the field of RT.

Aims and Objectives

To compare visual and auditory reaction time on the basis of gender in first year medical students

Materials and Methods

After obtaining approval from research and ethical committee, DVVPF's medical college a total 120 first year medical students of 2016 batch were selected and written informed consent was taken from all the participants. They were categorized into two groups; first group consisted of 60 first year MBBS male students and Second group comprised of 60 first year MBBS female students. The study was conducted in the research lab, Department of Physiology, vikhe patil Medical College, between 3.00pm and 5.00pm .

Inclusion Criteria

120 healthy medical students in age group of 17-24 yrs both male and females.

Exclusion Criteria

1. History of smoking, alcoholism.
2. Those having any history of hearing and visual disorders.
3. History of any medications affecting cognitive performance was excluded from the study.
4. Those having any major illness in the present or past,

Visual Reaction time and auditory reaction time were recorded by using audiovisual Reaction time apparatus designed by Anand agencies Pune. It works on 230 volts AC. The instrument is specially designed to measure reaction time in seconds. It has Inbuilt digital chronoscope present on examiners side which measures the reaction time in seconds [9].

All the subjects were thoroughly acquainted with the apparatus. All tests were done in quite room at room temperature of 26-32 degree Celsius

Auditory Reaction Time

The auditory stimulus was provided in the form of high (beep tone) frequency sound. After connecting the instrument to mains, subject was asked to sit on chair in front of the instrument. He/she was asked to press the response switch using the thumb as soon as, he/she hears the tone. Like wise 3 readings were taken and average of these three readings was taken as the subject's best reading.

Visual Reaction Time

The visual stimulus was provided in the form of green and red color light. Both visual stimuli were given separately. Subject was asked to press response switch as soon as the red or green color light blinks. 3 readings were taken and average of these 3 readings was taken as the subject's best reading.

The data was statistically analyzed by using student unpaired 't' test.

Results

Graph I Comparison of ART and VRT in between male and female.

Table 1 show that visual reaction time for green color light in males (0.189±0.036) was significantly faster than in females (0.207±0.032).

Table 2 show that visual reaction time for red color light in males (0.177±0.037) was significantly faster than in females (0.195±0.028).

Table 3 show that auditory reaction time in males (0.192±0.047) was significantly faster than females (0.210±0.031).

Table 1: Comparison of visual reaction (green color light) time in seconds between male and female

Gender	N	Mean ± SD	'p' value
Male	60	0.189 ± 0.036	
Female	60	0.207 ± 0.032	0.004*

* p<0.05 statistically significant ** p<0.001 statistically highly significant

Table 2: Comparison of visual reaction (red color light) time in seconds between male and female

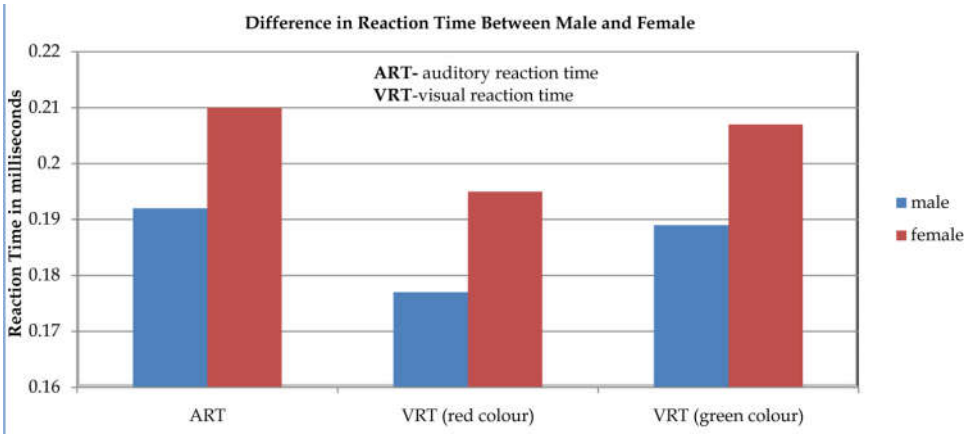
Sex	N	Mean ± SD	'p' value
Male	60	0.177 ± 0.037	0.0032*
Female	60	0.195 ± 0.028	

* p<0.05 statistically significant ** p<0.001 statistically highly significant

Table 3: Comparison of auditory reaction time in seconds between male and female

Sex	N	Mean ± SD	'p' value
Male	60	0.192 ± 0.047	0.0147*
Female	60	0.210 ± 0.031	

* p<0.05 statistically significant ** p<0.001 statistically highly significant



Graph 1: Showing faster VRT and ART in males as compared to in females

Discussion

The present study was aimed to compare visual reaction time (VRT) and auditory reaction time (ART) in 1 st year MBBS medical students on the basis of gender.

We compared visual reaction time (red and green color light) and auditory reaction time in 60 male and 60 female medical students. We have chosen red and green color as maximum number of cones present in retina is activated for red color, followed by blue and least response was for green color [10]. In the present study we found that both VRT and ART in male were statistically significant than in female. Table 1, Table 2 and Graph 1 shows visual reaction time for green and red color light in male is faster than in female ($p<0.05$) . Table 3 and Graph 1 shows auditory reaction time in males is faster than in females ($p<0.05$).

Reaction time is dependant on several factors like arrival of stimulus at the sensory organ to neural signal, neural transmission, processing and muscular activation. Research done by Misra et.al showed that both reaction time (ART and VRT) of hands and feet were faster in males than in females [11]. Another study done by Narhare P et al showed that males responded faster than females for choice reaction time [12].

Research done by Dane S et al showed that VRT in male handball players was faster than in female hand ball players [13]. Study done by Pawlak Jason with the help of javascript software also showed that

males have faster reaction time than females [14]. Another study done by David Lipps et al in sprinters also found reaction time was faster in male than in female [15]. Few other studies also had similar findings [16,17,18].

Probable Mechanism Include [12,19]

1. Time lag between the presentation of stimulus and the beginning of motor response to stimulus is faster in male as compared to female.
2. It takes same time for both visual and auditory stimuli to reach the cortex but, the time taken for the corresponding motor response and muscle contraction might differ.
3. Males have more muscle fibres than females which allows them to perform physical actions more quickly than females.

Conclusion

Thus our study showed males have faster reaction time than females. Males react faster than females to changes in the external environment.

Abbreviation

RT- Reaction Time

ART- Auditory Reaction Time

VRT- Visual Reaction Time

Acknowledgement

Authors are thankful to the first MBBS students involved in the study. Author would like to acknowledge Dr. Aarti Buge for her kind guidance in writing the article.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.14

A Hospital Based Case-Control Study on Risk Factors of Breast Cancer among Patients of Coastal Karnataka

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Abstract

Background: Cancer is the third leading non communicable health issue after diabetes and hypertension worldwide. Breast cancer is the commonest cancer among women with a highly variable incidence between countries and regions. The present study aimed at studying the risk factors among breast cancer patients. *Materials & Methods:* 100 participants including 50 cases of breast cancer and 50 controls aged 25-70 years were included in the study considering the various inclusion and exclusion criteria. Association of various risk factors (general and reproductive variables) with breast cancer was studied. *Results:* Literacy level, social status, blood group, sedentary lifestyle, age at menarche and menopause were all significantly associated with breast cancer. ($p<0.05$). *Conclusion:* We conclude that low literacy, low socioeconomic status, O+ve blood group and early onset of menarche and late menopause were significantly associated with breast cancer.

Keywords: Blood Group; Breast Cancer; Menarche; Risk Factors.

Introduction

Cancer is the third leading non communicable health issue after diabetes and hypertension worldwide. Breast cancer is the commonest cancer among women with a highly variable incidence between countries and regions. Nearly a million cases are diagnosed every year worldwide [1]. American cancer society predicted an approximate 232,340 to be newly diagnosed with invasive breast cancer and 39,620 women to die from breast cancer in 2013. In India, an estimated 1,44,937 women were newly detected with breast cancer according to International Agency for Research in Cancer (WHO) in 2012 with 50% mortality[2].

