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Life Style Modification in Subjects with Mild and Moderate Hypertension

Medical Science

KEYWORDS : Hypertension, Aerobic Exercise, Pulse monitor, Sphygmomanometer

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ABSTRACT

Hypertension, one of the most common medical disorders, is associated with an increased incidence of cardiovascular mortality. This study aimed tofind out the effectiveness of lifestyle modification in reduction of blood pressure along with body mass index (BMI), waist circumference and cholesterol level in subjects with mild and moderate hypertension. The study was carried out in KhorfakkanMinistry of Health Hospital, Sharjah, United Arab Emirate. Twenty subjects with mild to moderate hypertension were included in the study after the screening by medical officer. All subjects performed 15 minutes warmup, 30 minutes aerobic exercises and 15 minutes cool down exercises for six weeks. The blood pressure (BP), BMI, waist circumferenceand cholesterol were measured and statistically analyzed.There was significant reduction of blood pressure, through lifestyle modification in subject with mild to moderate hypertension. The mean reduction of Systolic BP was 13.9±7.4 and Diastolic BP was 8.4±3.2. The mean difference of BMI and waist circumference was 1.7±1.2 and 3.3±2.7. The mean decrease in total cholesterol was 17.2±16.5.This study concludes that lifestyle modification has an important role in reduction of blood pressure in subjects with hypertension.

Introduction

Hypertension in its simple term means an increase in blood pressure (BP). It is commonly asymptomatic, readily detectable and usually treated easily. If left untreated it often leads to lethal complications. Hypertension is a major risk factor for stroke[1], coronary artery disease[1], heart failure[2], peripheral arterial disease[2] and end stage renal disease.[3]An elevated arterial pressure is probably the most important public health problem all over the world. Hypertension remains a major public health problem in the United States, with 58.4 million (28.7%) Americans aged 18 years or older having hypertension.[4-6]

In United Arab Emirates (UAE) the prevalence of hypertension is 33% (under diagnosed) in the rural population. Many factors contribute to this problem including poor treatment compliance, lack of access to health care and lack of physician adherence to therapeutic guidelines. The high prevalence of undiagnosed hypertension is emphasized by the large number of cases discovered incidentally.

Cardiovascular diseases are known to be the leading cause of morbidity and mortality in the UAE among both the national and the expatriates, who constitute the majority (approximately 80%) of the population.[7] Of particular concern is the prevalence of obesity, which reaches 35% among adolescent, Bedouin Arab women and about 24% among medical students[7]. These students also reported high stress levels (65%), unhealthy diets (50%) and low levels of physical activity (77%). Also smoking has increased among men. Hypertension is also common with prevalence reported as 19-25% and 15.3% (urban population) and 10.6% (rural population).[7]Mild to moderate essential hypertension was defined as a systolic blood pressure between (SBP) 140 and 179 mm Hg and/or diastolic blood pressure (DBP) between 90 and 109 mm Hg, according to WHO blood pressure classification.[8-10]

Research has been done and is still going on regarding the control and prevention of hypertension by people of various disciplines. Most of the research done is directed towards reducing the risk factors mainly Insulin resistance, obesity, diet, physical inactivity, and smoking.Of the many treatment modalities available for hypertension, most depend on management through medications. Although medications have a beneficial effect on lowering blood pressure, it is important to acknowledge that drugs have some side effects but life style modifications have no harm.

Most of the studies show that regular aerobic exercise by subjects with essential hypertension is associated with beneficial changes in blood pressure, lipoprotein profile, glucose metabolism, and neurohormonal release. Recent epidemiological studies have shown that physical exercise reduces cardiovascular morbidity in the general population including individuals with hypertension and exercise is recommended as the initial treatment option to control hypertension.[10-13]

Exercise is the cornerstone therapy for the primary prevention, treatment and control of hypertension.[14]Specific dietary guidelines that have shown to lower hypertension are explained in the dietary approaches to stop hypertension, which recommends a diet rich in fruits, vegetable and low fat dairy foods as well as restriction of alcohol and sodiumintake.[15]This study aims to compare the effect of lifestyle modification in reduction of blood pressure in non-medicated as well as medicated subject with mild and moderate hypertension and to find the association between the demographic variables like age, education with their reduction in blood pressure.

