Original Research Paper

International Physiology 6(3), September - December 2018

DOI: https://dx.doi.org/10.21088/ip.2347.1506.6318.3

Association of Beck's Depression Score with Blood Pressure Load and Dipper State in Normotensive Young Adult Males

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Received on: August 14, 2018
Accepted on: September 17, 2018

Abstract

Context: Hypertension is a multifactorial disease and is a leading cause of cardiovascular morbidity. Depression is the most common psychiatric disorder in practice. Different studies have contradictory opinions about effect of depression on blood pressure. So, this study was planned to assess the association of depression scores and 24 hours ambulatory BP parameters. *Aims:* 1. To compare Beck's depression score with day and night blood pressure load. 2. To compare Beck's depression score in dippers and non-dippers. *Methods and Material:* The study included 60 healthy young adults of age between 20 to 35 years. Their day & night BP load and dipper state was assessed by 24 hours Ambulatory blood pressure measurement done by Contec Ambulatory Blood Pressure Monitor. Beck's Depression Inventory-II (BDI-II) was used to calculate the depression scores in them. Independent T test was used to compare the depression scores and dipper state & BP load. *Results:* The mean BDI II scores of non-dippers were significantly higher than dippers [10.11±4.22 vs 6.14±4.21; p = 0.02]. Similarly, the mean BDI II scores of subjects with increased systolic day and night BP load were significantly higher than normal BP load [13.0±3.39 vs 6.2±3.86; p< 0.01 for day] and [12.0±3.85 vs 6.17±3.95; p< 0.01 for night]. *Conclusions:* As subjects with higher systolic BP load had more depression scores and also depression scores were higher in non-dippers. So, depression can lead to future cardiovascular morbidity and mortality.

Keywords: Beck's Depression Score; Dipper State; BP Load.

Introduction

Hypertension is a major contributor to cardiovascular morbidity and mortality in the modern world. Prevalence of hypertension is increasing day by day worldwide as well as in India.

Hypertension has a multiple risk factors with obesity, sedentary behaviour, alcohol, smoking, salt intake, diabetes mellitus, family history of hypertension and psychological disorders being of great importance. Psychological status has an intricate relationship with cardiovascular system. Since cardiovascular system is regulated by the autonomic nervous system, psychological status like depression can have a profound influence on it especially the blood pressure. [1,2]

Depression is a state of low mood and aversion to activity that can affect a person's thoughts, behaviour, tendencies, feelings, and sense of well-being. It is an illness that affects both the mind and the body and is a leading cause of disability, workplace absenteeism, decreased productivity and high suicide rates. Depression is the most common psychiatric disorder in general practice and about one in ten patients seen in the primary care settings suffer from some form of depression [3].

According to Chennai Urban Rural Epidemiology Study (CURES), The overall age adjusted prevalence of depression in urban South India was 15.1%. [3] According to a study done by Sahoo et al depressive symptoms were present in 18.5% of the young adult population. [4] Whereas

in Amritsar the overall prevalence of depression among college going students was found to be 16.5%. Depression appear to have a high prevalence of physical or somatic health problems [5].

Different studies have contradictory opinions about effect of depression on blood pressure. Some studies suggest that individuals experiencing depression are at high risk for developing hypertension while others showed a decrease in blood pressure.

The present study aims to investigate the association of ambulatory blood pressure and depression in healthy young adults.

The Beck Depression Inventory-II (BDI-II) is a brief self-reported scale acceptable to patients and clinicians that is a reliable indicator of symptom & severity of depression. Its validity and case-finding capability as a screening instrument is well established [6].

Ambulatory blood pressure monitoring has gradually become a widely used clinical tool for diagnosis of hypertension. It is a simple, reliable and novel method to measure BP and various aspects of blood pressure monitoring such as dipping state and BP load because it measures BP at regular intervals even at night when the subject is sleeping.

Blood pressure follows a circadian variation. The decrease in BP during sleep is referred to as "nocturnal dipping" and is partly attributable to decrease in sympathetic output. Although arbitrary, a decrease of 10% to 20% in mean nocturnal BP (both systolic and diastolic) compared with mean daytime BP is considered normal. Conversely, an absence of nocturnal dipping, or non-dipping, is designated as a less than 10% decrease in nocturnal BP. Lack or diminished nocturnal dipping of BP is a strong, independent predictor of hypertension and cardiovascular risk in future [7].

BP load is defined as the proportion of 24-hour BP recordings that are increased relative to the thresholds for waking and sleep BP with threshold being 140/90 mm Hg during the awake period and 120/80 mm Hg during the sleep hours. Normal Day BP load should be less than 40% & night BP load less than 50%. Increased BP load is associated with future risk of target organ damage and stroke [7].

