



Effect of Reflex Therapy on Stress and Blood Pressure among Older Adults with Hypertension

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Authors' contributions

This work was carried out in collaboration among all authors. Author SM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors JSH and AA managed the analyses of the study. Author JSH managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Reflex therapy relieves tension, relaxes the mind, improves the circulation of the body. In hypertension, vascular resistance increases the pressure of the blood vessels. The study was aimed to assess the pretest and post-test levels of stress and blood pressure (BP), evaluate the effectiveness of the reflex therapy among older adults with hypertension, and to associate the level of stress and BP with demographic variables.

Study Design: Community-based randomized controlled trial was adopted.

Place and Duration of Study: The urban area, Poonamallee, in Chennai, between October to December 2019.

Methodology: Among 100 older adults, 50 participants were selected in each experimental and control group by using simple randomization. Perceived Stress Scale (PSS) and dual function BP monitor was used to assess the stress and BP respectively. Reflex therapy was provided for 6 weeks to the older adults with hypertension, who had low and moderate levels of stress in the experimental group. The different pressures such as 100%, 75%, and 50%, that was applied in the

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foot for 15 minutes weekly twice by reflexology stick, when the participants were in an empty stomach. The data were analyzed using descriptive and inferential statistics.

Results: The mean and standard deviation value of pretest and post-test stress level was 14.84 ± 6.02 , 9.4 ± 4.73 in experimental group, 13.32 ± 5.3 and 13.04 ± 5.09 in control group respectively. This proves that reflex therapy was effective in reducing stress levels which was statistically significant ($P=0.001$). Mean and standard deviation of systolic BP in pretest and post-test was 142.74 ± 5.98 and 137.78 ± 5.69 ; 141.11 ± 6.18 and 142.03 ± 6.29 , and diastolic BP was 98.21 ± 3.28 ; 97.31 ± 3.15 and 97.94 ± 3.59 ; 98.96 ± 3.34 in experimental and control group respectively indicated that the reflex therapy helps to reduce the level of BP ($P=0.001$).

Conclusion: Reflex therapy is beneficial to older adults particularly with hypertension for relieving stress and reducing systolic and diastolic BP.

Keywords: Reflex therapy; effect; older adults; stress; blood pressure; hypertension.

1. INTRODUCTION

Aging is a process of human beings as a biological experience for them in this world. During this process, sequential changes are happening throughout the human's life span. Though it is a multidimensional process, it is the last stage of life for an individual [1]. According to the World Health Organization, currently in the world's population around 10% is comprised of older adults with the age of 65 years and above. This figure is set to rise as 30% in some societies. Major challenges are faced by many countries globally to make sure that their health and social systems are prepared to face the most of this demographic transition [2].

Hypertension is one of the major public health problems and chronic issues in India and the world in which the blood pressure (BP) in arteries, persistently elevated and increasing the risk of cardiovascular and kidney diseases [3]. Hypertension prevalence is related to age due to mental stress and anxiety [4]. Stress is playing a vital role as a cause, consequence, and mostly potentiating factor for hypertension [5]. The overall prevalence of hypertension is about 33% in Indians which leads to the risk of stroke, which needs urgent intervention [6].

Reflex therapy is a complementary therapy. It is a systematic function based on some pressure applied by using tools that aid in targeting and adding more pressure on specific points. The functions of different organs in the body are indicated by various reflex points. The health of the body organs is affected by the cells in humans, when reflex points are stimulated, by creating a reflex impact [7,8]. Reflex therapy relieves tension, relaxes the mind, improves circulation, and promotes the natural function of the body [9].

As a complementary therapy, sole reflexology is a non-invasive and alternative treatment. In this current scenario, few investigators have been started some methods of intervention through the non-pharmacological way [10]. Previous researches provided only limited evidences in results, that stress reduction programs are associated with significant BP control. Some interventions like relaxation techniques was the least effective for reducing the level of stress and BP. Some of the researchers proved that foot reflexology promotes relaxation to the mind and stimulates equilibrium. Hypertension prevalence increases related to old age, affecting approximately 66% of the older adult population. Most of them are stressful [11].

