

Environmental Exposure to Silica Dust and Health Effects

Raul Harari, Homero Harari, Susan Woskie, Fred Youngs, Dhimiter Bello, Susan Shepherd, Rocío Freire M., Gonzalo Albuja, Mauro Fierro, Roberto Billante



BACKGROUND.-

Crystalline silica is known to be carcinogenic to humans (Group 1) according to IARC Classification. Between the health effects are found fibrosis, silicosis, silicotuberculosis.

Occupational exposure to silica dust have been more defined and many efforts are conducted to control it. In the other hand environmental exposure to silica due to construction mining have been difficult to define, specially in Ecuador when this problem have occurred and occurs in the last 40 years.

Exposure to mineral dust of workers and population in construction mining is common in the northeast of Quito, Ecuador.

THE STUDY.-

We designed a cross-sectional study in a population settled during more than 20 years near but in different distances of construction mine in the northeast of Quito. A referent group was selected from other area with no mining activity.

A questionnaire was designed and applied, but as tuberculosis is considered associated with poverty, it also looked for social, economical and environmental issues. Habits of smoke were also considered.

Exposure was assessed through air sampling for respirable dust in the communities of Tanlahua and Santa Rosa, which are inside the mining areas. Sampling was conducted during the working time of the mine. Sampling methods and equipment as well as samples analysis were provided by the Laboratory of Industrial Hygiene of the Department of Work Environment, University of Massachusetts Lowell.

In the study were selected individuals from the community, who were living in the area for more than 20 years and never worked on it.

Each individual was examined clinically, with chest x-ray and performed a spirometry. X-rays examinations were analyzed by two different Readers A.

The study population was divided in groups according to the area where they belong:

Tanlahua Community

People living near the mine, less than 500 meters.
Recluted 41 men and 84 women.

Santa Rosa Community

Living near a mine, closed in the past 5 years.
Recluted 16 men and 27 women.

Rumicucho Community

3 km away from the active mine
Recluted 35 men and 70 women.

Atucucho Community

Far away from the mining area.
Recluted 15 men and 30 women.

AIMS OF THE STUDY.-

- To identify exposure to respirable dust.
- To identify silica dust content.
- To determine associations between environmental exposure to silica dust and silicosis, silicotuberculosis, fibrosis and tuberculosis.

RESULTS.-

Table I and II show the concentrations of respirable dust in the communities of Tanlahua and Santa Rosa.

According to mineralogical analysis of the composition of the mine material reported by mining officers the content of silica in Tanlahua and Santa Rosa will be around 40%.

Table I

Sampling Area	CONCENTRATION ug/m3
Tanlahua 1	214.18
Tanlahua 2	35.24
Tanlahua 3	141.98
Tanlahua 4	231.14
Tanlahua 5	89.79
Tanlahua 6	610.26
Tanlahua 7	142.41
Tanlahua 8	40.97

Table II

Sampling Area	CONCENTRATION ug/m3
Santa Rosa 1	381.45
Santa Rosa 2	126.63
Santa Rosa 3	153.92
Santa Rosa 4	98.90

Table III shows health effects. In Tanlahua we have high prevalence of silicosis and silicotuberculosis, in particular in women.

In Santa Rosa we found also high prevalence of silicosis and fibrosis but less presence of tuberculosis.

In Rumicucho we found less cases of silicosis and tuberculosis than in the mentioned sites.

The Reference group of Atucucho did not showed any kind of this respiratory diseases.

Population income is low in all the groups but specially in the Tanlahua population.

There is a correlation between years of exposure and presence of health effects probably due to silica presence in the air.

A particular result that help to see the environmental impact is the presence of a high number of women affected. Women never worked in the mines, and seems that have been exposed at home, beside the mines.

Low frequency of smoke and the absence of other confounding (tuberculosis, Kaplan Syndrome), give this results an importance to explain other way of exposure to dust in developing countries where preventive measures are absent.

The following maps help to identify the different sites and also to look at the different distance from the mine of the studied population.

CONCLUSIONS.-

Further analyses are needed to confirm these results but some conclusions could be considered:

1) High environmental exposures to mineral dusts are frequent in mining areas in Ecuador. The lack of control and the similarities in mining in developing countries could lead to health effects.

2) The lack of adequate health services, lead to underestimation and misdiagnosing of lung effects associated with environmental exposures.

3) Preventive measures are needed and requires an integral strategy that help to reduce poverty, infectious diseases and silica effects.



Tanlahua



Santa Rosa



Rumicucho

Table III

Neighbourhood	Characteristics	Total Population	Men	Women	Age Average	Exposure Duration Average	Smokers
	Normal and Abnormal						
Tanlahua	Abnormal	32	11	21	60,09	55,81	3
Tanlahua	Normal	93	30	63	40,64	39,16	11
Santa Rosa	Abnormal	17	9	8	61	54,35	9
Santa Rosa	Normal	26	7	19	38,15	35,19	3
Rumicucho	Abnormal	12	4	8	51,5	21	3
Rumicucho	Normal	93	31	62	35,27	17,94	29
Atucucho	Abnormal	3	-	3	69	18,92	0
Atucucho	Normal	42	15	27	42,3	18,15	5



FONDO AMBIENTAL

QUITO

DIRECCIÓN METROPOLITANA DE MEDIO AMBIENTE

QUITO



Domingo de Brieva N38-107 y Villalengua
Urbanización Granda Centeno
Phone: + 593 2 2439929
Fax: + 593 2 2275662
Email: ifa@ifa.org.ec
P. O. Box: 17-08-8386
Quito- Ecuador