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Risks/Hygiene

Toxicology

Cancer mortality among population groups exposed to HCH and other pesticides in Cidade dos Meninos, Duque de Caxias, RJ, Brazil: preliminary results

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Introduction

A pesticides producing plant manufacturing HCH, DDT and pentachlorophenol started to operate in Cidade dos Meninos, municipality of Duque de Caxias, RJ, Brazil in 1950, when such chemicals were used by governmental vectors control programs. Following the increase of production costs, the plant stopped operation in 1961, leaving behind 250 tonnes of HCH piled in the former industry fields. Continuous press denounces about uncontrolled pesticides sells in a public market in the area started in 1989, thus yielding governmental authorities to evaluate and to implant remedial actions aiming chemical pollution control. Hence, private firm services were contracted in 1995 and lime was added to the surface land, which was revolved by a tractor. Further soil analysis that was carried out revealed that more volatile and toxic agents such as dioxins and trichlorobenzene had resulted from such initiative, also contaminating air and local water supplies.

This paper presents preliminary results on cancer mortality among population groups living in Cidade dos Meninos and the surrounding area following long-term exposure to chemical substances such as HCH, DDT, pentachlorophenol and others.

Methods

The framework of the study includes the focus area in which around two thousand persons used to live in a rural area since the sixties. The fast growing surrounding area was also analysed, despite the fact that reliable population estimates were unavailable. Since the area has no population based cancer registry, data provided by the national mortality system were used to estimate cancer mortality.

All cancer deaths from the municipality of Duque de Caxias, RJ, where Cidade dos Meninos is located, were searched during 1980, 1985 and 1991 (Ministerio da Saude 1980; 1985; 1991). Further, cancer mortality rates were ascertained and compared among Duque de Caxias county, Nilopolis, which is geographically near the former, and the State of Rio de Janeiro, wherein both are located.

Then, cancer proportional mortality ratios (CPMR) and specific cancer site distribution patterns were obtained in different areas according to their closeness to the focus area where the old factory was located (less than 4 km, less than 8 km, 8-12 km and more than 12 km). Also their occurrence probability by chance was estimated towards Poisson distribution.

Results

No major differences on sex and age cancer mortality rates were observed between Duque de Caxias, Nilópolis and the State of Rio de Janeiro during the study period (Tables 1 and 2). Cancer mortality increasing trends have not been observed in Duque de Caxias County, wherein Cidade dos Meninos is located, during the period 1980-1991 (Tables 3 and 4). In the area located 4 km far from the old factory where 2 cancer deaths would be expected/year, 7 were observed in 1980 (ratio between observed and expected deaths = 3.5, Poisson $p = 0.03$), 6 in 1985 (ratio = 3.0, $p = 0.01$) and 19 in 1991 (ratio $p < 0.0000001$).

Cancer mortality patterns were also similar between Duque de Caxias, Nilopolis and the State of Rio de Janeiro (Table 5). Nevertheless, haematological, pancreatic, liver and bladder cancer were the most prevalent tumour sites among men in the area located up to 7 km far from the focus area, being the former the first cause of cancer mortality among women. In the same surrounding area of the former factory, the absolute number of cancer deaths increased 5 folds for pancreatic and liver cancer, 4 folds for larynx cancer, 3 folds for bladder cancer and 2.5 folds for haematological neoplasia among men during the period 1980 and 1991. Among women, a two folds increase (absolute number of deaths) was observed for pancreatic and haematological tumours in the same time interval.

Discussion

Pesticides exposure has been reported in the literature as associated to acute and chronic intoxication, reproductive disturbances (spontaneous abortion, birth defects, infertility, birth weight changes) and cancer. This research aimed to carry out an exploratory evaluation of cancer mortality following environmental exposure to mixed pesticides (HCH, DDT, pentachlorophenol, dioxins) in Cidade dos Meninos area in Brazil.

The option to use data from the national mortality system was supported by previous research confirming a high observed reliability according to official cancer mortality data in selected Brazilian regions, including the State of Rio de Janeiro (Monteiro *et al.*, 1997).

The first step was to evaluate if Duque de Caxias County had been showing higher cancer mortality either than the State of Rio De Janeiro or the neighbour Nilopolis County located in the same geographical region (Baixada Fluminense). We could confirm that Duque de Caxias County neither had higher cancer mortality rates, nor an increasing rate trend could be observed. Thus, if Cidade dos Meninos has been showing a higher cancer distribution, it seems improbable that this could lead to higher cancer mortality rates observed in Duque de Caxias County.

Mortality data verification was carried out searching all death certificates in Duque de Caxias county mentioning any cancer as a cause of death during 1980, 1985 and 1991, being the respective addresses geographically located according to their distances from the old pesticides factory in Cidade dos Meninos. The chosen years allowed a long-time exposure observation necessary to evaluate cancer latency.

