SCRIPTA MEDICA (BRNO) – 81 (3): 159–164, *October 2008*

PREMETABOLIC SYNDROME, BODY MASS INDEX AND PULSE PRESSURE

CORNÉLISSEN G.[1], SIEGELOVÁ J.[2], FIŠER B.[2], ABRAMSON J.[3], SUNDARAM B.[4], MANDEL J.[3], HOLLEY D.[4], HALBERG F.[1]

[1] Halberg Chronobiology Center, University of Minnesota, Minneapolis, Minnesota, USA
[2] Masaryk University, Brno, Czech Republic
[3] Rollins School of Public Health, Emory University, Atlanta, Georgia, USA
[4] San Jose State University, San Jose, California, USA

Received after revision Juny 2008

A b s t r a c t

On 140 clinically healthy adults, Abramson et al. reported a positive association of markers of inflammation and blood pressure variability. The data from Abramson et al. are reanalyzed herein with another smaller sample of clinically healthy immigrants from Silicon Valley to examine any relation to body mass index (BMI), to pulse pressure and markers of inflammation. An association of pulse pressure with BMI ($r=0.418$, $P<0.001$) is shown which holds separately for subjects with BMIs below and above 30 kg/m^2 as well as an association with BMI of CRP ($r=0.431$, $P<0.001$) and tumor necrosis factor ($r=0.164$, $P<0.042$). The inflammation, gauged by CRP, relates to pulse pressure ($r=0.296$, $P<0.001$).

The data suggest that prospective studies are warranted to investigate, notably in schools, any associations of vascular variability disorders, such as an elevated pulse pressure, with other aspects of physiology and pathology, notably obesity, so as to institute timely preventive treatment.

K e y w o r d s

Body mass index, Pulse pressure, Markers of inflammation, Premetabolic syndrome, Obesity

INTRODUCTION

Background. On 140 clinically healthy adults, *Abramson et al.* (*5*) reported a positive association of markers of inflammation and BP variability. In a slightly extended subject population, the MESOR of HR and the pulse pressure (PP) were found to be positively associated with C-reactive protein (CRP) (*6*). Vascular variability disorders (VVDs) (*7*), such as CHAT (Circadian Hyper-Amplitude-Tension, a condition characterized by an excessive circadian BP variation), were also detected in this population of clinically healthy subjects (*6*).

Aim. To complement the detection of prehypertension (*1, 2*) and prediabetes (*3, 4*) with chronobiologically interpreted ambulatory blood pressure (BP) and heart rate (HR) monitoring by focus with the same approach upon obesity.

Method. The data from *Abramson et al.* (*5, 6*) are reanalyzed herein with another smaller sample of clinically healthy immigrants from Silicon Valley (*8*) to examine any relation to body mass index (BMI), to pulse pressure and markers of inflammation.

RESULTS

Fig. 1 shows an association of pulse pressure with BMI (r=0.418, P <0.001), which holds separately for subjects with BMIs below and above 30 kg/m^2, as seen in *Fig. 2.* A similar relation is found for men and for women in the USA, but only for women in 7-day records from the Czech Republic. *Figs. 3 and 4* show some association with BMI of CRP (r=0.431, P <0.001) and tumor necrosis factor (r=0.164, P<0.042). *Fig. 5* is in keeping with the assumption that inflammation, gauged by CRP, relates to PP (r=0.296, P < 0.001). We had earlier found in young healthy individuals that an increased BMI is associated with a lower double amplitude of systolic and diastolic blood pressure (*8*).

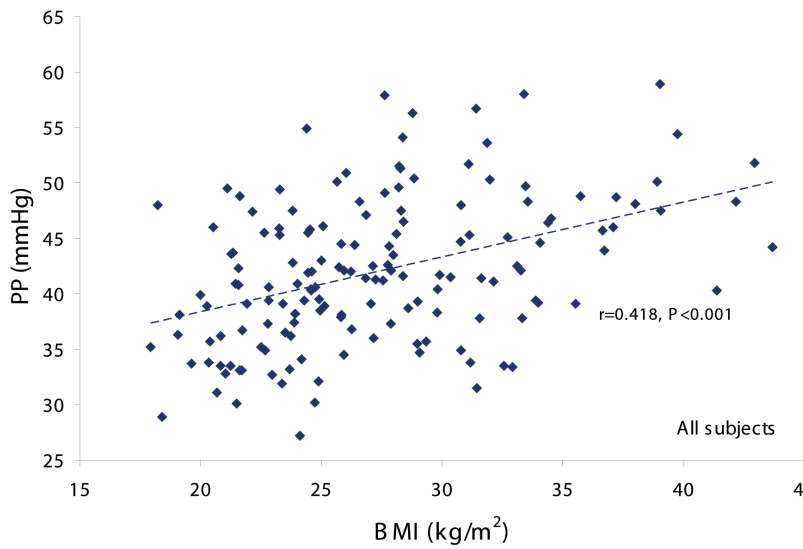

Fig. 1
An association of pulse pressure with BMI (r=0.418, P <0.001)

