ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Assessment of psychological parameters, psychomotor speed, and quality of life in pre-hypertensive women

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Submission: 17-07-2022 Revision: 29-11-2022 Publication: 01-01-2023

ABSTRACT

Background: Individual is considered as pre-hypertensive when the blood pressure is between 120 and 139/80–89 mmHg. There is an increase in the prevalence of pre-hypertension in Indian population. Hence, early diagnosis of pre-hypertension helps to prevent these diseases and increase the quantity and quality of life. **Aims and Objectives:** The present study was undertaken to observe the psychological parameters, psychomotor speed, and quality of life in pre-hypertensive women. **Materials and Methods:** Thirty cases of pre-hypertensive women between the age of 25 and 50 years and 30 age-matched non-pre-hypertensive women were included in the study. Depression, anxiety and stress, self-esteem, negative affectivity (NA) and social inhibition (SA), and quality of life were assessed using standard questionnaires. Visual and auditory reaction time (RT) was assessed using RT apparatus. **Results:** There was a significant ($P<0.001$) lower physical health score, psychological score, social relationships score, and environmental scores pre-hypertensive women when compared to healthy individuals. There was significantly ($P<0.05$) longer visual and auditory RT for the right and left responses in pre-hypertensive women when compared to healthy individuals. Significantly higher ($P<0.05$) levels of depression, anxiety, and stress and significantly lower self-esteem scores were observed in pre-hypertensive women when compared with healthy individuals. NA and SA were significantly higher ($P<0.001$) in pre-hypertensive women when compared with healthy individuals. **Conclusion:** Pre-hypertension has strong negative impact on psychological parameters, RT and quality of life. It is the need of time to increase awareness of pre-hypertension in general population. We recommend planning and implementation of special care programs for these individuals.

Key words: Pre-hypertension; Reaction time; Psychological parameters; Quality of life

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v14i1.46762

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Blood pressure between 120 and 139/80–89 mmHg is considered as pre-hypertension.[1] Increased blood pressure is most common in the present-day life style and it is categorized as one of the major public health issues.[2] The prevalence of prehypertension is reported as 32% in India and urban population is reported as at risk.[3-5] Further in Lucknow, North India, the prevalence of pre-hypertension was 32.3% and in Chennai, South India, was 36.1%.[2,6] Pre-hypertension is more common in males when compared to females. Pre-hypertension is considered as predictor for cardiovascular and cerebrovascular diseases. Hence, early diagnosis of pre-hypertension helps to prevent these diseases and increase the quantity and quality of life.[7] Earlier studies reported that there was an increase in the prevalence of pre-hypertension in Indian population. The contributing factors are family history, sedentary life

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style, obesity, consumption of alcohol, and smoking.[5] The management plan of pre-hypertension is by changing the life style and recommending exercise. Prescribing drugs is not recommended for pre-hypertension.[8,9] Among the cardiovascular disorders, the hypertension is reported to be the major contributor for impairment of cognition.[10] The key target of hypertension is the brain and it causes decrease in the processing speed of information in brain and also impairs memory.[11,12] It was reported that there was significant decrease in the quality of life in the patients with high blood pressure.[13] Further, it was reported that among the pre-hypertensive population, about 37% become hypertensive in a span of 4 years.[14] Hence, it is very essential to diagnose the pre-hypertension at the earliest and manage it to prevent hypertension. It is need of time to consider assessment of psychological parameters, psychomotor speed, and quality of life for the diagnosis and management of pre-hypertension. Hence, the present study was aimed to observe the psychological parameters, psychomotor speed, and quality of life in pre-hypertensive women.

Aims and objectives

The present study aimed to observe the psychological parameters, psychomotor speed, and quality of life in pre-hypertensive women.

MATERIALS AND METHODS

Study design

This was a case–control study

Study setting

The present study was conducted at the Department of Physiology, R.D. Gardi Medical College, Ujjain, India in collaboration with the Department of Biochemistry, R.D.Gardi Medical College, Ujjain, India.

