Demographic and Anthropometric Variables Related to Longevity: Results from a Greek Centenarians' Study

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Abstract: Centenarian research contributes to expanding our knowledge on longevity and healthy aging. In Greece, a variety of studies have been conducted in order to explore exceptional longevity. This is a retrospective study of 106 centenarians employing both quantitative and qualitative measures in order to explore centenarians own perspective on longevity. Basic socio demographic and life style variables where associated with centenarians beliefs and perceptions about their longevity. The majority of centenarians attributed their longevity to God and to living a good life overall. God and social networks were reported as their main source of strength in order to continue living. Gender differences were also evident as male centenarians reported non abusive behaviors and a sense of having a measure in daily living, as well as nutrition as their main source of longevity, while female emphasized on God and social networks. Gender differences on Body Mass Index and Smoking are also evident. Centenarians own perception of longevity could be further explored and findings could be incorporated in future research and intervention programs aiming at healthy longevity.

Keywords: Centenarians, longevity, Greek Population, aging.

INTRODUCTION

Centenarians' research plays an important role in the study of health and longevity [1]. The evident gradual increase of both the number of centenarians and life expectancy in developed countries has stimulated researchers to study the putative determinants of longevity that would be taken into account when designing and applying new public health policies [2].

According to official statistics, 1.737 centenarians lived in Greece in 2011, ranking the country in the 12th place among 32 OECD (The Organization for Economic Co-operation and Development) countries, with regards to centenarian's rate [3]. In recent years, various studies have focused on exploring functionally, perceptions, attitudes and life style choices of Greek centenarians [3, 4, 5, 6]. Regarding the mapping of centenarians' anthropometric and socio-demographic characteristics, numerous studies in different regions of the world have been conducted [3, 7-12]. Contrary to the number of quantitative studies, the qualitative ones are rather limited, with relatively small samples [4, 13-16].

Still, qualitative studies in centenarians are of great importance as they highlight, perceptions, beliefs, attitudes, life style choices, and provide an opportunity for more in depth analysis.

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The current study aims at expanding our current knowledge on centenarians. The objectives are: a) to examine the mapping of demographic and anthropometric variables in centenarian population including variables as age, gender, Body Mass Index (BMI), income, smoking, occupation and number of children) b) the correlation of the aforementioned variables with selective qualitative data regarding centenarians perceptions about their longevity. Findings, could enhance current knowledge and contribute to a better understanding of the mechanisms that allow centenarians to enjoy exceptional longevity, incorporating centenarians own views about longevity.

METHOD

Sample

The final analysis includes 106 Greek centenarians (56.5% female), spanning age 100 to 110. The mean age of the sample was 101.66 years (SD= 2.02).

For sampling purposes and in the absence of an updated official registry system, a snowball like technique was applied in order to identify centenarians. Interviewers employed their social networks and contacts with officials and health professionals (i.e. hospitals, health centers, open care centers for the elderly etc.) in order to identify centenarians, throughout all the Greek region. Hence, our sample is a convenient sample, but extends throughout the Greek region, reflects the distribution of the general population in terms of gender and constitutes a sizeable percentage of all centenarians in Greece. The

ISSN: 1814-8085 / E-ISSN: 1927-5129/15

only exclusion criteria applied, was severe cognitive dysfunction (i.e Alzheimer) that would not allow the centenarian to participate and complete the interview.

Data Collection Tools

For data collection, a semi-structured interview was conducted, including 26 questions, covering 5 thematic axis, namely a) longevity interpretation (i.e. What gives you the strength to continue living?), b) interpersonal relations (i.e., What are your criteria for selecting friends?), c) self-image (i.e., Do you love yourself?), d) lifestyle (i.e., How important would you say is your personal schedule in your life?), and e) philosophy – attitudes (i.e., Do you have any connection with society, nonprofit organizations). The content of the interview guide is fully presented in Table **1**.

