International Journal of Physical Education, Fitness and Sports

ISSN: 2277: 5447 | Vol.3.No.4 | December 2014

TWENTY-FOUR HOUR BLOOD PRESSURE VARIATION AND CARDIOVASCULAR RISKS BETWEEN SMOKERS AND NONSMOKERS

Prasanna Sundara Raju[a] and **B. Chittibabu**[b,*]

[a]*Lecturer in Physical Education, PIMS, Puducherry – 605014.*
[b]*Assistant Professor, Dept. of Physical Education and Sports Sciences, Annamalai University.*
**Corresponding Author Ph: 09443531508; Email:* b.chitti@hotmail.com

DOI: 10.26524/14413

ABSTRACT: There are short-term and long-term variations seen in blood pressure. An abnormal pattern in cyclic variations of blood pressure (diurnal or seasonal) correlates well with an increased cardiovascular risk for hypertension, regardless of the resting blood pressure level. Increased blood pressure reactivity to smoking is also associated with a higher cardiovascular risk, and may be a significant determinant of cyclic blood pressure variations. The purpose of the study was to compare systolic (SBP) and diastolic blood pressure (DBP) between smokers and non smokers and elicit the cardiovascular risk. To achieve the purpose twenty (20) male athletes were selected from Dept. of physical education and sports science, Annamalai University, among these selected subjects ten (10) were smokers and ten (10) were non smokers. The parameters analyzed were 24-hour daytime and nighttime systolic and diastolic blood pressure using sphygmomanometer. The data was collected at six different times of the day 02:00, 06:00, 10:00, 14:00, 18:00 and 22:00 hours respectively. The data was collected from smokers and non smokers on SBP and DBP and 2 × 6 ANOVA with last factor repeated was computed. SBP and DBP showed significant variations between smokers and non smokers. SBP and DBP showed significant variations between smokers and non smokers at different times of the day. Not only the absolute value of blood pressure, but also the patterns of its excessive variation are closely related to the occurrence of cardiovascular events, so these patterns are clinically important. It may be difficult to explain the exact mechanisms of various abnormal short-term and long-term blood pressure variations at present. Smoking has been suggested as the causes of abnormal variations in blood pressure.

Keywords: Systolic blood pressure, diastolic blood pressure, rhythm, handball, players.

ISSN: 2277: 5447 | Vol.3.No.4 | December 2014

INTRODUCTION

Conventional wisdom has it that participation in athletic programs positively influences athletes health-related behavior. Coaches, athletic administrators, the mass media, and the general public often assert that interscholastic athletic participation helps teenagers and adults develop healthy habits while steering them away from tobacco, alcohol, drugs, dangerous dietary practices, physical inactivity, and other detrimental behaviors. On the other hand, some sport critics focus on a variety of negative health-related behaviors they believe are associated with athletic participation one among them is tobacco consumption mainly cigarette smoking this is the most wide spread known carcinogenic agents to which man is exposed.

Tobacco smoke delivers nicotine in much lower quantities to the smoker, much being destroyed through the heat from burning the leaf. However even taken in low quantities, nicotine is a potent chemical. It causes a range of physiological changes. Smoking elevates blood fat levels (cholesterol and triglycerides) and having high blood pressure result in cardiovascular disease.

A better understanding of the 24-hour effect of smoking on blood pressure trends, actual systemic blood pressure and the impact on target organs is required. Blood pressure monitoring is the diagnostic tool that enables this analysis, providing a profile of daytime and nighttime blood pressure variations. This test provides a better understanding of athletes blood pressure for diagnosis, prognosis or treatment purposes.

The purpose of the study was to compare systolic (SBP) and diastolic blood pressure (DBP) rhythm between smokers and non smokers and elicit the cardiovascular risk.

METHODS

Selection of Subjects and variable

Twenty athletes were selected and they were classified into two groups. These athletes were designated as smokers (10) and non smokers (10). These subjects were selected from Department of physical education and sports sciences, Annamalai University. Their age ranged between 22 and 24. All subjects gave their written concern. The characteristics of smokers and non smokers are presented in Table I. The systolic and diastolic blood pressure was selected as criterion variable and measured by sphygmomanometer.

ISSN: 2277: 5447 | Vol.3.No.4 | December 2014

Table 1: Characteristics of smokers and nonsmokers

Variable	Smokers (n = 10)	Nonsmokers (n = 10)
Age (yrs)	23 ± 1	22 ± 2
Height (cm)	173 ± 8	172 ± 8
Weight (kg)	79 ± 14	77 ± 15
Resting Heart Rate (bpm)	70 ± 3	67 ± 3
Resting SBP (mmHg)	120 ± 12	116 ± 10
Resting DBP (mmHg)	78 ± 10	74 ± 10
Cigarettes per day	11 ± 10	NA
Years smoking	6 ± 5	NA

Time schedule for collection of data

A circadian rhythm is a roughly-24-hour cycle in the biochemical, physiological processes of living beings. So the data was collected at six different times of the day 02:00, 06:00, 10:00, 14:00, 18:00 and 22:00 hours respectively.

