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Introduction: Hexavalent chromium (Cr(VI)) is an important occupational carcinogen. In addition to air monitoring, bio-monitoring is commonly applied to monitor exposure to Cr(VI). Within the EU human biomonitoring initiative, HBM4EU, we explored the applicability of different biomonitoring methods in the assessment of occupational exposure to Cr(VI) in welding and surface treatment activities.

Materials and Methods: A multi-center cross-sectional study was performed in Belgium, Finland, France, Italy, Poland, Portugal, the Netherlands, Luxembourg and United Kingdom. Harmonized procedures were used to collect biological and industrial hygiene samples. Contextual information was collected using questionnaires. Altogether 602 exposed workers and controls were included in the study. Exposure biomarkers studied included Cr in urine, red blood cells (RBC), plasma (P) and Cr(III)/Cr(VI) in exhaled breath condensate (EBC). In addition, a number of effect biomarkers were studied.

Results: Among chrome plating workers exposures were the highest. Cr in urine was highly correlated with air Cr(VI) in bath platers and welders. Observed low correlations between different exposure biomarkers suggest that these approaches are not interchangeable but rather complementary.

Conclusions: Cr in urine showed its value as the first approach for the assessment of internal exposure to Cr(VI). We recommend pre- and post-shift samples for low exposure levels. RBC/P-Cr and EBC-Cr(VI)/Cr(III) provide additional information when more specific information on exposure is needed. The current exposure levels require analytical methods with high sensitivity

Sp35-2

Biomonitoring of metal oxide nanoparticles in stainless steel welders

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Introduction: Welding can cause worker exposure to metal oxide nanoparticles (MO-NPs), including Cr₂O₃, Mn₃O₄ and NiO NPs. Our aim was to assess MO-NP exposure in welders through biological monitoring.

Materials and Methods: Welders (n. 18), from 2 Italian welding companies, provided exhaled breath condensate (EBC) and urine samples at the beginning and at the end of the shift on the 1st and 5th day of the workweek, and plasma samples at this latter time-point. Unexposed controls (n. 15) provided only one sample for each biological matrix. Single Particle Mass Spectrometry (SP-ICP-MS) technique was used to assess MO-NPs exposure in terms of particle concentration (p/mL) and size (nm).

Results: In welder EBC, Cr₂O₃ NPs showed a significantly higher median concentration at the post-shift of the 5th day of the week (64645 p/mL; 55.1 nm) compared to the pre-shift of the 1st day (15836 p/mL; 57.7 nm). The median Cr₂O₃ NP plasma concentration and size were significantly lower than in EBC (7762 p/mL; 44.3 nm), while no Cr₂O₃ NPs were determined in urine. Welders from one of the two companies showed NiO NPs in EBC of the 5th day (median 22000 p/mL; 64.8 nm) and plasma (8248 p/mL; 37.4 nm), although not in EBC of the 1st day and in urine. Cr₂O₃ and NiO NPs were not determined in controls. Mn₃O₄ NPs were not detected in any samples of welders and controls.

Conclusions: Although promising, the usefulness of EBC biomarkers of MO-NP exposure needs confirmation on a greater number of workers, under different quantitative and qualitative exposure conditions in order to inform risk assessment and management in welding operations

Sp35-3

Diffuse brain deposition of beta-amyloid among italian ferroalloy workers

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Introduction: Occupational manganese (Mn) exposure is associated with cognitive impairment and memory dysfunction. A potential neurotoxic mechanism leading to cognitive dysfunction is increased formation of β -amyloid, a marker of cognitive decline and dementia.

Materials and Methods: We examined differences in cognitive functioning and β -amyloid brain deposition in 6 ferroalloy workers (average age 64 and average Mn exposure duration 31 years) and 5 historical sex- and age-matched control workers (average age 63), not exposed to metals. Cognitive function was assessed with a battery of neuropsychological tests including the Montreal Cognitive Assessment (MOCA). Mn exposure was based on the 25-years annual assessment of workplace air monitoring

and biological monitoring. The presence of β -amyloid deposition was assessed with a General Electric Discovery 690 PET-CT scanner after the injection of 185 MBq of [^{18}F]flutemamol (Vizamyl, GE Healthcare, Marlborough, MA, USA) through a catheter placed in an intravenous line in an antecubital vein. PET acquisition was carried out for 20 minutes, starting 90 minutes after injection. We performed t-tests to compare the Mn exposed workers and the controls.