Materials and Method

This study was conducted at Physiotherapy department

of Khorfakkanhospital, Emirate of Sharjah, UAE, from July 2008 to July 2009. A total of 41 subjects were potentially eligible to participate during this period, of these, 21 subjects were excluded because of inability to participate in this period. 10 subjects found that the time was not convenient, 5 subjects were un-cooperative, 5 did not show any interest (they didn't want to reveal their disease to others) and one subject fully participated in the study but did not cooperate to take the investigations. The final study sample includes 20 subjects with mild to moderate essential hypertension (male-13 and Female-7) and the mean age of male and female were 48.8±10.5 and 46.7±10.5 respectively. Subjects were screened by designated medical officer before entry in to the study with medical history and physical examination, complete blood count, routine chemistriesand urine analysis.

Individuals were excluded from the study if they had clinically significant medical illness such as cardiac, renal, hepatic or gastrointestinal disease and laboratory abnormalities. Individuals with a recent history of surgery, smoking or drug or alcohol abuse were also excluded.All subjects were informed about the study objectives and methods and informed written consent was obtained.The procedures followed were in accordance with American College of Sports Medicine guidelines and protocol was approved by ethical committee of Khorfakkan Hospital and Ministry of Health, UAE.

BP was measured by using manual sphygmomanometer by standard technique. For all the subjects, three casual BP measurements were obtained in the morning after 15 minute of quite seated rest. The BP values obtained on each of the three days were averaged and this became the study entry BP value for each subject. Also Body Mass Index (BMI) and waist circumference of each subject were measured and total cholesterol, *Low Density Lipoprotein* (LDL) cholesterol were checked before the study. All subjects were given dietary advice to reduce salt, caffeine, carbonated and fatty food intake and to take plenty of high fiber diet, vegetable and fruits. All subjects were subjected to six minute walk test to assess their exercise capacity. They were included in the study once they achieved 60% of their exercise capacity.

All subjects were categorized in to those with and without medical treatment. Both subjects had performed aerobic exercise thrice a week over a period of six weeks. On the study day, subjects' baseline BP and heart rate were recorded after five minute of rest. They were connected to heart rate monitoring device (Beurer PM25). After 15 minutes of warming up program they were given 30 minutes of aerobic exercise to maintain 60–80% of target heart rate(Karvanonformula), followed by 15 minutes of cool down exercise. Their final blood pressure and pulse rate were measured after 15 minutes of rest. After 6 weeks of the exercise program their BMI, Waist Circumference, Average BP, Total Cholesterol and LDL were measured and were statistically analyzed.

The effectiveness of life style modifications was assessed by paired t test on the pre and post test data. The relationships between BMI and waist circumference were studied and interpreted by Karl Pearson's correlation coefficient. The association of reduction of blood pressure with the demographic characteristics was analyzed and interpreted by χ^2 (Chi square test). The above statistical procedures were performed by the statistical package SPSS (13.0) at 5% level of significance.

Results and Discussions

The study subjects were classified according to their study variables like BMI, waist circumference, level of total cholesterol, LDL, SBP, DBP and demographic features like age, education and habit of medication at the time of starting life style modifications (aerobic exercise).

Table-1: Percentage distribution of mild and moderate hypertensive subjects, according to their demographic physiological and bio-chemical variables

Sl. No.	Variables	Component	Study Subjects n=20	
			No.	%
1	Age	< 50 years	12	60.0
		50 and above	08	40.0
2	Educational Status	Below Secondary Level(BSL)	08	40.0
		Secondary Level (SL)	02	10.0
		Above Secondary Level (ASL)	01	05.0
		Graduates (G)	09	45.0
3	Medications	Non-Medicated	12	60.0
		Medicated	08	40.0
4	BMI	Normal	01	05.0
		above normal	19	95.0
5	Waist circumference	Normal	09	45.0
		above normal	11	55.0
6	Total cholesterol	Normal	11	55.0
		above normal	09	45.00
7	LDL	Normal	11	55.00
		above normal	09	45.00