Though it was thought to be more common in developed countries, the number is steadily rising in the developing country as well. As against the lifetime risk, age specific risk of occurrence of breast cancer is found to be low. Carcinoma of the breast below the age of 20 years among females is almost unheard of. There is a steady rise thereafter. At 30 years, incidence rises to 1:622 females and at 60 years, it becomes 1:24 females [3].

Breast cancer incidence is found to peak after the age of 40 years in India as compared to 50 years elsewhere [4]. Breast cancer records have been maintained by various registries of national cancer registry project in India and it has been observed that the there is an increasing trend in the incidence of breast cancer. Also, India is fast becoming the largest contributor of breast cancer deaths [5].

The primary risk factors for breast cancer are female gender and older age [6]. With rising incidence and awareness, breast cancer is found to be commonest cancer among urban Indian females and the second most common in rural India. Other potential risk factors include: genetics, lack or delayed childbearing or lack of breastfeeding, higher levels of certain hormones, certain dietary patterns and obesity [7-11].

The multifactorial risk factors are majorly dependent on the age of the woman [12]. Depending on the age of presentation, breast cancer can be grouped as reproductive-age (occurring at <40 years of age), peri menopausal – age (occurring between 40 to 55 years) and post menopausal (occurring at >55 years of age) [12]. This is mainly because the timing of reproductive events affects the hormonal and

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Received on: May 02, 2017 **Accepted on:** May 16, 2017

immunological status as well as the stage of breast tissue differentiation thus influencing the breast cancer risk [13].

India is a sub continent with huge diversity in culture, behavioural patterns, customs and practices, diet and lifestyle. Hence the information related to these factors which can potentially be a contributor for the occurrence of breast cancer is still limited. There is a need for mining more information on these factors which will give us an edge for the better understanding of science of breast cancer.

Increasing awareness and screening for the potential risk factors is the need of the hour. Since there are only few such studies done in coastal Karnataka, there is a need to study the association of various risk parameters on the occurrence of the disease.

Materials and Methods

100 participants aged 25-70 years were included in the study. 50 patients had breast cancer and 50 were healthy age matched volunteers. 50 cases of breast cancer between the age groups of 25 to 70 years were taken as cases and ±2 years age and gender matched 50 healthy volunteers who accompanied other patients to the hospital were considered as controls. All volunteers who were pregnant, with gynaecological problems and cases of male breast cancer formed the exclusion criteria for this study. Hundred cases and controls were recruited for this study to detect a minimum difference of 20% association of various risk factors with breast cancer with an alpha of 0.05 and power of 80%. Written informed consent was obtained from all the volunteers and ethical clearance for the study was also obtained from the Institutional Ethics Committee.

Study participants' age, anthropometric measurements and Body Mass Index (BMI) using Quetlet's formula were recorded. Socioeconomic status was ascertained by determining if the study participants were above or below poverty line. A pretested and duly validated questionnaire consisting of sets of questions pertaining to education level, employment status and income was administered to the study group and in accordance to Kuppuswamy classification all the participants were categorized as upper lower class, upper middle class and lower middle class. Information regarding the highest level of education was collected from all the study participants and they were categorized as uneducated, 1^{st} – 7^{th} std, 8^{th} – 12^{th} std and >12^{th} std. Status of employment was also noted for all the study participants. Blood sample of all participants were collected under aseptic precautions and blood group (ABO system and Rh system) was determined using standard agglutination method. Information regarding the type of diet (vegetarian diet/ mixed diet) consumed was recorded from all the study participants. Consumption of any form of tobacco or alcohol was also recorded.

A detailed history including past medical/ surgical history, personal history, drug history and family history were taken. Also, general physical examination, vital signs, and complete systemic examinations were done on all participants. A detailed history of reproductive variables such as age at menarche, age at marriage, age at first child birth, number of children, abortion history, use of oral contraceptive pills, age of menopause if attained, were taken and study samples were grouped appropriately for each of these reproductive variables.

Responses of socio-economic status, diet, physical activity, literacy and employment, use of tobacco and various reproductive variables were analyzed among the participants statistically. Age, BMI and blood group parameters among the study group were analyzed by using the statistical software SPSS version 21.0 and MS Excel 2007. Chi square test to compare the frequencies and unpaired t test to check the significance was used. All tests were two-tailed and $p < 0.05$ was considered as significant.

Results

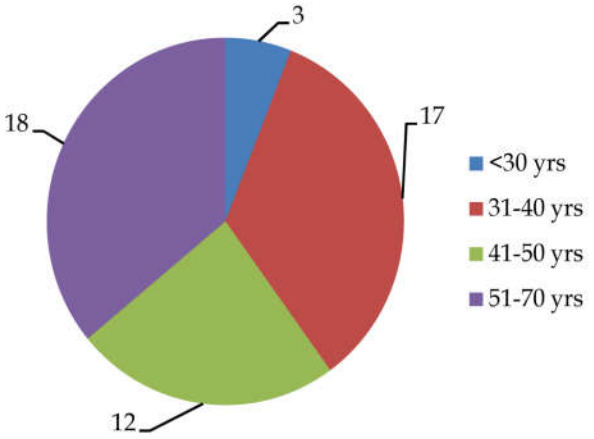

Fig. 1: Age wise distribution of breast cancer cases (n=50)

Table 1: Comparison of different general variables among cases and controls (n=100)

General Variables	Groups	Cases		Controls		p value
		N	%	N	%	
Level of education	Uneducated	11	22	3	6	0.01*
	1st to 7th std	22	44	15	30	
	8th to 12th std	13	26	21	42	
	>12th std	4	8	11	22	
Social status	Upper lower class	14	28	13	26	0.01*
	Upper middle class	7	14	22	44	
	Lower middle class	29	58	15	30	
Occupational status	Unemployed	38	76	12	24	0.49
	Employed	35	70	15	30	
Blood group	A+	12	24	13	26	0.03*
	B+	14	28	16	32	
	AB+	04	08	04	08	
	O+	20	40	08	16	
	A-	0	0	03	06	
	B-	0	0	0	0	
	AB-	0	0	01	02	
	O-	0	0	05	10	
BMI	Normal (18-24.9)	34	68	27	54	0.31
	Overweight (25-29.9)	13	26	20	40	
	Obese (>30)	03	06	03	06	
Physical activity	Sedentary	38	76	25	50	0.02*
	Non sedentary	12	24	25	50	
Tobacco use	Absent	41	82	50	100	0.00**
	present	09	18	0	0	

*p<0.05 is considered to be significant, **p<0.00 is considered to be highly significant

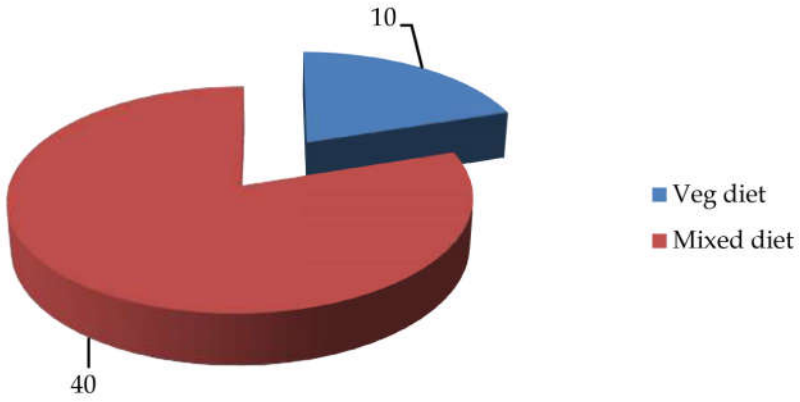

Fig. 2: Type of diet among the breast cancer cases (n=50)

