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Effect of Aerobic Exercise on Quality of Life on Mild Hypertensive Patients

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Abstract
The purpose of the study was to investigate the effect of aerobic exercise on quality of life on mild hypertensive patients. 60 male mild hypertensive (stage 1 hypertension) patients (Systolic blood pressure 140-159 mmHg and/or Diastolic blood pressure 90-99 mmHg) from Thiruvananthapuram Corporation, Kerala were selected as subjects for the study. The age of the subjects ranged from 55-65 years (Mean age 58.28±3.8 years). The subjects were randomly divided into two groups of Experimental group and Control group consisting of 30 subjects each. The experimental group underwent aerobic exercise programme (Brisk walking at target heart rate zone, low impact aerobic exercise and recreational games) 5 days a week for a period of six months, each session was of 60 minutes duration. For both the experimental and control group data were collected on all the selected variables prior to the training programme (pretest), and after 2 months (mid test1), 4 months (mid test 2), and 6 months of the training programme (posttest). ANCOVA revealed significant improvement in overall quality of life in mild hypertensive patients following aerobic exercise. In the experimental group, Stage 3 reported higher adjusted mean (68.55) score followed by stage 2 (68.175) and Stage 1 (64.45). But in the control group there did not exist significant stage-wise differences in the overall quality of life scores (P>0.05).

Keywords: aerobic exercises, hypertensive patients, quality of life.

Introduction

The morbidity and mortality associated with hypertension are substantial. Nearly one billion people in the world currently have hypertension, causing high blood pressure to be one of the ten leading risk factors influencing the global burden of disease. It is estimated to lead to over seven million deaths each year, about 13 per cent of the total deaths worldwide (Kearney *et al*. 2005) [8]. By 2020, 1.56 billion adults worldwide will have hypertension (WHO 2013). Poorly controlled hypertension is a significant public health concern all over the world, in term of morbidity, mortality, and economic burden especially among older adults (Ogedegbe *et al*., 2013) [11].

Hypertension is a major public health problem and is the most prevalent chronic disease in India and the prevalence of it is rapidly increasing among both urban and rural populations in India. Studies show that for every known person with hypertension, there are two persons with either undiagnosed hypertension or prehypertension. In India, raised blood pressure increased from 5% in the 1960s to nearly 12% in 1990s, to more than 30% in 2008 (WHO 2013) [13]. Figure 1 shows age standardized prevalence of raised blood pressure in adults aged 25+ years East Asia region in 2008.

A survey of 26,000 adults in South India showed a hypertension prevalence of 20% (men 23% and women 17%) but 67% of those with hypertension was unaware of their diagnosis. Majority of hypertensive subjects still remain undetected and the control of hypertension is also inadequate. Reducing blood pressure can decrease cardiovascular risk and this can be achieved by lifestyle measures in mild cases and is considered the initial approach to hypertension management in all cases, including dietary interventions, weight reduction, tobacco cessation, and physical activity (Gupta and Gupta 2010) [5].

Indian hypertensive prevalence studies has shown higher hypertensive prevalence in Kerala (Criteria: JNC VI guidelines) reported 37% prevalence of hypertension among 30-64 age group in 1998 and 55% among 40-60 age group during 2000 (Zachariah *et al*. 2003) [14]. A higher prevalence of 69% and 55% was recorded among elderly populations aged sixty and

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above in the urban and rural areas respectively during 2000 (WHO 2001) [12]. 27.2% prevalence of hypertension was reported in 18-69 age group on a study conducted on Chennai (Kaur *et al.* 2007) [7]. In a study conducted on 20-69 age group 20% prevalence of hypertension was reported at national (Kinra *et al.* 2010) [9].

