

Influence of Environment, Lifestyle and Gender on the Health Status of Long-Lived Persons

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ABSTRACT. Since 2004, the nationwide Georgian Longevity Study has been undertaken by Department of gerontology and geriatrics at the National Center of Therapy. Interesting features have emerged regarding gender, geography and diet. The female-to-male longevity ratio is more than six to one and it is not uniform throughout Georgia, varying according to the proximity of inhabitants to the seashore or mountains. Significant dietary groups were noted. Although fewer in number, men are better off functionally and medically. Long-lived people in the mountainous regions have better state of health than those living near the sea. Similar findings have also been noted in Korea and Italy. It can be concluded that habitation might influence gender differences in longevity, particularly via the influence of diet and physical activity. © 2011 Bull. Georg. Natl. Acad. Sci.

Key words: long-lived persons, geographic region, diet.

Georgia is a unique country due to its geographical position and beautiful climate. It starts high in the Caucasian mountains covered with snow even in summer and finishes on the Black Sea shore with subtropical climate. Georgia is a highly populated country with people living high in the mountains breeding domestic animals and people living on the shores of the Black Sea feeding on fish, fruits and vegetables.

Leading a traditional way of life, Georgians became famous for their longevity. National population census revealed quite a number of long-lived people aged over 90, which prompted the study of the influence of life-style on the life span and growing number of long-lived persons.

Analogous studies were carried out in Sardinia (Italy), Korea [1, 2]. Certain factors affecting human longevity such as genetic, gender-specific features, dietary, social, psychological, ecological, etc. have been considered [3-11].

The study of the life of long-lived persons in Georgia was performed at the Acad.N.Kipshidze National Centre

of Therapy. The goal was to reveal the factors influencing longevity of Georgian people, taking into consideration gender, geographic location, diet, etc.

Materials and Methods. According to the data of the Georgian Centre of Population Research, some districts (Tbilisi, Gurjaani, Khulo, Batumi, etc.) with an index of maximal long life were chosen for investigation. At the beginning of the research there were 136 long-lived persons over 90 years old. The group of people was divided further into subgroups according to geographic location: mountainous and coastal regions. The area situated at 0-100 m a.s.l. was considered to be a coastal region and the area situated at 30 km distance from the sea and at 200m a.s.l. a mountainous region. In each region men and women were selected randomly. Their exact age was verified by three sources: State birth certificate, the age of siblings, additional information from neighbours and relatives. Finally 69 required candidates (12 men and 57 women) were selected from the mountainous region and 67 (6 men and 61 women) from the coastal region. For further studies

each participant or his/her relation was informed about the investigation and with their consent an interview with elderly participants was conducted. Each person was examined. Clinical and biochemical analyses of blood were made. Blood test of every participant was done by means of autoanalyzer and glucose level, total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides, total protein, albumin calcium, phosphorus, aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, creatinine and blood area were determined. Red blood cells (RBC), white blood cells (WBC), haemoglobin (Hb), haematocrit (Hct), vitamin B12 and folic acid were determined by immunofluorescence analysis. For further statistical analysis a statistical packet was used. Each main datum expressed an average standard deviation. Significant differences between data were estimated with t-test and correlation test.

Results. Basic characteristics of long-lived individuals, such as age, education level, number of siblings were identified and comparative analysis was made. It was revealed that the average age of the subjects under study was 95.1 years old. For the residents in the mountainous region it was 96.5 and in the coastal region - 94.1 years old (Table 1). Most of the persons studied lived with the family (94.4%), with the son and daughter-in-law (55.6%), daughter-in-law (22.2%), grandchildren and nephews (7.4%), daughter and son-in-law (5.6%), unmarried daughter/son (1.8%), with the spouse (1.8%). An average number of years spent with a spouse was 39.1+18.6.

Health and mode of living. In the mountainous region 82.5% out of 69 long-lived persons under study evaluated his/her state of health as "very good" or "good". In the coastal region this index was 64.1% out of 67 long-lived persons. Their self-evaluation was confirmed by the family members or other relatives. A small number of old persons used food additives. Only 29.4% of the participants were tobacco smokers and 68.4% - alcohol consumers (by KANHNS [4] research they were 51.7% and 50.4%, respectively). The frequency and quantity of alcohol consumption were very low. 1/3 part of the subjects never drank alcohol. 5.6% drank alcohol every day at dinner (Table 1); the amount of the drink was less than 45 ml (mainly red wine).

There was no significant difference in alcohol and tobacco consumption in the two different geographical areas (Table 1).

22% of the research subjects had chronic diseases: diabetes, essential hypertension, various heart diseases. Only one out of 10 took required medicines. Chronic diseases appeared with less frequency in the mountainous

region ($p < 0.05$), although no difference was found between men and women.