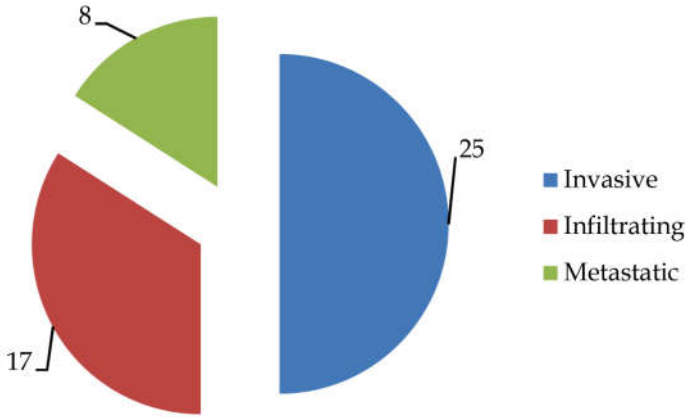

Fig. 3: Distribution of type of breast cancer among cases (n=50)

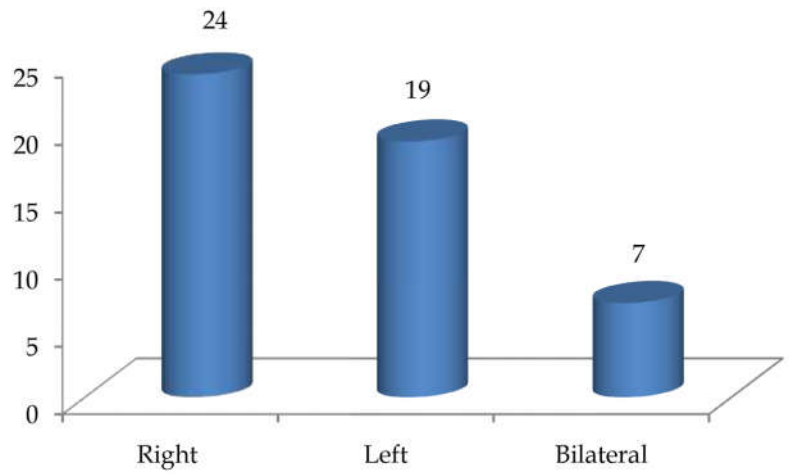

Figure 4: Side of breast involvement among cases (n=50)

Table 2: Comparison of various reproductive variables among cases and control (n=100)

Reproductive Variables	Groups	Cases		Controls		p value
		N	%	N	%	
Age at menarche	≤ 13 yrs	29	58	18	36	0.03*
	>13 yrs	21	42	32	64	
Menstrual cycle	Regular	41	82	40	80	0.79
	Irregular	9	18	10	20	
Age at marriage	Unmarried	3	6	0	0	0.13
	≤ 30 yrs	47	94	49	98	
	>30 yrs	0	0	1	2	
Age at first child	No child	5	10	2	4	0.47
	≤20 yrs	22	44	23	46	
	21 – 30 yrs	22	44	25	50	
	>30 yrs	1	2	0	0	
Breast feeding	Not done	9	18	4	8	0.14
	Done	41	82	46	92	
Parity	Nulliparous	5	10	2	4	0.45
	≤2 children	21	42	20	40	
	>2 children	24	48	28	56	
Use of OCP s	No	49	98	41	82	0.00**
	Yes	1	2	9	18	
Menopause	Not reached	21	42	27	54	0.01*
	<45 yrs	10	20	16	32	
	>45 yrs	19	38	7	14	

*p<0.05 is considered to be significant, **p<0.00 is considered to be highly significant

Discussion

The present study was aimed to find out the association of various general variables and reproductive variables as risk factors contributing to the precipitation of breast cancer. In the present study, majority of the cases (36%) were distributed in the age group of 31–40 years followed by 34% of the cases occurring in the age group of 51-70 years (Figure 1). Number of cases in the age group of <30 years were the least, contributing to only 6% of the total cases. An American database confirms that 7% of the total breast cancer is detected before the age of 40 years. It also emphasizes the fact that survival rates are lower among younger age group and young age is an independent predictor of adverse outcome [14].

When a comparison of level of education was done among cases and control (Table 1), it was found that the number of cases were significantly higher among lesser educated as compared to higher educated. Studies indicate that higher literacy has helped improve the knowledge and awareness amongst the masses about the cancer, our study showed a significantly higher incidence among lesser educated.

When socioeconomic status was compared between the cases and control, the number of cases was significantly high (58%) among lower middle class group of people. 86% of the cases were from upper lower class and lower middle class group of people. The need for spreading awareness is indeed very high among the lower rung of socioeconomic ladder of people.

There was no significant difference observed among the employed and unemployed group of people (Table 1). However, there was a significant increase in number of cases among the people with sedentary lifestyle as compared to people who were more physically active (Table 1). Sedentary lifestyle certainly plays an important role in development of non communicable disease like cancer. Earlier studies have however shown a positive association between body mass index and breast cancer in postmenopausal women and a large population based study concluded that obesity, high calorie intake and sedentary lifestyle all contribute to breast cancer in premenopausal women [15]. Adipose tissue is an extragonadal source of estrogen and increased exposure of estrogen to breast tissue may trigger the initiation and promotion of breast cancer [16]. It also increases the levels of insulin and insulin like growth factors which are a risk factor for breast cancer [17].

A significantly higher number of cases was seen among people with O+ blood group (40%) followed by B+ (28%) and then A+ (24%). There were no cases of breast cancer reported from people having negative blood group (Table 1). It is worthwhile to mention that majority of the Indian population belong to O+ and hence the majority of the cases might belong to this blood group. But the next highest number of cases belonged to B+ though the percentage of population having this blood group is quite low. Many studies have shown association of blood group to greater susceptibility to cancer. ABO antigen is mapped to 9q34 region and any mutation in this region is known to be associated with cancers [18].

Blood group antigens expressed on cancer cells are different from that of those expressed on normal cells. They have a role in systemic inflammatory response in pathogenesis of cancer. There is an altered motility of these cells which may lead to metastasis. They escape from apoptosis and from immune response which furthers cancer progress [19,20]. Majority of the sample population (91%) had no history of substance (tobacco) abuse, 9% of the women who had habit of tobacco consumption were found to have breast cancer (Table 1). Tobacco use is known to be associated with risk of developing various cancers.

Interestingly, when type of diet was compared among women suffering from breast cancer (Figure 2), it was found that 80% of the cases consumed mixed type of diet as compared to only 20% of the cases consuming vegetarian diet. Review of earlier studies has found that most of them found a positive association of improved survival among breast cancer cases with intake of vegetables, fruits and micronutrients [21].

It is very important to identify the signs and symptoms of breast cancer earlier on, so that appropriate treatment is provided at the earliest which improves the prognosis with minimum cost expenditure. Figure 3 shows that majority of the cases (50%) were found to be suffering from invasive type of breast cancer and metastatic type was found to be least prevalent (16%). Efforts should be made in enhancing the knowledge and awareness of these signs and symptoms of the disease amongst the population. Self breast examination should be taught and encouraged to achieve the goal of early detection. Involvement of right breast was highest (48%) as compared to left (38%) and bilateral involvement (14%) [Figure 4].

On comparing various reproductive variables, we found that (Table 2) earlier the age of menarche significantly higher was the incidence of breast cancer. 58% of the cases attained menarche lesser than or equal to 13 years of age. Early onset of menarche is found to be associated with increase in period of exposure of breast tissue to estrogen which is associated with increase in risk of breast cancer.[22] Type of menstrual cycle (regular/ irregular) was not found to be significantly associated with breast cancer. There was no significant association found between the age of marriage and breast cancer incidence. 88% of the breast cancer cases were aged less than or equal to 30 years at the time of birth of first child. Association of breast cancer with age at birth of first child was also not found to be significant. 10% of the cases were found to be nulliparous. More such studies are required on larger sample size. Earlier studies have revealed that the risk of breast cancer decreases with increase in the number of children. 82% of the cancer cases had done breast feeding when compared to 92% of those healthy volunteers. Studies show that the incidence of breast cancer is lower in breast fed women [23]. But alteration of lifestyle and increase in literacy and employment among Indian women is resulting in a change in breast feeding trend.

