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STRESS-THE SILENT KILLER OF SAVIORS?

Cardiology

Shisode V Assistant Professor, Dept. of Cardiology, MGM medical college and hospital, Aurangabad.

Rajput R Assistant Professor, Dept. of Medicine, MGM medical college and hospital, Aurangabad, .

Chhabra A Senior Resident, Dept. of Cardiology, MGM medical college and hospital, Aurangabad.

Paithankar A.* Junior Resident, Dept. of Medicine, MGM medical college and hospital, Aurangabad. *Corresponding Author

ABSTRACT

Medical professionals work under tremendous stress of patient's fluctuating health issues, stress of workplace, stress of sleep deprivation, financial stress and stress of coping up with the ever growing knowledge in the medical field. Moreover due to their busy schedules and lack of exercise, medical professionals are at higher risk of developing obesity, hypertension and other lifestyle diseases. In this context we had done this study regarding the Inter-relationship between stress, Waist Circumference and Blood pressure by using Ambulatory Blood Pressure Monitoring in medical professionals in our institute and subsequently create awareness amongst the medical fraternity.

KEYWORDS

blood pressure, waist circumference

INTRODUCTION

Hypertension is one of the most significant or important modifiable risk factors for development of various cardiovascular diseases (CVD) as well as cerebrovascular diseases globally. The problems caused by the hypertension are accountable for nearly ten million deaths in the whole world annually. [1] Likewise, hypertension is also accountable for nearly fifty percent of the deaths from CVD and fifty percent of the deaths from stroke as such. [2] The lasting effect of the hypertension and the CVD is determined by different risk factors such as tobacco use or abuse, excessive alcohol consumption or intake, unhealthy diet regimes, low or physical inactivity, overweight status, obesity, elevated blood glucose levels in the body and dyslipidemia.

The link between excess body weights with HTN has been proved already in various studies. [3,4] In addition, body fat distribution is an important contributor to the association between obesity and hypertension. [5,6] Central obesity and high BP frequently combined with metabolic problems or complications like insulin resistance and dyslipidemia, also known famously as metabolic syndrome. [7] Moreover, the amount of central or abdominal fat plays an important role in the relationship between BP and its metabolic derangements. [8] Insulin resistance with the existing hyperinsulinemia may be the transitional link in the association of central obesity with elevated BP. [9] Both, the central accumulation of fat or obesity and hypertension are frequently found along with hyperinsulinemia, glucose intolerance and elevated levels of triglyceride and serum uric acid levels in the body. [10] However, the reasons or causes of these significant associations and the role that central fat accumulation or obesity plays in relation to the development of insulin resistance and hypertension are still under the clouds.

One study suggests that the existence of various risk factors for cardiovascular disease elevates significantly with a body mass index (BMI) greater than twenty kilograms per meter square. [11] However it is now found that the risk also alters according to the distribution of the body fat. [12, 13] Fat location in the body is clinically quiet important because even the subjects with an average BMI can be at an heightened or increased risk of cardiovascular or cerebrovascular diseases if a high proportion or amount of their body fat is located per abdominal. [14] Waist circumference or girth is usually preferred over other measuring scales for fat accumulation and correlates strongly to the health problems because waist measurement shows total as well as abdominal fat accumulation it is also not significantly changed or influenced by the height of the subject. [15-16]

Stress is projected as the discernment of the various environmental demands that are believed to be in excess of our available resources for adjusting and getting used to the situation. [17] The severity and time duration of the exposure are quiet significant risk issue and effects of stress factors on blood pressure have been quiet established but the ongoing experience of stressor is linked to hypertension. [18] The effects of long term exposure to a stress like work related stress, the relationship problem stress, low socioeconomic status levels(SES) etc have been studied. Relations between these stressors and BP issues have been evaluated but still there are certain things that are under study and not yet been evaluated.