The table-1 states that among the study subjects 60% were below 50years and 40% were above 50 years. The median age of the study group was 48 years. In respect of their educational status, 40% had studied below secondary level, 10% had secondary level, 5% had above secondary level and 45% had obtained graduation. 60% of the study participants were not taking any medicine for controlling blood pressure. The normal BMI subjects were 5% and normal waist circumference were 45%. Fifty five percent of the subjects were normal total cholesterol and LDL. The mean age of the total subject was 48.1±10.4 (n=20). The mean age of male and female were 48.8±10.5 and 46.7±10.5 (male-13 and Female-7) respectively. The difference between the mean age of male and female was not statistically significant (P>0.05). The mean age of non-medicated and medicated subjects were 45.1±8.9 and 52.5±11.4 respectively.

The effectiveness of life style modifications

The effectiveness of life style modifications was studied by observing the blood pressure after 6 weeks of introduction of exercise, along with other variables, which were considered to be etiological factors to induce hypertension namely obesity, waist circumference, total cholesterol and LDL. The pre and post test results with inference were posted in the below table.

Table-2: Effectiveness of life style modifications on reduction of blood pressure with other etiological factors

Variable	Pre		Post		t	P
	Mean	SD	Mean	SD		
SBP	140.7	8.0	126.8	6.0	8.403	.000
DBP	91.0	4.5	82.6	2.9	11.730	.000
BMI	30.7	4.2	29.0	4.1	6.263	.000
Waist circumference	100.1	9.8	96.8	9.9	5.586	.000
Total Cholesterol	204.5	40.2	187.3	30.5	4.639	.000
LDL	138.7	33.4	129.1	33.7	2.853	.010

The pre and post test results enumerated in table-3 clearly shows that the SBP was considerably reduced from 140.7±8.0 to 126.8±6. The mean reduction of SBP as 13.9±7.4 was statistically significant (P<0.01). Similarly, the DBP was decreased from 91.0±4.5 to 82.6±2.9 mm/Hg. This mean decrease as 8.4±3.2 was also statistically significant (P<0.001). The above significant reductions were made by the life style modification approach. The other tabulated variables were also considered as Co-variables for increasing the blood pressure. They were

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also tested and found that the BMI was differentiated from 30.7±4.2 to 29±4.1. The mean difference as 1.7±1.2 was also statically highly significant (p<.001). The waist circumference was 100.1±9.8 before the introduction of life style modifications. The same was decreased as 96.8±9.9.The mean decrease 3.3±2.7 was statistically highly significant (P<0.001). The total cholesterol was decreased as 187.3±30.5 from 204.5±40.2 after the life style modifications. The mean decrease was 17.2±16.5 and the same was statistically significant (P<0.001) The LDL was also significantly reduced from 138.7±33.4 to 129.1±33.7 with a mean decrease as 9.6±15.0. The decrement was also statistically significant (P<0.05). The above analyses and interpretations provethat the life style modifications reduce the BMI, waist circumstances, total cholesterol and LDL.

Relationship between the hypertension with body mass index and waist circumference

The Body mass Indices (Pre and Posttest) were related with hypertension (pre and post SBP and DBP). Similarly the waist circumferences (pre and Post) were related with Pre and post SBP and DBP. The results were shown in table-3.The physiological pretest variables were not related since p>0.05. The posttest variables were also not related since p>0.05.

Table-3: Relationship of Body mass Index and waist circumference withHypertension

Relationship between	Correlation Coefficient	P
Pre BMI with Pre SBP	.036	.880
Pre BMI with Pre DBP	.029	.904
Pre waist circumference with Pre SBP	.194	.412
Pre waist circumference with Pre DBP	.008	.972
Post BMI with Post SBP	.214	.366
Post BMI with Post DBP	.338	.145
Post- waist circumference with SBP	.145	.541
Post waist circumference with DBP	.184	.437

Comparison of BMI and waist circumferences

The body mass index was compared with respective waist circumference in both occasions. The results available in the table-4 reveal that there was significant association between BMI and waist circumference in pre and posttests.

