

COMMENTARY

Night shifts and hypertension

Peter W. de Leeuw MD, PhD, FAHA 

Department of Medicine, Maastricht University Medical Center and Cardiovascular Research Institute Maastricht (CARIM), Maastricht, The Netherlands

Correspondence

Peter W. de Leeuw, MD, PhD, FAHA, Department of Medicine, Maastricht University Medical Center, PO Box 5800, 6202 AZ Maastricht, The Netherlands.
Email: p.deleeuw@maastrichtuniversity.nl

Abstract

Shift workers may develop increased blood pressure.

KEYWORDS

blood pressure, hypertension, shift work

This issue of the *Journal* features a paper on the relationship between night shifts and the prevalence of hypertension among female nurses of different age groups.¹ This is an important topic as anyone who studies medicine or is involved in nursing will at some point be confronted with night shifts, either voluntarily or as part of the training program. For many representatives of older generations such night shifts form a normal part of the work and something that one should not worry or complain about. It is not surprising, therefore, that the effects of night work have hardly, if at all, been studied before the second half of the last century and inasmuch as studies are available they focus mainly on the relationship between shift work and output efficiency. A PubMed search reveals that the first paper dealing with the physiology and pathology of night shift workers appeared only in 1950.² Yet, it was already recognized at the time that night work and shift changes led to feelings of fatigue and disturbances of appetite, digestion, and sleeping times.³

When considering the possible ill-effects of night shifts on physical and mental health, we have to bear in mind that the body displays a variety of circadian rhythms with a periodicity of approximately 24 h. By and large, these rhythms are under the control of molecular clock genes. In addition, environmental and behavioral factors may influence certain physiological variables in such a way that a day/night rhythm is generated that looks as if it is circadian while, in reality, it is not. This is likely to be the case with respect to blood pressure. It has been known for a very long time that blood pressure falls during sleep and rises again during the early morning hours. Although many investigators loosely refer to this phenomenon as the circadian pattern of blood

pressure, several arguments speak against an innate rhythm of pressure itself. First of all, the level of blood pressure is the resultant of the actions of a multitude of physiological systems with a bearing on cardiac output, vascular resistance, arterial compliance and volume control. If it were purely circadian, all these systems would have to work together in absolute harmony to generate a reproducible, cyclical blood pressure pattern. Second, physical activity is a major determinant of blood pressure while sensory deprivation in itself is not.⁴ In other words, the nighttime fall in pressure may largely be related to rest and not so much to the light/dark cycle. Finally, in shift-workers the day-night pattern of blood pressure is rapidly reversed when changing to a night shift⁵ which is something one would not expect when an intrinsic mechanism would have to be reset. Thus, in all likelihood the enhanced physical and mental activity associated with nocturnal work is responsible for the normal or elevated blood pressure during the night.

Notwithstanding the huge ability of man to adapt to environmental challenges, it appears that repeated shifts of diurnal activities and rhythms is not without adverse effects.⁶ Indeed, various abnormalities have been described in shift-workers such as a disturbance in bone physiology and perhaps a greater risk of osteoporosis⁷ as well as breast cancer.⁸ While many of the reported associations still require confirmation, numerous reports have shown that shift work markedly enhances the risk for developing hypertension although this is based mainly on cross-sectional data as there is a paucity of longitudinal (cohort) studies. In a recent systematic review and meta-analysis, Gamboa Madeira and colleagues tried to determine the magnitude of blood

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial](https://creativecommons.org/licenses/by-nc/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2022 The Authors. *The Journal of Clinical Hypertension* published by Wiley Periodicals LLC.

pressure changes and hypertension risk among shift workers in comparison to daytime workers.⁹ Their analysis shows that night and rotational shift workers exhibit a significant, albeit modest, increase in systolic pressure. Concerning hypertension risk, they found no significant increase in either group. However, the population that was included in the analysis, was relatively young (below 40 years of age) and this may have precluded the detection of such a risk. In this regard, the paper in the present issue adds a further piece to existing knowledge on this matter. In a very large study, comprising over 100,000 female nurses from the Hebei province in China, the authors of this paper found an interaction between age and night shift frequency on the prevalence of hypertension.¹ Age was clearly associated with hypertension risk and so was a higher frequency of night shifts. Compared to nurses without night work, the risk increased with more than 5 or 10 shifts per month, particularly in the older age group. In other words, age and the frequency of night shifts had an additive effect.