To answer the question, how does reflex therapy effect on the level of stress and BP among older adults with hypertension, the study researchers aimed for investigation to assess the pretest and post-test level of stress and blood pressure (BP), evaluate the effectiveness of the reflex therapy among older adults with hypertension, and to associate the level of stress and BP with demographic variables.

2. MATERIALS AND METHODS

2.1 Study Design

This was a community based randomized controlled trial where two groups with pre and post-test evaluative approach was used with reflex therapy as intervention (independent variable) on stress and BP changes (dependent variable). This study was conducted among older adults with hypertension from the age of 56 years (as per aged care guide criteria), living at the place of Poonamallee in Chennai who had low and moderate levels of stress. The study participants were calculated to be 120 older

adults with a 95% confidence level by using the power analysis of sample size calculation. After the attrition due to non-consent and migration, the total sample of 100 older adults, in which 50 older adults for the experimental group and 50 older adults for the control group, included in the study. They were selected through simple random sampling by getting a random number from the generator using assigned random numbers (from 1 to 100). The research was approved by the Institutional Human Ethical Clearance Committee, and the study purpose, along with the associated possible risks and benefits was explained to the older adults in their understandable (Tamil) language. Informed written consent was explained and obtained from all study participants. Older adults people with hypertension, from the age of 56 years, shown interest of participating in the research, with low and moderate stress levels including both men and women, who were in regular and similar group of antihypertensive drugs with increased BP were included in the study. Hypertensive people already controlled BP, undergoing reflex and other complementary therapies and people with abnormalities in the hand and foot like a fracture, foot ulcer, wound and selected psychiatric illnesses such as paranoid schizophrenia, dementia, and older adults with complicated hypertensive and critically ill were excluded from the study.

2.2 Description of the Tool

The tool consists of three parts. Part one comprised of demographic variables consisting of age, sex, educational status, occupation, family type, marital status, physical activity, duration of hypertension, and comorbid illness. Part two included assessment of blood pressure for which, DM-3000, dual-function BP monitor in automatic mode with the digital column was used. Part three included the Perceived Stress Scale (PSS), which is a classic stress assessment instrument. The tool was developed in 1983, for helping to identify the various situations that affect perceived stress and feelings. Many researchers reported that PSS is a relatively satisfactory tool and has good reliability [12] Internal consistency of PSS ($\alpha=0.79$) was tested in India for its validity and reliability, which was satisfactory [13]. Intra-rater reliability was also adequate for all the items of the tool. The item of questions in the tool are related to people's thoughts and feelings which was experienced in the previous month. In this PSS tool, the Individual scores range from 0 to

40. In that, the higher scores indicate a higher perceived stress level. The range of score from (0 to 13) is considered as low stress, from (14 to 26) as moderate stress and from (27 to 40) considered as high perceived stress. However, the older adults people with hypertension, who had low stress and moderate stress were included in the research.

2.3 Reflex Therapy

Reflex therapy is an alternative practice or a complementary therapy, in that the pressure applied in various points. It works on the feet to ensure the healing of the whole person and not alone the prevailing symptoms. Reflex therapy is the scientific method of stimulating the reflexes of a foot, hand or ear, especially that parts are corresponding to gland, organ and part of the body, because in each hand and foot there are 7,200 nerve endings [14]. Reflex therapy can be used to restore and maintain the body's natural equilibrium. In reflex therapy, the vital energy flows through the vessels of blood, that are circulating between organs of the human body, which will enable us to penetrate each living cell. As the reflex therapy called as the zone therapy, the zone blockage will be treated while there is blockage of energy. Reflex therapy is known to be a natural therapy that relaxes the body and as a non-invasive therapy, it is not harmful. Rarely, there will be some manifestations like nausea, headache, perspiration, coldness due to the release of toxins that may be the natural healing process of the body. However, these symptoms are not directly due to reflex therapy, and moreover, they are temporary and harmless. The researcher who had undergone professional training and certified for providing reflex therapy. The researcher used three different pressures as 100%, 75%, and 50%. The pressure was applied for 15 minutes in the foot, by using the fingers and reflexology stick, when the participant was in an empty stomach. The pressure points are for the glands such as pituitary, pineal, thyroid, and parathyroid, also for the sense of balance, kidneys, ureters, head part for blood supply, where pressures have been given.

