

Relationship between Serum Selenium Concentrations and Smoking Habits in Japanese Males

Y. Deguchi and A. Ogata

*Department of Environmental Health, Fukui Medical School,
Fukui 910-11, Japan*

SUMMARY

Correlations between serum selenium (Se) concentrations and smoking habits in Japanese males were investigated with special attention to age and daily cigarette consumption. Sera were collected from 307 men (22-87 years old) of the seaside residents in Fukui Pref. Japan, who were participants of health examination held in Aug.-Sept. 1986. Serum Se concentrations were determined by spectrofluorometry. The results are as follows.

- 1) Although there was no significant correlation between the serum Se concentrations and age for non-smokers ($r = -0.139$, $N=141$), significant correlations were observed for 1-20 cigarettes/day smokers ($r = -0.365$, $N=117$, $p < 0.001$) and 21 or more cigarettes/day smokers ($r = -0.633$, $N=49$, $p < 0.001$), respectively.
- 2) There was no significant difference in the serum Se levels between the smokers and the non-smokers of 22-39 years, whereas significantly lower Se levels were observed in the smokers of 40 years or older.
- 3) A negative dose-response relationship was also observed between daily cigarette consumption and the serum Se levels in the 7th decade smokers. These results indicate that smoking habits could have more lowering effect on the serum Se levels in older men than in younger men.

INTRODUCTION

While cigarette smoking has been regarded as a significant risk factor for cancer and myocardial infarction, selenium (Se) has been reported to be a possible preventive factor for such diseases^{1,2}. However, little information is available on the relationship between cigarette smoking and Se status in man.

In Japan, although the number of smokers is gradually decreasing in aged people, more than 50% of male adults are smokers and the age-adjusted mortality rate of tracheal, bronchial and/or lung cancer has been increasing year after year (from 1.9 per 100,000 male population in 1950 to 17.3 in 1985).

Thus, the purpose of this study is to investigate the relationship between serum Se concentrations and smoking habits in Japanese males with special attention to age and daily cigarette consumption.

METHODS

Sera were collected from 307 men (22-87 years of age) of the seaside residents in Fukui Pref. who were participants of health examination held in Aug.-Sept. 1986. Their age distribution and the rate of smokers are shown in Fig. 1. Serum Se concentrations were determined by spectrofluorometry³ after wet digestion. Statistical significance of mean differences and correlation coefficients was

examined by the t-test.

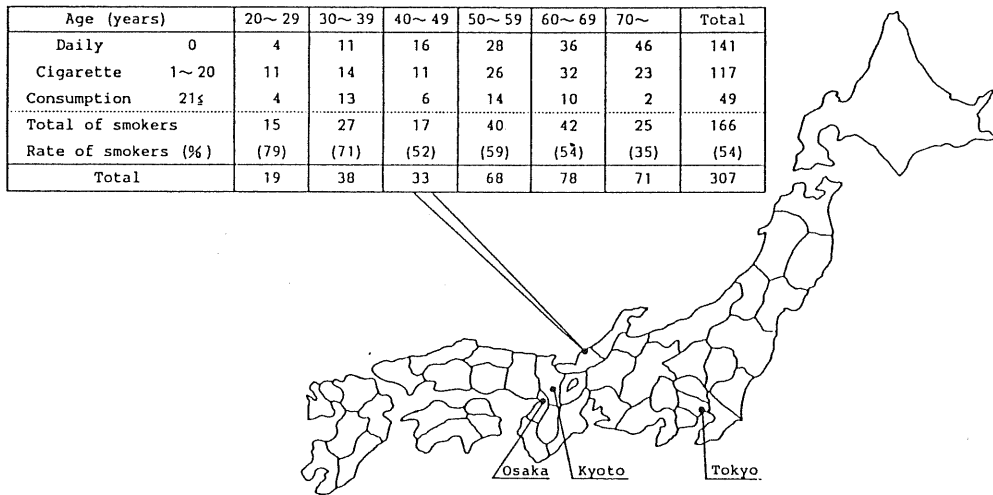


Fig. 1. Location of the sampling district and age distribution of subjects.

RESULTS

Serum Se concentrations were in the range of 50—240 ng/ml (mean ± SD: 127 ± 23 ng/ml). The correlations between serum Se concentrations and age are shown in Fig.2. Although there was no significant correlation for non-smokers, significant correlations were observed for smokers. In addition, there was no significant difference in the serum Se levels between the smokers and non-smokers aged 22—39 years, whereas significantly lower Se concentrations were found for the

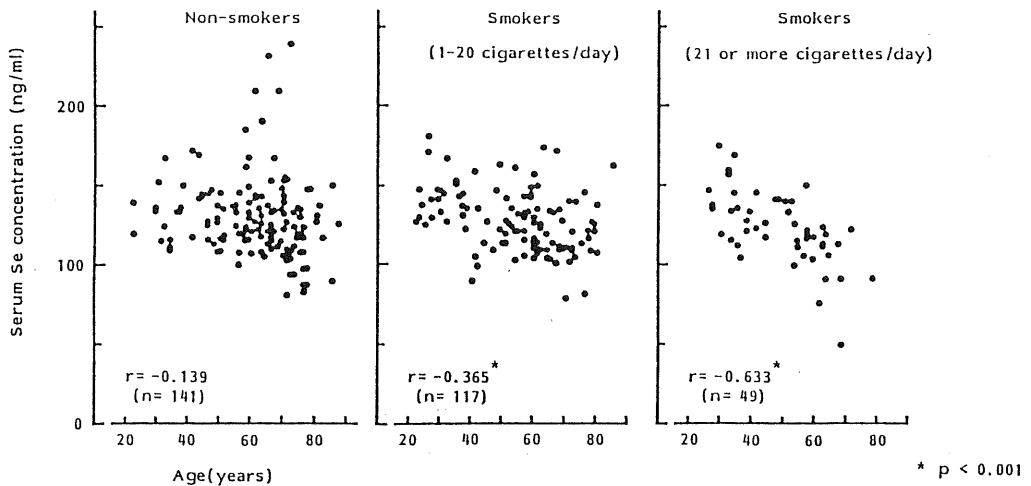


Fig. 2. Correlations between serum Se concentrations and age.

