

CHRONIC WORK NOISE AND MYOCARDIAL INFARCTION: Results from the NaRoMI (Noise and Risk of Myocardial Infarction)-Study

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Introduction Cardiovascular diseases are the leading cause of mortality worldwide. The known cardiovascular risk factors account for only a limited number of events of myocardial infarction (MI). Chronic noise exposure has been shown to be associated with increased catecholamine levels and with adverse effects on blood pressure and plasma lipids, and may eventually lead to the development of an acute MI. Only few longitudinal studies have examined chronic work noise as a risk factor for MI producing controversial results. In this analysis we present the results of the NaRoMI-Study regarding different parameters of work noise exposure and their association with MI.

Methods In this case-control study, consecutive patients admitted to all 32 major hospitals in Berlin with confirmed diagnosis of acute MI were enrolled from 1998 to 2001. Controls were matched according to gender, age, and hospital (case:control ratio of 1:1 for men and 1:2 for women). In standardized computerized interviews conducted during the hospital stay information was obtained on 3 different sources (on a 5 point likert-scale) of annoyance caused by noise: i. from outside the working room, ii. from own machines or appliances, iii. from machines or appliances used by colleagues. The 10 years work noise exposure (sound levels) were determined according to ISO 9921/1 assessing vocal effort for speech communication and according to catalogues for workplaces and machines. For the latter, type and duration of wearing hearing protection was assessed and considered in the sound level assessments. In multiple logistic regression models, the odds ratios (OR) and 95% confidence intervals (95%CI) of noise variables were adjusted for cardiovascular risk factors and sociodemographic variables.

Results A total of 4,115 patients (3,054 men, 56+/-9 years, 1,061 women, 58+/-9 years) were included in the study. During the last 10 years 76.2 % of the women and 90.8 % of the men were employed continuously or intermittently. Those study subjects without a job in the 10-year time frame were included in the analyses as a separate category. Univariate results of the categorized (quartiles) sum index of all noise annoyance variables showed only for men a significant increase in risk of MI: OR 1.36 (95%CI 1.06-1.75) for those scoring in the second quartile (=slight annoyance) and OR 1.29 (1.03-1.62) for those in the third quartile (=rather high annoyance) compared with the first quarter (=no annoyance). After adjusting for possible confounders a significant risk increase remained only for men scoring in the second quartile: OR 1.40 (1.05-1.86).

The sound level at work (according to vocal effort) was associated with increased risk of MI in men exposed to >70-85 dB (see table 1), compared to the reference group.

Table 1: Sound level at work according to vocal effort (ISO 9921/1) and risk of MI

	Women		Men	
	adj. OR	95%CI	adj. OR	95%CI
up to 55 dB	Reference		Reference	
>55-70 dB	0.86	0.51-1.44	1.12	0.90-1.40
>70 dB (women)	1.08	0.53-2.22	1.37	1.01-1.85
>70-85 dB (men)				
>85 dB	-	-	1.07	0.73-1.57

Sound level assessments according to catalogues for workplaces/machines did not show a significant increase in risk of MI. On the contrary, after adjusting for possible confounders we found for men that sound levels >55 dB were associated with a significantly decreased risk of MI. Adjusting for environmental noise (subjective and objective parameters) did not substantially change the results for any of the work noise variables.

Discussion A significantly increased risk of MI was only found for men scoring in the second highest (sound level assessment according to vocal effort) or third highest (annoyance sum index) exposure category. The highest category of these two variables was not associated with a significantly increased risk. This could have been due to the low number of study subjects (5.6% of cases vs. 4.6% of controls were exposed >85 dB according to vocal effort) or a healthy worker effect: only the fittest employees get and remain at the physically demanding highly exposed jobs. The decreased risk of MI for men exposed >55 dB (according to catalogue assessments) was not related to the correction for hearing protection. Sensitivity analyses without considering hearing protection did not alter the presented results. However, only a third of all study subjects working >85 dB actually used their protectors regularly. Our data suggests that work noise exposure may increase the risk of MI for men. The partly contrary findings (again for men only) indicate the need to use other assessments besides daily sound pressure level, e.g. disturbance of normal speech communication or noise annoyance to evaluate the risks of cardiovascular disease due to work noise.

Keywords: myocardial infarction, work noise, noise annoyance, sound level exposure