**INTRODUCTION**

Arsenic and its inorganic compounds are classified as carcinogenic to humans. Exposures to inorganic arsenic (As) in drinking water are associated with both carcinogenic and non-carcinogenic effects. The risk assessment of exposures to low-moderate levels of environmental arsenic (As) is a challenging objective for research and public health. Therefore, an epidemiological study based on human Biomonitoring Survey (SEpiAs study) was carried out in four areas of Italy (figure 1).

Source of As is natural in Amiata and Viterbese (soil and water), anthropogenic in Taranto and Gela. A contamination of tap water by arsenic is documented in Viterbese where mean value significantly exceed 10 μg/l (low limit established by the Directive 98/83/CE). Gela and Taranto were declared as Reclamation Sites of National Interest characterized by industrial areas (Refinery, steel plant) on the basis of documented soil contaminations or presence of hazardous waste (figures 2 and 3). Numerous epidemiological studies have reported health risks in the four areas.

**OBJECTIVES**

The main objectives are the:
- description of As distribution by area;
- identification of subjects with high level of iAs;
- evaluation of the relationship between arsenic concentration and factors of exposure;
- development of indicators for environment and health monitoring system.

**METHODS**

The study design is a multicentric observational epidemiological survey based on the measure of biological markers. 271 subjects (132 men) aged 20-44, were randomly sampled stratifying by area, gender and age classes (20-29, 30-39, 40-44 years) (table 1). Individual data on residential history, socio-economic status, environmental and occupational exposures, lifestyle and dietary habits, were collected through interviews using questionnaire. In urine samples of recruited subjects, the concentration of iAs and methylated species (MMA, DMA) was measured using inductively coupled mass spectrometer (DRCQP-MS), after chromatographic separation (HPLC).

Genetic susceptibility was evaluated by a set of polymorphism reported in scientific literature as associated with As (AS3MTInt287Thr, GST-T1, GST-M1, OGG1). The distributions of iAs and iAs+MMA+DMA were described by area and gender using Geometric Mean (GM) and percentiles (50p, 75p, 95p).

The associations between As species and exposure variables were evaluated by Geometric Mean Ratio (GMR), adjusted for genetic susceptibility and fish consumption in the three days before the urine sample taken.

**RESULTS**

The percentages of iAs and MMA on total As were respectively 25.3% and 20.5%, close to the upper limit of ranges reported in scientific literature (respectively 10%-30%, 10-20%). In males of Taranto and Gela the percentages of iAs were the highest (about 27%, figure 5).

Table 1. Number and percentage of sample units with iAs>1.5 μg/l by gender and area.

<table>
<thead>
<tr>
<th>Area</th>
<th>Female (%)</th>
<th>Male (%)</th>
<th>Total</th>
<th>GM (μg/L)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amiata</td>
<td>3 (16.7)</td>
<td>11 (58.9)</td>
<td>14 (20.7)</td>
<td>0.17 (0.01-1.99)</td>
<td>0.86-2.61</td>
</tr>
<tr>
<td>Viterbese</td>
<td>2 (10.0)</td>
<td>7 (35.3)</td>
<td>9 (12.0)</td>
<td>0.04 (0.001-0.30)</td>
<td>0.001-0.30</td>
</tr>
<tr>
<td>Taranto</td>
<td>1 (5.3)</td>
<td>6 (31.6)</td>
<td>7 (11.4)</td>
<td>0.10 (0.05-0.20)</td>
<td>0.05-0.20</td>
</tr>
<tr>
<td>Gela</td>
<td>1 (5.3)</td>
<td>9 (47.4)</td>
<td>10 (16.7)</td>
<td>0.30 (0.10-1.50)</td>
<td>0.10-1.50</td>
</tr>
<tr>
<td>Total</td>
<td>7 (3.6)</td>
<td>25 (13.2)</td>
<td>32 (5.0)</td>
<td>0.11 (0.05-0.22)</td>
<td>0.05-0.22</td>
</tr>
</tbody>
</table>

**CONCLUSIONS**

The result showed mean concentrations of iAs higher in areas characterized by anthropogenic As pollution than those characterized by natural sources. The main sources of As exposure appear to be occupational and related to some type of food (fruit and vegetables) and beverages (water and milk). The results showed different exposure pathway among areas. Results are relevant to identify and take care of subjects outliers for inorganic-organic arsenic and to aim primary prevention measures for decreasing the level of population exposure.

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