# Blood Glucose and Cholesterol Concentrations in a Mediterranean Rural Population of Andros Island, Greece

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Brief Communication

## ABSTRACT

**Background:** This study conducted as part of a screening program for the promotion of community health in the primary care setting of Ormos Korthi in Andros, Greece. The objective of this study was to identify the levels of glucose and total cholesterol in individuals without major cardiovascular problems in order to identify cases of undetected dyslipidemia and high blood glucose levels, in a rural population located in the southern part of Andros Island, Greece.

**Methods:** In total, 242 individuals (152 women, mean age 65.1 ± 12.3 and range 33-91 years) were examined for the determination of serum glucose and total cholesterol levels. Participants were arbitrarily divided into 5 age groups and statistical differences between groups investigated.

**Results:** The mean serum glucose level was 125.1 ± 42.4 mg/dl and the mean total serum cholesterol level was 225.2 ± 44.9 mg/dl. Statistical differences were not observed between the age groups in either the glucose or cholesterol levels. Difference between men and women was not significant regarding glucose levels while women had significantly elevated levels of total cholesterol ($P < 0.01$). Age was significantly correlated with glucose, but statistical analysis did not show significant correlation between age and total cholesterol levels.

**Conclusions:** The present study confirms that dyslipidemia and high blood glucose levels are prevalent among the rural populations of Greece and therefore informative campaigns and structured screening programs are required to promote preventive health care.

**Keywords:** Cholesterol, glucose, Greece, Mediterranean diet, rural, screening

## INTRODUCTION

It is well-documented in the international literature that elevated levels of cholesterol, triglycerides, and glucose are significant risk factors, among others, for coronary heart disease (CHD).[1,2]

Considerable efforts were made in the past to inform people of the critical consequences their lifestyle could have on their metabolic profile.[3] As a result of alterations in the dietary habits in Western Europe, USA, and Canada, in the past 30 years, there has been a decline in cholesterol levels as well as in CHD mortality in these countries.[4] Lipid levels are directly associated with nutritional patterns. The ingestion of saturated and trans fatty acids and dietary cholesterol and consumption of fruit and vegetables highly influence low-density and high-density lipoprotein cholesterol levels and consequently, the occurrence of CHD.[5,6]

A rational hypothesis is that in rural populations of countries around the Mediterranean Sea, the incidence of high glucose, cholesterol, and triglyceride levels in the blood should be significantly lower, compared to urban populations, because of the diet pattern similar to the Mediterranean model.[7-9]

The primary purpose of this study was to investigate the mean levels of serum lipids and glucose, compare them within different age and sex groups, in a rural population located in the Ormos Korthiou municipality in the southern region of Andros Island, Greece [Figure 1].

## METHODS

This study included measurements recorded in the Regional Surgery Unit (a primary care setting) of Ormos, the capital city of Korthi municipality in the southern region of Andros. The examinations were conducted during a screening program for community health promotion supported by the municipal authorities. Individuals that had not measured the levels of glucose and cholesterol for at least 1 year prior to the study were invited through public announcement to participate in the study. The exclusion criteria were age <30 years and >95 years, body mass index between 18.5 and 30 (normal weight and preobese individuals, according to WHO classification[10]), current diagnosis of coronary disease or diabetes, current use of lipid-and/or glucose-lowering drugs and of course denial of participation. All individuals presented in the Regional Surgery Unit and did not meet any of the exclusion criteria were included in the study.

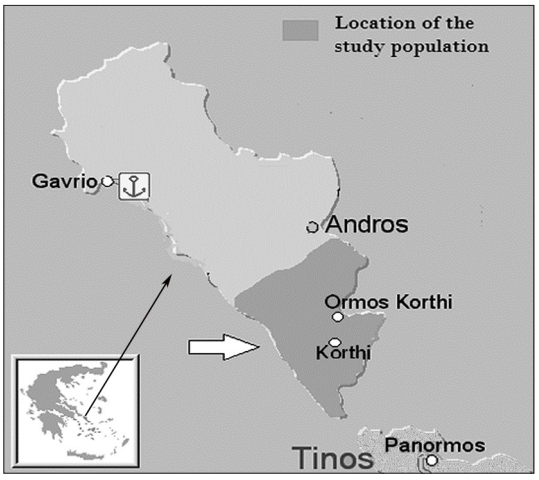


**Figure 1:** Map of Andros Island, Greece. Location of the study population is indicated

After acquiring the complete medical history of each participant, blood samples were obtained between 8.00 a.m. and 10.00 a.m. after an overnight fast. The physician obtained blood samples from finger pricks made using disposable lancets and determined the plasma concentrations of total cholesterol and glucose with Accutrend® GCT (Roche Diagnostics, Basel, Switzerland). The device used for the measurements did not precisely quantify cholesterol values below 150 mg/dl and above 300 mg/dl. In these cases, the values 150 mg/dl and 300 mg/dl were used for statistical analysis. Two consecutive measurements were taken, and the mean value was used for the study.