2.4 Data Collection

In the data collection procedure, after obtaining informed consent, the investigator collected the data through the interview method for demographic details and the PSS scale. Participant's BP was checked with dual-function digital BP monitor. Among the 120 older adults

with hypertension, 100 older adults with mild and moderate stress were selected as per inclusion criteria. Then using a simple random sampling technique, getting a random number from the generator (random numbers from 1 to 100), 50 older adults were selected in the experimental group and the remaining 50 were included in the control group. After the pretest, reflex therapy was provided weekly twice to older adult people who were with low and moderate levels of stress in the experimental group. Fortunately, all 50 participants received the therapy completely. After 6 weeks of therapy, the post-test level of stress and BP was assessed among both experimental and control groups.

2.5 Statistical Method

Frequency and the percentage distribution was used for analyzing the demographic variables among older adults in the experimental and control groups. Mean and standard deviation was calculated to assess the pretest level of stress, systolic and diastolic BP among older adults in the experimental and control groups. The effectiveness of reflex therapy on stress and BP within the group and between experimental and control groups was determined through inferential statistics by calculating 't' test value for the significance ($P > 0.05$). Chi-square test was used to associate between selected demographic variables and post-test levels of stress and BP among older adults in the experimental group ($P > 0.05$).

3. RESULTS

The frequency and percentage of stress levels show that in the experimental group, out of 50 samples, majority 24 (48%) had low level of stress, and 26 (52%) had moderate level of stress with hypertension in the pretest, and 42 (84%) had low level of stress and eight (16%) had moderate level of stress in post-test. It proves that there was increase in the number of and percentage of low and moderate levels of stress in post-test after the intervention of reflex therapy.

In the control group, 28 (56%) had low stress and 22 (44%) had moderate stress with hypertension in pretest, and 30 (60%) had low stress and 20 (40%) had moderate stress among older adults in post-test. There was no much difference in the levels of stress in pretest and post-test in the control group.

The experimental and control groups had no statistically significant difference in the mean score of stress level before the therapy ($t = 1.35443$, $P > 0.05$). The experimental and control group had a statistically significant difference ($t = -3.7455$, $P < 0.001$) in the mean score of stress level after the six weeks of therapy given in 12 sessions to the intervention group.

The mean score difference between before and after reflex therapy proves that there was a statistical significance in the experimental group ($t = -11.6798$, $P < 0.001$). The mean score difference evidenced that there was reduction of stress level. The mean score difference between the pretest and post-test proves that there was no statistical significance in the control group ($t = -1.15865$, $P > 0.05$).

The effectiveness of reflex therapy on stress, between the experimental and control group, was found that it was statistically significant ($t = -2.62131$, $P = .01$).

The experimental and control group had no statistically significant difference in the mean score of the systolic BP level before the therapy ($t = 1.237$, $P > 0.05$). The experimental and control group had a statistically significant difference in the mean score of systolic BP level after the therapy ($t = -3.522$, $P < 0.01$). The mean score difference before and after reflex therapy proves that there was a statistical significance in the experimental group ($t = -11.079$, $P < 0.001$). The mean score difference of pre and post-test proves that there was no statistical significance in the control group ($t = -3.382$, $P > 0.05$). The effectiveness of reflex therapy on systolic BP, between the experimental and control group, which was statistically significant ($t = 3.525$, $P = .001$) with the degrees of freedom (98) and standard error of difference was 1.206.

The experimental and control group had no statistically significant difference in the mean score of diastolic BP level before the therapy ($t = 0.38$, $P > 0.05$). The experimental and control group had a statistically significant difference in the mean score of systolic BP level after the therapy ($t = -2.518$, $P < .01$). The mean score difference before and after reflex therapy proves that there was a statistical significance in the experimental group ($t = 8.79$, $P < 0.001$). The mean score difference of pre and post-test proves that there was statistical significance in the control group ($t = -6.633$, $P > 0.001$), but the mean score

was increasing after six weeks instead of reducing. The effectiveness of reflex therapy on diastolic BP, between the experimental and control group, was statistically significant ($t=2.514$, $P=.01$) with the degrees of freedom (98) and the standard error of difference was 0.656. It shows that reflex therapy was effective in controlling BP among the study participants.