Exercise training has been recommended as one of the important lifestyle modifications for the prevention and management of hypertension. When compared with active and fit individuals, those who are sedentary have a 20% to 50% increased risk of developing hypertension. Endurance exercise training by individuals who are at high risk for developing hypertension will reduce the increase in blood pressure that occurs with age (Franklin *et al.*, 2000) [4].
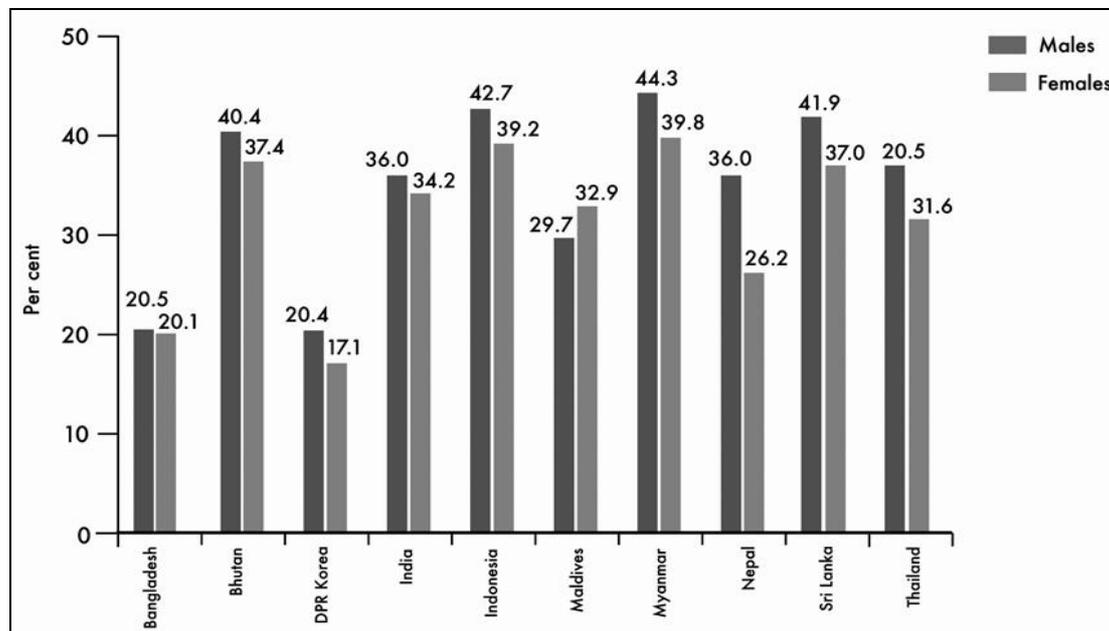

Fig 1: Age – standardized prevalence of raised blood pressure in adults aged 25+ years, South – East Asia Region, 2008(WHO 2011)

Physical fitness and Quality of life

Quality of life consist of several physical and psychological components. Health related quality of life factors are those that are influenced by health and physical function. Cross-sectional studies demonstrate positive associations between physical activity or physical fitness and health related quality of life (Bize., Johnson, and Plotnikoff 2007) [1]. It is generally accepted that in people who have a level of fitness that compromises their daily physical functioning, both aerobic and resistance training may contribute to an improved health-related quality of life (Izawa *et al.* 2004) [6].

Research by Breslow and Breslow (1993) [2] has shown that a person can increase their life span by nine years and lower your risk of disability by 50% by living a healthy life style, includes no smoking, moderate alcohol use, daily breakfast, limited snacking, 7 to 8 hours of sleep per night, regular physical activity, and maintaining a healthy weight.

Participants

Sixty male mild hypertensive patients (SBP140-159 mmHg and/or 90-99 mmHg) from Thiruvananthapuram city, Kerala were selected as subjects for the study. Their age ranged from 55-65 years (Mean age 58.28±3.8 years) of age. Participants were recruited from the general population through, notice advertisement, residential associations, and physician's referral from D.M. hospital powdikonam, Thiruvananthapuram. Subjects were selected for the study through screening. After screening participants completed Physical Activity Readiness Questionnaire (PAR-Q) and a medical history form, which was designed to establish an individual's fitness for physical activity and to identify individual who need medical clearance.

Table 1: Initial characteristics of subjects

Variable	Experimental Group	Control Group
Age(years)	58.87±3.96	57.7±3.66
Height(cm)	165.9±5.7	167.17±6.8
Systolic blood pressure(mmHg)	149.1±10.03	148.4±8.14
Diastolic blood pressure(mmHg)	93.13±4.17	92.2±5.36
VO$_{2max}$(ml/kg/min)	31.82±3.91	32.13±3.02
Body weight(kg)	74.91±9.2	73.69±7.4
Body fat (%)	26.38±3.4	25.77±3.5
Resting heart rate	75.17±6.36	73.93±6.09

The variable selected was quality of life using WHOQOL-BREF questionnaire.