Additionally, socio-demographic characteristics including age, gender, place of residence, income, and number of children were recorded. Anthropometric measures included BMI, while life style choices

Table 1: Interview Guide with Centenarians

Interview guide-questionnaire
A) Longevity interpretation
1. In your opinion, what is the main reason for reaching this age?
2. What do you think gives you strength to continue living?
B) Interpersonal relations
3. Do you think you had the upper hand in the relationship with your partner?
4. What were your criteria to hang out with someone?
5. How do you react to disagreements-fights?
6. In your opinion do your children resemble you or the other parent?
7. How do you react to others' criticism?
8. How easily are you influenced by others' opinion in your decisions?
C) Self-image
9. Do you love yourself?
10. How would you describe yourself in a few words?
D) Lifestyle
11. Do you generally set about many things?
12. What is healthy for you?
13. How important would you say your daily schedule was in your life?
E) Philosophy-Attitude
14. Are you satisfied with your life?
15. Would you say that your childhood was happy?
16. What are you most afraid of in your life?
17. Do you have any feelings of guilt?
18. When do you have feelings of guilt?
19. Do you have unfulfilled desires?
20. Did you have any connection with society for the greater good?
21. Are you happy?
22. What is God to you?
23. What are the most important things in your life?
24. What do you think about death?
25. What do you do when you encounter something that causes you stress?
26.If you lived again, what would you change?

included questions on smoking. BMI calculation was in accordance to the weight/height*2 formula. Four categories were formed: low BMI (<18.5 kg/m2), normal (18.5–24.99 kg/m2), overweight (25–29.99 kg/m2), and obese (≥30 kg/m2). Finally diagnosed medical conditions were also recorded.

Process

Interviews were carried out by a team of experienced interviewers, all health professionals. All participants were informed about the purposes of the study and the process, and prior to conducting the interview an informed consent was obtained. A few days after the first written contact, a telephone contact was made for appointment arrangements and to finalize the dates of the interview. The interviews were conducted in centenarians residences, as well as outdoors (i.e., coffee houses) at the request of centenarians. The age of the participants was validated by providing an official registry paper, as their official identification card, passport, or a birth certificate. In cases of doubt as to the real age, individuals were excluded from the study.

Interviewers were given clear instructions to keep an active listener role to the maximum extent, and to allow centenarians to freely express what they wanted. Interviewers could only intervene in the flow of the centenarian's answers when participants were completely off the subject, in order to re ask the question, or clarifying a question (i.e. What exactly does it mean?), but always without violating the main structure of the interview and their instructions.

Firstly, all essential socio-demographic, anthropometric and life style variables were collected. Afterwards, the semi-structured interview was conducted. The average duration for the interviews was approximately 38 minutes, and not all centenarians provided answers to all questions. All interviews, with the centenarians' informed consent were videotaped to ensure no loss of data, but as well as to record any nonverbal information's. All interviews were afterwards transcribed verbatim.

Data Analysis

The data deriving from the transcribed interviews were re coded in quantitative terms in order to be statistically processed (Robson, 1994). The quantitative codification was implemented after expert group meetings were conducted, consisting of psychologists, health visitors, physicians and members of the interviewers in order to have a full consensus on codification – consolidation of similar answers and gradation as to codification of extreme answers – values.

In the statistical analysis the distributions of the 106 participants were calculated as to each question and percentages per answer. At a second level, we implemented correlational analyses (pearson r) to diagnose relations between axes and factors. Finally, we implemented analysis of variance (ANOVA) to determine statistically significant differences in averages. Statistical calculations were performed using SPSS Vol.21 (SPSS Inc., Chicago, IL).

RESULTS

106 Greek centenarians were included in the analysis. 56.5% were female, spanning age 100 to 110. The mean age of the sample was 101.66 years (SD= 2.02). Female centenarians had a statistically significant higher average age compared to males ($p<0.05$).

Regarding their place of residence, 48.10% centenarians lived in urban centers (>10,000 residents), while 51.90% lived in provincial areas (<10,000 residents). In terms of their past occupations, the majority of women reported being housewives for the most of their lives (52%), while the majority of men, (39%) being farmers.