Participants

Thirty cases of newly diagnosed pre-hypertensive women between the age of 25 and 50 years and 30 age-matched non-pre-hypertensive women were included in the study after obtaining written informed consent. All the participants were right-handed. All the participants were advised to continue their routine habits and diet throughout the study. The following criteria were followed while selecting the cases.

Inclusion criteria

Individuals newly diagnosed with a systolic blood pressure of 120–139 mmHg or diastolic blood pressure of 80–89 mmHg, not suffering from any other disease, under no medication, and not practicing any stress management techniques were included in the study.

Exclusion criteria

Pregnancy or postpartum <3 months and body mass index >40 kg/m^2, those already attained menopause, smokers and alcoholics, and unwilling participants were excluded from the study.

Recording of blood pressure

Blood pressure was recorded in the right arm in the sitting position by diamond digital blood pressure monitor-fully automatic M60 (BPDG024), manufactured by Industrial Electronic and allied products.[15] The effective variable on BP was controlled as much as possible. However, individual differences, incidents, and daily stress, and also the way individuals adapted themselves with life affairs were uncontrollable variables of the study.

Outcome measures

Recording of all parameters was done between 1 and 2 pm to minimize diurnal variation. Filling up of the questionnaires and assessment of reaction time (RT) was conducted simultaneously.

Assessment of quality of life

The World Health Organization Quality of Life questionnaire was used to assess four domains of quality of life that is physical health, psychological, social relationship, and environmental. Total scores of each domain are transformed into 1–100 scores using the template provided by the World Health Organization. Prior permission was obtained from the World Health Organization to use the questionnaire.[16]

Assessment of psychomotor speed

RT apparatus used in the study to record auditory and visual RT was purchased from Anand Agencies, Pune. The RT apparatus presents two auditory (high and low pitch sounds) and two visual stimuli (red and green light). The apparatus possesses two sides; one is E side (examiner side) and the other is S side (subject side) and in between it has a chronoscope. Four stimulus selection switches, selector switches to select desired response, fore period knob, start and reset switches, and main switch are present on E side. Desired stimulus was presented automatically during the trial using stimuli selection switches. Light emitting diode indicator present in front of each stimuli selection switch glows and indicates the stimulus selected for the trial. The device is programmed in such a way that only one stimulus can be selected at a time. The fore period can be fixed between 0.5 s and 5.5 s. After completion of one trail, the instrument was reset for the next trail. Visual stimuli were presented by red and green light mounted side by side on S side. Auditory stimuli were presented by speakers mounted inside the apparatus. The right and left response keys are mounted on S side for the right- and left-hand responses.

Participants were instructed to press the response keys with the index finger of the corresponding hand. RT was recorded in ms by in built chronoscope. RT was recorded in a well air conditioned, noise free, and sound proof room. The subjects were well explained about the procedure before conducting the study. They were given training to use RT apparatus. The location and direction of the RT apparatus and position of the participant and sequence of application of stimulus were maintained constant throughout the study period. After familiarizing, the subjects were used for recording actual value of RT. Three readings of the RT for each stimulus were recorded individually by randomly varying the fore period. The lowest value of three readings was considered as RT for that particular stimulus.[17]

Assessment of psychological parameters

Depression, anxiety, and stress scale (DASS-42)[14]

DASS-42 questionnaire is comprised of three self-reported scales to measure negative emotional states of depression, anxiety, and stress. Each scale has 14 items, divided into 2–5-item subscales of similar content. DASS scale measures the negative psychological emotions. Participants were asked to respond to 42 items based on a 4-point scale from 0=did not apply to all to 3=applied very much, to grade the extent of the items applied to them over the past week. DASS final score was obtained by summing all items in each scale. In case of depression, scores ranging from 0 to 9 are normal, 10–13 is mild, 14–20 is moderate, 21–27 is severe, and 28 and above represents extremely severe depression. In case of anxiety, scores ranging from 0 to 7 are normal, 8–9 is mild, 10–14 is moderate, 15–19 is severe, and 20 and above represents extremely severe anxiety. In case of stress, scores ranging from 0 to 14 are normal, 15–18 is mild, 19–25 is moderate, 26–33 is severe, 34 and above represents extremely severe stress.[18]