Instrument

The WHOQOL-100 quality of life assessments was developed by the WHOQOL group, programme on mental health, World Health Organisation, Geneva, Switzerland, with fifteen international field centres, simultaneously, in an attempt to develop quality of life assessment that would be applicable cross culturally. WHOQOL-BREF questionnaire consisting of 26 items. The questions were intended to test quality of life in four domains. The four domains are Physical health. Psychological health, Social relationships and Environment.

Intervention

The selected mild hypertensive men (N=60) were randomly divided into two equal groups an Experimental group (N=30) and a Control group (N=30). The experimental group was assigned to aerobic exercise programme (Brisk walking at target heart rate zone, low impact aerobic exercise and recreational games) 5 days a week for a period of six months. Control group consisting of 30 (thirty) mild hypertensive men did not undergo any structured physical activity programme

during this period. During the experimental trials subjects of both groups were repeatedly instructed to keep dietary and usual activities as constant as possible. For both the experimental and control group data were collected on the selected variables prior to the 6 months training programme (pre-test), and after 2 months (mid test1), 4 months (mid test 2) and 6 months (posttest) of the training programme and the scores were recorded.

Results

Table 2: Descriptive statistics of Physical Health Domain of Quality of Life Scores in the Experimental and Control groups

Group	Experimental		Control	
Test	Mean	SD	Mean	SD
Pre	60.40	5.03	61.07	5.36
Mid 1	64.27	4.33	60.83	5.65
Mid 2	69.80	3.43	60.50	7.15
Post	70.20	3.99	61.20	6.03

Comparison of Physical Health Domain of Quality Of Life during Different Stages in the Experimental and Control Groups

Table 3: ANCOVA for stage wise difference of Physical Health Domain of Quality of Life for Experimental and Control group

Group	Source	SS	df	MS	F	P
Experiment	Between	659.822	2	329.911	39.633	<0.01**
	Within	715.871	86	8.324		
	Total	1375.693	88			
Control	Between	7.356	2	3.678	0.27	0.764 ns
	Within	1173.566	86	13.646		
	Total	1180.922	88			

ns: not significant(P>0.05), **: significant at 1% level(P<0.01)

Table 4: Scheffe's post hoc comparisons of Physical Health Domain of Quality of Life during different stages in the experimental and control groups

Group	Stage 1	Stage 2	Stage 3	MD	P
Experiment	64.267	69.8		-5.533	<0.01**
	64.267		70.2	-5.933	<0.01**
		69.8	70.2	-0.4	0.593 ns
Control	60.833	60.5		0.333	0.728 ns
	60.833		61.2	-0.367	0.702ns
		60.5	61.2	-0.7	0.465 ns

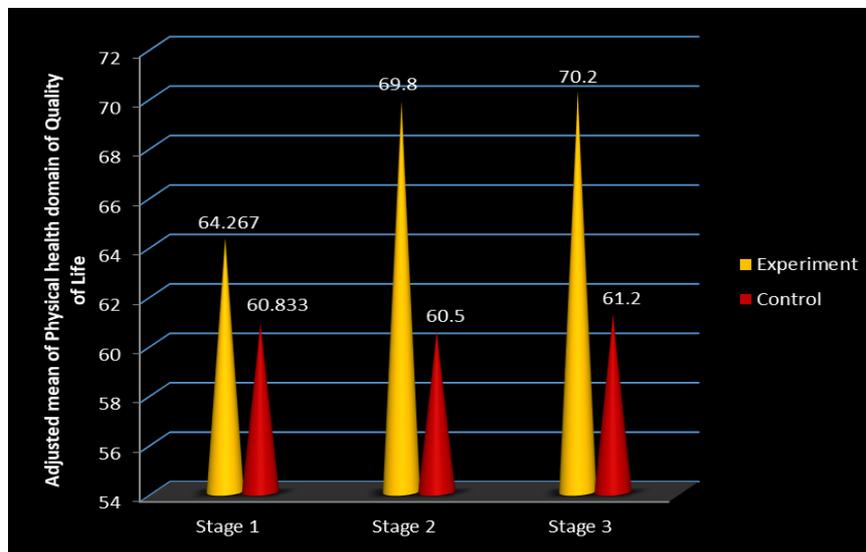ns: not significant(P>0.05), **: significant at 1% level(P<0.01)