For the purposes of the study, participants were arbitrarily divided into the following age groups:

- Group 1, comprising individuals who were between 30 and 49 years of age
- Group 2, 50-59 years
- Group 3, 60-69 years
- Group 4, 70-79 years; and
- Group 5, 80-99 years.

The completed data forms were analyzed using Microsoft Excel 2007 for Windows (Microsoft Corporation, Redmond, WA, USA) and SPSS version 16.0 for Windows (SPSS Inc., Chicago, IL, USA). The differences in the mean values in terms of age groups were assessed by the analysis of variance method and Bonferroni *post hoc* test. A significance level of 5% was selected. The work that was undertaken conforms to the provisions of the Declaration of Helsinki (as revised in Tokyo 2004).

## RESULTS

Two hundred and forty-two individuals, 90 men and 152 women (37% and 63% respectively), were included in the study. Demographic data and clinical characteristics of all subjects are summarized in Table 1. Data on the levels of glucose and cholesterol were available for 186 and 170 individuals, respectively.

The mean value of serum glucose level was 125.1 ± 42.4 mg/dl with no significant difference found between men and women (men 122.38 ± 42.43 and women 126.61 ± 42.59. $P$ =0.645). A statistically positive correlation was established between age and glucose values ($P < 0.01$).

The mean value of total serum cholesterol level was 225.2 ± 44.9 mg/dl with a statistically significant difference between men and women (men 207.03 ± 44.57, women 236.09 ± 41.89. $P$ =0.003). In contrast, no correlation was found between cholesterol values and age ($P = 0.694$).

Comparison between the different groups did not reveal statistically significant differences even if for the case of glucose, the result was only marginal ($P = 0.051$) [Figure 2].

## DISCUSSION

About glucose levels, the results emphasized the need for intensive monitoring of glucose levels in people who are unaware of their metabolic status.

**Table 1:** Data summary (242 participants)

| | |
|---|---|
| Sex (%) | |
| Male | 90 (37.2) |
| Female | 152 (62.8) |
| Age (years) | |
| Range | 33-91 |
| Mean (SD) | 65.1±12.3 |
| BMI (kg/m²) | |
| Total | 23.59±4.18 |
| Male | 25.62±3.38 |
| Female | 24.31±3.63 |
| Age groups (number of participants) (%) | |
| 30-49 | 16 (13.2) |
| 50-59 | 19 (15.7) |
| 60-69 | 38 (31.4) |
| 70-79 | 34 (28.1) |
| 80-99 | 14 (11.6) |

BMI=Body mass index, SD=Standard deviation

Most of the participants stated that they had not had their metabolic blood values measured for several years.

The total cholesterol values were quite elevated in all the participants irrespective of age; moreover, the values were higher in women than in men. This difference in values could be attributed to the fact that women underwent blood examinations very rarely compared to men, who were more aware of the threat of CHD.

The study had a primary focus on the relatively younger population and an observation of special interest is that the total cholesterol concentration values were not very different between the age groups. The cholesterol level in Group 1 (30-49 years) was 220 mg/dl while that in Group 5 (80-99 years) was 208 mg/dl. Younger men and women mentioned that cholesterol value was not an issue of major concern for them, although they admitted that it was widely known that even younger adults are in danger of CHD.[11]

The active population of the area is 2547 people (2001 census) and consequently, approximately 10% of the population participated in the study. We consider this percentage adequate to provide significant evidence.

## CONCLUSIONS

The results of the study show an increase in the prevalence of hyperglycemia and hypercholesterolemia in the island population.

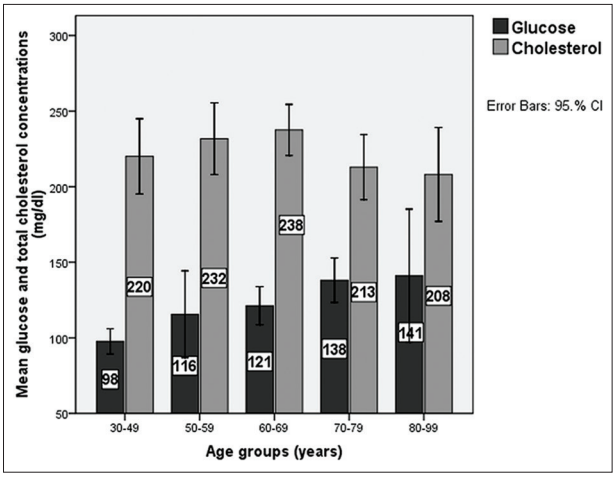


**Figure 2:** Mean glucose and cholesterol concentration values of the suggested age groups. Exact value is indicated in each group bar. Error bars (95% confidence intervals) are also illustrated

The findings of this study corroborate results from previous studies[12-14] where the importance of screening control was demonstrated and highlight the absolute necessity for the regular investigation of the metabolic profile of populations inhabiting Greece.

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