Measuring the BP of a patient is quiet important for the diagnosis and treatment of hypertension. [19] Selecting the accurate and outright BP measuring method is therefore necessary. A study observed that any measurement of blood pressure may be regarded as a representative for the true blood pressure of the patient which is actually the mean level.[20] Compared with the conventional and routine methods of taking a low number of readings of BP, ambulatory blood pressure monitoring I.e. ABPM helps us to collect blood pressure readings several times in an hour during the entire day as well as night. These readings can be compiled together to show twenty four hour means and also grouped into time frame values. The different blood pressure classifications and categorizations helped by ambulatory blood pressure monitoring are critical and valuable for pharmacotherapy of high blood pressure.[21] Several studies promote the use of ambulatory blood pressure monitoring in our clinical practice .[22-29] Medical professionals work under tremendous stress of patient's fluctuating health issues, stress of workplace, stress of sleep deprivation, financial stress and stress of coping up with the ever growing knowledge in the medical field. Moreover due to their busy schedules and lack of exercise, medical professionals are at higher risk of developing obesity, hypertension and other lifestyle diseases. In this context we had done this study regarding the Inter-relationship between stress, Waist Circumference and Blood pressure by using Ambulatory Blood Pressure Monitoring in medical professionals in our institute and subsequently create awareness amongst the medical fraternity.

MATERIALS AND METHODS

Aim

To study inter-relationship of stress, waist circumference and blood pressure in medical professionals

Objectives

1. To do ambulatory blood pressure monitoring in medical professionals
2. To do stress assessment and measure waist circumference
3. Finding out relationship of stress, waist circumference with blood pressure

The present study was conducted in MGM Medical College and

Hospital Aurangabad after getting the approval from Institutional ethical committee. Study was conducted as per ICH and GCP guidelines

Study design:

- A 24 hr Observational, single arm, single center study conducted on medical professionals working in MGM Medical College and Hospital Aurangabad
- Medical professionals working across MGM Medical College and Hospital Aurangabad fulfilling the inclusion criteria and ready to give informed consent were included in the study
- After doing through physical examination weight, waist circumference and blood pressure was recorded manually with sphygmomanometer. These parameters were recorded on case record form
- Subject was given Perceived Stress Scale (PSS) for stress scoring. Resultant score was recorded on case record form
- Ambulatory blood pressure monitoring apparatus was attached to them for 24 hours and they were advised to continue their daily routine work
- The results obtained from ambulatory BP monitoring were recorded and resultant was used to establish the relationship between stress, waist circumference and ambulatory BP.

Inclusion Criteria:

Healthy medical professionals age between 18-65yrs
Medical professional willing to give consent

Exclusion criteria:

Known case of hypertension
Chronic kidney disease.

OBSERVATIONS AND RESULTS

Table 1: Distribution of medical professionals according to Gender

Gender	No. of medical professionals	Percentage
Female	23	27.7 %
Male	60	72.3 %
Total	83	100.0 %

Table 2: Distribution of medical professionals according to Age-group

Age-Group	No. of medical professionals	Percentage
≤30 year	24	28.9%
31-40	27	32.5%
41-50	27	32.5%
51-60	05	03.6%
Total	83	100.0
Mean±SD	37.09±9.89 years	

Table 3: Distribution of medical professionals according to placement of duty

Posted for duty	No. of medical professionals	Percentage
ICU	34	41.0 %
Ward	49	59.0 %
Total	83	100.0 %

Table 4: Medical professionals according to Perceived stress scale Score Classification

PSS Score	No of Medical professionals	Percentage
0-13 LOW*	30	36.14%
14-26 MOD**	33	39.76%
27-40 HIGH***	20	24.09%
Total	83	100%

** Low stress*
*** Moderate stress*
**** High stress*

Table 5: Blood pressure outcome of medical professionals

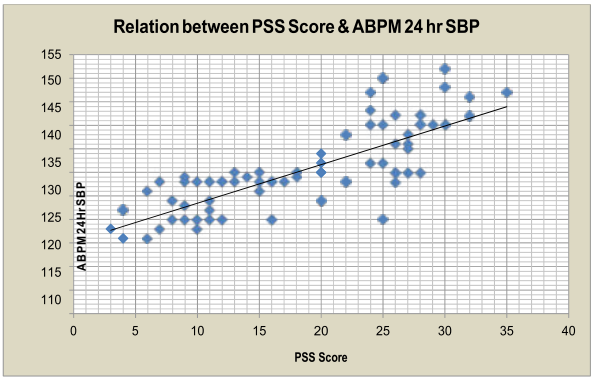
	Blood pressure				Total
	Normal value		Abnormal value		
	No.	%	No.	%	
ABPM 24 Hour*	52	62.7%	31	37.3%	83(100%)
ABPM day avg.**	47	56.6%	36	43.4%	83(100%)
ABPMnight avg.***	41	49.4%	42	50.6%	83(100%)