Fig 2: Comparisons of Physical health domain of quality of life scores during different stages in the Experimental and Control group

Table 5: Descriptive statistics of Psychological Domain of Quality of Life scores in the Experimental and Control groups

Group	Experimental		Control	
Test	Mean	SD	Mean	SD
Pre	59.67	6.67	60.47	7.89
Mid 1	62.90	6.77	60.53	8.03
Mid 2	67.10	6.11	60.73	7.67
Post	67.57	5.46	60.07	7.24

Comparison of Psychological Domain of Quality Of Life during Different Stages in the Experimental and Control Groups

Table 6: ANCOVA for stage wise difference of Psychological Domain of Quality of Life for Experimental and Control group

Group	Source	SS	df	MS	F	P
Experiment	Between	396.356	2	198.178	18.656	<0.01**
	Within	913.568	86	10.623		
	Total	1309.924	88			
Control	Between	7.022	2	3.511	0.289	0.75 ns
	Within	1043.765	86	12.137		
	Total	1050.787	88			

Table 7: Scheffe's post hoc comparisons of Psychological Domain of Quality of Life during different stages in the Experimental and Control groups

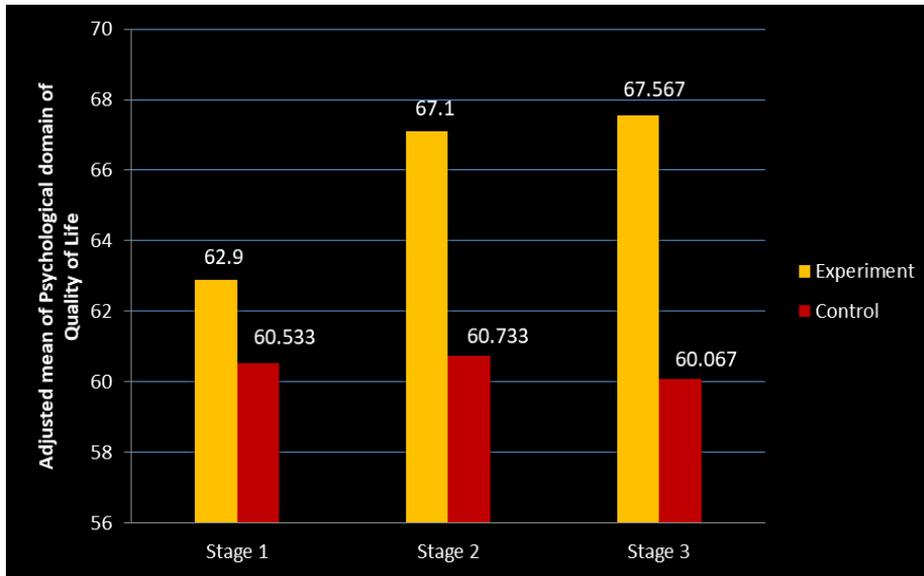| Group	Stage 1	Stage 2	Stage 3	MD	P
Experiment	62.9	67.1		-4.200	<0.01**
	62.9		67.567	-4.667	<0.01**
		67.1	67.567	-0.467	0.581 ns
Control	60.533	60.733		-0.200	0.825 ns
	60.533		60.067	0.466	0.605ns
		60.733	60.067	0.666	0.461 ns

Fig 3: Comparisons of Psychological Domain of Quality of Life scores during different stages in the Experimental and Control group

Table 8: Descriptive statistics of Social Relationships Domain of Quality of Life scores in the Experimental and Control groups

Group	Experimental		Control	
Test	Mean	SD	Mean	SD
Pre	62.13	8.34	62.90	9.52
Mid 1	66.37	6.63	62.87	11.04
Mid 2	71.13	5.06	63.13	9.43
Post	71.53	5.11	62.50	9.25

Comparison of Social Relationship Domain of Quality of Life during Different Stages in the Experimental and Control Group

Table 9: ANCOVA for stage wise difference of Social Relationship Domain of Quality of Life for Experimental and Control group

