Effectiveness of Progressive Muscle Relaxation on Blood Pressure and Quality of Life in Hypertensive and Normotensive Subjects

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Abstract: A quasi-experimental study, to know the effectiveness of progressive muscle relaxation on blood pressure and quality of life in essential hypertensive and normotensive subjects, was done with 20 hypertensive subjects divide to two groups A₁ & A₂. 10 normotensive subjects in group B. Progressive muscle relaxation technique was taught to the subjects in group A₁ & B. They were asked to perform it twice daily for a period of 10 weeks. Measurement blood pressure and quality of life was taken baseline and after 10 weeks. The data was analyzed using paired ‘t’ test for within group analysis and independent ‘t’ test for analysis between groups A₁ & A₂ at 5% level of significance. Result: The analysis within groups showed significant reduction blood pressure in groups A₁ & A₂ no significant change in group B, and no significant change in quality of life in group A₁ and significant change in domain I & II of quality of life in group A₂ & B. The between group analysis showed no significant difference in pre-test values of blood pressure and quality of life, the post-test values of blood pressure showed significant difference. But no significant difference post-test values of quality of life. Conclusion: Progressive muscle relaxation can be used as an adjunct treatment to treat essential hypertension

Keywords: Progressive muscle relaxation, hypertensive, quality of life

1. Introduction

Hypertension is one the major potentially modifiable risk factors for cardiovascular diseases and death. Hypertension is ranked as fourth top most disease on the basis of its prevalence [21]. It affects approximately one billion individuals worldwide [13]. Preventing and controlling hypertension is one of the most cost effective strategies to reduce global burden of cardiovascular disease in the general population. Reducing systolic blood pressure by just 3 mmHg in general population has the potential to reduce stroke mortality by 8% and coronary heart disease by 5% [3].

In India, the prevalence of hypertension in adult population varies from 3 to 10% and the average figure is 4.8%. The population at risk above the age of 20 years is 330 million as per 1981 population figures[18]. It is a major health problem and biggest of the challenges of the 21st century. Since many individuals who suffer from hypertension do not have specific symptoms related to their elevated blood pressure, so it is often called as the silent killer disease [9]. Essential, primary or idiopathic hypertension is defined as high blood pressure in which secondary causes such as renovascular diseases, renal failure, pheochromocytoma, aldosteronism or other causes of secondary hypertension are not present.

Essential hypertension accounts for 95% of all cases of hypertension [20]. It is a heterogeneous disorder, with different patients having different causal factors that lead to high blood pressure, it is also greatly influenced by diet and lifestyle.

World Health Organization recommended the use of non-pharmacological approaches in the treatment of hypertension. Various non-pharmacological measures includes life style modification, weight reduction, regular physical exercises, cessation of smoking, tobacco use cessation, increase in intake of fruits and vegetable, reduction in alcohol, sodium intake and potassium supplementation.

Lifestyle changes include changes that need to be made before initiating, or in addition to pharmacologic treatment. These changes protect individuals from hypertension, prevent the advancement of hypertension in its initial stages and support treatment. Implementing lifestyle changes can also decrease the number and dosage of antihypertensive medications, many of which have side effects, thereby preventing complications. Another lifestyle risk factor that has been shown to contribute to high blood pressure is psychosocial stress. In 2007 Canadian Hypertension Education Program recommends considering stress reduction intervention for normotensive and hypertensive patients [22].

Relaxation training is often viewed as one component of a more comprehensive package of stress management. Reducing stress can lower high blood pressure. Relaxation is an active process involving technique that claims body and mind. Progressive relaxation technique is a well-known and widely practiced technique for reducing stress, anxiety and depression, there by reduction in blood pressure. Progressive relaxation technique consists of a physical and mental component. The physical component involves tensing and relaxing the muscle groups voluntarily. The mental component focuses on the differences between the feeling of muscle at its states of tension and relaxation.
2. Methodology

Aim: To study the effectiveness of progressive relaxation technique on systolic and diastolic blood pressure and quality of life in mild hypertensive.

Objectives
- To find out the effect of progressive muscle relaxation on systolic and diastolic blood pressure and quality of life in hypertensive.
- To know the effect of progressive muscle relaxation on systolic and diastolic blood pressure and quality of life in normotensive.
- To compare the effect of progressive muscle relaxation versus conventional management on systolic and diastolic blood pressure and quality of life between hypertensive groups.

Study design: Quasi experimental study

Sampling technique: Purposive sampling technique

Sample size: 20 hypertensive subjects divide into two groups A1 and A2 and 10 normotensive subjects in group B

Inclusion criteria
- Cooperative
- Age between 35 and 55 years.
- Systolic blood pressure over 140mmHg/ Diastolic over 90mmHg.
- With antihypertensive medications.