**24 hr average of blood pressure by Ambulatory blood pressure monitor*
*** Day average (8am-8pm) blood pressure by Ambulatory blood pressure monitor*
**** Night average (8pm-8am) blood pressure by Ambulatory blood pressure monitor*

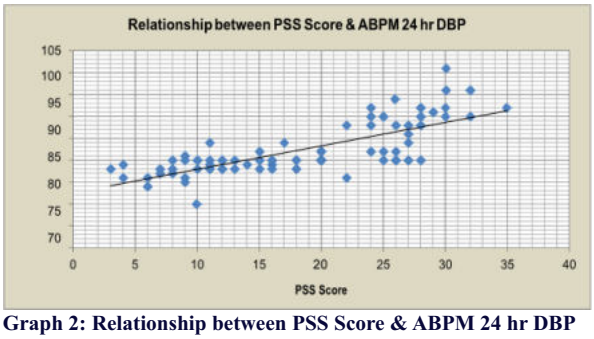
Table 6: Correlation between PSS Score, Waist circumference, BMI, Age, blood pressure records by Ambulatory Blood Pressure Monitoring. (Karl person correlation test)

	age	*BMI*	*waist circumfe rence*	*ABPM 24 hr SBP*	*ABPM 24 hr DBP*	*ABPM day SBP*	*ABPM day DBP*	*ABPM night SBP*	*ABPM night DBP*
PSS score	r=0.326 P<0.000 1 S	r=0.718 P=0.0001 S	r=0.504 P<0.000 1 S	r=0.802 P<0.000 1 S	r=0.755 P<0.0001 S	r=0.833 P<0.000 1 S	r=0.80 P<0.000 1 S	r=0.724 P<0.000 1 S	r=0.667 P<0.0001 S
Age	1	r=0.54 P<0.0001 S	r=0.272 P=0.013 S	r=0.448 P<0.000 1 S	r=0.369 P=0.001 S	r=0.468 P<0.000 1 S	r=0.404 P<0.000 1 S	r=0.513 P<0.000 1 S	r=0.365 P=0.001 S
BMI		1	r=0.628 P<0.000 1 S	r=0.760 P<0.000 1 S	r=0.674 P<0.0001 S	r=0.790 P<0.000 1 S	r=0.738 P<0.000 1 S	r=0.735 P<0.000 1 S	r=0.630 P<0.0001 S
waist circumfe rence			1	r=.587 P<0.000 1 S	r=0.448 P<0.0001 S	r=0.581 P<0.000 1 S	r=0.453 P<0.000 1 S	r=0.475 P<0.000 1 S	r=0.351 P=0.001 S
ABPM 24hr SBP				1	r=0.858 P<0.0001 S	r=0.952 P<0.000 1 S	r=0.836 P<0.000 1 S	r=0.897 P<0.000 1 S	r=0.746 P=0.001 S
ABPM 24hr DBP					1	r=.860 P<0.000 1 S	r=0.916 P<0.000 1 S	r=0.803 P<0.000 1 S	R=0.836 P<0.000
ABPM day SBP						1	r=0.898* P<0.000 1	r=0.886 P<0.000 1	r=.777 P<0.0001
ABPM day DBP							1	r=0.808 P<0.000 1 S	r=0.805 P<0.0001 S
ABPM night SBP								1	r=0.871 P<0.0001 S

