

# Prevalence of Risk Factors for Cardiovascular Disease in Employees of the Research Center at Petrobras

Maria de Fátima Duarte Matos, Nelson Albuquerque Souza e Silva, Armando Jorge Marques Pimenta, Antonio José Ledo Alves da Cunha

Rio de Janeiro, RJ - Brazil

**Objective** - To determine the prevalence of risk factors for cardiovascular diseases in employees of the research center at Petrobras.

**Methods** - In a cross-sectional study, employees of the research center at Petrobras were assessed clinically and by laboratory testing from March 2000 and February 2001. Those who did not attend the periodical annual medical examination of 2000 were excluded from the study. The percentage of risk factor occurrence and the mean standard deviation of the biochemical variables, blood pressure, and body mass index were calculated.

**Results** - Of 1,911 employees, 970 were studied, 75.4% were men and 24.6% were women with a mean age of 42.2 years old. The risk factors were lack of exercise (67.3%), cholesterol > 200 mg/dL (56.6%), overweight (42%), obesity (17%), blood hypertension (18.2%), smoking (12.4%), and diabetes mellitus (2.5%).

**Conclusion** - The high prevalence of risk factors for cardiovascular disease in young individuals draws attention to the need for the adoption of workplace programs to encourage healthy lifestyles and to prevent diseases.

**Key words:** atherosclerotic disease, risk factors, work place

Historically, interest in workplace diseases and their complications has focused on the level of occupational exposure leading to work-related health risks <sup>1</sup>.

In recent years, the emphasis has changed to noncontagious chronic diseases, and the workplace has attracted attention as a potential place for causal studies and interventions. These interventional studies aim at changing triggering behaviors of diseases, nonspecific to occupational function, such as diet, exercise, and smoking.

Cardiovascular diseases play an unquestionable role in the morbidity and mortality of the Western world, both in developed countries and in developing ones. Ischemic heart diseases and stroke are, and will be, according to predictions for the year 2002, the main causes of death; and of years lived with disability <sup>2,3</sup>.

Because of this high prevalence of cardiovascular diseases, of the few national studies, and of the possibility of risk factor intervention in the workplace, this research was carried out using employees of the Research Center at Petrobras, aiming at assessing risk factors for cardiovascular diseases and then developing actions to promote health.

## Methods

This cross-sectional case study was performed with employees from the Research Center at Petrobras, in Rio de Janeiro, from March 2000 to February 2001.

Petrobras has 39.908 employees, performing expert and integrated work in fields related to the oil, gas, and power industries and is the technology base for Brazilian oil. Its staff comprises physicists, mathematicians, biologists, engineers, physicians, technicians, and managers, with 1191 employees being those with masters degrees, MD degrees, and managers with MBAs (Master Business Administration) working on research projects concerning exploration, production, and refinement of national oil, in addition to searching for alternative sources of energy for the country. The center has 137 laboratories and a park with 28 pilot units (units for tests in refineries).

The study included 1,191 employees who were requested to undergo the company's annual examination du-

Faculdade de Medicina da Universidade Federal do Rio de Janeiro  
Mailing address: CENPES/SMS/SAUDE - Cidade Universitária - Quadra 7 - Ilha do Fundão - Cep 21949-900 - Rio de Janeiro, RJ, Brazil  
E-mail: mfmatos@cenpes.petrobras.com.br  
Received: 5/15/2002  
Accepted: 5/13/2003

ring the period mentioned. The employees who participated underwent standardized clinical and laboratory examinations. The blood was collected by an expert technician from an accredited laboratory, and it was sent for analysis on the same day. Clinical examination was performed by company doctors, and the anthropometric measures and blood pressure were taken by technicians and trained nurses using a regularly calibrated sphygmomanometer.

Lipid profile values were assessed according to the National Cholesterol Education Program of the USA (NCEP)<sup>4</sup>, which classifies total cholesterol as desirable (< 200 mg/dL), borderline (200-239 mg/dL) and undesirable (>240 mg/dL); triglycerides as desirable (<200 mg/dL), borderline (200-400 mg/dL), high (400-1000 mg/dL) and extremely high (> 1000 mg/dL) and HDL cholesterol as low (< 35 mg/dL), normal (35-59 mg/dL) and high (> 60 mg/dL).

The presence of first-degree relatives with manifest coronary artery disease and/or cerebrovascular and/or peripheral artery disease was considered a positive familial history.

A diagnosis of diabetes mellitus (fasting glycemia  $\geq$  126 mg/dL) followed the guidelines of the Expert Committee on Diagnosis and Classification of Diabetes Mellitus<sup>5</sup>.

Those individuals who did not participate in regular physical activity or with a frequency of  $\leq$  2 times a week, lasting at least 30 minutes were considered sedentary individuals.

Individuals who regularly smoked 3 or more cigarettes a day for  $\geq$  1 year, inhaling the smoke were considered smokers.