The present study tries to investigate the association between Beck's depression score with dipper state and BP load.

Objectives

1. To compare Beck's depression score with Day and night blood pressure load.
2. To compare Beck's depression score in dippers and non-dippers.

Subjects and Methods

The present study was conducted in the Department of Physiology of Saraswathi Institute of Medical Sciences, Hapur from the month March 2017 to July 2017. A convenient sample of 60 healthy young adult males of age between 20 to 35 years who volunteered for the study were enrolled after taking written informed consent from them. Ethical clearance was obtained from Institutional Ethical Committee. Subjects with any H/o hypertension, cardiovascular, renal disorders, diabetes mellitus, smokers, alcoholics, obese (BMI > 25 kg/m^2) and with family history of hypertension were excluded.

The subjects were supposed to report to the Department of Physiology at 10.30 am and measurement of Ambulatory BP recording was started by 11 am. The subjects were supposed to tie the cuff of Ambulatory BP monitor for 24 hours even during their sleep. As disturbed sleep may not decrease the sympathetic activity in the body and hence may not result in decrease in BP during sleep. the subjects who complained of disturbed sleep at night were also excluded from the study.

Subjects were allowed to sit quietly for 15 min prior to assessment of BP; three consecutive measurements were made 5 min apart, and baseline BP was determined as the lowest of the three readings. 24 hours Ambulatory Blood Pressure was measured using Contec Ambulatory Blood Pressure Monitor. The cuff of the BP apparatus was tied on the non-dominant arm. Subjects were enquired about daily morning wake up time and night bed time. AMBP was set to measure BP every 15 min during daytime and every 30-min in night time while sleeping. Subjects were divided into two groups according to their dipper profile, as defined: dippers (nocturnal decrease in systolic BP was ≥ 10% of daytime BP) and non-dippers (nocturnal decrease in systolic BP was <10% of daytime BP). The subjects were also divided in two groups based on day and night BP loads. Day systolic and diastolic BP load: normal being 40% BP values < 140/90 mm Hg. Night systolic and diastolic BP load: normal being 50% BP values < 120/80 mm Hg [8].

All the subjects were given the Beck's depression inventory II (BDI II) questionnaire to answer and by the assessment of their responses to all the questions, the depression score was calculated. BDI II is a 21-item self-reported validated instrument for assessing depression in an individual. Items on the BDI-II are rated on four-point scales ranging from zero to three, with a maximum total score of 63. Higher scores indicate more severe depressive symptoms [6].

Descriptive statistics was carried out in terms of means & standard deviations. Independent T test was used to compare depression scores in high & normal BP load and in dipper & non-dipper state.

Results

The mean age of the subjects was 24.36±4.58 years. None of subjects reported any disturbance in sleep. Out of the 60 subjects 9 were found to be non- dippers and 10 had high day & night BP load. The mean BDI II scores of non-dippers were significantly higher than dippers [Table 1]. Similarly, the mean BDI II scores of subjects with increased systolic day BP load was significantly higher than normal BP load [Table 1] and also the mean BDI II scores of subjects with increased systolic night BP load was significantly higher than normal BP load [Table 1]. As far as diastolic BP loads were concerned, there was no significant difference found in both day & night values.

Discussion

The present study was a retrospective study which intended to investigate the association of dipper state and BP load with Beck's depression scores. We found that BDI II scores were higher in non-dippers than dippers showing depression may lead to a non-dipping state.

Our study showed an increase in BDI II scores in subjects with high day and night systolic BP loads showing that depression can lead to increase in both day and night systolic BP above threshold in more proportion of the day.

Different studies have shown different views as far as association of BP and depression is concerned.

Symptoms of depression and anxiety were associated with a diagnosis of hypertension assessed 5 years later was the conclusion of Ginty et al. With regard to physiological dysregulation, altered activity of the hypothalamic–pituitary–adrenal axis has been observed in approximately 50% of depressed patients and this, in turn, may increase the risk of hypertension. Altered autonomic function has also been suggested as a possible psychophysiological mechanism [9].

Similar to the present study, several studies like that of Meng et al have shown depression as an independent risk factor of hypertension [10].

Negative affect was based on combined symptoms of depression and anxiety. Negative affect is predictive of development of hypertension. [11].

A study done in older subjects with age > 75 years showed that depressive symptoms in elderly subjects may contribute towards increasing the cardiovascular risk through a deregulation of the BP circadian profile. It showed that depressive symptoms presented a significantly lower night-time SBP fall than non-depressed ones with a significantly higher occurrence of non-dipper state [12].

Another study done in Japanese adults revealed that non-dipping was more frequent among subjects with mild depressive state than non-depressive normotensives [13].