Exclusion criteria
- Diabetes mellitus
- Chronic liver disease
- Endocrine disease

Study method

Consent for participation, initial assessment and record of blood pressure was done using Sphygmomanometer and quality of life using WHOQOL-BREF questionnaire. Progressive muscular relaxation was taught to the subjects in group A2 and B, and was asked to perform once in supervision. These subjects have been provided with a leaflet containing instruction of the technique and they were asked to perform twice daily over a period of 10 weeks. After 10 weeks blood pressure measurement and quality of life questionnaire was taken as with the same protocol as done for initial assessment.

Progressive muscle relaxation:
- The subject was made to sit on a chair with back and hands supported comfortably.
- The surrounding should be quite and ventilated.
- The subject was instructed to close eyes and focus attention on a given muscle group and not to hold breath during exercise.
- The subject was asked to concentrate and feel the difference between the states of tension and relaxation.

The subject was asked to contract the following muscle groups sequentially
1) Make a fist with the dominant hand without involving the upper arm.
2) Push the elbow of the same arm down against the arm of the chair, while keeping the hand relaxed.
3) Make a fist with the non-dominant hand without involving the upper arm.
4) Push the elbow of the non-dominant arm down against the arm of the chair, while keeping the hand relaxed.
5) Raise the eyebrows.
6) Screw up the eyes and wrinkling the nose.
7) Clench the teeth and pull back the corners of the mouth.
8) Pull the chin down and press the head back, tensing the neck muscles.
9) Draw the shoulders back.
10) Tighten the abdominal muscles.
11) Tense the thigh of the dominant leg by contracting the knee flexors and extensors together.
12) Point the dominant foot down.
13) Pull the dominant foot up.
14) Tense the thigh on the non-dominant leg by contracting the knee flexors and extensors together.
15) Point the non-dominant foot down.
16) Pull the non-dominant foot up.

At the end of the session the subject was asked to move feet and legs slowly, bend and stretch the arms and hands, move the head slowly and to open the eyes slowly.

3. Results

The statistical analysis were done using paired ‘t’ test and independent ‘t’ test.

Table 1 shows the paired ‘t’ test analysis of blood pressure for group A1, A2, B.

In group A1 systolic blood pressure, calculated ‘t’ value was 4.00, which is greater than the table ‘t’ value of 2.262, there is significant difference between the pre-test and post -test values. Diastolic blood pressure the calculated ‘t’ value was 3.28, which is greater than the table ‘t’ value of 2.262, there is significant difference between the pre-test and post -test values.

In group A2 systolic blood pressure the calculated ‘t’ value was 19.89 which is greater than the table ‘t’ value of 2.262, there is significant difference between the pre-test and post -test values. Diastolic blood pressure the calculated ‘t’ value was 7.36, which is greater than the table ‘t’ value of 2.262, there is significant difference between the pre-test and post -test values.

In group B Systolic blood pressure the calculated ‘t’ value was 1.79 which is lesser than the table ‘t’ value of 2.262. Therefore there is no significant difference between the pre-test and post -test values. Diastolic blood pressure the calculated ‘t’ value was 0.89 which is lesser than the table ‘t’ value of 2.262. Therefore there is no significant difference between the pre-test and post -test values.
**Table 1: Paired ‘t’ test analysis of blood pressure**

<table>
<thead>
<tr>
<th></th>
<th>Group A1</th>
<th>Group A2</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SBP Pre-test</strong></td>
<td>145.7</td>
<td>93.6</td>
<td>145.8</td>
</tr>
<tr>
<td><strong>SBP Post-test</strong></td>
<td>144.9</td>
<td>92.9</td>
<td>141.4</td>
</tr>
<tr>
<td><strong>DBP Pre-test</strong></td>
<td>93.6</td>
<td>145.8</td>
<td>93.2</td>
</tr>
<tr>
<td><strong>DBP Post-test</strong></td>
<td>92.9</td>
<td>141.4</td>
<td>90.5</td>
</tr>
<tr>
<td><strong>Mean value</strong></td>
<td>145.7</td>
<td>93.6</td>
<td>145.8</td>
</tr>
<tr>
<td><strong>Post-test</strong></td>
<td>144.9</td>
<td>92.9</td>
<td>141.4</td>
</tr>
<tr>
<td><strong>Calculated ‘t’ value</strong></td>
<td>4.00</td>
<td>3.28</td>
<td>19.89</td>
</tr>
<tr>
<td><strong>Table ‘t’ value</strong></td>
<td>2.52</td>
<td>2.262</td>
<td></td>
</tr>
</tbody>
</table>

**P value**

- Group A1 vs Group A2: P value < 0.05
- Group A1 vs Group B: P value > 0.05
- Group A2 vs Group B: P value > 0.05

Table 2 shows paired ‘t’ test of quality of life for group A1, A2, B.

