



Ruprecht-Karls-Universität Heidelberg
Medizinische Fakultät Mannheim
Dissertations-Kurzfassung

Associations between psychosocial work stress, circadian cortisol secretion and common carotid artery intima-media thickness: a cross-sectional study in industrial employees

Autor: Maren E. Thole
Institut / Klinik: Institut für Public Health, Sozial- und Präventivmedizin
Doktorvater: Prof. Dr. J. E. Fischer

Background: Cardiovascular diseases (CVD) rank first among causes of death in high-income countries. In particular, psychosocial work stress has often been linked with an increased risk of CVD. In view of the demographic change and the resulting burden for European social systems it is essential to maintain good health in the working population. Intima-media thickness (IMT) of common carotid artery (CCA) has been used as an early surrogate marker for CVD risk. Studies have suggested that psychosocial stress exerts its adverse health effect by causing alterations to the body's allostatic systems; one of the key endocrinological systems is the hypothalamic-pituitary-adrenal (HPA) axis. Hence, the association between work stress and CVD may be mediated by impaired HPA axis functioning. Cortisol secretion and, especially, salivary cortisol, which is easy to sample, is suitable to resemble HPA axis malfunctioning. So far, the literature on salivary cortisol remains inconsistent and considerable heterogeneity exists with respect to the most suitable cortisol parameter to indicate psychosocial stress or predict health outcome. It remains unknown whether cortisol secretion acts as a mediator between work stress and IMT, and whether variations in IMT can be explained by cortisol secretion patterns. Also, few studies have addressed associations between psychosocial work stress and IMT or moderators in the relation between psychosocial work stress and IMT. Objectives: The aim of this doctoral thesis is to examine associations between job stress and cortisol secretion or IMT, and between cortisol secretion and IMT. Additionally, the study analyses moderators of associations of chronic work stress with cortisol, and cortisol with IMT from different domains (socioeconomic status, healthy behaviour, social resources and personal overcommitment). Methodology: The design of the study was cross-sectional. The research population was drawn from one industrial site of the MIPH Industrial Cohort Studies (MICS) and included 792 employees (both white and blue collar workers, 10.2% female). Participants underwent a medical examination and provided demographic, psychosocial and further relevant information by three validated questionnaires. A conceptual research model was developed and empirically tested. Work stress was operationalised by two stress models (Job demand-control; Effort-reward imbalance). IMT of right CCA was measured using Fast B-Mode ultrasound (ARTLAB system). Seven salivary cortisol samples were collected from two consecutive days (polyester tampons, Sarstedt device) and analysed using the IBL assay. Thirteen different cortisol secretion parameters were calculated. Linear regression analyses were performed to determine relationships and to identify moderators. Mediation effects were tested by the joint significance test. Confounders for IMT and cortisol were controlled for. Results: Effort-reward imbalance for blue collar workers was associated with diurnal cortisol decline (awakening – bedtime, $\beta = 0.208$, $p < 0.05$). A significant amount of variation of the awakening – bedtime cortisol difference in blue collar workers could be explained by adding effort-reward imbalance to the model (R^2 -change 3.2%, $p < 0.05$; total $R^2 = 8.5\%$). In blue collar workers, higher education buffered the effect of unfavourable scores of job demand-control on the cortisol awakening level ($\beta = 0.231$, $p < 0.01$). Significant associations between cortisol and IMT were found for the awakening level, the cortisol awakening response (CAR) (120 – 30, 120 – awakening, Area under curve (AUC) ground), and the diurnal decline (awakening – bedtime), these associations were inconsistent among blue and white collar workers. Among blue collar workers variances in IMT were best explained by the CAR (120 – awakening, R^2 -change 1.2%, $p < 0.05$; total $R^2 = 41.8\%$). Conclusion: From all awakening and diurnal cortisol parameters only diurnal decline was associated with psychosocial work stress, whereas the awakening response could predict IMT. The quality of these two cortisol parameters as part of risk assessment and prediction for health outcome should

now be substantiated by longitudinal studies with multiple-day cortisol sampling. Importantly, the effects on cortisol secretion and IMT provide further evidence for a social gradient in health.