Group	Source	SS	df	MS	F	P
Experiment	Between	495.756	2	247.878	13.316	<0.01**
	Within	1600.844	86	18.614		
	Total	2096.6	88			
Control	Between	6.067	2	3.033	0.191	0.826 ns
	Within	1364.92	86	15.871		
	Total	1370.987	88			

ns: not significant(P>0.05), **: significant at 1% level(P<0.01)

Table 10: Scheffe's post hoc comparisons of Social Relationships Domain of Quality of Life during different stages in the Experimental and Control groups

Group	Stage 1	Stage 2	Stage 3	MD	P
Experiment	66.367	71.133		-4.766	<0.01**
	66.367		71.533	-5.166	<0.01**
		71.133	71.533	-0.400	0.72 ns
Control	62.867	63.133		-0.266	0.796 ns
	62.867		62.5	0.367	0.722 ns
		63.133	62.5	0.633	0.54 ns

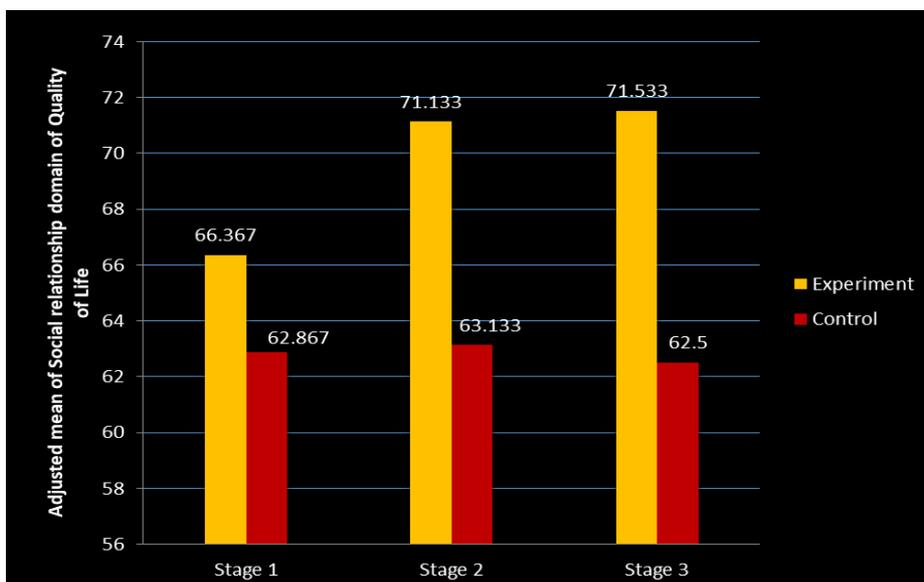ns: not significant(P>0.05), **: significant at 1% level(P<0.01)

Fig 4: Comparisons of Social Relationships Domain of Quality of Life scores during different stages in the Experimental and Control group

Table 11: Descriptive statistics of Environmental Domain of Quality of Life scores in the Experimental and Control groups

Group	Experimental		Control	
Test	Mean	SD	Mean	SD
Pre	63.37	6.31	62.33	6.45
Mid 1	64.27	5.87	62.13	6.13
Mid 2	64.67	6.18	62.53	6.14
Post	64.90	6.18	62.73	6.85

Comparison of Environmental Domain of Quality Of Life during Different Stages in the Experimental and Control Group

Table 12: ANCOVA for stage wise difference of Environmental Domain of Quality of Life for Experimental and Control group

Group	Source	SS	df	MS	F	P
Experiment	Between	6.156	2	3.078	0.395	0.675 ns
	Within	669.731	86	7.788		
	Total	675.887	88			
Control	Between	5.6	2	2.800	0.591	0.556 ns
	Within	407.535	86	4.739		
	Total	413.135	88			

ns: not significant($P>0.05$)

Table 13: Scheffe's post hoc comparisons of Environmental Domain of Quality of Life during different stages in the Experimental and Control groups