Table-4: Relationship between BMI with waist circumference in pre and post tests

Occasions	Related variables	r	Significance
Pre-test	BMI and waist circumference	0.684	.001
Post-test	BMI and waist circumference	0.659	.001

The pretest BMI related with pre- test waist circumference and the relationship was statistically significant P<0.01). The r^2=0.4678 reveals that 46.78% of the body mass index was explained or determined by waist circumference. The posttest BMI and waist circumference were also positively correlated and the relation was statistically significant (p<0.01). The r^2=0.4342 reveals that 43.42% of the body mass Index was determined by the waist circumference or vice versa.

Comparison of non-mediated and medicated in reduction of blood pressure by life style modifications

The non-medicated and medicated mild and moderate hypertensive subjects were compared with reference to the effectiveness of life style modifications.The pre and post systolic and diastolic blood pressures were compared and the results were obtained in the below table-5.

Table-5: Comparison of systolic and diastolic blood pressure in pre and post of non-medicated and medicated subjects

Category	BP	Pre test		Post test		't'	Significance
		Mean	SD	Mean	SD		
Non-mediated	SBP	140.8	8.8	124.5	4.7	7.508	.000
	DBP	91.0	4.6	82.0	2.9	9.362	.000
Medicated	SBP	140.4	7.3	130.1	6.4	4.977	.002
	DBP	90.9	4.6	83.5	2.9	7.255	.000

The above table-5 states that the SBP of non-medicated subjects was significantly reduced from 140.8±8.8 to 124.5±4.7. The mean reduction of BP was 16.3±7.5. Similarly the medicated SBP was significantly reduced form 140.4±7.3 to 130.1±6.4. The mean reduction was 10.3±5.8. The difference between the mean reductions of Non-medicated and medicated subjects were compared and found that the Non-medicated SBP reduction (16.3±7.5) was significantly greater than the medicated subjects SBP reduction (10.3±5.8). The difference between the mean reductions of BP was statistically significant. Similarly, the DBP reductions of both non-medicated and medicated subjects were compared and found that the non-medicated mean reduction (9.0±3.3) was greater than the medicated mean reduction (7.4±2.9). But the difference between the two mean reductions was not statistically significant. (p=0.262.) The analysis and interpretation proves that the life style modifications control the blood pressure among the non-medicated subjects than the medicated hypertensive subjects.

Association between demographic characteristics, educational status and medications with reduction of blood pressure

The posttest blood pressure was associated with their demographic characteristics like age, education and medication. The association showed in the above table-6 shows that no association between the age with post SBP and Post DBP was found (p>0.05). The educational status of the study subjects did not have any significant association with either post SBP or Post DBP (Table-7). The non-medicated or medicated study participants did not have any association with either post SBP or post DBP (Table-8). The demographic variables like age, education and medication were not associated with either post SBP or Post DBP.

Table-6: Association between age and reduction of blood pressure

Age	Association with post SBP					Association with post DBP				
	<Median	Median+	Total	χ^2	Significant	<Median	Median+	Total	χ^2	Significant
< 50 years	4	9	13	1.31	0.251	7	6	13	0.220	0.639
50 + years	4	3	7			3	4	7		
Total	8	12	20			10	10	20		

Table-7: Association between educational status with Post SBP and Post DBP

Education	Association with POST SBP					Association with POST DBP				
	<Median	Median+	Total	χ^2	Significant	<Median	Median+	Total	χ^2	Significant
BSL	3	5	8	0.845	0.839	3	5	8	3.6	0.307
SL	1	1	2			2	0	2		
ASL	0	1	1			0	1	1		
G	4	5	9			5	4	9		
Total	8	12	20			10	10	20		

Table-8: Association between medication with Post SBP and Post DBP

Medication	Association with POST SBP					Association with POST DBP				
	<Median	Median+	Total	χ^2	Significant	<Median	Median+	Total	χ^2	Significant
Non-medicated	6	6	12	1.250	0.264	8	4	12	3.333	0.068
Medicated	2	6	8			2	6	8		
Total	8	12	20			10	10	20		

Conclusion

The aerobic exercise significantly reduced the physiological variables like SBP, DBP, BMI and waist circumference. The life style modifications by the activities of aerobic exercise significantly reduced the bio-chemical variables like total cholesterol and LDL without any medication. The body mass index was positively correlated with waist circumferences.

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