Statistical technique

The data was collected from smokers and non smokers on SBP and DBP 2 × 6 ANOVA with last factor repeated was computed using SPSS.

RESULTS

The mean of systolic and diastolic blood pressure of smokers and non smokers are at six different times of the day are presented in Figure 1 & 2.

ISSN: 2277: 5447 | Vol.3.No.4 | December 2014

Figure 1
24 hour mean of SBP of Smokers and Non smokers

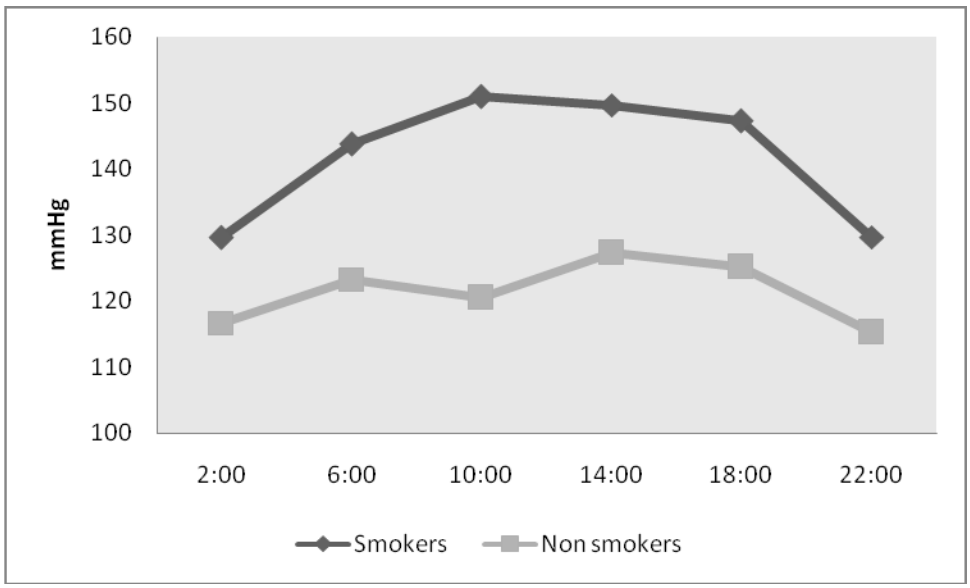
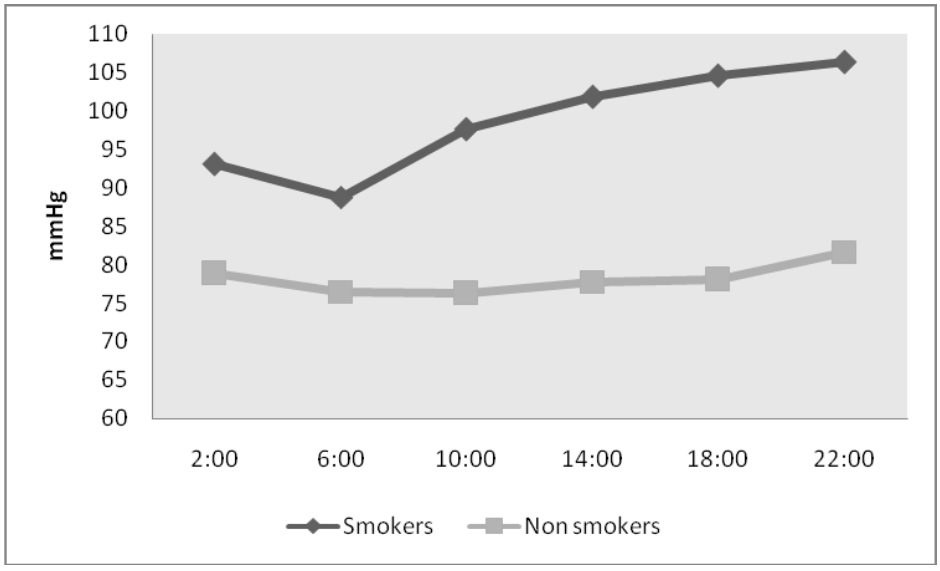


Figure 2
24 hour mean of DBP of Smokers and Non smokers



ISSN: 2277: 5447 | Vol.3.No.4 | December 2014

The data of SBP and DBP have been analysed by 2 × 6 ANOVA with last factor repeated and the obtained results are presented in Table 2. It clearly show that irrespective of testing conditions groups differ significantly in SBP and DBP. Similarly, at different times of the day also displayed significance in both SBP and DBP. The interaction also found to be significant for SBP and DBP at 0.05 level of confidence simple effect test has been used for further analysis and the results are presented in Table 2.

