REFERENCE VALUES FOR LEAD, CADMIUM AND MERCURY IN BLOOD OF ADULTS FROM THE METROPOLITAN AREA OF SÃO PAULO (BRAZIL)

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1.INTRODUCTION

The aim of this study was to derive reference values (RV) for metals in blood of adults from the Metropolitan Area of Sao Paulo (Brazil). The reference values, that is the 95th percentile of the background exposure, was derived for lead, cadmium and mercury. The association between blood metals and sociodemographic and lifestyle factors was also investigated.

2. MATERIAL AND METHODS

Samples of 653 blood donors were collected from November 15 to December 16 of 2006. The study group was restricted to non smokers without any occupational exposure to the studied metals. In our evaluations we distinguished between the younger group (18 to 39 years) and the older group (40 to 65 years).

Blood was collected by venous phlebotomy and stored in sodium heparin anticoagulant tubes that were prescreened for background lead, cadmium and mercury contamination. Questionnaires were applied to collect information on basic demographic data and lifestyle.

Lead and cadmium were determined by graphite-furnace atomic absorption spectrometry (GFAAS) in the laboratory of CETESB, and mercury by cold vapor atomic spectrometry (CVAFS) in the laboratory of the German Federal Environmental Agency (Umweltbundesamt - UBA) in Berlin.

3. RESULTS AND DISCUSSION

The reference values for the studied metals are presented in the table.

Pb and Cd levels showed a significant association with sex and age. The results of multiple linear regression indicated men had 50% more lead in blood, and the older group had 23% more lead. The variables most related to Hg levels were fish consumption and amalgam fillings, as well, the educational level and age.

Cadmium levels are lower than reported in other countries, suggesting a different level of environmental exposure.

In general the background levels found in the present study are close to those reported in biomonitoring programs in other countries, such as the NHANES (US), GerES (Germany) and the EHMS (Czech Republic). There are very few comparable studies in Brazil.

4. CONCLUSION

The geometric means and the and 95th percentiles found in the present study indicate that the studied population – adults with background exposure only - is not exposed to dangerous levels of the analyzed metals. Biomonitoring studies should be performed continuously enabling to assess trends and to update RV to the current population exposure.

Due to the high susceptibility of children and women of childbearing age to the effects of the metals it is recommended to conduct additional studies in Brazil specially with these populations subgroups.

Lead, mercury and cadmium in blood (ug/L) of the study groups

	N	GM	CI-GM	P95	CI-P95
Lead					
Males					
18-39	234	26.46	25.00-28.00	54.76	50.20 – 59.73
40-65	82	32.94	29.90-36.30	68.81	59.30 – 79.84
Females					
18-39	158	17.61	16.23-19.10	41.56	36.68 – 47.09
40-65	65	21.26	18.65-24.24	51.61	42.21 – 63.10
Mercury					
Males					
18-39	234	0.94	0.83-1.06	3.57	2.96 – 4.30
40-65	94	1.14	0.98-1.32	4.05	3.21 – 5.10
Females					
18-39	185	0.94	0.85-1.05	3.16	2.68 – 3.71
40-65	80	1.10	0.91-1.33	4.56	3.41 – 6.10
Cadmium					
Males					
18-39	234	0.08	0.08-0.09	0.35	0.30 – 0.41
40-65	82	0.09	0.07-0.10	0.28	0,22 – 0,35
Females					
18-39	158	0.07	0.06-0.08	0.39	0.32 – 0.48
40-65	65	0.11	0.09-0.13	0.36	0.29 – 0.44

GM – Geometric mean
CI-GM - 95% confidence interval for GM
P 95 – Percentil 95
CI-P95 – 95% confidence interval for P95