A study done on depressive patients with chronic kidney disease showed positive association between depression and chronic kidney disease [14].

Table 1: Comparison of BDI II scores in dipper & non-dipper state and in high & normal BP load:

	Mean ± Standard deviation		P value
	Dipper (n = 42)	**Non-dipper (n = 18)**	
BDI II score	6.14 ± 4.21	10.11 ± 4.22	0.02
	Normal Day BP Load (n = 50)	**High Day BP load (n = 10)**	
BDI II score	6.2 ± 3.86	13.0 ± 3.39	<0.01
	Normal Night BP Load (n = 50)	**High Night BP load (n = 10)**	
BDI II score	6.17 ± 3.95	12.0 ± 3.85	<0.01

A study done by Nabi et al. suggested that the risk of hypertension increases with repeated experience of depressive episodes over time and becomes evident in later adulthood.

Several plausible mechanisms may explain this association. First, because hypertension develops over a long-time span, it may be that depressive symptoms in the long term rather than the short-term influence risk of high BP or hypertension. Thus, the trend toward an increase in the odds for hypertension in participants in the increasing depression group could be seen as a consequence of depressive symptoms that are likely to be persistent, severe, or less responsive to treatment. This could also explain why the risk of hypertension started to strengthen after the age of 55 years among men with increased depression scores. Second, it has been proposed that depressive symptoms could be linked to hypertension through their effect on the autonomic nervous system involved in the regulation of BP [15].

The American Heart Association has concluded that depression can accelerate atherosclerosis as well as promote the onset and severity of the coronary risk factors like hypertension, and high levels of low-density lipoprotein. The most important reason, depression increases the risk for cardiovascular disease, is its effects on lifestyle and compliance with recommended treatments. Depression has been shown to increase the risk of an unhealthy lifestyle, including smoking; diet higher in calories, salt, and saturated fat; and decrease in exercise. Each of these increases the risk of cardiovascular disease and worsens the outcome.

In addition to its effects on compliance, physiologically, depression is associated with an increase in the stress hormone cortisone. High levels of cortisone can lead to increased blood pressure. It can also increase other hormones (adrenaline), which can increase resting heart rate, blood pressure, and heart rate response to exertion, each of which may increase the risk of myocardial infarction, arrhythmias, and heart failure [16].

But some studies contradict the findings of our study. A study done by Licht et al. found that depressive disorder is associated with low systolic blood pressure and less hypertension [17]. Another study done by Hildrum et al. also showed that symptoms of anxiety and depression were associated with decrease in blood pressure [18]. The central monoamine system may be a possible source of this common factor. Depression and anxiety are characterized by altered levels of neuropeptide Y, an important modulator of norepinephrine signalling. The same alterations in neuropeptide Y may suppress sympathetic activity and decrease BP [19].

To our knowledge, the present study is the only study done in India to investigate the association of depression scores with 24 hours Ambulatory blood pressure and that too in normotensive healthy young adults.

Most of the studies are done either on diseased patients or in elderly age group. Our study results showed that depression leads to an increased risk of high systolic BP load and non-dipping state. Both these states are considered to be a risk of future hypertension and cardiovascular comorbidities.

It has been proved that subjects with mild hypertension and increased BP load have a higher target organ damage which include greater relative myocardial wall thickness and total peripheral resistance, retinopathy and lower cardiac index increasing the adverse cardiac risk profile [7,20].

Studies have shown that non-dipping state may result in increased risk of cardiovascular morbidities and mortality. Several cross-sectional studies have revealed that cardiac hypertrophy, silent cerebral infarction and microalbuminuria in normotensive or hypertensive populations were more common in non-dippers than dippers [7, 21,22].

Conclusion

We conclude that subjects with higher systolic BP load had more depression scores showing that depression is one of the contributing factors of rise in systolic BP. Secondly the depression scores were higher in non-dippers. So, depression can lead to non-dipping state which is itself a risk factor for future cardiovascular morbidity and mortality.

So, in patients suffering from depression, the 24-hour ABPM can be recommended to know about their dipper state and BP load so as to evaluate the future risk of hypertension and cardiovascular disorders in them.

Key Message

24-hour ABPM can be recommended in patients suffering from depression, to know about their dipper state and BP load, so as to evaluate the future risk of hypertension and cardiovascular disorders in them.