In group A1, the calculated ‘t’ value for domain I, II, III & IV was 1.50, 1.49, 1.0 & 0.56 respectively, which is lesser than the table ‘t’ value of 2.262. Therefore there is no significant difference between the pre-test and post -test values in quality of life.

In group A2, the calculated ‘t’ value for domain I, II, III & IV was 3.66, 2.52, 1.12 & 1.50 respectively, domain I & II values is greater than and domain III & IV is lesser than the table ‘t’ value of 2.262. Therefore there is significant difference between the pre-test and post-test values in domain I & II and there is no significant difference between the pre-test and post-test values in domain III & IV of quality of life.

In group B, the calculated ‘t’ value for domain I, II, III & IV was 2.33, 2.98, 1.84 & 0.99 respectively, domain I & II values is greater than and domain III & IV is lesser than the table ‘t’ value of 2.262. Therefore there is significant difference between the pre-test and post-test values in domain I & II and there is no significant difference between the pre-test and post-test values in domain III & IV of quality of life.

**Table 2: Paired ‘t’ test analysis of quality of life of group A1**

<table>
<thead>
<tr>
<th>WHOBREF-QOL domains</th>
<th>Group A1</th>
<th>Group A2</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean value</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>51.40</td>
<td>49.40</td>
<td>67.40</td>
</tr>
<tr>
<td>Post-test</td>
<td>52.60</td>
<td>50.70</td>
<td>61.40</td>
</tr>
<tr>
<td><strong>Calculated ‘t’ value</strong></td>
<td>1.50</td>
<td>1.49</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Table ‘t’ value</strong></td>
<td>2.262</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P value**

- Group A1 vs Group A2: P value > 0.05
- Group A1 vs Group B: P value < 0.05
- Group A2 vs Group B: P value < 0.05

Table 3 shows independent ‘t’ test of blood pressure between group A1 and A2.

In pre-test systolic blood pressure the calculated ‘t’ value was 0.629 and diastolic blood pressure calculated ‘t’ value was 0.323 which is lesser than the table ‘t’ value of 2.101. Therefore there is no significant difference in pre-test values of systolic and diastolic blood pressure between two groups.

In post-test the calculated ‘t’ value for systolic blood pressure was 2.352 and diastolic blood pressure was 2.239 which is greater than the table ‘t’ value of 2.101.There is significant difference in post-test values of systolic and diastolic blood pressure between two groups.

**Table 3: Independent ‘t’ test analysis of blood pressure**

<table>
<thead>
<tr>
<th>Independent ‘t’ test</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group A1</td>
<td>145.7</td>
<td>144.9</td>
</tr>
<tr>
<td>Group A2</td>
<td>145.8</td>
<td>141.4</td>
</tr>
<tr>
<td><strong>SBP</strong></td>
<td>145.7</td>
<td>144.9</td>
</tr>
<tr>
<td><strong>DBP</strong></td>
<td>93.6</td>
<td>92.9</td>
</tr>
<tr>
<td><strong>Calculated ‘t’ value</strong></td>
<td>0.629</td>
<td>0.323</td>
</tr>
<tr>
<td><strong>Table ‘t’ value</strong></td>
<td>2.101</td>
<td></td>
</tr>
</tbody>
</table>

**P value**

- Group A1 vs Group A2: P value > 0.05
- Group A1 vs Group B: P value < 0.05
- Group A2 vs Group B: P value < 0.05

Table 4 shows independent ‘t’ test of quality of life between group A1 and A2.

In pre-test, the calculated ‘t’ value for domain I, II, III & IV was 0.342, 0.454,1.211 & 0.829 respectively was is lesser than the table ‘t’ value of 2.101.Therefore there is no significant difference in pre-test values of quality of life between two groups.

In post-test, the calculated ‘t’ value for domain I, II, III & IV was 1.998, 0.075, 1.176 & 0.907 respectively was is lesser than the table ‘t’ value of 2.101.Therefore there is no significant difference in post-test values of quality of life between two groups.
Table 4: Independent ‘t’ test analysis of quality of life

<table>
<thead>
<tr>
<th>WHOBREF-QOL domains</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>Mean value</td>
<td>Group A1</td>
<td>51.40</td>
</tr>
<tr>
<td></td>
<td>Group A2</td>
<td>52.50</td>
</tr>
<tr>
<td>Calculated ‘t’ value</td>
<td></td>
<td>0.342</td>
</tr>
<tr>
<td>Table ‘t’ value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P value</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Discussion

Hypertension is the disease, which causes multi system involvement. It poses severe risk factors on various diseases. Current treatment guidelines for hypertension include antihypertensive medications and health-promoting lifestyle modifications.

