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P3.12: BLOOD PRESSURE CHANGES IN ASSOCIATION WITH PERSONAL BLACK CARBON EXPOSURE ARE NOT MEDIATED THROUGH MICROCIRCULATORY RESPONSES

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P3.11

CAROTID INTIMA-MEDIA THICKNESS IS POSITIVELY ASSOCIATED WITH SUBCHRONIC PERSONAL EXPOSURE TO BLACK CARBON: A STUDY IN A PANEL OF HEALTHY ADULTS

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Background: Research shows an association between particulate air pollution exposure and cardiovascular morbidity and mortality, with atherosclerosis as an implied underlying mechanism. The accurate assessment of personal exposure is a major challenge in epidemiological research since it is strongly related to time-activity patterns. We investigated carotid intima-media thickness (CIMT) in association with subchronic personal exposure to black carbon (BC) in a panel of healthy adults.

Methods: Personal BC exposure of 54 participants (92.3% female; mean age 40.7 years) was measured during one average workweek as a proxy for subchronic exposure. Within this week, the CIMT of each participant was measured ultrasonographically on two separate days. The effect of personal BC exposure on CIMT was estimated using mixed models adjusted for covariates including gender, age, exposure to secondhand smoke and general health indicators.

Results: The analyses showed a strong positive association between CIMT and personally measured BC. An interquartile range (320.8 ng/m³) higher personal BC exposure was associated with a 40.7 μm (95% CI: 16.0 to 65.5 μm; p=0.0026) thicker CIMT. Each year increase in age was associated with a 5.02 μm (3.30 to 6.74; p<0.0001) thicker CIMT, suggesting that an IQR higher personal BC exposure is equivalent to 8 years of ageing.

Conclusion: Based on individually measured BC exposures in a relatively young cohort of healthy nurses, our results suggest a larger impact of BC on CIMT than reported so far for other measures of pollution, including particulate matter.

P3.12

BLOOD PRESSURE CHANGES IN ASSOCIATION WITH PERSONAL BLACK CARBON EXPOSURE ARE NOT MEDIATED THROUGH MICROCIRCULATORY RESPONSES

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Exposure to ambient particulate matter and elevated blood pressure are risk factors for cardiovascular morbidity and mortality. Microvascular changes might be an important pathway in the association between air pollution and blood pressure. The objective of the study was to evaluate the role of the retinal microcirculation in the association between black carbon exposure and blood pressure.

A total of 56 healthy adults were provided with a μ-aethalometer for one week to measure personal exposure to black carbon. Blood pressure and retinal microvasculature were measured on average on four different days (range: 2-4) during this week.

Mean black carbon exposure was 866 ± 425 ng/m³ and ranged from 201 ng/m³ to 2415 ng/m³. An interquartile range increase (313 ng/m³) in black carbon exposure was associated with a 2.80 mm Hg (95% CI: 1.12 to 4.49, p<0.01) increase in systolic blood pressure and a 2.48 mm Hg (95% CI: 1.21 to 3.74, p<0.001) increase in diastolic blood pressure. These associations were independent of individual characteristics and time varying factors. Mediation analysis failed to reveal an effect of retinal microvasculature in the association between blood pressure and black carbon.

In conclusion, we found a positive association between blood pressure and personal black carbon exposure in healthy adults. This finding adds evidence to the association between black carbon exposure and cardiovascular health effects, with elevated blood pressure as a plausible intermediate effector. Our results suggest that the association between a person's usual blood pressure and black carbon exposure operates independent of the microcirculation.

P4.1

IMPACT OF AGE AND GENDER ON THE DETERMINANTS OF PULSE PRESSURE AND ISOLATED SYSTOLIC HYPERTENSION

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Age-related increases in pulse pressure (PP) across the adult age-span, and the development of isolated systolic hypertension (ISH), the extreme form of high PP, are often presumed due to age-related arterial stiffening. However, stroke volume (SV) is a key physiological determinant of PP, but the impact of SV on age-related changes in PP and ISH is unclear. We sought to quantify the impact of age on the physiological determinants of PP and ISH.

Detailed haemodynamic data including blood pressure (BP), SV and aortic pulse wave velocity (aPWV) were available in 5496 individuals (2470 males), aged between 18-92 years. Data were stratified by gender. ISH was defined as SBP≥140mmHg and DBP<90mmHg.

SV and aPWV were independently associated with PP (P<0.001 for both) and there was a strong interaction with age, where PP and aPWV increased significantly across the adult age-span (P<0.001 for both) but SV declined significantly with increasing age (P<0.001). In younger individuals (<30 years), SV, but not aPWV, was associated with increasing quartiles of PP in both males and females (P<0.001 for both) and was elevated in subjects with ISH versus normotensives (P<0.001). However, the opposite pattern was evident in older individuals, with aPWV rather than SV associated with high PP and ISH (P<0.001 for all comparisons).

The haemodynamic mechanisms underlying elevated PP and ISH change across the adult life-span. Moreover, due to the age-related decline in SV, PP may underestimate the true age-related increase in aortic stiffness.

P4.2

THE CARDIOVASCULAR RISKS PROFILES AND CENTRAL HEMODYNAMICS IN SURVIVORS OF ADULTHOOD CANCER WHO HAVE ANNUAL HEALTH CHECK-UP IN JAPAN

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Objective: This cross-sectional study was conducted to examine whether the risk profile for cardiovascular disease (CVD) and central hemodynamics, an independent marker for CVD, are not worsened in cancer survivors (CanS), who have annual health check-up, as compared to age-adjusted subjects without cancer (SWC).

Design: A cross-sectional cohort study.

Setting: Japan

Participants: From June 1, 2006, through November 30, 2007, Japanese subjects (4813 men and 3500 women) who had annual health check-up at the Health Care Center of Tokyo Medical University.

Main Outcomes and Measures: The prevalence rate of subjects quit smoking, hypertension, diabetes mellitus, hypercholesterolemia, and metabolic syndrome. Radial augmentation index (rAI) and the second peak of radial pressure wave form (SP2), marker of central hemodynamics

Results: In both genders, the age-adjusted prevalence rate of hypertension and that of metabolic syndrome were lower in the CanS (127 men and 127 women) than in the SWC (p < 0.05). These variables were significant determinants for the elevation of SP2. Then, age-adjusted SP2 was also lower in the CanS (109.2 mmHg) than in the SWC (110.4 mmHg)(p < 0.05).

Conclusions and Relevance: In Japanese male and female CanS who have annual health check-up, the risk profiles for CVD were not worsened and might be rather preferable as compared to SWC. Such preferable profiles might provide beneficial effects on central hemodynamics especially in male survivors. Thus, in Japan, CanS with the mind and condition to have annual health check-up may have rather preferable pathophysiological profiles with the prevention of CVD.

P4.3

INFLUENCE OF GENDER ON AORTIC STIFFNESS IN COPD

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Background: Male patients with chronic obstructive pulmonary disease (COPD) are at greater risk of cardiovascular (CV) events than females¹.