The simple effect clearly show that smokers found to have high SBP and DBP than non smokers at all time points and assume significance. It also show a significant variations within smokers and non smokers group at different time points.

Table 2
2 × 6 ANOVA with last factor repeated on SBP and DBP of smokers and non smokers at six different time of the day

Variables	Factors	F value	Simple effect	F value
Systolic blood pressure	Groups (Smokers & Non Smokers)	72.76*	Smokers	5.59*
			Non smokers	23.34*
	Different times of the day	25.43*	02:00	25.74*
			06:00	20.37*
			10:00	51.46*
			14:00	113.91*
	Interaction	6.55*	18:00	61.44*
			22:00	59.80*
Diastolic blood pressure	Groups (Smokers & Non Smokers)	427.99*	Smokers	24.55*
			Non smokers	2.16
	Different times of the day	17.05*	02:00	56.32*
			06:00	42.26*
			10:00	126.73*
			14:00	160.90*
	Interaction	8.750*	18:00	196.17*
			22:00	156.90*

* $p < 0.05$

ISSN: 2277: 5447 | Vol.3.No.4 | December 2014

DISCUSSION

In regular smokers nicotine levels raise and fall during the day, with declining levels leading to the urge to smoke another cigarette. Nicotine has a half life of 6 to 8 hours, meaning that it gradually accumulates over the course of the day, and decreases during the night [1]. One of the commonly used measures of an individual's addictiveness is how soon he or she reaches for their first cigarette on waking [2].

Once it enters the bloodstream, nicotine reaches the brain in 10–19 seconds [3], and acts through specialised cell receptors located in the brain and other organs and muscles. When the receptors signal the presence of nicotine, a wide range of physical reactions take place. Heart rate and blood pressure increase. Blood flow is altered, some sites (for example the skin) receive less flow and experience a drop in temperature, while others (such as skeletal muscle) experience increased blood flow. Vasoconstriction occurs in the coronary arteries [4]. Additionally, brain waves are altered, a number of endocrine changes occur, and skeletal muscle relaxation takes place [5]. Nicotine also increases metabolic rate, and suppresses appetite, with the result that smokers weigh an average of 4 kilograms lighter than non-smokers [6].

CONCLUSIONS

Not only the absolute value of blood pressure, but also the patterns of its excessive variation are closely related to the occurrence of cardiovascular events, so these patterns are clinically important. It may be difficult to explain the exact mechanisms of various abnormal short-term and long-term blood pressure variations at present. But several common hypotheses that include the sympathetic nervous system and the increase of arterial stiffness have been suggested as the causes of abnormal blood pressure variations. Efforts to understand these underlying disease mechanisms and to normalize blood pressure variation are expected to contribute to further reducing the cardiovascular risks, in addition to administering the currently available blood pressure treatments.

REFERENCES

1. D. A. Sica, What are the influences of salt, potassium, the sympathetic nervous system, and the renin-angiotensin system on the circadian variation in blood pressure? *Blood Pressure Monitoring*, 4 (1999) 9-16.
2. K. Narkiewicz, M. Winnicki, K. Schroeder, B. G. Phillips, M. Kato, E. Cwalina, V. K. Somers, Relationship between muscle sympathetic nerve activity and diurnal blood pressure profile, *Journal of Hypertension,* 39 (2002) 168-72.
3. F. Portaluppi, B. Bagni, E. degli Uberti, L. Montanari, R. Cavallini, G. Trasforini, A. Margutti, M. Ferlini, M. Zanella, M. Parti, Circadian rhythms of atrial natriuretic peptide, rennin, aldosterone, cortisol, blood pressure and heart rate in normal and hypertensive subjects, *Journal of Hypertension*, 8 (1990) 85-95.
4. S. J. Kim, H. S. Kang, S. J. Hwang, I. S. Sohn, C. W. Choue, K. S. Kim, J. S. Song, J. H. Bae, The relation of circadian blood pressure variation to left ventricular mass, diastolic function, and dynamic QT dispersion, *Korean Circulation Journal*, 35 (2005) 382-388.
5. K. Kario, K. Shimada, Risers and extreme-dippers of nocturnal blood pressure in hypertension: antihypertensive strategy for nocturnal blood pressure, *Clinical and Experimental Hypertension*, 26 (2004) 177-189.
6. K. Kario, T. G. Pickering, Y. Umeda, S. Hoshide, Y. Hoshide, M. Morinari, M. Murata, T. Kuroda, J. E. Schwartz, K. Shimada, Morning surge in blood pressure as a predictor of silent and clinical cerebrovascular disease in elderly hypertensives: a prospective study, *Circulation*, 107 (2003) 1401-1406.