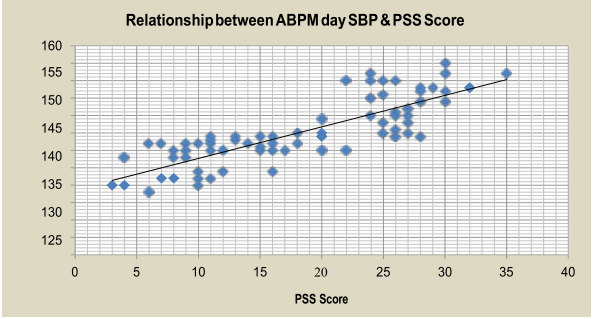
S: Significant, NS: Not Significant



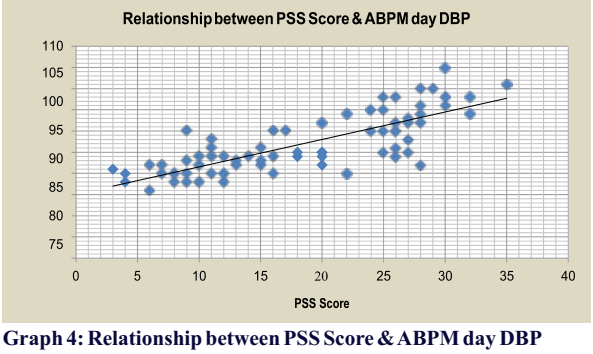
Graph 1: Relation between PSS Score & ABPM 24 hr SBP



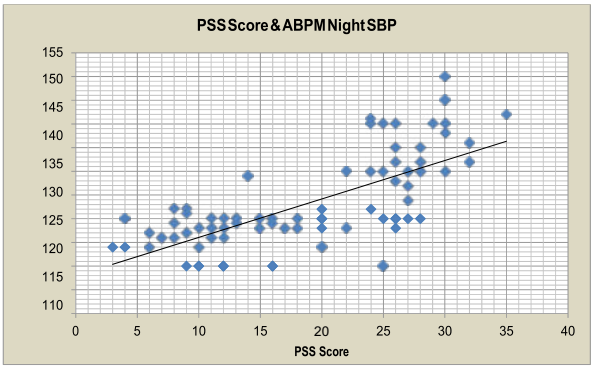
Graph 2: Relationship between PSS Score & ABPM 24 hr DBP



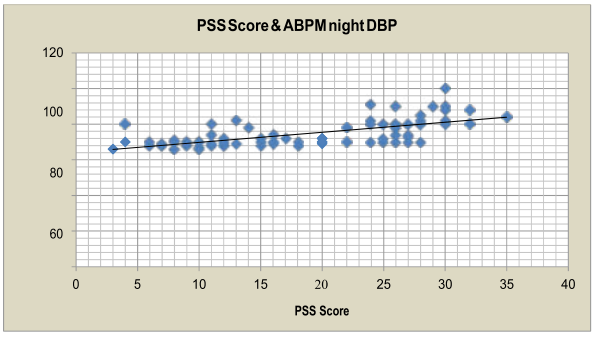
Graph 3: Relationship between ABPM day SBP & PSS Score



Graph 4: Relationship between PSS Score & ABPM day DBP



Graph 5: Relationship between PSS Score & ABPM Night SBP



Graph 6: Relationship between PSS Score & ABPM night DBP

When we analyzed the correlation between all study variables, the PSS score when correlated with ABPM 24 hr SBP, correlation of coefficient i.e. 'r' value came out to be 0.802 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM 24 hr DBP, the 'r' value came out to be 0.755 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM day SBP, the 'r' value came out to be 0.833 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM day DBP, the 'r' value came out to be 0.80 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM night SBP, the 'r' value came out to be 0.724 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM night DBP, the 'r' value came out to be 0.667 with p value < 0.0001 which was statistically significant.

The waist circumference score when correlated with ABPM 24 hr SBP, correlation of coefficient i.e. 'r' value came out to be 0.587 with p value < 0.0001 which was statistically significant. The waist circumference when correlated with ABPM 24 hr DBP, the 'r' value came out to be 0.448 with p value < 0.0001 which was statistically significant. The waist circumference when correlated with ABPM day SBP, the 'r' value came out to be 0.581 with p value < 0.0001 which was statistically significant. The waist circumference when correlated with ABPM day DBP, the 'r' value came out to be 0.453 with p value < 0.0001 which was statistically significant. The waist circumference score when correlated with ABPM night SBP, the 'r' value came out to be 0.475 with p value < 0.0001 which was statistically significant. The waist circumference score when correlated with ABPM night DBP, the 'r' value came out to be 0.351 with p value = 0.001 which was statistically significant. Finally, when the PSS score was correlated with the waist circumference, the 'r' value came out to be 0.504 with p value < 0.0001 which was statistically significant.

Table 7: Comparison of mean PSS Score of medical professionals according to duty i.e. Ward & ICU (*student t test*)

Duty	Medical professionals	Mean±SD	t-value	P-value
Ward	49	17.04±7.94	2.27	P=0.026
ICU	34	21.23±8.70		S

The mean PSS Score of the study subjects (medical professionals) working in the wards was 17.04 which was significantly lower (P=0.026) than the PSS Score of study subjects working in the ICU i.e. 21.23.