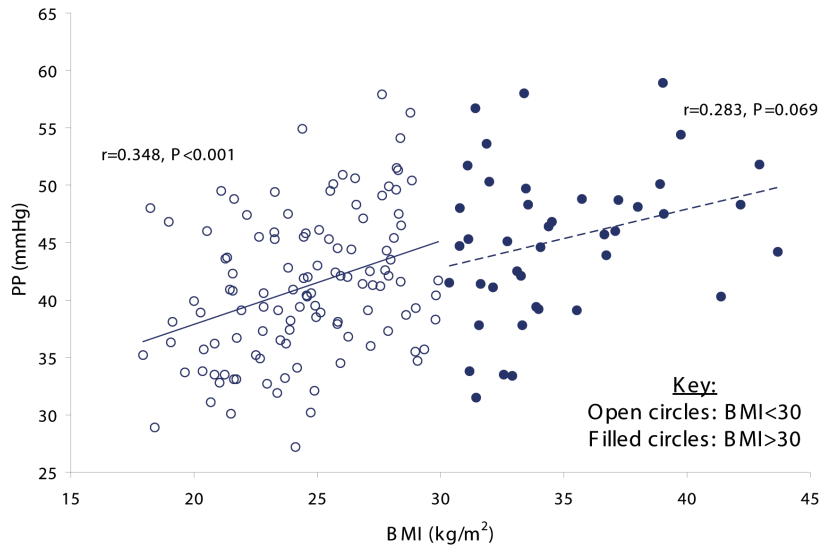

Fig. 2
An association of pulse pressure with BMI separately for subjects with BMIs below and above 30 kg/m^2.

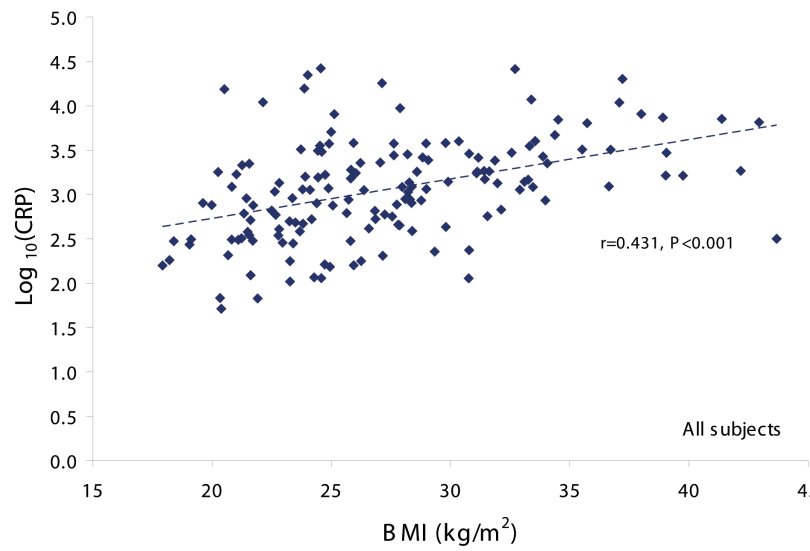

Fig. 3
An association with BMI of CRP (r=0.431, P <0.001)

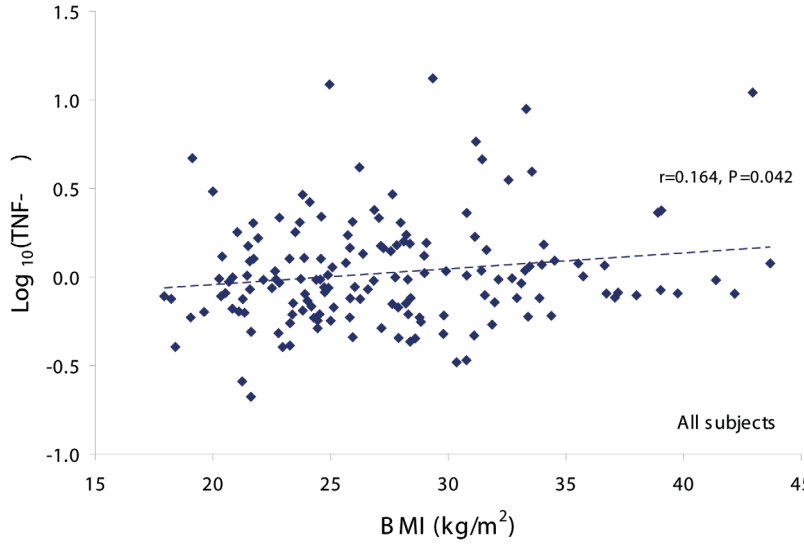

Fig. 4
An association with BMI of tumor necrosis factor (r=0.164, P<0.042)