When use of oral contraceptive pills was determined, it was found that 90% of the sample population did not use pills. Earlier literature reveals

that, though pills are highly effective contraceptive measure, they are found to be associated with high incidence of breast cancer. Since our study was short term hospital based with limited number of sample size, we did not find any association of breast cancer and use of oral contraceptive pills. Larger population based studies for a longer duration need to be done to quantify the amount of this association.

Earlier attainment of menopause was significantly associated with lower incidence of breast cancer (Table 2). Only 20% of the breast cancer cases had attained menopause before the age of 45 years as compared to 32% of healthy volunteers. Also 38% of all breast cancer occurred in the cases that had attained menopause after the age of 45 years. However, the bulk of the cases i.e. 42% occurred among women who had not yet attained menopause. Though earlier studies are suggestive of occurrence of cancer in the elderly age group, the current scenario shows a rising incidence of cancer in earlier part of life itself. This is a disturbing trend, and more efforts need to be done in studying risk factors and drawing effective precautionary measures and screening tools to lessen the burden of this disease.

Acknowledgement

This study was funded by ICMR – STS 2016.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.15

Comparison of FEF between Smokers and Non-Smokers

L.K. Sudeer Kumar

Abstract

Introduction: The value of FEF 25%-75% has been both praised and condemned. The test has been recommended by Leuallen E. et al as an early index of airway obstruction. According to Gilbert R. et al. a normal value has poor specificity. It has been suggested by Voter K.Z that obstruction in peripheral airways can be discriminated from that in larger airways by a disproportionate decrease in FEF 25%-75% compared to FEV1. *Methodology:* First, case history is taken with special emphasis on personal habits. Then secondly the physical examination including the measurement of height and weight. All the tests are done at the same time of the day to avoid possible diurnal variation. Subject is allowed to sit comfortably on the stool. Instructions are given about the tests. *Results:* Non-smokers with normal weight is having mean FEF of 71.13 with a standard deviation of 20.15 and non-smokers with over weight the mean is 74.86 and standard deviation is 18.83. *Conclusion:* The effect of smoking on FEF is more affected in overweight group of subjects than the normal weight group of subjects.

Keywords: FEF; Smoking; Overweight.

Introduction

Wide spread smoking was a major stumbling block to a successful achievement of WHO's goal of 'health for all by the year 2000'. As a cause of death, smoking out numbers alcohol, cocaine, heroin, suicide, homicide, HIV/AIDS and road traffic accidents combined on an annual basis. Each year tobacco is responsible for the death of some 3.5million people or one death every nine seconds. Unless current trends are reversed this numbers will go on increasing [1]. In 1996 it was estimated that about 8.15 million males above 30 years and 4.21 millions females above 30 years are chronic smokers. In developed countries, about 30-40% of men and 20-40% women smoke. In developing countries like India between 2-10% of women smoke. In smoking the male to female ratio is 1.5:1. Smoking is also one of the main causes of premature death. It is estimated that in future smoking related deaths will increase from 3.5 million to 10 million per year at the end of 2025. Smoking adversely affects every single organ system in the body in one way or other. It greatly increases the risk of lung cancer, other respiratory diseases, coronary heart diseases, peripheral vascular disease and ulcers. Smoking is also responsible for the low birth weight babies and premature deaths. In women lung cancer increases dramatically following adaptation to smoking. It is also demonstrated that passive smoking causes several diseases including lung cancer. The epidemiological evidence suggests that cigarette smoking is the single major factor associated with respiratory diseases. The major respiratory diseases caused by cigarette smoking are lung cancer, chronic bronchitis, emphysema, chronic obstructive pulmonary diseases and lung failure. Inhalation of tobacco smoke first cause immediate rise in airway resistance. This change is a reflex response due to the deposition of dust particles upon the epithelium of respiratory tree and in not due to tobacco smoke. But ultimately tobacco smoke causes airway obstruction by damaging mucus secreting cells, cilia, bronchial muscles, small airways and alveoli. Mucosal glands undergo hypertrophic changes with excess mucus secretion. The above changes are slow. Only a minor

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Received on: September 25, 2017 **Accepted on:** October 05, 2017

proportion of cigarette smokers show progressive deterioration, but the knowledge of natural history is insufficient to identify those individuals who are at risk. These persons can be identified only by doing Pulmonary Function Tests (PFT) [Spirometry]. This test is the simplest, easiest and most reliable test. In chronic smokers all measures of pulmonary function tests decline especially Forced Expiratory Volume in one second. (FEV1) Obesity/Over weight is another major risk factors and which adversely affect health. It affects pulmonary system by reducing the pulmonary complaints and small airway caliber (Biring M.S et al, 1997, Ray et. al, 1983 & Berger et al, 2001) and is associated with a number of pulmonary abnormalities [2,3,4].

Forced Mid Expiratory Flow Rate (FEF 25%-75%) FEF 25%-75% is the mean forced expiratory flow during the middle half of the FVC. It was formerly called the maximal mid expiratory flow rate (MMEF). It was expressed in liters/sec. Locating the points on the volume time curve corresponding to 25% and 75% of the FVC and then passing a straight line through them determine the FEF 25%-75%. The slope of this line represents the average rate of airflow over the mid portion of the FVC. Normal values Males > 2.0L/sec, Females > 1.6L/sec. The value of FEF 25%-75% has been both praised and condemned. The test has been recommended by Leuallen E. et al (1955) as an early index of airway obstruction. According to Gilbert R. et al. a normal value has poor specificity. It has been suggested by Voter K. Z that obstruction in peripheral airways can be discriminated from that in larger airways by a disproportionate decrease in FEF 25%-75% compared to FEV1. But reliability of this interpretation has been questioned, primarily because of the large variability of this measurement. Others like Birath et al (1963) and Sobol et al (1965) have found PEF 15%-75% less useful than other measurements because of poor correlation with other ventilatory measurements and wide range of normal values.

Peak Expiratory Flow Rate (PEFR) It is the maximum flow, which can be sustained for a period of 10 milliseconds during expiration from a position of full inspiration. PEFR can be measured either from an MEFV (Maximum Expiratory Flow Volume) curve or by using portable peak flow meters. PEFR is a reflection of the status of the large airways and body and chest development (Mead j et al (1967). There is a definite correlation between FEV1 and PEFR in patients with asthma and COPD who are undergoing bronchodilator therapy (Shim C 1978,Kelly C.A et al 1988) [5,6].

Methodology

At first a thorough physical examination was carried out and also make sure that patient had not taken cigarette or heavy meals at least an hour prior to the test.

Selection of Tests: When choosing tests for lung function a number of criteria should he taken into account.

1. The tests should be safe, simple and should not be inconvenient to the subjects.
2. The information, which it is intended to be obtained from a tests, should ideally be independent of both the motivation and extent of emotional participation of the subjects and personality of the operator.
3. The tests should be repeatable.
4. The tests of lung function should be appropriate to circumstances for which they are required. So the tests were selected with a view for pointing information on different aspects of function.

Procedure: First, case history is taken with special emphasis on personal habits. Then secondly the physical examination including the measurement of height and weight. All the tests are done at the same time of the day to avoid possible diurnal variation. Subject is allowed to sit comfortably on the stool. Instructions are given about the tests. A very enthusiastic demonstration by the operator is required. So that a maximum effort is made by the subject when carrying out the forced expiratory test. Subjects who has not previously examined on spirometry should have two or more practice attempts until it appears that maximum effort is being obtained. A disposable mouthpiece should be used in each subject. The mouthpiece was positioned so that the subject's chin was slightly elevated and neck extended. After the insertion of mouth piece a careful check was made to ensure that there was no air leak present. The subject was asked to make maxima! effort for each test and was closely watched to ensure that he maintained an airtight seal between the lips and the mouthpiece of the instrument. First the subject data was entered as name, age, sex, height, weight, address, occupation, addiction etc. Then the required measurement was called up from menu. Forced Vital Capacity (FVC) The subject is made comfortable and the nose clip kept in place to close the nostril to prevent air entry through the nose. Then the mouthpiece is placed in the mouth and which is connected to pneumotach. Then the

subject is asked to breach via, the mouthpiece. After a brief period of quiet normal breathing subject is asked to breathe in and completely as possible then suddenly breathe out forcefully, rapidly and completely as much as possible. The performance of the maneuver was evaluated by inspecting the graphic output of flow volume curve and the subject was reinstructed if necessary. Repeat it for 2 to 3 times. Measurement was taken from the best of the three tests.