Results: β -amyloid deposition in the ferroalloy workers was more diffuse than controls ($p,0.05$). Cognitive function did not differ between the two groups.

Conclusions: To our knowledge this is the first study showing increased β -amyloid brain deposition in manganese exposed individuals. Further research is warranted to test the hypothesis of β -amyloid as a predictor of Mn-induced cognitive decline.

Special Session 36 Unemployment, Job Insecurity and Health for Vulnerable Workers Pre, During and Post Pandemic

Chair: Minha Rajput-Ray

Session introduction

Workers can be more vulnerable because of their social conditions, their health, and disabilities, and/or being in higher-risk jobs. The Covid-19 pandemic has brought about an unprecedented level of uncertainty with loss to lives and livelihoods. This has impacted the health and wellbeing of populations directly through infection, as well as through societal factors made worse by chronic disease and economic factors. Furthermore, there is evidence that vulnerable populations are disproportionately affected in terms of both their health and the socio-economic impact. UJIH-SC aims to share the evaluation of the effects of this pandemic on vulnerable workers in the context of health and work. We explore the challenges facing the global workforce during the COVID-19 pandemic.

Sp36-1

Chronic Disease Burden - Nutrition and Lifestyle affecting Lives and Livelihoods in the Covid-19 Pandemic

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Introduction: The covid-19 pandemic had widened the health gap, further exposing the challenges that workers face. These individuals are often marginalised by job role, geographical location changes due to migration or societal stigma in terms of ethnic origin, gender and disability. This paper further explores the challenges that vulnerable workers face in terms of nutrition and lifestyle factors (as defined by the United Nations Sustainable Development Goals) that play an important role in disease.

Materials and Methods: A case series of workers globally affected by the above factors were researched and nutritionally relevant health factors analysed. This series covers all continents and was able to cover the burden of poor nutritional status as a contributing factor to covid 19 related mortality and morbidity. In particular, the effects nutrition being of relevance in the management of Long Covid was also flagged.

Results: Poor nutritional status, in particular micronutrient deficiency and the double edged effects of both under and over nutrition have had direct and indirect effects on the susceptibility and

recovery from covid-19. The findings further support that prevention and disease management is noted to be a key variable in the vulnerable worker population.

Conclusions: The implementation of key nutritional parameters as part of the health and economic ecosystem is a significant factor in the saving of Lives and Livelihoods !

Sp36-2

The prevalence and risk factors for common mental disorders in informal economy workers

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Introduction: Informal economy workers are often marginalised with minimal or no benefits from occupational health and safety regulations, labour laws, social protection and/or health care. Awareness and the prevalence of common mental disorders (CMD) is generally low in these workers. The aim of this study was to determine the prevalence and risk factors of CMD in informal economy workers.

Materials and Methods: Data from two primary studies (Informal waste pickers and golf caddies) were analysed. A sample of 332 (73% female and 27% male) waste pickers, 375 make golf course workers (300 caddies and 75 non-caddies). The WHO Self Reporting Questionnaire (SRQ-20) was used to assess self-reported CMD. Logistic regression determined significant risk factors (socio-demographic, substance abuse and work stress-related factors).

Results: The prevalence of CMDs was 37.3% in waste pickers, 35.3% in golf caddies and 24.3% in non-caddies. The majority in both groups had Income levels of <\$300 per month and had secondary level education. Both groups had poor working conditions and job insecurity. The results showed significantly higher odds for CMDs among caddies that had high intake of alcohol, were intimidated at work, and had existing comorbidities. In addition, for waste pickers the odds of having CMD were >2 higher in females and smokers.

Conclusions: The prevalence of CMD in both caddies and waste pickers is higher compared to the general population. A comprehensive approach is required, including increased awareness of CMD, decreasing job insecurity and provision of occupational health services to address these challenges.

Sp36-3

Implementing the OH guide in Indonesia for Creating and Safe and Healthy Workplace

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Introduction: The Covid-19 pandemic highlighted the ever increasing importance of Occupational Health and Safety issues at work. Lack of resources in the local language is a barrier to effect awareness and communication.

Materials and Methods: The relevant permissions were sought and colleagues came together at Binawan University were able to