Self-esteem

The Rosenberg self-esteem scale was used to assess the positive and negative feelings. It comprises of ten items. The participants were asked to answer on a 4-point scale ranging from 1 to 4, where 1 refers to strongly disagree, 2 – disagree, 3 – agree, 4 –strongly agree. Question number 2, 5, 6, 8, and 9 are reversely scored. High scores indicate high self-esteem.[19,20]

Negative affectivity (NA) and social inhibition (SA)

The Type D scale (DS14) is a standard questionnaire to assess the NA and SA. It consists of 14 items and the participants were asked to respond on a 5-point Likert scale. Fourteen items are divided into two sub scales consisting of seven items each. For NA, the scores of questions numbers 2, 4, 5, 7, 9, 12, and 13 are summed up and for SA; the scores of questions number 1, 3, 6, 8, 10, 11, and 14 were summed up. Question 1 and 3 are reversely scored wherein if the participant circles one, it is scored as three and if zero as four, respectively. The individual is considered a Type D personality if the scores of NA and SI are ≥10.[21]

Ethical considerations

The study was approved by the Institutional Human Ethical Committee. Confidentiality of data was assured. Written informed consent was obtained from all the participants.

Statistical analysis

The study was powered at 0.90, considering the intra-group variation of 10–15% a sample size of 30 was estimated. Data were analyzed using SPSS 20.0 version. Mann–Whitney U test was applied to analyze qualitative data to observe the significance of difference between the groups. Unpaired t-test was applied for quantitative data to observe the significance of difference between the groups. P<0.05 was considered as significant.

RESULTS

The mean age of the participants in the control group is 33.33±7.48 and in the pre-hypertensive group is 34.23±6.51. The difference is not statistically significant (P=0.6209). The mean body mass index of the participants in the control group is 21.89±2.0 and those in the pre-hypertensive group are 22.51±2.70. The difference is not statistically significant (P=0.3120). Figure 1 shows the four domains of quality of life that is physical health score, psychological score, social relationships score, and environmental scores. The scores of each domain range

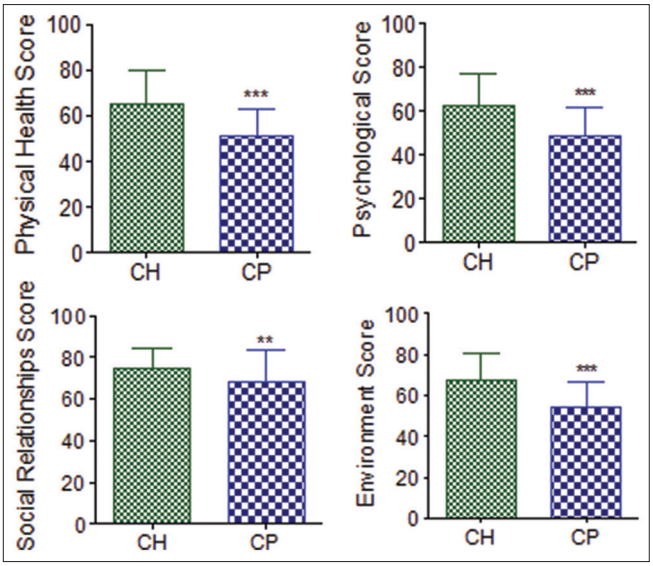

Figure 1: Physical health score, psychological health score, social relationships score, environmental score of pre-hypertensive (CP), and control group (CH) participants. (Data presented was mean±SE) (*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant)

from 0 to 100. Higher the score, higher is the quality of life. The mean scores (mean and SD) of physical health domain in healthy women are 65.3±14.91 whereas in the pre-hypertensive women are 50.97±12.20. The mean scores of psychological domain in healthy women are 62.3±14.94 where as in pre-hypertensive women are 48.73±12.79. The mean scores of social relationships domain in healthy women are 75.07±9.60 whereas in the pre-hypertensive women are 68±15.31. The mean scores of environmental domain in healthy women are 67.40±13.11 whereas in pre-hypertensive women are 54.23±12.76. There was significant lower physical health score (P=0.0002), psychological score (P=0.0006), social relationships score (P=0.0063), and environmental scores (P=0.0007) in pre-hypertensive women when compared to healthy individuals.

