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Lifestyle Factors of People with Exceptional Longevity

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Abstract

OBJECTIVES—To assess lifestyle factors including physical activity, smoking, alcohol consumption, and dietary habits in men and women with exceptional longevity.

DESIGN—Retrospective cohort study.

SETTING—A cohort of community-dwelling Ashkenazi Jewish individuals with exceptional longevity defined as survival and living independently at age 95 and older.

PARTICIPANTS—Four hundred seventy-seven individuals (mean 97.3 ± 2.8, range 95–109; 74.6% women) and a subset of participants of the National Health and Nutrition Examination Survey (NHANES) I (n = 3,164) representing the same birth cohort as a comparison group.

MEASUREMENTS—A trained interviewer administrated study questionnaires to collect information on lifestyle factors and collected data on anthropometry.

RESULTS—People with exceptional longevity had similar mean body mass index (men, 25.4 ± 2.8 kg/m^2 vs 25.6 ± 4.0 kg/m^2, P = .63; women, 25.0 ± 3.5 kg/m^2 vs 24.9 ± 5.4 kg/m^2; P = .90) and a similar proportion of daily alcohol consumption (men, 23.9 vs 22.4, P = .77; women, 12.1 vs 11.3, P = .80), of regular physical activity (men: 43.1 vs 57.2; P = .07; women: 47.0 vs 44.1, P = .76), and of a low-calorie diet (men: 20.8 vs 21.1, P = .32; women: 27.3 vs 27.1, P = .14) as the NHANES population.

CONCLUSION—People with exceptional longevity are not distinct in terms of lifestyle factors from the general population, suggesting that people with exceptional longevity may interact with environmental factors differently than others. This requires further investigation.

Keywords

longevity; lifestyle

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Several studies have suggested that lifestyle and genetic factors play an important role in human longevity by protecting against age-related chronic diseases such as cancer, cardiovascular disease, and dementia.[1] Although it is difficult to estimate the relative contributions of these two factors in promoting healthy longevity, studies conducted in monozygotic and dizygotic twins in Scandinavian countries have indicated that genetic factors may contribute to one-third of the genetic variance in life expectancy,[2,3] but these results may not be relevant to people who live exceptionally long, for example, to 100 years. Evidence from existing studies suggests that the genetic contribution to a healthy life span in those with exceptional longevity may be greater than that in the general population,[4–6] and several genes have been found to be associated with longevity these individuals.[7–11] Although most of the studies in individuals with exceptional longevity have focused on genetic factors, the lifestyle of this population has received less attention. It is possible that those with exceptional longevity may practice a healthy lifestyle, or “longevity”-associated genes may protected them against the detrimental effects of an unhealthy lifestyle. To evaluate the lifestyle factors, including obesity, smoking, and physical activity, of individuals with exceptional longevity, a study was conducted in a well-defined cohort of Ashkenazi Jews with exceptional longevity.[10–12]

METHODS

A cohort of Ashkenazi Jews with exceptional longevity was recruited as previously described.[10,12–14] The Ashkenazi population descended from a founder population (estimated to be tens of thousands) originating in the 15th century.[15] Most of the study group were born in the United States or moved there before World War II.

The current analysis reports information collected on 477 Ashkenazi Jewish participants with exceptional longevity, defined as aged 95 and older. Birth certificates or dates of birth as stated on passports were used to verify participants’ ages. The study population had a mean age of 97.3 ± 2.8 (range 95–109) and included 74.6% women. In general, this study population is well educated for the pertinent time period, with almost 75% of the individuals completing at least high school. Detailed sociodemographic and personal and medical history data were collected as previously described.[12–14]

To calculate the prevalence of overweight and obesity during lifetime, the reported maximum height and weight, which was available in 339 individuals, was used. Participants were queried about lifestyle factors present at approximately age 70 rather than currently (at age ≥95), because it is more likely that this represents the general lifestyle followed for most of their adult life. Data on smoking history was available in 388, physical activity (At approximately the age of 70 years, how often did you engage in moderate exercise including regular walking, bicycling, housework etc.?) in 336, and dietary habits (Before the age of 70, did you try any of following diets?—with options of low-calorie, low fat etc.?) in 218. In addition, 293 of these participants answered an open-ended question, “In your opinion, what do you think contributed to your long life?” and were allowed to include more than one factor. Written informed consent was obtained in accordance with the policy of the Committee on Clinical Investigation of the Albert Einstein College of Medicine, New York.

As a comparison group, data from white individuals aged 65 to 74 (n = 3,164; 52.7% female; mean age 69.0 ± 2.8) from the National Health and Nutrition Examination Survey (NHANES) I collected between 1971 and 1974 were used.[16,17] These individuals were chose for comparison because this group represents essentially the same birth cohort as the study population with exceptional longevity. Of these individuals, 3,161 reported data on physical activity and alcohol consumption and 1,036 on smoking. For appropriate comparison of prevalence of overweight and obesity during their lifetime, data from all adults aged 21 and older (n = 13,178) in NHANES I were used. In this group, information on dietary habits, such as low fat, low salt, or low calorie, was available in 1,838 individuals.