Regarding other socio-demographic variables, only 5.9% of centenarians reported not having children. 27.7% have two children, 19.8% three children, 11.9% four while having one child was reported by 8.9%. Five children or more was reported by 26.4%

The average monthly income of centenarians was 596.63 Euros (SD =369.79). Our analysis in order to explore the effect that income might have on shaping perceptions, attitudes and life style choices, showed a connection between income and the attachment to society for a greater cause (meaning people being more involved with society and working within it in order to achieve a greater cause for all). In more detail, we found that centenarians, who reported higher monthly income, reported having a stronger connection with society for achieving a greater cause, compared to those who had lower incomes. In terms of income, centenarians who actively participated in public affairs and maters, reported an average income of 693.92

Euros, while those who had not been involved, had an average income of 527.71 Euros. Difference in averages was marginally statistically significant (p= 0.089, F=3.004).

In addition, correlational analysis showed a statistically significant relationship between income and daily routine [r=+0.268 (p<0.05]. More specifically, higher income was positively related to centenarians believing that having and maintaining a daily routine and schedule is very important.

Regarding anthropometric measures, BMI analysis showed that 2% of the centenarians were underweight (low BMI), 67.6% were of normal weight, 21.6% were overweight and 8.8% were obese. Gender analysis showed no statistically significant differences in low and normal BMI categories. In the contrary both in the overweight and obese categories women outnumbered men in a significant statistical level (p>0.05).

Regarding participants smoking habits, 82.1% were nonsmokers, and 13.2% reported been ex-smokers. Gender analysis showed that the vast majority of women do not smoke, nor used to (93%), as opposed to men who reported to currently being smokers or ex-smokers at a higher proportion (33%). This gender difference is statistically significant (p<0.001). Furthermore, average daily cigarette consumption among smokers, was recorded at 6.20 cigarettes per day. The mean value of the years that the ex-smokers reported having quit the habit is 45 years and the mean value of the years of being active smokers was approximately 26.30 years. This means that centenarians who reported been ex-smokers were engaged to that habit for almost 1/4 of their lives.

Table **2**, summarizes the results on the first open question regarding centenarians own interpretation of longevity, "In your opinion what is the reason for reaching this age?" Frequencies are reported both for the total sample population and in terms of gender. Statistical differences are also presented. As shown in Table **1**, sixteen major categories of answers were formed after the appropriate re coding of the qualitative data. The majority of the centenarians 26.2% attributed their longevity to “God”, while 19.81% believed that the fact that they have lived a good life (in terms of a happy, full filing life) is the main reason of their exceptional longevity. 16.04% answered that their nutrition is the source of longevity, while an 11.32% said that not being engaged in any abusive behavior (in terms of food, alcohol and in terms of daily leaving) and having a simple life characterized by always keeping a measure, is the source of their longevity. A total of 10.38% of the centenarians believe that industriousness, meaning hard working, is the reason for their long lives, while 5.66% attributed their longevity to lack. 5.66% of centenarians also answered that they do not know the reason at all, while only 4.72% of centenarians believe that their genes are the reason of their longevity.

Gender analysis, also presented in Table **1** showed some statistical significant differences. In more detail, been a male centenarian, is significantly correlated to the "absence of abuses and having a simple life characterized by always keeping a measure", (p <0.001) while being a female centenarian is significantly correlated with "God" (p <0.001) and having "social networks" (p <0.05).

The second question exploring their interpretations of longevity was "What do you think gives you the strength to continue living". After re coding the qualitative data, seventeen major theme answers emerged. Findings are fully presented in Table **3**. According to results, 37.74% of centenarians rely on their social networks to keep on living and 12.26% on God. A total of 8.49% stated that they do not wish to continue living and a 6.60% of centenarians answered that nothing gives them the strength to continue living. Statistically significant gender differences were also evident. Women had a statistically significant higher chance to report unwillingness to keep living (p <0.01) compared to men, and to draw strength from their social networks (p <0.01). On the contrary, male centenarians had a statistical significant chance to report their nutritional choices as the source of their strength in order to continue living up to this age (p <0.05).