Diet habits. Most of the subjects of the study took 3 meals a day at the same time. In average, during a week they ate meat or fish 4 times, eggs - 2.3 times, soy products - 4.7 times and marine vegetation - 4.4 times. 65% ate together with his/her family. 90% had good appetite. The risk of deficient diet was evaluated by a simple diet screening test. The average datum was 13.3 2.7 (out of 21 scores). 47.6% had good diet habits (14 scores) and only 12.7% had deficient dietary habits (9 scores). The number of persons reaching 100 years, and taking 3 meals a day, was greater in the mountainous region than that on the coastal region (100.0% vs. 84.6%).

Results of blood laboratory test. Table 2 shows the number of elders (in per cent) with normal blood indices. Only high density lipoproteins (HDL) exceed the norm limit (45 mg/dl). Albumin level and HDL in persons living in the coastal region was much lower than in the mountainous region (37.5 vs. 47.4 mg/dl, $p < 0.01$). In the mountainous region the number of old people with normal indices of HDL, albumin, vitamin B12 and folic acid was much higher. All the other indices: phosphorus, AST, ALT, total bilirubin, creatinin and urea were almost the same for old persons in both geographical areas.

Male-female differences. Interestingly enough, 83.3% of old men lived in the mountainous region, whereas only 47.9% old women resided in the same area. Significant difference between men-women was also noted in respect of the habitation ($p < 0.05$) (Table 1). In general 83.3% of men and 70.8% of women evaluated the state of their health as "very good" or "good". Among old men there were more tobacco consumers ($p < 0.05$), and among women more alcohol consumers (Table 1). As for physical activity, men had a higher index as they made bodily exercises regularly.

Many old women had low indices of Hb, RBC, HCT, protein, whereas old men had those indices within the normal limits (Table 2). This means that most of long-lived women were anaemic (Table 2). Total cholesterol, LDL and triglyceride level were within the norm in both groups, though these indices were lower in men than in women (Table 2). Blood albumin level was the same in both groups though in 16.7% of men and 13.2% of women it was < 3.3 g/dl.

As is known, vitamin B₁₂ and folic acid are low in old persons' blood serum, but during the study B₁₂ level was marked as normal in old men and only one third of old persons had folic acid level < 3 ng/ml. Both indices were

Table 1.

Mode of living of long-lived persons

	Men	Women	Mountainous region	Coastal region	Total (region, gender)
Average age (years)	94.7±3.9	96.1±4.7	96.5±4.4	94.1±3.7	95.1±4.7
Gender:					
men			12 (17.4%)	6 (8.95%)	18 (13.2%)
women			57 (82.6%)	61 (91.05%)	118 (86.8%)
Region:					
mountainous	6 (33.3%)	63 (53.4%)			69 (50.7%)
costal	12 (66.7%)	55 (46.6%)			67 (49.3%)
Health:					
very good	7 (29.2%)	56 (50.2%)	42 (60.8%)	21 (31.3%)	63 (46.3%)
good	9 (37.5%)	28 (25.0%)	15 (21.7%)	22 (32.8%)	37 (27.2%)
normal	8 (33.3%)	9 (8.0%)	12 (17.5%)	5 (7.5%)	17 (12.5%)
bad	0 (0.0%)	19 (17.0%)	0 (0.0%)	19 (28.4%)	19 (14.0%)
Taking food additives:					
yes	3 (16.7%)	10 (8.5%)	7 (10.1%)	6 (9.8%)	13 (9.6%)
no	15 (83.3%)	108 (91.5%)	62 (89.9%)	61 (90.2%)	123 (90.4%)
Tobacco consumption:					
yes	9 (50%)	31 (45.6%)	24 (34.8%)	16 (23.9%)	40 (29.4%)
no	9 (50%)	37 (54.6%)	45 (65.2%)	51 (76.1%)	96 (70.6%)
Cigarette: (per day)					
1-10	11 (78.6%)	25 (92.6%)	22 (91.7%)	14 (81.2%)	36 (87.8%)
11-20	3 (21.4%)	2 (7.4%)	2 (8.3%)	3 (18.8%)	5 (12.2%)
Alcohol consumption:					
never	2 (9.1%)	91 (79.8%)	46 (66.7%)	47 (70.1%)	93 (68.4%)
sometimes	11 (50.0%)	17 (14.9%)	14 (20.3%)	14 (20.9%)	28 (20.6%)
every day	9 (30.9%)	6 (5.3%)	9 (13.0%)	6 (9.0%)	15 (11.0%)
Regular exercises:					
yes	15 (83.3%)	71 (60.2%)	44 (63.8%)	42 (62.7%)	86 (63.2%)
no	3 (16.7%)	47 (39.8%)	25 (36.2%)	25 (37.3%)	50 (36.8%)
Acting area:					
in the room	13 (44.8%)	29 (27.1%)	19 (27.5%)	23 (34.3%)	42 (30.9%)
at home	10 (34.5%)	28 (26.2%)	15 (21.7%)	23 (34.3%)	38 (27.9%)
outside	6 (20.7%)	50 (46.7%)	35 (50.8%)	21 (31.4%)	56 (41.2%)
Chronic diseases:					
yes	6 (33.3%)	24 (20.3%)	8 (11.6%)	22 (32.8%)	30 (22.1%)
no	12 (66.7%)	94 (79.7%)	61 (88.4%)	45 (67.2%)	106 (77.9%)