RESULTS

As shown in Table 1, for men and women, mean body mass index (BMI) was similar in those with exceptional longevity and the NHANES I population. Furthermore, there was no difference in proportion of overweight or obesity in the two groups (men, 47.8% vs 55.0%, $P = .31$; women, 43.8% vs 41.2%, $P = .71$). When obesity and overweight was evaluated separately in women, the lifetime overweight prevalence was higher in those with exceptional longevity than in NHANES I (34.2% vs 25.0%; $P = .001$), although this trend was the opposite for obesity prevalence (9.6% vs 16.2%; $P = .006$). In men, although the prevalence of lifetime obesity was higher in NHANES I than in the study population (12.1% vs 4.5%; $P = .03$), the overweight prevalence in these two groups was similar (43.3% vs 42.9%; $P = .89$).

As seen in Table 2, although the ever-smoking rates in men in NHANES (74.5%) were higher than in the study population, a substantial proportion of men with exceptional longevity (59.6%) had smoked more than 100 cigarettes during their lifetime. In addition, male smokers in the study population reported an average ± standard deviation of 33.9 ± 19.5 (range 1–85) years of smoking during their lifetime, with an average of 14.1 ± 11.5 (range 1–48) cigarettes per day. The smoking rates were similar in the two populations. In addition, a higher proportion of long-lived men reported consumption of any alcohol than of NHANES I men (76.4% vs 67.0%; $P = .07$), which was opposite the trend observed in women, who had much lower self-reported alcohol consumption. The proportion of individuals consuming alcohol daily was similar in the two populations for both sexes, although lack of information on duration of consumption in the cohort limits these data. In terms of physical activity, only 43% of men with exceptional longevity reported regular exercise of moderate intensity, which was lower than in the NHANES population ($P = .07$). These estimates in women were similar in the two groups. In addition, the proportion of men and women reporting special dietary habits such as low-fat or low-calorie diets were similar.

In response to their beliefs about factors that may have contributed to their long life (Table 3), more than one-third of individuals suggested the role of family history or “good” genes. Although this answer was most popular in women, men commonly reported healthy diet. Twenty percent of individuals (higher proportion of men than women) believed that physical activity also played a role in their lifespan. Other factors included positive attitude (18.8%), busy or active life (11.6%), less smoking and drinking (14.7%), good luck (8.2%), and religion or spirituality (5.8%); the perceptions of their relative importance differed according to sex.

DISCUSSION

Overall, this study suggests that people with exceptional longevity were not healthier earlier in life in terms of BMI, smoking, physical activity, or diet than the general U.S. population. These results support the notion that those with exceptional longevity may interact with environmental and lifestyle factors differently than others.

As previously noted, it has been suggested that, in the general population, lifestyle factors play a larger role in human lifespan than do genetic factors. Studies in the Seventh Day Adventist population, who typically follow a healthier lifestyle, suggest that such choices could add up to 8 additional years of life expectancy,[18] although the role of genetics in the human lifespan may be more relevant in extreme longevity than in the general population. Studies in older adults in the United States suggest that male and female siblings of centenarians were 17 and 8 times as likely to attain the age of 100 as controls, suggesting that the survival probabilities for siblings of centenarians increase markedly at older ages.[6] It was previously shown that the parents of people with exceptional longevity were more likely to have lived to the age of 90 to 100 than parents of controls.[14] It was also found that children of these long-lived individuals had a lower prevalence of cardiovascular disease, hypertension, and lipid abnormalities than age-matched controls.[12,14] It has previously been shown that several genes are associated with age-related illnesses and human longevity in different populations.[9–11,19–22] Some of these genes include those related to cholesteryl ester transfer protein,[9] apolipoproteins,[10,23] methylenetetrahydrofolate reductase enzyme,[24] angiotensin converting enzyme,[23] FOXO3A,[25] and adiponectin.[11] Although people with exceptional longevity may interact differently with the environment, they also seem to possess as many risk alleles associated with high disease risk as the general population.[7,26] This was also observed in the current study population, and a “buffering” mechanism by which longevity alleles protect against diseases alleles has been suggested.[27] Thus, although for most people, interaction with the environment is important, and a healthier lifestyle may enhance lifespan, the presence of longevity genes in people with exceptional longevity counter the presence of disease-associated genes.