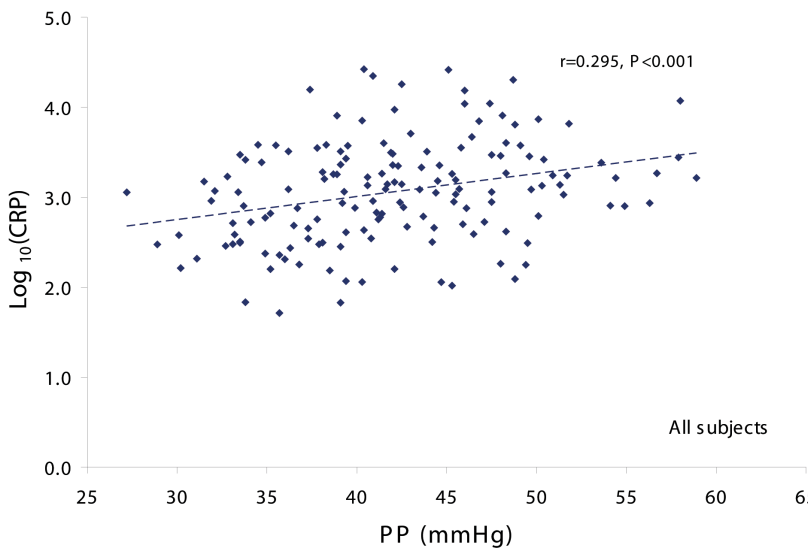

Fig. 5
The inflammation, gauged by CRP, relates to pulse pressure (r=0.296, P < 0.001)

DISCUSSION

All of the correlation coefficients reported herein are below 0.5, and there are discrepancies in that a gender difference seen in less unreliable 7-day records from the Czech Republic is not reproduced in the less reliable 24-hour profiles from the USA. That profiles for 2-, 3- and 4-day scan fail when longer series separate severe or early outcomes from health has been reported earlier (*4, 9*).

The US sample allowed a check on ethnic differences that were not found in the limited available sample. The gender difference found in Europeans in Europe, but not in "white" Americans, remains a puzzle. The data suffice, however, to suggest that prospective studies are warranted to investigate, notably in schools, any associations of VVDs, such as an elevated PP, with other aspects of physiology and pathology, notably obesity (*10*), so as to institute timely preventive treatment.

Acknowledgement

Supported by grant MSM 0021622402.

REFERENCES

1. *Cornélissen G, Halberg F, Otsuka K, Singh RB, Chen CH.* Chronobiology predicts actual and proxy outcomes when dipping fails. Hypertension 2007; 49: 237–239. doi:10.1161/01.HYP.0000250392.51418.64
2. *Halberg F, Cornélissen G, Halberg J, Schwartzkopff O.* Pre-hypertensive and other variabilities also await treatment. Am J Medicine 2007; 120: 19–20. doi:10.1016/j.amjmed.2006.02.045.
3. *Sanchez de la Peña S, Gonzalez C, Cornélissen G, Halberg F.* Blood pressure (BP), heart rate (HR) and non-insulin-dependent diabetes mellitus (NIDDM) chronobiology. Int J Cardiol 2004; 97 (Suppl 2): S14.
4. *Gupta AK, Greenway FL, Cornélissen G, Pan W, Halberg F.* Prediabetes is associated with abnormal circadian blood pressure variability. J Human Hypertension 2008; 22: 627–633. doi:10.1038/jhh.2008.32.
5. *Abramson JL, Lewis C, Murrah NV, Anderson GT, Vaccarino V.* Relation of C-reactive protein and tumor necrosis factor-alpha to ambulatory blood pressure variability in healthy adults. Am J Cardiol 2006; 98: 649–652. doi:10.1016/j.amjcard.2006.03.045.
6. *Abramson J, Cornélissen G, Mandel J, Halberg F.* Blood pressure overswinging, CHAT, found by 24-hour monitoring, needs validation by follow-up. Proceedings, International Conference on the Frontiers of Biomedical Science: Chronobiology, Chengdu, China, September 24–26, 2006, p. 43–45.
7. *Halberg F, Cornélissen F, Schwartzkopff O, Blagonravov ML, Chibisov SM, Otsuka K, Siegelova J, Beaty L, Nolley E, Sanchez de la Peña S, Zaslavskaya R, Radysh IV.* Vascular variability disorders (VVDs) and syndromes (VVSs): MESOR-hypertension, CHAT and other. Proceedings, 1st International Workshop, Physiology of adaptation and quality of life: problems of traditional medicine and innovation, People's Friendship University of Russia, Moscow, Russia, May 14–16, 2008: p. 401–403.
8. *Sundaram B, Hanumansetty R, Cornélissen G, Otsuka K, Katinas G, Siegelova J, Homolka P, Sanchez de la Peña S, Borer K, Schaffer E, Holley DC, Halberg F.* Blood pressure and pulse dynamics quantify everyday life's emotions – if excessive by circadian overswinging, CHAT. Am J Hypertens 2004; 17 (5 Part 2): 57a-58a.
9. *Schaffer E, Cornélissen G, Rhodus N, Halhuber M, Watanabe Y, Halberg F.* Outcomes of chronobiologically normotensive dental patients: a 7-year follow-up. JADA 2001; 132: 891–899.
10. *Després JP.* Cardiovascular disease under the influence of excess visceral fat. Critical Pathways in Cardiology 2007; 6: 51–59.