DISCUSSION

The high rate of centenarians in Greece, rating 12th among 32 OECD countries, makes Greece a country of research interest regarding centenarians, and findings from such studies add to previous knowledge [3]. Our study, contrary to previous quantitative studies, correlates socio-demographic and anthropometric characteristics with qualitative findings about centenarian’s own interpenetration of their longevity.

According to our findings from the analysis on centenarians own interpretation of their longevity, the majority of them attributes it to God and they find

Table 2: "In your Opinion what is the Reason for Reaching this Age?" Frequencies and Gender Differences

Longevity causes	Men	Women	Number of participants who stated it	Percentage of the total	Sig.
The cause of reaching this age is God	5	23	28	26.42	***
The cause of reaching this age is Good Life	6	15	21	19.81	NS
The cause of reaching this age is Nutrition	8	9	17	16.04	NS
The cause of reaching this age is Absence of Abuses/Simple Living (keeping a measure)	12	0	12	11.32	***
The cause of reaching this age is Industriousness	7	4	11	10.38	NS
The cause of reaching this age is Luck	2	4	6	5.66	NS
I do not know what is the cause of reaching this age	3	3	6	5.66	NS
The cause of reaching this age is Quiet Life	4	1	5	4.72	NS
The cause of reaching this age is Biological/Genetic Factors	3	2	5	4.72	NS
The cause of reaching this age is Social Networks	0	5	5	4.72	*
The cause of reaching this age are Personality Traits	3	1	4	3.77	NS
There is no cause for reaching this age	1	1	2	1.89	NS
The cause of reaching this age is Austere Lifestyle	1	1	2	1.89	NS
The cause of reaching this age is Sleep Quality	1	0	1	0.94	NS
The cause of reaching this age is Non-Urban Environment	0	1	1	0.94	NS
The cause of reaching this age is Financial Situation	0	1	1	0.94	NS

*p>0,05.
***p>0,001.

Table 3: "What do you think Gives you Strength to Continue Living?" Frequencies and Gender Differences

	Men	Women	Total	Percent %	Sig.
What gives me courage to continue living is my social networking	12	28	40	37.74%	**
What gives me courage to continue living is divine providence/ God	6	7	13	12.26%	NS
I do not want to live any more	1	8	9	8.49%	*
Nothing gives me courage to continue living	3	4	7	6.60%	NS
What gives me courage to continue living is health/absence of disease	2	4	6	5.66%	NS
What gives me courage to continue living is my own strengths	4	1	5	4.72%	NS
What gives me courage to continue living is industriousness	3	1	4	3.77%	NS
What gives me courage to continue living is my proper nutrition	4	0	4	3.77%	*
What gives me courage to continue living is good life	1	2	3	2.83%	NS
What gives me courage to continue living is my will to live	2	1	3	2.83%	NS
What gives me courage to continue living is my love for life	2	1	3	2.83%	NS
What gives me courage to continue living is avoidance of tensions	2	1	3	2.83%	NS
What gives me courage to continue living is my satisfaction with life	2	0	2	1.89%	NS
I do not know what gives me courage to continue living	1	1	2	1.89%	NS
What gives me courage to continue living is my self-management	1	0	1	0.94%	NS
What gives me courage to continue living is sleep	1	0	1	0.94%	NS
What gives me courage to continue living is my daily activities	1	0	1	0.94%	NS

**p<0,01.
*p<0,05.

strength to continue living at this age, in their social networks. Still, interesting statistical significant gender differences exist.

More specifically, being a male centenarian seems to associate longevity to the absence of abuses and living a simple life characterized by always keeping a measure in daily life, while their strength to continue living at this age derives from proper nutrition choices. On the other hand, female centenarians attribute their exceptional longevity mainly on God and on managing to keep strong social networks, which is also their main source of strength to continue living. Moreover, women are more prone to report an unwillingness to continue living at a higher statistical level compared to men.

This could probably be the effect of different locus of control characteristic in male and female centenarians. More specifically, answers of men suggest a rather internal locus of control center, believing that they are solely responsible for things that happen in their lives. On the contrary, the answers given by women indicate a rather external locus of control center, which is consistent with previous data regarding gender differences of locus of control center in centenarians [17].