Not only shared genes, but also shared lifestyle and environmental factors could explain the aforementioned exceptional longevity trait in families, but it is difficult to estimate the relative contribution of these two factors, commonly referred to as “nature vs nurture.” The current study did not find a pattern of apparently healthier lifestyle in terms of body weight, smoking, and physical activity in the population of individuals with exceptional longevity. In addition, most of these individuals did not claim a proactive reason for their longevity, whereas one-third of the participants reported a family history of longevity as the most popular answer. It may be that the longevity genes may help their bearers to interact with the environment more favorably than the rest of the population. For example, if a particular gene may prolong life by protecting against cardiovascular disease, specifically by defending against the detrimental effects of smoking on the process of atherosclerosis, such a gene will be more common in people with exceptional longevity, despite high smoking rates.

Furthermore, different genotypes may be differently associated with relevant clinical phenotypes depending on the presence or absence of certain environmental and lifestyle factors. For example, in the case of the above-hypothesized gene, it is possible that the protective effects may be apparent only in smokers. This is analogous to existing evidence from studies in *Drosophila*, where crowding, as measured by larval density, affects lifespan only in long-lived strains but not in short-lived strains.[28] Thus, despite a similar lifestyle portfolio of the cohort of exceptional longevity and the general population, individuals who bear several such longevity genes may be protected from developing age-related illnesses resulting in a longer, healthier life.

The existence of a well-defined cohort of people with exceptional longevity is a unique strength of this study, but certain limitations need consideration. First, although it was attempted to choose a comparison group that best represented a birth cohort similar to the study population, it is possible that the subset of NHANES included was not a perfect comparison. In addition, it was possible to compare only the lifestyle factors collected in the study, and it is possible that there may be important differences in certain unmeasured environmental factors between the two groups. Furthermore, recall bias and imprecision of the instruments used also limited the collected data, which could explain the lack of significant difference. In conclusion, although lifestyle factors are important for determining lifespan in humans, their contribution to extreme longevity remains debatable. This study suggests that people with exceptional longevity reach older ages despite lifestyle choices similar to those of the general population, supporting the notion that genetic factors related to exceptional longevity may also protect against the detrimental effects of poor lifestyle choices. It is also possible that epigenetic factors may contribute to exceptional longevity.[29] Future studies should confirm these findings and evaluate specific gene–environment interactions in relation to age-related diseases and longevity.

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Conflict of Interest: The editor in chief has reviewed the conflict of interest checklist provided by the authors and has determined that the authors have no financial or any other kind of personal conflicts with this paper.

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Table 1

Mean Maximum Body Mass Index (BMI) and Prevalence of Overweight and Obesity During Lifetime in People with Exceptional Longevity and the National Health and Nutrition Examination Survey (NHANES) Population

	Men			Women		
BMI, kg/m^2	**With Exceptional Longevity (n = 90)**	**NHANES (n = 5,254)**	***P*-Value**	**With Exceptional Longevity (n = 249)**	**NHANES (n = 7,924)**	***P*-Value**
Maximum, mean ± standard deviation	25.4 ± 2.8	25.6 ± 4.0	.63	25.0 ± 3.5	24.9 ± 5.4	.90
<25.0, %	52.2	45.0	.19	56.2	58.8	.33
≥25.0, %	47.8	55.0	.31	43.8	41.2	.71
25.0–29.9 (overweight), %	43.3	42.9	.89	34.2	25.0	.001
≥30.0 (obese), %	4.5	12.1	.03	9.6	16.2	.006

Table 2

Lifestyle Factors in Ashkenazi Centenarians and National Health and Nutrition Examination Survey (NHANES) I Population

	Men			Women		
Lifestyle Factor	**Exceptional Longevity (n = 90) (%)**	**NHANES (n = 1,497) (%)**	***P*-Value***	**Exceptional Longevity (n = 356) (%)**	**NHANES (n = 1,667) (%)**	***P*-Value***
Smoked ≥100 cigarettes during life	59.6	74.5	.003	29.9	26.2	.25
Consumed alcohol daily	23.9	22.4	.77	12.1	11.3	.80
Reported regular moderate physical activity	43.1	57.2	.07	47.0	44.1	.76
Reported low-calorie	20.8	21.1	.32	27.3	27.1	.14
Reporting low-fat	29.1	41.1	.17	35.4	38.5	.22
Reporting low-salt diet	32.1	34.3	.80	30.5	30.1	.67

*Derived from Student *t*-test or chi-square test.

Table 3

Beliefs About Factors Contributing to Long Life in People with Exceptional Longevity

Factor	Women (n = 214)	Men (n = 79)
“Good” genes	34.6	25.3
Diet	28.0	35.4
Physical activity	15.9	31.6
Positive attitude	16.8	24.1
Social or family support	14.0	24.1
No smoking and moderate alcohol	10.3	26.6
Keep busy or active, work	8.4	20.3
Luck	7.9	8.9
God, religion, spirituality	7.0	2.5
Charity or helping those in need	5.6	2.5