The antihypertensive medications and lifestyle modifications successfully reduce blood pressure to optimal levels. However, despite the effectiveness of antihypertensive medication, adherence to medication regimens is often poor and interferes with the goal of reducing blood pressure. In addition, hypertensive medications can produce troublesome side effects such as insomnia, sedation, dry mouth, drowsiness, impotence, and headaches [14]. Due to difficulty adhering, side effects, and prescription drug costs, hypertensive individuals may desire a nonpharmacologic intervention to avoid or complement their antihypertensive medication regimen. Therefore, whereas continued improvement in pharmacologic treatments is necessary, these advancements must be complemented by nonpharmacological approaches to blood pressure control.

The paired ‘t’ test results of blood pressure showed significant difference in group A1 and A2. The difference is due to the antihypertensive medication in group A1, and in group A2 is due to progressive relaxation training and antihypertensive medication. But there is no significant difference in group B as the blood pressure level is optimal, so progressive relaxation training does not lower blood pressure as it does in hypertensive. The quality of life was assessed using four domains physical health, psychological, social relationships and environment. The paired ‘t’ test results of quality of life in group A1 showed no significant difference in all the four domains, group A2 showed significant difference in physical health and psychological domains but no significant difference in social relationships and environment domains, group B showed significant difference in physical health and psychological domains but no significant difference in social relationships and environment domains.

The independent ‘t’ test result showed insignificant difference in pre-test values of blood pressure and quality of life which suggest that group A1 and A2 have almost same values of blood pressure and quality of life.

The independent ‘t’ test result of post-test values showed significant difference in blood pressure, which suggest that blood pressure in group A2 has been reduced, this could be due to the effect of progressive relaxation training that involves physical and mental components in form of tensing and relaxing of muscle groups and focusing the difference between the feelings of the tension and relaxation.

The main idea of initiating the relaxation response in this way is to take control of the voluntary muscles through creation of tension in them, followed by forcing them into a state of relaxation. When the body is aware of the presence of the tension, it will respond by triggering the muscles to relax, where the rest of the other components of the relaxation response will naturally follow. Further, it is believed that blood pressure may accompany anxiety; one can reduce anxiety by learning how to relax the muscular tension, but no significant difference was observed in any of the domains of quality of life.

Chesney et al observed that individuals with higher baseline blood pressures tend to benefit more from relaxation therapy than individuals with lower baseline blood pressures [15].

Stewart et al suggest that progressive relaxation training does not automatically lead to blood pressure lowering. Apparently cognitive processes can interfere with or promote the blood-pressure-lowering effect of muscle relaxation [16].

This study found systolic blood pressure decline of 3.5 mmHg and diastolic blood pressure decline of 2.4 mmHg in hypertensive subjects when compared between the hypertensive groups, within the relaxation group in hypertensive showed decline of 4.4 mmHg in systolic blood pressure and 2.7 mmHg in diastolic blood pressure and in normotensive systolic blood pressure decline of 1mmHg and diastolic blood pressure decline of 0.3 was noted after 10 weeks of progressive relaxation training.

A 2008 review of evidence for relaxation for high blood pressure found some evidence that progressive muscle relaxation lowered blood pressure a small amount. However, the review found no evidence that this effect was enough to reduce the risk of heart disease, stroke, or other health issues due to high blood pressure [17]. Thus the relaxation technique is a method of reducing blood pressure but did not return blood pressure to normal levels. This study suggests that progressive relaxation training can be used as an adjuvant therapy.

5. Conclusion

This study aimed at finding the effect of progressive relaxation training on blood pressure and quality of life in essential hypertensive and normotensive subjects.

This study found that progressive relaxation training has lowered the blood pressure in hypertensive group and there
no marked reduction in blood pressure in normotensive group. The paired ‘t’ test found improvement in domain I (physical health) & II (psychological) of quality of life in hypertensive and normotensive who received training.

Thus, progressive relaxation training can be used as an adjunct treatment to treat essential hypertension and can be practiced to reduce stress. The main advantage is that the technique is simple and easy to use, does not require any equipment.

6. Future Scope

- Studies can be done with larger sample.
- Further follow-up and assessment can be done to know the long term effects of progressive relaxation training on blood pressure and quality of life.
- Progressive relaxation training and other methods of relaxation can be compared.
- Studies can be done with progressive relaxation training along with walking and breathing exercise.
- Other classifications of blood pressure can be studied.

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