Results

The statistical analysis in smokers in relation to body mass index showed that there is reduction of FEF in obese smokers, which denotes that there is statistically significant difference of FEF in over weight smokers.

As per the Table 1 non-smokers with normal weight is having mean FEF of 71.13 with a standard deviation of 20.15 and non-smokers with over weight the mean is 74.86 and standard deviation is 18.83. This values are tested using chi-square test and it is found that the difference actually observed does not have significance since the p value is more than 0.05. In smokers, the smokers with normal weight the mean is 54.34 and the standard deviation is 27.52. In smokers with overweight the mean is 51.75 and the standard deviation is 24.07. When this values are tested using chi-square test, it is found that there is significant difference, according to the chi-square test the P value is less than 0.05 and it shows that the effect of smoking on FEF is more affected in overweight group of subjects than the normal weight group of subjects.

Table 1: Statistical analysis of FEF

Category	Mean	Std Deviation
Non Smokers Normal Wt.	71.13	20.15
Non Smokers Over Wt.	74.86	18.83
Smokers Normal Wt.	54.34	27.52
Smokers Over Wt.	51.75	24.7

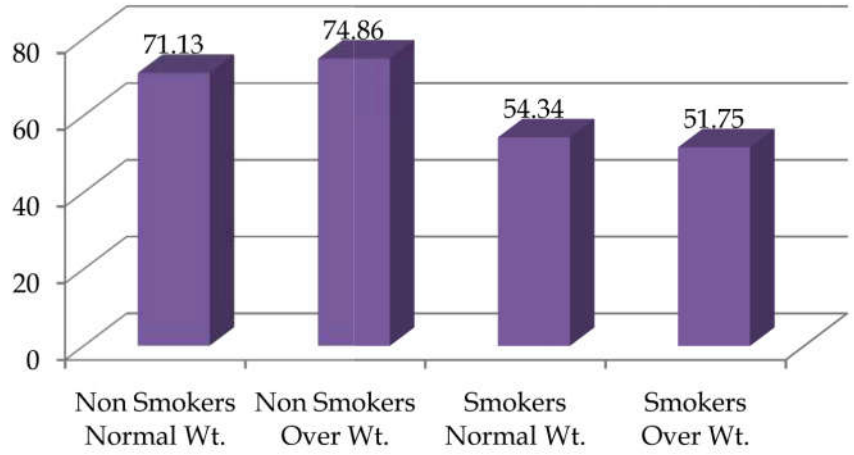

Fig. 1: Comparison of FEF

Discussion

The adverse effect of cigarette smoking on Spirometric indices have been well documented. Tobacco smoke contains a number of substances which may exert their effects upon the body; they include particles of dust which disturb the function of the airways, tar which exerts an irritant effect; pon the bronchial epithelium and nicotine which increase heart rate and elevates systemic Blood Pressure [Cotes, 1968]. Cigarette smoking affects pulmonary function soon after it is started (Seely 3.E, 1971). The inhalation of tobacco smoke causes an immediate rise in airway resistance, which persists for at least an hour. Early changes are mild and reversible following cessation of smoking or modification of smoking habits (Buist As 1976, McCarthy Ds, 1976). PFT in Smokers Cigarette smoking has been identified as a single most significant cause of preventable morbidity (McGinnis 3M 1993). One of the two continuing smokers wily die of a smoking related diseases [7]. (Thun M 3, 1995

and Boll R & Peter 1994). Half of all cigarette smokers will eventually be killed by their habit (Boll R & Peter 1994). The death may be due to Lung cancer, chronic bronchitis & emphysema, corpulmonale, ischemic heart disease and cerebero vascular accident (Royal College of Physicians, 1997). The annual excess mortality is nearly 440, 000, out of these majorities will die prematurely (Centers for control and prevention of disease, U.S, 1984). Coronary heart disease, cancer and various respiratory diseases account for the majority of excess mortality related to cigarette smoking (Center of Control and Prevention of Diseases, U.S, 1993). From cancer death 29% where from lung cancer and 83% of these death were attributed to smoking (Center for Control and Prevention, U.S., 1993 and Rock ville 1990). COPD such as chronic bronchitis and emphysema account for another percentage of death annually by smoking (Centre for Control and Preventing, 1'13) [8].

It has been estimated that an average of 7 minutes of life is lost for each cigarette smoked. This estimated in based on an average reduction in life expectancy for cigarette smokers of 6.6 years (LEW E.A 1987). Smoking one pack per day (20 cigarettes), the reduction of life in average 4.6 years (Public Health Service, Washington, 1979). Smoking was also associated with irreversible obstructive changes in the airways in some subjects (Fleature C., 1997). Cigarette smoking is usually regarded as the dominant risk factor for developing COPD (U.S. Dept of Health, 1979). Smoking related lung damage occurs as a result of inflammation and eventual scarring of the small or peripheral airways. It was suggested that smokers those who are susceptible to COPD can identified by PFT in early middle age (Burrows .B., 1991). It is by FEV1 and in smokers FEV1 declines by twice compared with non smokers (Sandrik L. et al, 1995 and Marcus E.B. et al., 1995). Cigarette smoking affects pulmonary function soon after it is started (Seely 3E. 1971). Tobacco smoke causes an immediate rise in airway resistance (Buist AS. 1976 and McCarthy D.S.,1976). Walter and Richard in 1991 proved that smoking in adolescents and early aoulthood diminishes the airway growth. Previously by Lebowitz et al. 1987 [9].

In smokers, PFT shows reduced FEVI and it is the early sign to stop smoking (Tager IB., et. al., 1988). On average, cigarette smokers have a high annual rate of decline in FEV1 of about 50 ml which 30 ml annually in nonsmokers. In some smokers, there is rapid decline in FEV1 and this may be early sign of COPD (Tager. IB. et. al., 1988). Stopping cigarette smoking does not produce a substantial improvement in FEV1, but the subsequent rate of decline in decreased (Authonisen NR et. al. 1994 and Fletcher et.al 1976) The rate of decline of FEVI can be used to assess susceptibility in cigarette smokers, progression of the disease and reversibility of the airway obstruction (ATS 1995, Siafakas NM et al 1995 and British Thoracic Society, 1997).

In some smokers PFT shows low or normal FVC. If PVC is low it is the early sign of restrictive respiratory diseases but it can be lower in other respiratory diseases also (ATS 1995 and BTS 1997). The FEV1/ FVC also decline in smokers, which is the early sign of COPD, but less sensitive than FEVI. (Brain N Legere et al., 1993) FEF 25-75% is a useful measure meant to detect airflow limitation. In smokers it fall less than 50% of predicted value. This is considered to be an indicator of small airway function, but probably provide no more clinical useful information than measurement of FEVI (ATS, 1991) Smokers show low FEF than predicted. This can be measured directly from the flow volume loop or measured with a hand-held peak flow meter. This is an inferior measurement of airway obstruction compared to FEVI (Detels R., et al., 1982) The pulmonary function values of the smokers found lower than those of the non smokers such as VC, IRV, IC, FVC, FEVI, MMEF, PEF, FEF, FEV 25- 75% and MW. FEVI, PEF are sensitive indicator of large way resistance and WIEF, FEF and FEF 25-75% are sensitive indicator of small airway resistance [10]. The ventilatory function tests carried out in smokers showed there is significant lowering of the following parameters VC, IRV, IC, FVC, FEV, FEF, PEF, MMEF, FEF 25-75% and MW. This showed there is definite tendency to narrowing of both the large and small airways.