References

1. Shanthirani CS, Pradeepa R, Deepa R, Premalatha G, Saroja R, Mohan V. Prevalence and risk factors of hypertension in a selected South Indian Population – The Chennai Urban Population Study. J Assoc Physicians India 2003;51:20-27.
2. Mermerelis A, Kyvelou SM, Vellinga A, Stefanadis C, Papageorgiou C, Douzenis A. Anxiety and Depression Prevalence in Essential Hypertensive Patients is there an Association with Arterial Stiffness? J Depress Anxiety 2018;7(2):1-5.
3. Poongothai S, Pradeepa R, Ganesan A, Mohan V. Prevalence of Depression in a Large Urban South Indian Population — The Chennai Urban Rural Epidemiology Study (Cures – 70). PLoS One 2009;4(9): 71-85.
4. Sahoo S, Khess CR. Prevalence of depression, anxiety, and stress among young male adults in India: a dimensional and categorical diagnoses-based study. J Nerv Ment Dis 2010;198(12):901-4.
5. Kaur S, Deepti SS, Lal M. Prevalence and Correlates of Depression among College going students of District Amritsar, India. Int Res J Medical Sci 2014;2(11):5–9.
6. Wang YP, Gorenstein C. Assessment of depression in medical patients: A systematic review of the utility of the Beck Depression Inventory-II. Clinics. 2013;68(9): 1274-1287.
7. Sirisha PL, Babu GK, Babu PS, Koteswari P. Ambulatory blood pressure monitoring: a non-invasive gold standard for hypertensive therapy. Int J Pharm Sci Res2014;5(12):5073-87.
8. Agarwal JL, Garg S, Singh G. Association of circadian variation of blood pressure with obesity in healthy young adult males. International Physiology 2018; 6(1):29-33.
9. Ginty AT, Carroll D, Roseboom TJ, Phillips AC, de Rooij SR. Depression and anxiety are associated with a diagnosis of hypertension 5 years later in a cohort of late middle-aged men and women. Journal of Human Hypertension 2013;27:187–190.
10. Meng L , Chen D, Yang Y, Zheng Y, Hui R. Depression increases the risk of hypertension incidence: a meta-analysis of prospective cohort studies. J Hypertens. 2012 May;30(5):842-51.
11. Jonas BS, Lando JF. Negative Affect as a Prospective Risk Factor for Hypertension Psychosomatic Medicine 2000;62(2):188-196.
12. Scuteri A, Spalletta G, Cangelosi M, Gianni W, Assisi A, Brancati AM et al. Decreased nocturnal systolic blood pressure fall in older subjects with depression. Aging Clin Exp Res 2009;21(4/5):292-97.
13. Okajima K, Yamanaka G, Oinuma S, Kikichi T, Yamanaka T, Otsuka K et al. Even mild depression is associated with among-day blood pressure variability, including masked non-dipping assessed by 7-d/24-h ambulatory blood pressure monitoring. Clin Exp Hypertens. 2015;37(5):426-32.
14. Jun Z, Bin Z, Cheng W, Cuicui L, Wenbo Z, Ming L et al. Depression is associated with non-dipping Blood pressure in patients with chronic Kidney disease. Heart 2012;98:E-278.
15. Nabi H, Chastang JF, Lefevre T, Dugravot A, Melchior M, Marmot MG et al. Trajectories of Depressive Episodes and Hypertension over 24 Years - The Whitehall II Prospective Cohort Study. Hypertension. 2011;57:710-16.
16. Riba M, Wulsin L, Rubenfire M. Psychiatry and Heart Disease: The Mind, Brain, and Heart. Hoboken, NJ: Wiley-Blackwell; 2011.
17. Licht CMM, de Geus EJC, Seldenrijk A, Van Hout HPJ, Zitman FG, van Dyck R. Depression Is Associated With Decreased Blood Pressure, but Antidepressant Use Increases the Risk for Hypertension. Hypertension. 2009;53:631-38.
18. Hildrum B, Mykletun A, Holmen J, Dahl AA. Effect of anxiety and depression on blood pressure: 11-year longitudinal population study. The British Journal of Psychiatry 2008;193:108–13.
19. Karl T, Herzog H. Behavioral profiling of NPY in aggression and neuropsychiatric diseases. Peptides. 2007;28:326–33.
20. Mule G, Nardi E, Andronico G, Cottone S, Raspanti F, Piazza G. Relationships between 24 h blood pressure load and target organ damage in patients with mild-to-moderate essential hypertension. Blood Press Monit 2001;6(3):115-23.
21. Verdecchia P, Schillaci G, Guerrieri M, Gatteschi C, Benemio G, Boldrini F, Porcellati C. Circadian blood pressure changes and left ventricular hypertrophy in essential hypertension. Circulation 1990;81:528–36.
22. Shimada K, Kawamoto A, Matsubayashi K, Nishinaga M, Kimura S, Ozawa T. Diurnal blood pressure variations and silent cerebrovascular damage in elderly patients with hypertension. J Hypertens 1992;10:875–78.