There was a significantly longer visual RT for the right (P=0.0178) and left (P=0.014) responses for green light in pre-hypertensive women when compared to healthy individuals (Figure 2). There was a significantly longer visual RT for the right (P=0.0168) and left (P=0.0034) responses for red light in pre-hypertensive women when compared to healthy individuals (Figure 2). There was significantly longer auditory RT for the right (P=0.0015) and left (P=0.0032) responses for high pitch sound in pre-hypertensive women when compared to healthy individuals (Figure 3). There was a significantly longer auditory RT for the right (P<0.0001) and left (P<0.0001) responses for low pitch sound in pre-hypertensive women when compared to healthy individuals (Figure 3).

The mean scores of depression in healthy women are 8.37±3.45 whereas in pre-hypertensive women are 11.1±4.81. The mean scores of anxiety in healthy women are 7.37±2.83 whereas in pre-hypertensive women are 10.53±4.13. The mean scores of stress in healthy women are 9.20±2.51 whereas in pre-hypertensive women are 15.27±4.02. The mean scores of self-esteem in healthy women are 16.57±4.55 whereas in pre-hypertensive women are 13.8±2.91. Significantly higher levels of depression (P=0.029), anxiety (P=0.0035), and stress (P<0.0001) and significantly lower self-esteem (P=0.0179) scores were observed in pre-hypertensive women when compared with healthy individuals (Figure 4). The mean scores of NA in healthy women are 6.83±2.38 whereas in the pre-hypertensive women are 9.2±3.12. The mean scores of SA in the healthy women are 10.7±2.37 whereas in pre-

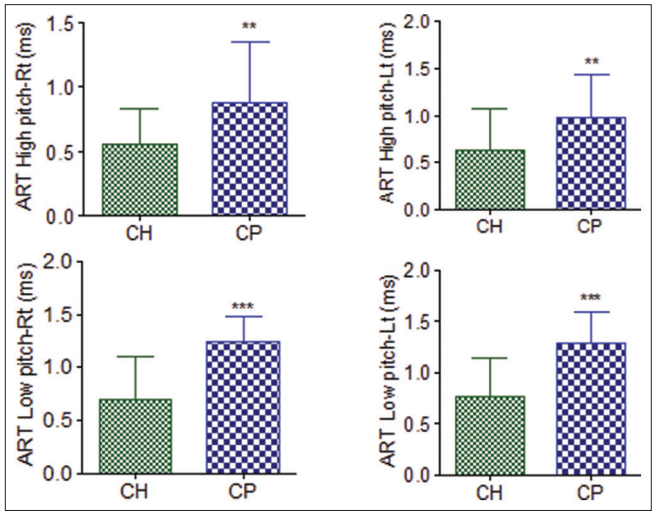

Figure 3: ART- right (Rt) and left (Lt) hand responses for high and low pitch sounds in pre-hypertensive (CP) and control group (CH) participants. (Data presented was mean±SE) (*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant

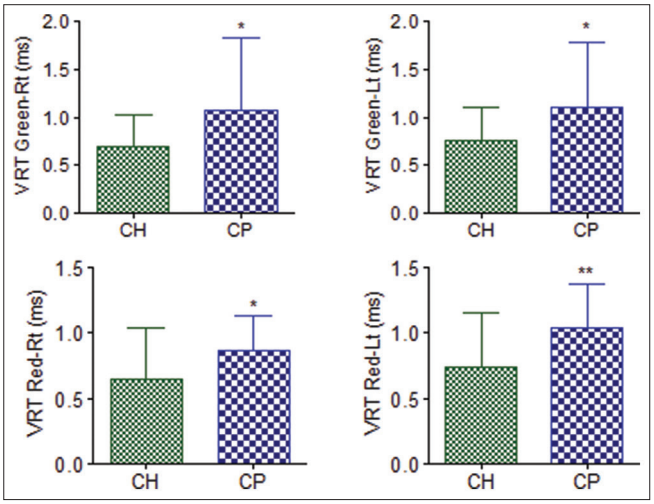

Figure 2: VRT- right (Rt) and left (Lt) hand responses for green and red light in pre-hypertensive (CP) and control group (CH) participants. (Data presented was mean±SE) (*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant)

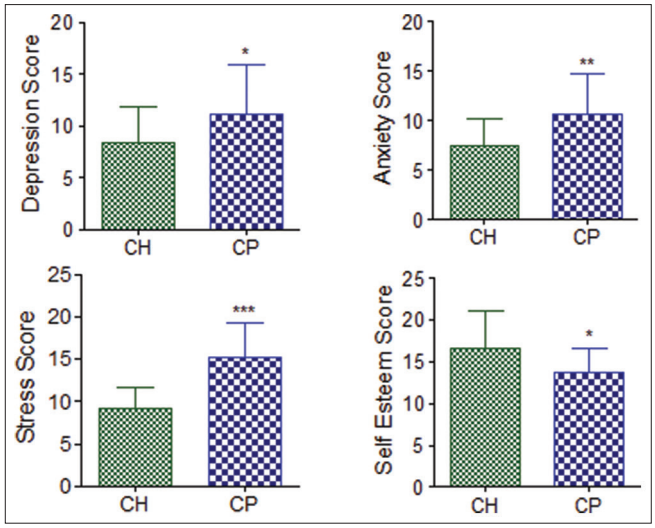

Figure 4: Depression, anxiety, stress, and self-esteem scores in pre-hypertensive (CP) and control group (CH) participants. (Data presented was mean ± SE) (*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant)

hypertensive women are 12.53±1.98. NA (P=0.0054) and SA (P=0.0066) were significantly higher in pre-hypertensive women when compared with healthy individuals (Figure 5).

Visual RT (VRT) right response was not significantly different between red and green light in control group. VRT left response was not significantly different between red and green light in control group. VRT right response was not significantly different between red and green light in pre-hypertensive group. VRT left response was not significantly different between red and green light in pre-hypertensive group (Figure 6). Auditory RT (ART) right versus left responses were not significantly different between high pitch and low pitch sounds in control group. ART for low pitch sound was significantly higher (P<0.01) for the right and left responses in pre-hypertensive group (Figure 7). VRT right versus left responses for green light were not significantly different in control and pre-hypertensive groups. VRT right versus left responses for red light were not significantly different in control group. VRT right response for red light was significantly lower (P=0.0328) when compared with the left response in pre-hypertensive group. ART right versus left responses for high pitch were not significantly different in control and pre-hypertensive groups. ART right versus left responses for low pitch were not significantly different in control and pre-hypertensive groups.

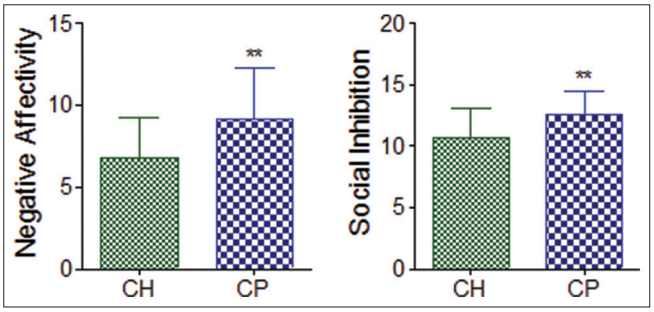

Figure 5: NA and SA scores in pre-hypertensive (CP) and control group (CH) participants. (Data presented was mean±SE) (*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant)