within the norm in old women. Average quantity of carbohydrates and proteins in men was significantly higher than in women. Men took more phosphorus, sodium, potassium, zinc and vitamin E in quantity, than women.

Discussion. The influence of environment and genetics on the life span is a subject of debate. The improvement of the medical care system and service played a positive role in increasing the age of life.

The present study pays special attention to the influence of environment and gender on the life span. We revealed a difference in life duration in terms of gender. The difference may in part be due to old life style and peculiarities of social responsibility in Georgian traditional society.

Gender-specific differences revealed in the mountainous region and costal region (considering social, cultural factors, habitation) indicated that environmental factors have a significant effect on the length of life. Climate (especially temperature), place of residence, quality and accessibility of medical care also condition regional differences. The fact that old persons living in the mountainous region of Georgia were more active physically than in the costal region, confirms the significant impact of life style on the age of life. Men's state of health and function were better than those of women but we could not explain this phenomenon.

The health state of most of the old-lived persons involved in the study was good, which was confirmed by

Table 2

Clinical and biochemical indices of long-lived persons' blood in Georgia

Blood test	Men	Women	Mountainous Region	Coastal strip
Glucose (60-110mg/dl)	100.0	60.5	66.7	63.2
Haemoglobin (120-180g/l)	142.0	132.6	134.0	147.4
Haematocrit (36-48 %)	38.0	41.3	39.2	44.2
Erythrocytes ($4.0-5.0 \times 10^{12}/l$)	4.6	4.4	4.7	4.2
Leucocytes ($4.0-9.0 \times 10^9/l$)	4.3	5.6	6.3	4.9
Total cholesterol (≤ 160 mg/dl)	141.0	126.4	125.8	144.0
HDL (≥ 40 mg/dl)	50.0	36.4	58.3	35.8
LDL (≤ 100 mg/dl)	82.0	73.7	75.0	79.0
TG (≤ 150 mg/dl)	100.0	97.4	100.0	94.7
Albumin (≥ 3.3 g/dl)	5.7	5.8	6.5	4.3
Globulin (≥ 2.5 g/l)	5.3	4.8	4.5	6.3
Vitamin B ₁₂ (150-750 ng/ml)	201.0	174.2	195.8	173.7
Folic acid (3-17 ng/ml)	13.7	7.1	12.5	9.7
Calcium (9-11 mg/dl)	10.1	9.1	9.3	10.2
Phosphorus (0.74-1.32 mmol/l)	1.12	0.87	0.95	1.02

medical examination and laboratory data. During the study certain differences in dietary intake were revealed. Because of material well-being and better diet men took more proteins and iron than women. Almost half of long-lived women under study (23.7%-52.6%) and not a single man were anaemic.

Significant differences were revealed in health level in relation to the habitation. Only 4.2% of those living in the mountainous region had serum albumin level 3.3 g/dl, whereas the same index was noted in 26.3% of old people living in the coastal region. It is well known that serum albumin level is a good indicator of human health and dietary level. In old-age persons low albumin level correlates with low cognitive function.

Long-livers residing in the coastal region ate meat, fish and soy products more frequently than individuals living in the mountainous region (although statistically this difference did not matter). As is known, deficiency of vitamin B₁₂ and folic acid is often marked in old men. 95.8% and 73.7% of elders in mountainous and coastal regions, respectively, had normal level of those indices. In the researchers' opinion, Georgian traditional food rich in vitamin B₁₂ protects man's organism from developing the deficiency of this vitamin.