From a quantitative approach, an excess of cancer deaths in the area located up to 4 km from the former factory was observed since 1980 (3.5 times higher than the expected according to Duque de Caxias cancer mortality), which reached 9 folds higher in 1991, being statistically significant. When the geographical area was enlarged up to 7 km far from the factory, a significant increase of the observed compared to the expected number of cancer cases was identified for pancreatic, liver, bladder and haematological tumours. These cancer sites were reported in the literature as associated with environmental and occupational exposures to some chemical substances, including pesticides. A similar magnitude of observed compared to expected cancer distribution pattern was not noted in the geographical area located 12 km far from the factory.

It is worth to mention that these preliminary results did not reveal similar increases of stomach, lung and breast cancer, at the most prevalent cancer sites in the State of Rio de Janeiro even at a distance of 7 km from the factory. Such observations seem to be confirmed by comparing the most important cancer sites detected in the State of Rio de Janeiro, Nilopolis and Duque de Caxias County, all of which showed quite similar patterns while Cidade dos Meninos, seemed to display a different pattern

Further research in progress will try to confirm if such observations persist in more recent years. Moreover, a comprehensive follow-up program of the affected population groups started to be organised. On the other hand, appropriate remediation of the chemical contamination in the Cidade dos Meninos has also been discussed to be soon implemented by the governmental authorities in Brazil.

Conclusions

The municipality of Duque de Caxias has showed similar cancer mortality rates than the neighbour municipality of Nilopolis and the State of Rio de Janeiro where both are located. On the other hand, a higher than expected cancer distribution was observed in the area surrounding Cidade dos Meninos (up to 7 km far from the old HCH producing plant) during 1980, 1985 and 1991. The cancer site distribution pattern in this area was also different from that observed among population groups living 13 km far from the focus area. This is mainly a consequence of an increased distribution of pancreatic, liver, bladder and haematological cancer in the former.

References

1. Ministério da Saúde, Estatísticas de Mortalidade, Brasil, 1980.
2. Ministério da Saúde, Estatísticas de Mortalidade, Brasil, 1985
3. Ministério da Saúde, Estatísticas de Mortalidade, Brasil, 1991.
4. Monteiro G.T.R.; Koifman R.J.; Koifman S. (1997). Reliability and accuracy of reported causes of death from cancer. I. Reliability of all cancer reported in the State of Rio de Janeiro, Brazil. *Cad. Saude Publ*, Rio de Janeiro, 13 (Supl. 1), 39-52.

Table 1. All sites cancer mortality* among men, State of Rio de Janeiro, Duque de Caxias and Nilópolis counties, 1990-92

Age	Duque de Caxias	Nilópolis	State of Rio Janeiro
0-14	4.0	4.7	5.7
15-29	7.5	6.3	8.7
30-49	40.8	51.9	48.8
50-69	360.6	433.1	409.5
70 and more	1,004.5	1,329.0	1,228.1

* rates per 100,000 men

Table 2. All sites cancer mortality* among women, State of Rio de Janeiro, Duque de Caxias and Nilópolis counties, 1990-92

Age	Duque de Caxias	Nilópolis	Estado Rio Janeiro
0-14	4.4	4.9	4.9
15-29	6.8	3.0	7.6
30-49	50.1	47.0	55.1
50-69	262.2	322.0	283.1
70 and more	632.9	722.0	752.6

* rates per 100,000 women

Table 3. All sites cancer mortality* among men, Duque de Caxias county, 1980-81, 1984-86 and 1990-92

Age	1980-81	1984-86	1990-92
0-14	7.5	8.4	4.0
15-29	8.1	7.4	7.5
30-49	53.1	50.1	40.8
50-69	353.9	357.5	332.9
70 and more	714.8	717.0	752.6

* rates per 100,000 men

Table 4. All sites cancer mortality* among women, Duque de Caxias county, 1980-81, 1984-86 and 1990-92

Age	1980-81	1984-86	1990-92
0-14	8.2	5.1	4.4
15-29	6.2	6.9	6.8
30-49	64.8	56.5	50.1
50-69	281.6	252.5	262.2
70 and more	783.4	537.8	632.9

* rates per 100,000 women

Table 5. Cancer mortality distribution by gender and anatomic site, State of Rio de Janeiro, Nilópolis county, Duque de Caxias county and Cidade dos Meninos, 1990-92

Ranking	State of Rio Janeiro	Nilópolis	Duque de Caxias	Cidade dos Meninos *
Men				
1 st	Lung	Lung	Lung	Lung/Stomach
2 nd	Stomach	Stomach	Stomach	Haematological
3 rd	Prostate	Prostate	Prostate	Pancreas/Liver
4 th	Esophagus	Larynx	Larynx	Bladder/Prostate
5 th	Larynx	Colon	Esophagus	Esophagus
Women				
1 st	Breast	Breast	Cervix	Haematological
2 nd	Cervix	Cervix	Breast	Stomach
3 rd	Stomach	Stomach	Lung	Breast
4 th	Lung	Lung	Stomach	Pancreas
5 th	Colon	Colon	Colon	Cervix

* - including surrounding areas until 7 km far from the former pesticides factory