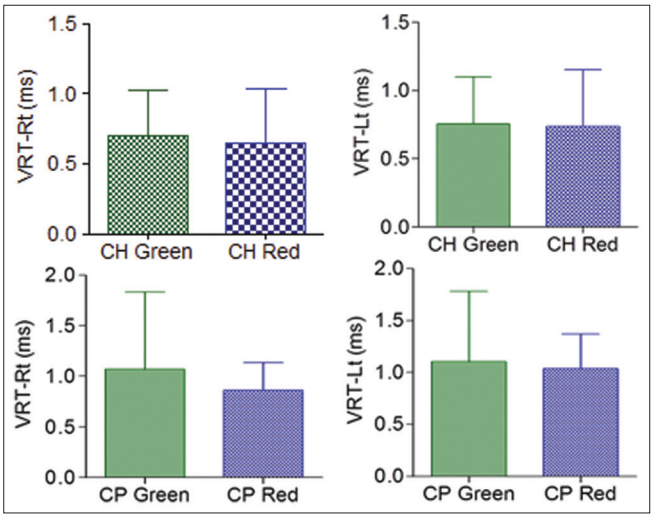

Figure 6: Comparison of right and left responses of VRT for red and green light in pre-hypertensive (CP) and control group (CH) participants

DISCUSSION

Individuals with pre-hypertension had a greater risk of developing hypertension if untreated. The prevalence of prehypertension in India was reported as 32% in urban population.[2,15] Further the prevalence was reported to be higher in females.[22] The present study was aimed to observe and compare the psychological parameters, auditory and VRT and quality of life in pre-hypertensive women with healthy individuals. It was observed that pre-hypertension has strong negative impact on psychological parameters, RT and quality of life. Mental well-being is of global health priority.[23] Mental health is associated with blood pressure such as exposure to chronic stress leads to sustained elevation of blood pressure and increases the risk of development of hypertension.[24,25] Further, this situation may create pressure and stress on heart leading to Infarction. The present study showed a positive correlation between pre-hypertension and depression, contradictory to some studies that showed no strong association between hypertension and depression. However, these studies were done among specific population in perceived racism. Stated that there is no significant association with stress-related racial discrimination and prevalence of hypertension.[26,27] A study conducted by Farah et al., reported no correlation between the blood pressure and stress scores in young adults.[28] Yet, there are certain supportive studies, those showed similar results to our

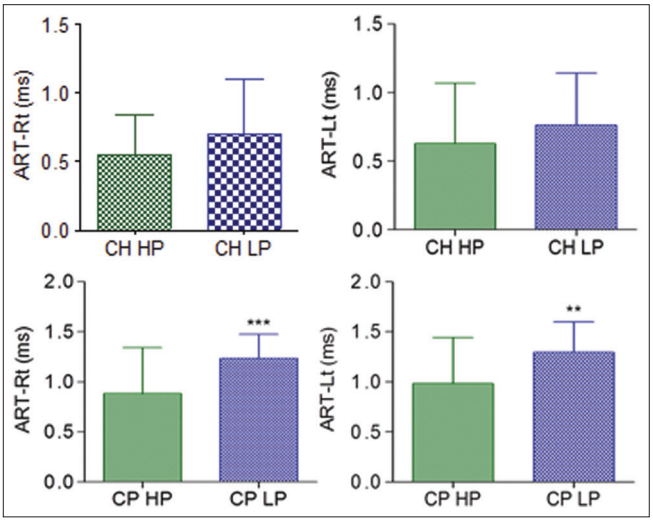

Figure 7: Comparison of right and left responses ART for high pitch (HP) and low pitch (LP) in pre-hypertensive (CP) and control group (CH) participants. (**P<0.01 is significant)

study, stated that depression is one of the most common symptoms seen in hypertensive individuals, studies showed a positive and significant association between depression and hypertension.[25] It was reported that the higher levels of depression, anxiety, and stress fasten the progression of pre-hypertension to hypertension.[29] In the present study, higher scores of depression, anxiety, and stress was observed in pre-hypertensive individuals when compared to healthy controls.