There was a significant association found between post-test stress level and marital status, and duration of hypertension physical activity ($P<.05$) in the experimental group (Table 5). Also, there was a significant association found between systolic BP and education, family type, and physical activity ($P<.05$).

Table 1. Distribution of frequency and percentage of demographic variables of older adults in experimental and control groups

Variables		Experimental group(n=50) N (%)	Control group(n=50) N (%)
Age	56-60 years	24 (48)	26 (52)
	61-70 years	16 (32)	20 (40)
	71-80 years	8 (16)	4 (8)
	>80 years	2 (4)	0 (0)
Sex	Male	22 (44)	20 (40)
	Female	28 (56)	30 (60)
Educational Status	Non-literate	4 (8)	6 (12)
	Primary education	6 (12)	2 (4)
	High school	16 (32)	12 (24)
	Higher secondary	14 (28)	10 (20)
	Graduate & others	10 (20)	20 (40)
Occupation	Business	16 (32)	12 (24)
	Government Job	4 (8)	2 (4)
	Private Job	8 (16)	14 (28)
	Retired	10 (20)	12 (24)
	Unemployed	12 (24)	10 (20)
Family type	Nuclear	42 (84)	38 (76)
	Joint	8 (16)	12 (24)
Marital Status	Single	4 (8)	4 (8)
	Married	36 (72)	40 (80)
	Widow/Widower	6 (12)	6 (12)
	Divorcee	4 (8)	0 (0)
Physical Activity	Sedentary	24 (48)	16 (32)
	Moderate	22 (44)	32 (64)
	Heavy	4 (8)	2 (4)
Duration of Hypertension	< 2 years	20 (40)	16 (32)
	2-5 years	16 (32)	18 (36)
	more than 5 years	14 (28)	16 (32)
Co-morbid Illness	Lung Disease	4 (8)	4 (8)
	Heart Disease	6 (12)	1 (2)
	Diabetes	36 (72)	34 (68)
	Others	4 (8)	11(22)

N, number of subjects

Table 2. Effect of reflex therapy on stress in experimental and control group

Study group	Pretest	Post-test	Paired 't' test
	Mean (SD)	Mean (SD)	
Experimental group	14.84 (6.02)	9.4 (4.73)	$t= -11.6798$ $P=0.00001*(S)$
Control group	13.32 (5.3)	13.04 (5.09)	$t= -1.15865$ $P=0.258(NS)$
Independent 't' test	$t= 1.35443$ $P=0.178714(NS)$	$t= -3.7455$ $P=0.000304*(S)$	

*N=50; * Significant at $P<.001$; NS-Non-Significant*

Table 3. Effect of reflex therapy on systolic BP in experimental and control group

Study group	Pretest	Post-test	Paired 't' test
	Mean (SD)	Mean (SD)	
Experimental group	142.74 (5.98)	137.78 (5.69)	t= 11.079, df=49 P=0.00001*(S)
Control group	141.11 (6.18)	142.03 (6.29)	t= -3.382, df=49 P=0.999(NS)
Independent 't' test	t= 1.237 P=0.219(NS)	t= -3.522 P=0.001*(S)	

N=50; * Significant at P=.001; NS-Non-Significant

Table 4. Effect of reflex therapy on diastolic BP in experimental and control group

Study group	Pretest	Post-test	Paired 't' test
	Mean (SD)	Mean (SD)	
Experimental group	98.21 (3.28)	97.31 (3.15)	t= 8.79, df=49 P=0.00001*(S)
Control group	97.94 (3.59)	98.96 (3.34)	t= -6.633 P=0.0001*(S)
Independent 't' test	t= 0.38 P=0.705(NS)	t= -2.518 P=0.013*(S)	

N=50; * Significant at P=.01; NS-Non-Significant

Table 5. Association between stress level and selected demographic variables in experimental group (n=50)

Demographic variables		Stress level (Post-test)		Chi-square test
		Low	Moderate	
Marital Status	Single	6	2	X ² =8.6475 P=.034364*
	Married	64	8	
	Widow/Widower	10	2	
	Divorcee	4	4	
Physical Activity	Sedentary	42	6	X ² =22.7205 P=.000012*
	Moderate	40	4	
	Heavy 8	2	6	
Duration of Hypertension	< 2 years	38	2	X ² =7.0738 P=.029104*
	2-5 years	26	6	
	> 5 years	20	8	