A few comments on this study are in order. One is, of course, that an incident reading after 5 min of rest does not necessarily yield a representative blood pressure value in a given individual. Moreover, different devices to measure the pressure were used. While it is possible to measure systolic and diastolic pressure with the mercury sphygmomanometer, most electronic devices which were also used in this study only detect mean arterial pressure and calculate the values for systolic and diastolic pressure. Another problem is that nurses measured the pressure themselves. Although they are certainly qualified to do so, this may have introduced some bias, in particular when they were well aware of the purpose of the study. Nevertheless, some of these problems may have been compensated for by the enormous number of data points. Given the large sample size of this study, the data look very convincing but because this was a cross-sectional analysis, there is still room for some doubt. In the current 24/7 economy, however, it should not be too difficult to set up properly designed, prospective, longitudinal studies in different populations of all ages and both sexes to explore whether shift work does, indeed, raise blood pressure and whether it may accelerate the development of hypertension.

Another point that deserves attention, is that we should start to reflect on how to organize health care in modern society. Surely, medicine is an around-the-clock profession and we simply cannot avoid having people at work during nightly hours. But if we, at the same time,

would be responsible for the development of high blood pressure in shift workers, this would pose us for an ethical problem and the same may be true for other sectors of society.

CONFLICT OF INTEREST

The author has no competing interests

ORCID

Peter W. de Leeuw MD, PhD, FAHA  <https://orcid.org/0000-0002-4949-5812>

REFERENCES

1. Zhao B, Li J, Li Y, et al. A cross-sectional study of the interaction between night shift frequency and age on hypertension prevalence among female nurses. *J Clin Hypertens (Greenwich)*. 2022.
2. Menzel W. Zur Physiologie und Pathologie des Nacht- und Schichtarbeiters. *Arbeitsphysiologie*. 1950;14(3):304–318.
3. Wyatt S, Marriott R. Night work and shift changes. *Br J Ind Med*. 1953;10(3):164–172.
4. van den Meiracker AH, Man in 't Veld AJ, van Eck HJ, Wenting GJ, Schalekamp MA. Determinants of short-term blood pressure variability. Effects of bed rest and sensory deprivation in essential hypertension. *Am J Hypertens*. 1988;1(1):22–26.
5. Sundberg S, Kohvakka A, Gordin A. Rapid reversal of circadian blood pressure rhythm in shift workers. *J Hypertens*. 1988;6(5):393–396.
6. Khaper N, Bailey CDC, Ghugre NR, et al. Implications of disturbances in circadian rhythms for cardiovascular health: a new frontier in free radical biology. *Free Radic Biol Med*. 2018;119:85–92.
7. Bukowska-Damska A, Skowronska-Jozwiak E, Peplonska B. Night shift work and osteoporosis: evidence and hypothesis. *Chronobiol Int*. 2019;36(2):171–180.
8. Gehlert S, Clanton M, On behalf of the shift W, breast cancer strategic advisory G. shift work and breast cancer. *Int J Environ Res Public Health*. 2020;17(24):1–8.
9. Gamboa Madeira S, Fernandes C, Paiva T, Santos Moreira C, Caldeira D. The impact of different types of shift work on blood pressure and hypertension: a systematic review and meta-analysis. *Int J Environ Res Public Health*. 2021;18(13).

How to cite this article: de Leeuw PW. Night shifts and hypertension. *J Clin Hypertens*. 2022;24:609–610. <https://doi.org/10.1111/jch.14459>