smokers aged 40 years or older ($p < 0.01$)

Furthermore, a negative dose-response relationship was also observed between daily cigarette consumption and the serum Se levels for the 7th decade smokers (Fig.3).

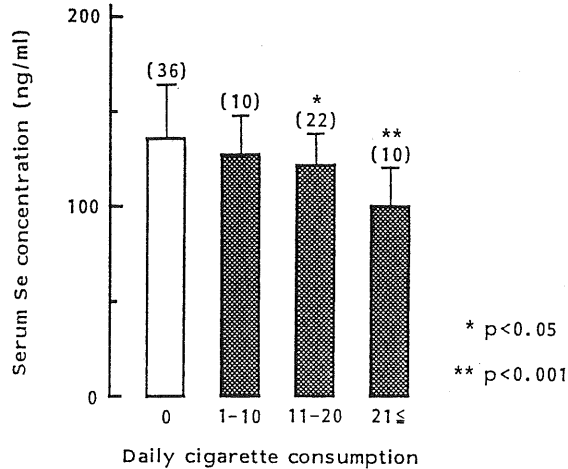


Fig. 3. Relationship between serum Se concentrations and daily cigarette consumption in the 7th decade smokers.

DISCUSSION

As shown in Fig.1, the rate of smokers in our subjects gradually decreased from younger generation to older generation. This is in good accordance with the recent tendency throughout Japan.

Fig.2 and 3 suggest that smoking habits could have more lowering effect on the Se levels in older men than younger men. Our data are partly in agreement with the reports by Lloyd *et al.*⁴ and Chow *et al.*⁵. Lloyd and his colleagues observed significant lower Se levels in plasma for male smokers aged 31—85 years who were healthy residents in the south of England. On the contrary, Chow and his co-workers found no significant difference between male smokers (35.1 ± 0.9 years) and age- and race-matched non-smokers (34.4 ± 0.9 years) in the plasma Se levels. However, we have found not only the lowering effect of smoking habits on the Se levels in whole blood for aged men living in another rural district of Fukui Pref. and in an urban district of Osaka, respectively, but also a significantly negative correlation between Se concentrations in whole blood and years of smoking.

Although the reason for the decreased Se levels in aged smokers is not known at present, it is speculated that more Se could be consumed for smokers in detoxification of heavy metals such as cadmium (Cd) since Cd is accumulated more in smokers than in non-smokers⁶ and Se is known to counteract the toxic effects of heavy metals in animals⁷. In fact, as reported by Ellis⁸, we have also observed significantly negative relationships between Se and Cd concentrations in whole blood both for the rural and the urban male residents aged 40—59 years, respectively.

In any case, the effect of smoking habits on the Se levels in men could indirectly support the suggestion by many reports that Se is a preventive factor for cancer.

REFERENCES

1. Salonen, J. T., Salonen, R., Lappetläenoää, R., Maenoää P., Alfthan, G. and Puska P. (1985): Risk of cancer in relation to serum concentrations of selenium and vitamins A and E: matched case-control analysis of prospective data. *Br. Med. J.*, 290, 417—420.
2. Salonen, J. T., Alfthan, G., Huttunen, J. K., Pikkarainen, J. and Puska, P. (1982): Association between cardiovascular death and myocardial infarction and serum selenium in a matched-pair longitudinal study. *Lancet*, ii, 175—179.
3. Michie, N. D., Dixon, E. J. and Bunton, N. G. (1978): Critical review of AOAC fluorometric method for determining selenium in foods. *J. Assoc. Off. Anal. Chem.*, 61, 48—51.
4. Lloyd, B., Lloyd, R. S. and Clayton, B. E. (1983): Effect of smoking, alcohol, and other factors on the selenium status of a healthy population. *J. Epidemiol. Community Health*, 37, 213—217.
5. Chow, C. K., Thacker, R. R., Changchit, C., Bridges, R. B., Rehm, S. R., Humble, J. and Turbek, J. (1986): Lower levels of vitamin C and carotenes in plasma of cigarette smokers. *J. Am. Col. Nutr.*, 5, 305—312.
6. Lewis, G. P., Coughlin, L. L., Jusko, W. J. and Hartz, S. (1972): Contribution of cigarette smoking to cadmium accumulation in man. *Lancet*, i, 291—292.
7. Whanger, P. D. (1985): Metabolic interactions of selenium with cadmium, mercury and silver. *Adv. Nutr. Res.*, 7, 221—250.
8. Ellis, N., Lloyd, B., Lloyd, R. S. and Clayton B. E. (1984): Selenium and vitamin E in relation to risk factors for coronary heart disease. *J. Clin. Pathol.*, 37, 200—206.