According to body mass index (BMI), individuals were classified as: normal weight (BMI  $\geq$  18m<sup>2</sup> and  $\leq$  24.99 kg/m<sup>2</sup>); overweight (BMI  $\geq$  25 and  $\leq$  29.99 kg/m<sup>2</sup>); obese (BMI  $\geq$  30 kg/m<sup>2</sup>).

Regarding blood pressure, the reference values adopted followed the recommendations of the Joint National Committee VI (JNC VI)<sup>7</sup>, which defines as blood hypertension levels  $\geq$  90 mmHg for diastolic pressure and  $\geq$  140 mmHg for systolic pressure. People who had blood pressure below these levels but were using antihypertensive medication were also considered hypertensive.

After clinical and laboratory evaluation, a descriptive statistical analysis was performed with calculation of the minimum value, the first quartile, median, third quartile, maximum, mean, and standard deviation for biochemical variables, for blood pressure, and for body mass index, and the percentage of risk factors was calculated.

## Results

Of the 1,191 employees recruited, 970 attended and were assessed, 75.4% were men, and 24.6% were women with a mean age of 42.2 years old.

Data concerning the laboratory profile are found in table I, and those referring to blood pressure and body mass index are found in table II. Figure 1 presents the prevalence of the main risk factors.

Being sedentary, which occurred in 63.7% of the sample, was the most prevalent risk factor. Obesity was observed in 17% of the population, and 42% of the population was overweight. Blood hypertension was present in 18.2% of the

Statistics Descriptives	Glycemia (mg/dL)	Cholesterol (mg/dL)	HDL (mg/dL)	LDL* (mg/dL)	Triglycerides (mg/dl)
Mean	91.9	208.4	48.1	132.3	143.3
Standard-deviation	16.1	41.3	11.5	36.5	127.1
Minimum	65	107	22	20.8	32
1st quartile	85	179	40	107.2	76
Median	90	205	46	130.6	109
3rd quartile	95	231	55	151.8	165
Maximum	299	376	110	297.6	1,725

\* n=967

Statistics Descriptives	Systolic BP (mmHg)	Diastolic BP (mmHg)	BMI (Kg/m <sup>2</sup> )
Mean	116.4	75.7	26.5
Standard-deviation	15.1	10.5	4.5
Minimum	80	50	16.9
1st quartile	110	70	23.6
Median	120	80	25.8
3rd quartile	120	80	28.6
Maximum	230	140	51.6

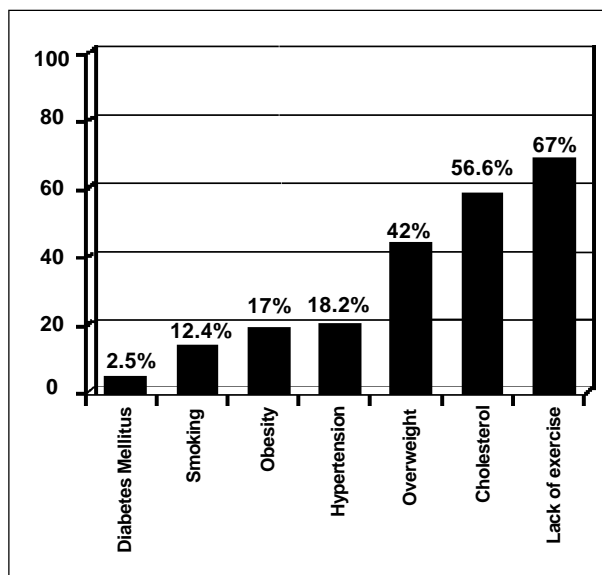


Fig. 1 - Prevalence of main risk factors in the 970 employees at CENPES, Rio de Janeiro, 2000.

employees, and hypertension was controlled in only 16% of the hypertensive individuals. Smoking was observed in 12.4% of the sample, and diabetes mellitus in 2.5%.

Regarding family history, coronary artery disease was present in 25.5%; systemic blood hypertension and stroke in 45.6%, and 12.5%, respectively.

Total cholesterol levels above normal values (borderline and undesirable) were observed in 56.6% of the individuals; 19.3% were higher than 240 mg/dL. Decreased levels

of HDL cholesterol were found in 8.7% of the population and high levels of HDL cholesterol were found in 15.4% of the population. Triglyceride levels above 200 mg/dL were found in 17% of the population.

## Discussion

For a long time, the idea that cardiovascular diseases were genetically determined and that little could be done about their prevention has prevailed. However, the recognition of risk factors has changed this view.

Initial results of the first intervention project on the habits of a population group, performed in the Finnish town of North Karelia, a town with an extremely high incidence and mortality due to coronary artery disease, have demonstrated the possibility of important reductions in these indexes, through wide-reaching actions regarding lifestyles<sup>8</sup>.

Although the study group was very different, the indexes presented were quite similar to those of other populations, regardless of the social, economic, and cultural level.