Conclusion

The statistical analysis in smokers in relation to body mass index showed that there is reduction of FEF in obese smokers, which denotes that there is statistically significant difference of FEF in over weight smokers.

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Original Research Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.16

Relationship between Big Five Personality Domains and Blood Groups

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Abstract

In this study the relationship between two important variables, namely blood group and big five personality traits, are determined in the research framework. Many statisticians have incorporated the five-factor model and the NEO Personality Inventory, both describing various aspects of personality including the five domains of personality—neuroticism, extraversion, openness, agreeableness, and conscientiousness—into determining whether blood type influences personality [1,5,]. In this study, involving about 100 undergraduate medical students who were aware of their own blood groups, participants were asked to rate various aspects of their personality by using personality inventory questionnaire of Buchanan (2001) based on Five-Factor Modality (FFM). In our study the difference in ratings for the different blood types is not statistically significant for Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness ($p>0.05$). So it is concluded that there was no evidence of any association between blood type and personality. However, the study showed weakness such as small sample sizes and unequal sample size, more accurate studies should be performed in the future to confirm or reject the results of this study.

Keywords: Blood Groups; Personality Domains; Five-Factor Modality (FFM).

Introduction

Aims and objectives of our study are- (1)To investigate the relationship between Five Factor Model of Personality (FFM) and Blood groups. (2) The recognition of the personality based on the blood type of students.

This paper studied the relation of blood groups with the big five personality domains.

Numerous research studies are performed with relation to the recognition of the personality based on the blood type of people [1]. For the past 50 years, the Japanese have been gathering data to support "Theory B", a system used to classify personality based on blood type [2], The purpose of this study is, therefore, the recognition of the personality based on the blood type of students using five-factor model of personality

In Japan, blood type is analogous to zodiac signs and is applied in many aspects, from matchmaking to job hiring; it is applied to such a degree that Junichi wadayama, a health, welfare, and labour ministry official, claims "blood types could lead to discrimination" [3]. Four of the top ten Japanese best sellers were about the link between blood type and personality; these books combine for a total of five million copies sold. According to this theory, "Type As are sensitive perfectionists but overanxious; Type Bs are cheerful but eccentric and selfish, Os are curious, generous, but stubborn; and ABs are arty but mysterious and unpredictable"[3]. The idea originated from Nazi race ideologues and was later adopted in the 1930s by the Japanese militarist government in order to breed more suitable soldiers; the theory was abandoned a few years later. However, in the 1970s, Masahiko Nomi, who had no medical background, advocated the theory and brought back the craze. Currently, blood type is used to determine compatibility for matchmaking, to make business decisions such as promotions, to divide schoolchildren into groups, and to customize athlete's fitness training [3]. The five-factor model and the NEO Personality Inventory [4]. The five-factor model consists of five personality domains—Neuroticism,

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Received on: June 16, 2017 **Accepted on:** July 07, 2017

Extraversion, Openness, Agreeableness, and Conscientiousness, often referred to as N, E, O, A, and C [5]—and has become the most widely accepted model for personality [6]. The five-factor model has been incorporated into studies about the linkage between blood type and personality; the NEO Personality Inventory is an approach based on the five-factor model that allows participants to rate the five domains of their personality [5]. "The genetic influence on neuroticism has been estimated at 41%, extraversion at 53%, openness to experience at 61%, agreeableness at 41%, and conscientiousness at 44% [6]. Historical studies concluded, "Approximately 40% of the variation in personality can be explained by genes" [5]. Because blood type is genetic and can be easily identified, many studies have analyzed the dependence of personality on blood type in Australia, Canada, Greece, India, Italy, Japan, and the United States [5]. However, only about half of the studies found a relationship between personality and blood type, while the other half did not. The studies that found a relationship were conducted by Furukawa from 1927 to 1930 [7]; Cattell, Boutourline, and Hundleby in 1964 [8]; and Wu, Lindsted, and Lee in 2003 [5], reaching the general conclusion that Type A blood individuals are melancholic, tender-minded, and anxious and Type O blood individuals more passive and self-conscious.

However, Furukawa concluded that Type B blood individuals were more sanguine. The personalities of Type AB individuals remain unclear and contradictory [6]. Angst and Maurer-Groeli (1974) [9] found higher Neuroticism scores among persons with Type B. Jogawar (1983) [1] found that people with Type B blood were less emotionally stable, more Apprehensive, and less self-sufficient. Gupta (1990) [10]observed that Neuroticism scores were significantly higher for participants with Type B blood. Similarly, Marutham and Prakash (1990) [11] reported that Type B scored significantly higher on Neuroticism than other groups did. Three studies have reported associations between neuroticism and blood type. Jogawar (1984) [1] found those with Type B blood to be more neurotic than individuals of other blood types. Marutham and Indira (1990) [11] initially found no difference between blood groups and extraversion, neuroticism and "Type A" behaviour, but after dividing the groups on the basis of EPI norms, found that blood Type Bs had higher scores on neuroticism than did any other group. Studies focusing on the association between extraversion and blood type were conducted by Angst and Maurer-Groeli in 1974 [12], Lester and Gatto in 1987 [13], and d'Abamo and Whitney in 2001 [14]; conclusions were often contradictory, especially for Type AB blood individuals, and included that Type Os and ABs were extraverted (and, in another study, introverted), On the other hand, many studies concluded that there was no association between these two factors; these studies were conducted by Thompson in 1936 [15]. Cattell, Boutourline, and Hundleby in 1964 [6], Carmer and Imaike in 2000 [16], and Rogers and Glendon in 2000 [6]. Eysenck proposed that "anxiety and neuroticism levels varied with the proportion of Type B blood individuals" and that "introversion varied with the proportion of Type AB blood Personality and Blood Type individuals" [6].

the majority of studies are in agreement that Type A blood individuals are "passive, shy, docile, tender-minded, introverted, and emotionally vulnerable" [6] studies also agree that Type O blood individuals are generally "active, optimistic, sociable, and extraverted" [6] Studies on Type B blood individuals were less conclusive—some found them to be active, others sociable, honest, and light-hearted, and still others introverted. Studies on Type AB blood individuals were contradictory and inconclusive—conclusions ranged from passive to aggressive and from introverted to extraverted. Most of the above studies were designed poorly—all had unequal cell sizes, and some only analyzed one or two of the principal blood types; this makes definitive conclusions difficult to make.

Materials and Methods

This study was conducted in the dvvpfs medical college, Ahmednagar. We collected data from 100 students of age in between 18-20 years of first MBBS 2015-2016 batch who were aware of their own blood groups, Of these individuals, 60% were males and 40% were females. Demographic information such as age, gender was collected,

Inclusion criteria was 100 healthy medical students of first MBBS batch 2015-2016 who were aware of their own blood groups.

Exclusion criteria Students who are having any major illness were excluded from the study.

Ethical clearance was taken from institutional ethical committee and written consent was taken from the students of first MBBS those who are involved in the study.

At the start of the semester during classes a personality inventory was administered to the students. We used personality inventory

questionnaire of Buchanan (2001) based on Five-Factor Modality (FFM). The students rated each item on a 5-point Likert-type scale (1= strongly disagree, 5 = strongly agree). The FFM is based in a belief that people are rational beings and count for their own personality and behaving, can analyze their own actions and Reactions (McCrae & Costa, 1996).Then by using responses from the participants from the study, we calculated the average ratings for each of the five personality domains, for each of the four principal blood types.

Results

Table 1 show the distribution of blood groups in percentage in students who has participated in study.

Table 1: Percentage distribution of blood groups amongst the subjects

Blood Group	Present Age Distribution of Blood Groups
A	26%
B	16%
AB	10%
O	48%

Table 2: Statistical analysis of personality ratings for each blood type.