DISCUSSION

Hypertension, apart from essential or primary hypertension is caused by variety of etiological factors such as renal diseases, diabetes mellitus, adrenal gland tumors, smoking and tobacco use, drugs like corticosteroids and many others. Apart from these causative factors other important factors that influence the incidence, development and progress of hypertension in otherwise healthy individuals are obesity and stress. Obesity can be denoted or measured by identifying the waist circumference of the patient.

In this study, When we analyzed the correlation between all study variables, the PSS score when correlated with ABPM 24 hr SBP, correlation of coefficient i.e. 'r' value came out to be 0.802 with p value < 0.0001 which was statistically significant, as shown in table number 8. The PSS score when correlated with ABPM 24 hr DBP, the 'r' value came out to be 0.755 with p value < 0.0001 which was statistically significant. This correlation was shown in table number 8. The PSS

score when correlated with ABPM day SBP, the 'r' value came out to be 0.833 with p value < 0.0001 which was statistically significant. Again, this correlation was shown in table number 8. The PSS score when correlated with ABPM day DBP, the 'r' value came out to be 0.80 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM night SBP, the 'r' value came out to be 0.724 with p value < 0.0001 which was statistically significant. The PSS score when correlated with ABPM night DBP, the 'r' value came out to be 0.667 with p value < 0.0001 which was statistically significant. These correlations were depicted in table number 8. These results suggests that the stress levels in the patients have a directly proportional impact on blood pressure levels during different times throughout the day and night. These findings are similar to the study done by Caroll D et al. Another study done by Stewart JC et al also corroborates the finding of this study. [30,31]

Our study	Caroll D et al	Stewart JC et al
Systolic blood pressure was directly correlated to the stress and the association was satistically significant with p value < 0.0001	SBP reactions to stress correlated positively with follow up SBP. Systolic reactivity was predictive of follow up SBP and accounted for 2.3 percent of the variance.	The analysis revealed that after adjusting for initial BP, age, BMI, sex, parental history of HTN and length of the follow up, increased heart rate reactivity was associated with increased follow up SBP with P value of less than 0.05.

This correlation between stress and blood pressure elevation might be attributed to sympathetic nervous system response, in which release of catecholamines results in increased heart rate, cardiac output and BP. It may be due to repeated activation of adrenergic system, failure to return to resting levels following any stressful events, failure to get used to repeated stressors or stress inducers of the same type again and again or some combination that is responsible for the development of high blood pressure. Stressful events may compulsorily lead to certain negative effects including depression, anxiety, and anger and to negative thoughts about the events which according to this theory can sustain physiological arousal in subjects. Numerous stress related emotions and thoughts are not limited or restricted to those times or occasions when a stressor is actually present, a significant amount of period may also be used up in hope of future stress and dealing with past stress.

Too much exposure to stressors or stressful events among the healthcare or medical personnel may result itself in several different outcomes including depression, anxiety, self doubt, post traumatic stress disorder i.e PTSD, loss of sleep, lowering immune function, elevation of CVD risk factors, burn out and disturbed relationship with one's family. Knowledge about presence of stress is therefore significant, and if found, should be given attention for timely intervention. Stress among health care professionals depends on the type of work, the organization, the personality of the doctor, the interpersonal relationships within and outside the health care fraternity and work life balance. In the european countries there is a greater awareness and outlook to the problems that are faced by the healthcare professional community. Several studies have shown high level of stress among medical practitioners as a result of their work which directly hampers their ability to provide high quality care to patients. We could not find any relevant study corroborating these findings.