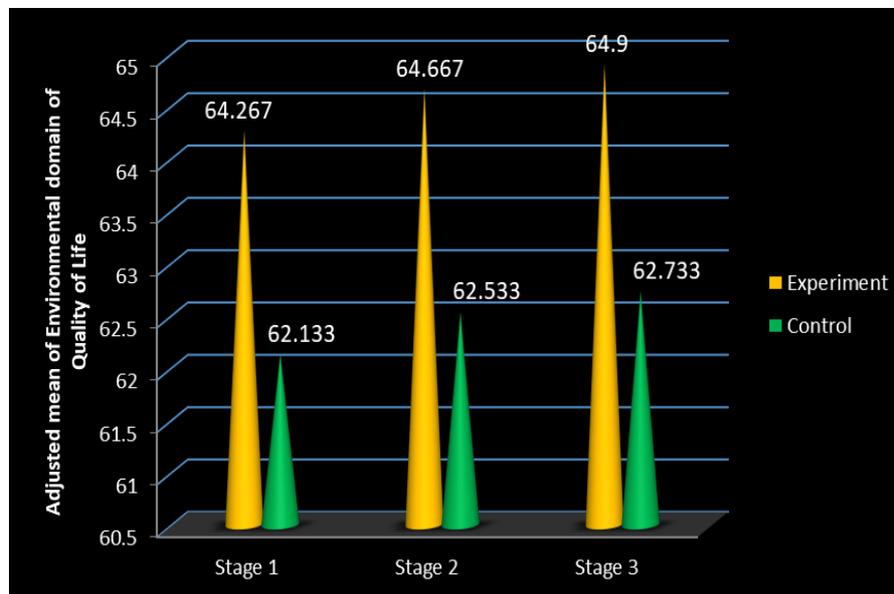| Group	Stage 1	Stage 2	Stage 3	MD	P
Experiment	64.267	64.667		-0.400	0.580 ns
	64.267		64.9	-0.633	0.382 ns
		64.667	64.9	-0.233	0.747 ns
Control	62.133	62.533		-0.400	0.479 ns
	62.133		62.733	-0.600	0.289 ns
		62.533	62.733	-0.200	0.723 ns

ns: not significant ($P>0.05$

Fig 5: Comparisons of Environmental Domain of Quality of Life scores during different stages in the experimental and Control group

Table 14: Descriptive statistics of Overall Quality of Life scores in the Experimental and Control group

Group	Experimental		Control	
Test	Mean	SD	Mean	SD
Pre	61.39	4.10	61.69	3.46
Mid 1	64.45	3.80	61.59	4.02
Mid 2	68.18	3.23	61.73	3.97
Post	68.55	3.11	61.63	3.44

Comparison of Overall Quality Of Life during Different Stages in the Control and Experimental Groups

Table 15: ANCOVA for stage wise difference of Overall Quality of Life for Experimental and Control group

Group	Source	SS	df	MS	F	P
Experiment	Between	308.263	2	154.131	41.066	<0.01**
	Within	322.779	86	3.753		
	Total	631.042	88			
Control	Between	0.289	2	0.144	0.034	0.967 ns
	Within	367.308	86	4.271		
	Total	367.597	88			

ns: not significant($P>0.05$), **: significant at 1% level($P<0.01$)

Table 16: Scheffe's post hoc comparisons of all Overall Quality of Life during different stages in the Experimental and Control group

Group	Stage 1	Stage 2	Stage 3	MD	P
Experiment	64.45	68.175		-3.725	<0.01**
	64.45		68.55	-4.100	<0.01**
		68.175	68.55	-0.375	0.455 ns
Control	61.592	61.725		-0.133	0.803 ns
	61.592		61.625	-0.033	0.95 ns
		61.725	61.625	0.100	0.852 ns