A. Neurotissim

Personality Trait	Blood Groups	Mean (St Deviation)	Significance
Neurotisim	A	4.308(1.798)	(p.>0.05) NS
	B	2.750(2.492)	(p>0.05) NS
	AB	2.600(2.190)	(p>0.05) NS
	O	4.334(2.478)	(p>0.05) NS

NS=not significant

B. Extraversion

Personality Trait	Blood Groups	Mean (St Deviation)	Significance
Extraversion-	A	6.616(1.710)	(p>0.05) NS
	B	6.250(2.252)	(p>0.05) NS
	AB	4.600(1.674)	(p>0.05) NS
	O	4.334(2.258)	(p>0.05) NS

NS=not significant

C. Openness-

Personality Trait	Blood Groups	Mean (St Deviation)	Significance
Openness-	A	6.1538(1.9082)	(p>0.05) NS
	B	6.750(1.488)	(p>0.05) NS
	AB	4.600(1.6734)	(p>0.05) NS
	O	6.0834(1.9092)	(p>0.05) NS

NS=not significant

D. Agreeablness

Personality Trait	Blood Groups	Mean (St Deviation)	Significance
Agreeablness-	A	6(1.8258)	(p>0.05) NS
	B	6.5(1.4142)	(p>0.05) NS
	AB	4.2(2.2804)	(p>0.05) NS
	O	6(1.865)	(p>0.05) NS

NS=not significant

E. Conciousness

Personality Trait	Blood Groups	Mean (St Deviation)	Significance
Conciousness-	A	6.0716(1.0378)	(p>0.05) NS
	B	6.5(1.7728)	(p>0.05) NS
	AB	6(1.8258)	(p>0.05) NS
	O	6.8334(1.7894)	(p>0.05) NS

NS=not significant

In that out of 100 students 26% students are having A blood group,16%are of B blood groups, 10% are of AB blood groups, and about 48% students are having O blood group.

Table 2 shows statistical analysis of personality ratings for each blood type. In that the difference in ratings for the different blood types is not statistically significant for Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness ($p>0.05$).

Conclusions

There was no evidence of an association between blood type and each personality domain; the difference in ratings was not statistically significant from that we cannot conclude that blood type influences personality in terms of neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness.

Discussion

The present paper has attempted to explore the predictability of personality by using blood groups in medical students by well-established personality measures the five factor model. The five-factor model of personality can provide a useful framework for examining the relationship between personality constructs and blood groups in the medical course.

In this study stastical analysis reveal that there is no evidence of an association between blood type and each personality domain; the difference in ratings was not statistically significant from that we cannot conclude that blood type influences personality in terms of neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness and is in consistent with the study of Thompson in 1936 [15], Cattell, Boutourline, and Hundleby in 1964 [8],Cramer & Imaike, 2002 [16] Rogers, M., & Glendon, A.I. (2000) [6] they found no significant relationship between blood type and personality.

As per previous research of Angst and Maurer-Groeli (1974) [12], Gupta (1990) [10] Marutham and Prakash (1990) [11] there is higher Neuroticism scores among persons with Type B .they scored significantly higher on Neuroticism than other groups did. They found that people with Type B blood were less emotionally stable, more apprehensive, and less self-sufficient and found those with Type B blood to be more neurotic than individuals of other blood types Rinieris, Christodoulou, and Stefanis (1980) [17] found that irrespective of blood type, females had a higher mean neuroticism score than males did. Their results suggested that gender may be an intervening variable in the relationship between blood type and personality.

In this study we evaluated a series of a priori hypotheses, each predicting a unique relation between blood type and personality, as measured by the five factor model of McCrae and Costa, 1987. The following seven hypotheses were evaluated:

1. There will be (a) higher extraversion scores among both Type ABs and Os, and (b) lower extraversion scores among both Type As and Bs [13].
2. There will be higher extraversion scores among Type Abs [8].
3. There will be higher extraversion scores among Type Os [19].
4. There will be lower extraversion scores among Type ABs [9,13].
5. There will be higher neuroticism scores among Type Bs [9,1]
6. There will be (a) higher neuroticism scores among Type As, and (b) lower neuroticism scores among Type Os [20].
7. There will be lower Agreeableness and Conscientiousness scores among Type Bs and ABs [12,13].

In this study statistical analysis reveal that there is no evidence of an association between blood type and each personality domain this may be due to many weaknesses in our study like 1) Small sample size, larger sample sizes allow for more accurate determination of whether populations were normally distributed. 2) Another limitation of the study was the sampling location. Because the sampling was limited to only students. 3) Unequal sample sizes were caused by differing proportions of each blood type—Type AB blood individuals make up a significantly smaller proportion of the world's population compared to Type O blood individuals

Because many weaknesses were present in this study further, more accurate research may prove otherwise.

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Review Paper

International Physiology
Vol. 5 No. 2, July - December 2017
DOI: https://dx.doi.org/10.21088/ip.2347.1506.5217.17

Role of Resting Membrane Potential in the Regulation of Cellular Functions

Amit Kant Singh[a], Reena Rani Verma[b]

Abstract

The membrane potential of a cell in non excited state is called Resting Membrane Potential (RMP). RMP of large nerve fiber is –90 mV. It allows a cell to function as a battery, providing power to operate a variety of "molecular devices" embedded in the membrane. In electrically excitable cells, it is used for transmitting signals between different parts of a cell. Membrane potential is contributed by the electrical force from mutual attraction between particles with opposite charges and repulsion between the particles with same charges. Diffusion also contributes to membrane potential by the tendency of particles to redistribute from regions of high concentration to low due to thermal energy. The diffusion potential across the membrane that exactly opposes the net diffusion of a particular ion through the membrane is called the Nernst potential for that ion. Factors responsible for generation of RMP are Na^+- K^+ pump and leakage of K^+. Membrane potential can be measured by patch clamp methods and voltage sensitive fluorescent dyes. Bioelectric properties can serve as markers for cell characterization, control cell mitotic activity and also cell cycle progression and differentiation.

Keywords: Resting Membrane Potential; Nernst Potential; Na^+- K^+ Pump; Bioelectric Properties.

Introduction

The membrane potential of a cell in non excited state is called Resting Membrane Potential (RMP). RMP of large nerve fiber is - 90 mV [1]. It allows a cell to function as a battery, providing power to operate a variety of "molecular devices" embedded in the membrane. In electrically excitable cells, it is used for transmitting signals between different parts of a cell [2]. Membrane potential is contributed by the electrical force from mutual attraction between particles with opposite charges and repulsion between the particles with same charges. Diffusion also contributes to membrane potential by tendency of particles to redistribute from regions of high concentration to low due to thermal energy [3].

Basic Physics of Membrane Potentials

The generation of membrane potential involves establishment of a diffusion potential across a nerve fiber membrane. It is established by diffusion of potassium ions from inside the cell to outside through a membrane that is selectively permeable only to potassium and also by the diffusion of sodium ions from outside to inside when the nerve fiber membrane is permeable only to sodium ions [1].

Nernst Equation describes the relation of diffusion potential to the ion concentration difference across the membrane. The diffusion potential across the membrane that exactly opposes the net diffusion of a particular ion through the membrane is called the *Nernst potential for that ion.* It is determined by the *ratio of the concentrations of that* specific ion on the two sides of the membrane. *Nernst equation* used to calculate the Nernst potential for any univalent ion at the normal body temperature of 98.6°F (37°C):

$$\text{EMF(mv)} = \pm\frac{61}{z} \times log\frac{concentration\quad inside}{concentration\quad outside}$$

Where *EMF is electromotive force and z is the electrical* charge of the ion [1].

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Received on: October 16, 2017 **Accepted on:** October 30, 2017

Goldman-Hodgkin-Katz Equation

Goldman-Hodgkin-Katz equation is used to calculate the diffusion potential when the membrane is permeable to several different ions. The diffusion potential that develops depends on three factors: The polarity of the electrical charge of each ion, the permeability of the membrane (P) to each ion and the concentrations (C) of the respective ions on the inside (I) and outside (O) of the membrane [1].