Regarding lipid profiles, it was observed that 55.6% of individuals had cholesterol > 200 mg/dL with 19.1% of individuals had cholesterol  $\geq$  240 mg/dL<sup>9</sup>. This was an even higher prevalence than that in the North American population, where 51.8% of the population's cholesterol is estimated at > 200 mg/dL and 20% > 240 mg/dL<sup>4</sup>. The mean total cholesterol was 207.6 mg/dL, which was also higher than that observed in some national studies. Ducan et al<sup>10</sup> found a mean cholesterol of 202.4 mg/dL, and the study performed in Cotia, a town near São Paulo<sup>11</sup>, had a mean cholesterol of 184.9 mg/dL. Souza<sup>12</sup> found a mean cholesterol of 211.6 mg/dL in a population of bus drivers with a mean age similar to that of the population of the Research Center at Petrobras.

The presence of higher levels of body mass index was another worrisome aspect in this population. Forty-two percent of the individuals were overweight, and 16% were obese; that is, 58% of the individuals had excessive weight. Mean body mass index was 26.3 kg/m<sup>2</sup>, and in the study by Souza<sup>12</sup> it was 25.8 kg/m<sup>2</sup> with 59.5% of overweight individuals. Data from the Latin American Consensus on Obesity<sup>13</sup> demonstrate that in Argentina 32.5% of the population is overweight, and 27% of the population is obese; in Uruguay, 42% of the population is overweight, and in Brazil, this number is 53%. In the USA, in 2000<sup>14</sup>, it was observed that 19.8% of the population is obese.

Regarding smoking, 69.4% of our population had never smoked, 18.2% were former smokers, and only 12.4% were smokers. These values are much lower than those observed in the literature. Souza<sup>12</sup> found a prevalence of 32.7%. In the population of the Ilha do Governador, the prevalence observed was 33%<sup>15</sup>. Moreira et al<sup>16</sup> and Pohlmann<sup>17</sup> observed a prevalence of 41.5% and 45.7%, respectively. Around the world, 1/3 of the adult population is estimated to be smokers. The low prevalence of this risk factor in the population studied is probably due to the intense work to persuade them to quit smoking developed by the company for approximately 10 years.

Being sedentary was another prevalent risk factor in our study. The findings demonstrate that 67.4% of the indi-

viduals did not exercise, and only 32.6% exercised regularly. Studies involving 37 American states demonstrate that 58% of this population does not exercise<sup>18</sup>. In the state of São Paulo<sup>19</sup>, 69% of the population is sedentary and in a study by Souza, 86%<sup>12</sup>.

The prevalence of diabetes mellitus was 2.5% (n=24), lower than that reported in the literature, considering the mean age of the population. Souza<sup>12</sup>, in a population with a mean age of 41.3 years old, found a prevalence of 7.32%.

The prevalence of hypertension in our population was 18.2%. This prevalence varies widely in the world, with values near 4% in China and around 20% in the USA<sup>20</sup>. Recently, an epidemiological, clinical survey was performed among the inhabitants of the XX Administrative Region of the City of Rio de Janeiro (Ilha do Governador) with findings of 38% hypertensive individuals, which is extremely higher than that described in other populations<sup>15</sup>. In the Souza study<sup>12</sup>, this value was 20.7%.

Lessa<sup>21</sup> presented a review of 51 Brazilian studies (including children and adolescents) on the prevalence of blood hypertension, performed between 1970 and around 1993. The differences between the prevalence mentioned in Brazil are extremely broad, ranging from 7.2% to 40.3% in the Northeast, 5.04% to 37.9% in the Southeast, 1.28% to 27.1% in the South, and 6.3% to 16.75% in the West-Center, due partly to the diversity of important methodological characteristics between the studies.

The lack of research on risk factors in the Brazilian population results in great disadvantages in comparison with developed countries. In the case of the economically active population, the lack of data is enormous, even in sectors of great economic importance.

Regarding the limitations of the study, we point out that, the necessary care for systematic error reduction was observed, through the training of the involved technical staff, as well as checking the equipment used. Concerning the 221 excluded employees, who could not attend the examination for several different reasons, we have inferred that they should not differ from the total sample, because the mean age and the distribution by sex are the same as that observed in 970 study employees.

Although the results obtained are very similar to those observed in the literature for different populations, the peculiar characteristics of the group studied do not allow for generalization of the observations to the general population.

Based on the data found, one may infer that the employees of the Research Center at Petrobras are at moderate risk of developing cardiovascular diseases, despite the relatively young age, the high education level, and the available resources at the company.

Taking into account that the presence of 3, 4, or more related risk factors in a the same patient is very common, it is not difficult to understand the need for multiple interventions. As men spend 65% of their lifetime at work, it is the ideal place to learn what they haven't learned in school or at home, because only with education is it possible to effectively prevent diseases. Thus, the development of preventive health programs aimed at changing lifestyles may be effective to sensitize the individual to change habits harmful to health.

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