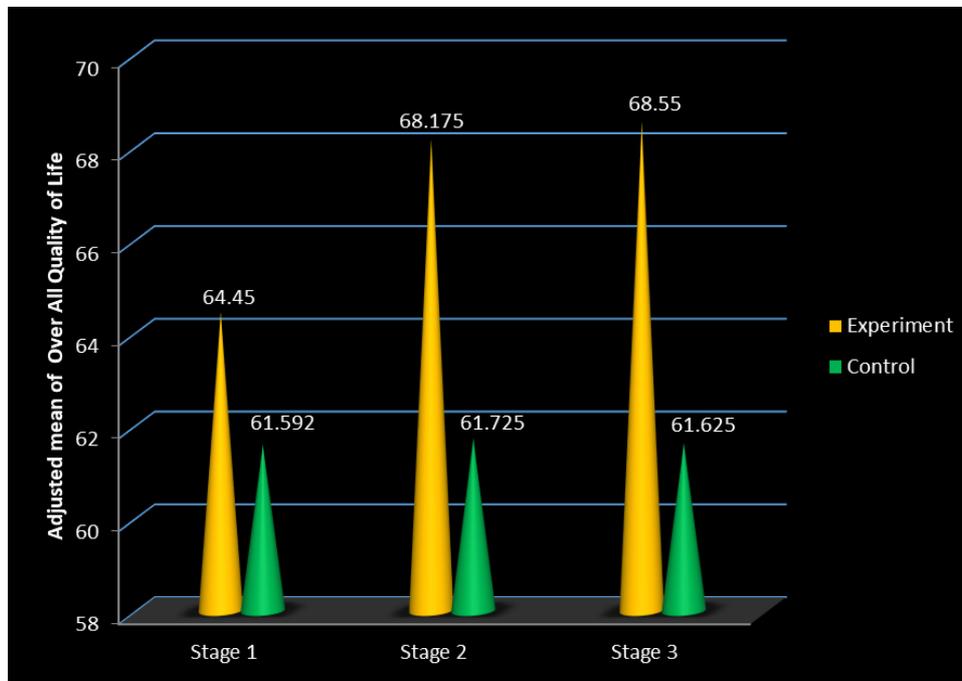ns: not significant($P>0.05$), **: significant at 1% level($P<0.01$)

Fig 6: Comparisons of Overall Quality of Life scores during different stages in the Experimental and Control group

Ethical considerations
Consent form was filled in by the participants. They were informed that their participation was voluntary, their responses would be confidential and that their participation would remain anonymous.

Discussion
The purpose of the study was to investigate the effect of aerobic exercise on quality of life of mild hypertensive patients.

Overall quality of life of the experimental group significantly improved as a result of 6 months of aerobic exercise programme. In the experimental group, Stage 3 reported higher adjusted mean score (68.55) followed by stage 2 (68.175) and Stage 1 (64.45). In the experimental group significant improvement in Overall quality of life was seen between stage 1 and stage 2, stage 1 and stage 3 but not between stage 2 and stage 3. The Overall quality of life included Physical, psychological, social and environmental domain of quality of life. In this study physical, psychological and social domain improved due to aerobic exercise programme, while in the case of environmental domain no changes were seen in any of the stages of training. The possible reasons for improvement in overall quality of life and the domains following the training programme might be:

1. As the aerobic exercise programme was performed in a group, which provided ample opportunities for mild hypertensive patients to widen their social networks, acquire new friendship and to obtain positive new roles in their retirement. This would have resulted in higher social domain.

2. Daily physical activities resulted in improved self-confidence, in other words, 'I can do it 'attitude developed. In this study health related physical fitness components of patients showed significant improvement following the training programme and this would have resulted in higher physical health domain of quality of life.

3. Daily physical activities plays an important role in normalizing the brain chemicals like Serotonin, dopamine, and norepinephrine and it also helps in mood elevation. This might have led to better psychological domain of quality of life.

4. In the current study environmental domain of quality of life did not show any improvement in the mild hypertensive subjects following the training programme and this would be because of environmental factors like transportation facilities, living environment, medical facilities, availability of resources, economic status are not affected by exercise and physical activity.

The Research Findings by Monga et.al. (2007) reported aerobic exercise 3 times a week for 8 weeks program improved social well-being and overall quality of life. Compatible with the findings of Cadmus *et al*., (2010) who found aquatic exercise offered therapeutic and pragmatic option to promote quality of life among individuals with both obesity and osteoarthritis

Conclusion
Sixteen weeks of Aerobic exercise programme improved overall quality of life in mild hypertensive patients.

Limitations of the study
The sample size in this study was small, but individual attention could be given. The diet and sodium intake was also one of the limitations. Most of them were taking medications which might have affected the result of the study.

Recommendations
With a larger sample size, randomized study groups and well selected measures, a better understanding of the quality of life could be achieved. There is a need for new approaches and methods to objectively measure the quality of life. This study suggests that aerobic exercise could be included in the exercise prescription for mild hypertensive patients.

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