Earlier studies reported that there was mild cognitive impairment in patients with high blood pressure.[30] Decrease in the volume of the gray matter was reported in the brain in hypertensive patients.[31] and recommended the need of a lowering the blood pressure with in normal limits to limit the decline in the cognitive functions.[32,33] Decrease in the processing speed, executive tests, and memory was reported in the individuals with pre-hypertension.[34] Assessment of RT indicates the speed of processing the information in the nervous system and coordination between the sensory and motor systems.[35] Earlier studies reported that there is a variation in the processing of colors in the brain with respect to the RT.[36] RT for red light was significantly lower than green light.[37] Whereas, another study reported that green color stimulates the visual receptors strongly and evokes faster response.[38] Hence, the present study considered assessment of RT for red and green light. There was mixed results regarding decrease in the psychomotor speed like RT in hypertension. Edwards et al., reported that there was no difference in the RT in hypertensive patients when compared with healthy controls.[33,39] In the present study, there was no difference in the VRT for the right and left responses for green and red light in both control and pre-hypertensive groups. Positive correlation was reported between VRT and duration of hypertension. Increase in the VRT was reported with increase in the duration of hypertension.[40] Earlier studies reported prolonged RT in hypertensive individuals when compared with healthy controls.[40,41] Neuropathy was reported as one of the major complications in hypertension which is non-specific.[40] Hypertension causes inflammation of the nerve fibers and also damages the blood supply to the nerve fibers which induces hypoxia. This may delay the nerve conduction and leads to prolongation of the RT.[40] There was no significant difference in the RT for high and low pitch sounds in both genders.[37] Prolonged RT indicates decrease in the cognitive functions.[36] In the present study, ART right versus left responses for high pitch was not significantly different in control and pre-hypertensive groups. ART right versus left responses for low pitch was not significantly different in control and pre-hypertensive groups. The present study results are in accordance with earlier studies as we have observed prolonged auditory and VRTs in pre-hypertension when compared with healthy individuals.[42]

It was reported that the RT difference among the right handers and left handers depends on the laterality balance of hand motor skills. Handedness has no influence on the VRT. Interestingly, there was a significant faster ART in left-handed women when compared with right-handed women.[43] In the present study, RT was recorded from the right and left hands of the participants. VRT for red and green light was not significantly different between right versus left hands. ART right versus left responses for high pitch were not significantly different in control and pre-hypertensive groups. ART right versus left responses for low pitch were not significantly different in control and pre-hypertensive groups. The possible explanation for the difference in the auditory RT may be due to extensive relaying of auditory pathways to both the temporal lobes equally.[44]

The assessment of quality life has become increasingly important in routine clinical practice to assess the effectiveness of the treatment.[45] Earlier studies have reported that the quality of life of patients with high blood pressure was significantly lower when compared with healthy individuals.[46,47] Hypertension was reported to be associated with the domains of quality of life such as physical health, general health, social functions, pain, etc.[48,49] In the present study, there were significant lower scores of four domains of the quality of life in the pre-hypertensive individuals when compared with healthy controls. The present study is of public health interest wherein it is said to be "Prevention is better than cure." If certain measures are taken to reduce the effect of hypertension on cognition, stress leading to depression and further to anxiety that may in turn affect the quality of life. Hence, our study emphasis the need to plan certain programs to decrease the effects of pre-hypertension leading to hypertension and its related complications.

Limitations of the study

The major limitation of the study was its lower sample size.

CONCLUSION

Pre-hypertension has strong negative impact on psychological parameters, RT, and quality of life. It is the need of time to increase awareness of pre-hypertension in general population. We recommend planning and implementation of special care programs for these individuals.

ACKNOWLEDGMENT

The authors would like to acknowledge with thanks to all the participants for their active participation.

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Authors Contribution:
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Source of Funding: Self-funding, **Conflicts of Interest:** None declared.