When we analyzed the inter-relationship between waist circumference and blood pressure, we came to now the following things; the waist circumference score when correlated with ABPM 24 hr SBP, correlation of coefficient i.e. 'r' value came out to be 0.587 with p value < 0.0001 which was statistically significant. The waist circumference when correlated with ABPM 24 hr DBP, the 'r' value came out to be 0.448 with p value < 0.0001 which was statistically significant. The waist circumference when correlated with ABPM day SBP, the 'r' value came out to be 0.581 with p value < 0.0001 which was statistically significant. The waist circumference when correlated with ABPM day DBP, the 'r' value came out to be 0.453 with p value < 0.0001 which was statistically significant. The waist circumference score when correlated with ABPM night SBP, the 'r' value came out to be 0.475 with p value < 0.0001 which was statistically significant. The waist circumference score when correlated with ABPM night DBP, the 'r' value came out to be 0.351 with p value = 0.001 which was statistically significant. Finally, when the PSS score was correlated with the waist circumference, the 'r' value came out to be 0.504 with p value < 0.0001 which was statistically significant. These findings were depicted in table number 8. This finding suggests the positive correlation between waist circumference and elevated blood pressures. Similar results were observed in a study conducted by Kokiwar et al. in Karimnagar, Telangana, India. [32] one more study conducted by Midha et al. in Lucknow, Uttar Pradesh, India also confirmed our findings. [33]

Our study	Kokiwar et al	Midha et al
Waist circumference when correlated with both SBP and DBP measured by ABPM, they were both positively correlated (p value < 0.0001)	The hypertensive subjects were having significantly increased waist circumference compared to normotensive (p< 0.001).	Multivariate logistic regression analysis among women revealed that the waist circumference (OR=2.151) was significant risk factors for HTN. In men also, waist circumference (OR=2.767) was significantly associated with HTN.

We also found out that the medical professionals working in the ICU setup were having higher stress levels (Mean±SD of 21.23±8.70) as depicted by the PSS scores as compared to medical professionals working in the wards (Mean±SD of 17.04±7.94) as shown in table number 9, with the't' value of 2.27 which was a statistically significant (P=0.026). This can be due to the working environment of the intensive care units where the medical professionals are having demanding duties, critical patients to deal with, deprived sleep or erratic sleep patterns and professionally demanding. Medical staff of special wards like ICU are exposed to many stress factors or stressors including being involved with critically ill patients and their relatives, work load, non-flexible timings, work in a closed environment and high amount of sound pollution due to various monitors, ventilators and infusion pumps with their repeated alarms and sounds. In numerous studies, the incidence of mental and stress related problems and its signs and symptoms has been reported to be higher in medical nurses who work in special wards like ICU rather than general wards. Bratt et al. reported that psychological stress and anxiety occurs more frequently in nurses who work in special wards. [34] On the other hand, some other studies have shown no differences between these two groups of medical professionals and even many of them showed that anxiety, stress and depression is relatively higher in medical professionals who work in the general wards in comparison with those who work in ICU setup.

Finally, when the PSS score was correlated with the waist circumference, the 'r' value came out to be 0.504 with p value < 0.0001 which was statistically significant. This suggests that the stress levels in a subject and his waist circumference are having significant correlationship with one another and both are having important contribution in development and progress of hypertension. This finding was also mentioned in a review article by Bjorntorp P. [35] we could not find any relevant study depicting relationship of all three study variables i.e. the waist circumference, stress and blood pressure changes by ABPM.

CONCLUSION

This study was conducted in the department of medicine at MGM's Medical college and hospital, Aurangabad from December 2016 till August 2018. A total of 83 medical professionals working across MGM Medical College and Hospital Aurangabad fulfilling the inclusion criteria and ready to give informed consent were included in the study. After doing through physical examination weight, waist circumference and blood pressure was recorded manually with sphygmomanometer. These parameters were recorded on case record form. Subject was given Perceived Stress Scale (PSS) for stress scoring. Resultant score was recorded on case record form. Ambulatory blood pressure monitoring apparatus was attached to them for 24 hours and they were advised to continue their daily routine work. The results obtained from ambulatory BP monitoring were recorded and resultant was used to establish the relationship between stress, waist circumference and ambulatory BP.

Through this study we conclude that stress, waist circumference and blood pressure are inter-related with one another. The more the amount of stress, more will be the blood pressure. Similarly higher the waist circumference more will be the blood pressure.

Advantages of the study:

1. It was a good study as most of the time hypertension and its

association with stress and waist circumference goes unnoticed, especially in medical professionals.
2. It will help create awareness regarding these problems amongst the healthcare workers.

Limitations of the study:

1. It was a single centre study.
2. Some intervention could have been done and its effects can be seen in the medical professionals.
3. We could have given some advice to the study subjects regarding the problem and how to overcome them.
4. Long term implications of the study variables and their correlation could not be studied.

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