Among the long-lived persons participating in the study the occurrence of cardiovascular disease was observed less and the number of corresponding causing factors was insignificant. In elderly people normal indices of total cholesterol, LDL and triglycerides were recorded (in contrast to data of other studies). 84.2% of long-lived men have low HDL. At the same time women of the same

category had a higher level of LDL and triglycerides ($p < 0.05$). More elderly men than women made physical exercises regularly (83.3% vs. 60.4%). Less physical loading, less balanced diet had a negative effect on the lipid spectrum of elderly women. At the same time HDL higher index in old-age men was caused by regular physical load and sufficient amount of protein. Antioxidants, such as β -carotin, vitamin E and minerals - calcium and selenium can be potential protectors from aging-associated diseases (cardiovascular and tumour diseases).

Dietary intake of elders living in the mountainous region consisted of adequate amount of vitamin A, vitamin B and phosphorus. In old persons living in the coastal region a tendency to deficient intake of antioxidants was observed.

Such large amount of antioxidants is caused by intake of traditional national food such as vegetarian foods made of plant leaves and stems. Dietary intake of elderly women did not include sufficient protein, vitamin E, vitamin B, calcium, iron and zinc. This was due to the fact that cuisine rich in nutrients was frequently inaccessible.

The male sex itself presents a risk-factor of many diseases and impaired health, but in contrast to this state our study revealed better indices of the health status in men than in women. The reason of this must be found in social-cultural factors and national traditions, which provide more appreciation of and respect for men.

Regular physical exercises, having dinner together with family, good dietary intake significantly correlated with intake of protein, zinc, iron and vitamins. The education level in elderly men was higher. At the same time they

got more and better care than women. The factors mentioned above evidently have an effect on the life span.

An analogous Italian study showed contrary data. It was revealed that the life span was less depended on gender. Elder women had better living conditions than men. Such differences between Georgian and Italian research data are due to cultural and anthropological features.

Studies of long-lived persons show that geographi-

cal location has a certain influence on human health and nutrition status. Long-lived men are fewer than women but they have better health. They follow active life, get more and better care.

All our research results mentioned above attest that the place of residence and living conditions influence long-lived men and women in different ways because of different physical activity, dietary intake, diet habits and social-cultural attitudes.

სამედიცინო მეცნიერებანი

გარემო ფაქტორების, ცხოვრების წესის და სქესის ზეგავლენა დღევანდელთა ჯანმრთელობის სტატუსზე

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2004-2007 წლებში აკად. ნ. ყიფშიძის სახელობის თერაპიის ეროვნულ ცენტრში ჩატარდა კვლევა, რომელიც მოიცავდა დღევანდელთა სოციალურ, სამედიცინო, კვების, ფსიქოლოგიურ, ეკოლოგიურ, დემოგრაფიულ და ანთროპოლოგიურ ასპექტებს. კვლევის განმავლობაში გამოვლინდა მრავალი საინტერესო თავისებურება სქესთან, გეოგრაფიულ მდებარეობასა და კვების რაციონთან მიმართებაში. დღევანდელ ქალთა და მამაკაცთა თანაფარდობა შეადგენდა 6/1, თუმცა ეს არ იყო ფიქსირებული მაჩვენებელი და იგი იცვლებოდა გეოგრაფიული მდებარეობის მიხედვით (მთიანი რეგიონები, სანაპირო ზოლი). კვლევის განმავლობაში ასევე გამოვლინდა მნიშვნელოვანი განსხვავება კვებით ფაქტორებში ამ ორ ფართო გეოგრაფიულ ჯგუფს შორის. მთიან რეგიონში მცხოვრებ უხუცესთა ჯანმრთელობის მდგომარეობა იყო გაცილებით უკეთესი ვიდრე სანაპირო ზოლში მცხოვრებ დღევანდელ ადამიანებში. ამის საფუძველზე შეიძლება დაგასკვნათ, რომ საცხოვრებელი ადგილი და სქესი მნიშვნელოვან ზეგავლენას ახდენს ადამიანის სიცოცხლის ხანგრძლივობაზე. ამავე კვლევაში აღინიშნა კვებითი რაციონის და ფიზიკური აქტივობის განსაკუთრებული როლი ადამიანის სიცოცხლის ხანგრძლივობაზე. საქართველოში ქალთა სიცოცხლის საშუალო ხანგრძლივობა მნიშვნელოვნად მეტია მამაკაცებთან შედარებით. სხვაობა შეადგენს საშუალოდ შვიდ წელს. მრავალი სამეცნიერო ნაშრომი ამტკიცებს რომ მამაკაცებთან შედარებით ქალებს აქვთ სიცოცხლის ხანგრძლივობის გენეტიკური უპირატესობა. სხვა მონაცემების თანახმად გეოგრაფიული მდებარეობა, განსაკუთრებით მთიანი რეგიონები ასევე დიდ ზეგავლენას ახდენენ ადამიანის სიცოცხლის ხანგრძლივობაზე.

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