The fact that a significant number of female centenarians answered that they do not wish to continue living is possibly attributed to their poor functional status and their increased likelihood of chronic diseases which, as mentioned before, has been demonstrated by several studies to date.

Regarding findings on socio-demographic and anthropometric measures, the total mean age years was 101.66 years, resembling that of the Iowa Centenarian Study [8]. Women in our sample are older than men in contrast to the sample of an earlier study in Greek centenarians where there was no significant difference between average age of male and female centenarians [5]. In complete accordance with our findings, other studies show that increased age is more often in women. For example, a study in Switzerland has indicated the ratio of women to men as to the probability of survival over 80 years at 2.2/1, while the ratio for living over100 years was estimated at 6.2/1 [11].As to super centenarians, that is people older than 110 years, on January 15, 2014 there were 63 women and only 4 men [18] thus reflecting the ratio of men to women at 15.75/1.

Findings on BMI, indicated a percentage of 67.6% normal weighted centenarians, which is a bit higher than that of a previous study in centenarians in Greece, in which 60% had normal BMI [3] and much higher than the 54% of the Iowa Centenarian Study [8]. Statistical significant higher proportions of female centenarians being overweight or obese compared to males is inconsistent with previous studies on Greek centenarians, and it could be attributed to the fact that this is a convenient and non-representative sample of centenarians.

Regarding financial state, the average income of our sample was 596.63 Euros, a percentage well below the average income of Greeks at the time of the interviews [19]. The above finding is inconsistent with the results of a Swedish study where centenarians seemed not to differ to a great extent from the general population in terms of their income [20]. In our study, income was also found to be positively related to engagement in social activities aiming at serving a greater cause. One can assume, that centenarians with higher income, and hence in a better financial state, are those with the ability to contribute to public affairs, but also that, exactly because of this engagement to public affairs, they acquired a higher income. Higher income was also positively associated with the question ‘‘How important would you say your personal daily schedule was in your life?”. Perhaps people with austere personal schedule are able to gain an increased income.

Although previous research on longevity has focused on the relationship between longevity and both the place of residence [21] and having children [22] the lack of Greek birth cohorts perspective monitoring does not allow us to make comparisons and draw conclusions about a possible relationship of these variables in our study. The above in combination with the rapid socio-demographic changes in Greece after the end of WWII cannot allow any comparisons at all, since residency of participants may have changed several times during their lifetime due to increasing internal migration.

Regarding smoking, male centenarians reported statistically significant higher proportion of been smokers or ex-smokers compared to female centenarians. The 82.1% of our sample who reported never having smoked is in much consistent with the 83.3% of an Italian study [23] and demonstrates the importance of abstinence from smoking in favor of longevity. Furthermore, the small number of cigarettes per day, the small period of smoking and the many years of abstinence from smoking should be

considered as of particular utility in promoting antismoking campaigns and developing health promotion programs for smoking prevention and cessation.

The major limitation of our study is that our sample is non-representative and hence some of the findings should be verified by further research. With regards to our sample's ratio of women and men (1.3/1,) that contradicts ratios of 1.69/1 [6] and 2.35/1 [3], shown by earlier Greek studies, as well as international ones with similar or even higher proportions of women to men [10, 11, 24-26], a possible explanation could be the nature of the current qualitative study. Women centenarians are shown to enjoy less good health and functionality compared to men [24, 27]. Hence, they are less likely to participate in a lengthy interview that requires a lot of time and a relatively good health status.

In conclusion, socio-demographic and anthropometric data of our study, with the exemption of male to female ratio do not seem to be inconsistent with the findings of other studies in centenarians. The present study is part of a greater study regarding centenarians. Our data will help the discovery of the psychological and behavioral profile of centenarians. Future research directions also include the depiction of structural models regarding longevity with focus on psychological, social, economic and environmental variables.

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Received on 22-04-2015 Accepted on 12-05-2015 Published on 17-06-2015

http://dx.doi.org/10.6000/1927-5129.2015.11.54