The Goldman equation infers that sodium, potassium, and chloride ions are the most important ions involved in the development of membrane potentials in nerve and muscle fibres. Also the concentration gradient of each of these ions across the membrane helps determine the voltage of the membrane potential. Further, the quantitative importance of each of the ions in determining the voltage is proportional to the membrane permeability for that particular ion and a positive ion concentration gradient from *inside the membrane to the outside causes electro-negativity* inside the membrane [1].

Measurement of Membrane Potential

Small pipette filled with an electrolyte solution is impaled through the cell membrane to the interior of the fibre. Another electrode, called the "indifferent electrode", is then placed in the extracellular fluid. The potential difference between the inside and outside of the fibre is measured using an appropriate voltmeter. The other methods of measuring membrane potential in small cells is by Patch clamp method and Voltage-sensitive fluorescent dyes. The advantages of these methods are, they are easy to use and simultaneous monitoring of many cells can be done [4,5].

Factors Responsible for Generation of RMP

The RMP of neuron is due to Na^+- K^+ pump and also due to leakage of K^+ through membrane. Na^+- K^+ pump is an electrogenic pump – more positive charges are pumped to the outside than to the inside (3 Na^+ outside and 2K^+ inside). Na^+-K^+ pump causes concentration gradient of Na^+(outside): 142mEq/L, Na^+(inside): 14mEq/L, K^+(outside): 4mEq/L, K^+ (inside): 140mEq/L. The ratios of these two respective ions from the inside to the outside are: Na^+ inside/Na^+ outside = 0.1 and K^+ inside /K^+ outside = 35.0 [1].

Leakage of potassium through the nerve cell membrane through *Potassium channel, or Potassium [K^+] "leak" channel located in the* nerve membrane. The potassium can leak even in a resting cell state, these K+ leak channels may also leak sodium ions slightly but are 100 times more permeable to potassium than to sodium [1].

Origin of the Normal Resting Membrane Potential

Normal resting membrane potential is attained by the contribution of potassium and sodium diffusion potential. The ratio of potassium ions inside to outside is 35: 1. The Nernst potential corresponding to this ratio is -94 mV (the logarithm of 35 is 1.54, and this multiplied by -61 mV is -94 mV). Therefore, if potassium ions were the only factor causing the resting potential, the resting potential inside the fibre would be equal to -94 mV. The ratio of sodium ions from inside to outside the membrane is 0.1, which gives a calculated Nernst potential for the inside of the membrane of +61 mV.

Summated potential can be derived from Goldman equation. If the membrane is highly permeable to potassium but only slightly permeable to sodium, the diffusion of potassium contributes far more to the membrane potential than does the diffusion of sodium. Using this value in the Goldman equation gives a potential inside the membrane of -86 mV, which is near the potassium potential [1].

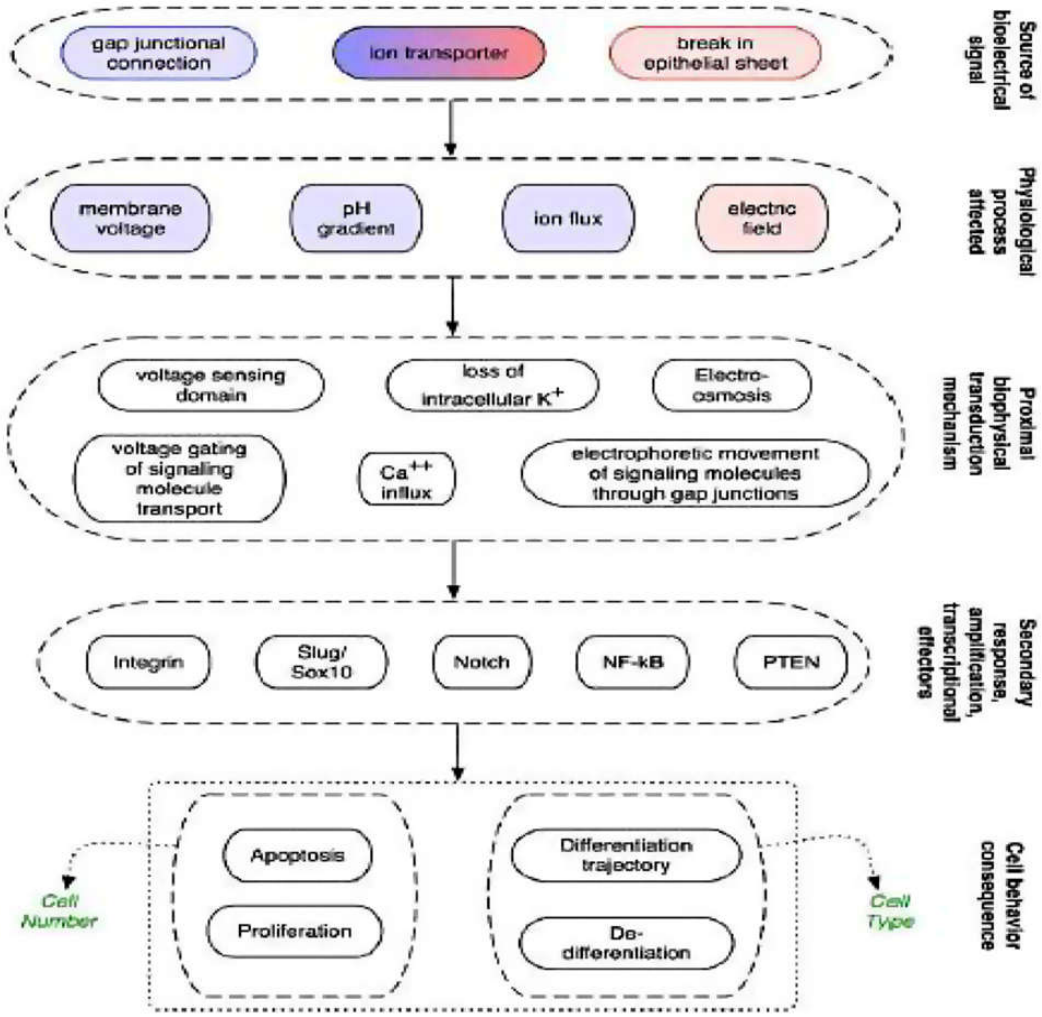
Na^+-K^+ pump also contributes to origin of RMP. Pumping of three sodium ions to the outside occurs for two potassium ions pumped to the inside of the membrane. Loss of positive charges from inside the membrane creates an additional degree of negativity of -4 mV inside [1].

Probable Systemic Effects of Resetting of RMP [6,7]

Cell/ Tissue/ System	RMP towards depolarization	RMP towards hyperpolarization
Nerve & Muscle	Shortened reaction time, Flickering, Fasciculation, Twitching	Increased reaction time, Flaccidity
Cardiovascular Conducting cells/ tissue myocytes	↑HR , Arrhythmias ↑ force of contraction	↓HR, Heart block ↓ force of contraction

Respiratory- Smooth muscles	Bronchospasm	Bronchodilation
GIT smooth muscles	Motility increases leading to diarrhoea.	Motility decreases leading to constipation.
Reproductive system		
Female	↑ Contractility- Cervical, Vaginal , Uterine- Sperm transport Fallopian tubes- Ovum transport	↓Contractility- Cervical, Vaginal , Uterine- ↓Sperm transport Fallopian tubes- ↓Ovum transport
Ova	↑ fertilization capacity	↓ fertilization capacity
Male	Early ejaculation	Delayed ejaculation/ Anejaculation
Sperm cell	↓ fertilization capacity	↑ fertilization capacity
CNS	Anxiety, Tremors, Seizures, Exaggerated reflexes, Rigidity, Spasticity	Depression, Decreased reflexes, Flaccidity
Cell proliferation & differentiation	↑	↓

Bioelectric Signal Causes Cell Proliferation and Differentiation [4]



Conclusion

The above stated studies conclude that every cell of body has its own resting membrane potential and react differently to resetting of RMP and the bioelectric properties can serve as markers for cell characterization, control of cellular mitotic activity and also cell cycle progression and differentiation.

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[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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