* Significant at P<.05

4. DISCUSSION

The results of the present study showed that 44% of males and 56% of females participated in the experimental group (Table 1). The study conducted on the effect of foot reflexology and back massage on hemodialysis patient's fatigue and sleep quality by Unal and Akpınar [14] showed that 52.4% were males and 47.6% were females. In our study, reflex therapy proved that the stress level in pretest was 14.84 ± 6.02 and in the post-test was 9.4 ± 4.73 . This was supported by a similar study on the effect of reflexology on stress management done by Bernard Payrau et al (2017) which evidenced that analysis of covariance performance adjusting on stress level into 41.73 from 44.89 [15]. In a study conducted by Ali Khaledifar et. Al, the study subjects, who received reflex therapy there was a reduction of stress level slightly from 60.60 ± 7.20 to 34.70 ± 4.70 compared with the other two groups [16].

The current study evidenced that 6 weeks of reflex therapy reduce the systolic and diastolic BP levels among older adults with hypertension. These results were supported by the research investigated the impact of reflexology on essential hypertension patients [17].

The present study demonstrated that reflex therapy decreases the level of BP among older adults with hypertension which was in agreement with Ali Khaledifar et. al. [16]. The effect of reflex therapy proved on vital signs and the level of stress for the people before undergoing coronary angiography, it helped to stabilize the vital sign as well as reduce the level of stress. The study proved that the systolic pressure 144.40 ± 27.60 before intervention was decreased to 139.60 ± 26.40 which was significant at $P < 0.001$ and the diastolic pressure 86.60 ± 13.50 before intervention was decreased to 82.40 ± 13.00 which was significant at $P < 0.002$. In accordance with the reports presented by our study, systolic

BP was 137.78 ± 5.69 after intervention from 142.74 ± 5.98 and the t value -11.079 proved that there was a significant decrease in systolic BP at $P < 0.001$ in the experimental group. In the current study there was a significant decrease in diastolic BP after the reflex therapy mean and SD was 97.31 ± 3.18 compared to the pretest value 98.21 ± 3.32 , proved by $t = -8.79$, $P = .001$. The results proved that foot reflexology was an effective intervention to decrease systolic pressure, and triglyceride [18]. Foot reflexology had a powerful effect on cardiovascular parameters [19] and it has the most beneficial effect on people with feet impairment especially in type 2 diabetes mellitus [20].

The chi-square test in this study reveals that there was a significant association found between stress level and marital status, and duration of hypertension physical activity ($P < .05$). However, a study was carried out by Diaz-Godino, et al evidenced that there was a significant association between anxiety and marital status ($P = 0.043$) [21]. Also, there was a significant association found between systolic BP and education, family type, and physical activity ($P < .05$) in this present research. The study resulted that there was a significant association between time spent in total physical activity and mean arterial BP ($P = 0.04$). Similarly, for each hour per day spent in indoor activities, there was a 2.35 and 2.15 mm Hg decrease in diastolic BP ($P = 0.001$) and mean arterial BP ($P = 0.004$), respectively [22].

The study was carried among patients with cancer, which evidenced that there was a significant decrease in all indices including systolic BP, diastolic BP, heart rate, and respiratory rate after 30 minutes of reflex therapy [23].

5. CONCLUSION

Older adult people life is stressful due to many reasons. Some of the people with hypertension BP is increased even though they are under treatment of antihypertensive drugs. In a condition, this study results proved that reflex therapy is beneficial to older adults particularly with hypertension for relieving stress and reducing systolic and diastolic BP. Hence, the reflex therapy can be practiced by the older adults with stress and increased BP. In prospects for further study can be conducted to investigate the effect of reflex therapy with a high level of stress among older adults also this foot reflex

therapy compared with the effect of facial reflexology.

CONSENT

The written patients' consent have been collected and preserved by the authors as per the standard of the university.

ETHICAL APPROVAL

The authors have obtained ethical approval (IHEC No.2019-34) from the Institutional Ethical Committee. This confirms that this study is either not against the public interest, or the release of information allowed by legislation. As per the standard of the university written ethical approval has been obtained and preserved by the authors in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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